A1.1 BACKGROUND

One of the key areas of input for the assessment process adopted in this study is land use change. The value commonly employed to represent this change is total impervious area (TIMP) of the watershed. TIMP is a parameter that addresses land use change in a quantifiable manner while also representing a key aspect of the way in which land use change can impact hydrologic regime. It is a commonly accepted premise in planning and stormwater management that as a watershed is developed, and surface areas become impervious (or less pervious), that a larger percentage of rainfall becomes runoff, and runoff makes its way into stream channels much quicker than it did prior to development. Therefore, TIMP is a good variable to use in the search for relationships between development (urbanization) and change in stream channel morphology.

A1.2 PROCESS

In order to estimate the change in TIMP over time in the watersheds of the study sites three sources of data were used. The primary source was land use data from the Southern California Association of Governements (SCAG). They had commissioned a series of land use maps to be prepared by Aerial Information Systems of Redlands, CA that used black and white aerial photographs from 1990 and 1993, and color aerial photographs from 2001. These maps were provided in the form of ArcGIS compatible files geo-referenced using the Universal Transverse Mercator (UTM) projection. These maps provided a good data set spanning an adequate period of time to cover most of the changes observed in the study sites. However, the time period covered fell a little short of the significant land use changes that have occurred in two of the Los Angeles County sites (Hasley and Plum canyons), and a little late for the changes that had occurred in some of the Orange County sites (Borrego Canyon and Serrano Creek). Thus two additional sources of land use data were obtained. Additional data on the Hasley Canyon and Plum Canyon watersheds were obtained from DigitalGlobe in the form of digital satellite imagery and an assessment of impervious area using computer evaluation of spectral data. Evaluation of earlier land uses within the Borrego Canyon and Serrano Creek watersheds came from a combination of aerial photo and map interpretation using historical documents.

SCAG Data. Land use areas were calculated from the SCAG data for each of the watersheds using ArcGIS software and the watershed boundaries, for the three years available in this data (1990, 1993, and 2001). Expected average percentages of impervious area for each of the land uses encountered in these watersheds were assigned based on general experience, literature values, and local knowlede of development practices. A summary of the selected values for percent impervious by land use, and the range of values recommended in the literature for the same or similar land uses, are provided in Table A1-1. Calculated land use amounts and impervious area percentages are given for the individual sites in Tables A1-2 through A1-11. Land use maps for each of the watersheds in each time period are provided in Plates A-1 through A-7.

DigitalGlobe Data. TIMP values for Hasley Canyon and Plum Canyon were calculated from the DigitalGlobe QuickBird® satellite imagery in a similar fashion. Areas showing construction of residential housing in the actual images for Hasley Canyon (taken on 23-July-2002) and Plum Canyon (taken on 22-March-2003) were coded under the SCAG land use category for Under Construction (1700) for the respective time period in each watershed. Since construction has since been completed in the Hasley Canyon watershed, and the density easily observable from the site, a subsequent time period (2003) was used to express the change from under construction to Low-Density Single Family Residential (1112) land use. The DigitalGlobe data was further divided at the Hasley Canyon site, because of the decision to split this location into an upstream site (encompassing cross section HAS-04) and a downstream site (including the HAS-01, HAS-02, and HAS-03 sections). The upstream cross section was above the tributary (storm drain) input from the newly developed part of the watershed, and therefore was

not subject to the effects of urbanization. Thus, the upstream site behaved more like a control site due to the lack of watershed change.

Construction was confirmed to be nearly complete for the Plum Canyon watershed at the time of field surveys. A brief inspection of these residential areas revealed them to be High-Desity Single Family Residential (1111) land use. Therefore, the current year (2004) was used to express this land use change for Plum Canyon.

In addition to these calculations made from the satellite imagery provided by DigitalGlobe, they also prepared separate calculations of impervious area by watershed. The TIMP values claculated by DigitalGlobe using their proprietory methods resulted in values that were slightly inconsistent with values caluculated from land uses with an assumed percent impervious. These data are also provided in Table A1-3 (for Hasely Canyon), Table A1-4 (for Plum Canyon upstream), and Table A1-5 (for Plum Canyon downstream). However, in order to use consistent values of TIMP for the different time periods in the assessment of relationships, only the TIMP values calculated from the land use assessments were used further. DigitalGlobe and Earth Tech are looking into the reasons for these inconsistencies between methods, but will have to report any results at a later date.

Aerial Photo Interpretation. The final data source was aerial photo interpretation of a series of balck and white photos taken from about 1952 through 1993. Land use areas had already been measured for the Serrano Creek watershed by Federico (2003) using these aerial photos and a series of USGS topographic quadrangle maps (7.5 minute series) covering the same time period. The Serrano Creek data had to be adjusted for the watershed area of the site location used in this study, and TIMP values calculated accordingly. The TIMP factors employed for the land use categories of this assessment are also given in Table A1-1, as the categories are different from the SCAG land use categories. The resulting land use area data and calculated TIMP values for Serrano Creek are provided in Table A1-8a. Land use maps showing each of these time periods are presented in Figures A1-1 through A1-5. Actual aerial photo interpretation was performed for the Borrego Canyon watershed for this study using the same aerial photos used by Federico (2003), but only for the time period prior to the SCAG data. The resulting land use area measurements and calculated TIMP values for the watersheds of the two Borrego Canyon sites are provided in Tables A1-6a and A1-7a. Figures A1-1 through A1-4 show the land use area maps for the corresponding time periods.

A1.3 RESULTS

Final calculations of land use areas, impervious surface areas, and TIMP are provided in the tables that follow. They are arranged by order of site number, starting with Topanga Creek (Site 1) and ending with Hicks Canyon (Site 27). Maps showing the location and areal coverage of land uses within each watershed are given in Plates A-1 through A-7 at the end of this Appendix. Maps of earlier land uses in the Borrego Canyon watershed and the Serrano Creek watershed are provided in Figures A1-1 through A1-5.

Table A1-1. Comparison of Land Use and Imperviousness

	SWAT (1)			Hromadka (2)		TR-55 (3)	Orange Co. (4)	Los Angeles Co. (5)	SCAG Land Use (6)			Aerial Photo Interpre (7)	
Category	Impervious Average	Connected Impervious	Impervious Range	Impervious Recommend	Impervious Range	Impervious Average							
Transportation	0.98	0.95	0.88 - 1.00						0.65	1413	Freeways and Major Roads	0.65	Major Roads
									0.95	1415	Bus Terminals and Yards		
									0.05	1420	Communication Facilities		
									0.05	1431	Electrical Power Facilities		
									0.05	1434	Water Storage Facilities		
									0.30	1435	Natural Gas and Petroleum Facilities		
									0.30	1436	Water Transfer Facilities		
									0.95	1437	Improved Flood Waterways and Structures		
Comercial or Downtown Business	0.67	0.62	0.48 - 0.99	0.90	0.80 - 1.00	0.85	0.80 - 1.00	0.909 - 0.985	0.80	1211	Low- to Medium-Rise Major Office Use	0.85	Commercial
									0.95	1222	Rail Centers (Non-Strip with Contiguous Interconnected Off-Street Parking		
									0.90	1223	Modern Strip Development		
									0.85	1224	Older Strip development		
									0.90	1231	Commercial Storage		
									0.75	1233	Hotels and Motels		
Industrial	0.84	0.79	0.63 - 0.99			0.72		0.655 - 0.958	0.85	1311	Manufacturing, Assembly, and Industrial Services	0.85	Industrial
									0.90	1323	Open Storage		
									0.05	1331	Mineral Extraction Other Than Oil and Gas		
									0.05	1332	Mineral Extraction Oil and Gas		
									0.85	1340	Wholesaling and Warehousing		
Institutional	0.51	0.47	0.33 - 0.84				0.30 - 0.50	0.473 - 0.819	0.60	1243	Fire Stations		
									0.60	1245	Religious Facilities		
									0.65	1253	Other Special Uses		
									0.40	1262	Elementary Schools		
									0.10	1272	Vacant Area		
									0.10	1275	Former Military Vacant Area		
Mobile Home Park				0.75	0.60 - 0.85		0.60 - 0.85	0.418	0.75	1131	Trailer Parks and Mobile Home Courts High Density	0.60	Residential
Residential - High Density (>8 unit/acre)	0.60	0.44	0.42 - 0.82	0.65 - 0.8	0.45 - 0.90	0.65	0.35 - 0.55	0.418 - 0.819	0.65	1111	High Density Single Family Residential (>2 unit/acre)	0.00	Graded for Con
Single Family Residential (4-6 unit/acre)				0.50	0.45 - 0.55	0.38			0.30	1112	Low Density Single Family Residential (<2 unit/acre)		
Residential - Medium Density (1-4 unit/acre)	0.38	0.30	0.23 - 0.46	0.40	0.30 - 0.45	0.20 - 0.30	0.20 - 0.50	0.682 - 0.819	0.75	1122	Duplexes, Triplexes, and 2- or 3-Unit Condominiums or Townhouses		
Residential - Med/Low Density (>0.5-1 unit/acre)	0.20	0.17	0.14 - 0.26	0.20	0.10 - 0.25	0.20	0.10 - 0.25	0.418 - 0.682	0.65	1123	Low-Rise Apartments, Condominiums, or Townhouses		
Residential - Low Density (≤0.5 unit/acre)	0.12	0.10	0.07 - 0.18	0.10	0.05 - 0.15	0.12	0.50 - 0.15		0.25	1151	Rural Residential High Density		
									0.15	1152	Rural Residential Low Density		
Public Park							0.10 - 0.20		0.05	1810	Golf Courses	0.01	Chaparral
									0.10	1821	Developed Local Parks and Recreation		
									0.01	1850	Wildlife Preserves and Sanctuaries		
									0.01	1880	Other Open Space and Recreation		
Natural or Agricultural				0.00	0.00 - 0.10		0.00		0.00	2120	Non-Irrigated Cropland and Improved Pasture Land	0.02	Orchard
									0.02	2200	Orchards and Vineyards		
									0.05	2300	Nurseries		
									0.02	2600	Other Agriculture		
									0.02	2700	Horse Ranches		
									0.00	3100	Vacant Undifferentiated		
									0.00	3200	Abandoned Orchards and Vineyards		

1) Soil and Water Assessment Tool http://www.brc.tamus.edu/swat/manual2000/urbandb/dflt_tableA15.html

2) Hromadka, T. V., McKuen, R. H., DeVries, J. J., and Durbin, T. J. (1993). Computer Methods in Environmental and Water Resources

3) Soil Conservation Service (1986). Urban Hydrology for Small Watersheds, Washington, DC: U. S. Department of Agriculture.

4) Hromadka, T. V. (1986). Orange County Hydrology Manual.

5) City of Santa Monica, California; Municipal Code of Ordinances, Article 7: Public Works, Chapter 7.10 Urban Runoff Pollution.

6) Southern California Council of Governments

Table A1-2. Topanga Creek Land Use
Calculated from SCAG Land Use Data

Land Use	1990 (acres)	1993 (acres)	2001 (acres)	Land Use Imperviousness	Impervious Acreage 1990	1993	2001
1111	50.02	58.71	82.88	65%	32.51	38.16	53.87
1131	28.71	28.71	28.71	75%	21.53	21.53	21.53
1151	395.24	400.41	402.60	25%	98.81	100.10	100.65
1152	750.53	799.28	848.68	15%	112.58	119.89	127.30
1223	12.23	12.23	12.23	90%	11.00	11.00	11.00
1224	1.69	1.69	1.69	85%	1.44	1.44	1.44
1243	0.58	0.58	0.58	60%	0.35	0.35	0.35
1253	4.42	4.42	4.42	65%	2.87	2.87	2.87
1262	7.62	7.62	7.62	40%	3.05	3.05	3.05
1323	-	2.28	2.28	90%	-	2.05	2.05
1434	3.02	3.02	3.02	5%	0.15	0.15	0.15
1700	-	29.47	4.56	0%	-	-	-
1821	4.09	4.09	4.09	10%	0.41	0.41	0.41
1880	9.35	9.35	9.35	1%	0.09	0.09	0.09
2200	25.19	15.86	8.93	2%	0.50	0.32	0.18
2600	9.40	9.40	5.18	2%	0.19	0.19	0.10
2700	40.70	42.95	55.40	2%	0.81	0.86	1.11
3100	10,220.77	10,133.48	10,081.32	0%	-	-	-
Totals	11,563.56	11,563.56	11,563.56		286.31	302.48	326.17

Drainage Area: 18.07 square miles

Source	TIMP	Year
SCAG	2.48%	1990
SCAG	2.62%	1993
SCAG	2.82%	2003

Table A1-3. Hasley Canyon Upstream Land Use

Calculated from SCAG Land Use Data

Land Use	1990 (acres)	1993 (acres)	2001 (acres)	Land Use Imperviousness	Impervious Acreage 1990	1993	2001
1112	-	-	-	30%	-	-	-
1152	75.92	80.78	89.37	15%	11.39	12.12	13.41
1332	6.33	6.33	3.34	5%	0.32	0.32	0.17
1435	1.91	1.91	1.91	30%	0.57	0.57	0.57
1700	-	-	-	0%	-	-	-
2600	3.04	4.37	4.86	2%	0.06	0.09	0.10
3100	906.76	900.57	894.48	0%	-	-	-
Totals	993.96	993.96	993.96		12.34	13.09	14.24

Calculated from DigitalGlobe Imagery Interpretation

Land Use	2002 (acres)	2003 (acres)		Land Use Imperviousness	2002	2003
1112	-	-		85%	-	-
1152	89.37	89.37		5%	13.41	13.41
1332	3.34	3.34		0%	0.17	0.17
1435	1.91	1.91		0%	0.57	0.57
1700	-	-		0%	-	-
2600	4.86	4.86		0%	0.10	0.10
3100	894.48	894.48		0%	-	-
Totals	993.96	993.96			14.24	14.24

Drainage Area: 1.55 square miles

Source	TIMP	Year	
SCAG	1.24%	1990	
SCAG	1.32%	1993	
SCAG	1.43%	2001	
DG Interp.	1.43%	2002	(TIMP derived with imagery/land use interpretation)
DG Interp.	1.43%	2003	(TIMP derived with imagery/land use interpretation)

Table A1-4. Hasley Canyon Downstream Land Use

Calculated from SCAG Land Use Data

Land Use	1990 (acres)	1993 (acres)	2001 (acres)	Land Use Imperviousness	Impervious Acreage 1990	1993	2001
1112	-	-	-	30%	-	-	-
1152	77.78	82.64	91.23	15%	11.67	12.40	13.68
1332	6.33	6.33	3.34	5%	0.32	0.32	0.17
1435	1.91	1.91	1.91	30%	0.57	0.57	0.57
1700	-	-	-	0%	-	-	-
2600	3.04	4.37	4.86	2%	0.06	0.09	0.10
3100	975.30	969.12	963.03	0%	-	-	-
Totals	1,064.36	1,064.36	1,064.36		12.62	13.37	14.52

Calculated from DigitalGlobe Imagery Interpretation

Land Use	2002 (acres)	2003 (acres)		Land Use Imperviousness	2002	2003
1112	-	68.55		85%	-	20.57
1152	89.37	89.37		5%	13.41	13.41
1332	3.34	3.34		0%	0.17	0.17
1435	1.91	1.91		0%	0.57	0.57
1700	68.55	-		0%	-	-
2600	4.86	4.86		0%	0.10	0.10
3100	896.34	896.34		0%	-	-
Totals	1,064.36	1,064.36			14.24	34.81

Drainage Area: 1.66 square miles

Source	TIMP	Year	
SCAG	1.19%	1990	
SCAG	1.26%	1993	
SCAG	1.36%	2001	
DG Interp.	1.34%	2002	(TIMP derived with imagery/land use interpretation)
DG Calc.	3.48%	2002	(TIMP calculated by DigitalGlobe directly form digital sensor data)
DG Interp.	3.27%	2003	(TIMP derived with imagery/land use interpretation)

Table A1-5. Plum Canyon Upstream Land Use

Calculated from SCAG Land Use Data

Land Use	1990 (acres)	1993 (acres)	2001 (acres)	Land Use Imperviousness	Impervious Acreage 1990	1993	2001
1111	1.33	1.33	18.46	65%	0.87	0.87	12.00
1123	-	-	9.65	65%	-	-	6.27
1152	6.04	6.04	6.04	15%	0.91	0.91	0.91
1262	-	-	9.43	50%	-	-	4.72
1431	19.92	19.92	19.92	5%	1.00	1.00	1.00
1434	0.40	0.40	0.40	5%	0.02	0.02	0.02
1700	21.77	-	190.04	0%	-	-	-
2120	-	-	24.76	0%	-	-	-
2200	11.46	11.46	11.46	2%	0.23	0.23	0.23
3100	1,367.89	1,367.89	1,153.10	0%	-	-	-
Totals	1,428.81	1,407.04	1,443.25		3.02	3.02	25.14

Calculated from DigitalGlobe Imagery Interpretation

Land Use	2003 (acres)	2004 (acres)		Land Use Imperviousness	2003	2004
1111	18.46	356.61		65%	12.00	231.79
1123	9.65	9.65		65%	6.27	6.27
1152	6.04	6.04		15%	0.91	0.91
1262	9.43	9.43		50%	4.72	4.72
1431	19.92	19.92		5%	1.00	1.00
1434	0.40	0.40		5%	0.02	0.02
1700	338.15	-		0%	-	-
2120	24.76	24.76		0%	-	-
2200	-	-		2%	-	-
3100	1,016.44	1,016.44		0%	-	-
Totals	1,443.24	1,443.24			24.91	244.70

Drainage Area: 2.23 square miles

Source	TIMP	Year	
SCAG	0.21%	1990	
SCAG	0.21%	1993	
SCAG	1.74%	2001	
DG Interp.	1.73%	2003	(TIMP derived with imagery/land use interpretation)
DG Calc.	1.34%	2003	(TIMP calculated by DigitalGlobe directly form digital sensor data)
DG Interp.	16.96%	2004	(TIMP derived with imagery/land use interpretation)

Table A1-6. Plum Canyon Downstream Land Use

Calculated from SCAG Land Use Data

Land Use	1990 (acres)	1993 (acres)	2001 (acres)	Land Use Imperviousness	Impervious Acreage 1990	1993	2001
1111	1.33	1.33	18.46	65%	0.87	0.87	12.00
1123	-	-	9.65	65%	-	-	6.27
1152	6.04	6.04	6.04	15%	0.91	0.91	0.91
1262	-	-	9.43	50%	-	-	4.72
1431	19.92	19.92	19.92	5%	1.00	1.00	1.00
1434	0.40	0.40	0.40	5%	0.02	0.02	0.02
1700	21.77	-	208.77	0%	-	-	-
2120	-	-	24.76	0%	-	-	-
2200	11.46	11.46	11.46	2%	0.23	0.23	0.23
3100	1,472.16	1,493.93	1,224.20	0%	-	-	-
Totals	1,533.09	1,533.09	1,533.09		3.02	3.02	25.14

Calculated from DigitalGlobe Imagery Interpretation

Land Use	2003 (acres)	2004 (acres)		Land Use Imperviousness	Impervious Acreage 2003	2004
1111	18.46	393.37		65%	12.00	255.69
1123	9.65	9.65		65%	6.27	6.27
1152	6.04	6.04		15%	0.91	0.91
1262	9.43	9.43		50%	4.72	4.72
1431	19.92	19.92		5%	1.00	1.00
1434	0.40	0.40		5%	0.02	0.02
1700	374.91	-		0%	-	-
2120	24.76	24.76		0%	-	-
2200	-	-		2%	-	-
3100	1,069.52	1,069.52		0%	-	-
Totals	1,533.08	1,533.08			24.91	268.60

Drainage Area: 2.40 square miles

Source	TIMP	Year
SCAG	0.20%	1990
SCAG	0.20%	1993
SCAG	1.64%	2003

Table A1-7a. Borrego Canyon Upstream Land Use

Earth Tech Aerial Photo Interpretation: Watershed Area to Site 7u

Land Use	Acreage				Impervious Percent
	1952	1967	1972	1983	
ORCHARD	-	71	44	61	2%
CHAPARRAL	1,450	1,375	1,402	1,386	1%
RESIDENTIAL	-	-	-	-	60%
GRADED FOR CONSTRUCTIO	-	-	-	-	1%
MAJOR ROADS	-	-	-	-	65%
INDUSTRIAL	-	-	-	-	85%
AGRICULTURE	-	4	3	2	2%
STREAMS	-	-	-	-	
Totals	1,450	1,450	1,450	1,450	
		0.49	(0.01)	0.10	
		0%	0%	0%	

Impervious Percent	Impervious Area			
	1952	1967	1972	1983
ORCHARD	-	1.42	0.89	1.23
CHAPARRAL	14.50	13.75	14.02	13.86
RESIDENTIAL	-	-	-	-
GRADED FOR CONSTRUCTIO	-	-	-	-
MAJOR ROADS	-	-	-	-
INDUSTRIAL	-	-	-	-
AGRICULTURE	-	0.07	0.06	0.04
STREAMS	-	-	-	-
Totals	14.50	15.24	14.98	15.13
TIMP (Basin)	1.00%	1.05%	1.03%	1.04%

Table A1-7b. Borrego Canyon Upstream Land Use
Calculated from SCAG Land Use Data

Land Use	1990 (acres)	1993 (acres)	2001 (acres)	Land Use Imperviousness	Impervious Acreage 1990	1993	2001
1111	28.88	125.41	259.40	65%	18.77	81.52	168.61
1123	0.04	0.04	17.62	65%	0.03	0.03	11.45
1151	-	-	1.80	25%	-	-	0.45
1152	0.23	0.23	0.23	15%	0.03	0.03	0.03
1211	-	-	0.00	80%	-	-	0.00
1222	-	-	68.84	95%	-	-	65.40
1223	-	-	3.30	90%	-	-	2.97
1231	-	-	0.00	90%	-	-	0.00
1262	-	-	4.21	40%	-	-	1.68
1272	0.00	0.00	-	10%	0.00	0.00	-
1275	-	-	0.00	10%	-	-	0.00
1311	-	-	19.61	85%	-	-	16.67
1340	-	-	22.15	85%	-	-	18.83
1413	-	-	27.75	65%	-	-	18.04
1415	2.33	2.33	-	95%	2.21	2.21	-
1431	2.02	2.02	2.02	5%	0.10	0.10	0.10
1434	0.28	0.28	0.28	5%	0.01	0.01	0.01
1437	-	-	15.39	95%	-	-	14.62
1500	-	-	0.00	90%	-	-	0.00
1700	371.42	300.97	2.48	0%	-	-	-
1717	5.75	-	-	0%	-	-	-
1821	-	2.32	2.32	10%	-	0.23	0.23
1880	-	-	1.89	1%	-	-	0.02
2200	0.00	0.00	0.00	2%	0.00	0.00	0.00
2300	-	-	0.00	5%	-	-	0.00
3100	1,039.39	1,016.74	1,001.06	0%	-	-	-
Totals	1,450.34	1,450.34	1,450.34		21.16	84.14	319.11

Drainage Area: 2.27 square miles

Source	TIMP	Year
SCAG	1.46%	1990
SCAG	5.80%	1993
SCAG	22.00%	2003

Table A1-8a. Borrego Canyon Downstream Land Use

Earth Tech Aerial Photo Interpretation: Watershed Area to Site 7d

Land Use	Acreage				Impervious
	1952	1967	1972	1983	Percent
ORCHARD	-	100	87	103	2%
CHAPARRAL	1,806	1,847	1,844	1,660	1%
RESIDENTIAL	-	-	-	-	60%
GRADED FOR CONSTRUCTIO	-	-	-	-	1%
MAJOR ROADS	-	-	-	-	65%
INDUSTRIAL	-	-	-	-	85%
AGRICULTURE	153	11	27	45	2%
STREAMS	-	-	-	-	
Totals	1,959	1,958	1,958	1,808	
		1.00	1.00	151.29	
		0%	0%	8%	

Impervious	Impervious Area			
Percent	1952	1967	1972	1983
ORCHARD	3.06	2.00	1.74	2.06
CHAPARRAL	18.06	18.47	18.44	16.60
RESIDENTIAL	-	-	-	-
GRADED FOR CONSTRUCTIO	-	-	-	-
MAJOR ROADS	-	-	-	-
INDUSTRIAL	-	-	-	-
AGRICULTURE	3.06	0.22	0.54	0.89
STREAMS	-	-	-	-
Totals	24.18	20.69	20.72	19.56
TIMP (Basin)	1.23%	1.06%	1.06%	1.08%

Table A1-8b. Borrego Canyon Downstream Land Use
Calculated from SCAG Land Use Data

Land Use	1990 (acres)	1993 (acres)	2001 (acres)	Land Use Imperviousness	Impervious Acreage 1990	1993	2001
1111	28.88	125.41	259.40	65%	18.77	81.52	168.61
1123	0.04	0.04	17.62	65%	0.03	0.03	11.45
1151	-		1.80	25%	-	-	0.45
1152	4.12	4.12	4.12	15%	0.62	0.62	0.62
1211	-	-	21.38	80%	-	-	17.10
1222	-	-	68.84	95%	-	-	65.40
1223	-	-	3.30	90%	-	-	2.97
1231	-	-	22.28	90%	-	-	20.05
1262	-	-	4.21	40%	-	-	1.68
1272	114.20	114.20	-	10%	11.42	11.42	-
1275	-	-	114.20	10%	-	-	11.42
1311	-	-	54.52	85%	-	-	46.35
1340	-	-	27.92	85%	-	-	23.73
1413	-	-	27.75	65%	-	-	18.04
1415	2.33	2.33	-	95%	2.21	2.21	-
1431	2.02	2.02	2.02	5%	0.10	0.10	0.10
1434	0.90	0.90	2.30	5%	0.05	0.05	0.12
1437	-	-	15.39	95%	-	-	14.62
1500	-	-	4.92	90%	-	-	4.43
1700	484.07	424.32	20.97	0%	-	-	-
1717	5.75	-	-	0%	-	-	-
1821	-	2.32	2.32	10%	-	0.23	0.23
1880	-	-	1.89	1%	-	-	0.02
2200	167.96	163.69	74.50	2%	3.36	3.27	1.49
2300	-	-	49.28	5%	-	-	2.46
3100	1,148.42	1,119.33	1,157.76	0%	-	-	-
Totals	1,958.70	1,958.70	1,958.70		36.55	99.45	411.34

Drainage Area: 3.06 square miles

Source	TIMP	Year
SCAG	1.87%	1990
SCAG	5.08%	1993
SCAG	21.00%	2003

Table A1-9a. Serrano Creek Land Use

Federico (2003) Aerial Photo Interpretation

Land Use	Acreage					Impervious Percent
	1949	1968	1978	1982	1997	
ORCHARD	131	234	191	166	-	2%
CHAPARRAL	1,581	1,458	1,501	1,369	1,015	1%
RESIDENTIAL	-	-	-	72	214	60%
GRADED FOR CONSTRUCTIO	-	-	-	-	195	1%
COMMERCIAL	-	-	-	-	198	85%
INDUSTRIAL	-	-	-	-	69	85%
Totals	1,712	1,691	1,691	1,607	1,691	
		20.49	20.59	104.64	20.48	
		1%	1%	6%	1%	

Impervious Percent	Impervious Area				
	1949	1968	1978	1982	1997
ORCHARD	3	5	4	3	-
CHAPARRAL	16	15	15	14	10
RESIDENTIAL	-	-	-	43	129
GRADED FOR CONSTRUCTIO	-	-	-	-	2
COMMERCIAL	-	-	-	-	168
INDUSTRIAL	-	-	-	-	59
Totals	18	19	19	60	368
TIMP (Basin)	1.08%	1.14%	1.11%	3.74%	21.75%

Table A1-9b. Serrano Creek Land Use
Calculated from SCAG Land Use Data

Land Use	1990 (acres)	1993 (acres)	2001 (acres)	Land Use Imperviousness	Impervious Acreage 1990	1993	2001
1111	49.93	103.07	177.23	65%	32.45	67.00	115.20
1112	0.62	0.62	0.62	30%	0.19	0.19	0.19
1122	1.43	1.43	1.43	75%	1.07	1.07	1.07
1123	11.02	35.71	44.56	65%	7.16	23.21	28.97
1152	48.54	48.54	-	15%	7.28	7.28	-
1211	-	-	56.23	80%	-	-	44.98
1222	-	-	16.43	95%	-	-	15.61
1223	4.16	21.82	38.34	90%	3.74	19.64	34.50
1231	-	-	7.41	90%	-	-	6.67
1233	-	-	6.16	75%	-	-	4.62
1243	-	1.41	1.41	60%	-	0.85	0.85
1245	-	-	7.47	60%	-	-	4.48
1311	18.23	26.75	106.69	85%	15.50	22.74	90.68
1323	-	-	2.76	90%	-	-	2.48
1331	-	-	1.49	5%	-	-	0.07
1340	-	3.38	20.40	85%	-	2.87	17.34
1413	-	-	18.98	65%	-	-	12.34
1431	44.18	44.18	44.18	5%	2.21	2.21	2.21
1434	4.43	4.43	4.43	5%	0.22	0.22	0.22
1436	-	-	1.45	30%	-	-	0.44
1437	4.86	-	-	95%	4.62	-	-
1500	25.40	42.63	69.21	90%	22.86	38.36	62.29
1700	454.32	369.56	34.39	0%	-	-	-
1821	3.07	3.07	24.43	10%	0.31	0.31	2.44
1880	-	-	10.96	1%	-	-	0.11
2200	13.92	-	-	2%	0.28	-	-
2300	64.54	64.54	64.54	5%	3.23	3.23	3.23
3100	942.85	909.19	930.31	0%	-	-	-
3200	-	11.15	-	0%	-	-	-
Totals	1,691.49	1,691.49	1,691.49		101.11	189.18	450.99

Drainage Area: 2.64 square miles

Source	TIMP	Year

Table A1-10. Santiago Creek Land Use
Calculated from SCAG Land Use Data

Land Use	1990 (acres)	1993 (acres)	2001 (acres)	Land Use Imperviousness	Impervious Acreage 1990	1993	2001
1151	70.13	70.13	70.13	25%	17.53	17.53	17.53
1152	-	-	7.80	15%	-	-	1.17
1243	0.57	0.57	0.57	60%	0.34	0.34	0.34
1420	1.32	1.32	1.32	5%	0.07	0.07	0.07
1850	20.56	20.56	20.56	1%	0.21	0.21	0.21
2700	5.56	5.56	-	2%	0.11	0.11	-
3100	7,811.36	7,811.36	7,809.12	0%	-	-	-
Totals	7,909.50	7,909.50	7,909.50		18.26	18.26	19.32

Drainage Area: 12.36 square miles

Source	TIMP	Year
SCAG	0.23%	1990
SCAG	0.23%	1993
SCAG	0.24%	2003

Table A1-11. Dry Canyon Land Use
Calculated from SCAG Land Use Data

Land Use	1990 Acres	1993 Acres	2001 Acres	Land Use Imperviousness	Impervious Acreage 1990	1993	2001
1111	0.68	0.68	0.68	65%	0.44	0.44	0.44
1700	-	-	3.62	0%	-	-	-
1810	-	-	101.60	5%	-	-	5.08
3100	782.47	782.47	677.25	0%	-	-	-
Totals	783.15	783.15	783.15		0.44	0.44	5.52

Drainage Area: 1.22 square miles

Source	TIMP	Year
SCAG	0.06%	1990
SCAG	0.06%	1993
SCAG	0.70%	2003

Table A1-12. Hicks Canyon Land Use
Calculated from SCAG Land Use Data

Land Use	1990 (acres)	1993 (acres)	2001 (acres)	Land Use Imperviousness	Impervious Acreage 1990	1993	2001
1413	-	-	14.98	65%	-	-	9.74
2200	41.63	41.63	41.63	2%	0.83	0.83	0.83
3100	810.84	810.84	795.86	0%	-	-	-
Totals	852.48	852.48	852.48		0.83	0.83	10.57

Drainage Area: 1.33 square miles

Source	TIMP	Year
SCAG	0.10%	1990
SCAG	0.10%	1993
SCAG	1.24%	2003

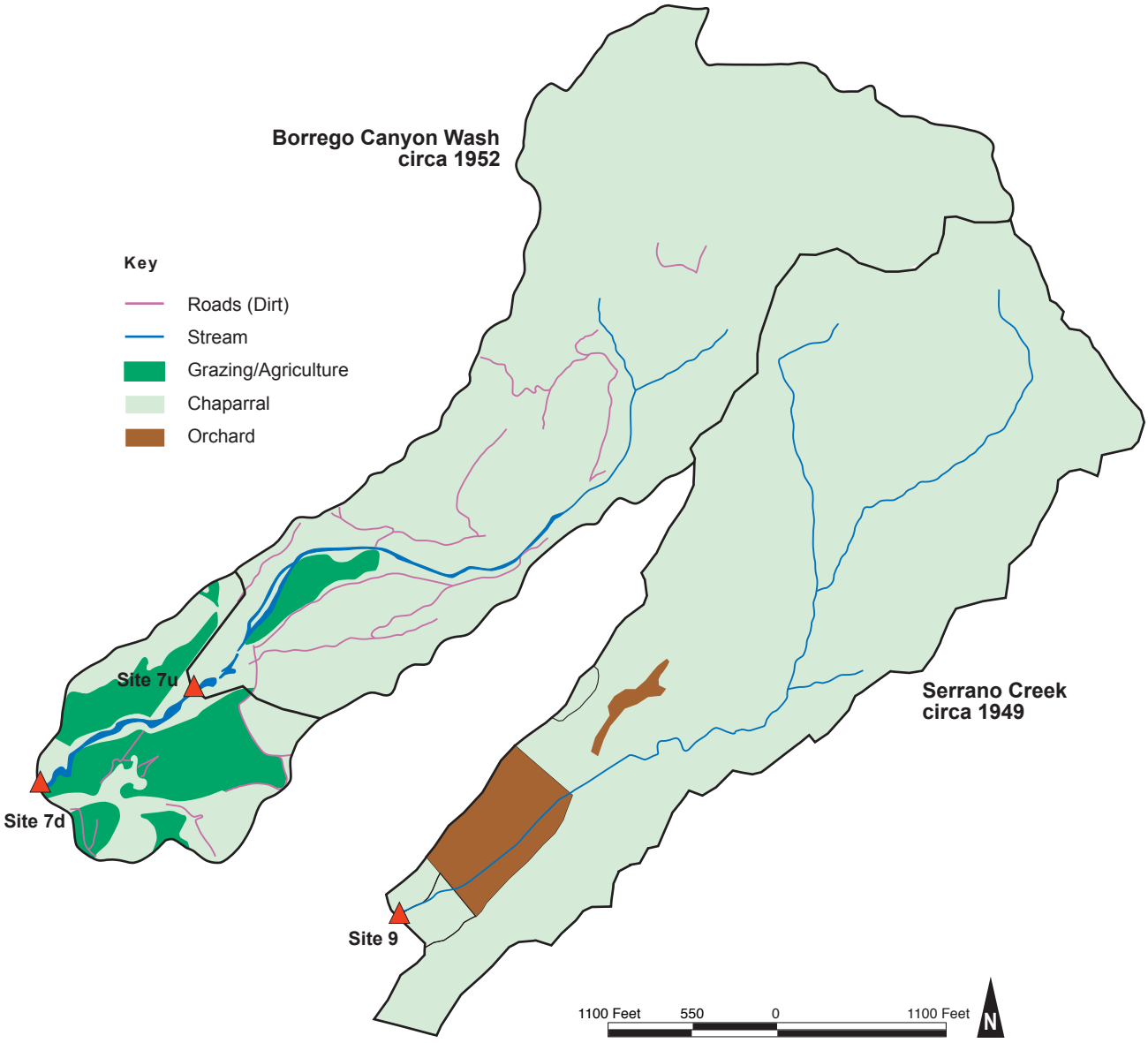


Figure A1-1. Borrego Canyon and Serrano Creek Land Use, Period 1

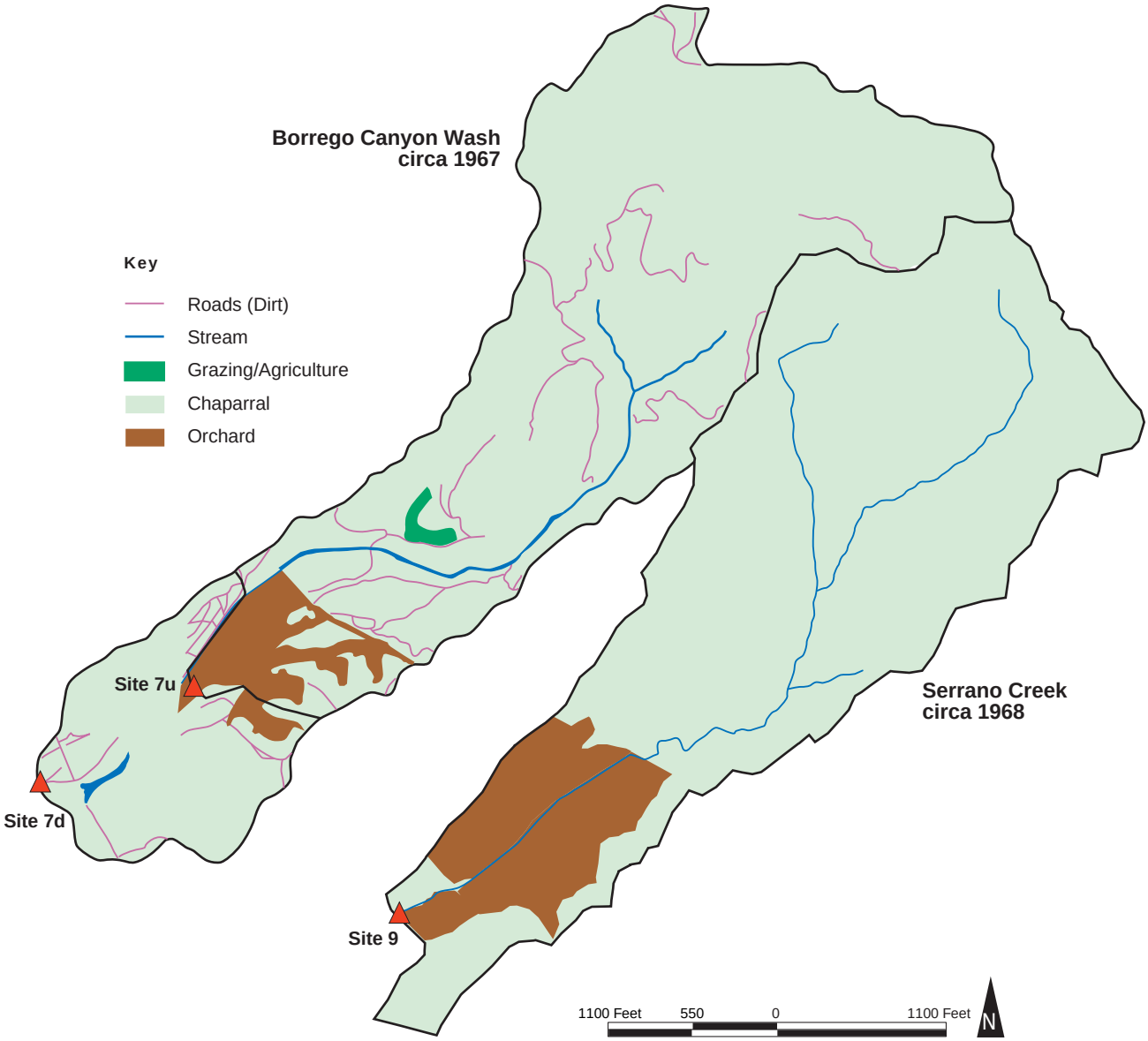


Figure A1-2. Borrego Canyon and Serrano Creek Land Use, Period 2

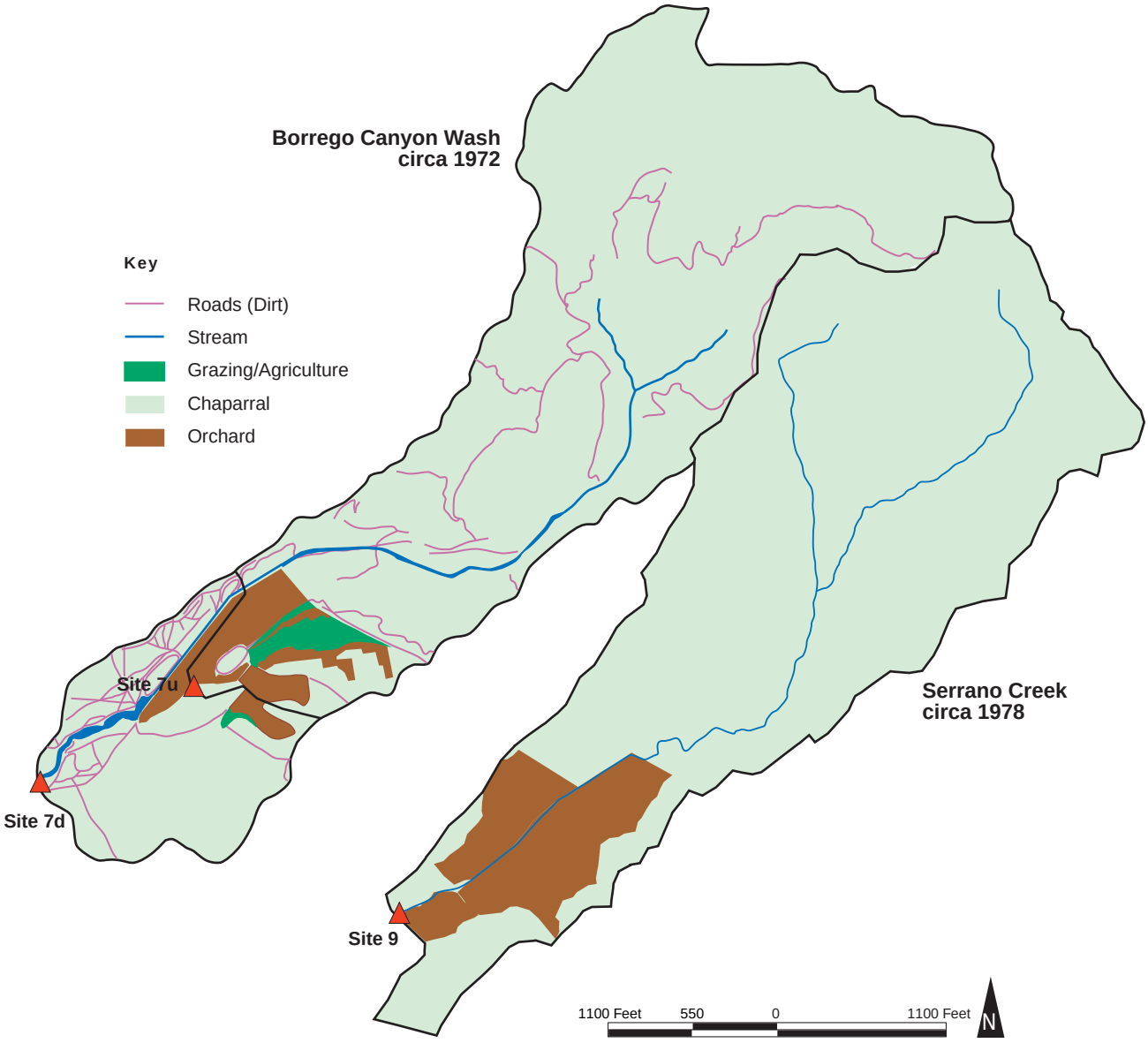


Figure A1-3. Borrego Canyon and Serrano Creek Land Use, Period 3

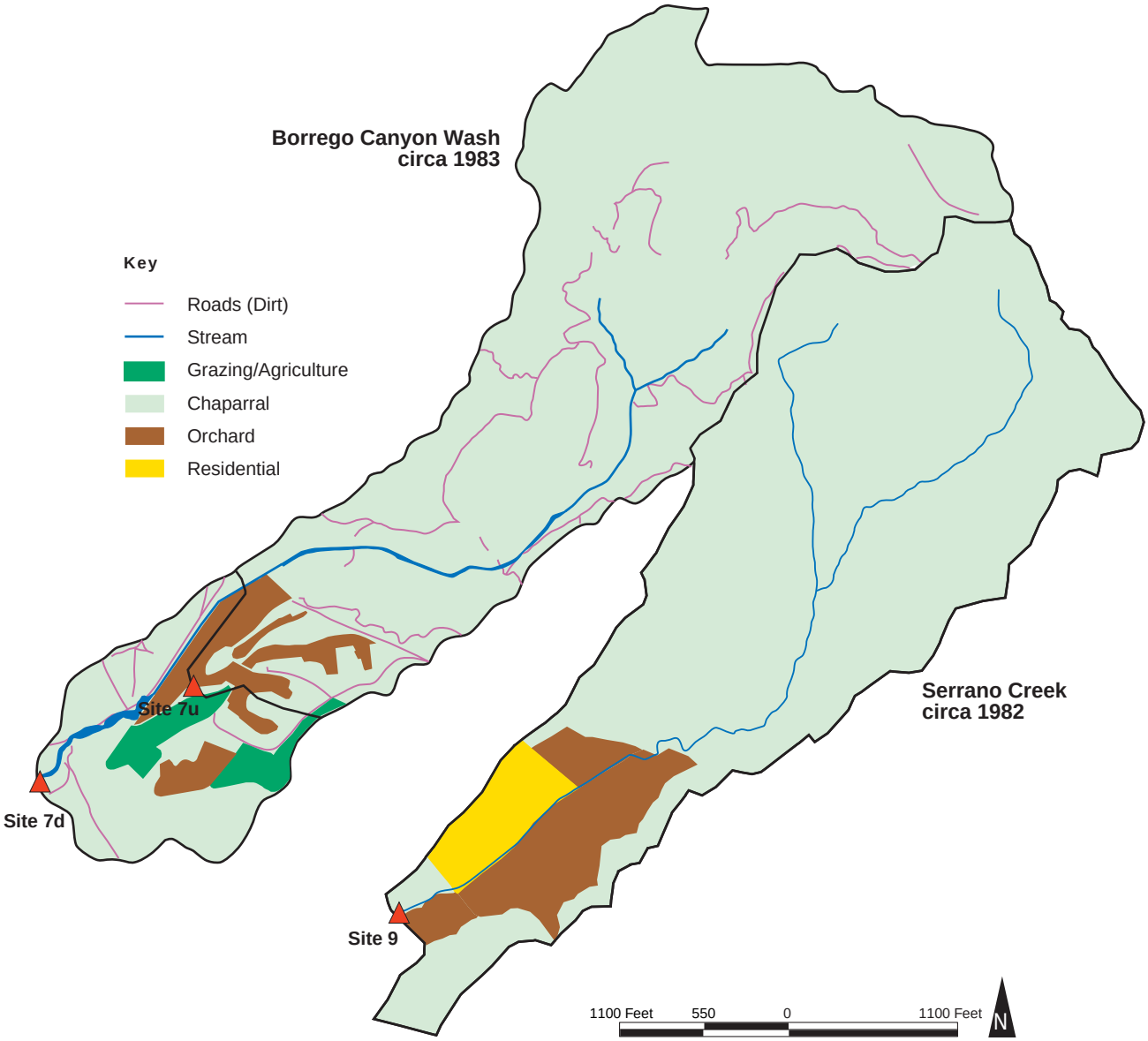


Figure A1-4. Borrego Canyon and Serrano Creek Land Use, Period 4

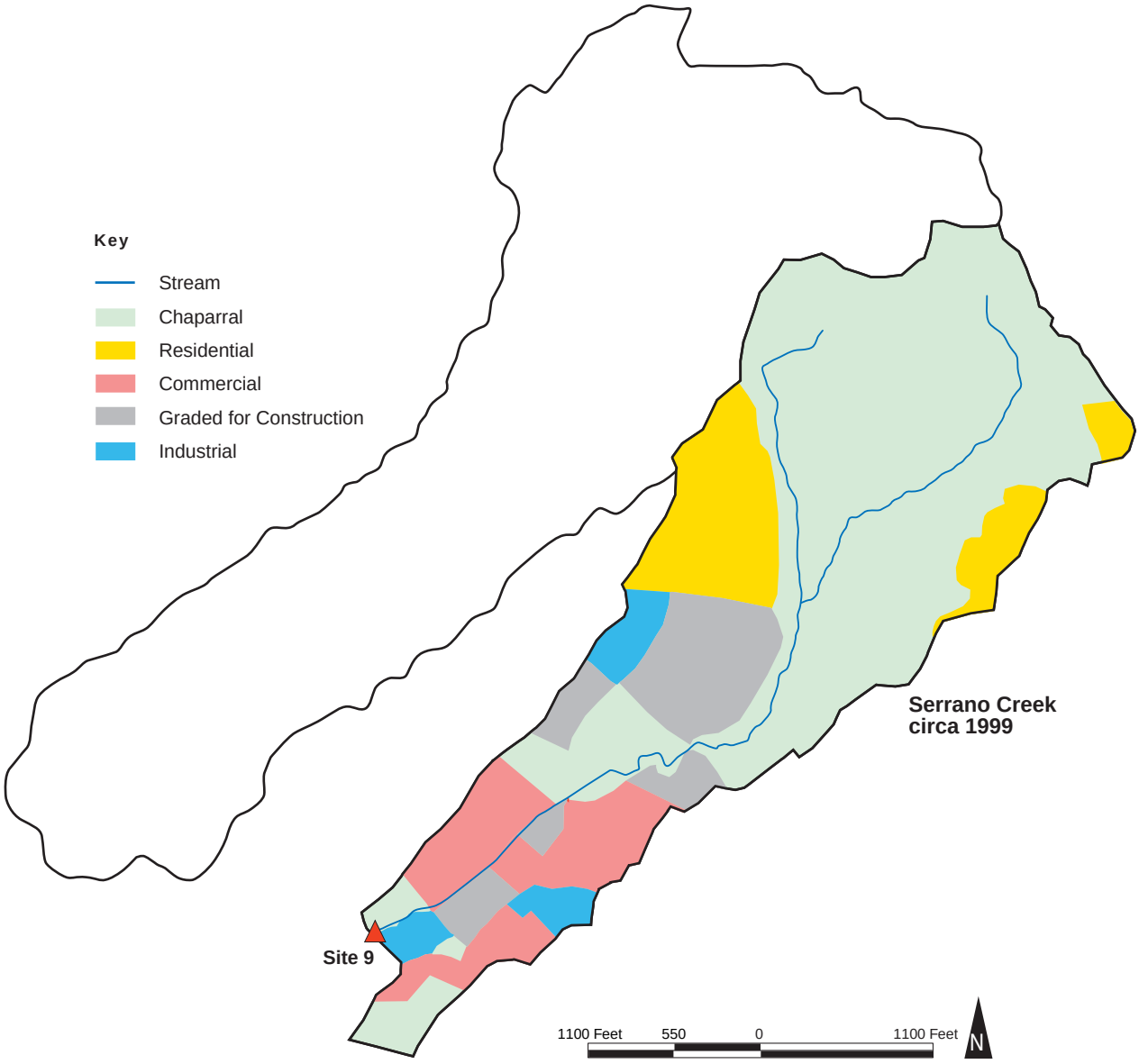


Figure A1-5. Serrano Creek Land Use, Period 5

A2.1 BACKGROUND

Precipitation is another key factor in determining stream flow rates and flood peaks, which in turn result in the channel morphology that is observed and measured in the field. However, this study is not using specific rainfall-runoff relationships to determine flows. Channel capacity and flows are estimated from physical evidence in the field to establish discharge quantities used in the assessment methods. Therefore, the primary significance of the precipitation records used here was to provide background on the relative abundance of rainfall during the years when these channels began reacting to the changes in watershed TIMP values. Average annual rainfall is useful to evaluate whether or not a particular year or series of years is representative of normal conditions.

A2.2 DATA

The data provided here is for the background evaluation of relative abundance of rainfall during the critical development period within any given watershed. Table A2-1 summarizes the weather stations for which data has been obtained. Tables A2-2 through A2-4 summarize the average annual rainfall amounts for the weather stations in each of the three counties where the study sites are located. Figures A2-1 through A2-4 show the distribution of annual rainfall through time for each of watersheds or groups of watersheds investigated here.

Table A2-1. Weather Stations

Station ID	Station Name	Location			Elevation	Record Length	
		County	Latitude	Longitude	(feet)	(dates)	(years)
LA DPW #6	Topanga Patrol	Los Angeles	34.0842	118.5992	745	1927-2003	77
LA DPW #372	San Francisquito Power House	Los Angeles	34.5339	118.5242	1,580	1939-2002	63
LA DPW #801B	Magic Mountain	Los Angeles	34.3883	118.3242	4,720	1966-2002	37
LA DPW #1012B	Castaic Junction	Los Angeles	34.7383	118.6119	1,005	1968-2003	35
LA DPW #1194	Santa Ynez Reservoir	Los Angeles	34.0731	118.5664	735	1971-2003	31
LA DPW #1262	Saugus Reclamation Plant	Los Angeles	34.4133	118.5397	1,150	1973-2003	19
LA DPW #1263	Valencia Reclamation Plant	Los Angeles	34.4319	118.6203	1,000	1986-2003	19
OC RDMD #121	Santa Ana	Orange	33.7511	117.8697	170	1908-2003	96
OC RDMD #165	Costa Mesa	Orange	33.6686	117.8931	53	1955-2002	48
OC RDMD #169	Corona del Mar	Orange	33.6097	117.8575	300	1959-2002	44
OC RDMD #173	Villa Park Dam	Orange	33.8147	117.7667	566	1961-2003	43
OC RDMD #176	El Toro	Orange	33.6275	117.6833	445	1964-2002	39
OC RDMD #216	Laguna Niguel	Orange	33.5497	117.7000	200	1974-2002	29
CIMIS #75	CIMIS Irvine	Orange	33.6886	117.7206	410	1987-2003	17
VC WPD #154	Simi, County Fire Station	Ventura	34.2700	118.7817	760	1947-2002	56
VC WPD #193	Santa Susana	Ventura	34.2708	118.7067	950	1955-2002	47
VC WPD #196	Tapo Canyon	Ventura	34.3283	118.6983	1,525	1956-2002	46

CIMIS California Irrigation Management Information system
LA DPW Los Angeles Department of Public Works
OC RDMD Orange County Resources and Development Management Department
VC WPD Ventura County Watershed Protection District

Table A2-2. Total Annual Rainfall, Los Angeles County Stations

		Station #0006		Station #0372		Station #0801		Station #1012b		Station #1194		Station #1262		Station #1263	
Year from	To	Precip (in)	Missing Days	Precip (in)	Missing Days	Precip (in)	Missing Days	Precip (in)	Missing Days	Precip (in)	Missing Days	Precip (in)	Missing Days	Precip (in)	Missing Day
1927	1928	14.50	24												
1928	1929	20.46													
1929	1930	18.39													
1930	1931	24.89													
1931	1932	28.07													
1932	1933	18.39													
1933	1934	26.74													
1934	1935	25.12													
1935	1936	22.52													
1936	1937	33.97													
1937	1938	38.74													
1938	1939	24.61													
1939	1940	23.28		13.72	6 (Oc)										
1940	1941	54.64		35.09											
1941	1942	18.19		11.94											
1942	1943	32.96		22.77											
1943	1944	28.35		22.73											
1944	1945	20.04		14.81											
1945	1946	19.89		14.61											
1946	1947	19.44		17.91											
1947	1948	10.92		7.45											
1948	1949	12.65		9.82											
1949	1950	18.36		12.53											
1950	1951	12.62		8.04											
1951	1952	45.24		25.99											
1952	1953	14.92		8.58											
1953	1954	21.36		13.46											
1954	1955	20.25		13.18											
1955	1956	24.38		15.92											
1956	1957	17.65		13.28											
1957	1958	40.26		30.64											
1958	1959	11.67		6.77											
1959	1960	15.86		9.67											
1960	1961	8.96		7.38											
1961	1962	39.55		20.22											
1962	1963	16.35		11.77											
1963	1964	12.99		9.15											
1964	1965	19.65		14.95											
1965	1966	31.29		21.86											
1966	1967	38.63		23.18		30.45	36 (Oc-No)								
1967	1968	20.94		15.27		10.16									
1968	1969	48.99		30.05		0.57		21.59							
1969	1970	12.68		10.70		0.24		8.79							
1970	1971	24.00		15.14		-		12.5							
1971	1972	11.85		10.00		10.32		8.04							
1972	1973	33.68		19.81		27.02		14.78							

Table A2-2. Total Annual Rainfall, Los Angeles County Stations

		Station #0006		Station #0372		Station #0801		Station #1012b		Station #1194		Station #1262		Station #1263	
Year from	To	Precip (in)	Missing Days	Precip (in)	Missing Days	Precip (in)	Missing Days	Precip (in)	Missing Days	Precip (in)	Missing Days	Precip (in)	Missing Days	Precip (in)	Missing Day
1973	1974	25.30		15.45		16.61		12.23		20.18	7 (Oc)				
1974	1975	22.81	133 (Ju-Se)	15.63		18.67		11.18		19.83					
1975	1976	11.06	10 (Oc)	10.95		19.09		9.08		8.94					
1976	1977	16.07		13.68		14.70		11.74		13.51					
1977	1978	56.50		39.50		6.99		31.98		40.55					
1978	1979	28.70		21.11		10.72		18.16		22.74					
1979	1980	49.60		25.97		40.14		23.6		38.73					
1980	1981	16.30		9.36		-		9.91		12.99					
1981	1982	21.80		18.37		-		13.68		17.84					
1982	1983	54.30		34.75		-		29.51		44.43					
1983	1984	14.10		11.71		-		8.51		11.30					
1984	1985	13.10		5.20		-		9.51		14.20					
1985	1986	31.69		23.59		32.56		18.24		27.45		17.00	7 (Oc)	18.23	7 (Oc)
1986	1987	7.89		6.82		9.25		5.5		6.20		3.97		4.16	
1987	1988	21.62		13.90		25.17		4.8		15.89		16.96		16.65	
1988	1989	12.79		11.80		18.11		9.17		14.30		8.22		8.01	
1989	1990	12.40		10.72		13.77		4.71		1.97		4.89		4.99	
1990	1991	17.20		20.06		20.00		12.94		10.02		14.76		12.86	
1991	1992	33.00		28.91		22.65		22.72		27.56		24.77		22.57	
1992	1993	48.60				59.19		26.76	20 (Oc)	37.07		15.50		24.58	
1993	1994	15.90		9.01		14.02		8.2	9 (Fe)	8.61		9.03		8.00	
1994	1995	46.53		19.60		43.48		21.78	23 (Ja, Mr)	37.17		22.34		19.08	
1995	1996	18.90		8.10		22.78		9.74		16.88		7.28		8.02	
1996	1997	15.78	29 (De-Ja)	8.60		25.74		2.44		21.47		9.57		9.34	
1997	1998	35.12		36.51	10 (Fe)	53.64		6.54	8 (No)	34.57		29.95		29.64	
1998	1999	13.76		9.11		13.32		2.64	113 (Ju-Se)	11.84		7.23		7.30	
1999	2000	17.96		15.04		21.71		6.09		14.60		17.31		6.16	
2000	2001	27.80		16.82		17.85				28.39		16.17		14.29	
2001	2002	6.88	168 (Jn-Se)	4.06		9.92		2.28	197 (Ap-Se)	10.33		7.86		3.83	
2002	2003	17.92	2 (No, De)	19.21		19.84	183 (No, Jn-Se)	8.16	5 (Ap)	24.83		18.70		9.53	
2003	2004	13.16						6.49	4 (De)	13.43	36 (Ja, Se)	7.95	92 (Ju-Se)	4.21	92 (Ju-Se)
AVE. ANN. PRECIPITATION		23.94		16.22		17.53		12.40		20.25		13.66		12.18	
YEARS OF RECORD		77.00		63		37		35		31.00		19		19	
Hasley (Site 3) 3-Year Period				2001-2003		2001-2003		2001-2003				2001-2003		2001-2003	
3-Year Average				11.64		14.88		5.64				11.50		5.86	
5-Year Period				1998-2002		1998-2002		1998-2002				1998-2002		1998-2002	
5-Year Average				12.85		16.53		4.79				13.45		8.22	
10-Year Period				1993-2002		1993-2002		1993-2002				1993-2002		1993-2002	
10-Year Average				14.61		24.23		7.54				14.54		11.52	

Table A2-3. Total Annual Rainfall, Orange County Stations

Year from	To	Station #121 Precip (in.)	Station #165 Precip (in.)	Station #169 Precip (in.)	Station #173 Precip (in.)	Station #176 Precip (in.)	Station #216 Precip (in.)	CIMIS Sta #75 Irvine Precip (in.)
1908	1909	15.44						
1909	1910	13.62						
1910	1911	12.31						
1911	1912	7.85						
1912	1913	8.44						
1913	1914	14.67						
1914	1915	20.00						
1915	1916	18.13						
1916	1917	11.87						
1917	1918	10.24						
1918	1919	7.81						
1919	1920	14.51						
1920	1921	12.16						
1921	1922	17.14						
1922	1923	7.58						
1923	1924	12.04						
1924	1925	5.92						
1925	1926	13.35						
1926	1927	16.81						
1927	1928	13.84						
1928	1929	9.74						
1929	1930	11.85						
1930	1931	11.66						
1931	1932	15.30						
1932	1933	9.80						
1933	1934	8.91						
1934	1935	17.66						
1935	1936	8.98						
1936	1937	22.77						
1937	1938	17.58						
1938	1939	18.51						
1939	1940	12.94						
1940	1941	32.14						
1941	1942	12.55						
1942	1943	15.57						
1943	1944	16.71						

Table A2-3. Total Annual Rainfall, Orange County Stations

Year from	To	Station #121 Precip (in.)	Station #165 Precip (in.)	Station #169 Precip (in.)	Station #173 Precip (in.)	Station #176 Precip (in.)	Station #216 Precip (in.)	CIMIS Sta #75 Irvine Precip (in.)
1944	1945	15.20						
1945	1946	9.21						
1946	1947	11.94						
1947	1948	7.40						
1948	1949	8.14						
1949	1950	9.16						
1950	1951	8.11						
1951	1952	22.65						
1952	1953	9.38						
1953	1954	11.20						
1954	1955	10.74						
1955	1956	13.05	10.94					
1956	1957	8.43	8.09					
1957	1958	22.11	20.83					
1958	1959	5.90	5.32					
1959	1960	10.00	9.29	8.33				
1960	1961	3.57	3.73	2.94				
1961	1962	13.51	13.65	13.63	14.28			
1962	1963	7.78	6.85	7.33	8.12			
1963	1964	8.38	7.99	10.27	11.85			
1964	1965	10.56	10.83	10.88	10.47	11.08		
1965	1966	12.56	13.04	12.55	14.55	15.54		
1966	1967	15.41	14.81	13.65	19.07	16.71		
1967	1968	9.42	7.96	8.21	9.77	9.84		
1968	1969	19.71	19.63	19.48	26.55	26.37		
1969	1970	9.01	6.79	8.21	9.78	9.67		
1970	1971	8.60	8.07	8.88	9.64	9.63		
1971	1972	4.88	4.51	5.99	7.21	8.36		
1972	1973	16.30	14.74	15.17	18.55	18.92		
1973	1974	11.46	9.12	9.73	12.63	11.26		
1974	1975	12.08	11.61	13.74	11.63	12.96	10.91	
1975	1976	7.18	10.52	7.42	8.11	9.12	7.97	
1976	1977	10.42	10.52	10.61	12.44	10.99	10.16	
1977	1978	28.52	27.33	27.17	34.16	30.77	24.88	
1978	1979	18.47	19.74	17.44	19.85	21.06	19.75	
1979	1980	21.20	20.07	20.51	26.97	26.99	25.7	

Table A2-3. Total Annual Rainfall, Orange County Stations

Year from	To	Station #121 Precip (in.)	Station #165 Precip (in.)	Station #169 Precip (in.)	Station #173 Precip (in.)	Station #176 Precip (in.)	Station #216 Precip (in.)	CIMIS Sta #75 Irvine Precip (in.)
1980	1981	8.76	8.67	9.24	9.43	7.64	7.24	
1981	1982	13.05	13.18	13.56	15.74	13.19	13	
1982	1983	26.55	27.05	26.88	28.19	26.71	23.12	
1983	1984	9.08	7.94	9.46	10.48	11.03	11.68	
1984	1985	11.30	10.65	10.67	12.68	11.87	11.2	
1985	1986	16.09	13.80	14.45	16.85	15.33	14.97	
1986	1987	6.58	6.80	8.33	9.76	8.51	8.89	
1987	1988	9.87	11.25	10.95	12.38	12.24	10.71	12.5
1988	1989	7.46	7.25	7.36	9.46	8.45	6.97	9.29
1989	1990	8.65	6.97	7.15	9.62	8.36	10.79	8.33
1990	1991	11.31	12.07	10.06	12.29	12.08	11.65	14.07
1991	1992	15.56	12.31	14.68	17.55	16.99	16.01	52.28
1992	1993	24.12	23.61	23.90	29.96	29.55	25.62	14.86
1993	1994	12.06	9.17	7.24	12.66	10.36	8.78	7.99
1994	1995	24.76	20.77	23.80	27.24	28.00	25.01	14.15
1995	1996	11.33	9.13	9.28	11.56	9.53	11.14	11.21
1996	1997	13.53	12.27	12.83	14.69	14.17	13.72	12.29
1997	1998	30.59	29.11	31.88	34.89	38.58	35.32	31.34
1998	1999	7.55	6.65	6.70	8.05	7.52	8.82	7.74
1999	2000	8.06	7.20	6.89	9.73	8.77	8.72	7.19
2000	2001	14.87	13.34	13.09	14.78	14.90	18.12	11.65
2001	2002	3.82	4.27	3.94	5.24	4.45	5.1	4.17
2002	2003	14.57	13.17	13.57	16.83	16.01	16.82	14.47
2003	2004	8.41			9.86			8.56
Ave. Ann. Precipitation		12.98	12.14	12.46	15.01	14.96	14.58	14.24
Length of Record		96	48	44	43	39	29	17

Table A2-4. Total Annual Rainfall, Ventura County Stations

Year from	To	Station 154 Simi-County Fire Station Precip (in.)	Station 193 Precip (in.)	Station 196 Precip (in.)
1947	1948	6.35		
1948	1949	6.29		
1949	1950	10.30		
1950	1951	7.21		
1951	1952	24.42		
1952	1953	9.56		
1953	1954	11.66		
1954	1955	12.61		
1955	1956	13.78	13.38	
1956	1957	11.40	11.03	17.67
1957	1958	26.31	24.75	34.93
1958	1959	6.34	6.35	7.96
1959	1960	7.99	7.43	12.40
1960	1961	5.44	5.29	6.64
1961	1962	18.55	17.65	25.23
1962	1963	8.79	9.70	-
1963	1964	7.10	8.00	22.56
1964	1965	13.50	12.21	17.05
1965	1966	16.79	16.76	22.03
1966	1967	17.94	17.27	31.37
1967	1968	16.58	15.40	18.53
1968	1969	21.72	19.00	30.82
1969	1970	9.32	8.31	10.63
1970	1971	14.24	12.50	17.32
1971	1972	6.93	7.30	9.06
1972	1973	16.68	15.29	22.01
1973	1974	15.00	13.67	16.58
1974	1975	12.26	12.15	14.32
1975	1976	10.15	9.09	11.35
1976	1977	11.31	11.28	12.68
1977	1978	34.06	30.74	41.06
1978	1979	19.83	19.21	23.65
1979	1980	23.49	22.10	32.84
1980	1981	10.94	10.49	12.30
1981	1982	12.75	12.42	17.68
1982	1983	35.06	32.51	52.16
1983	1984	9.18	7.52	13.67
1984	1985	12.23	10.73	14.40
1985	1986	21.72	19.23	27.22
1986	1987	6.40	5.42	6.99
1987	1988	17.11	17.99	16.82
1988	1989	9.71	7.97	12.99
1989	1990	5.20	5.47	8.63
1990	1991	13.54	13.64	13.65
1991	1992	26.86	27.88	27.56
1992	1993	29.45	28.02	33.08
1993	1994	10.38	9.72	10.74
1994	1995	27.80	27.69	28.89
1995	1996	12.77	11.12	16.70
1996	1997	15.16	13.32	16.52
1997	1998	38.24	37.19	40.72
1998	1999	10.37	8.59	12.31
1999	2000	11.37	11.87	16.46
2000	2001	17.62	17.75	18.89
2001	2002	5.75	4.87	6.24
2002	2003	18.01		
Ave. Ann. Precipitation		12.68	12.67	17.74
Length of Record		28.00	20.00	19.00

Figure A2-1. Rainfall Near Topanga Creek

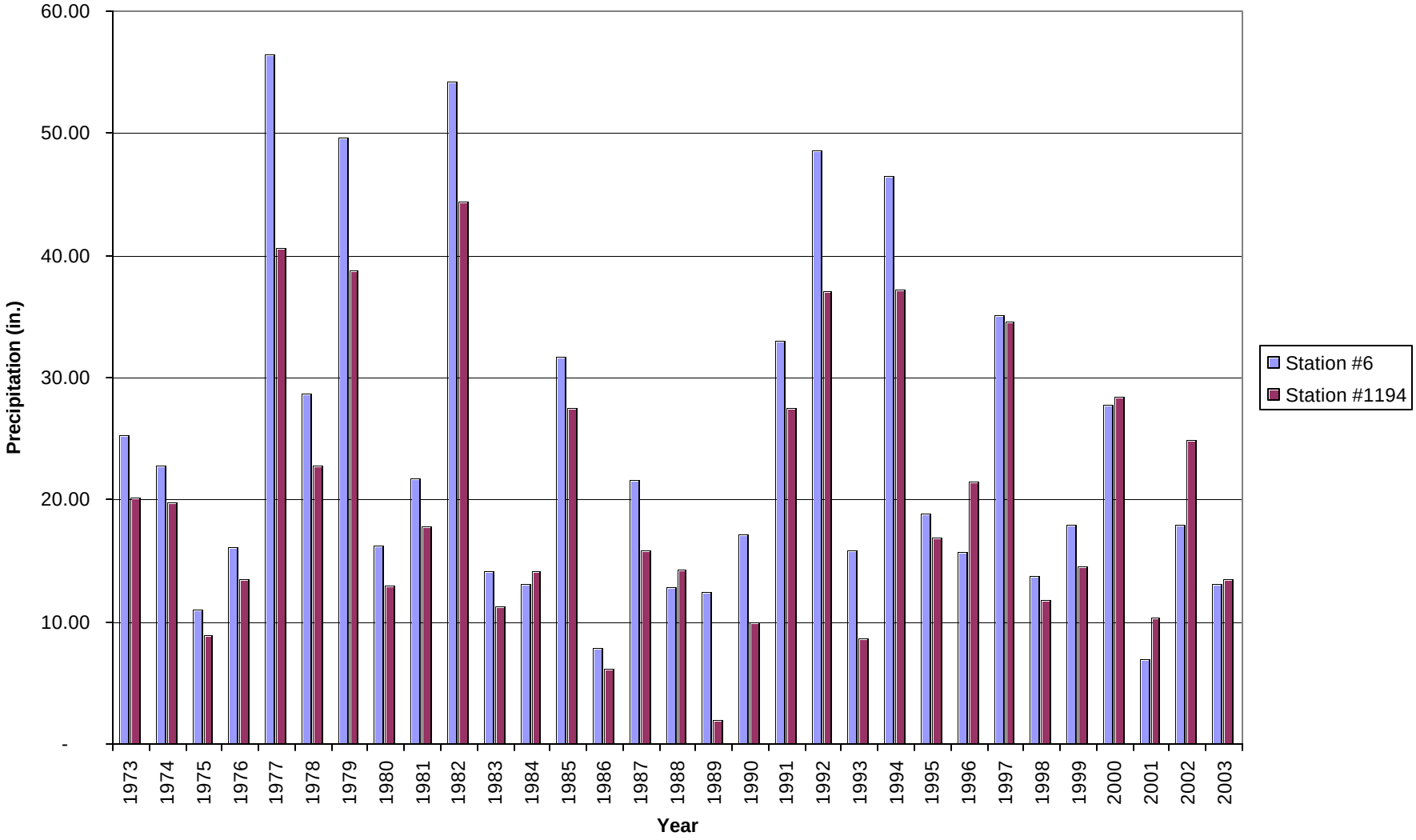


Figure A2-2. Rainfall Near Hasley and Plum Canyons

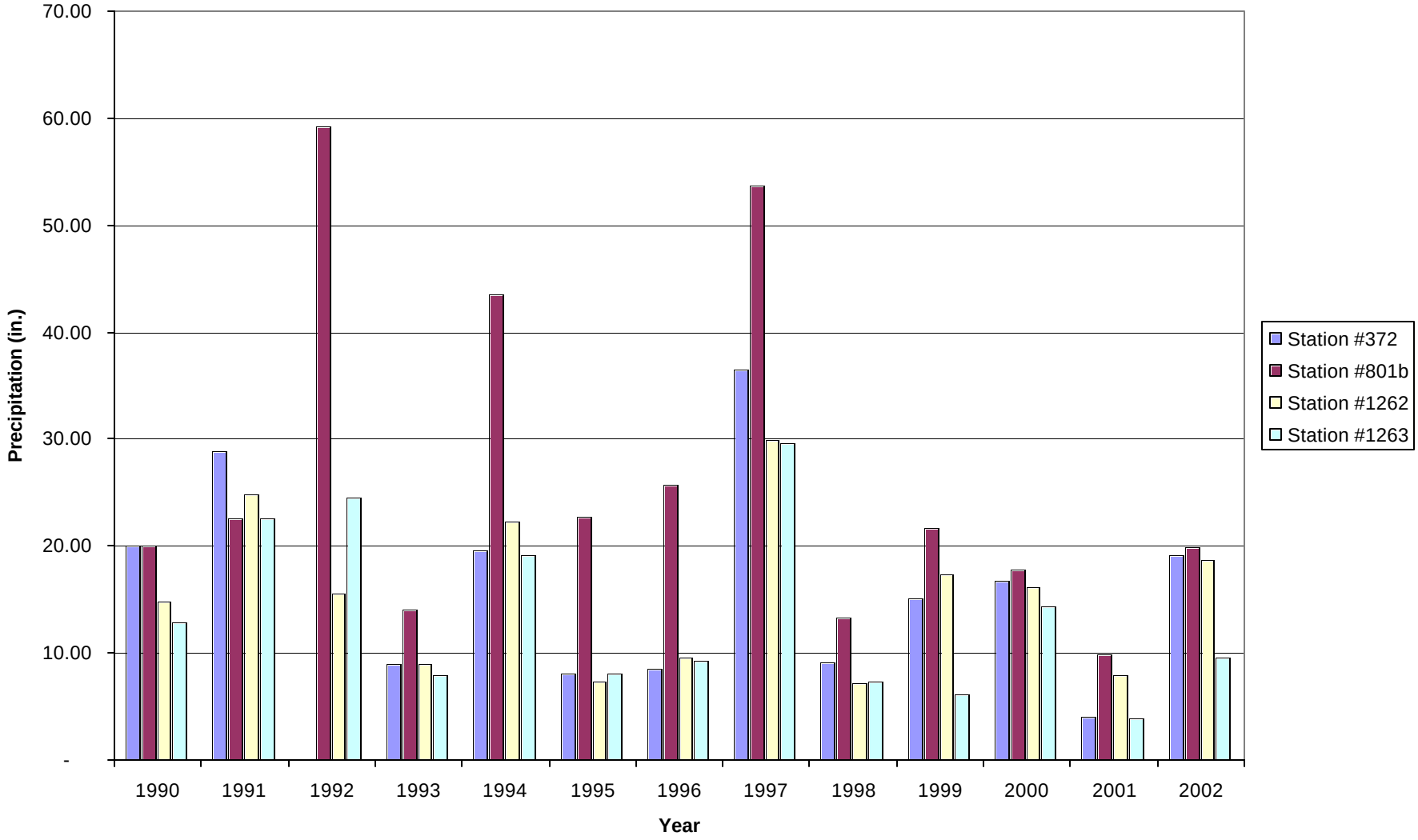


Figure A2-3. Rainfall Near Orange County Sites

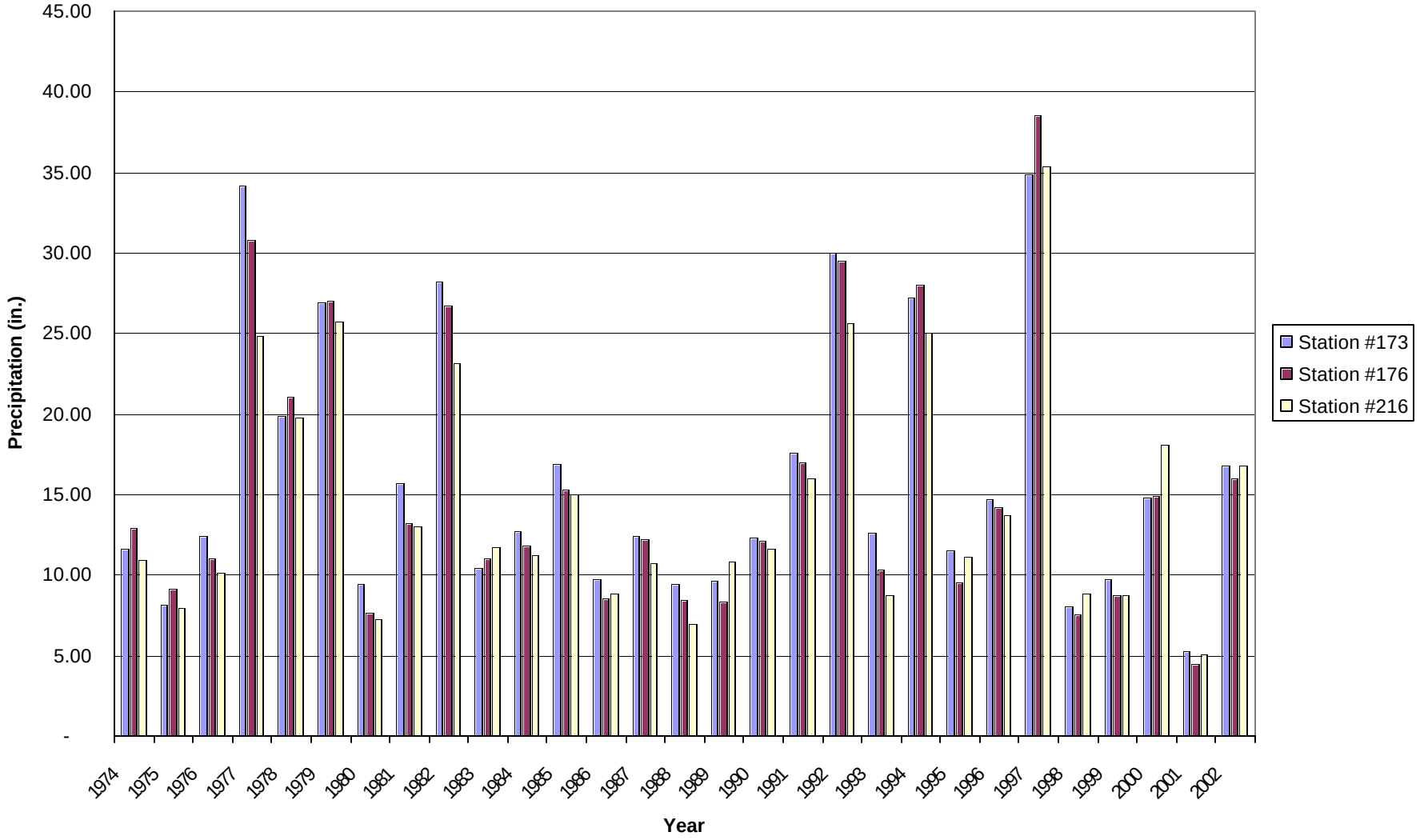
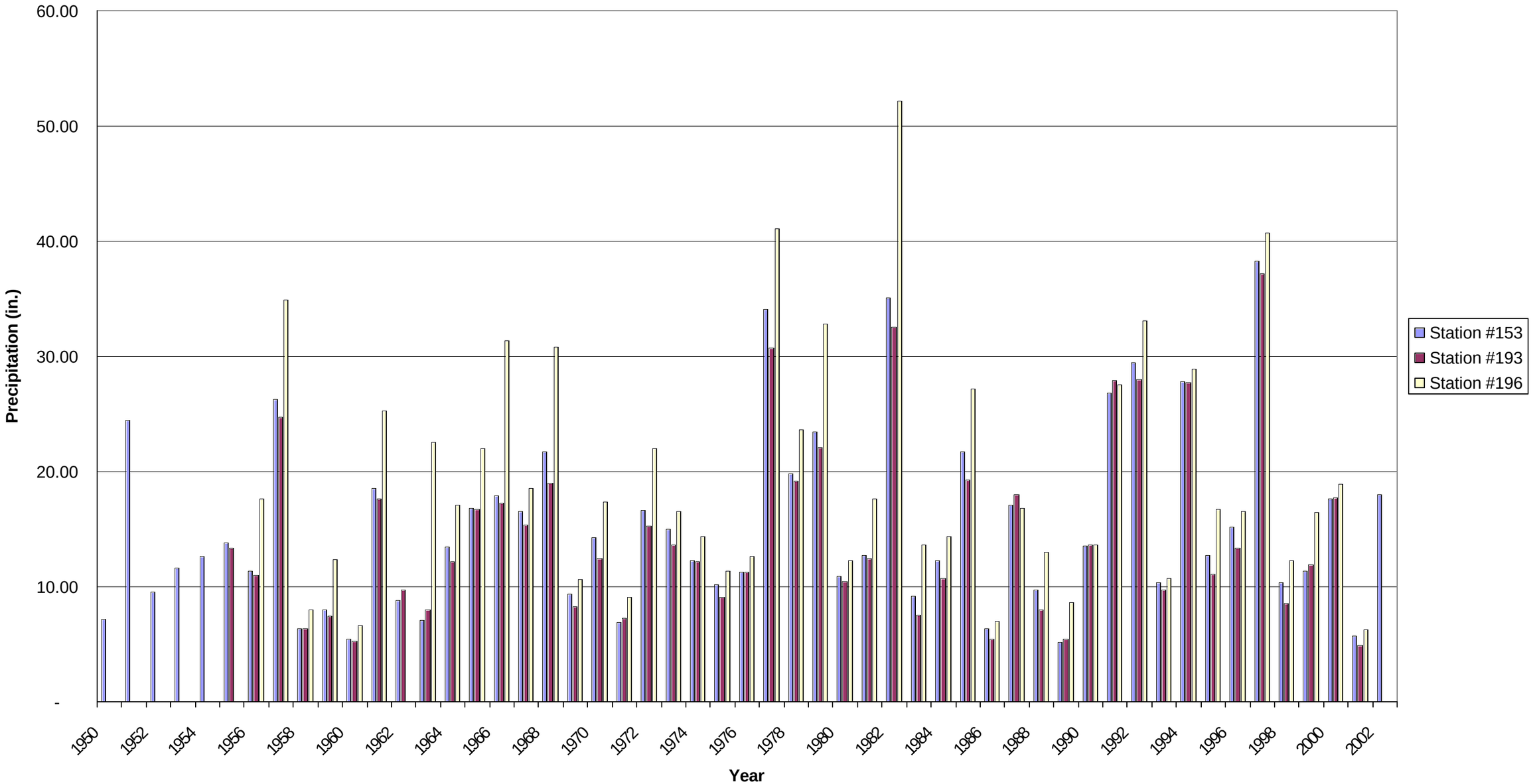


Figure A2-4. Rainfall Near Dry Canyon



A3.1 BACKGROUND

Stream flow records are very useful for channel morphology studies, particularly if they are records for the channel under consideration and the stream gage is located close to the study site. This is the case for only two of the ten study reaches, Topanga Creek and Santiago Creek. The remaining study sites have no nearby gage or not one in the same watershed, so additional gage records were used to look at establishing relationships for estimating recurrence interval based on watershed size (CDA) and peak flow rate.

A3.2 DATA

The data provided here is the annual maximum series of flood peak discharges for each of the stream gages listed in Table A3-1. Data for all but one of the two Topanga Creek sites came form the U. S. Geological Survey on-line database of records from their network of stream gages. Records from the Topanga Creek gage F54C-R were provided by Los Angeles County Department of Public Works. Note that in most cases these records terminated in the late 1970's or early 1980's. Only the Santiago Creek gage and LA County Topanga Creek gage are currently still operating.

Tables A3-2 through A3-7 list the peak flows in descending order of magnitude for each of these stream gage locations. Figures A3-1 through A3-6 provide dual hydrologic regime graphs of these stream records on semi-log plots.

Table A3-1. Stream Gages

Agency	Site ID No.	Site Name	Latitude	Longitude	Elevation (ft)	CDA (mi^2)	Record (dates)	Record (years)
USGS	11047500	Aliso Creek at El Toro, CA	33.6261	117.6851	440.0	7.9	1931-1979	50
USGS	11075800	Santiago Creek at Modjeska, CA	33.7128	117.6450	1,210.0	13.0	1961-2003	42
LA DPW	F54C-R	Topanga Creek above mouth of canyon	34.0643	118.5873	278.0	16.0	1930-2002	63
USGS	11104000	Topanga Creek near Topanga Beach, CA	34.0645	118.5870	265.6	18.0	1929-1978	49
USGS	11096500	Little Tujunga Creek near San Fernando, CA	34.2744	118.3726	1,068.4	21.1	1914-1973	46
USGS	11105850	Arroyo Simi near Simi, CA	34.2731	118.7879	720.0	70.6	1933-1982	42

Table A3-2. Aliso Creek Peak Flow Record

Rank	Peak Q (cfs)	Peak Date	Excedance Probability	Return Period (years)
[m]			[m/(n+1)]	[(n+1)/m]
1	2,500.0	24-Feb-69	1.961%	51.00
2	2,450.0	05-Jan-79	3.922%	25.50
3	1,950.0	06-Feb-37	5.882%	17.00
4	1,870.0	16-Feb-80	7.843%	12.75
5	1,420.0	12-Feb-36	9.804%	10.20
6	1,280.0	02-Mar-38	11.765%	8.50
7	1,240.0	02-Mar-35	13.725%	7.29
8	965.0	16-Mar-58	15.686%	6.38
9	950.0	16-Jan-52	17.647%	5.67
10	942.0	23-Jan-43	19.608%	5.10
11	881.0	22-Feb-44	21.569%	4.64
12	710.0	11-Feb-73	23.529%	4.25
13	680.0	14-Nov-44	25.490%	3.92
14	633.0	01-Mar-41	27.451%	3.64
15	528.0	03-Feb-40	29.412%	3.40
16	508.0	01-Feb-32	31.373%	3.19
17	506.0	26-Jan-56	33.333%	3.00
18	495.0	01-Jan-34	35.294%	2.83
19	360.0	10-Feb-78	37.255%	2.68
20	352.0	19-Jan-33	39.216%	2.55
21	333.0	06-Dec-66	41.176%	2.43
22	277.0	29-Dec-65	43.137%	2.32
23	231.0	03-Feb-39	45.098%	2.22
24	222.0	07-Jan-74	47.059%	2.13
25	183.0	22-Dec-45	49.020%	2.04
26	133.0	01-Dec-52	50.980%	1.96
27	122.0	13-Feb-54	52.941%	1.89
28	103.0	05-Dec-47	54.902%	1.82
29	95.0	04-Mar-70	56.863%	1.76
30	90.0	23-Nov-46	58.824%	1.70
31	88.0	10-Feb-63	60.784%	1.65
32	85.0	06-Feb-50	62.745%	1.59
33	81.0	28-Dec-71	64.706%	1.55
34	75.0	08-Mar-68	66.667%	1.50
35	73.0	15-Feb-62	68.627%	1.46
36	73.0	10-Apr-65	70.588%	1.42
37	67.0	20-Nov-63	72.549%	1.38
38	40.0	04-Dec-74	74.510%	1.34
39	35.0	19-Dec-70	76.471%	1.31
40	32.0	12-Jan-60	78.431%	1.28
41	20.0	11-Apr-42	80.392%	1.24
42	15.0	18-Jan-55	82.353%	1.21
43	13.0	08-May-77	84.314%	1.19
44	12.0	10-Sep-76	86.275%	1.16
45	2.9	15-Apr-09	88.235%	1.13
46	2.3	12-Jan-49	90.196%	1.11
47	2.1	13-Jan-57	92.157%	1.09
48	2.0	06-Jan-59	94.118%	1.06
49	-	05-May-09	96.078%	1.04
50	-	15-May-09	98.039%	1.02

Table A3-3. Santiago Creek Peak Flow Record

Rank	Peak Q (cfs)	Peak Date	Excedance Probability	Return Period (years)
[m]			[m/(n+1)]	[(n+1)/m]
1	6,520.0	25-Feb-69	2.326%	43.00
2	6,200.0	23-Feb-98	4.651%	21.50
3	3,400.0	02-Mar-83	6.977%	14.33
4	2,400.0	05-Mar-95	9.302%	10.75
5	1,810.0	18-Feb-80	11.628%	8.60
6	1,550.0	09-Feb-78	13.953%	7.17
7	1,500.0	22-Nov-65	16.279%	6.14
8	1,420.0	06-Dec-66	18.605%	5.38
9	1,400.0	19-Dec-84	20.930%	4.78
10	1,370.0	17-Jan-93	23.256%	4.30
11	825.0	16-Mar-03	25.581%	3.91
12	807.0	12-Feb-92	27.907%	3.58
13	575.0	08-Jan-74	30.233%	3.31
14	555.0	05-Jan-79	32.558%	3.07
15	516.0	11-Feb-73	34.884%	2.87
16	490.0	24-Nov-83	37.209%	2.69
17	483.0	29-Jan-81	39.535%	2.53
18	440.0	01-Mar-76	41.860%	2.39
19	396.0	29-Nov-85	44.186%	2.26
20	386.0	20-Jan-82	46.512%	2.15
21	302.0	11-Feb-62	48.837%	2.05
22	287.0	17-Feb-90	51.163%	1.95
23	274.0	01-Mar-91	53.488%	1.87
24	257.0	26-Jan-97	55.814%	1.79
25	241.0	25-Dec-71	58.140%	1.72
26	211.0	08-Mar-68	60.465%	1.65
27	203.0	17-Jan-88	62.791%	1.59
28	185.0	08-Mar-75	65.116%	1.54
29	175.0	09-Apr-65	67.442%	1.48
30	167.0	25-Dec-88	69.767%	1.43
31	97.0	21-Feb-00	72.093%	1.39
32	90.0	02-Mar-70	74.419%	1.34
33	77.0	21-Feb-96	76.744%	1.30
34	75.0	25-Feb-01	79.070%	1.26
35	56.0	21-Dec-70	81.395%	1.23
36	36.0	20-Feb-94	83.721%	1.19
37	30.0	10-Feb-63	86.047%	1.16
38	17.0	02-Apr-64	88.372%	1.13
39	16.0	07-Jan-77	90.698%	1.10
40	13.0	05-Jan-87	93.023%	1.08
41	5.6	26-Jan-99	95.349%	1.05
42	3.4	21-Dec-01	97.674%	1.02

Table A3-4. Topanga Creek Peak Flow Record (LA County)

Rank	Peak Q (cfs)	Peak Date	Excedance Probability	Return Period (years)	Rank	Peak Q (cfs)	Peak Date	Excedance Probability	Return Period (years)
[m]			[m/(n+1)]	[(n+1)/m]	[m]			[m/(n+1)]	[(n+1)/m]
1	20,200	17-Feb-84	1.563%	64.00	33	1,050	24-Feb-04	51.563%	1.94
2	12,200	26-Jan-73	3.125%	32.00	34	964	03-Feb-49	53.125%	1.88
3	10,200	28-Jan-87	4.688%	21.33	35	905	24-Dec-49	54.688%	1.83
4	10,127	05-Mar-82	6.250%	16.00	36	844	05-Mar-74	56.250%	1.78
5	9,300	03-Mar-42	7.813%	12.80	37	716	10-Apr-69	57.813%	1.73
6	8,700	21-Feb-45	9.375%	10.67	38	702	02-Dec-56	59.375%	1.68
7	6,050	16-Jan-56	10.938%	9.14	39	655	24-Feb-61	60.938%	1.64
8	5,135	15-Feb-90	12.500%	8.00	40	650	18-Mar-86	62.500%	1.60
9	5,070	23-Feb-48	14.063%	7.11	41	588	28-Dec-75	64.063%	1.56
10	4,510	01-Jan-38	15.625%	6.40	42	569	10-Feb-67	65.625%	1.52
11	3,950	04-Apr-62	17.188%	5.82	43	567	21-Nov-50	67.188%	1.49
12	3,840	12-Feb-77	18.750%	5.33	44	567	09-Mar-72	68.750%	1.45
13	3,500	30-Dec-69	20.313%	4.92	45	539	28-Apr-64	70.313%	1.42
14	3,020	30-Jan-75	21.875%	4.57	46	528	23-Feb-40	71.875%	1.39
15	2,820	12-Jan-05	23.438%	4.27	47	386	15-Feb-35	73.438%	1.36
16	2,790	11-Feb-66	25.000%	4.00	48	385	29-Dec-45	75.000%	1.33
17	2,612	26-Dec-87	26.563%	3.76	49	276	25-Mar-52	76.563%	1.31
18	2,490	28-Mar-83	28.125%	3.56	50	275	19-Dec-53	78.125%	1.28
19	2,470	24-Feb-02	29.688%	3.37	51	229	10-Dec-00	79.688%	1.25
20	2,280	25-Jan-71	31.250%	3.20	52	219	04-Jan-81	81.250%	1.23
21	2,200	23-Jan-47	32.813%	3.05	53	219	03-Mar-85	82.813%	1.21
22	2,090	14-Feb-58	34.375%	2.91	54	196	22-Jan-68	84.375%	1.19
23	2,060	08-Jan-78	35.938%	2.78	55	151	19-Jan-59	85.938%	1.16
24	1,670	07-Mar-79	37.500%	2.67	56	93	12-Apr-03	87.500%	1.14
25	1,660	13-Feb-07	39.063%	2.56	57	72	10-Feb-80	89.063%	1.12
26	1,540	27-Jan-60	40.625%	2.46	58	63	27-Dec-52	90.625%	1.10
27	1,510	07-Jan-63	42.188%	2.37	59	56	27-Dec-88	92.188%	1.08
28	1,430	20-Jan-37	43.750%	2.29	60	32	22-Dec-92	93.750%	1.07
29	1,280	02-Feb-44	45.313%	2.21	61	28	27-Jan-65	95.313%	1.05
30	1,250	09-Feb-36	46.875%	2.13	62	21	12-Jan-55	96.875%	1.03
31	1,200	06-Jan-39	48.438%	2.06	63	5	25-Nov-05	98.438%	1.02
32	1,130	16-Mar-41	50.000%	2.00					

Table A3-5. Topanga Creek Peak Flow Record (USGS)

Rank	Peak Q (cfs)	Peak Date	Excedance Probability	Return Period (years)
[m]			[m/(n+1)]	[(n+1)/m]
1	12,200	25-Jan-69	2.000%	50.00
2	10,130	04-Mar-78	4.000%	25.00
3	7,960	02-Mar-38	6.000%	16.67
4	6,050	15-Jan-52	8.000%	12.50
5	5,070	22-Feb-44	10.000%	10.00
6	4,510	31-Dec-33	12.000%	8.33
7	3,950	03-Apr-58	14.000%	7.14
8	3,840	11-Feb-73	16.000%	6.25
9	3,500	29-Dec-65	18.000%	5.56
10	3,020	29-Nov-70	20.000%	5.00
11	2,790	10-Feb-62	22.000%	4.55
12	2,490	27-Mar-79	24.000%	4.17
13	2,280	24-Jan-67	26.000%	3.85
14	2,200	22-Jan-43	28.000%	3.57
15	2,090	13-Feb-54	30.000%	3.33
16	2,060	07-Jan-74	32.000%	3.13
17	1,670	06-Mar-75	34.000%	2.94
18	1,540	26-Jan-56	36.000%	2.78
19	1,510	06-Jan-59	38.000%	2.63
20	1,430	19-Jan-33	40.000%	2.50
21	1,370	04-Feb-31	42.000%	2.38
22	1,280	01-Feb-40	44.000%	2.27
23	1,250	08-Feb-32	46.000%	2.17
24	1,200	05-Jan-35	48.000%	2.08
25	1,130	15-Mar-37	50.000%	2.00
26	1,100	20-Feb-41	52.000%	1.92
27	964	02-Feb-45	54.000%	1.85
28	905	23-Dec-45	56.000%	1.79
29	844	04-Mar-70	58.000%	1.72
30	716	09-Apr-65	60.000%	1.67
31	702	01-Dec-52	62.000%	1.61
32	655	23-Feb-57	64.000%	1.56
33	588	27-Dec-71	66.000%	1.52
34	569	09-Feb-63	68.000%	1.47
35	567	20-Nov-46	70.000%	1.43
36	567	08-Mar-68	72.000%	1.39
37	539	27-Apr-60	74.000%	1.35
38	528	22-Feb-36	76.000%	1.32
39	385	28-Dec-41	78.000%	1.28
40	340	15-Mar-30	80.000%	1.25
41	276	24-Mar-48	82.000%	1.22
42	275	18-Dec-49	84.000%	1.19
43	219	03-Jan-77	86.000%	1.16
44	196	21-Jan-64	88.000%	1.14
45	151	18-Jan-55	90.000%	1.11
46	72	09-Feb-76	92.000%	1.09
47	63	26-Dec-48	94.000%	1.06
48	28	26-Jan-61	96.000%	1.04
49	21	11-Jan-51	98.000%	1.02

Table A3-6. Little Tujunga Creek Peak Flow Record

Rank	Peak Q (cfs)	Peak Date	Excedance Probability	Return Period (years)
[m]			[m/(n+1)]	[(n+1)/m]
1	8,500	02-Mar-38	2.128%	47.00
2	4,220	22-Feb-44	4.255%	23.50
3	4,100	01-Jan-14	6.383%	15.67
4	3,700	23-Jan-43	8.511%	11.75
5	2,110	16-Jan-52	10.638%	9.40
6	2,090	08-Jan-40	12.766%	7.83
7	1,630	11-Feb-62	14.894%	6.71
8	1,570	11-Feb-73	17.021%	5.88
9	1,420	25-Feb-69	19.149%	5.22
10	1,360	01-Jan-34	21.277%	4.70
11	1,310	04-Mar-41	23.404%	4.27
12	1,300	22-Nov-65	25.532%	3.92
13	964	14-Feb-37	27.660%	3.62
14	901	06-Dec-66	29.787%	3.36
15	762	25-Dec-71	31.915%	3.13
16	660	09-Feb-32	34.043%	2.94
17	653	02-Feb-36	36.170%	2.76
18	569	29-Nov-70	38.298%	2.61
19	559	03-Apr-58	40.426%	2.47
20	450	19-Jan-33	42.553%	2.35
21	445	26-Jan-56	44.681%	2.24
22	353	28-Feb-70	46.809%	2.14
23	266	05-Nov-60	48.936%	2.04
24	256	22-Jan-64	51.064%	1.96
25	244	11-Nov-44	53.191%	1.88
26	223	09-Apr-65	55.319%	1.81
27	200	20-Nov-46	57.447%	1.74
28	198	28-Dec-41	59.574%	1.68
29	198	13-Feb-54	61.702%	1.62
30	175	09-Mar-39	63.830%	1.57
31	156	30-Mar-46	65.957%	1.52
32	138	01-Dec-52	68.085%	1.47
33	112	28-Feb-57	70.213%	1.42
34	112	19-Nov-67	72.340%	1.38
35	89	13-Dec-34	74.468%	1.34
36	84	06-Jan-59	76.596%	1.31
37	52	10-Feb-63	78.723%	1.27
38	35	18-Jan-55	80.851%	1.24
39	30	04-Feb-31	82.979%	1.21
40	16	24-Mar-48	85.106%	1.18
41	13	11-Jan-51	87.234%	1.15
42	10	18-Dec-49	89.362%	1.12
43	7	01-Feb-60	91.489%	1.09
44	1	19-May-49	93.617%	1.07
45	-	01-Jan-29	95.745%	1.04
46	-	01-Jan-30	97.872%	1.02

Table A3-7. Arroyo Simi Peak Flow Record

Rank	Peak Q (cfs)	Peak Date	Excedance Probability	Return Period (years)
[m]			[m/(n+1)]	[(n+1)/m]
1	10,700	01-Mar-83	2.326%	43.00
2	9,310	16-Feb-80	4.651%	21.50
3	7,730	04-Mar-78	6.977%	14.33
4	6,330	25-Feb-69	9.302%	10.75
5	5,210	29-Nov-70	11.628%	8.60
6	4,900	20-Nov-67	13.953%	7.17
7	4,040	27-Mar-79	16.279%	6.14
8	3,890	17-Nov-65	18.605%	5.38
9	3,200	11-Feb-73	20.930%	4.78
10	3,000	22-Feb-44	23.256%	4.30
11	3,000	15-Mar-52	25.581%	3.91
12	2,700	07-Jan-74	27.907%	3.58
13	2,420	04-Dec-74	30.233%	3.31
14	2,400	11-Feb-62	32.558%	3.07
15	2,040	07-Nov-66	34.884%	2.87
16	1,980	27-Dec-71	37.209%	2.69
17	1,700	02-Mar-38	39.535%	2.53
18	1,680	05-Mar-81	41.860%	2.39
19	1,480	03-Apr-58	44.186%	2.26
20	1,340	04-Mar-41	46.512%	2.15
21	1,070	03-Mar-43	48.837%	2.05
22	1,060	17-Mar-82	51.163%	1.95
23	1,000	13-Nov-46	53.488%	1.87
24	966	02-Jan-77	55.814%	1.79
25	760	26-Jan-56	58.140%	1.72
26	750	02-Mar-70	60.465%	1.65
27	740	19-Jan-54	62.791%	1.59
28	670	09-Feb-76	65.116%	1.54
29	540	18-Jan-55	67.442%	1.48
30	528	01-Apr-64	69.767%	1.43
31	455	08-Apr-65	72.093%	1.39
32	275	16-Mar-63	74.419%	1.34
33	270	31-Dec-33	76.744%	1.30
34	255	14-Feb-37	79.070%	1.26
35	174	28-Feb-57	81.395%	1.23
36	96	21-Dec-45	83.721%	1.19
37	74	02-Feb-45	86.047%	1.16
38	46	05-Jan-35	88.372%	1.13
39	34	06-Jan-59	90.698%	1.10
40	24	18-Dec-38	93.023%	1.08
41	14	01-Feb-60	95.349%	1.05
42	10	03-Feb-40	97.674%	1.02

Figure A3-1. Flow Recurrence: Aliso Creek

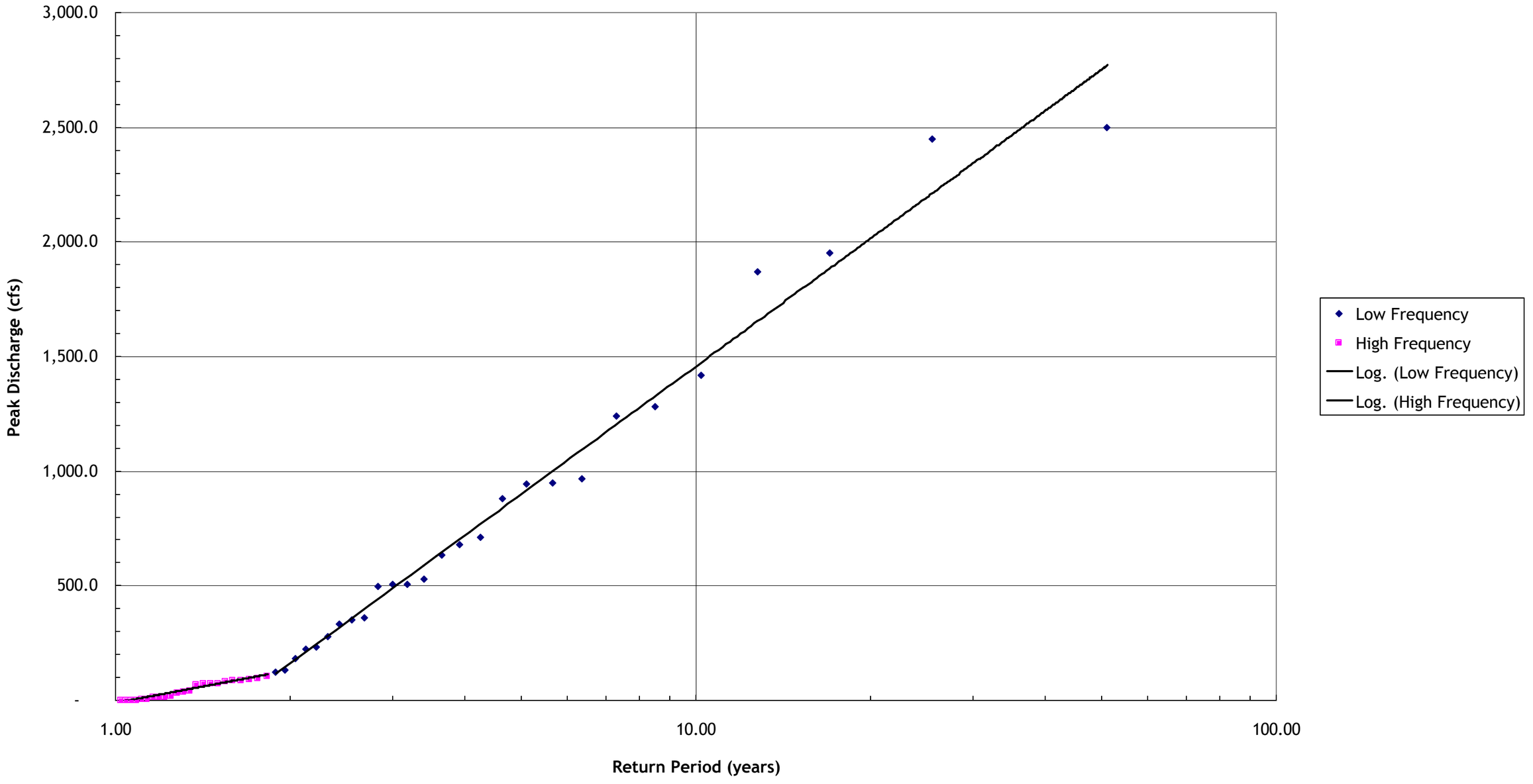


Figure A3-2. Flow Recurrence: Santiago Creek

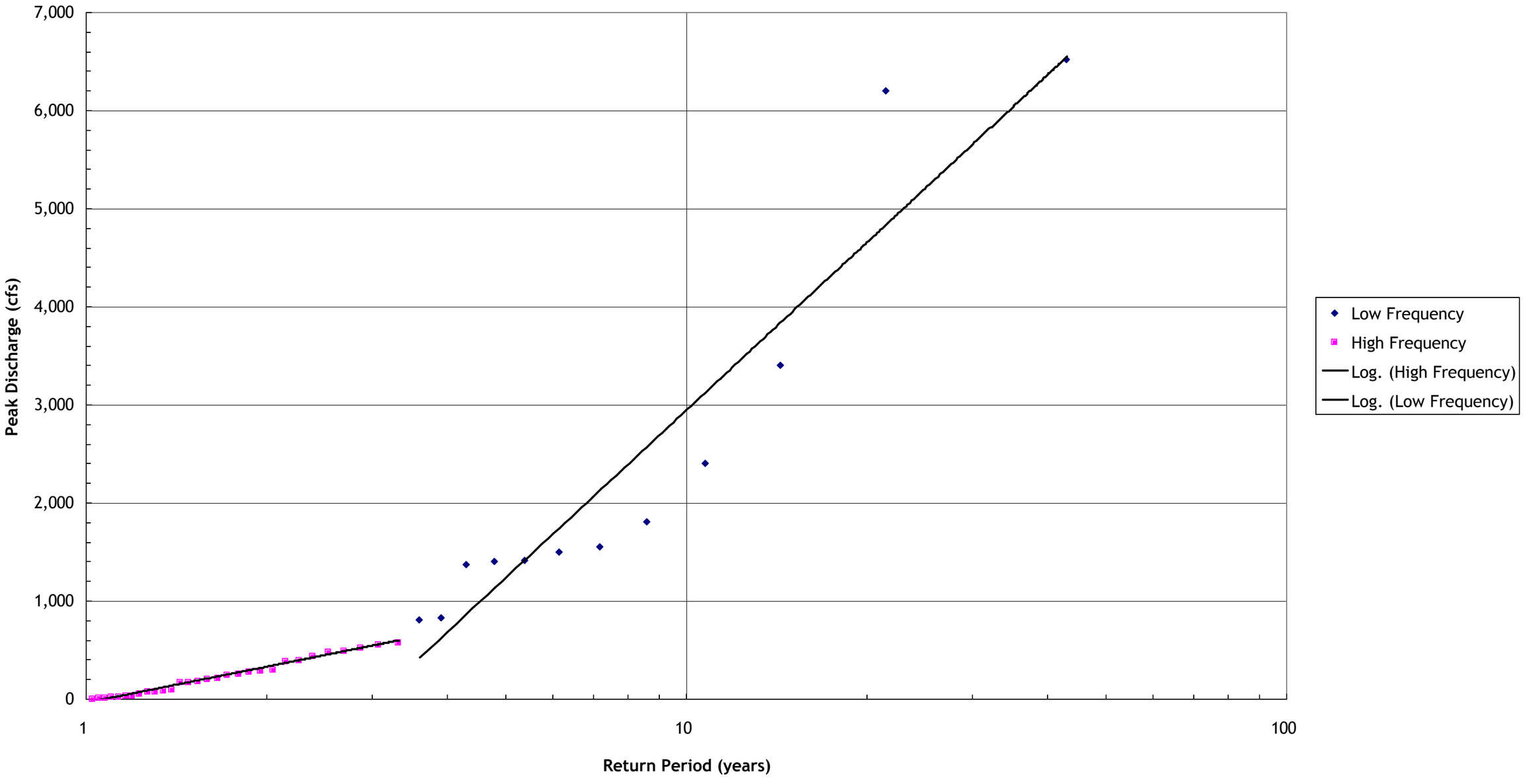


Figure A3-3. Flow Recurrence: Topanga Creek (LA County)

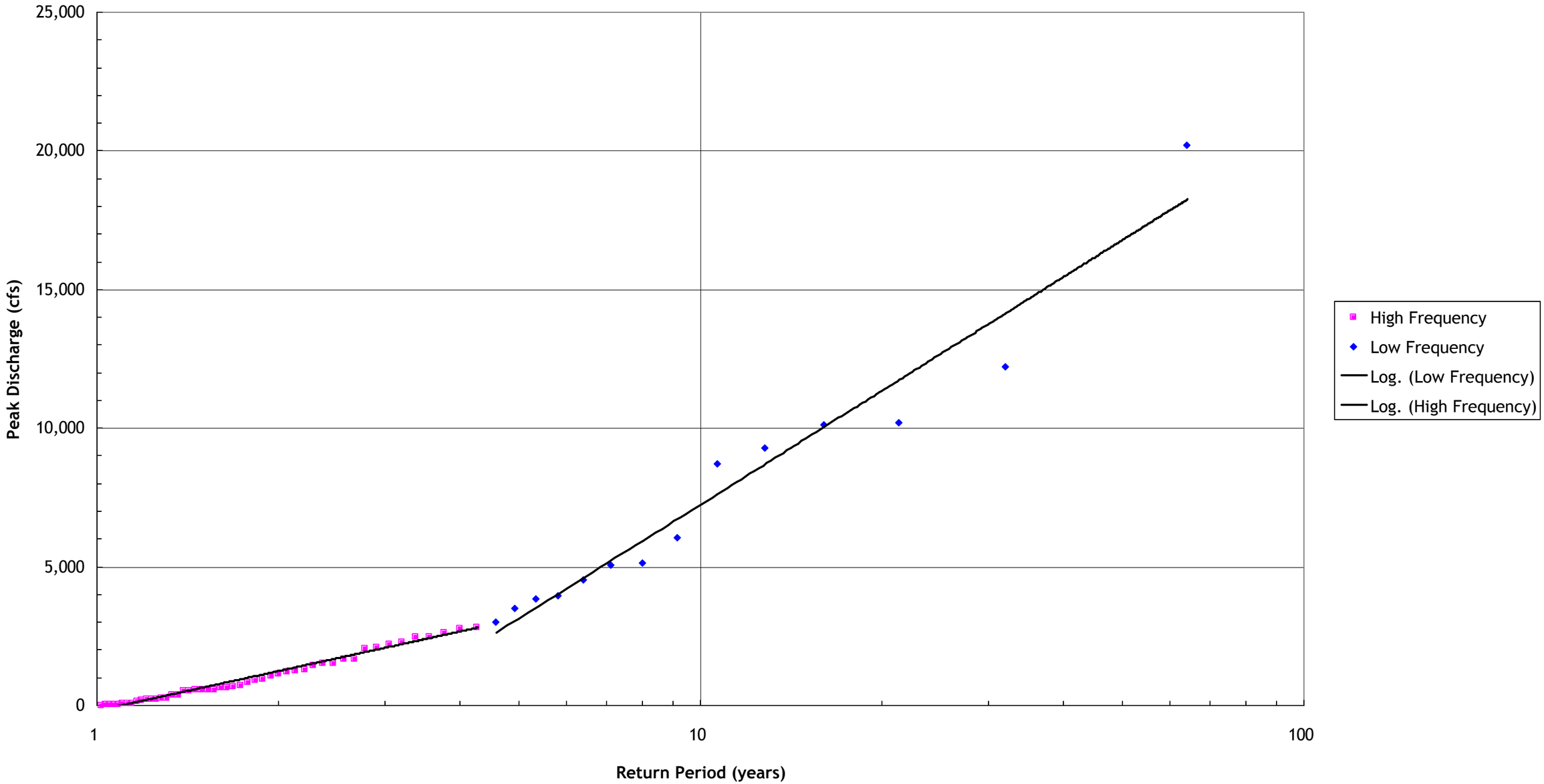


Figure A3-4. Flow Recurrence: Topanga Creek (USGS)

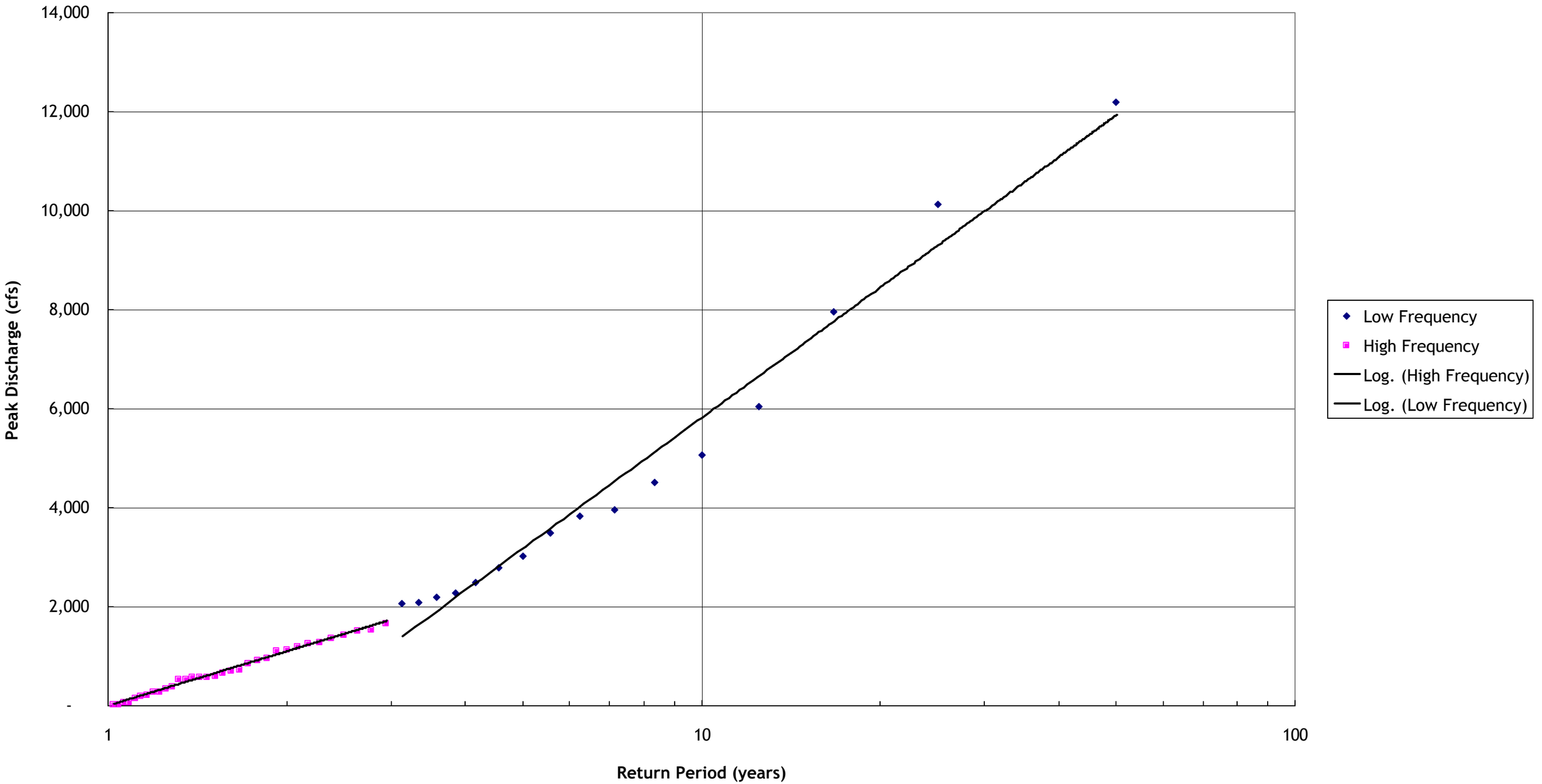


Figure A3-5. Flow Recurrence: Little Tujunga Creek

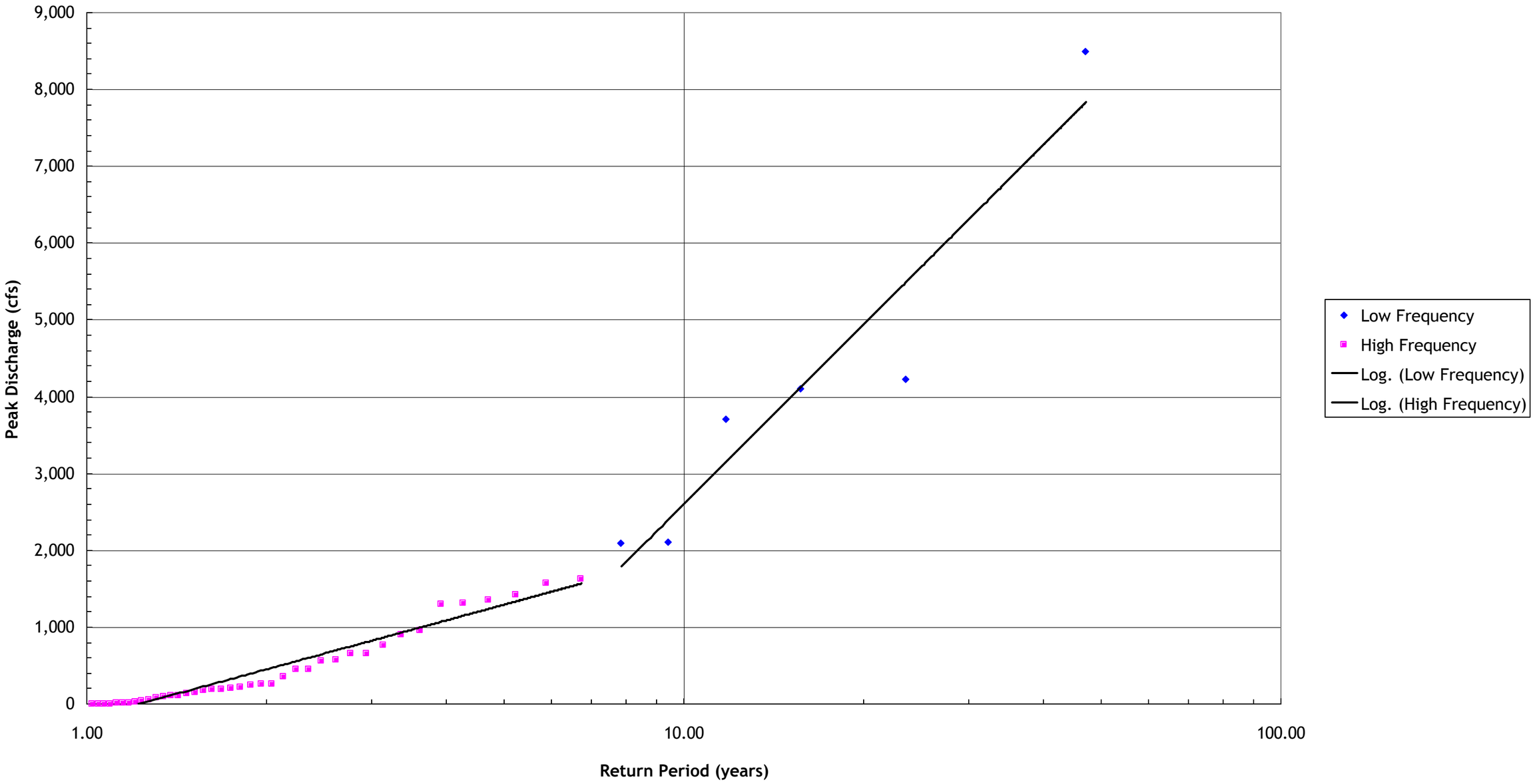
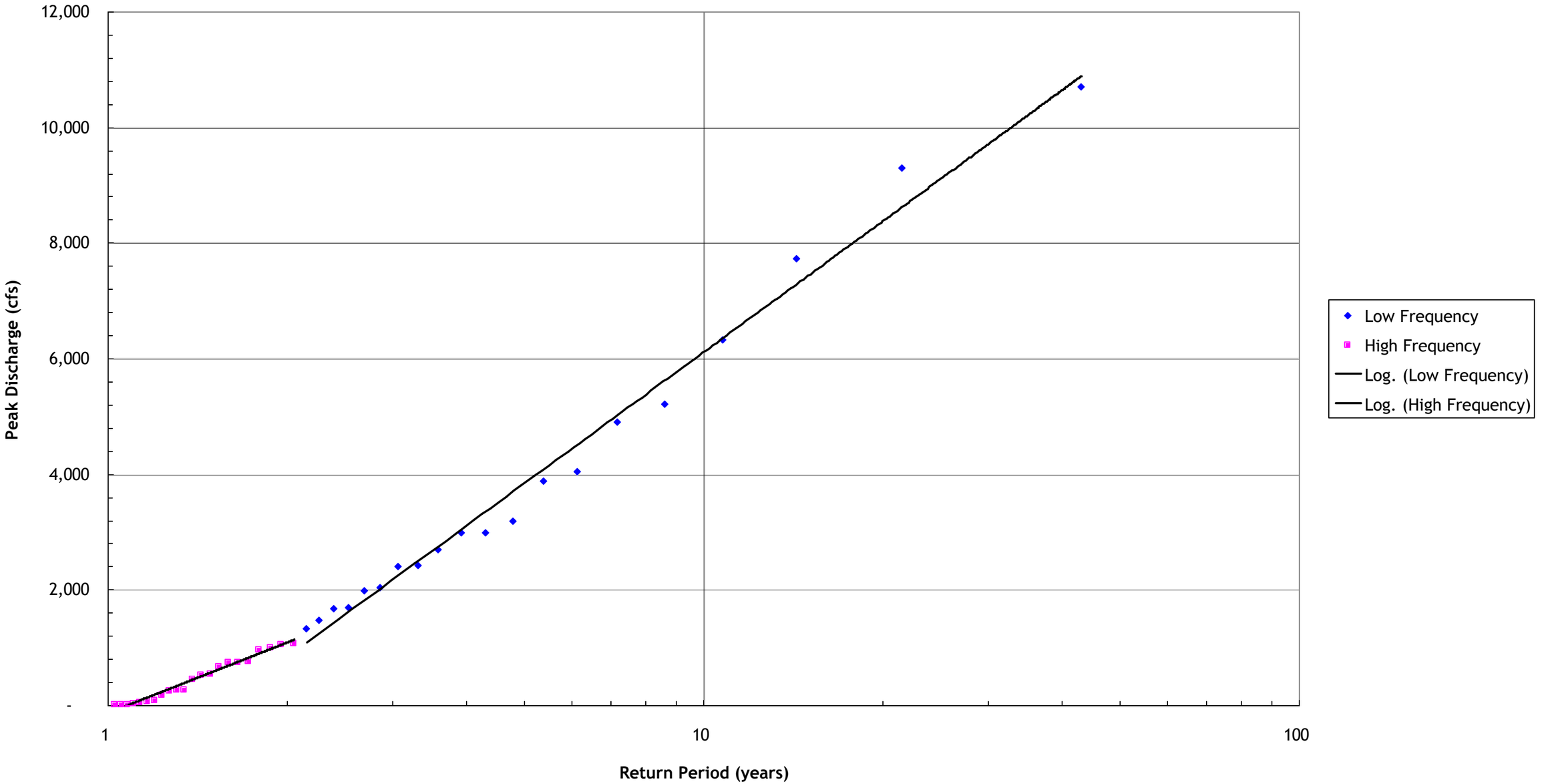


Figure A3-6. Flow Recurrence: Arroyo Simi



A4.1 BACKGROUND

The entire evaluation process is dependent on finding historic cross sections that have been surveyed at each study site, so that comparisons can be made over a period of time. This was one of the selection guidelines for the sites included in this study. Each of these study sites has a minimum of one cross section that has been surveyed previously, and most have more than one previously surveyed cross section.

A4.2 DATA

The data provided here are transcribed values of the actual surveys conducted on the dates indicated. Survey crews, where known, are also indicated. Plots of these historic cross sections are presented in Appendix B1 with the most current survey of the same cross section shown on the same plot.

le A4-1. Matching Cross Section Sur

Site ID	Site Name	Study Section	Historic Section	Data Table	Survey Dates
1	Topanga Creek	1	--		
		2	TS-2	A4-2	05-Nov-00
		3	--		
3	Hasley Canyon	--	HC-5		
		--	HC-4		
		--	HC-3		
		1	--		
		2	HC-2.5	A4-4	22-Feb-03, 14-Mar-03, 29-Mar-03, 19-Apr-03
		3	--		
		4	HC-2	A4-3	06-Oct-01, 01-Dec-01, 14-Dec-02, 28-Dec-02
		--	HC-1		
4u	Plum Canyon	--	PC-2.75		
	(upstream)	1	--		
		2	--		
		3	PC-3	A4-5	13-Oct-01, 19-Jan-03, 22-Feb-03, 14-Mar-03, 29-Mar-03
		4	PC-4	A4-6	03-Dec-04, 07-Feb-04
		5	--		
4d	Plum Canyon	1	--		
	(downstream)	2	PC-1	A4-7	13-Oct-01, 19-Jan-03, 22-Feb-03, 14-Mar-03, 29-Mar-03
		3	--		
		4	--		
		5	--		
		--	PC-2		
		--	PC-2.5		
7u	Borrego Canyo	1	--		
	(upstream)	2	--		
		3	Range 4A	A4-8	04-Sep-92, 01-Apr-93, 05-Dec-98, 02-Feb-03
		4	--		
		5	--		
7d	Borrego Canyo	1	--		
	(downstream)	2	--		
		3	Range 4D	A4-9	04-Sep-92, 01-Apr-93, 02-Feb-03
		4	--		
		5	--		
9	Serrano Creek	1	--		
		2	--		
		3	Range D	A4-12	04-Oct-97
		4	Range C	A4-11	28-Sep-91, 01-May-93
		5	Range B2	A4-10	01-Oct-97
10	Santiago Creek	1	XS-4	A4-16	28-Apr-95
		2	XS-3	A4-15	28-Apr-95
		3	XS-2	A4-14	28-Apr-95
		4	XS-1	A4-13	28-Apr-95
		5	--		
23	Dry Canyon	1	--		
		2	South	(1)	02-Oct-01, 25-Jan-02, 30-Sep-02, 14-Nov-02, 23-Dec-02, 2
		3	Middle	(1)	02-Oct-01, 25-Jan-02, 30-Sep-02, 14-Nov-02, 23-Dec-02, 1
		4	North	(1)	02-Oct-01, 25-Jan-02, 30-Sep-02, 14-Nov-02, 23-Dec-02, 1
		5	--		
27	Hicks Canyon W	1	--		
		2	Range A2	A4-17	05-Sep-86, 22-Apr-92, 16-Apr-93
		3	--		
		4	Range A4	A4-18	05-Sep-86, 22-Apr-92, 16-Apr-93
		5	--		
	(Hicks tributary)	6	Range A3		

(1) Data provided in AutoCADD drawing file format.

Table A4-2. Topanga Cross Section TS2

Surveyed on 5-Nov-2000

Stn (HI)	Distance (m)	BS (+)	FS (-)	Elevation (m)	Bearing to Rod	Notes
BM1 (100.24)	27	0.25			223	
BM2 (100.73)	20	0.76			222	Spray-painted rock east of fireplace.
1	23		1.46	99.28	222	W. bank/terrace 1/2 way bet high west & bouldery CH.
2	20		2.27	98.46	225	W. terrace - Rod bet. 2 alders (upstream)/Alder downst
3	16		2.97	97.76	228	West side of channel near conglomerate lt. Sst boulder
4	14		3.11	97.62	235	Edge of water west of channel side
5	13		3.23	97.51	238	~1.0 m in channel from west edge
6	12		3.23	97.50	240	In channel 1/2 m. from E. edge; water depth < 0.09 m.
7	8		2.77	97.96	249	At bottom of east bank before it rises
8	3		1.72	99.02	248	Top of east terrace/bank - in blackberry brambles
						[East bank (turn level 180º to face east)]
9	7		2.08	98.66	15	Channel side of alder, marked w/ paint - group of 5
10	13		2.98	97.76	41	W. bank of east channel, next to road
11	13		2.96	97.78	41	In east channel - 1 cm. Deep water, 2.5 m. wide CH.
12	16		2.92	97.81	38	East bank of east channel/4.70 m. high east bank.

Table A4-3a. Hasley Canyon Cross Section HC-2

Surveyed on 06-Oct-2001 (1)

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		1.44	101.44		100	tbm- concrete pad near barn
0+0	0.00			5.05	96.39	toe of hi bk, left side
0+20	20.00			5.30	96.14	grd
0+50	50.00			4.70	96.74	grd
0+80	80.00			4.30	97.14	grd
0+90	90.00			3.90	97.54	grd
0+94	94.00			4.20	97.24	top of bk, left side
0+98	98.00			6.00	95.44	slope of bank - grd
1+02	102.00			7.70	93.74	slope - grd - brk in slope
1+04.5	104.50			10.60	90.84	toe of stp slope
1+08	108.00			11.80	89.64	grd
1+12	112.00			11.60	89.84	grd - edge of low flow channel
1+14	114.00			12.40	89.04	edge of low flow channel
1+18	118.00			12.80	88.64	middle of low channel
1+20.5	120.50			12.40	89.04	rt edge low flow
1+24	124.00			10.4	91.04	up slope
1+26	126.00			8.7	92.74	top of low bank
1+32	132.00			7.60	93.84	at fenceline
1+34	134.00			6.80	94.64	inside fence
1+45	145.00			6.30	95.14	beg of rise
1+55	155.00			2.40	99.04	top of rise
1+66	166.00			1.80	99.64	at stake at fence
TBM		1.44				

Table A4-3b. Hasley Canyon Cross Section HC-2

Surveyed on 01-Dec-2001 (1)

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		2.21	102.21		100	
0+94	94.00			4.50	97.71	top high bank
1+03	103.00			8.10	94.11	top low bank
1+05	105.00			10.80	91.41	break in slope
1+07	107.00			12.20	90.01	toe of low bank
1+12	112.00			12.40	89.81	ground
1+13.5	113.50			12.70	89.51	channel edge
1+14.5	114.50			13.15	89.06	ground
1+17	117.00			13.25	88.96	ground
1+19	119.00			13.05	89.16	channel edge
1+20	120.00			12.50	89.71	toe of bank
1+23	123.00			10.80	91.41	middle slope
close		2.21				

(1) Field notes verified by M. Yeager 3/14/04

Table A4-3c. Hasley Canyon Cross Section HC-2

Surveyed on 14-Dec-2002 (1)

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		2.00	102.00			
0+94	94.00			4.60	97.40	
1+03	103.00			8.20	93.80	
1+05	105.00			10.95	91.05	
1+07	107.00			12.00	90.00	bottom of high bank
1+12	112.00			12.35	89.65	
1+14	114.00			12.95	89.05	
1+17	117.00			13.35	88.65	center of channel
1+20	120.00			12.95	89.05	
1+23	123.00			11.05	90.95	
1+26	126.00			9.25	92.75	top of high bank
1+32	132.00			7.65	94.35	fence line

Table A4-3d. Hasley Canyon Cross Section HC-2

Surveyed on 28-Dec-2002 (1)

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		1.95	101.95			
0+94	94.00			4.60	97.35	
1+03	103.00			8.25	93.70	
1+04	104.00			10.45	91.50	
1+05	105.00			11.00	90.95	
1+07	107.00			12.05	89.90	
1+12	112.00			12.20	89.75	
1+14	114.00			12.75	89.20	edge of low channel
1+17	117.00			12.70	89.25	
1+20.5	120.50			12.65	89.30	
1+23	123.00			11.10	90.85	
1+26	126.00			9.15	92.80	
1+32	132.00			7.55	94.40	6" from fenceline
		1.95				

(1) Field notes verified by M. Yeager 3/14/04

Table A4-4a. Hasley Canyon Cross Section HC-2.5

Surveyed on 22-Feb-2003 (1)

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		3.6	103.6			*Benchmark: lower NW corner of outfall l*
						215 degrees bearing of cross-section fro
0+10	10.00			1.00	102.60	
0+20	20.00			1.84	101.76	
0+28.5	28.50			1.88	101.72	*top of high bank*
0+29	29.00			3.24	100.36	
0+31	31.00			4.42	99.18	
0+34	34.00			7.82	95.78	
	35.50			8.25	95.35	
0+36	36.00			8.65	94.95	*edge of low channel*
0+40.5	40.50			9.18	94.42	
0+42	42.00			8.95	94.65	
0+42	42.00			7.75	95.85	*edge of low channel*
0+44.5	44.50			7.60	96.00	
0+45.5	45.50			6.62	96.98	*top of middle terrace*
0+48	48.00			6.28	97.32	
0+52	52.00			6.42	97.18	
0+56	56.00			5.82	97.78	
0+57	57.00			4.64	98.96	
0+63	63.00			4.10	99.50	
0+73	73.00			4.55	99.05	
0+79	79.00			4.78	98.82	
0+83.75	83.75			4.14	99.46	*at the stake*
TBM		3.6				

Table A4-4b. Hasley Canyon Cross Section HC-2.5

Surveyed on 14-Mar-2003 ''

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		3.88	103.88			
0+28.5	28.50			2.14	101.74	*top of high bank*
0+29	29.00			3.55	100.33	
0+33	33.00			6.08	97.80	*top of low bank*
0+34.5	34.50			8.18	95.70	*edge of channel*
0+35.5	35.50			8.40	95.48	
0+35.8	35.80			8.95	94.93	
0+38	38.00			9.48	94.40	
0+40.5	40.50			9.80	94.08	
0+42	42.00			9.15	94.73	
0+42.5	42.50			7.95	95.93	*edge of low channel*
0+44.5	44.50			7.92	95.96	
0+45	45.00			6.85	97.03	*top of mid-bank*
0+47	47.00			6.68	97.20	
0+54	54.00			6.36	97.52	
0+84	84.00			4.42	99.46	*at the stake (54 - 84 no change)*
TBM		3.88				
						re-survey

(1) Field notes verified by M. Yeager 3/14/04

Table A4-4c. Hasley Canyon Cross Section HC-2.5

Surveyed on 29-Mar-2003 (1)

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		3.45	103.45			
0+28.5	28.50			1.65	101.80	*top of bank*
0+29	29.00			3.10	100.35	
0+31.5	31.50			4.97	98.48	
0+34	34.00			7.64	95.81	
0+35.5	35.50			8.51	94.94	
0+37	37.00			8.74	94.71	
0+40	40.00			9.18	94.27	
0+42	42.00			8.91	94.54	
0+42	42.00			8.00	95.45	*vertical (edge of inset channel)*
0+42.5	42.50			7.61	95.84	
0+44.2	44.20			7.52	95.93	
0+44.5	44.50			6.55	96.90	*top of middle bank*
0+46	46.00			6.49	96.96	
0+47	47.00			6.19	97.26	
0+54	54.00			5.93	97.52	
TBM		3.44				

Table A4-4d. Hasley Canyon Cross Section HC-2.5

Surveyed on 19-Apr-2003 (1)

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		3.90	103.9			
0+28.5	28.50			2.10	101.80	*top of bank*
0+29	29.00			3.45	100.45	*slope*
0+32	32.00			5.35	98.55	*slope*
0+34	34.00			6.70	97.20	
0+34.5	34.50			8.14	95.76	
0+35.5	35.50			8.44	95.46	
0+35.5	35.50			8.88	95.02	*vertical (edge of channel)*
0+37	37.00			8.98	94.92	
0+38.5	38.50			9.55	94.35	
0+41	41.00			9.24	94.66	
0+42	42.00			9.05	94.85	
0+42	42.00			7.95	95.95	*vertical*
0+44.5	44.50			7.95	95.95	
0+45	45.00			6.80	97.10	
0+47	47.00			6.78	97.12	
0+47.5	47.5			6.55	97.35	
0+52	52			6.48	97.42	
TBM		3.89				

(1) Field notes verified by M. Yeager 3/14/04

Table A4-5a. Plum Canyon Cross Section PC-3

Surveyed on 13-Oct-2001 (1)

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		5.40	105.40		100.00	*226 from 0+00 to TBM*
0+00	0.00			1.10	104.30	*close to top of bank*
0+8	8.00			2.45	102.95	sloped bank
0+15	15.00			4.40	101.00	bottom of bank
0+24	24.00			4.75	100.65	*ground*
0+33	33.00			4.70	100.70	*ground*
0+36	36.00			5.10	100.30	*overband ground*
0+44.5	44.50			5.20	100.20	*top of bank of active channel*
0+45.5	45.50			7.80	97.60	*edge of active channel*
0+47	47.00			7.90	97.50	*toe deposit*
0+47.5	47.50			8.80	96.60	*in channel*
0+56	56.00			8.70	96.70	*ground*
0+71	71.00			8.40	97.00	*ground in channel*
0+77	77.00			8.05	97.35	*edge of bar*
0+79	79.00			8.60	96.80	*bottom of channel*
0+88	88.00			8.30	97.10	*ground*
1+00	100.00			8.40	97.00	*ground*
1+06	106.00			8.10	97.30	*toe of low bank*
1+08	108.00			7.60	97.80	*top of low bank*
1+17	117.00			7.50	97.90	*ground*
1+20	120.00			7.00	98.40	*small rise*
1+31	131.00			6.50	98.90	*ground*
1+35	135.00			6.30	99.10	*ground*
1+37	137.00			6.80	98.60	*ground*
1+54	154.00			5.05	100.35	*ground*
1+78	178.00			4.35	101.05	*end*
						close=5.39

Table A4-5b. Plum Canyon Cross Section PC-3

Surveyed on 19-Jan-2003 (1)

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		5.12	105.12			
0+0	0.00			0.65	104.47	
0+15	15.00			4.00	101.12	
0+30	30.00			4.66	100.46	
0+32.5	32.50			4.05	101.07	
0+36	36.00			4.70	100.42	
0+43	43.00			4.50	100.62	
0+44.5	44.50			4.90	100.22	*edge of bank*
0+45	45.00			7.22	97.90	*bottom of steep bank*
0+47.5	47.50			8.30	96.82	*edge of channel*
0+53	53.00			8.32	96.80	
0+56	56.00			8.72	96.40	
0+58	58.00			8.15	96.97	
0+63	63.00			8.35	96.77	
0+64.5	64.50			8.50	96.62	
0+72	72.00			8.05	97.07	
0+75	75.00			7.65	97.47	
0+79	79.00			7.60	97.52	
0+89	89.00			8.30	96.82	
0+96	96.00			8.25	96.87	
0+97.5	97.50			8.00	97.12	*top of low channel back*
1+06	106.00			7.85	97.27	
1+09	109.00			7.35	97.77	
1+18	118.00			7.12	98.00	
1+20	120.00			6.75	98.37	
1+28	128.00			6.40	98.72	
0+36	136.00			6.10	99.02	
1+45	145.00			6.25	98.87	
1+60	160.00			4.38	100.74	
1+70.5	170.50			4.05	101.07	*stake*
		5.12				

(1) Field notes verified by M. Yeager 3/14/04

Table A4-5c. Plum Canyon Cross Section PC-3

Surveyed on 22-Feb-2003 (1)

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		5.24	105.24			
0+35	35.00			5.65	99.59	*edge of bank*
0+35.5	35.50			8.10	97.14	*toe of bank, edge of channel*
0+42	42.00			8.14	97.10	
0+43.5	43.50			8.90	96.34	*edge of inset channel*
0+45	45.00			9.20	96.04	
0+53	53.00			9.58	95.66	
0+60	60.00			9.00	96.24	*edge of inset channel*
0+62.5	62.50			8.25	96.99	
0+66	66.00			7.85	97.39	
0+70.5	70.50			7.94	97.30	
0+80.5	80.50			8.40	96.84	
0+81.5	81.50			8.05	97.19	
1+00	100.00			7.85	97.39	
1+01	101.00			7.55	97.69	
1+05	105.00			7.75	97.49	
1+07	107.00			7.35	97.89	*edge of channel*
1+15	115.00			7.30	97.94	
		5.24				

Table A4-5d. Plum Canyon Cross Section PC-3

Surveyed on 14-Mar-2003 (1)

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		5.02	105.02			
0+35.5	35.50			4.48	100.54	*top of bank*
0+36	36.00			8.02	97.00	*bottom of bank*
0+39	39.00			7.85	97.17	
0+42	42.00			7.95	97.07	
0+44	44.00			8.70	96.32	*edge of low channel*
0+51	51.00			9.35	95.67	
0+55	55.00			9.40	95.62	
0+56	56.00			9.15	95.87	
0+60.5	60.50			9.00	96.02	
0+61	61.00			8.52	96.50	*edge of low channel*
0+62.5	62.50			8.18	96.84	
0+70	70.00			7.65	97.37	
0+71	71.00			8.12	96.90	
0+79	79.00			8.18	96.84	
0+80	80.00			7.98	97.04	
0+97	97.00			7.80	97.22	
1+02.5	102.50			7.36	97.66	
1+06	106.00			7.48	97.54	
1+08.5	108.50			7.08	97.94	*edge of channel*
		5.05				

(1) Field notes verified by M. Yeager 3/14/04

Table A4-5e. Plum Canyon Cross Section PC-3

Surveyed on 29-Mar-2003 (1)

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		5.27	105.27			*distance measured from end stake (zero stake missing)*
0+82	89.00			8.02	97.25	
0+98	73.00			8.22	97.05	
1+08	63.00			8.53	96.74	
1+10	61.00			8.05	97.22	
1+12	59.00			8.16	97.11	
1+14	57.00			8.15	97.12	
1+31	40.00			9.13	96.14	
1+40	31.00			9.38	95.89	
1+42	29.00			8.36	96.91	
1+42	29.00			5.10	100.17	*vertical*
		5.25				

(1) Field notes verified by M. Yeager 3/14/04

Table A4-6a. Plum Canyon Cross Section PC-4

Surveyed on 03-Jan-2004

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		9.00	109.00			
0+0	0.00			0.30	108.70	
0+30.7	30.70			1.10	107.90	top of bank
0+35	35.00			5.00	104.00	
0+41.5	41.50			5.65	103.35	
0+45	45.00			5.40	103.60	
0+47	47.00			5.80	103.20	
0+49	49.00			5.15	103.85	
0+51	51.00			5.35	103.65	
0+57	57.00			5.45	103.55	
0+61	61.00			5.25	103.75	
0+63	63.00			5.60	103.40	
0+66.5	66.50			5.85	103.15	
0+68	68.00			5.65	103.35	
0+68	68.00			5.70	103.30	
0+75	75.00			4.85	104.15	
0+83	83.00			4.18	104.82	
0+88	88.00			4.88	104.12	
0+88.5	88.50			5.32	103.68	
0+99	99.00			5.40	103.60	
1+03	103.00			5.15	103.85	
1+07	107.00			5.48	103.52	
1+22	122.00			5.68	103.32	
1+25.5	125.50			8.05	100.95	
1+29	129.00			7.85	101.15	
1+29.5	129.50			7.25	101.75	
1+30.5	130.50			6.48	102.52	
1+33	133.00			6.30	102.70	
1+37.5	137.50			7.12	101.88	
1+48	148.00			6.88	102.12	
1+51	151.00			5.55	103.45	
1+52	152.00			3.50	105.50	top of bank
1+88	188.00			4.40	104.60	stake
TBM		9.00				

Field data verified by M. Yeager 05/31/04

Table A4-6b. Plum Canyon Cross Section PC-4

Surveyed on 07-Feb-2004

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		8.85	108.85			
0+25.5	25.50			0.82	108.03	top of bank
0+25.5	25.50			2.45	106.40	
0+32	32.00			4.10	104.75	
0+32.5	32.50			2.10	106.75	
0+34.5	34.50			3.90	104.95	
0+35	35.00			4.85	104.00	
0+41	41.00			5.34	103.51	
0+41.5	41.50			5.48	103.37	
0+45	45.00			5.30	103.55	
0+46	46.00			5.55	103.30	
0+48	48.00			5.50	103.35	
0+49	49.00			5.08	103.77	
0+52	52.00			5.14	103.71	
0+53	53.00			4.98	103.87	
0+57	57.00			5.25	103.60	
0+60.5	60.50			5.10	103.75	
0+62	62.00			5.45	103.40	
0+64.5	64.50			5.48	103.37	
0+65	65.00			5.60	103.25	
0+66	66.00			5.68	103.17	
0+67.5	67.50			5.42	103.43	
0+68	68.00			5.50	103.35	edge of R channel
1+21	121.00			5.48	103.37	no change from 68-121
1+24	124.00			7.08	101.77	edge of L channel
1+24.5	124.50			7.78	101.07	
1+26	126.00			8.05	100.80	
1+28	128.00			7.80	101.05	
1+29	129.00			6.68	102.17	
1+30	130.00			6.30	102.55	
1+33	133.00			6.18	102.67	
1+35	135.00			6.64	102.21	
1+35.5	135.50			6.84	102.01	
1+37	137.00			6.95	101.90	
1+40	140.00			6.85	102.00	
1+41.5	141.50			6.94	101.91	
1+45	145.00			6.85	102.00	
1+46.5	146.50			6.48	102.37	
1+48	148.00			6.64	102.21	
1+49	149.00			6.38	102.47	
1+50	150.00			3.30	105.55	top of bank
TBM		8.85				

Field data verified by M. Yeager 05/31/04

Table A4-7a. Plum Canyon Cross Section PC-1

Surveyed on 13-Oct-2001

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		3.72	102.52			100
0+0	-			1.40	101.12	
0+3	3.00			2.70	99.82	
0+10	10.00			3.10	99.42	
0+20	20.00			3.60	98.92	tp of bank
0+26	26.00			9.30	93.22	btm bank
0+34	34.00			9.60	92.92	in channel - grd
0+43	43.00			9.10	93.42	channel-bar-grd
0+49	49.00			9.35	93.17	Channel-grd
0+61	61.00			9.40	93.12	btm of low bk
0+61.5	61.50			7.90	94.62	top low bank (left side)
0+67.5	67.50			6.70	95.82	middle hi bk
0+71	71.00			5.35	97.17	top of low bank
0+77	77.00			5.65	96.87	grd
0+90	90.00			5.50	97.02	grd
1+00	100.00			5.30	97.22	edge of dirt rd
1+09	109.00			4.75	97.77	edge of rd
1+14	114.00			3.60	98.92	end of section
TBM			close	3.72	98.80	close

Field data verified by M. Yeager 05/31/04

Bearing 320 degrees from 0 pt to tbm

Table A4-7b. Plum Canyon Cross Section PC-1

Surveyed on 19-Jan-2003

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		2.40			100.00	benchmark is on concrete downdrain
TBM1		2.44	102.44			
0+0	-			1.30	101.14	
0+3	3.00			2.32	100.12	edge of road
0+20	20.00			3.30	99.14	top of bank
0+23	23.00			6.76	95.68	
0+25	25.00			8.50	93.94	
0+27.5	27.50			9.30	93.14	edge of chnl
0+32	32.00			9.25	93.19	
0+39	39.00			8.65	93.79	
0+47	47.00			9.00	93.44	
0+51	51.00			9.05	93.39	
0+54.5	54.50			9.25	93.19	
0+61.5	61.50			9.20	93.24	
0+62.75	62.75			8.75	93.69	edge of bk
0+63	63.00			7.70	94.74	top of low bk
0+65.75	65.75			6.85	95.59	
0+71	71.00			5.25	97.19	
0+78	78.00			5.65	96.79	grd
0+83	83.00			5.90	96.54	
0+96	96.00			5.00	97.44	
1+00	100.00			5.10	97.34	edge of rd
1+10	110.00			4.60	97.84	edge of rd
1+14	114.00			3.50	98.94	at stake
		2.44				
				13.14	89.30	from bridge at culvert, center of channel

Field data verified by M. Yeager 05/31/04

Table A4-7c. Plum Canyon Cross Section PC-1

Surveyed on 22-Feb-2003

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		2.78	102.78			
0+0	-			1.75	101.03	
0+3	3.00			3.05	99.73	
0+19.8	19.80			3.85	98.93	top of bank
0+20	20.00			4.70	98.08	
0+24.5	24.50			8.35	94.43	toe of bank
0+26	26.00			8.48	94.30	
0+28.5	28.50			8.95	93.83	
0+30	30.00			8.65	94.13	
0+33	33.00			8.65	94.13	
0+34.5	34.50			9.12	93.66	
0+45	45.00			9.15	93.63	
0+46	46.00			8.85	93.93	
0+51	51.00			9.00	93.78	
0+54.5	54.50			8.75	94.03	
0+55.5	55.50			8.28	94.50	
0+59	59.00			8.25	94.53	
0+60	60.00			8.45	94.33	
0+65	65.00			8.40	94.38	edge of channel
0+65	65.00			7.55	95.23	edge of channel
0+69	69.00			6.48	96.30	
0+71	71.00			5.60	97.18	
TBM		2.78				
				13.45	89.33	from bridge at culvert, center of channel

Field data verified by M. Yeager 05/31/04

Table A4-7d. Plum Canyon Cross Section PC-1

Surveyed on 14-Mar-2003

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		3.02	103.02			
0+19.75	19.75			4.10	98.92	top of bank
0+20	20.00			4.95	98.07	
0+24.5	24.50			8.58	94.44	toe of bank
0+26	26.00			8.72	94.30	edge of channel
0+26.5	26.50			9.00	94.02	
0+29	29.00			9.19	93.83	
0+29.5	29.50			8.95	94.07	
0+33	33.00			8.95	94.07	
0+34.5	34.50			9.36	93.66	
0+45	45.00			9.46	93.56	
0+46	46.00			9.14	93.88	
0+50	50.00			9.15	93.87	
0+52.5	52.50			9.05	93.97	
0+54.5	54.50			9.04	93.98	
0+55.5	55.50			8.55	94.47	
0+58.5	58.50			8.48	94.54	
0+60	60.00			8.74	94.28	
0+65	65.00			8.65	94.37	edge of channel
0+65	65.00			7.86	95.16	vertical up
0+71	71.00			5.85	97.17	
TBM		3.02				

Field data verified by M. Yeager 05/31/04

Table A4-7e. Plum Canyon Cross Section PC-1

Surveyed on 29-Mar-2003

Station	Distance	BS	HI	FS	Elevation	Notes
TBM		2.84	102.84			
0+20	20.00			3.76	99.08	*top of bank*
0+21	21.00			5.20	97.64	
0+24.5	24.50			8.35	94.49	*edge of channel*
0+26	26.00			8.66	94.18	
0+28	28.00			9.94	92.90	
0+30	30.00			9.97	92.87	
0+32	32.00			9.76	93.08	
0+33.5	33.50			9.99	92.85	
0+41.5	41.50			9.06	93.78	
0+48	48.00			9.19	93.65	
0+48.5	48.50			8.95	93.89	
0+53.5	53.50			8.94	93.90	
0+55.5	55.50			8.34	94.50	
0+58	58.00			8.25	94.59	
0+60	60.00			8.50	94.34	
0+65	65.00			8.40	94.44	*edge of channel*
0+65	65.00			7.50	95.34	*top of bank*
0+68	68.00			6.78	96.06	
0+71	71.00			5.66	97.18	
		2.84				

Field data verified by M. Yeager 05/31/04

Table A4-8a. Borrego Canyon Range 4A

Surveyed on 02-Feb-2003

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
BM	4.71	104.71		100.00	Hi spot of rock below live oak, rt. bk.
9			7.90	96.81	Toe of slope - enter stream
32			7.80	96.91	Toe of slope - leave stream bed
34			6.40	98.31	Stream bank
60			4.80	99.91	Ground
99			5.40	99.31	Ground
102			6.10	98.61	Ground
130			6.50	98.21	Ground
163			6.50	98.21	Ground
164			5.60	99.11	Ground
177			5.20	99.51	Ground
200			5.40	99.31	Ground
			1.97	102.74	TP - High pt. Old refridg
		108.80			TP - Refridge.
220			9.50	99.30	Ground
250			9.90	98.90	Ground
280			10.70	98.10	Toe of high bank
292			4.80	104.00	Slope of bank
293			1.30	107.50	Top of high bank
295.5			1.40	107.40	Ground by stake
300			1.40	107.40	Ground
			6.06	102.74	Old Refidge
	1.98				TP old Refridg
			4.74		High spot on rock - TBA close

Survey crew: Trimble, Federico

Table A4-8b. Borrego Canyon Range 4A

Surveyed on 04-Sep-1992

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
0	2.20	102.20		100.00	Top of steel post #3, 29 ft. from sycamore
0			4.60	97.60	Ground at post
-20			1.90	100.30	Ground
10			5.50	96.70	Centerline of road
18			5.30	96.90	Top of bank
19			8.60	93.60	Ground, edge of alluvial fill sand
24			10.50	91.70	Edge of debris
40			10.70	91.50	
60			10.30	91.90	
80			10.40	91.80	
100			10.20	92.00	
120			10.20	92.00	
140			9.90	92.30	
160			9.60	92.60	
180			9.60	92.60	
200			9.30	92.90	
229			8.60	93.60	Edge of fill, base of bank
237			5.80	96.40	Ground
248			1.00	101.20	Top of Bank
258			0.40	101.80	Ground
			2.20	100.00	

Survey Crew: Trimble, Lewin

Table A4-8c. Borrego Canyon Range 4A

Surveyed on 01-Apr-1993

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
			0.30		Road surface + 200 ft us
	5.20	101.90		96.70	Approx. level of road 60 ft upstream of tree
-20			2.60	99.30	Spot on hill top of bank
-16			11.50	90.40	Toe of bank
0			11.40	90.50	Approximate ground
30			11.60	90.30	Ground
75			10.60	91.30	Ground
100			10.80	91.10	Ground
140			10.10	91.80	Ground
165			10.60	91.30	Ground
180			10.50	91.40	Ground
190			9.30	92.60	Ground
236			9.50	92.40	Edge of channel
255			1.60	100.30	Top of bank
267			1.10	100.80	Ground at live oak

Table A4-8d. Borrego Canyon Range 4A

Surveyed on 05-Dec-1998

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
	4.24	104.24		100.00	TBM A: carved pt. In soft rock below live oak
1			1.50	102.74	Slope below live oak
9			6.90	97.34	Top of high bank, enter channel
44			6.50	97.74	Enter brush piles and berm
61			4.60	99.64	Top of berm, leave brush
94			5.30	98.94	Ground
132			6.30	97.94	Low point in channel, enter brush
149			5.10	99.14	Top of berm in brush
165			5.80	98.44	Ground
-			2.00	102.24	Old flood plain terrace 100 ft left of line
-			1.30	102.94	Old flood plain terrace 150 ft right of line
200			5.20	99.04	Ground
265			6.10	98.14	Ground
280			6.30	97.94	Toe of high bank (repinned @ 00)
289			3.90	100.34	Ground
-	14.76	114.48	4.52	99.72	Turning point, top of buried stump in channel
291			7.50	106.98	Tp. Hi bk.
310			7.80	106.68	Ground
354			8.30	106.18	Centerline of road
-	4.30	104.00	14.78	99.70	TP #1, stump in channel
			4.02	99.98	TBM A, close, error = 0.02 ft.

Survey crew: Trimble, Coffman, Liu, Ramirez, Yeager

Table A4-9a. Borrego Canyon Range 4D

Surveyed on 04-Sep-1992

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
0	9.96	110.0		100.0	Nail in 12" eucalyptus on line (TBM)
6			10.6	99.4	Ground by TBM
-16			10.8	99.2	Edge of alluvial fill
-20			7.9	102.1	Ground on bank
20			11.4	98.6	Ground - on alluvial fill (sand)
40			11.2	98.8	Ground - on alluvial fill (sand)
60			10.9	99.1	Ground - on alluvial fill (sand)
84			10.6	99.4	Ground - on alluvial fill (sand)
100			10.2	99.8	Ground - on alluvial fill (sand)
120			10.1	99.9	Ground - on alluvial fill (sand)
138			9.6	100.4	Edge of fill, base of bank
143			1.2	108.8	Top of bank
165			1.5	108.5	Terrace
			10.0	100.0	Close on TBM

Survey crew: Trimble, Lewin

Table A4-9b. Borrego Canyon Range 4D

Surveyed on 01-Apr-1993

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
0	9.5	109.5		100.0	Upper-most nail, upstream side of eucalyptus
0			12.3	97.2	Ground at bench mark
-46			13.1	96.4	Toe of high bank
50			12.8	96.7	Ground at bench mark
120			12.0	97.5	Ground at bench mark
168			12.9	96.6	Toe of high-bank (left)
170			5.5	104.0	Top of left bank
180			5.5	104.0	Ground at bench mark
0			9.5	100.0	Closing on nail

Table A4-9c. Borrego Canyon Range 4D

Surveyed on 02-Feb-2003

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
-16	1.40	100.6		99.2	Ground
-20	1.60	100.8	100.6	99.2	Ground
-26			1.6	99.0	Ground
-28			3.8	96.8	Enter side channel
-47			3.8	96.8	Toe of high bank
0			4.3	96.3	Ground by tree
9			5.1	95.5	Top of low bank
12			6.2	94.4	Enter channel
32			6.2	94.4	Channel
41			5.6	95.0	Ground
60			6.4	94.2	Ground
70			5.7	94.9	Ground
82			6.2	94.4	Ground
95			5.5	95.1	Ground
110			6.3	94.3	Ground
134			6.5	94.1	Edge of channel
135			5.5	95.1	Top of low bank
165			4.6	96.0	Toe of rip-rap
175			0.1	100.5	Ground (Old terrace surface is 5.8 ft. above t
-16			1.4	99.2	Close

Survey crew: Trimble, Federico

Table A4-10. Serrano Creek Range B2

Surveyed on 01-Oct-1997

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
	2.85	102.85		100.0	Top of pipe (end of Range D)
0+00			4.1	98.8	Ground by edge of trail
0+10			4.4	98.5	Ground by other edge of trail
0+11.5			4.9	98.0	Top of high bank
0+29			14.8	88.1	Toe of high bank
0+39			15.7	87.2	Top of bank (channel edge)
0+41			18.2	84.7	Centerline of channel
0+56			3.6	99.3	Top of high bank (other side of channel)
0+61			3.2	99.7	Ground
			2.9	100.0	Close on top of pipe

Table A4-11a. Serrano Creek Range C

Surveyed on 28-Sep-1991

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
	2.37	102.37		100.0	NE-most corner of curb, btwn Bldgs 20581 & 20555
0+00			2.5	99.9	Ground at curb
0+07			4.4	98.0	Riding trail (edge)
0+18			4.8	97.6	Top of high bank
0+32			12.9	89.5	Channel
	4.38			102.37	New backsight
0+53			16.2	86.2	Edge of channel
0+62			6.2	96.2	Top of bank (far side)
0+70			5.2	97.2	Ground by RR tie fence-post

Survey crew: Trimble, LaVilla

Table A4-11b. Serrano Creek Range C

Surveyed on 01-May-1993

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
TBM				100.0	NE-most corner of curb, btwn Bldgs 20581 & 20555
0+00	2.82	102.82			
0+10			5.0	97.8	Ground at curb
0+18			5.4	97.4	Centerline of riding trail
0+28			12.0	90.8	Top of bank
0+45			16.1	86.7	Base (toe) of slope
0+51			17.5	85.3	Ground
0+57			9.4	93.4	Centerline of Channel
0+63			4.3	98.5	Ground
0+70			3.6	99.2	Top of bank (far side)
			2.8	100.0	Close on TBM (NE-most corner of curb)

Table A4-12. Serrano Creek Range D

Surveyed on 04-Oct-1997

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
TBM	2.85	102.85		100.0	Top of gas pipe in bushes
0+00			4.5	98.4	Ground at pipe
0+06			4.9	98.0	Centerline of riding trail
0+09			5.0	97.9	Top of bank, near trail
0+26			11.9	91.0	Ground
0+34			13.6	89.3	Top of high bank
0+39			18.2	84.7	Toe of high bank
0+50			18.2	84.7	Top of low bank
0+51			20.8	82.1	Centerline of Channel
0+55			17.3	85.6	Top of low bank
0+61			13.1	89.8	Ground
0+69			7.5	95.4	Top of bank
			2.9	100.0	Close on top of pipe

Survey crew: Trimble, Selay, and a third person

Table A4-13. Santiago Creek Cross Section X-1

Surveyed on 28-April-1995

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
T.O.S.	0.81	18.44		17.63	T.O.S., L.B. -- given
B.O.S.			1.04	17.4	B.O.S., L.B.
85			2.30	16.1	
83			3.10	15.3	L.B. HWM, -- Good debris line
80			4.20	14.2	Very light brush
75			5.60	12.8	Gravels, cobbles, & rocks (few > 12")
70			5.80	12.6	Gravels, cobbles, & rocks (few > 12")
65			6.00	12.4	Gravels, cobbles, & rocks (few > 12")
60			5.80	12.6	Gravels, cobbles, & rocks (few > 12")
55			5.00	13.4	Gravels, cobbles, & rocks (few > 12")
50			5.30	13.1	Gravels, cobbles, & rocks (few > 12")
45			5.60	12.8	Gravels, cobbles, & rocks (few > 12")
40			7.10	11.3	Gravels, cobbles, & rocks (few > 12")
35			7.70	10.7	Gravels, cobbles, & rocks (few > 12")
31			7.90	10.5	LEW --Active channel
30			8.30	10.1	Active channel
25			8.80	9.6	Active channel
20			7.90	10.5	REW --Active channel
15			7.70	10.7	
10			6.50	11.9	Same as above, but with more larger rocks
5			5.60	12.8	Same as above, but with more larger rocks
0			5.30	13.1	Same as above, but with more larger rocks
-2			4.70	13.7	Same as above, but with more larger rocks
-2			2.40	16.0	Same as above, but with more larger rocks
-3			1.88	16.6	T.O.S., R.B.
-3			1.59	16.9	B.O.S., R.B.

Survey crew: Agajanian, Agozino

Table A4-14. Santiago Creek Cross Section X-2

Surveyed on 28-April-1995

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
T.O.S.	8.65	24.06		15.41	T.O.S., L.B. -- given
B.O.S.			9.14	14.92	B.O.S., L.B.
86			10.63	13.43	L.B. HWM -- Fair wash line
85			11.10	13.0	Moderate cover of willows, sand silt, and willows
80			11.80	12.3	Moderate cover of willows, sand silt, and willows
75			11.70	12.4	Moderate cover of willows, sand silt, and willows
70			12.30	11.8	Moderate cover of willows, sand silt, and willows
65			12.60	11.5	Moderate cover of willows, sand silt, and willows
60			12.90	11.2	Gravels and cobbles, with few rocks greater than 1'
55			13.30	10.8	Gravels and cobbles, with few rocks greater than 1'
50			13.40	10.7	Gravels and cobbles, with few rocks greater than 1'
45			12.90	11.2	Gravels and cobbles, with few rocks greater than 1'
40			12.60	11.5	Gravels and cobbles, with few rocks greater than 1'
37			12.30	11.8	Gravels and cobbles, with few rocks greater than 1'
32			14.60	9.5	LEW -- Active channel
30			14.90	9.2	Active channel
25			15.40	8.7	Active channel
20			15.20	8.9	Active channel
16			14.70	9.4	REW -- Active channel
14			13.90	10.2	
10			13.90	10.2	
5			12.80	11.3	
0			11.60	12.5	
-2			8.00	16.1	
T.O.S.			7.54	16.5	T.O.S., R.B.
B.O.S.			6.94	17.1	B.O.S., R.B., close to within 0.01'

Survey crew: Agajanian, Agozino

Table A4-15. Santiago Creek Cross Section X-3

Surveyed on 28-April-1995

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
T.O.S.	7.51	23.16		15.65	T.O.S., L.B. -- given
B.O.S.			7.93	15.23	B.O.S., L.B.
111			10.46	12.7	L.B. HWM -- Fair debris line
108			11.70	11.5	Grassy slope
105			11.90	11.3	Grassy slope
100			11.60	11.6	Sands, gravels, and cobbles (few rocks > 10")
95			12.50	10.7	Sands, gravels, and cobbles (few rocks > 10")
90			12.60	10.6	Sands, gravels, and cobbles (few rocks > 10")
85			12.50	10.7	Sands, gravels, and cobbles (few rocks > 10")
80			11.50	11.7	Sands, gravels, and cobbles (few rocks > 10")
75			11.20	12.0	Sands, gravels, and cobbles (few rocks > 10")
70			11.10	12.1	Sands, gravels, and cobbles (few rocks > 10")
65			11.30	11.9	Sands, gravels, and cobbles (few rocks > 10")
60			11.60	11.6	Sands, gravels, and cobbles (few rocks > 10")
55			12.70	10.5	Sands, gravels, and cobbles (few rocks > 10")
50			13.00	10.2	Sands, gravels, and cobbles (few rocks > 10")
45			13.30	9.9	Sands, gravels, and cobbles (few rocks > 10")
40			13.70	9.5	Sands, gravels, and cobbles (few rocks > 10")
35			14.10	9.1	Sands, gravels, and cobbles (few rocks > 10")
31			14.70	8.5	LEW --Active channel
30			14.90	8.3	Active channel
25			15.00	8.2	Active channel
20			15.20	8.0	Active channel
15			15.20	8.0	Active channel
10			14.70	8.5	LEW --Active channel
6			13.30	9.9	
0			12.60	10.6	
-4			6.10	17.1	
T.O.S.			7.51	15.65	T.O.S., L.B. (No stake on right bank)

Survey crew: Agajanian, Agozino

Table A4-16. Santiago Creek Cross Section X-4

Surveyed on 28-April-1995

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
T.O.S.	2.25	19.43		17.18	T.O.S., L.B. -- given
B.O.S.			2.53	16.90	B.O.S., L.B.
100			4.00	15.43	
97			6.10	13.3	
93			7.81	11.6	L.B. HWM --Fair wash line
90			8.00	11.4	65 - 102: scattered brush; moderately dense ground,
85			8.90	10.5	Mule fat and willow
80			9.30	10.1	65 - 80: ground is sand silt and cobbles
75			9.20	10.2	
70			10.00	9.4	
65			10.40	9.0	
60			10.60	8.8	Sand, cobbles, and rocks, (very few >1')
55			10.10	9.3	Sand, cobbles, and rocks, (very few >1')
50			10.40	9.0	Sand, cobbles, and rocks, (very few >1')
45			10.50	8.9	Sand, cobbles, and rocks, (very few >1')
40			10.40	9.0	Sand, cobbles, and rocks, (very few >1')
35			11.10	8.3	Sand, cobbles, and rocks, (very few >1')
30			11.20	8.2	Sand, cobbles, and rocks, (very few >1')
25			11.90	7.5	Sand, cobbles, and rocks, (very few >1')
23			11.90	7.5	LEW -- Active Channel
20			12.30	7.1	Active Channel
15			12.20	7.2	Active Channel
10			12.50	6.9	Active Channel
5			12.70	6.7	Active Channel
1			11.90	7.5	LEW -- Active Channel
0			10.80	8.6	
-2			10.10	9.3	
-4			7.10	12.3	
B.O.S.			6.40	13.03	B.O.S., R.B.
T.O.S.			6.02	13.41	T.O.S., R.B., closed to within 0.02'

Survey crew: Agajanian, Agozino

Table A4-17a. Upper Hicks Canyon Range A2

Surveyed on 05-Sep-1986

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
TBM A1	4.58	104.58		100.00	Nail in west base of utility pole #1510124E
TBM A2	2.77	104.50	2.9	101.73	Nail in east base RR-tie fence post (center of 1 19 ft. U.S. of 0+00
0			4.0	100.5	F/L @ iron pole
20			5.5	99.0	Ground
32.5			4.6	99.9	Ground at TBM A1
47			5.5	99.0	Top of high bank
52			7.3	97.2	
58			12.3	92.2	Toe of bank, edge of channel
68			12.3	92.2	Toe of bank, edge of channel (far side
75			9.6	94.9	
91			9.3	95.2	Toe of high bank
98			4.3	100.2	Top of high bank
110			3.3	101.2	Ground
140			3.0	101.5	Ground
TBM A1			4.5	100.0	Close on benchmark

Survey crew: Trimble, Schmidt

Table A4-17b. Upper Hicks Canyon Range A2

Surveyed on 22-Apr-1992

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
TBM A1	5.06	105.06		100.0	Nail in west base of utility pole #1510124E at 0
32			5.2	99.9	
40			5.7	99.4	
47			6.1	99.0	Top of right bank
52			7.8	97.3	
57			12.9	92.2	Right side of channel
67			12.8	92.3	Left side of channel
74			10.1	95.0	
91			9.3	95.8	Toe of high bank
1			4.0	101.1	
TBM A1			5.1	100.0	

Survey crew: Trimble, Bueno

Table A4-17c. Upper Hicks Canyon: Range A2

Surveyed on 16-Apr-1993

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
TBM A1	7.45	107.45		100.0	Nail in west base of utility pole #1510124E at C
0			6.9	100.6	Ground at fence post
32.5			7.7	99.8	Ground at utility pole (TBM A1)
47			8.6	98.9	Top of high bank
52			10.2	97.3	Ground
56			14.7	92.8	Ground
59			15.4	92.1	Enter channel
67			15.3	92.2	Edge of channel
74			12.6	94.9	Top of low bank
90			12.2	95.3	Toe of high bank
101			6.4	101.1	Top of high bank

Table A4-18a. Upper Hicks Canyon: Range A4

Surveyed on 05-Sep-1986

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
TBM A3	3.27	109.36		106.09	Elevation is relative to TBM A1 elevation = 100
0			1.5	107.9	F/L
14			2.1	107.3	Ground
30			3.4	106.0	Ground at TBM A3
50			4.5	104.9	Ground
62			5.5	103.9	Top of high bank
77			13.4	96.0	Toe of high bank, enter channel
87			13.3	96.1	Edge of channel, toe of bank
91			10.4	99.0	Top of low bank
98			10.0	99.4	Toe of high bank, enter channel
106			7.0	102.4	Top of high bank
120			5.7	103.7	Ground
130			5.3	104.1	Ground
TBM A3			3.3	106.09	Close on TBM A3

Survey crew: Trimble, Schmidt

Table A4-18b. Upper Hicks Canyon: Range A4

Surveyed on 22-Apr-1992

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
0	2.63	108.72		106.09	Nail in utility pole, at station 0+30 (TBM A3)
30			2.9	105.8	Ground by TBM A3
60			4.6	104.1	Top of high bank
75			11.4	97.3	
77			13.4	95.3	Right side of channel
86			13.1	95.6	Left side of channel
91			9.5	99.2	Top of low bank
97			9.1	99.6	Toe of high bank
106			6.0	102.7	
			2.62	106.10	Close on TBM A3

Survey crew: Trimble, Bueno

Table A4-18c. Upper Hicks Canyon: Range A4

Surveyed on 16-Apr-1993

Station (ft)	BS	HI	FS	Elevation (ft)	Notes
0	7.45	107.45		100.0	Note: tied to TBM A2, but elevation not adjust
					to TBM A1
30					Ground at TBM A3, utility pole (not visible)
					Elevation not recorded, line of sight not clear
50			2.8	104.7	Ground
58			3.4	104.1	Top of high bank
67			8.5	99.0	Ground
71			9.7	97.8	Top of low bank
77			13.0	94.5	Edge of channel
84			12.8	94.7	Edge of channel
85			10.8	96.7	Top of low bank
90			9.1	98.4	Ground
97			8.7	98.8	Toe of high bank
102			5.7	101.8	Top of high bank
			7.46	99.99	Close on TBM A2