FLECHA CAIDA FLOOD IMPROVEMENT STUDY -

PHASE I

100-YEAR PEAK DISCHARGE

MAGNITUDES AND FLOODPLAIN MAPPING

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I. STUDY AREA

The Flecha Caida study area encompasses approximately eight square miles of the foothill region of the Santa Catalina Mountains. The area is bounded by the Coronado National Forest on the north, River Road on the south, Alvernon Way on the west, and Craycroft Road on the east.

The three major washes studied include Finger Rock Wash, Valley View Wash, and Flecha Caida Wash. One tributary (Sky Club Wash) to the Valley View Wash and three tributaries to the Finger Rock Wash were also included in this study.

II. PEAK DISCHARGE DETERMINATION

One-hundred year peak discharge magnitudes were determined at all concentration points shown on the drainage basin map which is contained in Appendix A. The criteria used to establish the location of each concentration point were 1) drainage area (0.5 square miles or larger), and 2) the location of the associated watercourse with respect to section lines or major roadways.

The soil group identifications are also shown on the drainage basin map. It should be noted that the upper limits of the drainage basins associated with the Finger Rock Wash, Valley View Wash, and Sky Club Wash are located within the Coronado National Forest. The soil group classifications for this area are 40 percent Soil Group C and 60 percent Soil Group D. The vegetation type is mountain brush at a cover density of 30 percent. The associated Curve Numbers are 82 and 90, respectively. The soil group classification for the lower limits of the drainage basins located within the study area are 100 percent Soil Group B. The vegetation type is desert brush at a cover density of 20 percent. The associated Curve Number is 83.

The impervious cover percentages used in the hydrologic calculations were based on projected densities as shown on the Catalina Foothillls Area Plan. The selected values are as follows:

Type of Development	Percent Impervious Cover
Natural	0
0.25 RAC	5
1 RAC	10
2 RAC	30
5 RAC	50
8 RAC	65
Commercial	65
Transitional	65

If the drainage basin contained a mixture of the above densities, a weighted value was computed. The weighted breakdown, where applicable, is shown on the back of the hydrologic data sheets which are contained in Appendix B.

In general, all basin factors were determined from aerial photographs and

field investigations of the areas which are currently developed. A basin factor for undeveloped areas was selected using the County's hydrology manual as a guide. If a particular watercourse traversed areas with different basin factors, a weighted value was computed. The weight breakdown where applicable is also shown on the back of each hydrologic data sheet.

Five one-hour precipitation depths (P_1-HR) were determined using the maps and procedure as presented in the County's hydrology manual. Those drainage basins extending into the Coronado National Forest are subject to a P_1-HR value approximately equal to 2.75 inches. Those drainage basins located in the southern-most region of the study area are subject to a P_1-HR value approximately equal to 2.60 inches. The P_1-HR value used in each hydrologic calculation was selected based on the location of the centroid of the respective drainage basin. The rainfall data sheet and depth versus return period curve used to determine the respective P_1-HR depths are also contained in Appendix B.

It should be noted that the 100-year peak discharge magnitudes for the Finger Rock Wash decrease in the downstream direction. This occurs primarily because the drainage area does not increase in proportion to the length of the watercourse. Therefore, the decrease in the effective rainfall intensity as computed using the County method has a more significant impact on the resultant peak discharge than does the increase in drainage area. Transmission losses is a natural process that can justify a slight reduction in the peak discharge, especially given the wide, sandy nature of the Finger Rock channel within the downstream reaches. However, the majority of the reduction is computational in nature.

III. FLOODPLAIN MAPPING

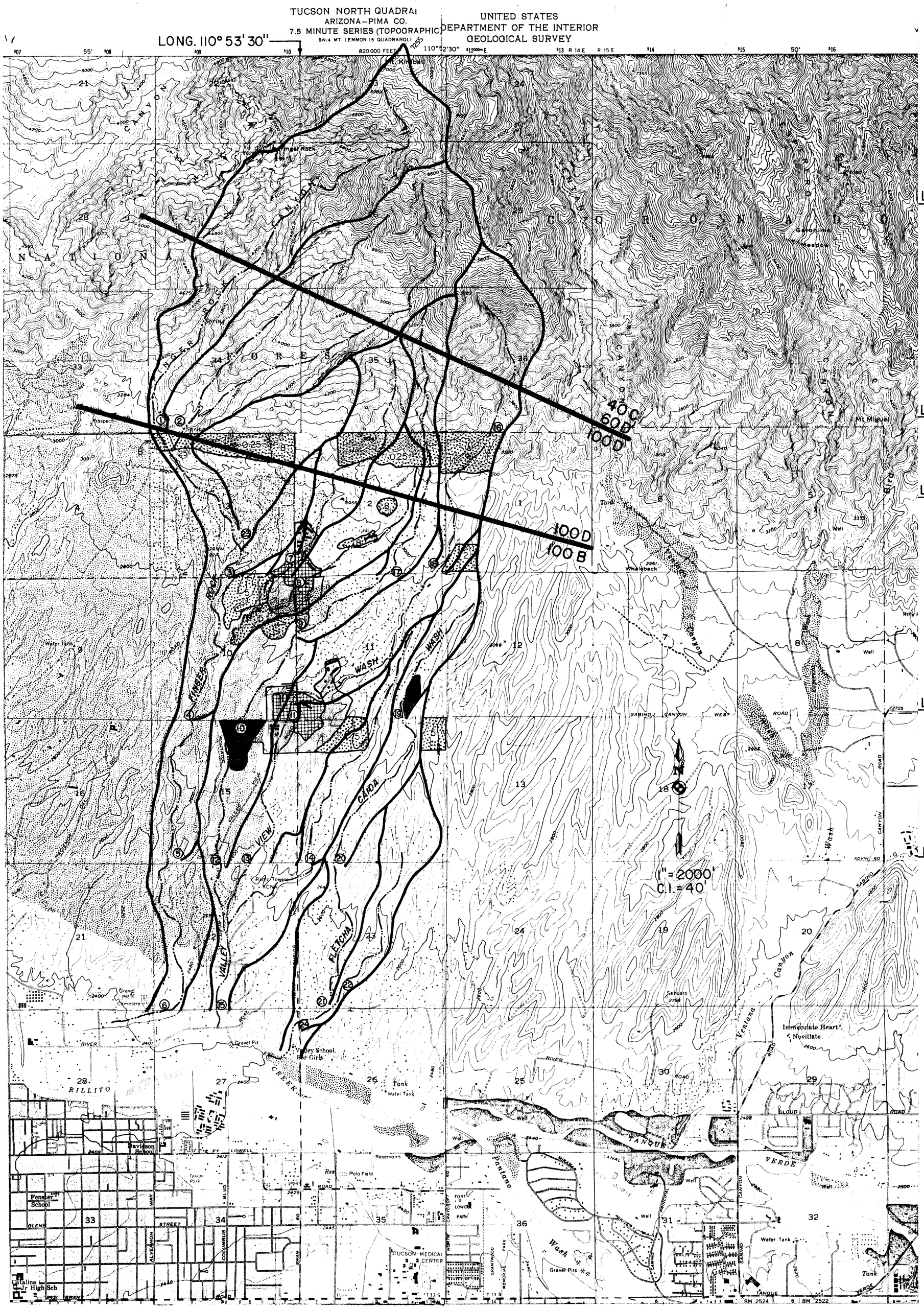
The 100-year floodplains associated with all reaches of the respective washes and their tributaries were modeled using the U.S. Army Corps of Engineers HEC-2 computer program. Approximately 77,500 feet or 14.7 miles of floodplain mapping was performed. Both subcritical and supercritical runs were generated. In general, the flow characteristic for all washes was supercritical. Therefore, the subcritical runs generated critical water-surface elevations. The 100-year floodplain maps (submitted under a separate document) prepared as a result of this study are based on the critical water-surface elevations. The flow velocities associated with the supercritical runs are provided to assist in determining the erosion potential along various reaches of the wash. They can also be used to establish design parameters for bank protection if the need arises.

At various locations along the respective washes and their tributaries, culverts have been constructed to provide a dry crossing. The design capacity of these structures vary. Some are capable of accommodating the entire 100-year peak discharge while others are designed only to accommodate runoff from more frequent storm events. The two main culvert types are concerte box culverts (CBC) and corrugated metal pipes (CMP, both round and arch shapes). Since washes within the study area are known to carry a significant sediment load accompanied by debris, a clogging factor was considered when the capacity of the existing structures were determined. Culvert performance curves (Appendix C) for the CMP's were prepared which incorporated a 50 percent clogging factor. The resulting headwater elevation at each crossing was then incorporated in the HEC-2 analysis as a known water-surface elevation. The HEC-2's special bridge routine was used to compute water-surface elevations associated with the CBC's. The cross-sectional area associated with each CBC was reduced to account for a 25 percent clogging factor.

The input data used in our HEC-2 analysis (both subcritical and supercritical) were copied onto a floppy disk (Appendix D) The floodplain maps (24 sheets) are submitted under separate document. However, a copy of the index map to the floodplain maps is contained in Appendix E. This map shows the reaches of each wash studied and identifies cross-section locations relative to each map sheet.

APPENDIX A

DRAINAGE BASIN MAP



NOTE:

VEGETATION BOUNDARY BETWEEN MOUNTAIN BRUSH AND DESERT BRUSH LOCATION ALONG CONTOUR 3200 FT.

LEGEND

- WATERSHED BOUNDARY
- 100D / 100B — HYDROLOGICAL SOIL GROUP BOUNDARY
- ① — DRAINAGE CONCENTRATION POINT
- PRIMARY & SECONDARY WATERCOURSES
- 8 — RESIDENCES/ACRE
- SCHOOL (ESTABLISHED OR PROPOSED)
- COMMERCIAL
- TRANSITIONAL

APPENDIX A

DRAINAGE BASIN MAP SHOWING HYDROLOGIC CHARACTERISTICS OF STUDY AREA

APPENDIX B

HYDROLOGIC DATA SHEETS

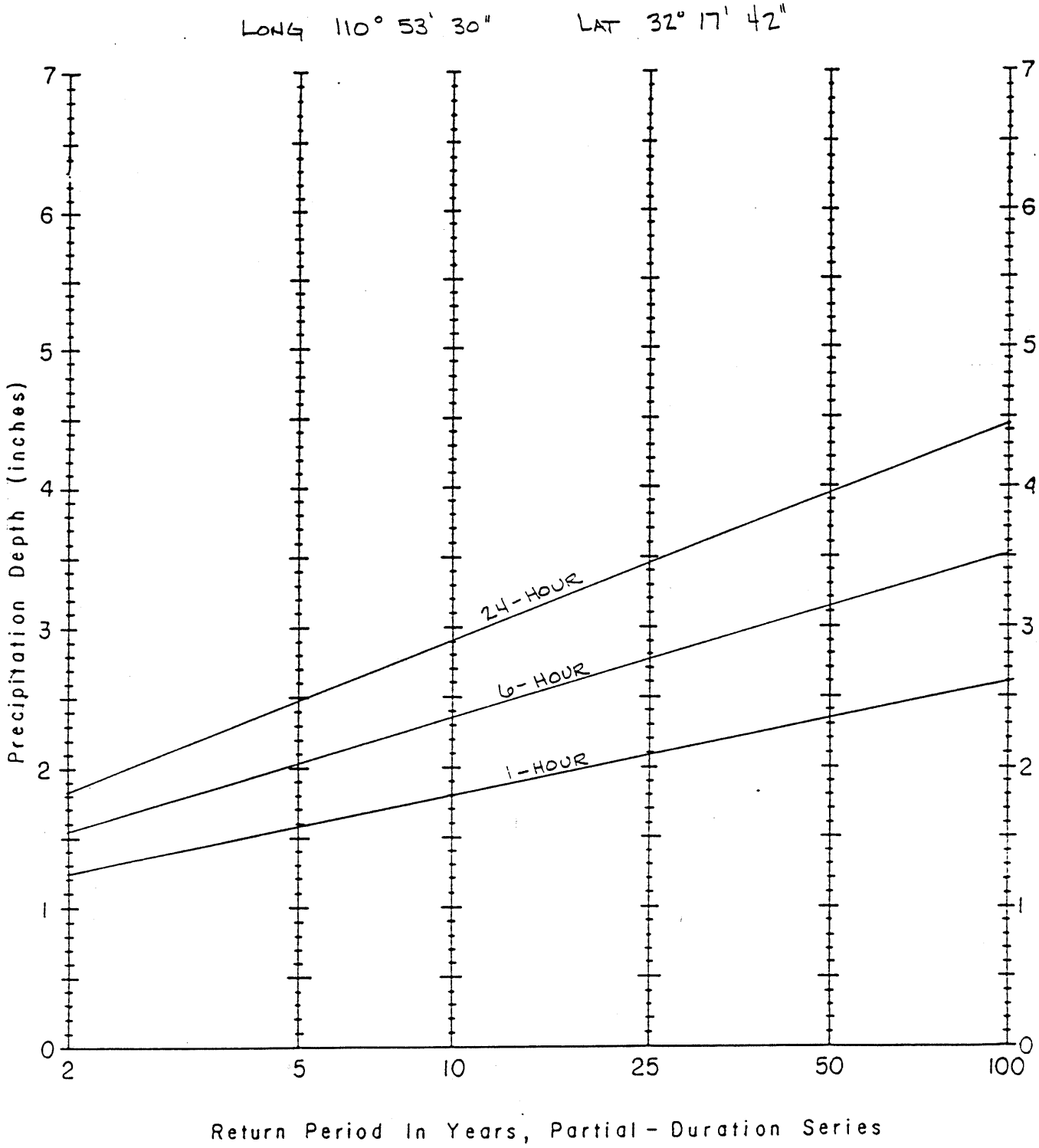
RAINFALL DATA SHEET

LONG 110° 53' 30" LAT 32° 17' 42"

Return Period (Years)	Precipitation Values (inches)*			
	6 Hour Duration		24 Hour Duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.53	X_1 1.55	1.82	X_2 1.82
5	2.00	2.03	2.45	2.47
10	2.38	2.36	2.85	2.89
25	2.82	2.77	3.55	3.45
50	3.20	3.15	3.95	3.95
100	3.45	X_3 3.52	4.40	X_4 4.44

$$Y_2 = -0.011 + 0.942\,(X_1^2/X_2) = 1.23''$$

$$Y_{100} = 0.494 + 0.755\,(X_3^2/X_4) = 2.60''$$



Precipitation Depth Versus Return Period for Partial-Duration Series

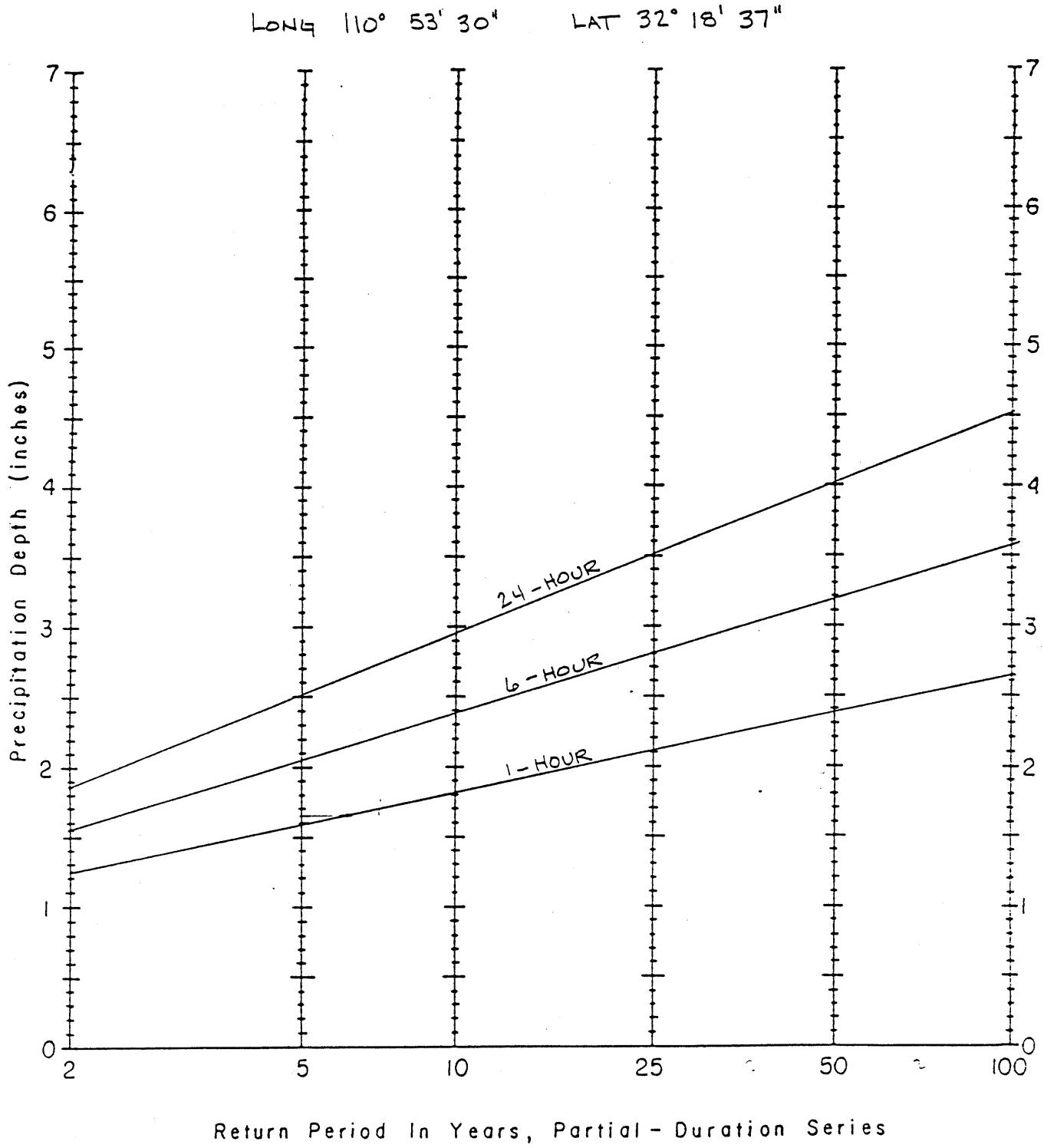
RAINFALL DATA SHEET

LONG 110° 53' 30" LAT 32° 18' 37"

Return Period (Years)	Precipitation Values (inches)*			
	6 Hour Duration		24 Hour Duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.55	X_1 1.57	1.88	X_2 1.86
5	2.04	2.07	2.50	2.52
10	2.42	2.40	2.90	2.95
25	2.88	2.82	3.60	3.51
50	3.25	3.20	4.00	4.02
100	3.50	X_3 3.58	4.50	X_4 4.51

$$Y_2 = -0.011 + 0.942(X_1^2/X_2) = 1.24''$$

$$Y_{100} = 0.494 + 0.755(X_3^2/X_4) = 2.64''$$



Precipitation Depth Versus Return Period for Partial-Duration Series

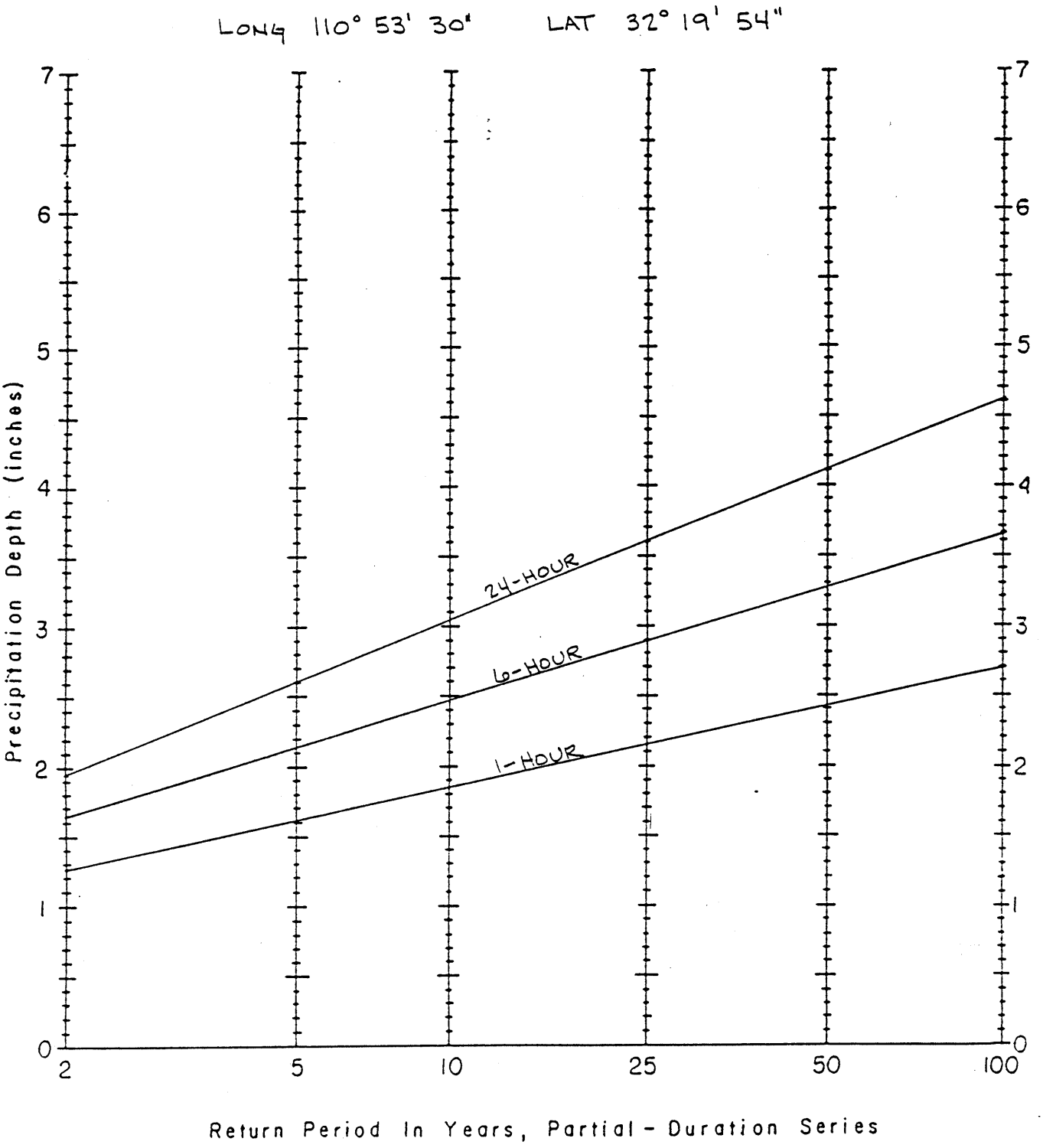
RAINFALL DATA SHEET

LONG 110° 53' 30" LAT 32° 19' 54"

Return Period (Years)	Precipitation Values (inches) *			
	6 Hour Duration		24 Hour Duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.60	X_1 1.63	1.95	X_2 1.94
5	2.10	2.13	2.58	2.60
10	2.50	2.46	3.00	3.03
25	2.95	2.90	3.65	3.60
50	3.32	3.29	4.10	4.11
100	3.60	X_3 3.67	4.60	X_4 4.61

$$Y_2 = -0.011 + 0.942\,(X_1^2/X_2) = 1.27''$$

$$Y_{100} = 0.494 + 0.755\,(X_3^2/X_4) = 2.70''$$



Precipitation Depth Versus Return Period for Partial-Duration Series

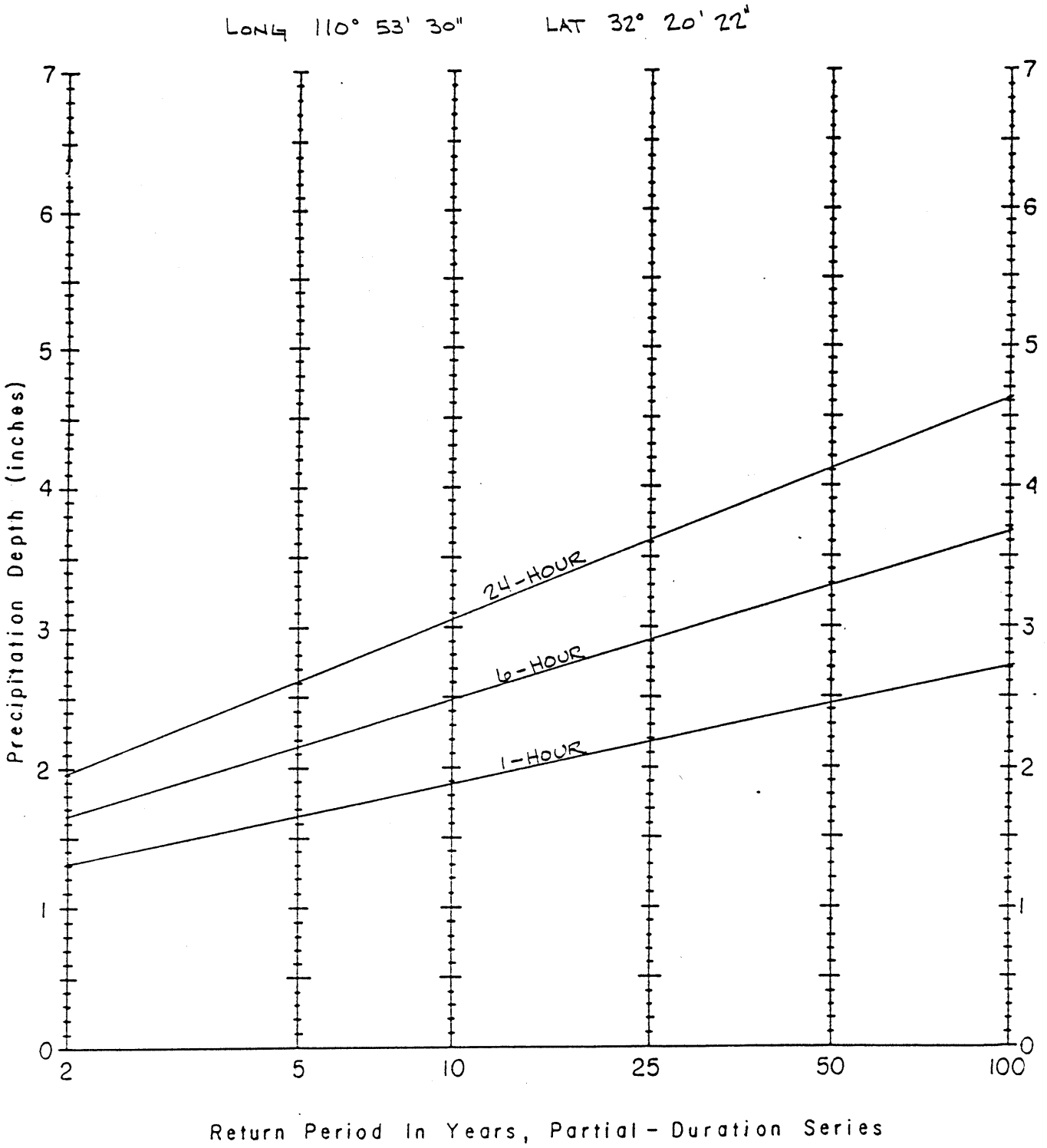
RAINFALL DATA SHEET

LONG 110° 53' 30" LAT 32° 20' 22"

Return Period (Years)	Precipitation Values (inches)*			
	6 Hour Duration		24 Hour Duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.62	X_1 1.65	1.98	X_2 1.96
5	2.12	2.15	2.60	2.61
10	2.52	2.48	3.00	3.05
25	2.98	2.92	3.65	3.61
50	3.35	3.30	4.12	4.12
100	3.60	X_3 3.68	4.62	X_4 4.62

$$Y_2 = -0.011 + 0.942\left(X_1^2/X_2\right) = 1.30''$$

$$Y_{100} = 0.494 + 0.755\left(X_3^2/X_4\right) = 2.71''$$



Precipitation Depth Versus Return Period for Partial-Duration Series

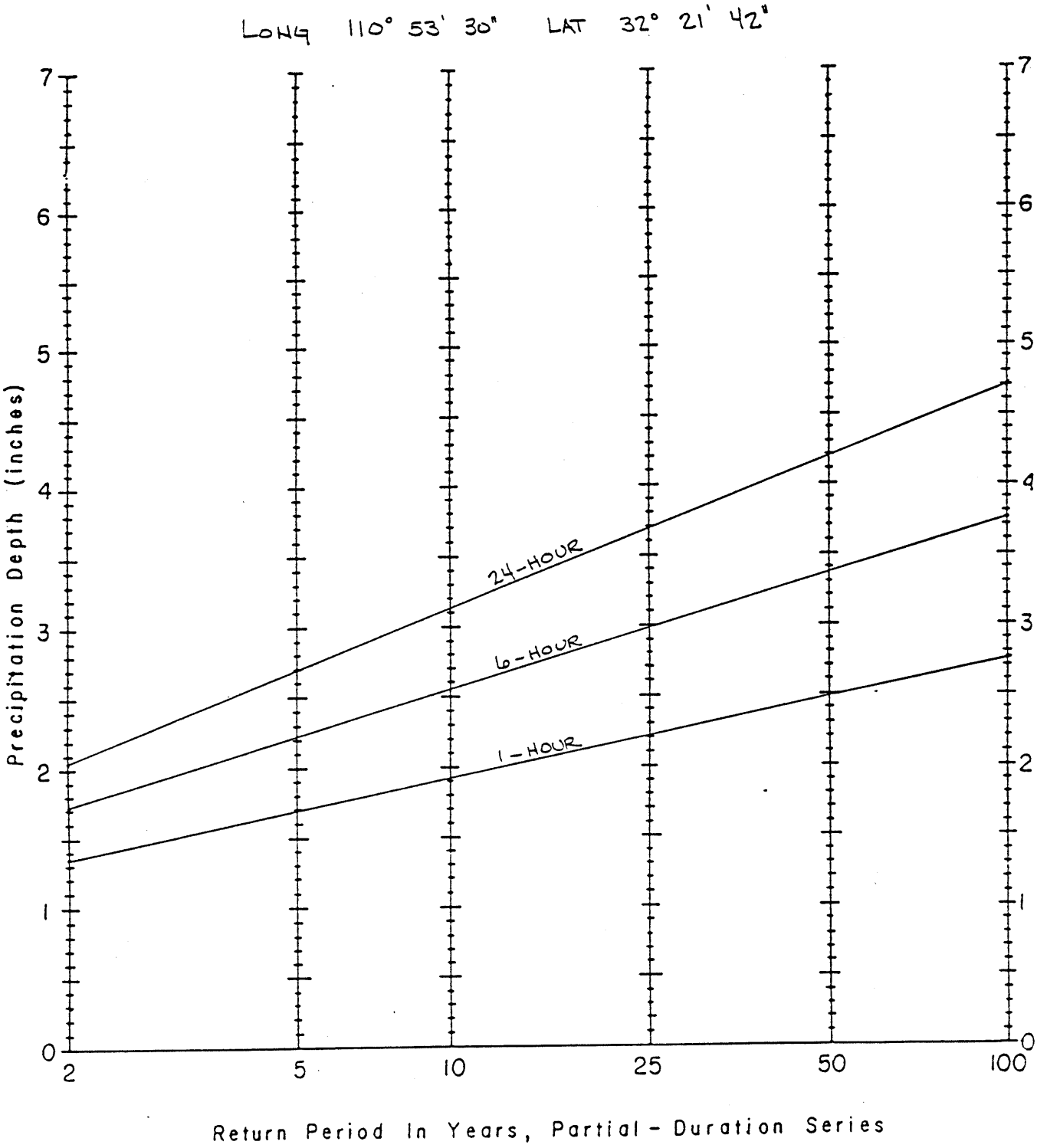
RAINFALL DATA SHEET

LONG 110° 53' 30" LAT 32° 21' 42"

Return Period (Years)	Precipitation Values (inches) *			
	6 Hour Duration		24 Hour Duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.70	X_1 1.71	2.08	X_2 2.04
5	2.18	2.22	2.65	2.70
10	2.58	2.55	3.08	3.13
25	3.02	2.98	3.72	3.70
50	3.40	3.37	4.30	4.21
100	3.70	X_3 3.75	4.65	X_4 4.71

$$Y_2 = -0.011 + 0.942\,(X_1^2 / X_2) = 1.34''$$

$$Y_{100} = 0.494 + 0.755\,(X_3^2 / X_4) = 2.75''$$



Precipitation Depth Versus Return Period for Partial-Duration Series

CHART FOR ADJUSTED CURVE NUMBERS (CN*'s)

CN		K_1		K_2
95		98.67		80.08
94		98.33		78.76
93		98.00		77.44
92		97.50		76.12
91		97.00		75.24
90	SOIL GROUP D @ 30%	96.50	MOUNTAIN BRUSH	73.92
89		96.00		72.60
88		95.50		71.72
87		95.00		70.40
86		94.50		69.52
85		94.00		68.20
84		93.50		66.88
83	SOIL GROUP B @ 20 %	93.00	DESERT BRUSH	66.00
82	SOIL GROUP C @ 30%	92.50	MOUNTAIN BRUSH	65.12
81		92.00		63.80
80		91.50		62.92
79		91.00		62.04
78		90.00		60.72
77		89.50		59.84
76		89.00		58.96
75		88.50		58.08
74		88.00		56.76
73		87.00		55.88
72		86.50		55.00
71		86.00		54.12
70		85.00		53.24
69		84.50		52.36
68		84.00		51.04
67		83.00		50.16
66		82.50		49.28
65		82.00		48.40
64		81.00		47.52
63		80.00		46.64
62		79.00		45.76
61		78.50		44.88
60		78.00		44.00

$$CN^* = \frac{K_1(P_1 - .88) + K_2}{P_1}$$

Where,

P_1 = 1 hour rainfall depth.

(Use areal depth, if applicable) .

Notes: (1) P_1 must always be greater than .88 inches.

(2) For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E1/2 R14E N2/3 T13S)

Drainage Concentration Point: #1 (FINGER ROCK WASH @ FOREST SERVICE BOUNDARY)

Watershed Area (A): 1033 acres/~~square miles~~.

Length of Watercourse (L_c): 19400 ft. Length to Center of Gravity (L_{ca}): 13000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4300	7255 - 6240 = 1015
10100	6240 - 3560 = 2680
5000	3560 - 3080 = 480

Mean Slope (S_c): 0.1892 ft./ft. Watershed Type(s): MOUNTAIN (UNDEVELOPED) EXIST ~~(Future)~~

Basin Factor (n_b): 0.060 EXIST ~~(Future)~~ Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.75 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 30% C 70% D Cover Type(s): MOUNTAIN BRUSH DESERT BRUSH MIX

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 0 % EXIST ~~(Future)~~

CN(s): 82 90 (pervious & impervious areas) CN*(s): 86.58, 92.50
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5426, 0.7165 (pervious areas) 0.9565 (impervious areas

Runoff Supply Rate (q): 0.6643 i in./hr. (function of i)

Time of Concentration (T_c): 55 $i^{-.4}$ ~~hrs.~~ /mins. (function of i)

Iterative Solution of T_c: 30 ~~hrs.~~ /mins.

Rainfall Intensity (i) at T_c: 4.4000 in./hr.

Runoff Supply Rate (q) at T_c: 2.9231 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 3044 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY

Drainage Concentration Point: #3A (@ CONFLUENCE WITH #27)

Watershed Area (A): 2896 acres/square miles.

Length of Watercourse (L_c): 28900 ft. Length to Center of Gravity (L_{ca}): 14900 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4300	7255 - 6240 = 1015
10100	6240 - 3560 = 2680
5000	3560 - 3080 = 480
6800	3080 - 2760 = 320
2700	2760 - 2690 = 70

Mean Slope (S_c): 0.0977 ft./ft. Watershed Type(s): MOUNTAIN UNDEVELOPED FOOTHILLS DEVELOPED (future)

Basin Factor (n_b): 0.053 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.72 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 17%B 18%C 65%D Cover Type(s): MOUNTAIN BRUSH DESERT BRUSH MIX

Cover Density (pervious areas): 30%(MB) 20%(DB) Impervious Cover: 3 % (future)

CN(s): 83, 82, 90 (pervious & impervious areas) CN*(s): 87.18, 86.51, 92.46
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5557, 0.5375, 0.7126 (pervious areas) 0.9568 (impervious areas)

Runoff Supply Rate (q): 0.6634 i in./hr. (function of i)

Time of Concentration (T_c): 74 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 46 hrs./mins.

Rainfall Intensity (i) at T_c: 3.2970 in./hr.

Runoff Supply Rate (q) at T_c: 2.1872 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 6385 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E 1/2 R14E N 2/3 T13S)

Drainage Concentration Point: #3 (@ SKYLINE DRIVE, SEC LINE 3 & 10)

Watershed Area (A): 2806 acres/~~square miles~~.

Length of Watercourse (L_c): 26200 ft. Length to Center of Gravity (L_{ca}): 14000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4300	7255 - 6240 = 1015
10100	6240 - 3560 = 2680
5000	3560 - 3080 = 480
6800	3080 - 2760 = 320

Mean Slope (S_c): 0.1190 ft./ft. Watershed Type(s): MOUNTAIN (UNDEVELOPED) ~~FOOTHILLS (DEVELOPED)~~ (future)

Basin Factor (n_b): 0.055 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour):	in.	Areal Value:	in.
P_6 (6 hour):	in.	Areal Value:	in.
P_1 (1 hour): 2.73	in.	Areal Value:	in.
P_2 (2 hour):	in.	Areal Value:	in.
P_3 (3 hour):	in.	Areal Value:	in.

Soil Group(s): 14% B 19% C 67% D Cover Type(s): MOUNTAIN BRUSH ~~DESERT BRUSH~~ MIX

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 2% (future)

CN(s): 83 82 90 (pervious & impervious areas) CN*(s): 87.20, 86.54, 92.47
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5569, 0.5392, 0.7139 (pervious areas) 0.9552 (impervious areas)

Runoff Supply Rate (q): 0.6647 i in./hr. (function of i)

Time of Concentration (T_c): 68 $i^{-.4}$ ~~hrs~~./mins. (function of i)

Iterative Solution of T_c: 41 ~~hrs~~/mins.

Rainfall Intensity (i) at T_c: 3.5803 in./hr.

Runoff Supply Rate (q) at T_c: 2.3798 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 6731 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E1/2 R14E N2/3 T13S)

Drainage Concentration Point: #4 (FINGER ROCK WASH @ SUNRISE DRIVE SEC LINE 10 & 15)

Watershed Area (A): 3716 acres/~~square miles~~

Length of Watercourse (L_c): 32200 ft. Length to Center of Gravity (L_{ca}): 19000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4300	7255 - 6240 = 1015
10100	6240 - 3560 = 2680
5000	3560 - 3080 = 480
6800	3080 - 2760 = 320
6000	2760 - 2630 = 130

Mean Slope (S_c): 0.0761 ft./ft. Watershed Type(s): ~~FOOTHILLS (DEVELOPED)~~ MOUNTAIN (UNDEVELOPED) (future)

Basin Factor (n_b): 0.050 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.72 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 26% B 15% C 59% D Cover Type(s): ~~DESERT BRUSH~~ MOUNTAIN BRUSH MIX

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 6% (future)

CN(s): 83, 82, 90 (pervious & impervious areas) CN*(s): 87.18, 86.51, 92.46
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5552, 0.5375, 0.7126 (pervious areas) 0.9568 (impervious areas)

Runoff Supply Rate (q): 0.6641 i in./hr. (function of i)

Time of Concentration (T_c): 86 $i^{-.4}$ ~~hrs~~./mins. (function of i)

Iterative Solution of T_c: 57 ~~hrs~~./mins.

Rainfall Intensity (i) at T_c: 2.8260 in./hr.

Runoff Supply Rate (q) at T_c: 1.8767 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 7030 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY

Drainage Concentration Point: #4 (FINGER ROCK WASH @ SUNRISE DRIVE ROUTED

Watershed Area (A): 3713 acres/square miles.

Length of Watercourse (L_c): 32000 ft. Length to Center of Gravity (L_{ca}): 19000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4300	7255 - 6240 = 1015
10100	6240 - 3560 = 2680
5000	3560 - 3080 = 480
6800	3080 - 2760 = 320
2700	2760 - 2690 = 70
3100	2690 - 2630 = 60

Mean Slope (S_c): 0.0774 ft./ft. Watershed Type(s): MOUNTAIN (UNDEVELOPED) FOOTHILLS (DEVELOPED) (future)

Basin Factor (n_b): 0.049 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.72 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 26% B 15% C 59% D Cover Type(s): MOUNTAIN BRUSH DESERT BRUSH MIX

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 7% (future)

CN(s): 83, 82, 90 (pervious & impervious areas) CN*(s): 87.18, 86.51, 92.46
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5552, 0.5375, 0.7126 (pervious areas) 0.9568 (impervious areas)

Runoff Supply Rate (q): 0.6672 i in./hr. (function of i)

Time of Concentration (T_c): 83 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 54 hrs./mins.

Rainfall Intensity (i) at T_c: 2.9405 in./hr.

Runoff Supply Rate (q) at T_c: 1.9619 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 7343 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E 1/2 R14E N 2/3 T13S)

Drainage Concentration Point: #5 (FINGER ROCK WASH @ SEC LINE 15 & 22)

Watershed Area (A): 3913 acres/~~square miles~~.

Length of Watercourse (L_c): 37800 ft. Length to Center of Gravity (L_{ca}): 19000 ft

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft
4300	7255 - 6240 = 1015
10100	6240 - 3560 = 2680
5000	3560 - 3080 = 480
6800	3080 - 2760 = 320
6000	2760 - 2630 = 130
5600	2630 - 2530 = 100

Mean Slope (S_c): 0.0568 ft./ft. Watershed Type(s): MOUNTAINS (UNDEVELOPED) FOOTHILLS (DEVELOPED) (future)

Basin Factor (n_b): 0.047 (future) Flood Frequency: 100 yrs

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.71 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 30% B 14% C 56% D Cover Type(s): MOUNTAIN BRUSH DESERT BRUSH MIX

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 7% (future

CN(s): 83, 82, 90 (pervious & impervious areas) CN*(s): 87.16, 86.49, 92.44
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5535, 0.5358, 0.7113 (pervious areas) 0.9566 (impervious areas

Runoff Supply Rate (q): 0.66616 i in./hr. (function of i)

Time of Concentration (T_c): 95 $i^{-.4}$ ~~hrs.~~/mins. (function of i)

Iterative Solution of T_c: 66 ~~hrs.~~/mins.

Rainfall Intensity (i) at T_c: 2.5209 in./hr.

Runoff Supply Rate (q) at T_c: 1.6678 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 6578 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E 1/2 R14E N 2/3 T13S)

Drainage Concentration Point: #6 (FINGER ROCK WASH @ ALVERNON WAY SEC CORNER 21, 22, 27, 28)

Watershed Area (A): 4124 acres/~~square miles~~.

Length of Watercourse (L_c): 44200 ft. Length to Center of Gravity (L_{ca}): 23000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4300	7255 - 6240 = 1015
10100	6240 - 3560 = 2680
5000	3560 - 3080 = 480
4300	3080 - 2760 = 320
6000	2760 - 2630 = 130
12000	2630 - 2420 = 210

Mean Slope (S_c): 0.0454 ft./ft. Watershed Type(s): ~~FOOTHILLS~~ MOUNTAINS (UNDEVELOPED) DEVELOPED (future)

Basin Factor (n_b): 0.045 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.71 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 34% B 13% C 53% D Cover Type(s): DESERT BRUSH

Cover Density (pervious areas): 30% (MB) 20% (DB Impervious Cover: 6% (future)

CN(s): 83, 82, 90 (pervious & impervious areas) CN*(s): 87.16, 86.49, 92.44
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5535, 0.5358, 0.7113 (pervious areas) 0.9566 (impervious areas)

Runoff Supply Rate (q): 0.6541 i in./hr. (function of i)

Time of Concentration (T_c): 111 $i^{-.4}$ ~~hrs~~./mins. (function of i)

Iterative Solution of T_c: 82 ~~hrs~~./mins.

Rainfall Intensity (i) at T_c: 2.1255 in./hr.

Runoff Supply Rate (q) at T_c: 1.3903 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

Peak Discharge:

1.008 qA (acres): 5779 cfs.

645.33qA (square miles): _____ cfs.

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E½ R14E N2/3T13S)

Drainage Concentration Point: # 7 (@ SWAN Rd SEC LINE 2 & 3)

Watershed Area (A): 312 (340 ⊕) acres/~~square miles~~.

Length of Watercourse (L_c): 10200 ft. Length to Center of Gravity (L_{ca}): 6000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	5280 - 4000 = 1280
2200	4000 - 3400 = 600
1800	3400 - 3080 = 320
4200	3080 - 2850 = 230

Mean Slope (S_c): 0.1243 ft./ft. Watershed Type(s): MOUNTAIN (UNDEVELOPED) ~~FOOTHILLS~~ (DEVELOPED) (future)

Basin Factor (n_b): 0.054 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.71 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 25% B 75% D Cover Type(s): MOUNTAIN BRUSH ~~DESERT~~ BRUSH MIX

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 8% (future)

CN(s): 83 90 (pervious & impervious areas) CN*(s): 87.16, 92.44
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5535, 0.7113 (pervious areas) 0.9566 (impervious areas)

Runoff Supply Rate (q): 0.6946 i in./hr. (function of i)

Time of Concentration (T_c): 37 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 19 hrs./mins.

Rainfall Intensity (i) at T_c: 5.5590 in./hr.

Runoff Supply Rate (q) at T_c: 3.8613 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 1214 (1323 ⊕) cfs.

645.33qA (square miles): _____ cfs.

⊕ @ SKYLINE DRIVE (SEC LINE 3 & 10)

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY

Drainage Concentration Point: #7A (UPSTREAM OF CONFLUENCE WITH 8A)

Watershed Area (A): 348 acres/square miles.

Length of Watercourse (L_c): 12600 ft. Length to Center of Gravity (L_{ca}): 7200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	5280 - 4000 = 1280
2200	4000 - 3400 = 600
1800	3400 - 3080 = 320
4200	3080 - 2850 = 230
2400	2850 - 2765 = 85

Mean Slope (S_c): 0.0914 ft./ft. Watershed Type(s): MOUNTAIN UNDEVELOPED ~~FOOTHILLS DEVELOPED~~ (future)

Basin Factor (n_b): 0.050 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.71 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 33% B 67% D Cover Type(s): MOUNTAIN BRUSH ~~DESERT BRUSH~~ MIX

Cover Density (pervious areas): 30% (MB) & 20% Impervious Cover: 11% (future)

CN(s): 83 90 (pervious & impervious areas) CN*(s): 87.16 92.44
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5535 0.7113 (pervious areas) 0.9566 (impervious areas)

Runoff Supply Rate (q): 0.6919 i in./hr. (function of i)

Time of Concentration (T_c): 44 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 23 hrs./mins.

Rainfall Intensity (i) at T_c: 5.0419 in./hr.

Runoff Supply Rate (q) at T_c: 3.4885 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 1224 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E1/2 R14E N2/3 T13S)

Drainage Concentration Point: #8 (@ SWAN ROAD SEC LINE 10 & 11).

Watershed Area (A): 285 acres/~~square miles~~

Length of Watercourse (L_c): 8600 ft. Length to Center of Gravity (L_{ca}): 4400 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1100	4000 - 3400 = 600
800	3400 - 3200 = 200
2500	3200 - 3000 = 200
4200	3000 - 2820 = 180

Mean Slope (S_c): 0.0713 ft./ft. Watershed Type(s): FOOT HILLS (DEVELOPED) (future)

Basin Factor (n_b): 0.043 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.69 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 75% B 25% D Cover Type(s): ~~DESERT~~ MOUNTAIN BRUSH BRUSH MIX

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 22% (future)

CN(s): 83 90 (pervious & impervious areas) CN*(s): 87.11, 92.41
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5501, 0.7086 (pervious areas) 0.9563 (impervious areas)

Runoff Supply Rate (q): 0.6703 i in./hr. (function of i)

Time of Concentration (T_c): 33 $i^{-.4}$ ~~hrs~~./mins. (function of i)

Iterative Solution of T_c: 16 ~~hrs~~./mins.

Rainfall Intensity (i) at T_c: 5.9778 in./hr.

Runoff Supply Rate (q) at T_c: 4.0072 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 1151 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY

Drainage Concentration Point: #8A (UPSTREAM OF CONFLUENCE WITH 7A)

Watershed Area (A): 315 acres/square miles.

Length of Watercourse (L_c): 10200 ft. Length to Center of Gravity (L_{ca}): 5200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1100	4000 - 3400 = 600
800	3400 - 3200 = 200
2500	3200 - 3000 = 200
4200	3000 - 2820 = 180
1600	2820 - 2765 = 55

Mean Slope (S_c): 0.0624 ft./ft. Watershed Type(s): ~~FOOTHILLS DEVELOPED~~ MOUNTAIN UNDEVELOPED (future)

Basin Factor (n_b): 0.042 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.69 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 77%B 23%D Cover Type(s): ~~DESERT BRUSH MIX~~ MOUNTAIN BRUSH

Cover Density (pervious areas): 30%(MB) 20%(DB) Impervious Cover: 26% (future)

CN(s): 83 90 (pervious & impervious areas) CN*(s): 87.11 92.41
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.5501, 0.7086 (pervious areas) 0.9563 (impervious areas)

Runoff Supply Rate (q): 0.6827 i in./hr. (function of i)

Time of Concentration (T_c): 37 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 19 hrs./mins.

Rainfall Intensity (i) at T_c: 5.5179 in./hr.

Runoff Supply Rate (q) at T_c: 3.7669 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 1196 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E½ R14E N2/3 T13S)

Drainage Concentration Point: #9 (@ SWAN ROAD SEC LINE 10 & 11)

Watershed Area (A): 367 acres/~~square miles~~.

Length of Watercourse (L_c): 15200 ft. Length to Center of Gravity (L_{ca}): 7600 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
5900	5780 - 3400 = 2380
1300	3400 - 3200 = 200
4000	3200 - 2950 = 250
4000	2950 - 2820 = 130

Mean Slope (S_c): 0.0896 ft./ft. Watershed Type(s): ~~FOOTHILLS (DEVELOPED)~~ MOUNTAIN (UNDEVELOPED) (future)

Basin Factor (n_b): 0.048 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.70 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 48% B 6% C 46% D Cover Type(s): ~~DESERT BRUSH~~ MOUNTAIN BRUSH MIX

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 7% (future)

CN(s): 83, 82, 90 (pervious & impervious areas) CN*(s): 87.13, 86.47, 92.46
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5518, 0.5340, 0.7099 (pervious areas) 0.9565 (impervious areas)

Runoff Supply Rate (q): 0.6468 i in./hr. (function of i)

Time of Concentration (T_c): 47 $i^{-.4}$ ~~hrs~~./mins. (function of i)

Iterative Solution of T_c: 25 ~~hrs~~./mins.

Rainfall Intensity (i) at T_c: 4.800 in./hr.

Runoff Supply Rate (q) at T_c: 3.1045 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 1148 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E1/2 R14E N2/3 T13S

Drainage Concentration Point: #10 (SUNRISE DRIVE SEC LINE 10 & 15)

Watershed Area (A): 537 acres/~~square miles~~.

Length of Watercourse (L_c): 19000 ft. Length to Center of Gravity (L_{ca}): 9500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
5900	5780 - 3400 = 2380
1300	3400 - 3200 = 200
4000	3200 - 2950 = 250
7800	2950 - 2720 = 230

Mean Slope (S_c): 0.0659 ft./ft. Watershed Type(s): MOUNTAIN (UNDEVELOPED) FOOTHILLS (DEVELOPED) (future)

Basin Factor (n_b): 0.044 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.68 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 65% B 4% C 31% D Cover Type(s): MOUNTAIN BRUSH DESERT BRUSH MIX

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 10% (future)

CN(s): 83, 82, 90 (pervious & impervious areas) CN*(s): 87.09, 86.43, 92.40
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5483, 0.5306, 0.7072 (pervious areas) 0.9562 (impervious areas)

Runoff Supply Rate (q): 0.6328 i in./hr. (function of i)

Time of Concentration (T_c): 56 $i^{-.4}$ ~~hrs.~~/mins. (function of i)

Iterative Solution of T_c: 32 ~~hrs.~~/mins.

Rainfall Intensity (i) at T_c: 4.1231 in./hr.

Runoff Supply Rate (q) at T_c: 2.6091 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 1412 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E½ R14E N⅔T13S)

Drainage Concentration Point: #11 (@ VALLEY VIEW WASH SWAN ROAD SEC LINE 10 & 11)

Watershed Area (A): 908 (927*) acres/square miles.

Length of Watercourse (L_c): 21700 ft. Length to Center of Gravity (L_{ca}): 10900 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1100	6080 - 5600 = 480
4000	5600 - 3800 = 1800
2200	3800 - 3400 = 400
1900	3400 - 3200 = 200
12500	3200 - 2740 = 460

Mean Slope (S_c): 0.0670 ft./ft. Watershed Type(s): MOUNTAIN (UNDEVELOPED) FOOTHILLS (DEVELOPED) (future)

Basin Factor (n_b): 0.047 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.69 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 38%B 13%C 49%D Cover Type(s): MOUNTAIN BRUSH DESERT BRUSH MIX

Cover Density (pervious areas): 30% (MB) 70% (DB) Impervious Cover: 8% (future)

CN(s): 83, 82, 90 (pervious & impervious areas) CN*(s): 87.11, 86.45, 92.41
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5501, 0.5323, 0.7086 (pervious areas) 0.9563 (impervious areas)

Runoff Supply Rate (q): 0.6519 i in./hr. (function of i)

Time of Concentration (T_c): 64 $i^{-.4}$ ~~hrs~~./mins. (function of i)

Iterative Solution of T_c: 38 ~~hrs~~./mins.

Rainfall Intensity (i) at T_c: 3.7103 in./hr.

Runoff Supply Rate (q) at T_c: 2.4187 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 2214 (2260*) cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

* @ SUNRISE DRIVE (SEC LINE 10 & 15)

22 Impervious cover breakdown

5% @ 65%
2% @ 30%
8% @ 5%
47% @ 0%
38% @ 10%

8%

basin factor breakdown

8400 @ 0.035
3400 @ 0.040
9900 @ 0.060

21700

0.047

CP11

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E½ R14E N½ T13S)

Drainage Concentration Point: #12 (@ SEC LINE 15-22)

Watershed Area (A): 794 acres/~~square miles~~. +32 @ 12A

Length of Watercourse (L_c): 24500 ft. Length to Center of Gravity (L_{ca}): 12250 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
5900	5780 - 3400 = 2380
1300	3400 - 3200 = 200
4000	3200 - 2950 = 250
13200	2950 - 2580 = 370

Mean Slope (S_c): 0.0511 ft./ft. Watershed Type(s): MOUNTAIN (UNDEVELOPED) ~~FOOTHILLS (DEVELOPED)~~ (future)

Basin Factor (n_b): 0.042 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.67 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 76%B 3%C 21%D Cover Type(s): MOUNTAIN BRUSH ~~DESERT BRUSH~~ MIX

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 11% (future)

CN(s): 83, 82, 90 (pervious & impervious areas) CN*(s): 87.07, 86.40, 92.38
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5466, 0.5288, 0.7058 (pervious areas) 0.9560 (impervious areas)

Runoff Supply Rate (q): 0.6209 i in./hr. (function of i)

Time of Concentration (T_c): 70 $i^{-.4}$ ~~hrs~~/mins. (function of i)

Iterative Solution of T_c: 43 hrs./mins.

Rainfall Intensity (i) at T_c: 3.3905 in./hr.

Runoff Supply Rate (q) at T_c: 2.1052 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 1685 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E 1/2 RIVE N 2/3 T13S)

Drainage Concentration Point: #13 (VALLEY VIEW WASH @ SEC LINE 15 & 22)

Watershed Area (A): 1239 acres/~~square miles~~.

Length of Watercourse (L_c): 27300 ft. Length to Center of Gravity (L_{ca}): 13700 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1100	6080 - 5600 = 480
4000	5600 - 3800 = 1800
2200	3800 - 3400 = 400
1900	3400 - 3200 = 200
12500	3200 - 2740 = 460
5600	2740 - 2580 = 160

Mean Slope (S_c): 0.0545 ft./ft. Watershed Type(s): _____ (future)

Basin Factor (n_b): 0.045 (future) Flood Frequency: _____ yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.68 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 53%B 10%C 37%D Cover Type(s): MOUNTAIN BRUSH DESERT BRUSH MIX

Cover Density (pervious areas): 30%(MB) 20%(DB) Impervious Cover: 12% (future)

N(s): 83, 82, 90 (pervious & impervious areas) CN*(s): 87.09, 86.43, 92.40
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5483, 0.53066, 0.7072 (pervious areas) 0.9562 (impervious areas)

Runoff Supply Rate (q): 0.6474 i in./hr. (function of i)

Time of Concentration (T_c): 77 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 49 hrs./mins.

Rainfall Intensity (i) at T_c: 3.1072 in./hr.

Runoff Supply Rate (q) at T_c: 2.0117 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 2512 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

1239 impervious cover breakdown

9%	@	65%
3%	@	30%
6%	@	5%
35%	@	0%
46%	@	10%
1%	@	50%
12%		

runoff factor breakdown

14000	@	0.035
3400	@	0.040
9900	@	0.060
27300		

CP 13

HYDROLOGIC DATA SHEET

roject Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E 1/2 R14E N 2/3 T13S)

Drainage Concentration Point: #14 (@ SEC LINE 14 & 23)

atershed Area (A): 239 acres/~~square miles~~.

Length of Watercourse (L_c): 10800 ft. Length to Center of Gravity (L_{ca}): 5000 ft.

ncremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4200	3000 - 2800 = 200
6600	2800 - 2610 = 190

ean Slope (S_c): 0.0345 ft./ft. Watershed Type(s): FOOTHILLS (DEVELOPED) (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

24 (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.63 in. Areal Value: _____ in.

2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

oil Group(s): 100% B Cover Type(s): DESERT BRUSH

Cover Density (pervious areas): 20% Impervious Cover: 15% (future)

N(s): 83 (pervious & impervious areas) CN*(s): 86.98
(curve number) (adjusted curve number)

unoff to Rainfall Ratio(s), (C): 0.5395 (pervious areas) 0.9553 (impervious areas)

Runoff Supply Rate (q): 0.6019 i in./hr. (function of i)

ime of Concentration (T_c): 41 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 22 hrs./mins.

Rainfall Intensity (i) at T_c: 5.0095 in./hr.

unoff Supply Rate (q) at T_c: 3.0152 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 726 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E1/2 R14E N2/3T13S)

Drainage Concentration Point: #15 (VALLEY VIEW WASH @ SEC LINE 22 & 27 (APPROX. RIVER RD).

Watershed Area (A): 2561 acres/square miles.

Length of Watercourse (L_c): 32900 ft. Length to Center of Gravity (L_{ca}): 16500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1100	6080 - 5600 = 480
4000	5600 - 3800 = 1800
2200	3800 - 3400 = 400
1900	3400 - 3200 = 200
12500	3200 - 2740 = 160
11200	2740 - 2440 = 300

Mean Slope (S_c): 0.0277 ft./ft. Watershed Type(s): MOUNTAIN (UNDEVELOPED) FOOTHILLS (DEVELOPED) (future)

Basin Factor (n_b): 0.042 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.66 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 70% B 6% C 24% D Cover Type(s): MOUNTAIN BRUSH DESERT BRUSH MIX

Cover Density (pervious areas): 30%(MB) 20%(DB) Impervious Cover: 12% (future)

CN(s): 83, 82, 90 (pervious & impervious areas) CN*(s): 87.05, 86.38, 92.36
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5448, 0.5270, 0.7044 (pervious areas) 0.9558 (impervious areas)

Runoff Supply Rate (q): 0.62169 i in./hr. (function of i)

Time of Concentration (T_c): 106 $i^{-.4}$ ~~hrs~~./mins. (function of i)

Iterative Solution of T_c: 78 hrs./mins.

Rainfall Intensity (i) at T_c: 2.1714 in./hr.

Runoff Supply Rate (q) at T_c: 1.3613 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 3514 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

roject Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E 1/2 R14E N 2/3 T13S)

Drainage Concentration Point: #16 (@ FOREST SERVICE BOUNDARY)

atershed Area (A): 390 acres/~~square miles~~.

Length of Watercourse (L_c): 7300 ft. Length to Center of Gravity (L_{ca}): 3700 ft.

ncremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1100	6080 - 5600 = 480
4000	5600 - 3800 = 1800
2200	3800 - 3400 = 400

ean Slope (S_c): 0.3259 ft./ft. Watershed Type(s): MOUNTAIN / UNDEVELOPED (EXIST ~~Future~~)

Basin Factor (n_b): 0.060 (EXIST ~~Future~~) Flood Frequency: 100 yrs.

24 (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.72 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

oil Group(s): 29% C 71% D Cover Type(s): MOUNTAIN BRUSH ~~DESERT BRUSH~~ MIX

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 0% (EXIST ~~Future~~)

CN(s): 82, 90 (pervious & impervious areas) CN*(s): 86.51, 92.46
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5375, 0.7126 (pervious areas) 0.9568 (impervious areas)

Runoff Supply Rate (q): 0.6618 i in./hr. (function of i)

Time of Concentration (T_c): 23 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 10 hrs./mins.

Rainfall Intensity (i) at T_c: 7.3440 in./hr.

Runoff Supply Rate (q) at T_c: 4.8603 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 1911 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E1/2 R14E N2/3 T13S)

Drainage Concentration Point: #17 (SEC LINE 2 & 11 ALONG SKYLINE DRIVE ALIGNMENT)

Watershed Area (A): 257 acres/~~square miles~~.

Length of Watercourse (L_c): 11200 ft. Length to Center of Gravity (L_{ca}): 5600 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
5900	5780 - 3400 = 2380
1300	3400 - 3200 = 200
4000	3200 - 2950 = 250

Mean Slope (S_c): 0.1533 ft./ft. Watershed Type(s): MOUNTAIN (UNDEVELOPED) ~~FOOTHILLS (DEVELOPED)~~ (future)

Basin Factor (n_b): 0.053 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.71 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 26% B 9% C 65% D Cover Type(s): MOUNTAIN BRUSH ~~DESERT BRUSH~~ MIX

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 4% (future)

CN(s): 83, 82, 90 (pervious & impervious areas) CN*(s): 87.16, 86.49, 92.44
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5535, 0.5358, 0.7113 (pervious areas) 0.9566 (impervious areas)

Runoff Supply Rate (q): 0.6665 i in./hr. (function of i)

Time of Concentration (T_c): 35 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 17 hrs./mins.

Rainfall Intensity (i) at T_c: 5.8595 in./hr.

Runoff Supply Rate (q) at T_c: 3.9055 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 1012 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E 1/2 R14E N 2/3 T13S)

Drainage Concentration Point: #18 (SEC LINE 7 & 11 SKYLINE DRIVE ALIGNMENT)

Watershed Area (A): 610 acres/~~square miles~~.

Length of Watercourse (L_c): 13300 ft. Length to Center of Gravity (L_{ca}): 7000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
1100	6080 - 5600 = 480
4000	5600 - 3800 = 1800
2200	3800 - 3400 = 400
1900	3400 - 3200 = 200
4100	3200 - 2980 = 220

Mean Slope (S_c): 0.1339 ft./ft. Watershed Type(s): ~~FOOTHILLS (DEVELOPED)~~ MOUNTAIN (UNDEVELOPED) (future)

Basin Factor (n_b): 0.055 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.72 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 8%B 19%C 73%D Cover Type(s): ~~DESERT BRUSH~~ MOUNTAIN BRUSH MIX

Cover Density (pervious areas): 30%(MB) 20%(DB) Impervious Cover: 3% (future)

CN(s): 83, 82, 90 (curve number) (pervious & impervious areas) CN*(s): 87.18, 86.51, 92.46 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5552, 0.5375, 0.7126 (pervious areas) 0.9568 (impervious areas)

Runoff Supply Rate (q): 0.6754 i in./hr. (function of i)

Time of Concentration (T_c): 42 $i^{-.4}$ ~~hrs~~./mins. (function of i)

Iterative Solution of T_c: 22 ~~hrs~~./mins.

Rainfall Intensity (i) at T_c: 5.1810 in./hr.

Runoff Supply Rate (q) at T_c: 3.4994 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

Peak Discharge:

1.008 qA (acres): 2152 cfs.

645.33qA (square miles): _____ cfs.

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E 1/2 R11E N 2/3 T13S)

Drainage Concentration Point: #19 (FLECHA CAIDA WASH @ SUNRISE DRIVE SEC LINE 11 & 14)

Watershed Area (A): 161 ac~~res~~/square miles.

Length of Watercourse (L_c): 7000 ft. Length to Center of Gravity (L_{ca}): 3500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	3080 - 2960 = 120
5000	2960 - 2830 = 130

Mean Slope (S_c): 0.0319 ft./ft. Watershed Type(s): FOOTHILLS (DEVELOPED) (future)

Basin Factor (n_b): 0.039 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour):	in.	Areal Value:	in.
P_6 (6 hour):	in.	Areal Value:	in.
P_1 (1 hour): 2.66	in.	Areal Value:	in.
P_2 (2 hour):	in.	Areal Value:	in.
P_3 (3 hour):	in.	Areal Value:	in.

Soil Group(s): 100% B Cover Type(s): DESERT BRUSH

Cover Density (pervious areas): 20% Impervious Cover: 10% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 87.05 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5448 (pervious areas) 0.9558 (impervious areas)

Runoff Supply Rate (q): 0.5859 i in./hr. (function of i)

Time of Concentration (T_c): 38 $i^{-.4}$ ~~hrs~~./mins. (function of i)

Iterative Solution of T_c: 19 ~~hr~~./mins.

Rainfall Intensity (i) at T_c: 5.4564 in./hr.

Runoff Supply Rate (q) at T_c: 3.1971 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 519 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E1/2 R14E N2/3 - T3S)

Drainage Concentration Point: #20 (FLECHA CAIDA WASH @ SEC LINE 14 & 23)

Watershed Area (A): 321 acres/~~square miles~~.

Length of Watercourse (L_c): 13600 ft. Length to Center of Gravity (L_{ca}): 6800 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	3080 - 2960 = 120
5000	2960 - 2830 = 130
6600	2830 - 2660 = 170

Mean Slope (S_c): 0.0287 ft./ft. Watershed Type(s): FOOTHILLS DEVELOPED (future)

Basin Factor (n_b): 0.037 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.64 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 100% B Cover Type(s): DESERT BRUSH

Cover Density (pervious areas): 20% Impervious Cover: 10% (future)

CN(s): 83 (pervious & impervious areas) CN*(s): 87.00
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.5413 (pervious areas) 0.9555 (impervious areas)

Runoff Supply Rate (q): 0.5827 i in./hr. (function of i)

Time of Concentration (T_c): 56 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 32 hrs./mins.

Rainfall Intensity (i) at T_c: 4.0615 in./hr.

Runoff Supply Rate (q) at T_c: 2.3668 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 766 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E1/2 R14E N2/3T13S)

Drainage Concentration Point: #21 (FLECHA CAIDA WASH @ SEC LINE 23 & 26 RIVER ROAD)

Watershed Area (A): 521 acres/~~square miles~~.

Length of Watercourse (L_c): 19400 ft. Length to Center of Gravity (L_{ca}): 9500 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	3080 - 2960 = 120
5000	2960 - 2830 = 130
6600	2830 - 2660 = 170
5800	2660 - 2480 = 180

Mean Slope (S_c): 0.0294 ft./ft. Watershed Type(s): ~~FOOTHILLS~~ (DEVELOPED) (future)

Basin Factor (n_b): 0.036 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.62 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 100% B Cover Type(s): ~~DESERT~~ BRUSH

Cover Density (pervious areas): 20% Impervious Cover: 10% (future)

CN(s): 83 (curve number) (pervious & impervious areas) CN*(s): 86.95 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5377 (pervious areas) 0.9552 (impervious areas)

Runoff Supply Rate (q): 0.5795 i in./hr. (function of i)

Time of Concentration (T_c): 67 $i^{-.4}$ ~~hrs~~./mins. (function of i)

Iterative Solution of T_c: 41 hrs./mins.

Rainfall Intensity (i) at T_c: 3.4361 in./hr.

Runoff Supply Rate (q) at T_c: 1.9911 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

Peak Discharge:

1.008 qA (acres): 1046 cfs.

645.33qA (square miles): _____ cfs.

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E½ R1E N⅔ T13S)

Drainage Concentration Point: #22 (SEC LINE 23 & 26)

Watershed Area (A): 253 acres/square miles.

Length of Watercourse (L_c): 10200 ft. Length to Center of Gravity (L_{ca}): 5100 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
3800	2850 - 2640 = 210
6400	2640 - 2480 = 160

Mean Slope (S_c): 0.0324 ft./ft. Watershed Type(s): FOOTHILLS (DEVELOPED) (future)

Basin Factor (n_b): 0.035 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour):	in.	Areal Value:	in.
P_6 (6 hour):	in.	Areal Value:	in.
P_1 (1 hour): 2.59	in.	Areal Value:	in.
P_2 (2 hour):	in.	Areal Value:	in.
P_3 (3 hour):	in.	Areal Value:	in.

Soil Group(s): 100% B Cover Type(s): DESERT BRUSH

Cover Density (pervious areas): 20% Impervious Cover: 10% (future)

CN(s): 83 (pervious & impervious areas) CN*(s): 86.88
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s),(C): 0.5323 (pervious areas) 0.9547 (impervious areas)

Runoff Supply Rate (q): 0.5745 i in./hr. (function of i)

Time of Concentration (T_c): 43 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 23 hrs./mins.

Rainfall Intensity (i) at T_c: 4.8186 in./hr.

Runoff Supply Rate (q) at T_c: 2.7683 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 706 cfs.

645.33qA (square miles): cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E 1/2 R14E N 2/3 T13S)

Drainage Concentration Point: #23 (WITHIN SE 1/4 SEC 3) @ FINGER ROCK WASH

Watershed Area (A): 390 acres/~~square miles~~.

Length of Watercourse (L_c): 8900 ft. Length to Center of Gravity (L_{ca}): 4400 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	5040 - 3680 = 1360
2100	3680 - 3200 = 480
1400	3200 - 3000 = 200
3400	3000 - 2800 = 200

Mean Slope (S_c): 0.1315 ft./ft. Watershed Type(s): MOUNTAIN (UNDEVELOPED) ~~FOOTHILLS~~ (DEVELOPED) (future)

Basin Factor (n_b): 0.050 (future) Flood Frequency: _____ yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.71 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 33% B 67% D Cover Type(s): MOUNTAIN BRUSH ~~DESERT BRUSH~~ MIX

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 8% (future)

CN(s): 83 90 (pervious & impervious areas) CN*(s): 87.16, 92.44
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5535, 0.7113 (pervious areas) 0.9566 (impervious areas)

Runoff Supply Rate (q): 0.6830 i in./hr. (function of i)

Time of Concentration (T_c): 30 $i^{-.4}$ ~~hrs.~~/mins. (function of i)

Iterative Solution of T_c: 14 hrs./mins.

Rainfall Intensity (i) at T_c: 6.3765 in./hr.

Runoff Supply Rate (q) at T_c: 4.3550 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

Peak Discharge:

1.008 qA (acres): 1712 cfs.

645.33qA (square miles): _____ cfs.

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E 1/2 R1E N 2/3 T13S)

Drainage Concentration Point: #24 (FLECHA CAIDA WASH @ SEC LINE 26 & 27 SWAN ROAD)

Watershed Area (A): 850 acres/~~square miles~~.

Length of Watercourse (L_c): 20600 ft. Length to Center of Gravity (L_{ca}): 10300 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	3080 - 2960 = 120
5000	2960 - 2830 = 130
6600	2830 - 2660 = 170
7000	2660 - 2450 = 210

Mean Slope (S_c): 0.0291 ft./ft. Watershed Type(s): ~~FOOTHILLS~~ (DEVELOPED) (future)

Basin Factor (n_b): 0.036 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.60 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 100% B Cover Type(s): ~~DESERT~~ BRUSH

Cover Density (pervious areas): 20% Impervious Cover: 10% (future)

CN(s): 83 (pervious & impervious areas) CN*(s): 86.91
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5341 (pervious areas) 0.9548 (impervious areas)

Runoff Supply Rate (q): 0.5762 i in./hr. (function of i)

Time of Concentration (T_c): 70 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 44 hrs./mins.

Rainfall Intensity (i) at T_c: 3.2500 in./hr.

Runoff Supply Rate (q) at T_c: 1.8726 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Note: For impervious areas, CN* = 99 (constant).

Peak Discharge:

1.008 qA (acres): 1604 cfs.

645.33qA (square miles): _____ cfs.

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY (E1/2 R14E N2/3 T13S)

Drainage Concentration Point: #25 (254) FINGER ROCK WASH JUST SOUTH OF FOREST SERVICE BOUNDAR

Watershed Area (A): 2167 (2254) acres/~~square miles~~

Length of Watercourse (L_c): 20400 (+3700) ft. Length to Center of Gravity (L_{ca}): 9500 (-1900) ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
4300	7255 - 6240 = 1015
10100	6240 - 3560 = 2680
5000	3560 - 3080 = 480
1000	3080 - 3000 = 80

Mean Slope (S_c): 0.1796 (0.1700) ft./ft. Watershed Type(s): MOUNTAIN (UNDEVELOPED) EXIST ~~(future)~~

3000 - 2840 = 160

Basin Factor (n_b): 0.060 (0.056) EXIST ~~(future)~~ Flood Frequency: 100 yrs.

P_{24} (24 hour):	in.	Areal Value:	in.
P_6 (6 hour):	in.	Areal Value:	in.
P_1 (1 hour):	2.74 in.	Areal Value:	in.
P_2 (2 hour):	in.	Areal Value:	in.
P_3 (3 hour):	in.	Areal Value:	in.

Soil Group(s): 1% B 25% C 74% D Cover Type(s): MOUNTAIN BRUSH / DESERT BRUSH

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 0% (10%) EXIST ~~(future)~~

CN(s): 83, 82, 90 (curve number) (pervious & impervious areas) CN*(s): 87.22, 86.56, 92.49 (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5585, 0.5409, 0.7152 (pervious areas) 0.9571 (impervious areas)

Runoff Supply Rate (q): 0.6701 i in./hr. (function of i)

Time of Concentration (T_c): 51 $i^{-.4}$ ~~hrs.~~/mins. (function of i)

Iterative Solution of T_c: 28 ~~hrs.~~/mins.

Rainfall Intensity (i) at T_c: 4.5667 in./hr.

Runoff Supply Rate (q) at T_c: 3.0600 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 6684 (3100) cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY

Drainage Concentration Point: #26 (CONFLUENCE #7 & #8) (FINGER ROCK TRIBUTARY)

Watershed Area (A): 663 acres/square miles.

Length of Watercourse (L_c): 12600 ft. Length to Center of Gravity (L_{ca}): 6000 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	5280 - 4000 = 1280
2200	4000 - 3400 = 600
1800	3400 - 3080 = 320
4200	3080 - 2850 = 230
2400	2850 - 2765 = 85

Mean Slope (S_c): 0.0914 ft./ft. Watershed Type(s): MOUNTAIN (UNDEVELOPED) FOOTHILLS DEVELOPED (future)

Basin Factor (n_b): 0.046 (future) Flood Frequency: 100 yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.70 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 54% B 46% D Cover Type(s): MOUNTAIN BRUSH DESERT BRUSH MIX

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 20% (future)

CN(s): 83, 90 (pervious & impervious areas) CN*(s): 87.13, 86.47, 92.45
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5518, 0.5340, 0.7099 (pervious areas) 0.9565 (impervious areas)

Runoff Supply Rate (q): 0.6875 i in./hr. (function of i)

Time of Concentration (T_c): 38 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 20 hrs./mins.

Rainfall Intensity (i) at T_c: 5.4000 in./hr.

Runoff Supply Rate (q) at T_c: 3.7125 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 2481 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

HYDROLOGIC DATA SHEET

Project Name and Location: FLECHA CAIDA FLOOD IMPROVEMENT STUDY

Drainage Concentration Point: #27 (CONFLUENCE WITH FINGER ROCK WASH)

Watershed Area (A): 698 acres/square miles.

Length of Watercourse (L_c): 14900 ft. Length to Center of Gravity (L_{ca}): 7200 ft.

Incremental Change in Length (L_i) - ft.	Incremental Change in Elevation (H_i) - ft.
2000	5280 - 4000 = 1280
2200	4000 - 3400 = 600
1800	3400 - 3080 = 320
4200	3080 - 2850 = 230
2400	2850 - 2765 = 85
2300	2765 - 2690 = 75

Mean Slope (S_c): 0.0750 ft./ft. Watershed Type(s): MOUNTAIN UNDEVELOPED FOOTHILLS DEVELOPED (future)

Basin Factor (n_b): 0.044 (future) Flood Frequency: _____ yrs.

P_{24} (24 hour): _____ in. Areal Value: _____ in.

P_6 (6 hour): _____ in. Areal Value: _____ in.

P_1 (1 hour): 2.69 in. Areal Value: _____ in.

P_2 (2 hour): _____ in. Areal Value: _____ in.

P_3 (3 hour): _____ in. Areal Value: _____ in.

Soil Group(s): 56% B 44% D Cover Type(s): MOUNTAIN BRUSH & DESERT BRUSH

Cover Density (pervious areas): 30% (MB) 20% (DB) Impervious Cover: 20% (future)

CN(s): 83, 90 (pervious & impervious areas) CN*(s): 87.11, 92.41
(curve number) (adjusted curve number)

Runoff to Rainfall Ratio(s), (C): 0.5501, 0.7086 (pervious areas) 0.9563 (impervious areas)

Runoff Supply Rate (q): 0.6871 i in./hr. (function of i)

Time of Concentration (T_c): 44 $i^{-.4}$ hrs./mins. (function of i)

Iterative Solution of T_c: 24 hrs./mins.

Rainfall Intensity (i) at T_c: 4.8909 in./hr.

Runoff Supply Rate (q) at T_c: 3.3605 in./hr.

Equation for T_c:

$$T_c = \frac{n_b}{50} \frac{(L_c L_{ca})^{.3}}{(S_c)^{.4}} q^{-.4} \text{ hours.}$$

Peak Discharge:

1.008 qA (acres): 2364 cfs.

645.33qA (square miles): _____ cfs.

Note: For impervious areas, CN* = 99 (constant).

APPENDIX C

CULVERT PERFORMANCE CURVES

sla
SIMONS, LI & ASSOCIATES, INC.

CLIENT ____ JOB NO. ____ PAGE ____
PROJECT ____ DATE CHECKED ____ DATE ____
DETAIL ____ CHECKED BY ____ COMPUTED BY ____

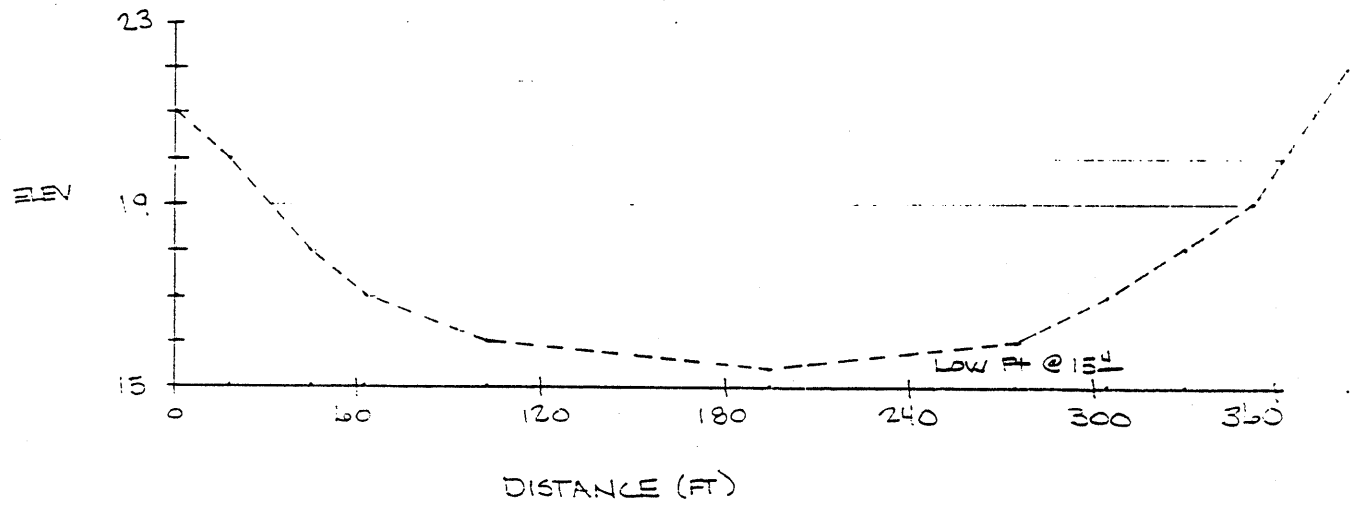
FINGER ROCK WASH

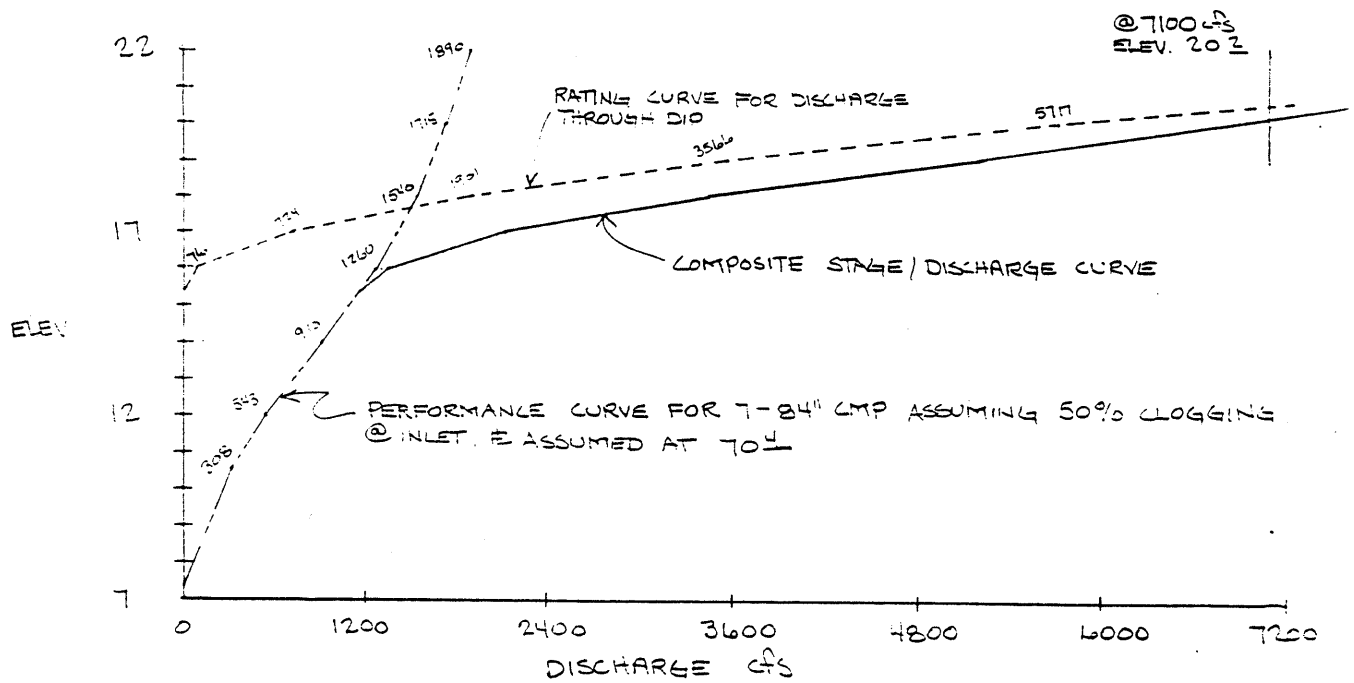
DISCHARGE RATING CURVE FOR 7-84" CMP & DIP SECTION AT PONTATOC CANYON DRIVE $Q_{100} \approx 7100$ cfs
$C_{WEIR} = 2.7$

DIP SECTION

0/21 18/20 45/18 63/17 103/16 195/15.4 275/16 305/17

330/18 353/19 362/20 383/22





APPENDIX C
SHEET 1 OF 8

049

FINGER ROCK WASH

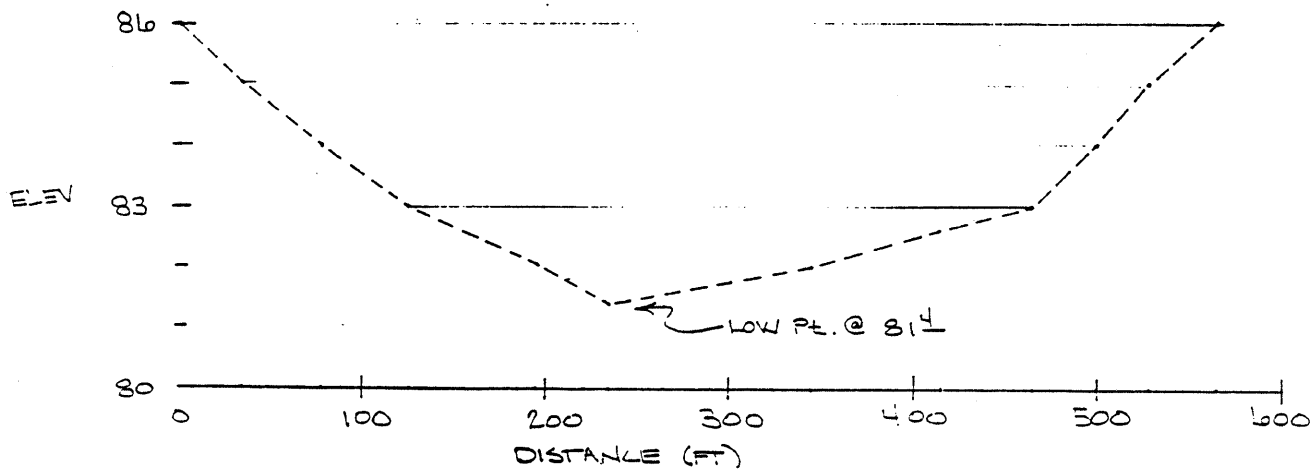
DISCHARGE RATING CURVE FOR 1-48" CMP & DIP SECTION AT SKYLINE DRIVE $Q_{100} \approx 6700$ cfs

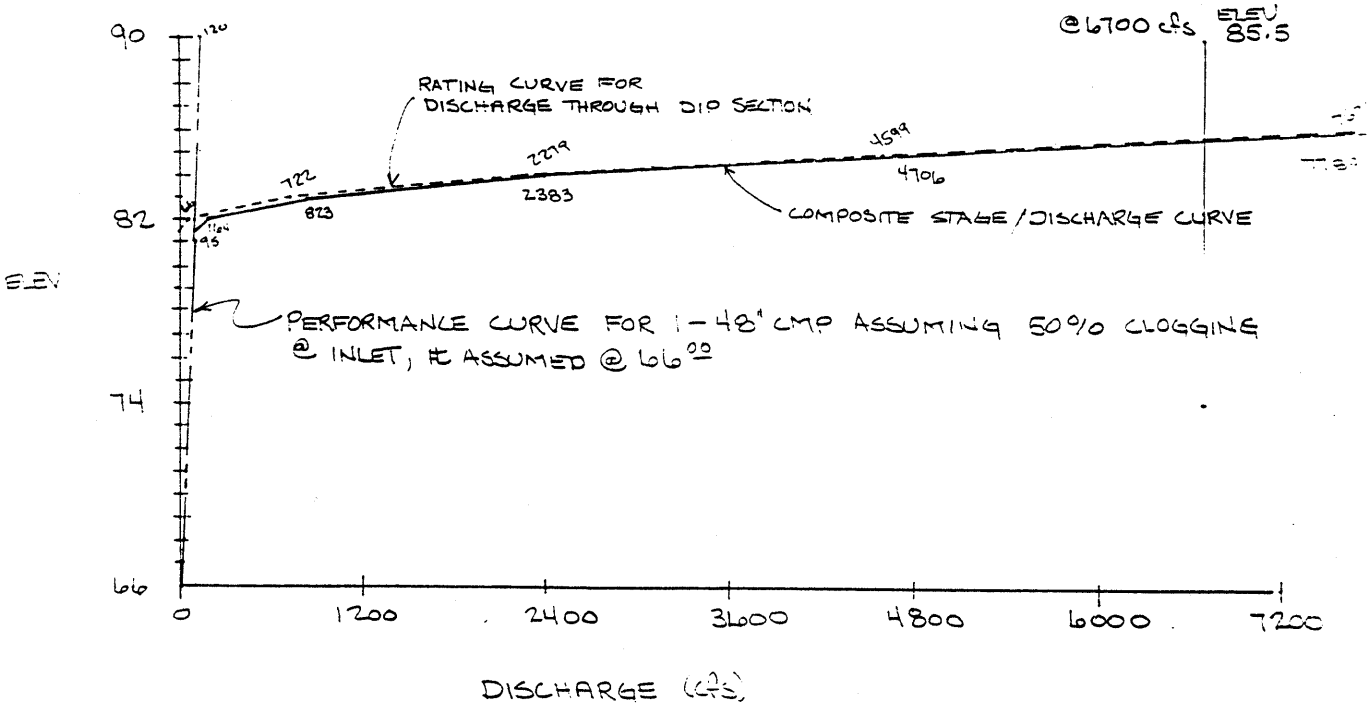
$C_{WEIR} = 2.7$

DIP SECTION

0/86 33/85 78/84 124/83 193/82 233/81.4 343/82

415/82.6 463/83 500/84 529/85 565/86





APPENDIX C
SHEET 2 OF 8

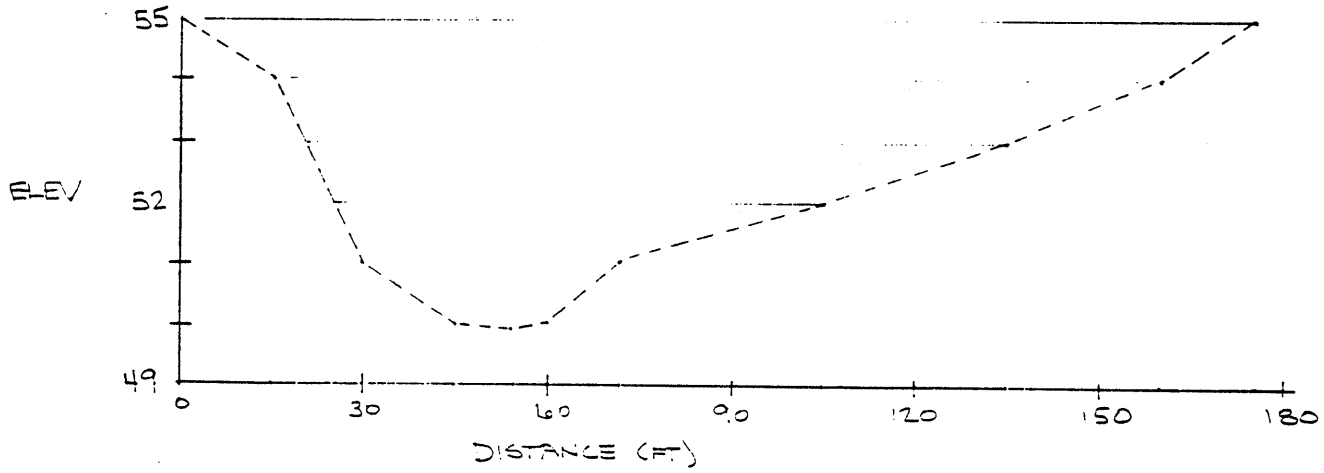
sla
SIMONS, LI & ASSOCIATES, INC.

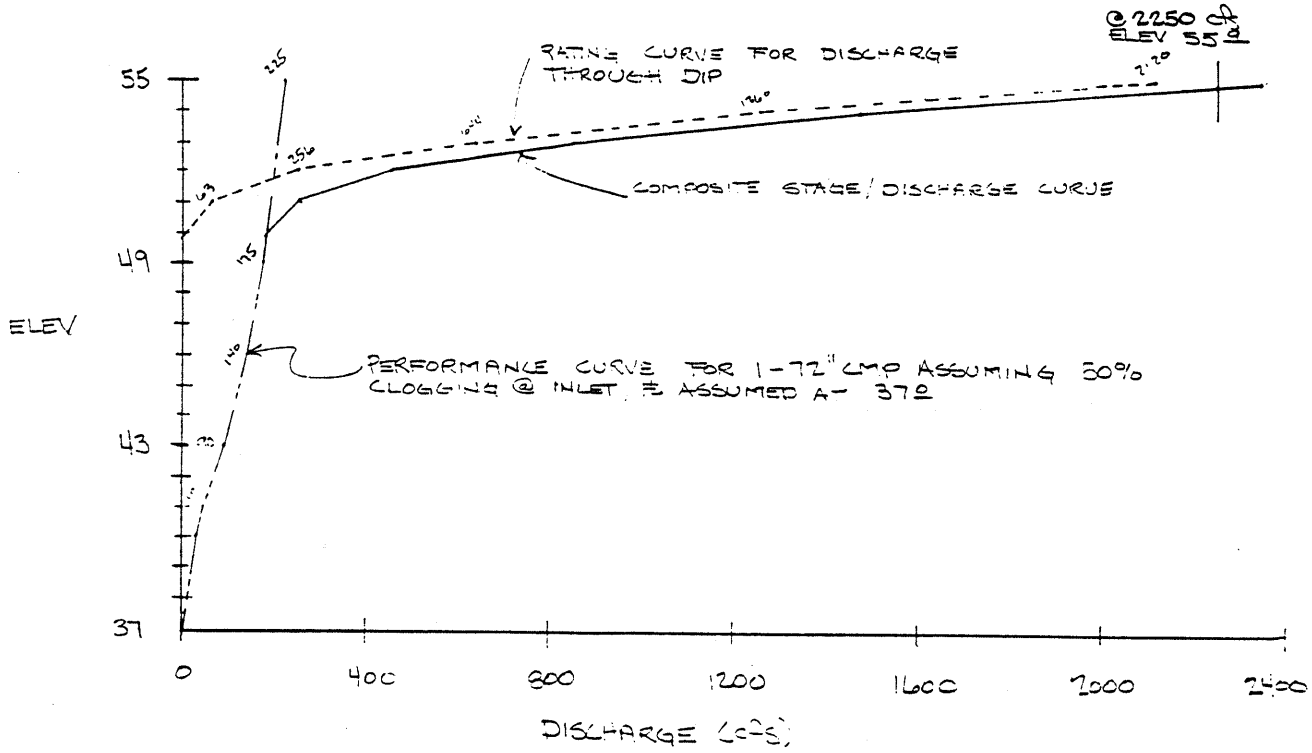
CLIENT _____ JOB NO. _____ PAGE _____
PROJECT _____ DATE CHECKED _____ DATE _____
DETAIL _____ CHECKED BY _____ COMPUTED BY _____

VALLEY VIEW WASH
HEC-2 SECTION NO 36
DISCHARGE RATING CURVE FOR 1-72" CMP & DIP SECTION AT SWAN RD Q_{100} = 2250 C_{WEIR} = 2.70

DIP SECTION

0/55 15/54 30/51 45/50 55/49.2 60/50 72/51 105/52
135/53 160/54 175/55





APPENDIX C
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sla
SIMONS, li & ASSOCIATES, INC.

CLIENT ____ JOB NO. ____ PAGE ____
PROJECT ____ DATE CHECKED ____ DATE ____
DETAIL ____ CHECKED BY ____ COMPUTED BY ____

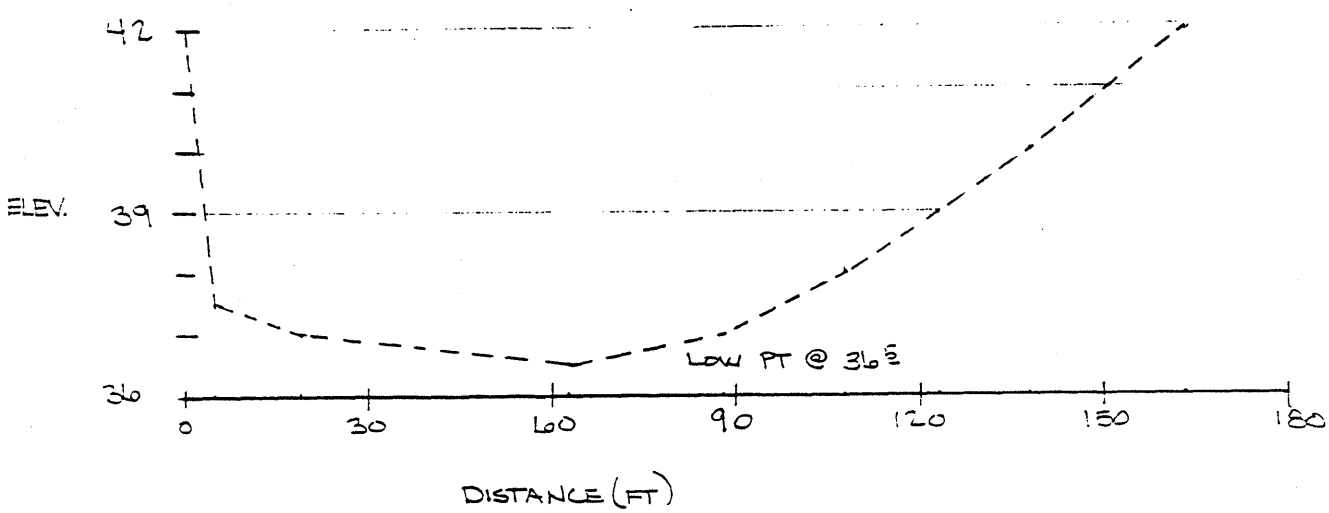
VALLEY VIEW WASH

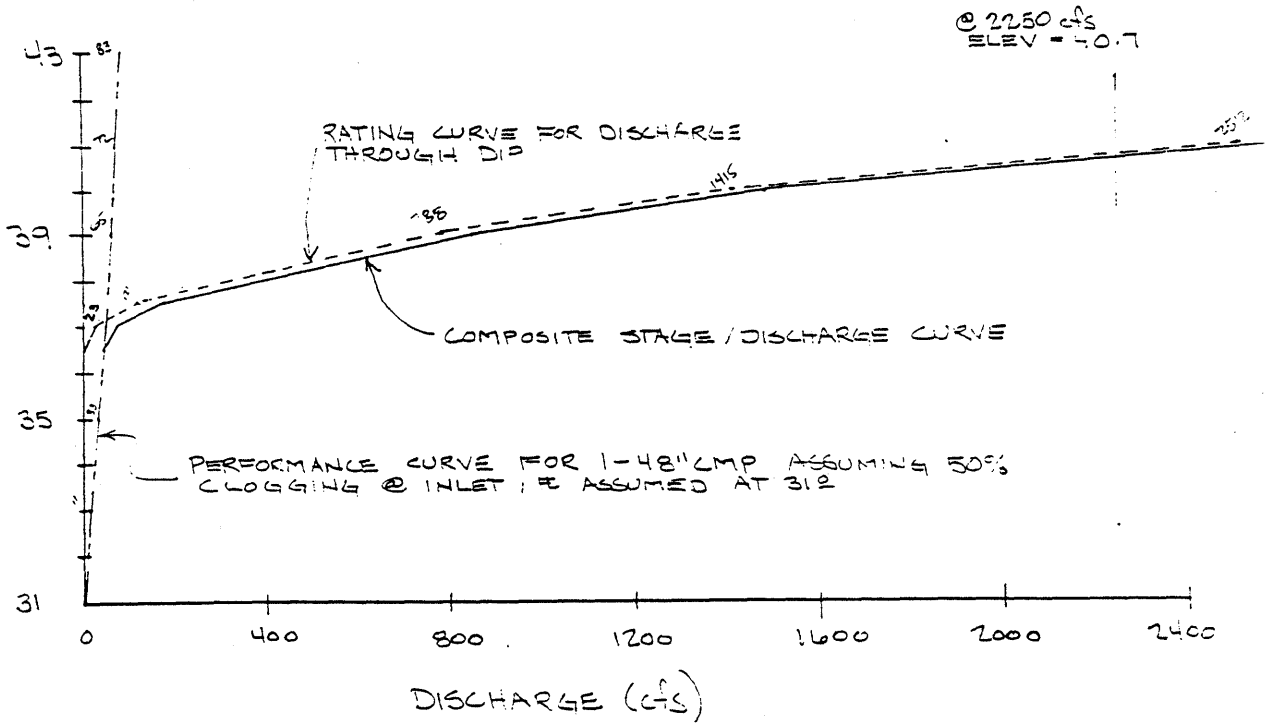
HEC-2 SECTION No. 51

DISCHARGE RATING CURVE FOR 1-48" CMP & DIP SECTION AT CMO. ARCO $Q_{100} = 2250$ $C_{WEIR} = 2.7$

DIP SECTION

0/42 5/37.5 19/37 63/36.5 88/37 108/38 123/39 138/40 163/42





APPENDIX C
SHEET 4 OF 8

sla
SIMONS, LI & ASSOCIATES, INC.

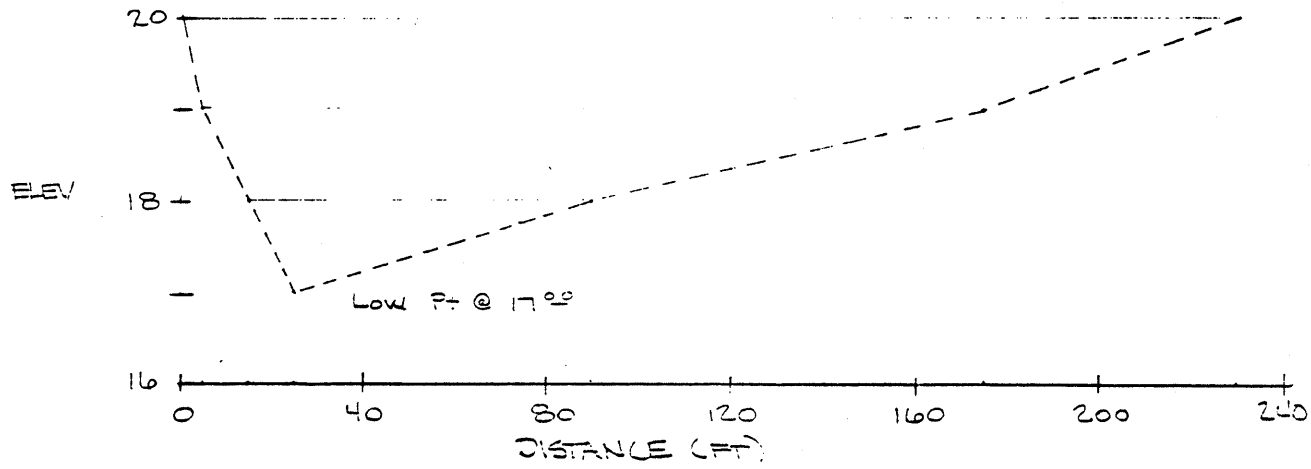
CLIENT _____ JOB NO. _____ PAGE _____
PROJECT _____ DATE CHECKED _____ DATE _____
DETAIL _____ CHECKED BY _____ COMPUTED BY _____

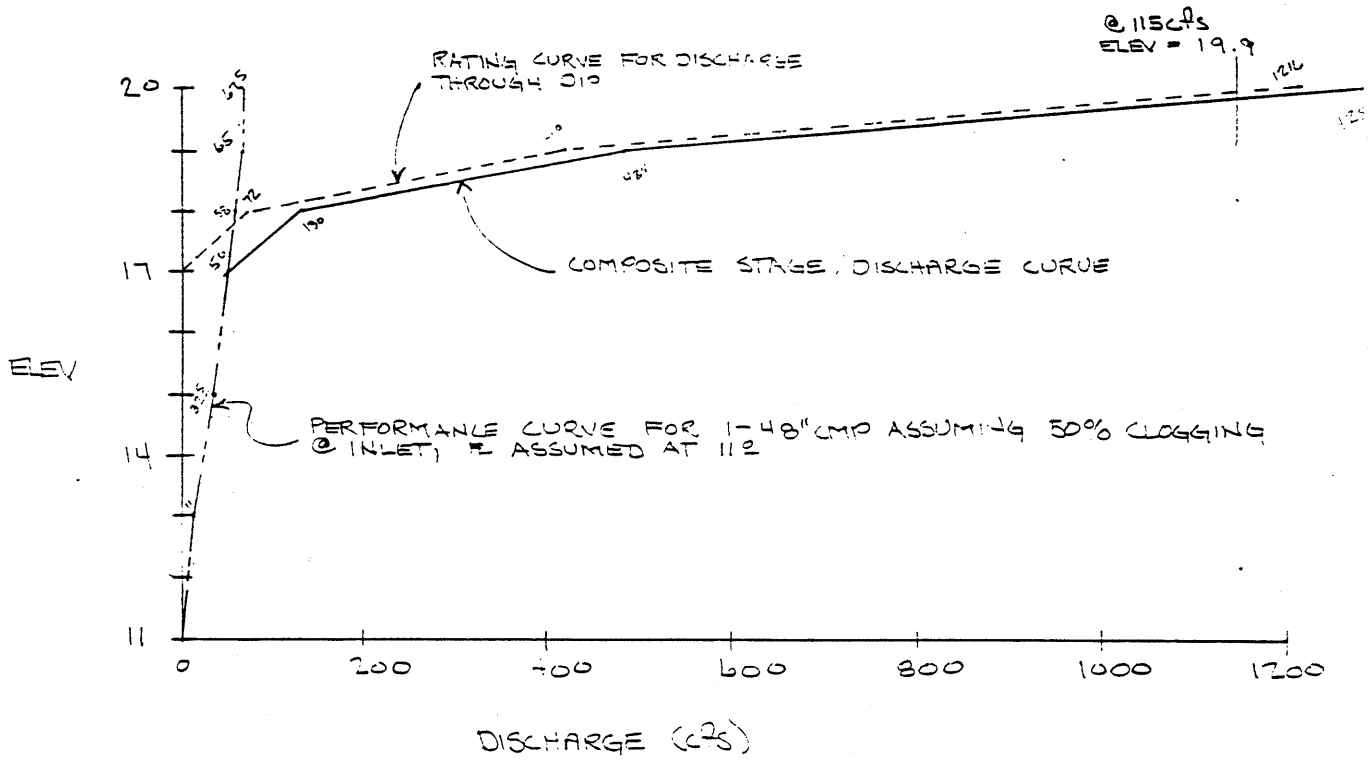
VALLEY VIEW WASH TRIBUTARY
(SKY CLUB WASH)

DISCHARGE RATING CURVE FOR 1-48" CMP & DIP SECTION AT SWAN ROAD $Q_{100} = 1150$ $C_{WEIR} = 2.7$

DIP SECTION

0/20 5/19 15/18 25/17 90/18 175/19 230/20





APPENDIX C
SHEET 5 OF 8

sla
SIMONS, LI & ASSOCIATES, INC.

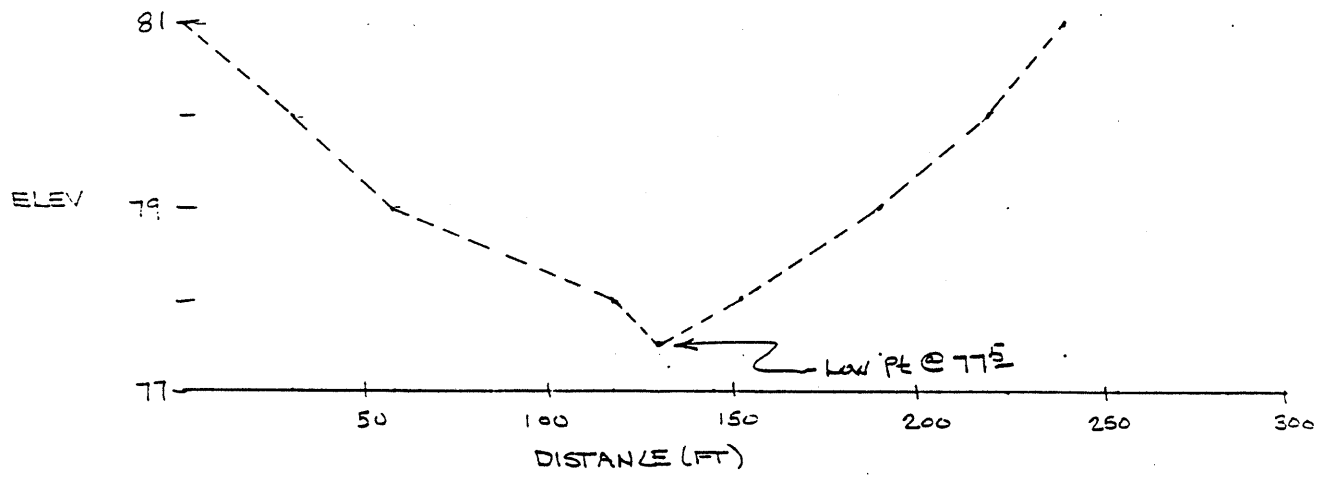
CLIENT _____ JOB NO. _____ PAGE _____
PROJECT _____ DATE CHECKED _____ DATE 10-10-85
DETAIL _____ CHECKED BY _____ COMPUTED BY RLS.

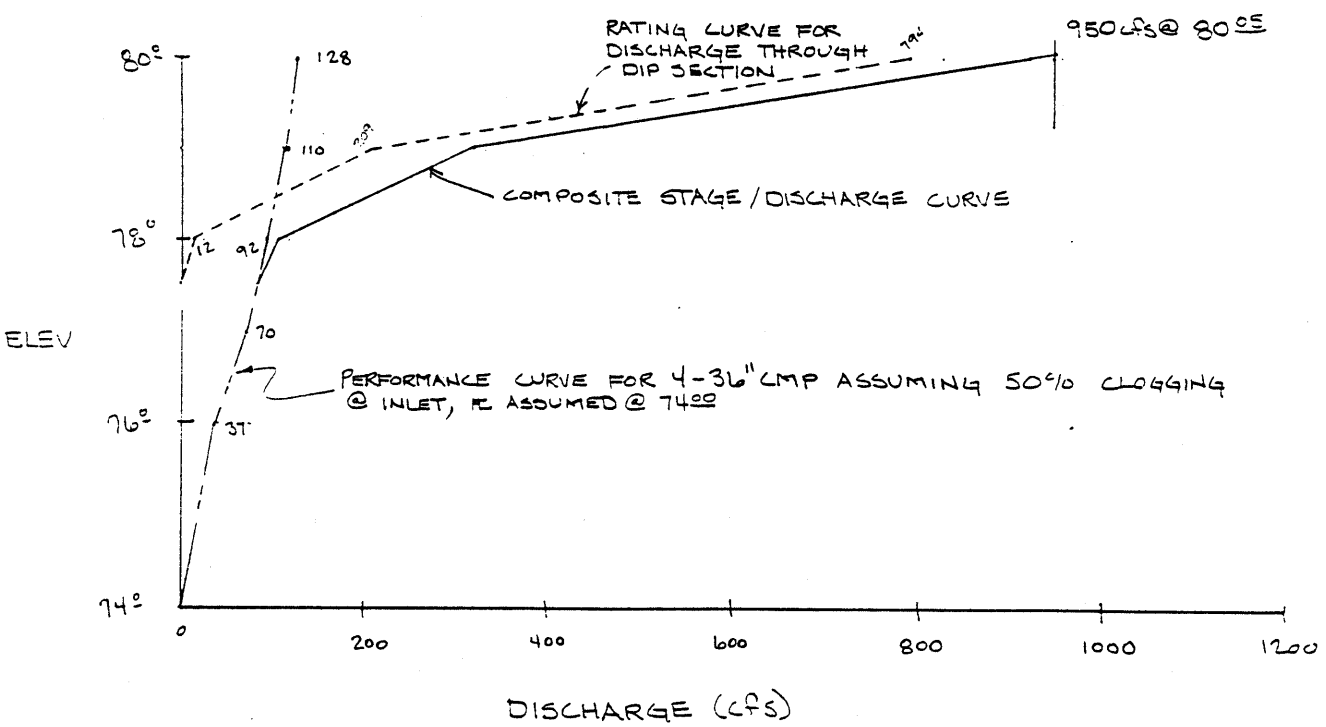
FLECHA CAIDA WASH

DISCHARGE RATING CURVE FOR 4-36" CMP & DIP SECTION AT CALLE DE LAS CHARAS $Q_{100} = 950$ cfs.
$C_{WEIR} = 2.70$

DIP SECTION

0/81 30/80 58/79 118/78 130/77.5 153/78 190/79 220/80 240/81





APPENDIX C
SHEET 6 OF 8

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sla
SIMONS, li & ASSOCIATES, INC.

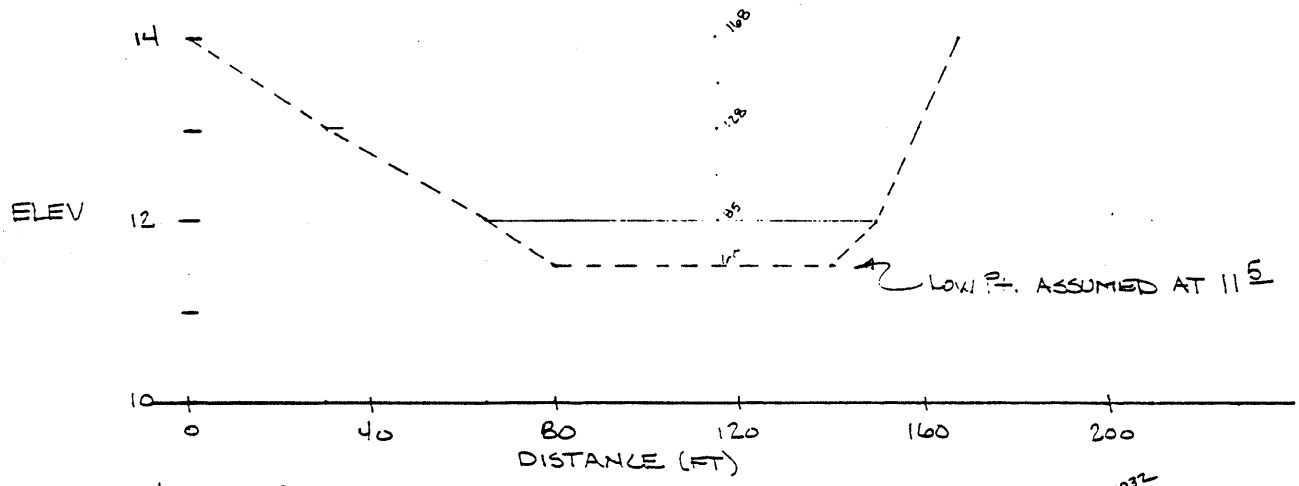
CLIENT ____ JOB NO. ____ PAGE ____
PROJECT ____ DATE CHECKED ____ DATE ____
DETAIL ____ CHECKED BY ____ COMPUTED BY ____

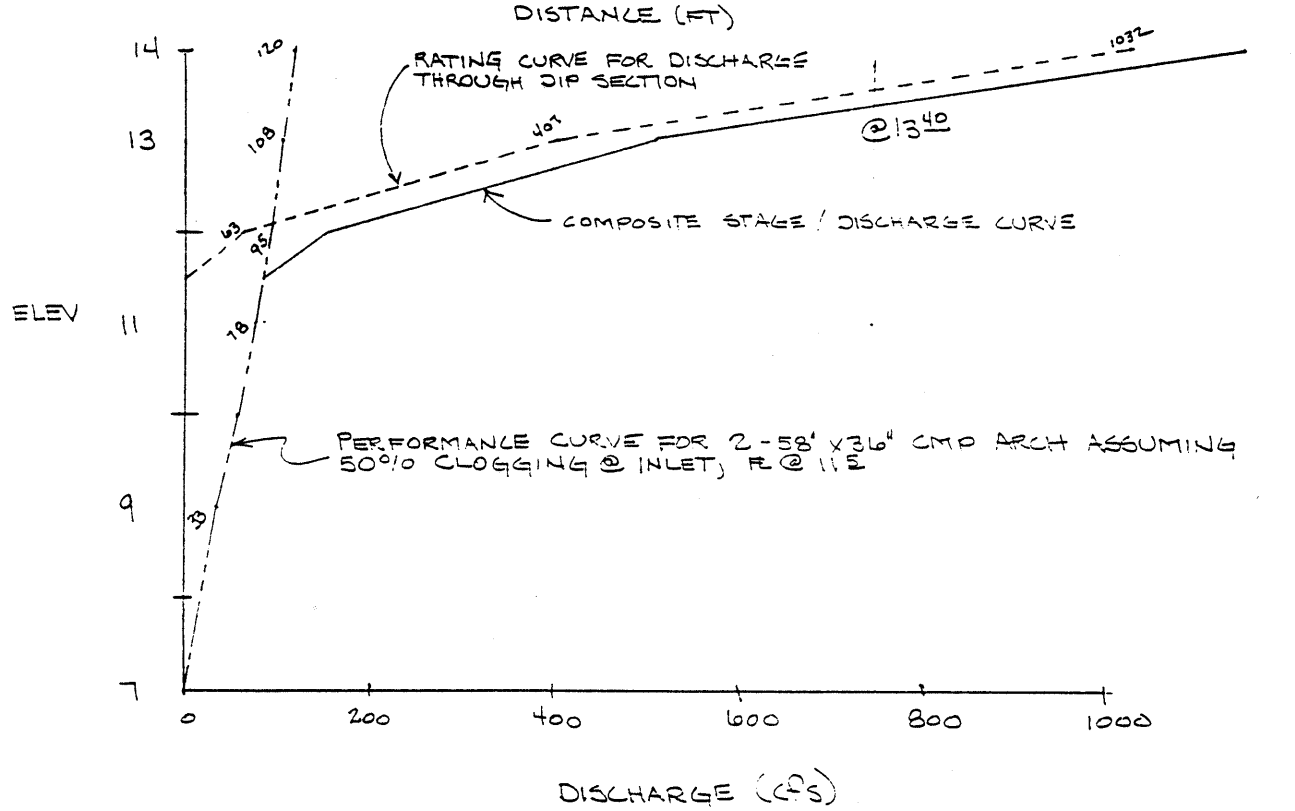
FLECHA CAIDA WASH

DISCHARGE RATING CURVE FOR 2-58"x36" CMP ARCH & DIP CROSSING AT PASEO DEL BAC Q_{100} = 750 cfs C_{WEIR} = 2.70

DIP SECTION

0/14 30/13 65/12 80/11.5 140/11.5 150/12 168/14





APPENDIX C
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sla
SIMONS, LI & ASSOCIATES, INC.

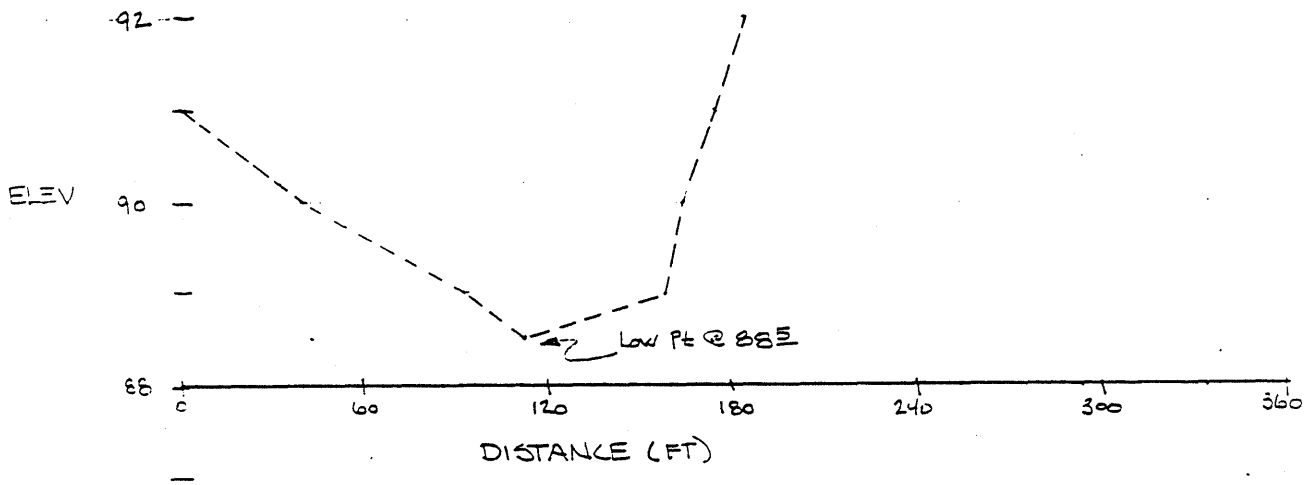
CLIENT ____ JOB NO. ____ PAGE ____
PROJECT ____ DATE CHECKED ____ DATE 10-10-85
DETAIL ____ CHECKED BY ____ COMPUTED BY RLS.

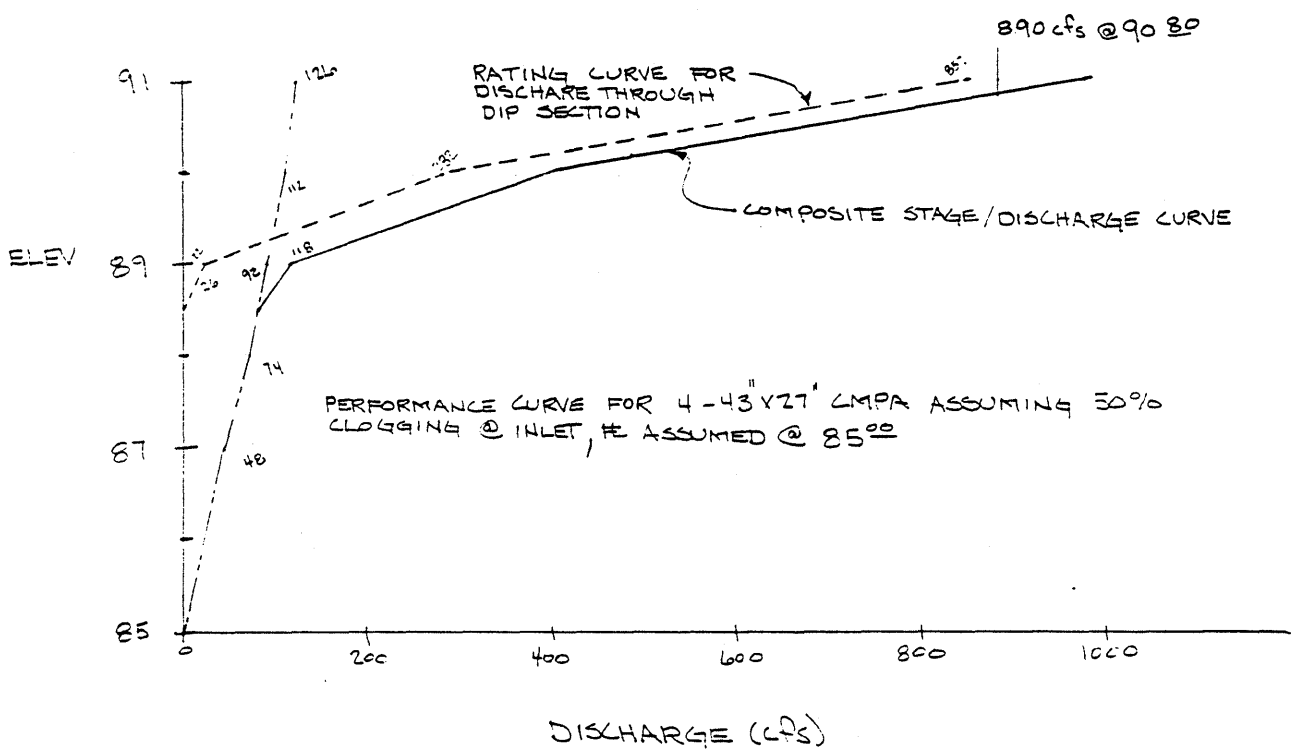
FLECHA CAIDA WASH

DISCHARGE RATING CURVE FOR 4-43" X 27" CMPA & DIP CROSSING OF COMO CARDENAL $Q_{100} = 890$ cfs $C_{WEIR} = 2.70$

DIP SECTION

0/91 40/90 92/89 112/88.5 158/89 165/90 295/90.2 175/90





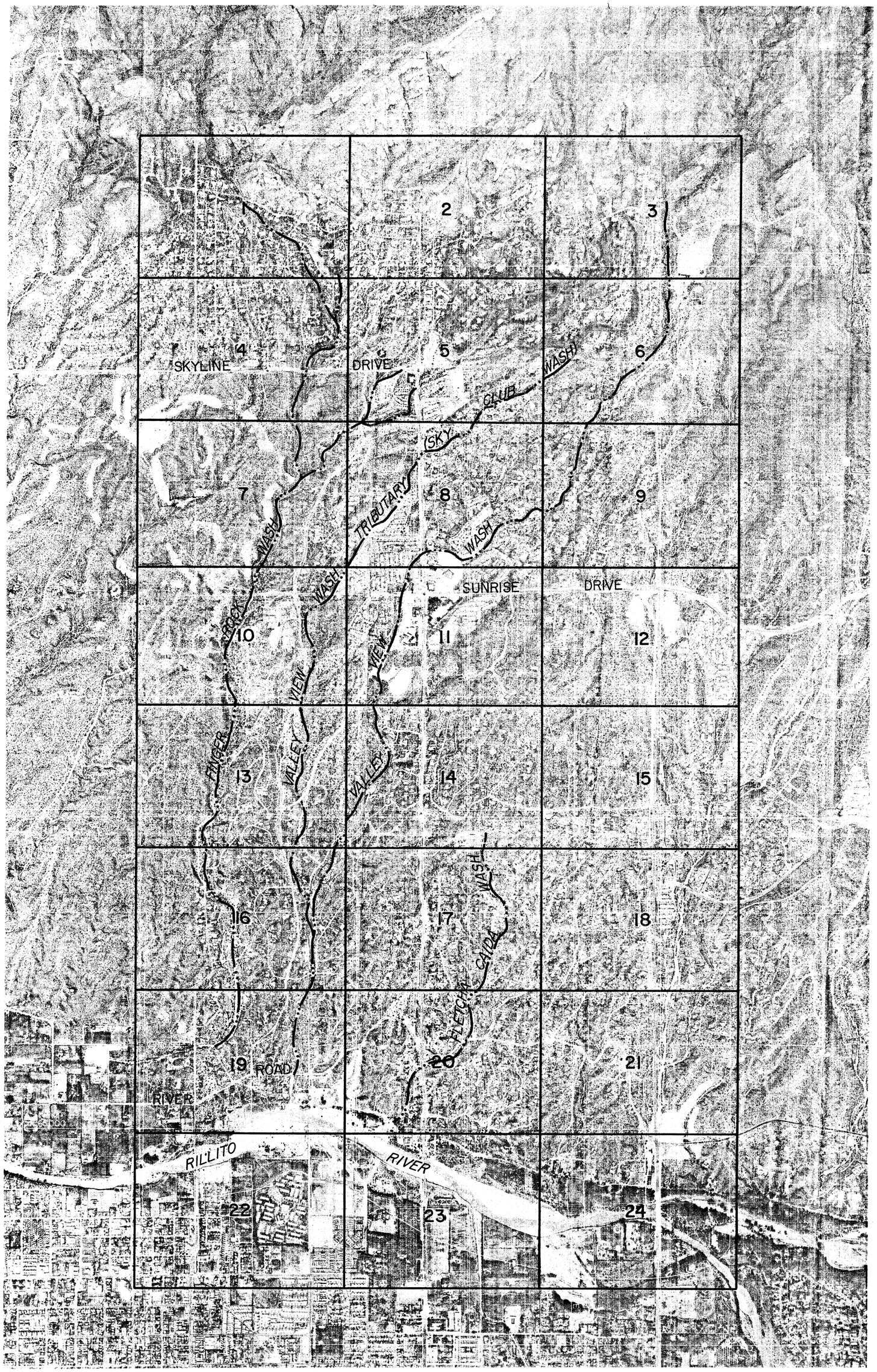
APPENDIX C
SHEET 8 OF 8

APPENDIX D

DISKETTE CONTAINING INPUT DATA FOR SUBCRITICAL AND SUPERCRITICAL RUNS

APPENDIX E

INDEX MAP TO THE FLOODPLAIN MAPS
(SEPARATE DOCUMENT)



CROSS SECTION REFERENCE TABLE

WASH	SECTION NUMBER	SHEET NUMBER
	-------FINGER ROCK WASH------	
Main Watercourse:	1 - 3	19
	4 - 10	16
	11 - 17	13
	18 - 26	10
	26 - 34	7
	35 - 44	4
	44 - 48	1
Tributaries:	1.1 - 3.1	7
	4.1 - 8.1	5
	1.11- 4.11	5
	1.2	4
	2.2 - 3.2	1
	-------VALLEY VIEW WASH------	
Main Watercourse:	1 - 5	19
	6 - 12	16
	12	17
	13	13
	13 - 24	14
	24 - 34	11
	35 - 43	8
	43 - 49	9
	49 - 57	6
	58 - 62	3
Tributary: (Sky Club Wash)	1.1 - 4.1	16
	4.1 - 10.1	13
	11.1 - 18.1	10
	19.1	11
	20.1 - 29.1	8
	30.1 - 33.1	5
	-------FLECHA CAIDA WASH------	
Main Watercourse:	1 - 9	20
	10 - 18	17
	19 - 20	14

SCALE 1" = 100'

100 50 0 100 200

CONTOUR INTERVAL 1 FOOT

INDEX MAP

100-YEAR FLOOD PLAINS FOR THE FLECHA CAIDA FLOOD IMPROVEMENT STUDY

1" = 100' sla SIMONS, LI & ASSOCIATES, INC. SHEET 1 OF 1

"FLECHA CAIDA"

PHOTO DATES: 10-13-84 & 8-3-84