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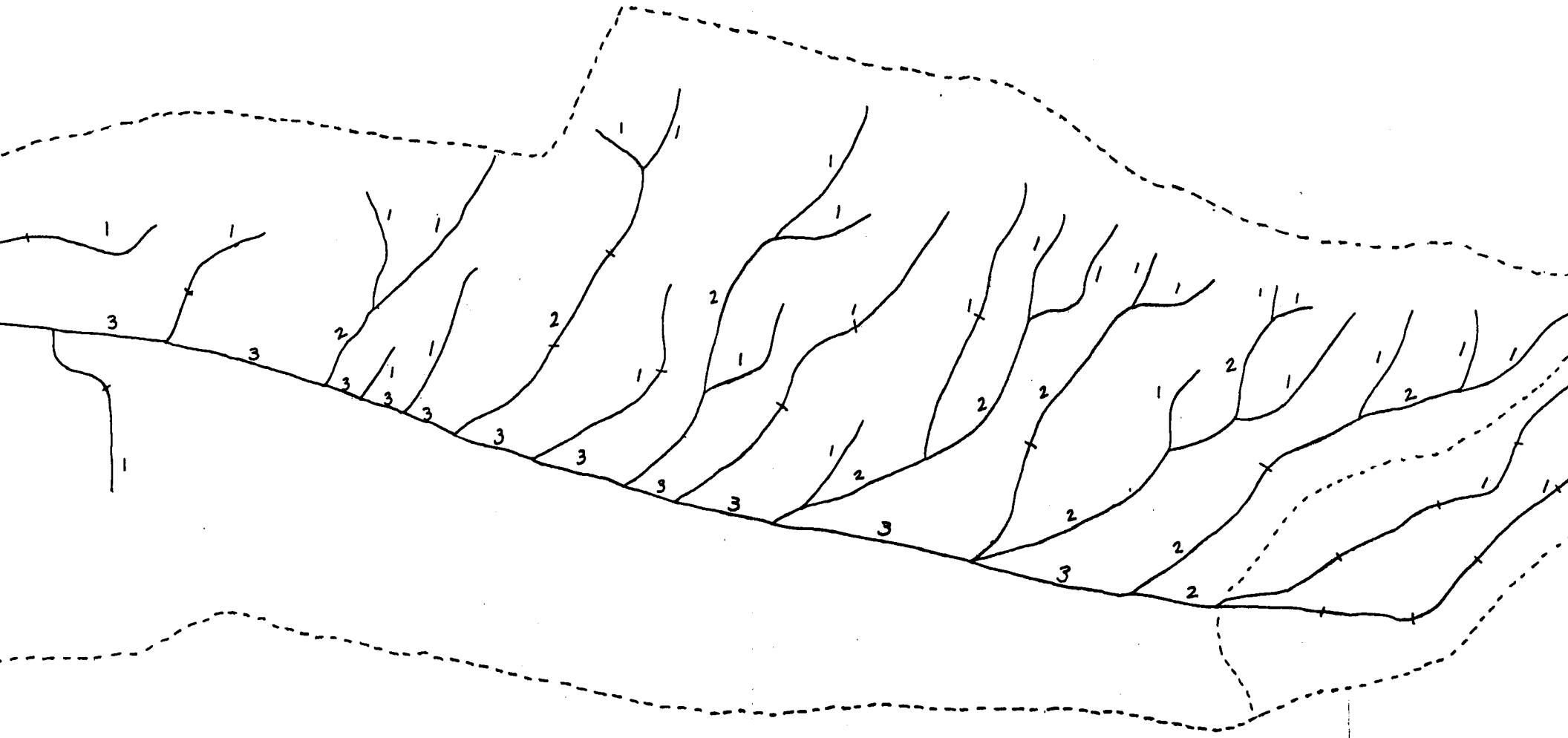
SOLITARIO CANYON WATERSHED RUNOFF AND CHANNEL INFILTRATION SIMULATIONS

DAW

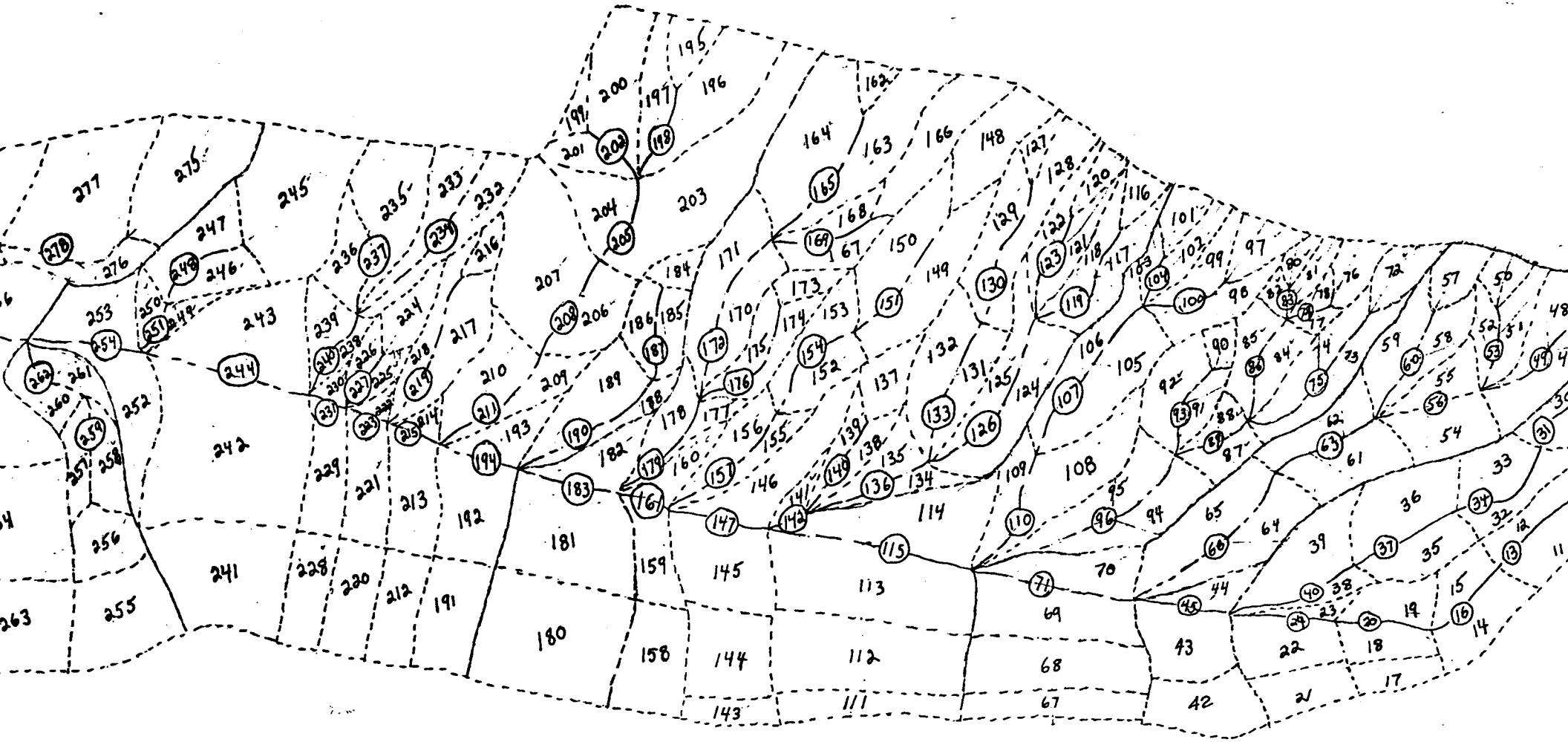
SOLITARIO CANYON WATERSHED RUNOFF AND CHANNEL INFILTRATION SIMULATIONS

This Notebook provides supplementary information to the watershed work described in Scientific Notebook No 294.

English Peary
10/29/99



0 500 m 1000 m



0 500m 1000m

SOLITARI

Calibration for Flar[illegible]

DAW

at 50 scale 1 Km = 163

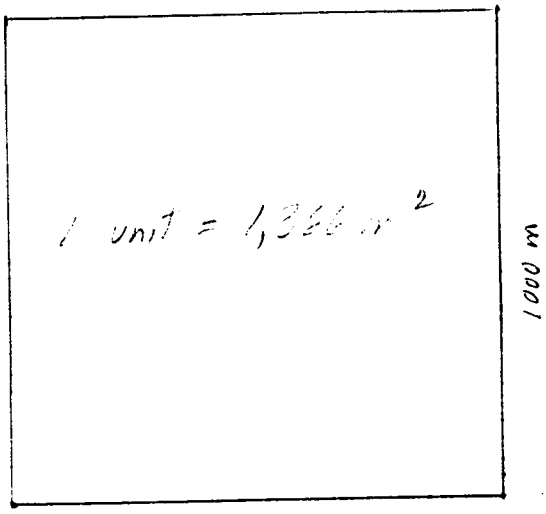
3.9" = [illegible]

1" = 39.[illegible] m

2.54 cm = 99.75 m

1 cm = 39.767 m

1m = [illegible]



715

1444 722

2165 722

183 units = 250,[illegible]

1 unit = 1,366

565 = [illegible]

(1 = 1,3[illegible])

with [illegible] = 140

722 units = 1,000,000 m²

1.00 = 1,385 m²

Solsub1 = 800 units = 1.11 Km² ✓

[illegible] units = 1.08 Km²

8/9/96 793 = 1.085 Km²

61 649 = 67,[illegible] m² [illegible] W = 377 m ✓

[illegible] 63 mm

1 [illegible] meter unit = 1,[illegible] m²

Solitario Canyon Plane + Channel Data (Worksheet)

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DAW

Station No	Area Plan, units	Length (m)	Δh m	
42	51	180	30	
43	52	260	85	
44	20	230	37	
45 channel		315	15	SOL45.PAR
HW 46	18	175	56	
47	46	200	78	
48	36	235	86	
49	connections	465	103	
HW 50	13	180	43	✓
51	24	210	75	
52	15	187	71	
53		280	85	
54	41	190	80	
55	24	162	63	
49, 53 → 56		355	38	
HW 57	23	250	63	✓
58	26	187	60	
59	33	140	55	
60		400	96	
61	46	200	75	
62	32	130	48	
56, 60 → 63		375	29	
64	46	220	53	
65	53	180	49	

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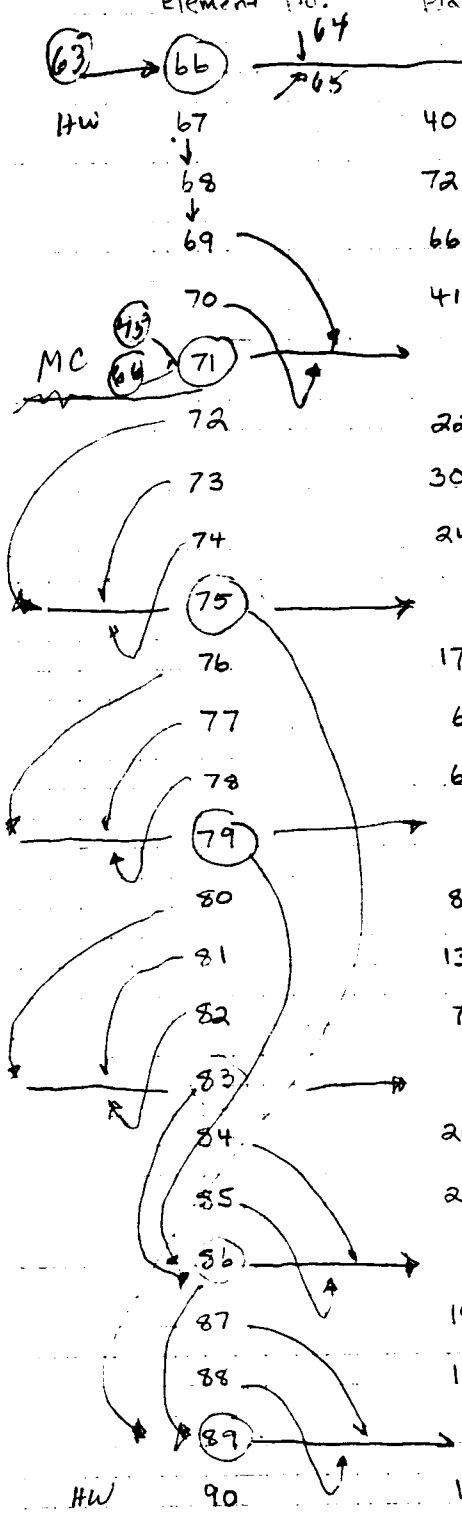
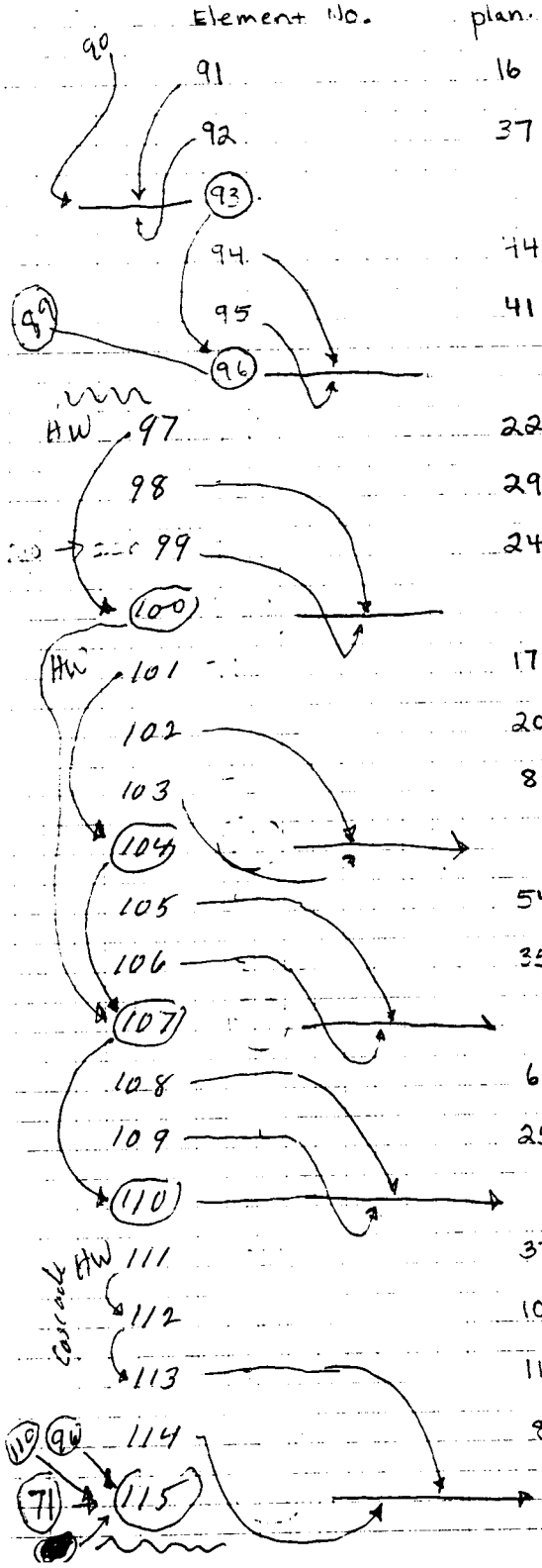
Element No.	Area Plan Units	Length (m)	Δh (m)	
63 → 66 → 64 / 65		640	43	
HW 67	40	90	7	
68	72	162	90	
69	66	187	38	
70	41	280	38	✓
MC 63 64 71		540	23	
72	22	270	66	✓
73	30	125	30	
74	24	165	45	
75		570	105	
76	17	212	58	
77	6	75	30	
78	6	100	38	
79		140	30	
80	8	140	48	✓
81	13	260	82	✓
82	7	110	40	
83		110	30	
84	20	140	47	
85	24	137	39	
86		367	56	
87	19	115	32	
88	13	112	32	
89		260	20	
HW 90	10	150	35	✓



315

Element No.	Area plan. Units	Length (m)	Δh (m)
91	16	150	27 ✓
92	37	150	48
93		325	46
94	44	165	33
95	41	135	70 ✓
96		750	53
97	22	250	73
98	29	150	40
99	24	140	53
100		285	45
101	17	240	70 ✓
102	20	360	100
103	8	112	37
104		175	40
105	54	187	61
106	35	125	22
107		600	50
108	64	535	87
109	25	275	32
110		442	37
111	37	87	12
112	108	237	112
113	117	270	41
114	82	375	40
115		687	27



Element No.	Area plan. Units	Length (m)	Δh (m)
116	13	200	50
117	34	412	100
118	25	160	48
119		437	88
120	11	260	72
121	25	290	91
122	20	150	36
123		362	68
124	54	160	34
125	35	100	17
126		624	47
127	12	187	48
128	46	150	33
129	35	125	42
130		497	87
131	30	140	22
132	45	130	48
133		475	40
134	15	250	25
135	24	220	45
136		430	25
137	24	250	35
138	17	150	25
139	12	150	30
140		380	40
141	115	11	150	20

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DAW

SOL147 PAR

Element No.	Area Plan. units	Length (m) 150	Δh (m) 8
143	21	90	15
144	59	280	120
145	70	230	50
146	60	450	50
147		340	11
148	44	330	70
149	61	230	48
150	53	190	60
151		[illegible]	60
152	29	175	43
153	30	200	50
154		450	27
155	20	160	20
156	28	200	25
157		500	30
158	56	350	150
159	36	340	48
160	23	250	12
161		170	8
162	10	140	40
163	60	300	95
164	88	400	100
165		500	100
166	56	600	100
167	26	120	40

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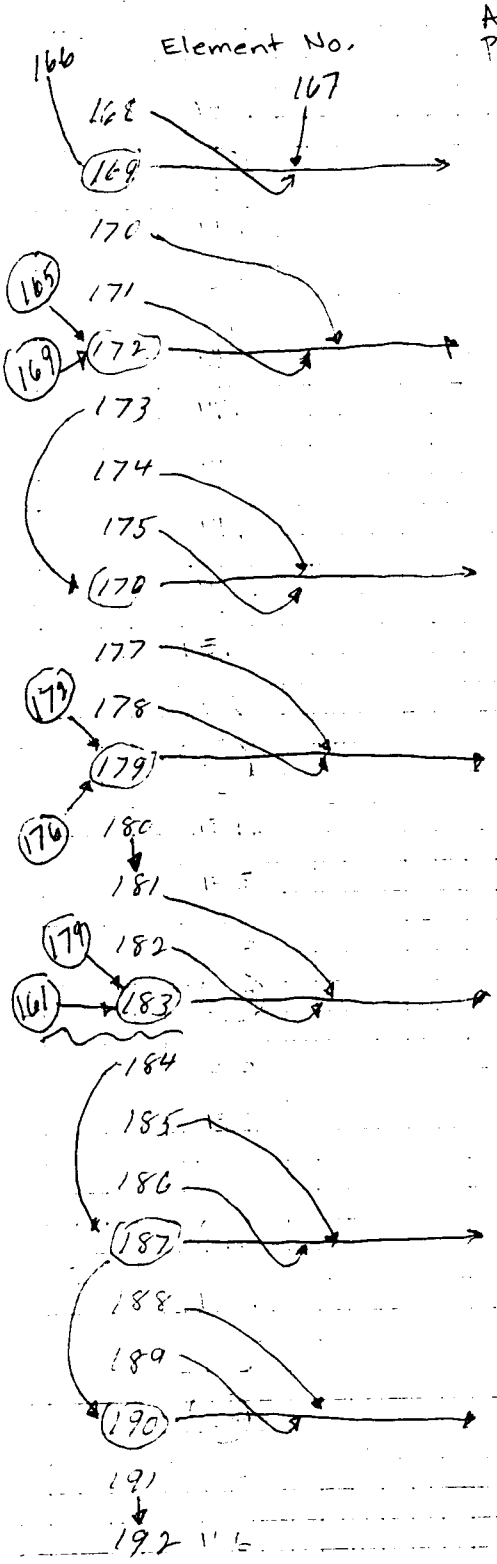
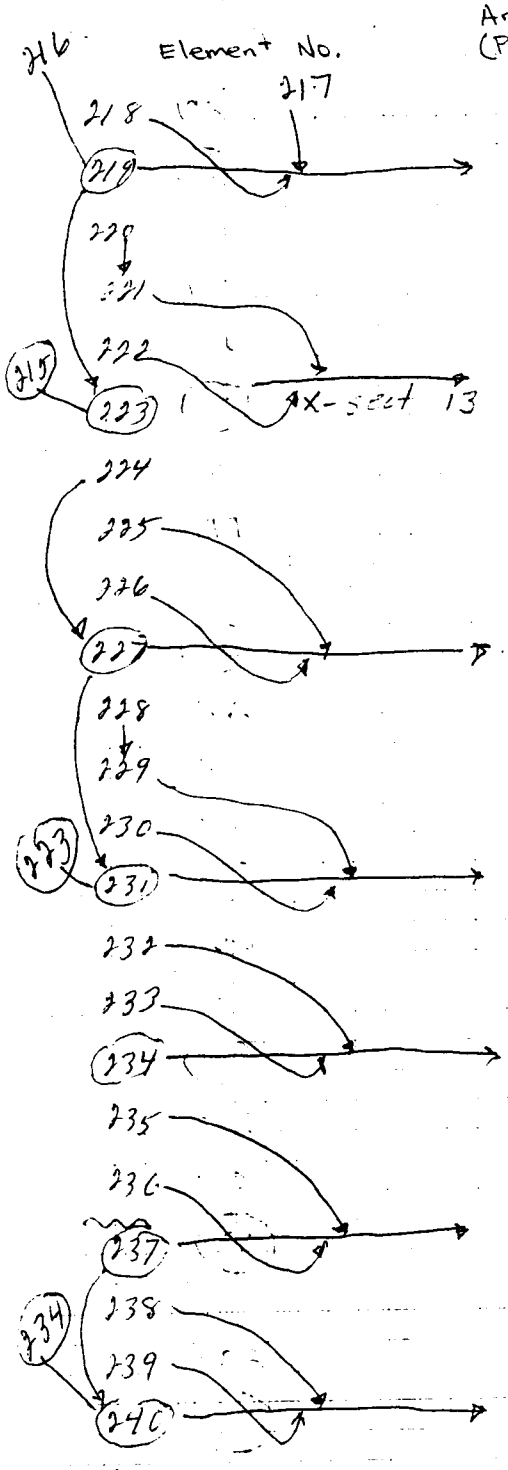


Area Plan. Units	Length (m)	Δh (m)
18	205	50
	350	55
37	150	32
52	140	50
	600	38
13	200	60
25	150	30
21	130	20
	440	40
14	200	30
26	180	20
	410	24
128	370	170
07	320	50
34	210	15
	340	10
14	150	30
21	100	25
20	100	35
	230	30
19	150	0
47	230	[illegible]
	570	55
53	350	[illegible]
58	340	60

DAW

Element No.	Area Flan. Units	Length (m)	Δh (m)
190			
193	28	250	20
192			
194		260	9
183			
195	20	200	60
196	66	450	95
197	30	400	100
198		350	65
199	12	100	20
200	59	450	115
201	20	200	70
202		230	50
203	128	900	160
204	36	320	70
205		340	22
198			
206	40	200	48
207	100	350	70
205			
208		370	24
209	25	150	25
210	46	200	33
210		460	22
212	42	350	185
213	49	380	65
194			
214	9	70	7
211			
215		190	6
216	12	180	20
217	46	290	48



Area (Plan. Units)	Length (m)	Δh (m)
27	140	20
	550	70
43	430	185
44	[illegible]	72
7	[illegible]	12
	140	5
24	250	30
12	100	12
13	120	12
	[illegible]	13
37	[illegible]	183
39	430	77
8	60	12
	140	5
43	200	60
35	310	90
	500	78
64	350	90
29	150	40
	300	35
10	100	20
24	150	40
	320	35
105	350	180
181	480	90

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Element No.	Area (Plan. Units)	Length (m)	Δh (m)
243	90	250	70
244 (X-sect 7 & 8)	411	570	21
245	111	400	90
246	26	[illegible]	45
247	36	200	40
248		370	33
249	10	100	25
250	14	150	30
251		170	20
252	53	550	97
253	45	220	40
254 (X sect 6+7)		390	13
255	71	290	155
256	34	250	63
257	20	150	23
258	28	175	43
259		350	46
260	23	160	25
261	21	235	21
262		290	26
263	41	310	138
264	157	380	106
265	179	530	61
266	73	220	23
267 (X-sect 2, 4, 5)		470	21

over

DAW 1/10

321A

Element No.	Area (Plan. units)	Length (m)	Δh (m)
[illegible]	81	450	198
269	72	320	40
270	35	300	35
271		840	90
272	25	260	20
273	7	100	7
274	X-sect 3	200	10
275	83	480	126
276	27	150	23
277	110	440	105
278		480	40
279	27	200	13
280	100	330	70
281		570	43
282	41	255	43
283	33	300	43
284	X-sect 1	200	6

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SOLITARIO CANYON | PLANIMETER DRAINAGE AREAS

Channel Number	Contribution [illegible]	1" A. X 1,369 Km²	From Spreadsheet
41 - Sub L	793	1.085	
	918	1.26	
45	1917	2.14	(2.18)
71	1334 1534 1569		
115	1022 2043 ΔA=1.40	A=3.54 Km²	(3.548)
183	1326 2031 ΔA=1.7 465 929 ΔA=.636	A 5.173 Km²	(5.139)
254	2033 ΔA 2.78	A=8.70	(8.905)
	1961 > 2022 2015 2.77		
284	1332 Δ1.82	A=10.58	(10.72)

Solitario Canyon Geometry Worksheet

DAW 1/12

EL. NO.	AREA PLAN. UNIT	AREA (SQ M)	LENGTH M	WIDTH (M)	DELTA H (M)	SLOPE	ACC AREA m^2
42	51.00	69819.00	180.00	387.88	30.00	0.167	
43	52.00	71188.00	260.00	273.80	85.00	0.327	
44	20.00	27380.00	230.00	119.04	37.00	0.161	
45		0.00	315.00	0.00	15.00	0.048	1253387
46	18.00	24642.00	175.00	140.81	56.00	0.320	
47	46.00	62974.00	200.00	314.87	78.00	0.390	
48	36.00	49284.00	235.00	209.72	86.00	0.366	
49		0.00	465.00	0.00	103.00	0.222	136900
50	13.00	17797.00	155.00	114.82	33.00	0.213	
51	24.00	32856.00	210.00	156.46	75.00	0.357	
52	15.00	20535.00	187.00	109.81	71.00	0.380	
53		0.00	280.00	0.00	85.00	0.304	71188
54	41.00	56129.00	190.00	295.42	80.00	0.421	
55	24.00	32856.00	162.00	202.81	63.00	0.389	
56		0.00	355.00	0.00	38.00	0.107	297073
57	23.00	31487.00	225.00	139.94	47.00	0.209	
58	26.00	35594.00	187.00	190.34	60.00	0.321	
59	33.00	45177.00	140.00	322.69	55.00	0.393	
60		0.00	400.00	0.00	96.00	0.240	112258
61	46.00	62974.00	200.00	314.87	75.00	0.375	
62	32.00	43808.00	130.00	336.98	48.00	0.369	
63		0.00	375.00	0.00	29.00	0.077	516113
64	46.00	62974.00	220.00	286.25	53.00	0.241	
65	53.00	72557.00	180.00	403.09	49.00	0.272	
66		0.00	640.00	0.00	43.00	0.067	651644
67	40.00	54760.00	90.00	608.44	7.00	0.078	
68	72.00	98568.00	162.00	608.44	90.00	0.556	
69	66.00	90354.00	187.00	483.18	38.00	0.203	
70	41.00	56129.00	280.00	200.46	38.00	0.136	
71		0.00	540.00	0.00	23.00	0.043	2036455
72	22.00	30118.00	270.00	111.55	66.00	0.244	
73	30.00	41070.00	125.00	328.56	30.00	0.240	
74	24.00	32856.00	165.00	199.13	45.00	0.273	
75		0.00	570.00	0.00	105.00	0.184	104044
76	17.00	23273.00	212.00	109.78	58.00	0.274	
77	6.00	8214.00	75.00	109.52	30.00	0.400	
78	6.00	8214.00	100.00	82.14	38.00	0.380	
79		0.00	140.00	0.00	30.00	0.214	39701
80	8.00	10952.00	140.00	78.23	48.00	0.343	
81	13.00	17797.00	260.00	68.45	82.00	0.315	
82	7.00	9583.00	110.00	87.12	40.00	0.364	
83		0.00	110.00	0.00	30.00	0.273	38332
84	20.00	27380.00	140.00	195.57	47.00	0.336	
85	24.00	32856.00	137.00	239.82	39.00	0.285	
86		0.00	367.00	0.00	56.00	0.153	98568
87	19.00	26011.00	115.00	226.18	32.00	0.278	

Note: Printout of ENABLE spreadsheet which calculates channel bottom area in m^2.

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DAW 2/11

BW	CHANNEL AREA M^2	SURFACE (LYSIN)
0	0	
0	0	
0	0	
5.189022	1634.542	45
0	0	
0	0	
0	0	
0.566766	263.5462	49
0	0	
0	0	
0	0	
0.294718	82.52113	53
0	0	
0	0	
1.229882	436.6082	56
0	0	
0	0	
0	0	
0.464748	185.8992	60
0	0	
0	0	
.36708	801.2654	63
0	0	
0	0	
2.697806	1726.596	66
0	0	
0	0	
0	0	
0	0	
8.430924	4552.699	71
0	0	
0	0	
0	0	
0.430742	245.523	75
0	0	
0	0	
0	0	
0.164362	23.0107	79
0	0	
0	0	
0	0	
0.158694	17.45639	83
0	0	
0	0	
0.408072	149.7622	86
0	0	

Daus 3/12

88	13.00	17797.00	112.00	158.90	32.00	0.286	
89		0.00	260.00	0.00	20.00	0.077	286121
90	10.00	13690.00	150.00	91.27	35.00	0.233	
91	16.00	21904.00	150.00	146.03	27.00	0.180	
92	37.00	50653.00	150.00	337.69	48.00	0.320	
93		0.00	325.00	0.00	46.00	0.142	86247
94	44.00	60236.00	165.00	365.07	33.00	0.200	
95	41.00	56129.00	135.00	415.77	40.00	0.296	
96		0.00	780.00	0.00	53.00	0.068	488733
97	22.00	30118.00	250.00	120.47	73.00	0.292	
98	29.00	39701.00	150.00	264.67	40.00	0.267	
99	24.00	32856.00	140.00	234.69	53.00	0.379	
100		0.00	285.00	0.00	45.00	0.158	102675
101	17.00	23273.00	240.00	96.97	70.00	0.292	
102	20.00	27380.00	360.00	76.06	100.00	0.278	
103	8.00	10952.00	112.00	97.79	37.00	0.330	
104		0.00	175.00	0.00	40.00	0.229	61605
105	54.00	73926.00	187.00	395.33	61.00	0.326	
106	35.00	47915.00	125.00	383.32	22.00	0.176	
107		0.00	600.00	0.00	50.00	0.083	286121
108	64.00	87616.00	535.00	163.77	87.00	0.163	
109	25.00	34225.00	275.00	124.45	32.00	0.116	
110		0.00	442.00	0.00	37.00	0.084	407962
111	37.00	50653.00	87.00	582.22	12.00	0.138	
112	108.00	147852.00	237.00	623.85	112.00	0.473	
113	117.00	160173.00	270.00	593.23	41.00	0.152	
114	82.00	112258.00	375.00	299.35	40.00	0.107	
115		0.00	687.00	0.00	27.00	0.039	3572473
116	13.00	17797.00	200.00	88.99	50.00	0.250	
117	34.00	46546.00	412.00	112.98	100.00	0.243	
118	25.00	34225.00	160.00	213.91	48.00	0.300	
119		0.00	437.00	0.00	88.00	0.201	98568
120	11.00	15059.00	260.00	57.92	72.00	0.277	
121	25.00	34225.00	290.00	118.02	91.00	0.314	
122	20.00	27380.00	150.00	182.53	36.00	0.240	
123		0.00	362.00	0.00	68.00	0.188	76664
124	54.00	73926.00	160.00	462.04	34.00	0.213	
125	35.00	47915.00	100.00	479.15	17.00	0.170	
126		0.00	624.00	0.00	47.00	0.075	297073
127	12.00	16428.00	187.00	87.85	48.00	0.257	
128	46.00	62974.00	150.00	419.83	33.00	0.220	
129	35.00	47915.00	125.00	383.32	42.00	0.336	
130		0.00	497.00	0.00	87.00	0.175	127317
131	30.00	41070.00	140.00	293.36	22.00	0.157	
132	45.00	61605.00	180.00	342.25	48.00	0.267	
133		0.00	475.00	0.00	40.00	0.084	229992
134	15.00	20535.00	250.00	82.14	25.00	0.100	
135	24.00	32856.00	220.00	149.35	45.00	0.205	
136		0.00	430.00	0.00	25.00	0.058	580456

DAW 4

0	0	
1.184541	307.9806	99
0	0	
0	0	
0	0	
0.357063	116.0453	93
0	0	
0	0	
2.023355	1578.217	96
0	0	
0	0	
0	0	
0.425075	121.1462	100
0	0	
0	0	
0	0	
0.255045	44.63282	104
0	0	
0	0	
1.184541	710.7246	107
0	0	
0	0	
1.688963	746.5215	110
0	0	
0	0	
0	0	
0	0	
14.79004	10160.76	115
0	0	
0	0	
0	0	
0.408072	178.3273	119
0	0	
0	0	
0	0	
0.317389	114.8948	123
0	0	
0	0	
1.229882	767.4465	126
0	0	
0	0	
0	0	
0.527092	261.9649	130
0	0	
0	0	
0.952167	452.2793	133
0	0	
0	0	
2.403088	1033.328	136

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137	24.00	32856.00	250.00	131.42	35.00	0.140	
138	17.00	23273.00	150.00	155.15	25.00	0.167	
139	12.00	16428.00	150.00	109.52	30.00	0.200	
140		0.00	380.00	0.00	40.00	0.105	72557
141	11.00	15059.00	150.00	100.39	20.00	0.133	
142		0.00	150.00	0.00	8.00	0.053	599622
143	21.00	28749.00	90.00	319.43	15.00	0.167	
144	59.00	80771.00	280.00	288.47	120.00	0.429	
145	70.00	95830.00	280.00	342.25	50.00	0.179	
146	60.00	82140.00	450.00	182.53	50.00	0.111	
147		0.00	340.00	0.00	11.00	0.032	4528035
148	44.00	60236.00	330.00	182.53	90.00	0.273	
149	61.00	83509.00	230.00	363.08	48.00	0.209	
150	53.00	72557.00	190.00	381.88	60.00	0.316	
151		0.00	500.00	0.00	60.00	0.120	216302
152	29.00	39701.00	175.00	226.86	43.00	0.246	
153	30.00	41070.00	200.00	205.35	50.00	0.250	
154		0.00	450.00	0.00	27.00	0.060	297073
155	20.00	27380.00	160.00	171.13	20.00	0.125	
156	28.00	38332.00	260.00	147.43	25.00	0.096	
157		0.00	500.00	0.00	30.00	0.060	362785
158	56.00	76664.00	350.00	219.04	150.00	0.429	
159	36.00	49284.00	340.00	144.95	48.00	0.141	
160	23.00	31487.00	250.00	125.95	12.00	0.048	
161		0.00	170.00	0.00	8.00	0.047	5048255
162	10.00	13690.00	140.00	97.79	40.00	0.286	
163	60.00	82140.00	300.00	273.80	85.00	0.283	
164	88.00	120472.00	400.00	301.18	100.00	0.250	
165		0.00	520.00	0.00	100.00	0.192	216302
166	56.00	76664.00	600.00	127.77	100.00	0.167	
167	26.00	35594.00	120.00	296.62	40.00	0.333	
168	18.00	24642.00	200.00	123.21	50.00	0.250	
169		0.00	350.00	0.00	63.00	0.180	136900
170	37.00	50653.00	150.00	337.69	32.00	0.213	
171	52.00	71188.00	140.00	508.49	50.00	0.357	
172		0.00	600.00	0.00	38.00	0.063	475043
173	13.00	17797.00	200.00	88.99	60.00	0.300	
174	25.00	34225.00	150.00	228.17	30.00	0.200	
175	21.00	28749.00	130.00	221.15	20.00	0.154	
176		0.00	440.00	0.00	40.00	0.091	80771
177	14.00	19166.00	200.00	95.83	30.00	0.150	
178	26.00	35594.00	180.00	197.74	20.00	0.111	
179		0.00	410.00	0.00	24.00	0.059	610574
180	128.00	175232.00	370.00	473.60	170.00	0.459	
181	97.00	132793.00	320.00	414.98	50.00	0.156	
182	34.00	46546.00	210.00	221.65	15.00	0.071	
183		0.00	340.00	0.00	10.00	0.029	6013400
184	14.00	19166.00	150.00	127.77	30.00	0.200	
185	21.00	28749.00	100.00	287.49	25.00	0.250	

Daw 6/19

0	0	
0	0	
0	0	
0.300386	114.1467	140
0	0	
2.482435	372.3653	142
0	0	
0	0	
0	0	
0	0	
18.74606	6373.662	147
0	0	
0	0	
0	0	
0.89549	447.7451	151
0	0	
0	0	
1.229882	553.447	154
0	0	
0	0	
1.50193	750.965	157
0	0	
0	0	
0	0	
.89978	3552.962	161
0	0	
0	0	
0	0	
0.89549	465.6549	165
0	0	
0	0	
0	0	
0.566766	198.3681	169
0	0	
0	0	
1.966678	1180.007	172
0	0	
0	0	
0	0	
0.334392	147.1325	176
0	0	
0	0	
2.527776	1036.388	179
0	0	
0	0	
0	0	
24.89548	8464.462	183
0	0	
0	0	

186	20.00	27380.00	100.00	273.80	35.00	0.350	
187		0.00	330.00	0.00	30.00	0.091	75295
188	19.00	26011.00	150.00	173.41	10.00	0.067	
189	47.00	64343.00	230.00	279.75	40.00	0.174	
190		0.00	520.00	0.00	33.00	0.063	165649
191	53.00	72557.00	350.00	207.31	180.00	0.514	
192	58.00	79402.00	340.00	233.54	60.00	0.176	
193	28.00	38332.00	250.00	153.33	20.00	0.080	
194		0.00	260.00	0.00	9.00	0.035	6369340
195	20.00	27380.00	200.00	136.90	60.00	0.300	
196	66.00	90354.00	450.00	200.79	105.00	0.233	
197	30.00	41070.00	400.00	102.68	100.00	0.250	
198		0.00	350.00	0.00	65.00	0.186	158804
199	12.00	16428.00	120.00	136.90	20.00	0.167	
200	59.00	80771.00	450.00	179.49	115.00	0.256	
201	20.00	27380.00	200.00	136.90	70.00	0.350	
202		0.00	230.00	0.00	50.00	0.217	124579
203	128.00	175232.00	800.00	219.04	160.00	0.200	
204	36.00	49284.00	220.00	224.02	90.00	0.409	
205		0.00	340.00	0.00	22.00	0.065	507899
206	40.00	54760.00	200.00	273.80	48.00	0.240	
207	100.00	136900.00	350.00	391.14	90.00	0.257	
208		0.00	370.00	0.00	24.00	0.065	699559
209	25.00	34225.00	150.00	228.17	25.00	0.167	
210	46.00	62974.00	200.00	314.87	33.00	0.165	
211		0.00	460.00	0.00	22.00	0.048	796758
212	42.00	57498.00	380.00	151.31	185.00	0.487	
213	49.00	67081.00	380.00	176.53	65.00	0.171	
214	9.00	12321.00	90.00	136.90	8.00	0.089	
215		0.00	190.00	0.00	6.00	0.032	7302998
216	12.00	16428.00	180.00	91.27	40.00	0.222	
217	46.00	62974.00	290.00	217.15	48.00	0.166	
218	27.00	36963.00	140.00	264.02	20.00	0.143	
219		0.00	550.00	0.00	70.00	0.127	116365
220	43.00	58867.00	400.00	147.17	185.00	0.463	
221	44.00	60236.00	400.00	150.59	72.00	0.180	
222	7.00	9583.00	90.00	106.48	12.00	0.133	
223		0.00	140.00	0.00	5.00	0.036	7548049
224	24.00	32856.00	250.00	131.42	30.00	0.120	
225	12.00	16428.00	130.00	126.37	12.00	0.092	
226	13.00	17797.00	120.00	148.31	12.00	0.100	
227		0.00	220.00	0.00	13.00	0.059	67081
228	37.00	50653.00	380.00	133.30	183.00	0.482	
229	39.00	53391.00	430.00	124.17	77.00	0.179	
230	8.00	10952.00	60.00	182.53	12.00	0.200	
231		0.00	140.00	0.00	5.00	0.036	7730126
232	43.00	58867.00	200.00	294.34	60.00	0.300	
233	35.00	47915.00	310.00	154.56	90.00	0.290	
234		0.00	500.00	0.00	78.00	0.156	106782

8
17

DAW

0	0	
0.311721	102.868	197
0	0	
0	0	
0.685787	356.6092	190
0	0	
0	0	
0	0	
26.36907	6855.958	194
0	0	
0	0	
0	0	
0.657449	230.107	198
0	0	
0	0	
0	0	
0.515757	118.6241	202
0	0	
0	0	
2.102702	714.9186	205
0	0	
0	0	
2.896174	1071.584	208
0	0	
0	0	
3.298578	1517.346	211
0	0	
0	0	
0	0	
30.23441	5744.538	215
0	0	
0	0	
0	0	
0.481751	264.9631	219
0	0	
0	0	
0	0	
31.24892	4374.849	223
0	0	
0	0	
0	0	
0.277715	61.09737	227
0	0	
0	0	
0	0	
32.00272	4480.381	231
0	0	
0	0	
0.442077	221.0387	234

235	64.00	87616.00	350.00	250.33	90.00	0.257	
236	29.00	39701.00	150.00	264.67	40.00	0.267	
237		0.00	300.00	0.00	65.00	0.217	127317
238	10.00	13690.00	100.00	136.90	20.00	0.200	
239	24.00	32856.00	150.00	219.04	40.00	0.267	
240		0.00	320.00	0.00	35.00	0.109	280645
241	105.00	143745.00	350.00	410.70	180.00	0.514	
242	181.00	247789.00	480.00	516.23	90.00	0.188	
243	90.00	123210.00	250.00	492.84	70.00	0.280	
244		0.00	570.00	0.00	21.00	0.037	8525515
245	111.00	151959.00	400.00	379.90	90.00	0.225	
246	26.00	35594.00	240.00	148.31	45.00	0.188	
247	36.00	49284.00	200.00	246.42	60.00	0.300	
248		0.00	370.00	0.00	33.00	0.089	236837
249	10.00	13690.00	100.00	136.90	25.00	0.250	
250	14.00	19166.00	150.00	127.77	30.00	0.200	
251		0.00	170.00	0.00	20.00	0.118	269693
252	53.00	72557.00	550.00	131.92	97.00	0.176	
253	45.00	61605.00	220.00	280.02	40.00	0.182	
254		0.00	390.00	0.00	13.00	0.033	8929370
255	71.00	97199.00	290.00	335.17	155.00	0.534	
256	34.00	46546.00	250.00	186.18	63.00	0.252	
257	20.00	27380.00	150.00	182.53	23.00	0.153	
258	28.00	38332.00	175.00	219.04	43.00	0.246	
259		0.00	350.00	0.00	46.00	0.131	209457
260	23.00	31487.00	160.00	196.79	25.00	0.156	
261	21.00	28749.00	235.00	122.34	21.00	0.089	
262		0.00	290.00	0.00	26.00	0.090	269693
263	81.00	110889.00	310.00	357.71	138.00	0.445	
264	157.00	214933.00	380.00	565.61	108.00	0.284	
265	179.00	245051.00	530.00	462.36	61.00	0.115	
266	73.00	99937.00	220.00	454.26	23.00	0.105	
267		0.00	470.00	0.00	21.00	0.045	9869873
268	81.00	110889.00	450.00	246.42	198.00	0.440	
269	72.00	98568.00	320.00	308.03	40.00	0.125	
270	35.00	47915.00	300.00	159.72	35.00	0.117	
271		0.00	840.00	0.00	90.00	0.107	257372
272	25.00	34225.00	260.00	131.63	20.00	0.077	
273	7.00	9583.00	100.00	95.83	7.00	0.070	
274		0.00	200.00	0.00	10.00	0.050	10171053
275	83.00	113627.00	480.00	236.72	126.00	0.263	
276	27.00	36963.00	150.00	246.42	23.00	0.153	
277	110.00	150590.00	440.00	342.25	105.00	0.239	
278		0.00	480.00	0.00	40.00	0.083	301180
279	27.00	36963.00	200.00	184.82	13.00	0.065	
280	100.00	136900.00	330.00	414.85	70.00	0.212	
281		0.00	570.00	0.00	43.00	0.075	475043
282	41.00	56129.00	255.00	220.11	43.00	0.169	
283	33.00	45177.00	300.00	150.59	43.00	0.143	

DAW

10/15

0	0	
0	0	
0.527092	158.1277	237
0	0	
0	0	
1.16187	371.7985	240
0	0	
0	0	
0	0	
35.29563	20118.51	244
0	0	
0	0	
0	0	
0.980505	362.7869	248
0	0	
0	0	
1.116529	189.8099	251
0	0	
0	0	
36.96759	14417.36	254
0	0	
0	0	
0	0	
0	0	
[illegible]367152	303.5032	259
0	0	
0	0	
1.116529	323.7934	262
0	0	
0	0	
0	0	
0	0	
40.86127	19204.8	267
0	0	
0	0	
0	0	
1.06552	895.0369	271
0	0	
0	0	
42.10816	8421.632	274
0	0	
0	0	
0	0	
1.246885	598.5049	278
0	0	
0	0	
1.966678	1121.006	281
0	0	
0	0	

DAW

11/12

284	0.00	200.00	0.00	6.00	0.030	10747402

334

Daw 12

44.49424 8898.849

Procedure

Use files SOL75, SOL77, SOL115, [illegible], SOL254 and SOL284.

1. [illegible] ✓
2. Create an unsteady system ✓
3. Test with constant inflow [illegible] ✓
4. Compare steady state outflow rate with inflow rate ✓
5. Compare [illegible] areas with angular areas ✓
6. Plot [illegible] versus time, T_0 = storage / [illegible] ✓
7. Plot T_0 versus area
8. When [illegible] is verified copy to next larger [illegible] system ✓
9. Change Mannings n on channels (first) from n = 0.0165 to 0.0511 floodplain 0.0611
10. Change Mannings n on [illegible] from 0.101 to 0.151 *

→ Ref: Simons, L. & Assoc. Table 6.1 Natural Channels
Some weeds, light brush, 0.04 – 0.05
increase by 0.01 to 0.02 for irregular section

* This is within the range given by Engman for range 0.01 – 0.32. The value given for the Mojave desert (Welte) cited by Singh is 0.09. Recommended n = 0.15 " from Welte

From Output for SOLS1002.OUT Area = 1,235,033.
or 1,234,271

R.F. rate = 50.8 mm/hr = 2"/hr.
Watershed Area ~~119.64~~ ha 122.9 ✓ with spreadsheet 122.935
Storage = ~~8.57~~ mm 8.61 T_0 = 10.4 min.
Channel 45 0.4 m depth (max) same with Δt adjusted
Max. R.O. Rate 50.78907
50.78728 with Δt adjusted

SOL71.PAR

SOL71IMP.PAR RF = 50.8 mm
Storage = 9.997 mm
T_0 = 11.81 min

Watershed area = 218.56 ha.
spreadsheet " = 218.08

0.5 m was o.k. for chan depth.
steady state R.O. rate = 50.7898 = 30.76 m^3/sec

SOL115.PAR

SOL115IM.PAR RF = 50.8mm
Storage = 11.55 mm T_0 = 13.64 min
Watershed area = 354.81 ha ✓
Spreadsheet area = 354.84 ha ✓
Steady state R.O. rate = 50.790 = 50.06 m^3/sec ✓

0.5 m still o.k. for channel 115

SOL183.PAR

147 o.k. .5
161 o.k. .5

SOL183IM.PAR RF = 50.8mm
STORAGE = 13.05 mm T_0 = 15.41
Watershed Area = 598.90 ha
Spreadsheet Area = 598.94
Steady State R.O. rate = 50.8 mm/hr.

183 could go to 2.6

10 180 not connected / ✓ corrected
Peak Flow = 84.49 m^3/sec @ 51 min = 50.8 mm/hr ✓

883.22
7.24
890.46

SOL 254.PAR

SOL 254IM.PAR RE = 50.8 mm/hr. ~~17.13~~ 15.84 mm

Watershed area = 890.46 ha storage = ~~15.79~~ mm ~~OK~~

Spreadsheet area = 890.53 ha T_0 = ~~18.64~~ min 18.70

252

50 m?

191 uncorrected ✓ corrected

1.5	242	-1.31%	181	-1.8% -.9 -1.46 (with adjusted step
-1	.8229	-1.60%	159	-1.9% -.95 -1.54 size, still has 8% error)
-1	.81221	-1.62%	145	-1.7% -.86
-1	77213	-1.53%	144	-1.04% -.51
-1	78192	-1.56%		

SOL 284.PAR Q = 44.91 mm/hr

SOL 284IM.PAR R.E. = 50.8 mm/hr STORAGE = 17.62 mm T_0 = ~~26.66~~ 20.22 min

Watershed area = 1,072 ✓

Spreadsheet area = 1,072.34 ✓ error < 1% 8/22/96 !!

Outflow Rate = 50.79 mm/hr. 8/22/96 Looks good!

Using Courant condition doesn't improve accuracy of planes with shocks – in fact error is worse than with $\Delta t = 0.5$ min.

Injected hydrograph from 254, program ran with 2% error.

256	-2.03%	channel 278 is OK	0.07%
264	-1.24%	281 " "	0.65%
265	-1.92%		

44.91 m³/s

Outflow = 69.48 m³/sec.

$$\frac{69.48}{10,723,372} \times 60 \times 60 = 45.54 \text{ mm/hr.}$$

→ Check connections between 283 + 254 ←

Is it possible that between 183 + 254 some files are being altered?

- Set intermediate printout at

  194, 215, 223, 231, 244 — DAW

  RUN SOL254JM.PAR Δt = 1 min

  NP = 2 for above

	Q (mm/hr)	Contributing Area
194	50.79	OK
215	50.79	OK
223	50.79	OK
231	50.79	OK
244	50.79	OK
254	44.91	OK
267	50.79	OK 8/22/96 !

Conclusion

- Files are being altered between 244 + 254
- There cannot be a maximum of 4 hydrographs stored between 244 + 254
- So run was — 1 min Δt

Decisions

- Call Carl Unknown - see what he might have this problem + units in NO function fixed
- If he need work OK.

  If not call Stuart + Gordon [illegible]

Check hydrographs with different Mannings n for overland flow and channel flow.

339

SOLS100.OUT n changed: Plane n = 0.151
Channel n = 0.0511
0.0105 →
0.0330 → Plane n = 0.0211

SOL45MR.OUT STOR = 13.73 T_0 = 16.21 min
Q = 50.786

SOL71MR.OUT STOR = 16.22 T_0 = 18.9 min
Q = 50.788 mm/hr
error < 1%

SOL115M.OUT STOR = 18.54 T_0 = 21.9 min
Q = 50.788 mm/hr.
error < 1% — Need longer R.F. DUR 60min

SOL183M.OUT STOR = 20.95 T_0 = 24.74 min
Q = 50.789

SOL254M.OUT STOR = 26.27 mm T_0 = 30.32
Q = 50.79

SOL284M.OUT
STOR = 28.27 T_0 = 33.39
Q = 50.79

Plot hydrographs for ~~peak~~ equal. cases at 284.

S284MM2.DAT
S284M.DAT

SOLITARIO | STORM SIMULATION 1st 50 yr SCHEME | DATE 8/14/96 | 1/3

340

STORM #		RUNOFF (mm)	Rain fall (mm)	Duration (min)	FILE
1	X	.025	25.9	228	PJULI.PRE
2		.46	17	113	PDEC2.
3		~~7.33~~ 7.41	36.8	93	PMAR3.
* 4.	9.97	14.89	20.	47 (14)	PAUG4.
5.	X	0.045	12.95	126.8 (120)	PJAN5.
6.	Y	0.19	13.5	93	PFEB6.
7.		10.36	21.1	47.5	PAUG7.
8.	X	0.005	12.95	148	PAUG8.
9.	X	0.0827	16.51	141	PNOV9.
10		6.10	18.5	34	PJAN10
11		8.44	25.7	69	PJAN11
12		0.25	14.22	180	PJUL12
13		0.375	15.7	218 (54)	PAUG13
14		13.32	20.6	28	PAUG14
* 15	5.39	10.57	18.29	77	PNOV15
16		7.52	22.5	95	PMAR16
17		4.89	18.6	106	PAUG17
18		1.89	24.6	99	PNOV18
19		3.64	13.0	28	PNOV19
20		7.76	22.1	45	PDEC20
21	X	.10	13.2	105	PMAY21
22	X	.22	14.0	197	PNOV22
23	X	.05	22.9	480	PJUL23
24		3.00	13.5	30	PNOV24
25		2.87	22.6	122	PNOV25
26	X	.02	20.6	392	PNOV26
* 27	5.69	10.5	14.5	33	PAPR27
28		9.44	29.5	83	PAPR28
29	X	0.021	17.8	202	PNOV29
30		1.38	18.0	90	PMAY30

0.01" = 0.25mm

Note: Parameter file is OTEST.PAR USE KIV.FIL

SOLSC-1B.

* Indicates poor storm disaggregation

FILE: CFES.PSD D:\PAPER

X – Under 0.01" runoff (28 events)

Solitario Canyon

Storm Simulation
1st 50 yr. Sequence

DAW

Storm #		Runoff (mm)	Rainfall (mm)	Duration (min)	File
31		3.06	14.2	89	PNOV 31
32		3.64	20.8	67	PJan 32
33		0.943	21.8	149	PJan 33
34	X	0.085	20.8	313	PAug 34
35		5.81	25.4	157	PJan 35
36		4.91	15.9	103	PJan 36
37		0.251	17.7	164	PAug 37
38	X	0.000	14.7	480	PJan 38
39		0.268	15.7	146	PNOV 39
40		1.63	17.2	89	PNOV 40
41	X	0.009	12.9	363	PNOV 41
* 42	3.14	8.06	13.2	29	PJUL 42
43		6.34	15.2	12	PAUG 43
44	X	0.049	13.2	184	PAUG 44
45	X	0.033	14.2	227	PAUG 45
46		1.92	13.2	24	PNOV 46
47		0.508	20.3	194	PNOV 47
48		0.672	15.5	120	PNOV 48
49		2.36	14.5	55	PNOV 49
50		1.97	14.2	73	PFeb 50
51		1.25	16.8	65	PAUG 51
52		1.09	20.8	186	PSep 52
53		0.725	15.3	62	PFeb 53
54		2.94	15.1	56	PJUN 54
55	X	0.016	18.8	480	PJUN 55
56		3.58	14.6	54	PFeb 56
57		2.58	16.5	105	PJUL 57
58		17.1	38.6	218	PSep 58
59		0.011	17.9	350	PNOV 59
60		6.58	13.7	18	PFeb 60
61		6.11	18.5	52	PSep 61
62	X	0.019	13.5	223	PNOV 62
63		4.02	29.0	112	PJan 63
64	X	0.068	15.7	109	PNOV 64
65		2.46	21.2	72	PNOV 65
66		1.15	18.0	87	PFeb 66
67		6.28	13.7	24	PAUG 67
68	X	0.065	19.3	366	PFeb 68
69		6.29	14.7	20	PNOV 69
70		12.1	22.1	18	PNOV 70
71		1.66	13.2	47	PAPR 71
72	X	0.001	14.2	379	PAPR 72

need [illegible]

Storm #		Runoff (mm)	Rainfall (mm)	Duration (min)	File
73	x	0.0002	18.8	418	PFeb73
74		4.57	18.4	50	PAug74
75	x	0.071	13.5	110	PAug75
76		4.75	15.5	46	PSep76
77	x	0.160	15.0	83	PNov77
78		0.700	17.6	79	PNov78
79		0.822	21.3	100	PFeb79
80		1.18	15.1	48	PNov80
81		0.628	14.5	57	PDec81
82	x	0.006	16.5	276	PFeb82
83		2.32	18.0	64	POct83
84	x	0.006	19.2	382	PNov84
85		9.24	15.2	22	PNov85
86		5.10	16.8	36	PNov86
87		0.358	15.5	82	PFeb87
88		2.24	22.6	102	PAug88
** 89	4.74	10.1	16.3	28	PAug89
90		0.669	16.8	57	PAug90
91		6.02	14.1	12	POct91
** 92	13.36	15.1	26.4	44	PNov92
93	x	0.004	15.2	180	PNov93
94	x	0.059	13.7	153	PNov94
95		0.678	15.5	95	PDec95
** 96	7.44	13.4	20.3	48	PAug96
97		8.53	19.8	36	PAug97
98		10.3	28.4	103	PSep98
99	x	0.054	13.0	159	PFeb99
Mean		3.43 mm	17.98	178.9 min	
Std. dev.		4.21	4.89	113.9	
Max.		17.1	36.8	480	
Min.		0	12.9	12	
Median		1.38 mm	~~28.6~~	93	
Skewness		1.78	1.71	1.55	
Kurtosis			3.78	1.72	

** double ✓ marked Door storm

This compares with 106.6 min for storms at Walnut Gulch or 147.5 min for 30 largest storms at Walnut Gulch (Annual Series) Partial Dur. see Woolhiser + Eamoponly (1986) (July - Aug).

STAT. summary D:\PSIPLOT\SOL50_1.TXT

Av. R.O. per year = 6.79 mm (0.27 in)

$\frac{55.6}{307} = 0.18$

1. Create a file with average length of overland flow and average slope. (176 planes)

$L_{ave} = 232.57$ m $\quad S_{AVG} = 0.244$ — DAW

56-3.58

FILE: PTESTAVG.PAR

2. Search storm files for event close to mean runoff (3.43 mm)

Storm # 56 file PFEB56.PRE 3.58 mm

Find storm with depth (R.O.) = mean + 1 std dev. (3.43 + 4.21) = 7.64 mm

Storm # 16 file: PMAR16.PRE 7.52 mm

storm # 20 file: PDEC20.PRE 7.76 mm

16. 7.52
20 7.76

	R.O. High n PTESTAVG.PAR	PLOT	PTEST high N	PTESTA n=0.101
PFEB56.PRE	0.548 mm	3.58 mm	1.99 mm	2.17 mm
PMAR16.PRE	3.94 mm	7.52 mm	6.30 mm	6.61 mm
PDEC20.PRE	2.90 mm	7.76 mm	4.45 mm	4.71 mm
PAUG67.PRE	.98 mm (CV=0)	6.28 mm		

	PTESTA
PFEB56.PRE	1.36
PMAR16.PRE	5.49
PDEC20.PRE	4.03

Note: Plot is from summary sheet. Some calculations were made with a lower n (.101) and a lower K_s (12.2). Some were made with earlier versions of MINEROSC which had a bug in the infiltration routine

all above runs were made with SAT = .251

SOLITARIO | COMPARISON OF INFILTRATION WITH + W/O WO=YES | DAW 8/27/96

344

A parameter file SOLW284.PAR has been created with WO=YES. It was tested by comparing output with a file without WO=YES. Less infiltration occurred when WO=YES, which is consistent with the model.

WE WILL TEST THIS COMPONENT WITH 2 LEVELS OF MANNING'S N.

1.) $n_p = 0.101$, $n_c = 0.0165$, $n_o = 0.0330$

2) $n_p = 0.151$, $n_c = 0.0511$, $n_o = 0.0611$

Rainfall Files: SOL28458.OUT

PSEPT58.PRE $n_p = 0.101$, $n_c = 0.0165$, $n_o = 0.0330$
$CV = 0.8$

Rainfall = 38.6 mm
Plant F = 28.85 mm
Channel F = 1.9 mm
Storage = 0.01 mm
Outflow = 7.77 mm

Plot R.O. = 17.1 mm

DAW

SOLITARIO CANYON	PEAK FLOW RATE CHECK	DAW 2/22/96	1

We can check the reasonableness of results generated by comparing simulated peak rate statistics with

a) Peak stream-flow data from crest-stage sites in vicinity of the site as shown in Table 3-2 p 3-10 of the Site Characterization plan.

b) Flood statistics for the region — DAW

a) Crest-stage sites

Set output at subwatersheds nearest to the following

Site No.	Drainage Area (Km²)	Discharge m³/s	Discharge mm/hr	Solitario Channel #	Solitario Channel Area (Km²)
1 (64-81)	3.83	3.96	3.45	115	3.55
4 (67-81)	2.21	1.73	6.23	71	2.18
5 (68-81)	2.47	0.55	1.98		
8 (67-80)	12.25	5.45	1.62	254	16.72
9 (64-79)	1.37	3.10	11.16	45	1.23
11 (65-80)	8.86	2.10	7.56	254	8.90

n=0.101 Solitario Channel — PSEPT58 QP mm/hr

45	23.39
71 (x8 ha)	13.7 m³/sec
115	20.35
254	16.1
284	15.3

Plane Infil = 28.85 mm
Channel Infil = 1.946 mm
RO = 7.77 mm

SOLW284.PAR n=0.101

PLANE F= 29.59
Channel F= 2.05 mm
RO = 6.90
45 – 19.00
71 – 17.99

CV = 0.8

SOL284W58.00T

n=0.15

45	18.98 mm/hr.
71	10.87 m³/sec (17.97 mm/hr)
115	15.81 mm/hr.
254	11.16
254	9.8

Rain = 38.6
Plane Infiltration = 29.59 mm
Channel " = 2.82 mm
R.O = 6.14 mm

Not a big difference for this storm! insig dif in peak rates

S284.55.00T

SOLITARY CANYON | SUL 50-1. Runoff Tests | 8/27/96 | 2/

346

	PTESTAVG SAT = .33	spacing = .5 m PTESTAVG SAT = .251	relief = 10 spacing = 1 SAT = .251
PFEB56. PRE	R.O. = .70 mm	.55 mm	.35 mm
PMAR16. PRE	PTESTAVG SAT = .37 R.O. = 4.68 mm	3.93 mm	2.98 mm
PAUG67. PRE	PTESTAVG SAT = .16 R.O. = .81 mm	.98 mm	.63 mm
PDEC20. PRE		2.90 mm	1.98 mm

DAW

	relief = 0 spacing = 1	relief = 30mm spacing = 1
PFeb 56. PRE	.15 mm	0.74/3.27
PMAR16. PRE	2.58 mm	4.41/13.76
PAUG 67. PRE	.23 mm	0.946/3.37 (47% runoff)
PDEC 20. PRE	.47 mm	3.42/10.89

1. First runs w/o WO = YES — DAW

Storm = PDEC2.PRE SOL 244.OUT USE KIN. FIL

Some runoff from planes.

Rainfall 16.96 mm
Inf. 16.93 mm ← for both planes & channels
storage 0.01713 mm

Out file shows inflow in m^3, infil in m^3, ro. in m^3. In this case there was a small amount of runoff from the planes. Every thing that ran off infiltrated into the channels.

Note: This storm had only 0.46 mm of r.o. from the plot. G = 80, K_s = 12.

STORM PAUG14.PRE 20.6 mm in 28 min.

Outflow = 2.4 mm storage = 0.29 mm

Runoff for plot was 13.32 mm.

Need to increase hydrograph time 60 to 90 min

With D = 90 min Outflow = 2.49 mm (2% error)
storage = 0.056
Infil = 17.68 mm

Rainfall = 174896 m^3 = 20.58 mm

Channel	mm/infil		Channel	mm		Channel	infil/mm	
244	0.116	1.4116	183	0.118	.8506	123	0.0029	
240	0.0069	.0143	179	0.016	-.0506	119	0.0039	
237	0.0031		176	0.0038		115	0.1389	-0.455
234	0.0046		172	0.0190		110	0.0123	-0.03
231	0.0572	1.251	169	0.0036		107	0.0134	
227	0.0100		165	0.0082		104	0.0014	
223	0.052	1.2137	161	0.0486	-.6880	100	0.0029	
219	0.03	- Meas. on fan	157	0.0135	-.0330	96	0.0194	-.03
215	0.1106	.1318	154	0.0106		93	0.0030	
211	0.022	.0503	151	0.0089		89	0.0060	
208	0.016		147	0.0890	-.0064	86	0.0043	
205	0.0108		142	0.0064	-.0334	83	0.0006	
202	0.0032		140	0.0034		79	0.0009	
198	0.0043		136	0.0174		75	0.0054	
194	0.0966	.2649	133	0.0091		71	0.0688	-.246
190	0.0081	.0117	130	0.0052		66	0.0269	-0.059
187	0.0036		126	0.0141		63	0.0131	

Storm PAUG14.PRE (Cont)

DAW

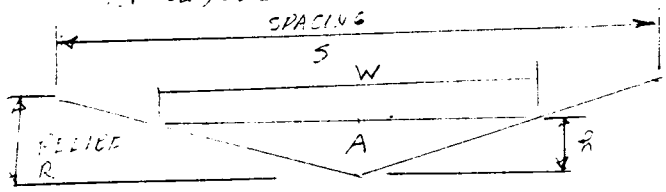
Channel	mm
60	0.0041
56	0.0079
53	0.0021
49	0.0056
45	0.026
40	0.0166 - .0239
37	0.0082
34	0.0049
31	0.0030
28	0.0012
24	0.0180 - .0531
20	0.0128
16	0.0085
13	0.0080
10	0.0057
7	0.0039
4	0.0018

Channel infil accumulated @ 244 = 1.412 mm
= 56.6 % of [illegible]

This run was done with older KINEROS 2 Program
Note that couldn't run S 284 because compound channels were still causing difficulties.

Objective: To determine an appropriate value of RELIEF and SPACING for single planes and for cascades.

DAW



$\bar{h} = \frac{A}{S}$

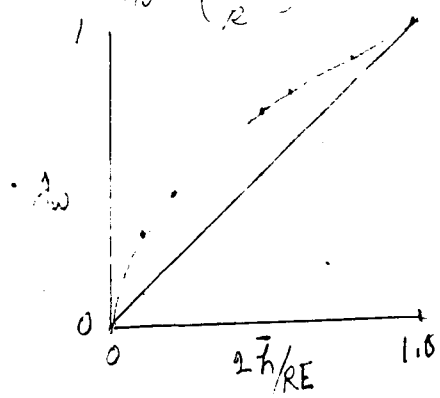
Area $A = h\frac{W}{2}$ Sol. Area settling, $A_w = W/S$

$A = h\frac{hS}{2R} = \frac{h^2 S}{2R}$

$\bar{h} = \frac{h^2}{2R}$ $A_w = \frac{W}{S} = \frac{h}{h}\frac{S}{S} = \frac{h^2}{R}$

$A_w = \frac{h}{R}$ $h = (2R\bar{h})^{1/2}$

$A_w = \left(\frac{2\bar{h}}{R}\right)^{1/2}$ when $h = R$ $\bar{h} = R/2$

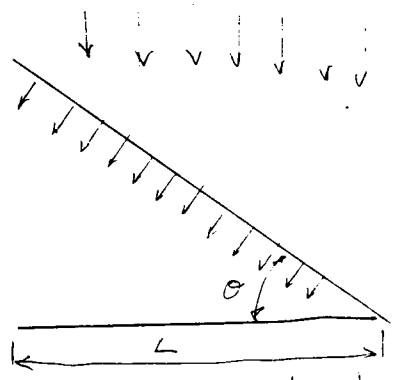


The main question is: what is an appropriate level of A_w or $(\bar{h}/R)$ or a "plane" at least L

350

The parameter, G is related to capillary forces and logically should be adjusted for very steep slopes

DAW



Slope = Tan θ

When the soil is unsaturated, the capillary forces are normal to the soil surface. The effective area is $L/\cos\theta$

For example: If Slope = 0.45

Arc Tan 0.45 = 24.2°

cos 24.2° = 0.91

$$L_e = \frac{L}{\cos\theta} = \frac{L}{\cos(\text{Arc Tan } S_o)}$$

$$\frac{L_e}{L} = \frac{1}{\cos(\text{Arc Tan } S_o)}$$

S_o	θ	L_e/L	G
.10	1	1.005	
.20		1.019	82
.30		1.04	83
.40		1.08	86
.50		1.12	90
.60		1.17	93

Worksheet - Volumes of Infiltration into Channels for 7 storms from 1st 50 yr. simulation

EL.	NO.	LENGTH	BW	AREA M^2	F VOL(m3) STORM -16	-20	-67	-56	-58	-92
	2									
	3									
	-4	270	0.3	81	17.3	14.9	10.8	[illegible]	[illegible]	[illegible]
	5			0						
	6			0						
	-7	340	0.6	204	26.2	33.5	23.1	[illegible]	[illegible]	
	8			0						
	9			0						
	-10	312	1	312	46.1	42.7	28.1	25.3	[illegible]	[illegible]
	11			0						
	12			0						
	-13	362	1.5	543	68.9	63.6	42.3	37.7	[illegible]	[illegible]
	14			0						
	15			0						
	-16	300	2	600	73.1	66.0	44.4	33.8	[illegible]	[illegible]
	17			0						
	18			0						
	19			0						
	-20	320	3	960	94.5	84.5	56.4	73.6	[illegible]	[illegible]
	21			0						
	22			0						
	23			0						
	-24	355	4	1420	125	108	68.9	52.7	[illegible]	[illegible]
	25			0						
	26			0						
	27			0						
	28	187	0.3	56.1	11.2	9.7	6.8	5.7	[illegible]	[illegible]
	29			0						
	30			0						
	-31	310	0.6	186	26.8	24.6	15.7	14.1	[illegible]	[illegible]
	32			0						
	33			0						
	-34	337	1	337	40.9	37.8	24.5	21.6	[illegible]	[illegible]
	35			0						
	36			0						
	-37	375	1.5	562.5	65.1	59.8	37.6	34.1	[illegible]	[illegible]
	38			0						
	39			0						
	-40	440	3	1320	115	103	62.3	47.1	176	164
+1	45	315	5.19	1634.85	212	177	107	76.5	[illegible]	[illegible]
[illegible]	49	465.00	0.567	263.655	49.9	44.1	27.8	24.1	[illegible]	[illegible]
[illegible]	53	280.00	0.295	82.6	19.7	17.2	11.9	9.9	[illegible]	[illegible]
	56	355.00	1.230	436.65	77.9	70.0	45.7	38.5	[illegible]	[illegible]
[illegible]	60	400.00	0.465	186	38.1	33.1	20.6	18.2	[illegible]	[illegible]
[illegible]	63	375.00	2.140	802.5	124	110.	71.9	60.1	[illegible]	[illegible]
[illegible]	66	640.00	2.700	1728	250	217	138	106	[illegible]	[illegible]
[illegible]	71	540.00	8.430	4552.2	525	438	247	171	[illegible]	[illegible]
[illegible]	75	570.00	0.431	245.67	56.1	49.0	30.1	26.6	[illegible]	[illegible]

CFI_16 CFI_20 .SSF

Note: These data are entered into the subsequent ENABLE spreadsheets

DAW

2

				16	29	67	[illegible]	59	92
79	140.00	0.164	22.96	9.6	8.2	5.5	4.5	[illegible]	[illegible]
83	110.00	0.159	17.49	6.2	5.3	3.8	3.1	[illegible]	[illegible]
86	367.00	0.408	149.736	48.9	42.5	29.0	24.3	[illegible]	[illegible]
89	260.00	1.180	306.8	63.3	55.	35.3	[illegible]	[illegible]	[illegible]
93	325.00	0.357	116.025	28.8	25.2	16.4	[illegible]	[illegible]	15.1
96	780.00	2.020	1575.6	249	217.	137.	117.	[illegible]	408
100	285.00	0.425	121.125	29.1	24.9	16.4	14.3	[illegible]	[illegible]
104	175.00	0.255	44.625	13.2	11.3	7.45	6.2	[illegible]	[illegible]
107	600.00	1.180	708	135	118	73.7	63.1	[illegible]	219
110	442.00	1.690	746.98	122	103	63.4	50.4	[illegible]	[illegible]
115	687.00	14.800	10167.6	392	692	375.	250	[illegible]	1320
119	437.00	0.408	178.296	38.8	33.8	20.5	[illegible]	[illegible]	62.7
123	362.00	0.317	114.754	28.7	25.2	17.1	[illegible]	[illegible]	[illegible]
126	624.00	1.230	767.52	143	124	76.2	[illegible]	[illegible]	235
130	497.00	0.527	261.919	49.8	43.7	27.7	[illegible]	[illegible]	77.4
133	475.00	0.952	452.2	91.7	81.8	50.5	[illegible]	[illegible]	147
136	430.00	2.400	1032	172	147	89.5	[illegible]	[illegible]	[illegible]
140	380.00	0.300	114	37.6	30.9	[illegible]	[illegible]	[illegible]	[illegible]
142	150.00	2.480	372	65.4	55.	33.2	[illegible]	[illegible]	[illegible]
147	340.00	18.700	6358	522	404.	215.	[illegible]	[illegible]	890
151	500.00	0.895	447.5	78.1	68.1	40.4	[illegible]	25	136
154	450.00	1.230	553.5	114	99.6	60.4	[illegible]	[illegible]	[illegible]
157	500.00	1.502	751	142	121	71.98	[illegible]	[illegible]	[illegible]
161	170.00	20.900	3553	240	181	101.	[illegible]	[illegible]	[illegible]
165	520.00	0.895	465.4	63.4	53.7	31.4	[illegible]	[illegible]	[illegible]
169	350.00	0.567	198.45	41.7	32.5	19.1	[illegible]	[illegible]	[illegible]
172	600.00	1.970	1182	195	164	98.5	[illegible]	[illegible]	[illegible]
176	440.00	0.334	146.96	43.0	37.7	25.8	[illegible]	[illegible]	[illegible]
179	410.00	2.530	1037.3	166	139	84.6	[illegible]	[illegible]	264
183	340.00	24.900	8466	600	454	244.	[illegible]	[illegible]	1116
187	330.00	0.312	102.96	43.4	37.2	26.2	[illegible]	67.8	[illegible]
190	520.00	0.686	356.72	86.2	75.6	47.7	[illegible]	[illegible]	141
194	260.00	26.400	6864	461	350	189.	[illegible]	[illegible]	[illegible]
198	350.00	0.657	229.95	39.6	33.3	19.9	[illegible]	[illegible]	65.1
202	230.00	0.516	118.68	25.8	30.4	9.8	[illegible]	37.9	[illegible]
205	340.00	2.100	714	102	82.7	47.3	[illegible]	[illegible]	171
208	370.00	2.900	1073	138	110.	58.1	41.4	235	[illegible]
211	460.00	3.300	1518	212	171.	90.6	[illegible]	[illegible]	[illegible]
215	190.00	30.200	5738	222	251.	149.	104	[illegible]	[illegible]
219	550.00	0.482	265.1	39.1	39.5	28.8	19.5	62.0	[illegible]
223	140.00	31.200	4368	226	175.	97.	[illegible]	468	[illegible]
227	220.00	0.278	61.16	16.8	16.2	11.4	[illegible]	[illegible]	[illegible]
231	140.00	32.000	4480	225	175.	95.7	[illegible]	467	[illegible]
234	500.00	0.442	221	42.2	36.7	24.4	[illegible]	[illegible]	67.[illegible]
237	300.00	0.527	158.1	25.8	22.1	12.6	[illegible]	43.1	[illegible]
240	320.00	1.160	371.2	71.2	[illegible]	37.5	[illegible]	[illegible]	[illegible]
244	570.00	35.300	20121	1406	1086	535.	[illegible]	[illegible]	[illegible]
248	370.00	0.981	362.97	84.5	[illegible]	51.3	[illegible]	139	[illegible]
251	170.00	1.120	190.4	35.2	30.	17.9	[illegible]	56.7	145

DAWS

					116	120	67	56	58	92			
					271	726	394.	231	362	85.1			
1070	254	390.00	36.970	14418.3	59.7	29.1	31.7		37.0				
	259	350.00	0.867	303.45	63.4	53.2	33.5						
	262	290.00	1.120	324.8	164	770	358.	215	795				
	267	470.00	40.900	19223	150	126	67.						
	271	840.00	1.070	898.8	457	366	168.						
	274	200.00	42.100	8420	99.6	81.8	46.3		105				
	278	480.00	1.250	600	162	133	69.7		266				
	281	570.00	1.970	1122.9	647	536	294.	63	1072				
517	284	200.00	44.500	8900									
				0									
		30114.00		0									
		381.19		0									

RF.	22.5	22.1	13.7	14.6	38.6	26.4	2
Plane F	18.1	18.5	12.1	13.7	28.5	15.4	14.
Channel F	1.27	1.03	0.58	0.41	2.15	2.2	1.6
R. O.	3.04	2.30	0.81	.39	7.86	8.6	5.
STDR		.17	.13	.12	.04	.13	.2
ERROR							4%

F1 -

1.03 mm/yr

S1_16.SSF

DAW 1

CHANNEL EL. NO.	INFILTRATION LENGTH	BW	SOL50_1 AREA M^2	STORM 16 F m^3	F depth cm
4	270	0.3	81	17.3	21.35802
7	340	0.6	204	38.2	18.72549
10	312	1	312	46.1	14.77564
13	362	1.5	543	68.9	12.68877
16	300	2	600	72.1	12.01667
20	320	3	960	94.5	9.84375
24	355	4	1420	125	8.802817
28	187	0.3	56.1	11.2	19.96435
31	310	0.6	186	28.6	15.37634
34	337	1	337	40.9	12.1365
37	375	1.5	562.5	65.1	11.57333
40	440	3	1320	115	8.712121
45	315	5.19	1634.85	212	12.96755
49	465.00	0.567	263.655	49.8	18.88832
53	280.00	0.295	82.6	19.7	23.84988
56	355.00	1.230	436.65	77.9	17.84038
60	400.00	0.465	186	38.1	20.48387
63	375.00	2.140	802.5	124	15.45171
66	640.00	2.700	1728	250	14.46759
71	540.00	8.430	4552.2	525	11.53289
75	570.00	0.431	245.67	56.1	22.83551
79	140.00	0.164	22.96	9.6	41.81185
83	110.00	0.159	17.49	6.2	35.44883
86	367.00	0.408	149.736	48.9	32.65748
89	260.00	1.180	306.8	63.3	20.63233
93	325.00	0.357	116.025	28.8	24.82224
96	780.00	2.020	1575.6	249	15.8035
100	285.00	0.425	121.125	29.1	24.02477
104	175.00	0.255	44.625	13.2	29.57983
107	600.00	1.180	708	135	19.0678
110	442.00	1.690	746.98	122	16.33243
115	687.00	14.800	10167.6	892	8.772965
119	437.00	0.408	178.296	38.8	21.76157
123	362.00	0.317	114.754	28.7	25.01002
126	624.00	1.230	767.52	143	18.63144
130	497.00	0.527	261.919	49.8	19.01351
133	475.00	0.952	452.2	91.7	20.27864
136	430.00	2.400	1032	172	16.66667
140	380.00	0.300	114	37.6	32.98246
142	150.00	2.480	372	65.4	17.58065
147	340.00	18.700	6358	532	8.367411
151	500.00	0.895	447.5	78.1	17.45251
154	450.00	1.230	553.5	114	20.59621
157	500.00	1.502	751	142	18.90812
161	170.00	20.900	3553	240	6.754855
165	520.00	0.895	465.4	63.4	13.62269

~~550-T.~~
51-16.55F

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169	350.00	0.567	198.45	41.7	21.01285
172	600.00	1.970	1182	195	16.49746
176	440.00	0.334	146.96	43	29.25966
179	410.00	2.530	1037.3	166	16.00308
183	340.00	24.900	8466	600	7.087172
187	330.00	0.312	102.96	43.4	42.15229
190	520.00	0.686	356.72	86.2	24.16461
194	260.00	26.400	6864	461	6.7162
198	350.00	0.657	229.95	39.6	17.22114
202	230.00	0.516	118.68	35.8	30.16515
205	340.00	2.100	714	102	14.28571
208	370.00	2.900	1073	138	12.86114
211	460.00	3.300	1518	212	13.96574
215	190.00	30.200	5738	322	5.611711
219	550.00	0.482	265.1	39.1	14.74915
223	140.00	31.200	4368	226	5.173993
227	220.00	0.278	61.16	16.8	27.46893
231	140.00	32.000	4480	225	5.022321
234	500.00	0.442	221	42.2	19.09502
237	300.00	0.527	158.1	25.8	16.31879
240	320.00	1.160	371.2	71.2	19.18103
244	570.00	35.300	20121	1406	6.987724
248	370.00	0.981	362.97	84.5	23.28016
251	170.00	1.120	190.4	35.2	18.48739
254	390.00	36.970	14418.3	871	6.040934
259	350.00	0.867	303.45	59.7	19.67375
262	290.00	1.120	324.8	63.4	19.5197
267	470.00	40.900	19223	964	5.014826
271	840.00	1.070	898.8	150	16.68892
274	200.00	42.100	8420	457	5.427553
278	480.00	1.250	600	99.6	16.6
281	570.00	1.970	1122.9	163	14.51599
284	200.00	44.500	8900	647	7.269663
	30114.00		SUM		1374.392
	381.19		AVG		17.39737

DAW

CHANNEL INFILTRATION SOL1-20.55F

EL. NO.	LENGTH	BW	AREA M^2	CHANNEL F M^3	F depth cm
4	270	0.30	81.0	14.9	18.4
7	340	0.60	204.0	33.5	16.4
10	312	1.00	312.0	42.7	13.7
13	362	1.50	543.0	63.6	11.7
16	300	2.00	600.0	66.0	11.0
20	320	3.00	960.0	84.5	8.8
24	355	4.00	1420.0	108.0	7.6
28	187	0.30	56.1	9.7	17.3
31	310	0.60	186.0	24.6	13.2
34	337	1.00	337.0	37.8	11.2
37	375	1.50	562.5	59.8	10.6
40	440	3.00	1320.0	103.0	7.8
45	315	5.19	1634.9	177.0	10.8
49	465.00	0.57	263.7	44.1	16.7
53	280.00	0.30	82.6	17.2	20.8
56	355.00	1.23	436.7	70.0	16.0
60	400.00	0.47	186.0	33.1	17.8
63	375.00	2.14	802.5	110.0	13.7
66	640.00	2.70	1728.0	217.0	12.6
71	540.00	8.43	4552.2	438.0	9.6
75	570.00	0.43	245.7	49.0	19.9
79	140.00	0.16	23.0	8.2	35.7
83	110.00	0.16	17.5	5.3	30.3
86	367.00	0.41	149.7	42.5	28.4
89	260.00	1.18	306.8	56.0	18.3
93	325.00	0.36	116.0	25.2	21.7
96	780.00	2.02	1575.6	217.0	13.8
100	285.00	0.43	121.1	24.9	20.6
104	175.00	0.26	44.6	11.3	25.3
107	600.00	1.18	708.0	118.0	16.7
110	442.00	1.69	747.0	103.0	13.8
115	687.00	14.80	10167.6	692.0	6.8
119	437.00	0.41	178.3	33.8	19.0
123	362.00	0.32	114.8	25.2	22.0
126	624.00	1.23	767.5	124.0	16.2
130	497.00	0.53	261.9	43.7	16.7
133	475.00	0.95	452.2	81.8	18.1
136	430.00	2.40	1032.0	147.0	14.2
140	380.00	0.30	114.0	32.9	28.9
142	150.00	2.48	372.0	55.0	14.8
147	340.00	18.70	6358.0	404.0	6.4
151	500.00	0.90	447.5	68.1	15.2
154	450.00	1.23	553.5	99.6	18.0
157	500.00	1.50	751.0	121.0	16.1

SOIL_AS.SSF

2

161	170.00	20.90	3553.0	181.0	5.1
165	520.00	0.90	465.4	53.7	11.5
169	350.00	0.57	198.5	32.5	16.4
172	600.00	1.97	1182.0	164.0	13.9
176	440.00	0.33	147.0	37.7	25.7
179	410.00	2.53	1037.3	139.0	13.4
183	340.00	24.90	8466.0	454.0	5.4
187	330.00	0.31	103.0	37.2	36.1
190	520.00	0.69	356.7	75.6	21.2
194	260.00	26.40	6864.0	350.0	5.1
198	350.00	0.66	230.0	33.3	14.5
202	230.00	0.52	118.7	30.4	25.6
205	340.00	2.10	714.0	82.7	11.6
208	370.00	2.90	1073.0	110.0	10.3
211	460.00	3.30	1518.0	171.0	11.3
215	190.00	30.20	5738.0	251.0	4.4
219	550.00	0.48	265.1	39.5	14.9
223	140.00	31.20	4368.0	175.0	4.0
227	220.00	0.28	61.2	16.2	26.5
231	140.00	32.00	4480.0	175.0	3.9
234	500.00	0.44	221.0	36.7	16.6
237	300.00	0.53	158.1	22.1	14.0
240	320.00	1.16	371.2	61.9	16.7
244	570.00	35.30	20121.0	1086.0	5.4
248	370.00	0.98	363.0	73.5	20.2
251	170.00	1.12	190.4	30.0	15.8
254	390.00	36.97	14418.3	726.0	5.0
259	350.00	0.87	303.5	49.1	16.2
262	290.00	1.12	324.8	53.2	16.4
267	470.00	40.90	19223.0	770.0	4.0
271	840.00	1.07	898.8	126.0	14.0
274	200.00	42.10	8420.0	366.0	4.3
278	480.00	1.25	600.0	81.8	13.6
281	570.00	1.97	1122.9	133.0	11.8
284	200.00	44.50	8900.0	536.0	6.0
SUM	30114.00				1183.3
AVERAGE	381.19				0.1

DAW

N=79

Ave = 15.0 cm DAW

Daus 1/1

CHANNEL INFILTRATION S1_56.SSF STORM 56

EL. NO.	LENGTH	BW	AREA M^2	F m^3	F depth cm
4	270	0.30	81.0	8.7	10.7
7	340	0.60	204.0	19.8	9.7
10	312	1.00	312.0	25.0	8.0
13	362	1.50	543.0	37.7	6.9
16	300	2.00	600.0	38.8	6.5
20	320	3.00	960.0	43.6	4.5
24	355	4.00	1420.0	50.7	3.6
28	187	0.30	56.1	5.7	10.2
31	310	0.60	186.0	14.1	7.6
34	337	1.00	337.0	21.6	6.4
37	375	1.50	562.5	34.1	6.1
40	440	3.00	1320.0	47.1	3.6
45	315	5.19	1634.9	76.5	4.7
49	465.00	0.57	263.7	24.1	9.1
53	280.00	0.30	82.6	9.9	12.0
56	355.00	1.23	436.7	38.5	8.8
60	400.00	0.47	186.0	18.2	9.8
63	375.00	2.14	802.5	60.1	7.5
66	640.00	2.70	1728.0	106.0	6.1
71	540.00	8.43	4552.2	171.0	3.8
75	570.00	0.43	245.7	26.6	10.8
79	140.00	0.16	23.0	4.8	20.9
83	110.00	0.16	17.5	3.1	17.7
86	367.00	0.41	149.7	24.3	16.2
89	260.00	1.18	306.8	30.5	9.9
93	325.00	0.36	116.0	14.5	12.5
96	780.00	2.02	1575.6	117.0	7.4
100	285.00	0.43	121.1	14.3	11.8
104	175.00	0.26	44.6	6.2	13.9
107	600.00	1.18	708.0	63.9	9.0
110	442.00	1.69	747.0	50.4	6.7
115	687.00	14.80	10167.6	255.0	2.5
119	437.00	0.41	178.3	17.4	9.8
123	362.00	0.32	114.8	13.6	11.9
126	624.00	1.23	767.5	64.0	8.3
130	497.00	0.53	261.9	24.8	9.5
133	475.00	0.95	452.2	45.2	10.0
136	430.00	2.40	1032.0	73.5	7.1
140	380.00	0.30	114.0	17.2	15.1
142	150.00	2.48	372.0	26.4	7.1
147	340.00	18.70	6358.0	145.0	2.3
151	500.00	0.90	447.5	34.2	7.6
154	450.00	1.23	553.5	50.9	9.2
157	500.00	1.50	751.0	55.9	7.4

SL-56.55E

2/1

161	170.00	20.90	3553.0	67.5	1.9
165	520.00	0.90	465.4	24.2	5.2
169	350.00	0.57	198.5	15.6	7.9
172	600.00	1.97	1182.0	75.2	6.4
176	440.00	0.33	147.0	21.1	14.4
179	410.00	2.53	1037.3	61.7	5.9
183	340.00	24.90	8466.0	164.0	1.9
187	330.00	0.31	103.0	21.6	21.0
190	520.00	0.69	356.7	40.9	11.5
194	260.00	26.40	6864.0	123.0	1.8
198	350.00	0.66	230.0	15.2	6.6
202	230.00	0.52	118.7	16.0	13.5
205	340.00	2.10	714.0	33.6	4.7
208	370.00	2.90	1073.0	41.9	3.9
211	460.00	3.30	1518.0	63.9	4.2
215	190.00	30.20	5738.0	104.0	1.8
219	550.00	0.48	265.1	19.8	7.5
223	140.00	31.20	4368.0	65.4	1.5
227	220.00	0.28	61.2	7.5	12.3
231	140.00	32.00	4480.0	65.5	1.5
234	500.00	0.44	221.0	19.5	8.8
237	300.00	0.53	158.1	11.2	7.1
240	320.00	1.16	371.2	32.0	8.6
244	570.00	35.30	20121.0	318.0	1.6
248	370.00	0.98	363.0	37.8	10.4
251	170.00	1.12	190.4	13.8	7.2
254	390.00	36.97	14418.3	231.0	1.6
259	350.00	0.87	303.5	21.5	7.1
262	290.00	1.12	324.8	23.9	7.4
267	470.00	40.90	19223.0	215.0	1.1
271	840.00	1.07	898.8	50.3	5.6
274	200.00	42.10	8420.0	95.4	1.1
278	480.00	1.25	600.0	34.0	5.7
281	570.00	1.97	1122.9	48.3	4.3
284	200.00	44.50	8900.0	163.0	1.8
SUM	30114.00				605.0
AVERAGE	381.19				0.0

Dans

Avg = 7.66 Ksi

Daus 1

CHANNEL INFILTRATION S1_58.SSF STORM 58 1st 50 yrs

EL. NO.	LENGTH	BW	AREA M^2	F m^3	F depth cm
4	270	0.30	81.0	26.9	33.2
7	340	0.60	204.0	58.5	28.7
10	312	1.00	312.0	70.5	22.6
13	362	1.50	543.0	105.0	19.3
16	300	2.00	600.0	109.0	18.2
20	320	3.00	960.0	142.0	14.8
24	355	4.00	1420.0	188.0	13.2
28	187	0.30	56.1	17.7	31.6
31	310	0.60	186.0	41.3	22.2
34	337	1.00	337.0	63.1	18.7
37	375	1.50	562.5	99.6	17.7
40	440	3.00	1320.0	176.0	13.3
45	315	5.19	1634.9	324.0	19.8
49	465.00	0.57	263.7	80.2	30.4
53	280.00	0.30	82.6	31.8	38.5
56	355.00	1.23	436.7	123.0	28.2
60	400.00	0.47	186.0	60.8	32.7
63	375.00	2.14	802.5	193.0	24.0
66	640.00	2.70	1728.0	383.0	22.2
71	540.00	8.43	4552.2	816.0	17.9
75	570.00	0.43	245.7	88.8	36.1
79	140.00	0.16	23.0	15.2	66.2
83	110.00	0.16	17.5	9.9	56.6
86	367.00	0.41	149.7	76.6	51.2
89	260.00	1.18	306.8	97.9	31.9
93	325.00	0.36	116.0	46.3	39.9
96	780.00	2.02	1575.6	380.0	24.1
100	285.00	0.43	121.1	46.2	38.1
104	175.00	0.26	44.6	21.3	47.7
107	600.00	1.18	708.0	210.0	29.7
110	442.00	1.69	747.0	193.0	25.8
115	687.00	14.80	10167.6	1461.0	14.4
119	437.00	0.41	178.3	62.5	35.1
123	362.00	0.32	114.8	46.2	40.3
126	624.00	1.23	767.5	225.0	29.3
130	497.00	0.53	261.9	79.6	30.4
133	475.00	0.95	452.2	144.0	31.8
136	430.00	2.40	1032.0	264.0	25.6
140	380.00	0.30	114.0	60.6	53.2
142	150.00	2.48	372.0	101.0	27.2
147	340.00	18.70	6358.0	903.0	14.2
151	500.00	0.90	447.5	125.0	27.9
154	450.00	1.23	553.5	179.0	32.3
157	500.00	1.50	751.0	221.0	29.4

51-58.55F

2

DAW

161	170.00	20.90	3553.0	446.0	12.6
165	520.00	0.90	465.4	104.0	22.3
169	350.00	0.57	198.5	72.4	36.5
172	600.00	1.97	1182.0	315.0	26.6
176	440.00	0.33	147.0	68.6	46.7
179	410.00	2.53	1037.3	262.0	25.3
183	340.00	24.90	8466.0	1125.0	13.3
187	330.00	0.31	103.0	67.8	65.9
190	520.00	0.69	356.7	136.0	38.1
194	260.00	26.40	6864.0	893.0	13.0
198	350.00	0.66	230.0	65.1	28.3
202	230.00	0.52	118.7	57.9	48.8
205	340.00	2.10	714.0	173.0	24.2
208	370.00	2.90	1073.0	235.0	21.9
211	460.00	3.30	1518.0	353.0	23.3
215	190.00	30.20	5738.0	662.0	11.5
219	550.00	0.48	265.1	62.6	23.6
223	140.00	31.20	4368.0	468.0	10.7
227	220.00	0.28	61.2	28.2	46.1
231	140.00	32.00	4480.0	467.0	10.4
234	500.00	0.44	221.0	68.0	30.8
237	300.00	0.53	158.1	42.1	26.6
240	320.00	1.16	371.2	112.0	30.2
244	570.00	35.30	20121.0	2474.0	12.3
248	370.00	0.98	363.0	139.0	38.3
251	170.00	1.12	190.4	56.9	29.9
254	390.00	36.97	14418.3	1362.0	9.4
259	350.00	0.87	303.5	97.0	32.0
262	290.00	1.12	324.8	101.0	31.1
267	470.00	40.90	19223.0	1795.0	9.3
271	840.00	1.07	898.8	246.0	27.4
274	200.00	42.10	8420.0	830.0	9.9
278	480.00	1.25	600.0	165.0	27.5
281	570.00	1.97	1122.9	266.0	23.7
284	200.00	44.50	8900.0	1072.0	12.0
SUM	30114.00				2205.2 ~~0.2~~
AVERAGE	381.19				

AVG 37.9 cm

1

CHANNEL INFILTRATION S1_70.SSF

EL. NO.	LENGTH	BW	AREA M^2	F m^3	F depth cm
4	270	0.30	81.0	23.2	28.6
7	340	0.60	204.0	49.9	24.5
10	312	1.00	312.0	57.7	18.5
13	362	1.50	543.0	86.7	16.0
16	300	2.00	600.0	90.2	15.0
20	320	3.00	960.0	117.8	12.3
24	355	4.00	1420.0	156.0	11.0
28	187	0.30	56.1	15.0	26.7
31	310	0.60	186.0	33.8	18.2
34	337	1.00	337.0	51.7	15.3
37	375	1.50	562.5	81.4	14.5
40	440	3.00	1320.0	141.0	10.7
45	315	5.19	1634.9	264.0	16.1
49	465.00	0.57	263.7	64.4	24.4
53	280.00	0.30	82.6	26.6	32.2
56	355.00	1.23	436.7	100.0	22.9
60	400.00	0.47	186.0	50.2	27.0
63	375.00	2.14	802.5	158.0	19.7
66	640.00	2.70	1728.0	310.0	17.9
71	540.00	8.43	4552.2	649.0	14.3
75	570.00	0.43	245.7	72.1	29.3
79	140.00	0.16	23.0	13.0	56.6
83	110.00	0.16	17.5	8.4	48.0
86	367.00	0.41	149.7	65.2	43.5
89	260.00	1.18	306.8	81.5	26.6
93	325.00	0.36	116.0	39.2	33.8
96	780.00	2.02	1575.6	323.0	20.5
100	285.00	0.43	121.1	39.0	32.2
104	175.00	0.26	44.6	17.6	39.4
107	600.00	1.18	708.0	173.0	24.4
110	442.00	1.69	747.0	153.0	20.5
115	687.00	14.80	10167.6	1127.0	11.1
119	437.00	0.41	178.3	49.3	27.7
123	362.00	0.32	114.8	37.8	32.9
126	624.00	1.23	767.5	184.0	24.0
130	497.00	0.53	261.9	66.8	25.5
133	475.00	0.95	452.2	119.0	26.3
136	430.00	2.40	1032.0	213.0	20.6
140	380.00	0.30	114.0	48.7	42.7
142	150.00	2.48	372.0	81.4	21.9
147	340.00	18.70	6358.0	690.0	10.9
151	500.00	0.90	447.5	99.5	22.2
154	450.00	1.23	553.5	146.0	26.4
157	500.00	1.50	751.0	177.0	23.6

51-70.556

2/4

DAW

161	170.00	20.90	3553.0	331.0	9.3
165	520.00	0.90	465.4	81.4	17.5
169	350.00	0.57	198.5	54.9	27.7
172	600.00	1.97	1182.0	248.0	21.0
176	440.00	0.33	147.0	57.2	38.9
179	410.00	2.53	1037.3	206.0	19.9
183	340.00	24.90	8466.0	834.0	9.9
187	330.00	0.31	103.0	59.2	57.5
190	520.00	0.69	356.7	113.0	31.7
194	260.00	26.40	6864.0	653.0	9.5
198	350.00	0.66	230.0	51.0	22.2
202	230.00	0.52	118.7	47.2	39.8
205	340.00	2.10	714.0	131.0	18.3
208	370.00	2.90	1073.0	177.0	16.5
211	460.00	3.30	1518.0	268.0	17.7
215	190.00	30.20	5738.0	450.0	7.8
219	550.00	0.48	265.1	54.5	20.6
223	140.00	31.20	4368.0	325.0	7.4
227	220.00	0.28	61.2	24.8	40.5
231	140.00	32.00	4480.0	323.0	7.2
234	500.00	0.44	221.0	53.9	24.4
237	300.00	0.53	158.1	34.2	21.6
240	320.00	1.16	371.2	90.3	24.3
244	570.00	35.30	20121.0	1935.0	9.6
248	370.00	0.98	363.0	115.0	31.7
251	170.00	1.12	190.4	44.8	23.5
254	390.00	36.97	14418.3	1070.0	7.4
259	350.00	0.87	303.5	78.4	25.8
262	290.00	1.12	324.8	82.1	25.3
267	470.00	40.90	19223.0	1346.0	7.0
271	840.00	1.07	898.8	189.0	21.0
274	200.00	42.10	8420.0	625.0	7.4
278	480.00	1.25	600.0	128.0	21.3
281	570.00	1.97	1122.9	205.0	18.3
284	200.00	44.50	8900.0	827.0	9.3
SUM	30114.00				1795.4
AVERAGE	381.19				~~0.1~~

22.7 6m

DAW 1/7

CHANNEL INFILTRATION SOL1_92

EL. NO.	LENGTH	BW	AREA M^2	F m^3	F depth cm
4	270	0.30	81.0	28.7	35.4
7	340	0.60	204.0	60.0	29.4
10	312	1.00	312.0	72.4	23.2
13	362	1.50	543.0	107.0	19.7
16	300	2.00	600.0	110.0	18.3
20	320	3.00	960.0	140.0	14.6
24	355	4.00	1420.0	183.0	12.9
28	187	0.30	56.1	18.3	32.6
31	310	0.60	186.0	42.2	22.7
34	337	1.00	337.0	63.7	18.9
37	375	1.50	562.5	100.0	17.8
40	440	3.00	1320.0	169.0	12.8
45	315	5.19	1634.9	327.0	20.0
49	465.00	0.57	263.7	79.2	30.0
53	280.00	0.30	82.6	30.7	37.2
56	355.00	1.23	436.7	126.0	28.9
60	400.00	0.47	186.0	60.0	32.3
63	375.00	2.14	802.5	200.0	24.9
66	640.00	2.70	1728.0	394.0	22.8
71	540.00	8.43	4552.2	811.0	17.8
75	570.00	0.43	245.7	89.6	36.5
79	140.00	0.16	23.0	15.6	67.9
83	110.00	0.16	17.5	10.0	57.2
86	367.00	0.41	149.7	76.6	51.2
89	260.00	1.18	306.8	103.0	33.6
93	325.00	0.36	116.0	45.1	38.9
96	780.00	2.02	1575.6	408.0	25.9
100	285.00	0.43	121.1	46.3	38.2
104	175.00	0.26	44.6	20.7	46.4
107	600.00	1.18	708.0	219.0	30.9
110	442.00	1.69	747.0	197.0	26.4
115	687.00	14.80	10167.6	1429.0	14.1
119	437.00	0.41	178.3	62.9	35.3
123	362.00	0.32	114.8	45.6	39.7
126	624.00	1.23	767.5	235.0	30.6
130	497.00	0.53	261.9	77.4	29.6
133	475.00	0.95	452.2	149.0	33.0
136	430.00	2.40	1032.0	270.0	26.2
140	380.00	0.30	114.0	61.5	53.9
142	150.00	2.48	372.0	104.0	28.0
147	340.00	18.70	6358.0	890.0	14.0
151	500.00	0.90	447.5	126.0	28.2
154	450.00	1.23	553.5	186.0	33.6
157	500.00	1.50	751.0	228.0	30.4

DAW 2/7

161	170.00	20.90	3553.0	439.0	12.4
165	520.00	0.90	465.4	104.0	22.3
169	350.00	0.57	198.5	71.4	36.0
172	600.00	1.97	1182.0	323.0	27.3
176	440.00	0.33	147.0	68.1	46.3
179	410.00	2.53	1037.3	268.0	25.8
183	340.00	24.90	8466.0	1116.0	13.2
187	330.00	0.31	103.0	70.1	68.1
190	520.00	0.69	356.7	141.0	39.5
194	260.00	26.40	6864.0	886.0	12.9
198	350.00	0.66	230.0	65.1	28.3
202	230.00	0.52	118.7	58.7	49.5
205	340.00	2.10	714.0	171.0	23.9
208	370.00	2.90	1073.0	234.0	21.8
211	460.00	3.30	1518.0	352.0	23.2
215	190.00	30.20	5738.0	724.0	12.6
219	550.00	0.48	265.1	70.2	26.5
223	140.00	31.20	4368.0	486.0	11.1
227	220.00	0.28	61.2	32.9	53.8
231	140.00	32.00	4480.0	489.0	10.9
234	500.00	0.44	221.0	67.9	30.7
237	300.00	0.53	158.1	40.9	25.9
240	320.00	1.16	371.2	115.0	31.0
244	570.00	35.30	20121.0	2539.0	12.6
248	370.00	0.98	363.0	145.0	39.9
251	170.00	1.12	190.4	58.1	30.5
254	390.00	36.97	14418.3	1390.0	9.6
259	350.00	0.87	303.5	97.7	32.2
262	290.00	1.12	324.8	103.0	31.7
267	470.00	40.90	19223.0	1861.0	9.7
271	840.00	1.07	898.8	244.0	27.1
274	200.00	42.10	8420.0	866.0	10.3
278	480.00	1.25	600.0	164.0	27.3
281	570.00	1.97	1122.9	266.0	23.7
284	200.00	44.50	8900.0	1117.0	12.6
SUM	30114.00				2242.0
AVERAGE	381.19				~~0.2~~

28.4 cm

DAWS

	1-70	S451_70.DAT	S451_70.DEP
	1-16	S451_16.DAT	S451_16.DEP
	1-20	S451_20.DAT	S451_20.DEP
	1-67	S451_67.DAT	S451_67.DEP
	1-56	S451_56.DAT	S451_56.DEP
	1-58	S451_58.DAT	S451_58.DEP
	1-92	S451_92.DAT	S451_92.DEP
	1-16	S711_16.DAT	S711_16.DEP
	1-20	S711_20.DAT	S711_20.DEP
	1-56	S711_56.DAT	S711_56.DEP
	1-58	S711_58.DAT	S711_58.DEP
	1-67	S711_67.DAT	S711_67.DEP
	1-70	S711_70.DAT	S711_70.DEP
	1-92	S711_92.DAT	S711_92.DEP
	1-16	S1151_16.DAT	S1151_16.DEP
	1-20	S1151_20.DAT	S1151_20.DEP
	1-56	S1151_56.DAT	S1151_56.DEP
	1-58	S1151_58.DAT	S1151_58.DEP
	1-67	S1151_67.DAT	S1151_67.DEP
	1-70	S1151_70.DAT	S1151_70.DEP
	1-92	S1151_92.DAT	S1151_92.DEP
	1-16	S2541_16.DAT	S2541_16.DEP
	1-20	S2541_20.DAT	S2541_20.DEP
	1-56	S2541_56.DAT	S2541_56.DEP
	1-58	S2541_58.DAT	S2541_58.DEP
	1-67	S2541_67.DAT	S2541_67.DEP
	1-70	S2541_70.DAT	S2541_70.DEP
	1-92	S2541_92.DAT	S2541_92.DEP
	1-16	S2841_16.DAT	S2841_16.DEP
	1-20	S2841_20.DAT	S2841_20.DEP
	1-56	S2841_56.DAT	S2841_56.DEP
	1-58	S2841_58.DAT	S2841_58.DEP
	1-67	S2841_67.DAT	S2841_67.DEP
	1-70	S2841_70.DAT	S2841_70.DEP
	1-92	S2841_92.DAT	S2841_92.DEP

[illegible]

BW = 5.8
SLOPE = .048
SS1 = [illegible]
SS2 = [illegible]
n = [illegible]

71

BW = 9.0
SLOPE = .04
SS1 = [illegible]
SS2 = [illegible]
n = .0511

115

BW = 17.7
SLOPE = .04
SS1 = [illegible]
SS2 = [illegible]
n = .0511

254

BW = 9.5
SLOPE = .03
SS1 = .23
SS2 = .18
n = .0511

284

WIDTH = 5.0
SLOPE = [illegible]
SS1 = [illegible]
SS2 = 0.04
n = .0511

[illegible]

T [illegible] H ✓ [illegible]
[illegible] [illegible] m m/s [illegible]

1. Runoff Volumes: — DAW

Plot Geometry

Average Geometry

Cascade Geometry

Watershed Scale

Possible Comparisons

1. Summit Watershed - Reynolds Cr. Hansen (1979) 83 ha
   3 yrs. Ave P = 254 mm/yr.
   Ave Qv = 4.13/3 = 1.4 mm/yr.

   El. 1265 – 1463 m.
   Soil: Shallow, very gravelly loams
   Veg: big sagebrush Artemisia tridentata

2. Wilcox et al (1990) Q/P .0008 — .220

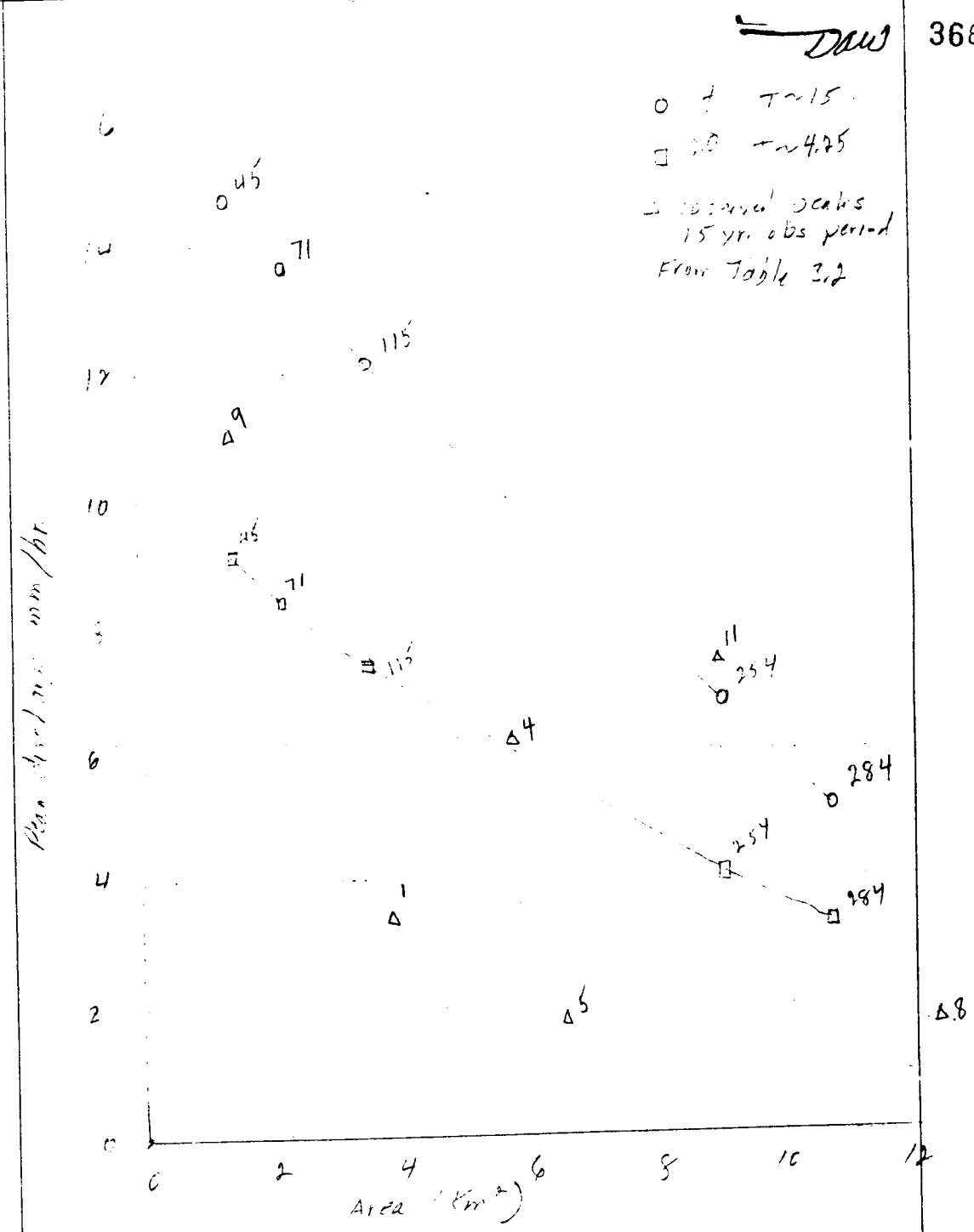
3. Wilcox et. al (1991) JSWC - Reynolds Cr. Soil frost important
   Q/P .51 – .01

4. Wilcox et al (1991) JRM - erosion plots - WERR Ro. Dreh.
   K_s range 18 – 54 mm/hr.

5. Osterkamp et al (1994) WRB.
   Yucca Wash - Av. R.O = ~~3.57 % of rain fall~~
   R.O + Recharge = 19% seems high!!

Plot [illegible] ordering (Simulated)

368



Solitario Canyon	Runoff Peak Frequency Comparisons	DAW 9/18/96	1

The 3rd ranked storm has approximately a 15 year recurrence interval. We will run this storm on Solitario Canyon and compare the runoff peaks at various subwatersheds with observed peak rates from the maximum stage data

storm is PAUG14.PRE

DAW

13/86 100 SHEETS FILLER 5 SQUARE
42-381 50 SHEETS EYE-EASE® 5 SQUARE
42-382 100 SHEETS EYE-EASE® 5 SQUARE
42-389 200 SHEETS EYE-EASE® 5 SQUARE
42-392 100 RECYCLED WHITE 5 SQUARE
42-399 200 RECYCLED WHITE 5 SQUARE
Made in U.S.A.
National® Brand

Solitario Canyon	Runoff and Channel Infiltration Volumes	EW 9/18/96.	1

DAW

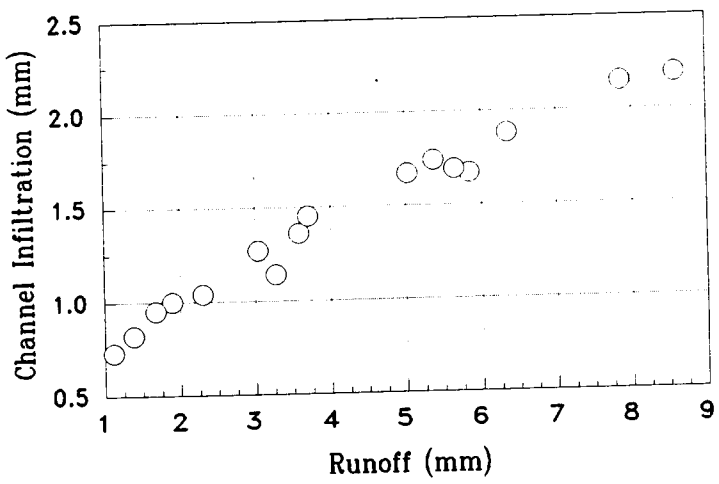
370

The runoff simulations on the plots show that 16.16% of the storms cause 51.8% of the runoff. Because surface runoff and channel infiltration are closely related, we could get a good estimate of annual average channel infiltration by running the storms that caused the 16 largest runoff events, then multiplying the resulting total infiltration and runoff by '1.5179'.

storms to run:

	runoff (mm)	Channel Infiltration (mm)
P AUG 14	3.58	1.36
P AUG 7	1.11	.73
P SEP 98	6.35	1.88
P AUG 4	5.37	1.74
P APR 28	5.84	1.67
P NOV 55	1.38	0.82
P JAN 11	3.27	1.14
P AUG 96	3.70	1.45
P MAR 3	5.643	1.69
P FEB 60	1.67	0.95 (2% error)
P AUG 97.	1.89	1.00

Note 5 of the top 16 events are in August.


Channel Infiltration (mm)
2.5
2.0
1.5
1.0
0.5
1
2
3
4
5
6
7
8
9
Runoff (mm)

DRW 372

D:\PSIPLOT\RFROB.PSD

Storm	Runoff (mm)	Rainfall	Duration	C6	C7	C8	Sol. Rel. mm	Char Inf.
1.0000	17.1000	25.9000	228.0000			.17	7.863	2.15
2.0000	13.3600	17.0000	113.0000			.25	8.591	2.19
3.0000	13.3200 *	36.8000	93.0000			.28	3.589	1.36
4.0000	12.1000	20.0000	47.0000			.33	5.027	1.67
5.0000	10.3600	12.9500	127.0000			[illegible]	1.114	0.73
6.0000	10.3000	13.5000	93.0000			[illegible]	6.353	1.89
7.0000	9.9700	21.1000	48.0000			.35	5.276	1.74
8.0000	9.4400	12.9500	148.0000			.29	5.844	1.67
9.0000	9.2400	16.5100	141.0000			.29	[illegible]	0.82
10.0000	8.5300	18.5000	34.0000			[illegible]	1.893	1.55
11.0000	8.4400	25.7000	69.0000			.35	3.277	1.14
12.0000	7.7600	14.2000	180.0000			.42	2.301	1.04
13.0000	7.5200	15.7000	218.0000			.47	3.041	1.27
14.0000	7.4400	20.6000	28.0000			.29	3.708	1.45
15.0000	7.4100	18.3000	77.0000			.39	5.645	1.67
16.0000	6.5800	22.5000	95.0000			.37	1.674	0.75
17.0000	6.3400	18.6000	106.0000					
18.0000	6.2900	24.6000	99.0000					
19.0000	6.2800	13.0000	28.0000					
20.0000	6.1100	22.1000	45.0000					
21.0000	6.1000	13.2000	105.0000					
22.0000	6.0200	14.0000	197.0000					
23.0000	5.8100	22.9000	480.0000					
24.0000	5.6900	13.5000	30.0000					
25.0000	5.3900	22.6000	122.0000					
26.0000	5.1000	20.6000	392.0000					
27.0000	4.9100	14.5000	33.0000					
28.0000	4.8900	29.5000	83.0000					
29.0000	4.7500	17.8000	202.0000					
30.0000	4.7400	18.0000	90.0000					
31.0000	4.5700	14.2000	89.0000					
32.0000	4.0200	20.8000	67.0000					
33.0000	3.6400	21.8000	149.0000					
34.0000	3.6400	20.8000	313.0000					
35.0000	3.5800	25.4000	157.0000					
36.0000	3.1400	15.9000	103.0000					
37.0000	3.0600	17.7000	164.0000					
38.0000	3.0000	14.7000	480.0000					
39.0000	2.9400	15.7000	146.0000					
40.0000	2.8700	17.2000	89.0000					
41.0000	2.5800	12.9000	363.0000					
42.0000	2.4600	13.2000	29.0000					
43.0000	2.3600	15.2000	12.0000					
44.0000	2.3200	13.2000	184.0000					
45.0000	2.2400	14.2000	227.0000					
46.0000	1.9700	13.2000	24.0000					
47.0000	1.9200	20.3000	194.0000					
48.0000	1.8900	15.5000	120.0000					
49.0000	1.6600	14.5000	55.0000					
50.0000	1.3800	14.2000	73.0000					
51.0000	1.2500	16.8000	65.0000					
52.0000	1.1800	20.8000	186.0000					

* Approx 15yr return interval

D:\PSIPLOT\RFROB.PSD

Storm	Runoff	Rainfall	Duration	C6	C7	C8
53.0000	1.1500	15.3000	62.0000			
54.0000	1.0900	15.1000	56.0000			
55.0000	0.9430	18.8000	480.0000			
56.0000	0.8220	14.6000	54.0000			
57.0000	0.7250	16.5000	105.0000			
58.0000	0.7000	38.6000	218.0000			
59.0000	0.6780	17.9000	350.0000			
60.0000	0.6720	13.7000	18.0000			
61.0000	0.6690	18.5000	52.0000			
62.0000	0.6280	13.5000	223.0000			
63.0000	0.5080	29.0000	112.0000			
64.0000	0.4600	15.7000	109.0000			
65.0000	0.3750	21.2000	72.0000			
66.0000	0.3580	18.0000	87.0000			
67.0000	0.2630	13.7000	24.0000			
68.0000	0.2630	19.3000	366.0000			
69.0000	0.2510	14.7000	20.0000			
70.0000	0.2500	22.1000	18.0000			
71.0000	0.2200	13.2000	47.0000			
72.0000	0.1900	14.2000	379.0000			
73.0000	0.1600	18.8000	418.0000			
74.0000	0.1000	18.4000	50.0000			
75.0000	0.0850	13.5000	110.0000			
76.0000	0.0827	15.5000	46.0000			
77.0000	0.0710	13.0000	83.0000			
78.0000	0.0680	17.6000	79.0000			
79.0000	0.0650	21.3000	100.0000			
80.0000	0.0590	15.1000	48.0000			
81.0000	0.0540	14.5000	57.0000			
82.0000	0.0500	16.5000	276.0000			
83.0000	0.0490	18.0000	64.0000			
84.0000	0.0450	19.2000	382.0000			
85.0000	0.0330	15.2000	22.0000			
86.0000	0.0250	16.8000	36.0000			
87.0000	0.0210	15.5000	82.0000			
88.0000	0.0200	22.6000	102.0000			
89.0000	0.0190	16.3000	28.0000			
90.0000	0.0160	16.8000	57.0000			
91.0000	0.0110	14.1000	12.0000			
92.0000	0.0090	26.4000	44.0000			
93.0000	0.0060	15.2000	180.0000			
94.0000	0.0060	13.7000	153.0000			
95.0000	0.0050	15.5000	95.0000			
96.0000	0.0040	20.3000	48.0000			
97.0000	0.0010	19.8000	36.0000			
98.0000	0.0002	28.4000	103.0000			
99.0000	0.0000	13.0000	159.0000			

Dau

```
------------------------------------------------------------
|                      Statistics Report                    |
------------------------------------------------------------

. IVar: Runoff
DepVar: Infiltration
      a:=        0.195353088
      b:=        0.608595674
   siga:=       0.0125367729
   sigb:=        0.279782456
Std Err:=       0.0740523773
   Corr:=        0.987623441

  ----------------------------------------
  |     (c) Poly Software International   |
  ----------------------------------------
```

Objective: To test 2 of the shock-forming cascades and to examine effects of RELIEF and SPACING on Runoff volumes and hydrographs. Also to check effects of adjusting G on steep slopes. DAW

Cascades chosen:

CAS1.PAR — planes 180 + 181 (370m, 320) — CAS1.PAR
CAS2.PAR — planes 263, 264, 265, 310, 380, 530 — CAS2.PAR

	PDEC 20	Runoff PMAR 16	PFEB 56	PAVG 67	
CAS1.PAR n = .101	0.8414/2.46	1.93/3.89	.089/.56	.250/1.05	CV=0
CV=0.8	1.43/3.54	2.37/4.56	.221/1.11	.40/1.52	CV=.8
CV=0.8, n=.151	0.82/2.39	1.39/3.05	.149/.745	.275/1.04	
CAS2.PAR CV=0.8, n=.151 RE=20 SPM=1.0	0.43/1.75	.612/1.59	.078/.397	.143/.562	

n .101
.151
KS 12.66

Note: Cascades seem to work o.k. shocks are generated but in many cases die before they reach the lower boundary

263 - .005
264 .007
265 .010

CAS2.PAR CV=0.8 n=.151 RELIEF=30 on 265	0.545/1.~~79~~ 58	.804/1.82	.109/.445	.193/.~~646~~ 687
relief=50 in 265	0.775/1.79	1.23/2.13	.158/.520	.306/.921
Plot PTEST.PAR	~~2.76~~ 4.44 DAW	~~2.52~~ 6.30 DAW	~~2.58~~ 1.99 DAW	~~1.28~~ 2.48 DAW
PAVG RELIEF=30	3.42	4.41	0.74	0.95
CAS1.PAR RE(180)=50 RE(181)=50	2.00	2.91	.305	.581
RE(181)=100	2.65	3.62	.522	.946

Need to run AVG plot

	PDEC20	PMAR16	PFEB56	PAUG67
CAS 2				
R(263)=50				
R(264)=100				
R(265)=150	2.04	2.82	.345	.700

+~~80~~ min
+~~100~~
+120 min.

On the basis of the above investigation we will set RELIEF = 50 mm for single planes
100 mm for the second plane in cascade
150 mm for the third plane in cascade.

There is no data to support this. It can be investigated with a detailed hillslope study. !!

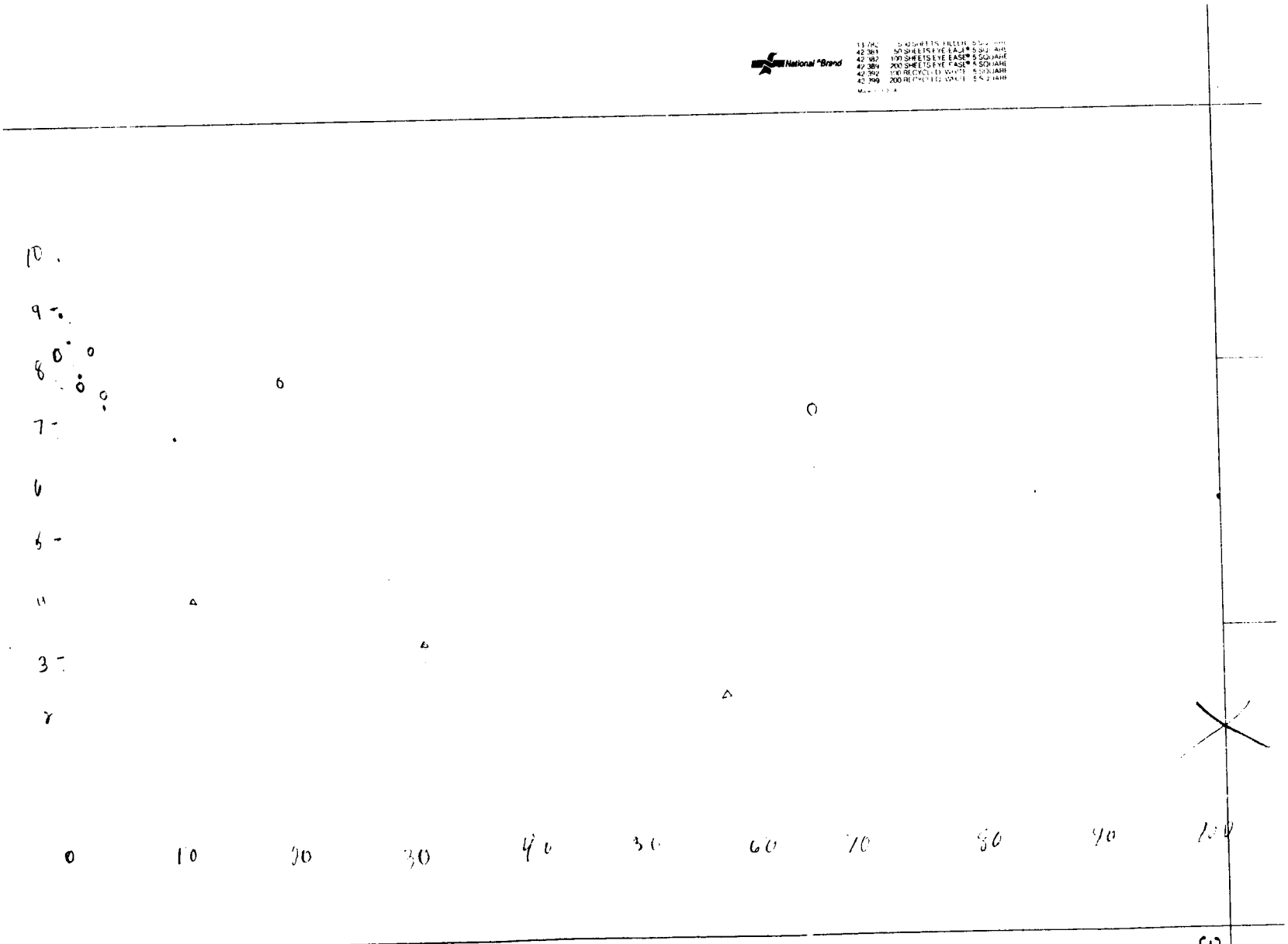
Summary Table

Runoff for Storm ~~N~~ (in mm)

	RELIEF (mm)	PMAR16	PDEC20	PFEB56	PAUG67
~~Plot~~	~~30~~	~~6.30~~	~~4.44~~	~~0.74~~	~~0.95~~
Plot	20	6.30	4.44	1.99	2.48
Ave. Plane	30	4.41	3.42	0.74	0.95
Cascade 1		2.91	2.00	0.31	0.58
180	50				
181	50				
180	50	3.62	2.65	0.52	0.95
181	100				
Cascade 2		0.80	0.55	0.11	0.19
263	20				
264	20				
265	30				
263	50	~~2.04~~ 2.82	2.04	0.35	0.70
264	100				
265	150				
Solitario					

SOLUTION [illegible]	STRAW [illegible] MASS	
Element	Acc (%)	CO [illegible] m^3	[illegible] (mm)
1	2.35	159	7.76
3	3.26	269	8.25
4	9.2	721	7.[illegible]
7	19.4	1501	7.73
10	27.5	2106	7.[illegible]
13	35.6	2669	7.[illegible]
16	43.2	3198	7.[illegible]
20	53.3	3884	7.[illegible]
24	65.1	4641	7.[illegible]
45	123	8569	6.96
57	5.47	442	6.[illegible]
222	.35	78.1	6.72
68	15.32	1228	8.01
69	24.35	1879	7.7[illegible]

DAW


National Brand
42 387 50 SHEETS EYE EASE® 5 SQUARE
42 387 100 SHEETS EYE EASE® 5 SQUARE
42 389 200 SHEETS EYE EASE® 5 SQUARE
42 392 100 RECYCLED WHITE 5 SQUARE
42 399 200 RECYCLED WHITE 5 SQUARE
10
9
8
7
6
5
4
3
2
0
10
20
30
40
50
60
70
80
90
100

SOLITARIO CANYON | SOLW84 PRODUCTION RUNS | DAW 8/30/96

RAINFALL INPUT FROM SOL50-1. sequence — DAW

STORMS

✓ PMAR16			200
✓ PDEC20			200
✓ PAUG67			200
✓ PFEB56			200
✓ PSEP56	- largest	17.1	[illegible]
✓ PNOV 92	- 2nd	13.[illegible]	180
PNOV 70	- 3rd	12.1	150

All [illegible] K_c = [illegible]

OUT NAMES

SOL1XX.CSV where XX is the storm #

Transfer infiltration volume [illegible] depth of infiltration - [illegible] Area.

Get peak flow rates at ( ) in mm/hr.

Area		98	16	20	67	56	58	92	70	14 *
1.23	45	29.44	15.7	9.22	4.4	2.25	21.2	46.3	22.1	14.76
2.18	71	27.28	14.3	8.4	3.9	1.95	20.2	42.9	20.4	13.76
3.55	115	23.98	12.2	7.4	3.2	1.49	18.6	37.7	18.2	12.1
8.91	254	14.34	6.2	4.1	1.2	.52	13.8	22.1	10.7	6.9
10.72	284	12.07	5.1	3.4	0.92	.38	12.3	18.6	9.0	5.8
							2.	1.	4.	5
200		3					1 *			
150										

56 - 95% completed 89 channel. Run time error M6 202
MATH - log: SING error - might try with D=180

6/22 PAUG14 - 3rd largest r.o. vol - plot 5th largest peak
PMAR3 - 5 " " " - Solitario Canyon
PNOV 70 - 4 " peak r.o. " " 4th in plot volume
PSEP98 - 3rd largest r.o. vol Solitario Canyon 3rd peak flow

3/17 89-12.75

* [illegible]

Solitario Canyon	Reduction in Runoff with Area	DAV 9/27/96	1

We have simulated data showing the reduction in runoff per unit area as a function of length (cascades) and area (Solitario Canyon and sub watersheds) Both are affected by the percent of RELIEF. DMR 380

We have no data to show what an appropriate value for RE should be. However, Simanton et al (1973) an engineer stationed at Walnut Gulch obtained a regression relationship between Curve Number, CN and area.

$$CN = 90.227x^{-0.0088}$$ x = area in hectares

$$Q = \frac{(R - 0.2S)^2}{R + 0.8S}$$

Q = R.O. vol.
S = storage parameter } all in inches
R = rain fall depth

$$S = \frac{1000}{CN} - 10$$

Area (ha)	CN	S	Q R=1.00"	Q R=.75"
[illegible]	90.78	1.0158	0.35 (8.89)	
1	90.23	1.083	0.329 (8.35)	0.176
2	89.67	1.152	0.308 (7.82)	
4	89.13	1.220	0.289 (7.34)	
10	88.41	1.311	0.266 (6.76)	
100	86.64	1.54	0.215 (5.46)	
1000	84.90	1.78	0.17 (4.36)	

1 ha = 100m x 100m

.635
.5922
.5715
.415

CNWRA Solitario Canyon	Runoff as function of Area - omit winter	DAW 1-31-97

If we omit the winter storms, the ranking by vol. in Table 2 Phase 2 Report "

		R.O. Vol (mm)	$T = \frac{m+1}{n}$
1	PSEPT 58	7.86	51
2	PSEPT 98	6.35	25.5
3	PAUG4	~~3.70~~ 5.37	17
4	PAUG96	3.70	12.75

DAW

Area (Km²)	Peak rate (mm/hr) for storm # 58	98	4	96
1.23	21.2		26.2	16.5
2.18	20.2		24.8	15.6
3.55	18.6		22.1	13.7
8.91	13.8		12.2	7.3
10.77	12.3		10.05	6.1

No. 5505 Engineer's Computation Pad ALVIN

Solitario Canyon | Cut off studies Computation duration | fw + DAW 9/18/96

	duration	comp. duration	storage (mm)	
✓PAUG 14	28	150	.24	1%
✓PAUG 7	48	180	.21	"
✓PSEP 98	103	200	.10	382
✓PAUG 4	47	150	.19	
✓[illegible]	[illegible]	200	.17	
✓[illegible]	[illegible]	150	.23	
✓[illegible]	69	200	.23	DAW
✓[illegible]	48	250	.09	
✓PMAR 3	93	220	.18	
✓PFEB 60	17	180	.14	
✓PDEC 20		200	.17	
✓PMAR 16		180	.12	
✓PAUG 97	36	200	.13	

Note: This is 1st 50 yr simulation.

1. Create files of Solitario Geometry with seasonal variations in initial water content and saturated hydraulic conductivity

Seasons for initial water content (Table 3 p15 Report I)

Jan-Feb-Mar-Apr SAT = 0.325

May-June-July-Aug-Sept-Oct SAT = 0.155

Nov-Dec SAT = 0.235

Daw

<u>FMIN Estimates</u> From Table 2 p13 Report I

Spring Average for Dec-June $(16.9+15.8)/2 = 16.35$ mm/hr

Fall Average for July-Nov $(7.1+10.8)/2 = 8.95$ mm/hr.

<u>File Names - Parameter files</u>

	Solitario Canyon	Average Slope
SAT average for Jan-Apr, KS for spring	SOLJ_A.PAR ✓	AVGJ_A.PAR ✓
SAT average for May-Oct, KS for Dec-June	SOLM_J.PAR ✓	AVGM_J.PAR
SAT average for May-Oct, KS for July-Nov	SOLJ_O.PAR ✓	AVGJ_O.PAR ✓
SAT average for Nov-Dec, KS for July-Nov	SOLN.PAR ✓	AVGN.PAR ✓
SAT average for Nov-Dec, Ks for Dec-June	SOLD.PAR	AVGD.PAR ✓

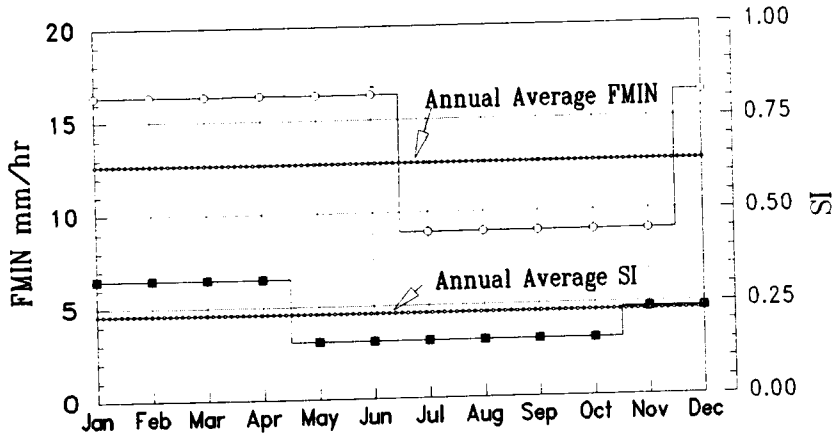
- Need [illegible] showing SAT + KSAT as a function of month. ✓

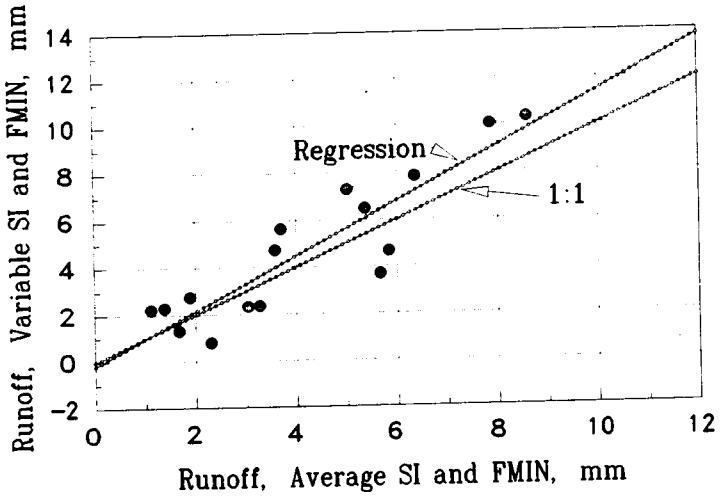
.PAR FILE	.PRE FILE	RUNOFF (mm)	
AVGJ_A.PAR	PJAN11.PRE ✓ *	3.94	
AVGJ_O.PAR	PAUG[illegible].PRE ✓ *	7.09	
AVGJ_O.PAR	PAUG7.PRE ✓	3.74	
AVGJ_O.PAR	PSEP98.PRE ✓ *	10.50	
AVGJ_O.PAR	PAUG4 ✓	9.19	
AVGJ_A	PAPR28 ✓ *	6.95	
AVGN	PNOV85 ✓	4.11	
AVGJ_O	PAUG96 ✓	6.82	
AVGJ_A	PMAR3 ✓ *	5.68	
AVGJ_A	PFEB60 ✓ *	2.62	
AVGD	PDEC20 ✓	1.90	
AVGJ_A	PMAR16 ✓ *	4.04	
AVGJ_O	PAUG97 ✓	4.40	
6. SOLJ_O	PSEP.98	7.80	Channel Inf. 2.07
AVGJ_O.PAR	PSEP58.PRE ✓	12.88	
AVGN.PAR	PNOV72 ✓	13.46	
AVGN.PAR	PNOV70 ✓	10.02	

				Storage	Channel Inf.	
15	SOLJ_A.PAR	PMAR3.PRE	3.68	.30	1.30	180
11	SOLJ_A.PAR	PJAN11	2.35	.17	.993	230
8	SOLJ_A	PAPR28	4.65	.18	1.50	200
16	SOLJ_A	PFEB60	1.31	.15	.840	180
13	SOLJ_A	PMAR16	2.33	.12	1.11	180
3.	SOLJ_O	PAUG14	4.73	.13	1.60	200
5.	SOLJ_O	PAUG7	2.22	.16	1.09	20[illegible]
7.	SOLJ_O	PAUG4	6.46	.12	1.91	18[illegible]
9	SOLN.	PNOV85	2.30	.12	1.09	20[illegible]
14	SOLJ_O	PAUG96	5.62	.10	0.97	200
12	SOLD.	PDEC20	0.79	.17	0.60	200
10.	SOLJ_O	PAUG97	2.76	.12	1.22	20[illegible]
2	SOLN.	PNOV[illegible]	10.30	.10	2.37	20[illegible]
4	SOLN.	PNOV70	7.27	.12	2.03	200
1.	SOLJ_O.	PS[illegible]58	10.03	.08	2.4[illegible]	240
		Σ	74.6		23.09	

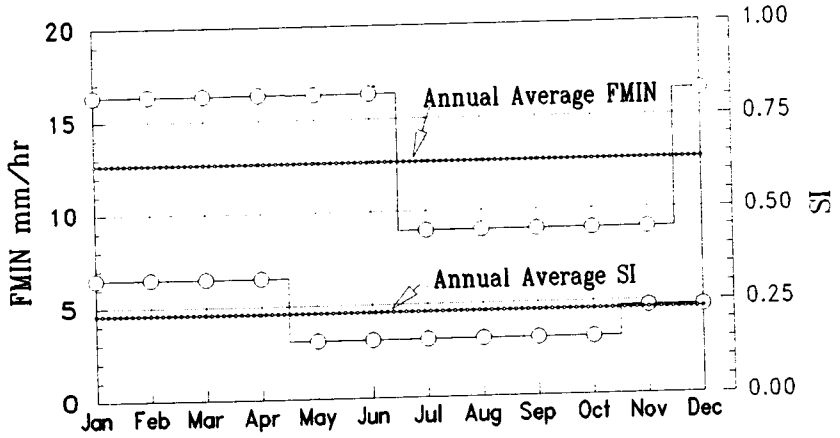
FILE: D:\1SIPLOT\VARPAR.PSD 2.88 mm 0.89 mm

Est. An. Avg


20
15
10
5
0
FMIN mm/hr
1.00
0.75
0.50
0.25
0.00
SI
Annual Average FMIN
Annual Average SI
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec



Effect of variable SI and FMIN on runoff


20
15
10
5
0
FMIN mm/hr
1.00
0.75
0.50
0.25
0.00
SI
Annual Average FMIN
Annual Average SI
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

E:\CONSULT\SWRI\SEASON\RUNOFF.PDW

PLOT R.O. (mm)	SOL R.O. (mm)	CH INF (mm)	AVG R.O. (mm)	Ind5	Dep6	Ind7
17.1000	7.8600	2.1500	12.8800	17.1000	13.8003	17.1000
13.3600	8.5900	2.1900	13.3600	13.3600	10.0983	13.3600
13.3200	3.5800	1.3600	7.0900	13.3200	10.0587	13.3200
12.1000	5.0200	1.6700	10.0200	12.1000	8.8511	12.1000
10.3600	1.1100	0.7300	3.7400	10.3600	7.1288	10.3600
10.3000	6.3500	1.8800	10.5000	10.3000	7.0694	10.3000
9.9700	5.3700	1.7400	9.1900	9.9700	6.7427	9.9700
9.4400	5.8400	1.6700	6.9500	9.4400	6.2181	9.4400
9.2400	1.3800	0.8200	4.1100	9.2400	6.0201	9.2400
8.5300	1.8900	1.0000	4.4000	8.5300	5.3173	8.5300
8.4400	3.2700	1.1400	3.9400	8.4400	5.2283	8.4400
7.7600	2.3000	1.0400	1.9000	7.7600	4.5552	7.7600
7.5200	3.0400	1.2700	4.0400	7.5200	4.3176	7.5200
7.4400	3.7000	1.4500	6.8200	7.4400	4.2384	7.4400
7.4100	5.6400	1.6900	5.6800	7.4100	4.2087	7.4100
6.5800	1.6700	0.9500	2.6200	6.5800	3.3871	6.5800

Note: with the computer I had at this time, 33 MHz, it took about 20 min. for each Solitario Canyon Run. This study was designed to see if there would be a high correlation between runoff simulated for Solitario Canyon and that simulated for an average plane element or for a typical erosion simulator plot. 9/17/99

E:\CONSULT\SWRI\SEASON\RUNOFF.PDW

Dep8	C9	C10	C11	C12	C13	C14
7.7376						
5.8733						
5.8533						
5.2452						
4.3778						
4.3479						
4.1834						
3.9192						
3.8195						
3.4655						
3.4207						
3.0817						
2.9621						
2.9222						
2.9072						
2.4935						

Straight Line: y=ax+b

Data File Name: Sheet: Untitled1

Save Data

Independent:	PLOT
Dependent:	SOL
Weight factor:	0
a:	0.49849168
b:	-0.78658584
Sum Sqrs:	50.22326547

Covaraince Matrix

cvm[1,1]:	0.0084115259
cvm[2,1]:	-0.083521195
cvm[2,2]:	0.89181327

Goodness of Fit Statistics ...

__ C O D:	0.37036233
__ Corrl:	0.60857401
__ M S C:	0.21261075

Parameter Statistics
__ 95 % Confidence Intervals

Parameter b:	-0.78658584
StdDev:	1.78865022

__ Uninvariant ...

LOW:	-4.62285899
HIGH:	3.04968730

Supporting Plane:

LOW:	-5.67774583
HIGH:	4.10457414
Parameter a:	0.49849168
StdDev:	0.17371041

__ Uninvariant ...

LOW:	0.12591991
HIGH:	0.87106346

Supporting Plane:

LOW:	0.023471242
HIGH:	0.97351212

(c) Poly Software International

DAW

Straight Line: y=ax+b

Data File Name: Sheet: Untitled1

Save Data

Independent:	PLOT
Dependent:	AVG
Weight factor:	0
a:	0.98984250
b:	-3.12601741
Sum Sqrs:	74.13747788

Covaraince Matrix

cvm[1,1]:	0.0084115259
cvm[2,1]:	-0.083521195
cvm[2,2]:	0.89181327

Goodness of Fit Statistics ...

__ C O D:	0.61107005
__ Corrl:	0.78170969
__ M S C:	0.69435602

Parameter Statistics
__ 95 % Confidence Intervals

Parameter b:	-3.12601741
StdDev:	2.17316074

__ Uninvariant ...

LOW:	-7.78698360
HIGH:	1.53494877

Supporting Plane:

LOW:	-9.06864204
HIGH:	2.81660721
Parameter a:	0.98984250
StdDev:	0.21105336

__ Uninvariant ...

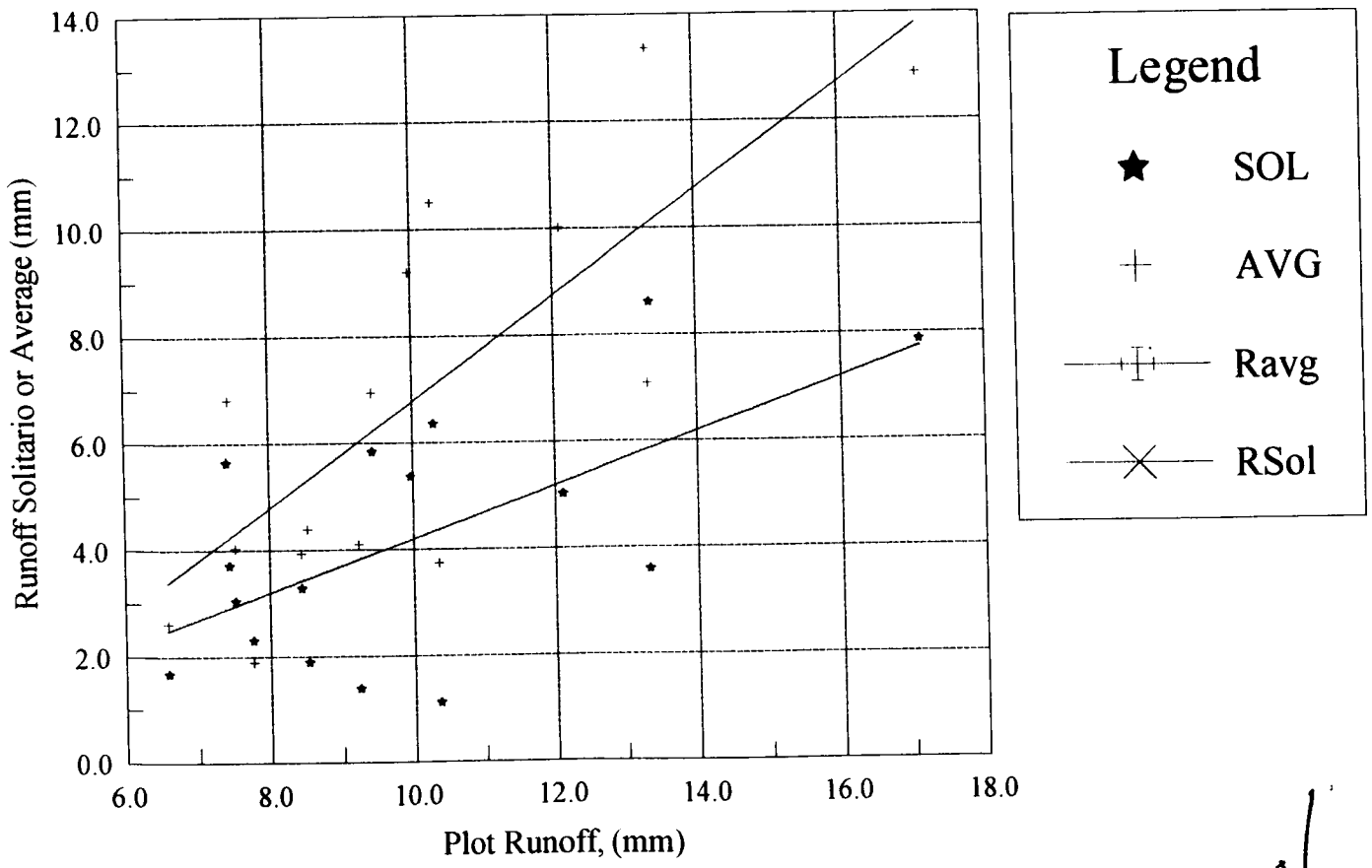
LOW:	0.53717806
HIGH:	1.44250695

Supporting Plane:

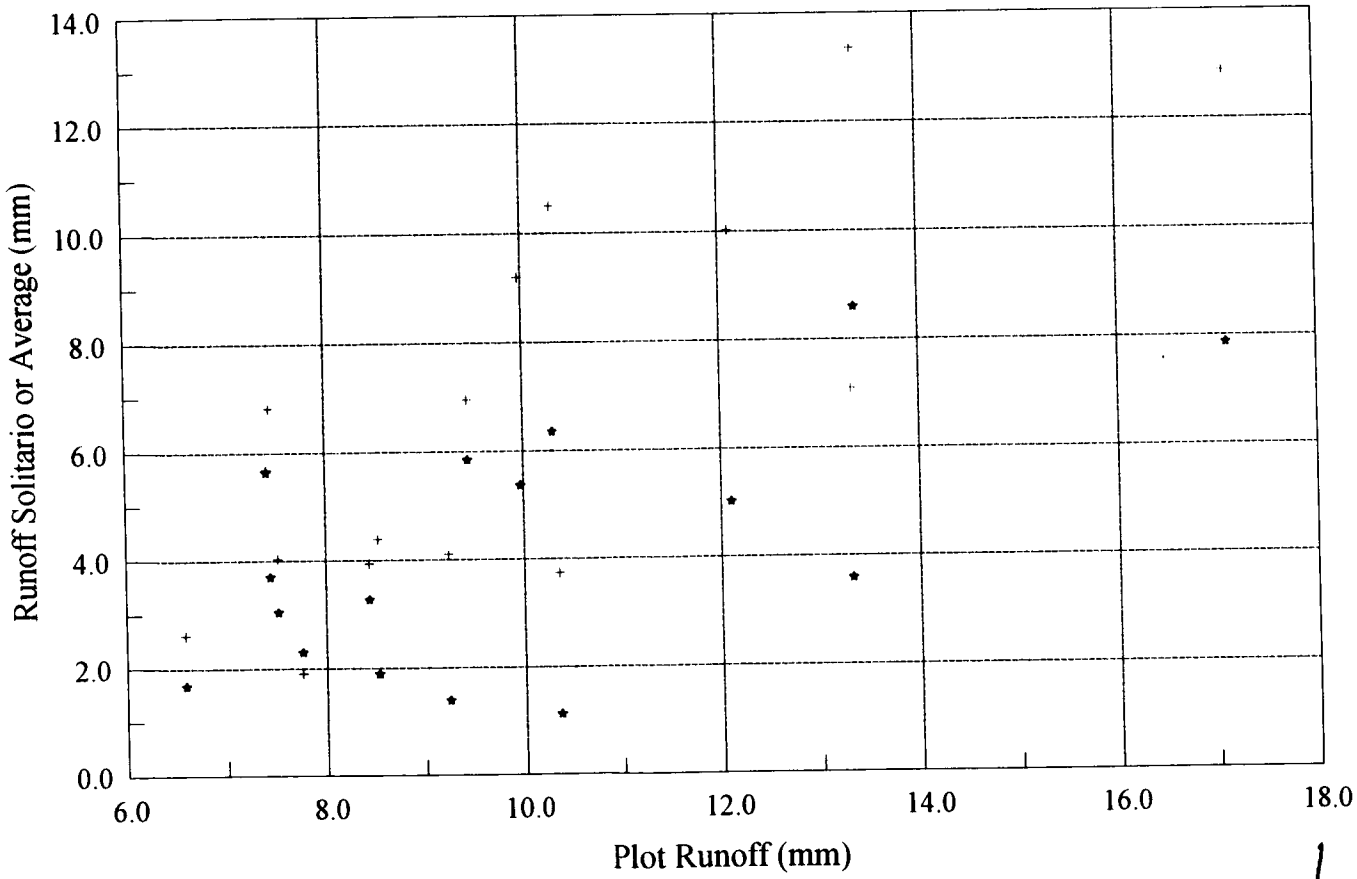
LOW:	0.41270576
HIGH:	1.56697925

(c) Poly Software International

Relationship between plot, average plane and watershed runoff



Relationship between plot, average plane and watershed runoff



```
BEGIN GLOBAL Hypothetical Watershed , Woolhiser Func.,
  CLEN = 300,  UNITS = METRIC
 END GLOBAL
!-----------------------------------------------------
BEGIN PLANE
  ID = 195, LEN = 200, WID = 137, SL = .15,  MANNING = .151
  SAT = .251, CV = 0.8,  PR = 1
  RELIEF = 50,  SPACING = 1.
  KS        G        DIST     POR       ROCK
  12.66     80.      0.25     .34       0
 END PLANE
!-----------------------------------------------------
 BEGIN PLANE
  ID = 196, LEN = 450,  WID = 201, SL = .11,  MANNING = .151
  SAT = .251, CV = 0.8,  PR = 1
  RELIEF = 50,  SPACING = 1.
  KS        G        DIST     POR       ROCK
  12.66     80.      0.25     .34       0
 END PLANE
!-----------------------------------------------------
 BEGIN PLANE
  ID = 197, LEN = 400,  WID = 103, SL = .12,  MANNING = .151
  SAT = .251, CV = 0.8,  PR = 1
  RELIEF = 50,  SPACING = 1.
  KS        G        DIST     POR       ROCK
  12.66     80.      0.25     .34       0
 END PLANE
!-----------------------------------------------------
BEGIN CHANNEL
  ID = 198, UP = 195, LEN = 350,  PR = 1,  LAT = 196,197
  WIDTH     SLOPE     MANNING     SS1     SS2
    0.7     .093      .0651     0.26    0.27
  SAT = .13   DEPTH = 0.5   WO = YES
  KS        G        POR      ROCK      DIST
  61.       63.      .44       0         .7
 END CHANNEL
 !----------------------------------------------------
 BEGIN PLANE
```

```
 ID = 199, LEN = 120, WID = 137, SL = .08,  MANNING = .151

 SAT = .251, CV = 0.8,  PR = 1

 RELIEF = 50,  SPACING = 1.

 KS        G        DIST     POR       ROCK
 12.66     80.      0.25     .34       0

END PLANE
!-----------------------------------------------------
BEGIN PLANE

 ID = 200, LEN = 450,  WID = 179, SL = .13,  MANNING = .151

 SAT = .251, CV = 0.8,  PR = 1

 RELIEF = 50,  SPACING = 1.

 KS        G        DIST     POR       ROCK
 12.66     80.      0.25     .34       0

END PLANE
!-----------------------------------------------------
BEGIN PLANE

 ID = 201, LEN = 200,  WID = 137, SL = .17,  MANNING = .151

 SAT = .251, CV = 0.8,  PR = 1

 RELIEF = 50,  SPACING = 1.

 KS        G        DIST     POR       ROCK
 12.66     80.      0.25     .34       0

END PLANE
!-----------------------------------------------------
BEGIN CHANNEL

 ID = 202, UP = 199, LEN = 230,  PR = 1,  LAT = 200,201

 WIDTH     SLOPE     MANNING     SS1     SS2
   0.5     .014       .0651     0.26    0.27

 SAT = .13   DEPTH = 0.5    WO = YES

 KS       G       POR       ROCK      DIST
 61.      63.     .44        0         .7

END CHANNEL
!-----------------------------------------------------
BEGIN PLANE

 ID = 203, LEN = 800,  WID = 219, SL = .10,  MANNING = .151

 SAT = .251, CV = 0.8,  PR = 1

 RELIEF = 50,  SPACING = 1.
```

```
 KS        G        DIST     POR       ROCK
 12.66     80.      0.25     .34       0

 ND PLANE
 ----------------------------------------------------
BEGIN PLANE

 ID = 204, LEN = 220,  WID = 224, SL = .20,  MANNING = .151

 SAT = .251, CV = 0.8,  PR = 1

 RELIEF = 50,  SPACING = 1.

 KS        G        DIST     POR       ROCK
 12.66     80.      0.25     .34       0

END PLANE
!----------------------------------------------------
BEGIN CHANNEL

 ID = 205, UP = 202,198, LEN = 340,  PR = 2,  LAT = 203,204,

 WIDTH     SLOPE     MANNING     SS1     SS2
   2.1     .035      .0651     0.26    0.27

 SAT = .13   DEPTH = 0.5   WO = YES

 KS       G       POR       ROCK      DIST
 61.      63.     .44        0         .7

END CHANNEL
!----------------------------------------------------
```

Objectives:

DAW

1. To visit Mercury NV rainfall simulator sites for visual comparision with Solitario Canyon, land surface, vegetation etc. to see if FMIN obtained is reasonable.
   - Could not find exact site. Did find general area

2. To make field measurements of the washes in the Solitario Canyon watershed to see if the technique used to estimate bottom widths and side slopes gave reasonable results. Also to get pictures for estimating Mannings n. and a better idea of sat. hydraulic conductivity.
   - Paced widths at selected channel segments and took pictures.

3. To select an area for a detailed hillslope study. We will need a map at a much smaller contour interval to perform such a study. - Have a map at 10' contour interval.

Strategy for wash measurement.

Need to write a modified project proposal with estimated cost.

SWRA STUDY SOLITARIO CANYON	ITEMS TO DISCUSS WITH GORDON WITTMEYER	DA - Woolhiser 1/7/97

1. Have been unable to get short-time-interval rainfall data. Have been in communication with Dr. Richard French but apparently the data he had analyzed for his intensity duration - frequency study was not archived. ✓

DAW

2. I have obtained hydrograph data for rainfall simulator studies at Mercury, NV, from ARS - Tucson. After looking at the simulator plot sites, we may wish to do additional work on the analysis & compare hydrographs.

1-8-97

Visited Mercury, NV. Were unable to find the exact locations of the rainfall simulator plots, given the description from but we were in the vicinity. Not much visual difference between here and Solitario Canyon for Mannings n values and Ks should be of the same order of magnitude

Made a quick tour of the lower 1/3 of Solitario Canyon. The channels are not well-defined and there is no evidence of recent surface runoff. The channels should have a greater roughness value - they are not sand-bedded channels like Walnut Gulch.

1-9-97

Went to Solitario Canyon. Located channel reaches on the ground and paced width of channel bottoms and took photos for assistance in estimating Mannings's n and possibly FMIN. There was no evidence of recent runoff at the USGS gaging station at the mouth of Solitario Canyon. Channels are also poorly defined and the surface is gravel covered but underneath is a fine sand

In the upper reaches of the main channel, there was evidence of flow - possibly in the summer. This raises a question regarding possible rainfall gradients

Hillslopes are covered with erosion pavement, and there is quite a bit of vegetation - brush, shrubs, some burned grass. Annual grasses were coming up under brush clumps and some shrubs were getting new leaves.

PNWRA Solitario Canyon	Future Studies under Phase II Outline	D. A. Woolhiser 1/17/97	1

DAW

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1. Figure 11 on p 32 of the Sept. 30, 1996 Phase 2 report shows that the simulated peak runoff rates for the PSENT98 storm (approx. 17 yr recurrence interval) are over twice as great as those observed at peak stage gages in the region.

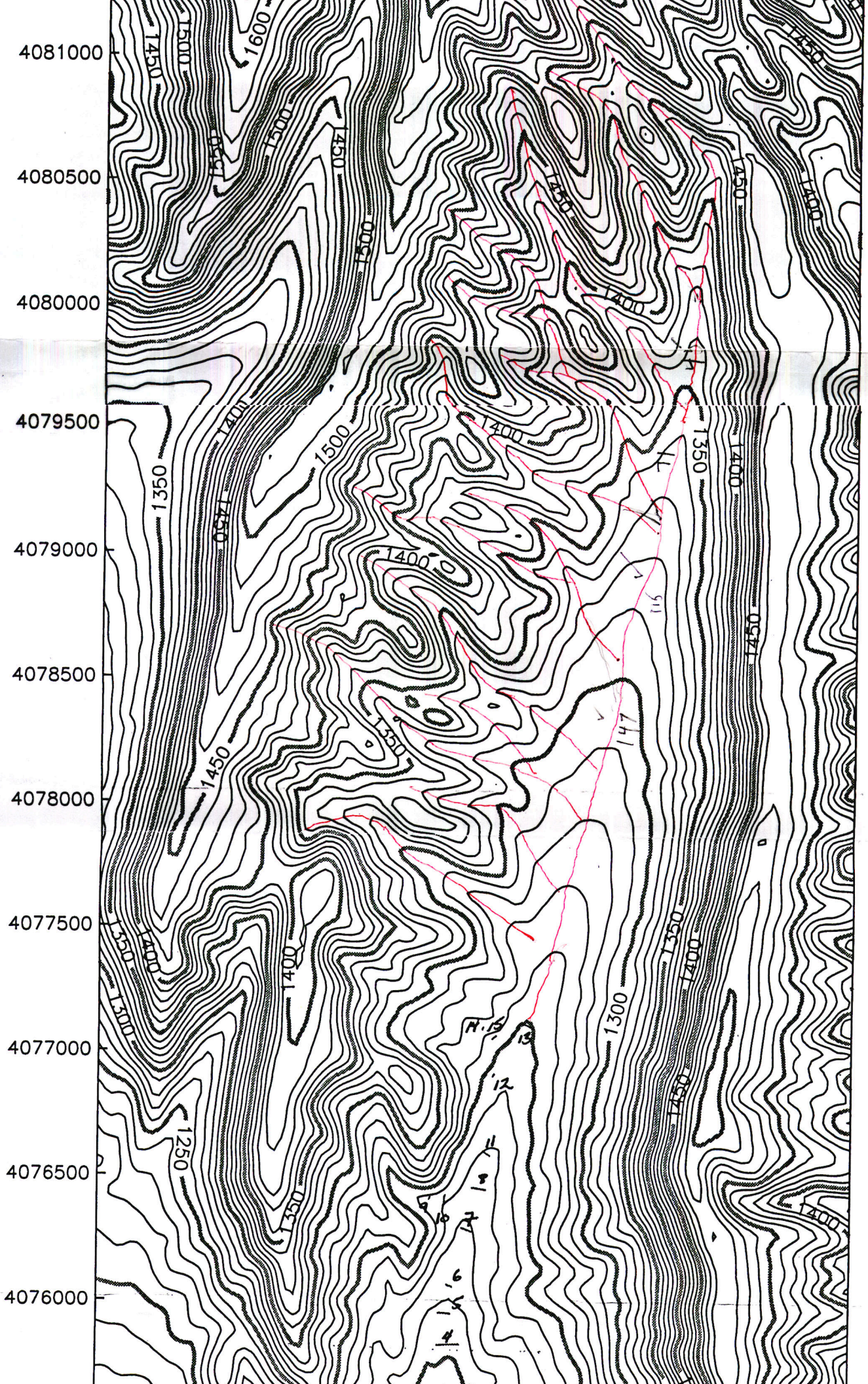
Our field investigations suggests that the Manning n values used are probably too small for the first and second order channels. n for these channels will be increased to 0.0651 and the PSENT98 storm will be run again.

Field investigations showed that the technique used to estimate channel bed widths, BW, is reasonably accurate, except for a few channels. Their width will be decreased to conform with field measurements.

The effective wetted perimeter factor in the channel infiltration routine in KINEROS will be studied by creating discharge-depth and discharge-wetted area curves using the cross sections surveyed by Wittmeyer and Stothoff.

2. After the above checks have been made and if the discharges are still too high. A run will be made with FMIN for planes set 30 mm/hr. based on the estimates by Schmidt (1988).

SCLW2543.2912 includes n = 0.0651 on 1st & 2nd order channels. Subdirectory SCL97.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Rainfall Files — 2nd 50 yr simulation — 401 1/3

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SOL50_2	DAY	127750	08-21-96	4:18p					
SOL50_2	CON	1599	01-24-97	4:04p					
SOL50_2	DUR	17520	01-27-97	12:03p					
SOL50_2	MAX	5960	01-27-97	12:34p					
PNOV1	PRE	457	01-27-97	12:17p	[illegible]	[illegible]	[illegible]	—	[illegible]
PAPR2	PRE	456	01-27-97	12:17p	175	14.0	[illegible]		[illegible]
PJUL3	PRE	458	01-27-97	12:18p	65.9	17.0	0.84	1.46	0.07
PAUG4	PRE	451	01-27-97	12:18p	[illegible]	26.7	11.1	[illegible]	5.44
PNOV5	PRE	458	01-27-97	12:18p	[illegible]	[illegible]	0.03	—	[illegible]
PFEB6	PRE	456	01-27-97	12:19p	175	19.2	0.09	0.17	[illegible]
PJUL7	PRE	453	01-27-97	12:19p	79.3	32.4	3.73	5.71	.10
PNOV8	PRE	453	01-27-97	12:19p	415	21.3	0.06	0.15	0
PMAY9	PRE	453	01-27-97	12:19p	91	13.0	0.02	0.04	0
PAUG10	PRE	456	01-27-97	12:20p	69.4	14.3	0.23	4.3	0.06
PDEC11	PRE	456	01-27-97	12:20p	222	15.2	0.01	—	0
PFEB12	PRE	353	01-27-97	12:20p	480	23.7	0	0	0
PNOV13	PRE	457	01-27-97	12:20p	352	13.7	0	0	0
PNOV14	PRE	452	01-27-97	12:21p	347	[illegible]	[illegible]	—	0
PFEB15	PRE	350	01-27-97	12:21p	482	19.3	0	0	0

Press any key to continue . . .

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PJUN16	PRE	456	01-27-97	12:21p	91	15.5	0.02	[illegible]	0
PJUL17	PRE	456	01-27-97	12:21p	17.9	16.3	4.41	15.3	.33
PAUG18	PRE	453	01-27-97	12:21p	[illegible]	16.5	3.7	7.4	.46
PJAN19	PRE	458	01-27-97	12:22p	455	15.5	0		0
PFEB20	PRE	352	01-27-97	12:22p	283	23.4	0.01	neg	0
PAUG21	PRE	456	01-27-97	12:22p			0.06		0
PFEB22	PRE	455	01-27-97	12:22p	223	26.4	0.51	1.98	0.23
PNOV23	PRE	457	01-27-97	12:22p	[illegible]	[illegible]	[illegible]	—	0
PNOV24	PRE	458	01-27-97	12:22p	[illegible]	[illegible]	0.00	—	0
PJUN25	PRE	454	01-27-97	12:22p	93	17.0	.05	—	0
PNOV26	PRE	457	01-27-97	12:23p	[illegible]	[illegible]	[illegible]	—	0
PDEC27	PRE	457	01-27-97	12:23p	356	13.3	0	0	0
PJUN28	PRE	456	01-27-97	12:23p	41	14.5	0.65	3.3	0.37
PNOV29	PRE	451	01-27-97	12:23p	121	16.3	0.13	0.23	0.01
PJAN30	PRE	352	01-27-97	12:24p	480	16.0	0.01	—	
PAUG31	PRE	456	01-27-97	12:24p	[illegible]	20.1	0.71	1.5	0.04
PAUG32	PRE	450	01-27-97	12:24p	124	20.8	0.71	2.[illegible]	0.23
PAUG33	PRE	458	01-27-97	12:24p	114	14.3	0.03		0
PAUG34	PRE	456	01-27-97	12:24p	43	14.7	0.09		0.003
PNOV35	PRE	455	01-27-97	12:24p	—	31.0	1.74	[illegible]	0.09
PNOV36	PRE	353	01-27-97	12:25p	480	[illegible]	0.13	0.30	0.003
PNOV37	PRE	456	01-27-97	12:25p	176	12.7	0.77	2.44	0.14

Press any key to continue . . .

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PFEB38	PRE	454	01-27-97	12:25p	[illegible]	13.5	0	0	
PAUG39	PRE	456	01-27-97	12:25p	[illegible]	[illegible]	3.04	[illegible]	.41
PJAN40	PRE	457	01-27-97	12:25p	223	13.7	0		
PNOV41	PRE	455	01-27-97	12:25p	234	20.6	0.56	1.39	0.05
PFEB42	PRE	355	01-27-97	12:25p	480	13.0	0	0	
PAUG43	PRE	456	01-27-97	12:25p	34	13.2	1.34	4.[illegible]	0.34

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PNOV44	PRE	456	01-27-97	12:25p	253	[illegible]	0.03	0.04	0
PFEB45	PRE	449	01-27-97	12:26p	[illegible]	26.4	0.78	[illegible]	0.51
PAUG46	PRE	455	01-27-97	12:26p	[illegible]	[illegible]	[illegible]	[illegible]	.63
[illegible]N47	PRE	457	01-27-97	12:26p	234	13.7	0.04	[illegible]	
[illegible]AY48	PRE	454	01-27-97	12:26p	99	[illegible]	0.08	0.3	0.10
PMAY49	PRE	449	01-27-97	12:26p	[illegible]	[illegible]	[illegible]	0.08	0.06
PMAY50	PRE	454	01-27-97	12:27p	[illegible]	23.9	3.6	0.6	3.17
PJUL51	PRE	455	01-27-97	12:27p	126	[illegible]	[illegible]	[illegible]	0.01
PNOV52	PRE	355	01-27-97	12:27p	[illegible]	27.2	0.04	—	0
PDEC53	PRE	458	01-27-97	12:27p	333	15.8	[illegible]	—	
PAUG54	PRE	453	01-27-97	12:27p	[illegible]	[illegible]	[illegible]	[illegible]	1.32
PNOV55	PRE	352	01-27-97	12:27p	480	23.6	0.003	—	0
PMAY56	PRE	456	01-27-97	12:27p	[illegible]	[illegible]	0	—	0
PNOV57	PRE	352	01-27-97	12:28p	480	18.0	0.005	—	0.001
PJUN58	PRE	456	01-27-97	12:28p	68	14.7	0.03	—	
PSEP59	PRE	455	01-27-97	12:28p	154	16.3	0.03	[illegible]	

Press any key to continue . . .

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PAUG60	PRE	455	01-27-97	12:28p	41	[illegible]	3.8	[illegible]	2.58
PNOV61	PRE	353	01-27-97	12:28p	480	17.5	0.03	—	0.002
PNOV62	PRE	460	01-27-97	12:29p	216	26.5	6.91	17.9	1.60
PNOV63	PRE	457	01-27-97	12:29p	455	15.1	0.04	—	
PNOV64	PRE	458	01-27-97	12:29p	427	18.1	0.05	0.11	0.01
PDEC65	PRE	355	01-27-97	12:29p	480	[illegible]	0.16	0.11	0.04
PJUL66	PRE	455	01-27-97	12:29p	59	18.0	2.29	5.26	0.33
PJUL67	PRE	453	01-27-97	12:29p	357	[illegible]	0.02	0.04	0
[illegible]OV68	PRE	352	01-27-97	12:30p	480	17.5	0.51	1.25	0.08
[illegible]C69	PRE	350	01-27-97	12:30p	[illegible]	[illegible]	[illegible]	[illegible]	
PDEC70	PRE	457	01-27-97	12:30p	276	16.3	0.06	[illegible]	
PNOV71	PRE	353	01-27-97	12:30p	440	13.5	0	—	
PJAN72	PRE	456	01-27-97	12:30p	[illegible]	24.6	[illegible]	[illegible]	
PAUG73	PRE	459	01-27-97	12:30p	[illegible]	13.5	.76	3.14	0.09
PAUG74	PRE	456	01-27-97	12:30p	121	20.3	1.29	[illegible]	0.07
PMAR75	PRE	453	01-27-97	12:31p	221	17.5	0.01	[illegible]	
PSEP76	PRE	435	01-27-97	12:31p	123	16.5	0.22	[illegible]	0.06
PNOV77	PRE	456	01-27-97	12:31p	38	15.0	2.29	17.11	0.38
PDEC78	PRE	356	01-27-97	12:31p	[illegible]	[illegible]	0.05	[illegible]	
PDEC79	PRE	354	01-27-97	12:31p	[illegible]	[illegible]	0.03	—	
PJAN80	PRE	353	01-27-97	12:31p	[illegible]	[illegible]	[illegible]	0.11	0.06
PFEB81	PRE	354	01-27-97	12:31p	[illegible]	15.3	0	0	

Press any key to continue . . .

PDEC78	PRE	356	01-27-97	12:31p
PDEC79	PRE	354	01-27-97	12:31p
PJAN80	PRE	353	01-27-97	12:31p
PFEB81	PRE	354	01-27-97	12:31p

Press any key to continue . . .

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PMAY82	PRE	457	01-27-97	12:32p	[illegible]	[illegible]	[illegible]	[illegible]	0.23
PAUG83	PRE	436	01-27-97	12:32p	[illegible]	23.9	2.05	[illegible]	.28
[illegible]R84	PRE	456	01-27-97	12:32p	174	[illegible]	0.[illegible]	[illegible]	
[illegible]P85	PRE	457	01-27-97	12:32p	[illegible]	[illegible]	1.2	3.1	0.05
PMAR86	PRE	459	01-27-97	12:32p	[illegible]	[illegible]	0	0	
PJUL87	PRE	453	01-27-97	12:33p	[illegible]	19.9	8.61	[illegible]	4.37
PNOV88	PRE	451	01-27-97	12:33p	185	14.2	0.10	0.24	0.02
PNOV89	PRE	458	01-27-97	12:33p	64	25.4	7.58	17.0	1.85

					Low Durham	Rain mm	Runoff mm	if mm/hr.	3/3
PNOV90	PRE	458	01-27-97	12:33p	456	15.5	0	1.71	0.06
PAUG91	PRE	457	01-27-97	12:33p	78	13.1	.60		
PJAN92	PRE	458	01-27-97	12:33p	402	12.8	0		
EP93	PRE	453	01-27-97	12:33p	100	14.7	0.13	Neg.	
OV94	PRE	355	01-27-97	12:33p	480	17.5	0.001	—	
PJAN95	PRE	351	01-27-97	12:34p	400	24.6	0.004	—	

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DAW

✓ Jan ~~IIII~~ IIII 8
✓ Feb ~~IIII~~ IIII -1 9 } AVGJ-A.
✓ Mar III
✓ April
✓ May ~~IIII~~ I } AVG J.
✓ June III
✓ July ~~IIII~~ II } AvgJ-J.
✓ Aug 17
✓ Sept IIII
Oct 4 — DAW 1-22-98 I found an error in the program which affects the output values. They go to zero the initial water content is lower than it should be. This showed in Nov. which resulted in a slight overestimation of runoff
Nov. ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ III AVG
✓ Dec ~~IIII~~ ~~IIII~~ 8 AVG

CNWRA
Solitario Canyon

Runoff and Infiltration
2nd 50 yr. Simulation

DAW 2/7/97

DAW

	STORM	DURATION	Channel F		Runoff		Est. Ann R.O.	Est Ann Channel F	max n	Stor
	PAUG4	40/200	2.27		8.18		1.39	0.386	51	0.12
	Rev. 2.94		3.31		5.13					0.12
	PAUG60.	41/[illegible]	1.94	[illegible]	6.15	14.23	1.36	0.42	25.5	0.15
	PJUL87.	37/[illegible]	1.93	6.14	5.87	[illegible]	1.34	0.41	7	0.10
			2.08		5.75					0.09
11	PNOV89	69/240 C	1.70	7.84	5.28	25.48	1.34	0.41	12.75	0.12
			1.85		5.14					0.11
	PNOV62.	31/340	1.71	[illegible]	4.75	30.23	1.33	0.42	[illegible]	0.03
6	PAUG54.	35/200	1.26	18.21	2.90	33.12	1.31	0.43	8.5	0.13
7	PJUL17.	18/200	1.26	[illegible]	2.65	35.78	[illegible]	0.44	7.3	0.12
8	PJUL7.	35/280	1.17	13.04	2.12	37.99	1.29	0.45	6.4	0.09
9	PAUG18.	26/260	1.15	14.39	2.12	[illegible]	1.27	0.46	5.7	0.07
	PAUG39.	100/320	49% error than 25.1				-log: 0.46		5.1	
			1.14	15.53	2.07	42.04	1.26	0.46		
	PMAY50.	132/340	1.13	16.60	2.03	44.1[illegible]	1.25	0.47	4.6	0.03
12	PAUG83.	104/310	1.03	17.69	1.67	45.89	1.24	0.48	4.25	0.05
13	PAUG46.	34/200	0.89	18.58	1.35	47.27	1.23	0.48	3.9	0.11

Est. ave. annual channel infiltration = 0.48 mm } est. by
" " " runoff from Solitario = 1.23 mm } proportion

DIR. E:\COMPUT\SURE\SOL97

SOLJ_0.PAR SAT = 0.155, FMIN = 8.95 ✓

SOLM_J.PAR SAT = 0.155, FMIN = 16.35 ✓

SOLN.PAR SAT = 0.235, FMIN = 8.95 ✓

Note: these [illegible] have the higher [illegible] in the first and 2nd order channels and the bottom width of canyons have been changed to correspond with field measurements.

Note: running PAUG4 with revised x-sect. properties for channel F resulted in ~ 1.76% increase in channel F

No. 5505 Engineer's Computation Pad ALVIN

If we hypothesize that winter rainfall events will not cause runoff (Note: in the 40 yrs at Walnut Gulch, no winter storms have caused runoff), we should modify the simulated rainfall series.

If the winter storms are eliminated from consideration, then the storm PAUG4 is the 3rd largest (in terms of runoff). This storm was run using SOLW784B.PAR results were (in first col) PAUG4U PAUG96

Area (Km²)	Peak rate mm/hr	
1.23	26.2	16.55
2.18	24.8	15.62
3.55	22.1	13.75
8.91	12.2	7.33
10.72	10.05	6.08

Rainfall	20.0 mm
Plane F	12.67
Channel F	1.86
Storage	0.11
Outflow	5.33

Rainfall	20.32
Plane F	15.0
Channel F	1.52
Stor	0.095
Outflow	3.63 mm

PAUG 96 becomes the 4th largest.

If these values were plotted on Fig 11 (Phase 2 Report) the values for PAUG 96 pass through the point for #11. Since this storm would have a recurrence interval of about 13 yrs, it should, perhaps, be lower. First, the flood report should be checked to see if winter storms account for runoff in the vicinity of Yucca Mtn. If not, the channel sat cond could be increased in the upper portion of the main channel to create a better fit. (Should also check with USGS to see if they have additional stage gage data.) Note: USGS Report P58 states that sat. hydr cond for channels can range from zero for bedrock to 90 mm/hr.

No. 5505 Engineer's Computation Pad

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Dur	P	RO	No	Ind5	Dep6	C7
40.0000	26.7000	11.1000	4.0000	20.4000	1.3625	
41.0000	26.2000	8.8000	60.0000	14.0000	0.3088	
39.0000	19.8000	8.6100	87.0000	17.0000	0.8027	
64.0000	25.4000	7.5800	89.0000	26.7000	2.3997	
216.0000	26.5000	6.9100	62.0000	25.6000	2.2186	
35.0000	18.5000	4.9000	54.0000	19.2000	1.1649	
18.0000	16.3000	4.4100	17.0000	23.4000	1.8564	
80.0000	23.4000	3.7300	7.0000	21.3000	1.5107	
26.0000	16.5000	3.7000	18.0000	13.0000	0.1442	
120.0000	21.8000	3.6400	39.0000	14.3000	0.3582	
132.0000	23.9000	3.6000	50.0000	15.2000	0.5064	
104.0000	23.9000	3.0500	83.0000	23.9000	1.9387	
34.0000	13.7000	2.7000	46.0000	13.7000	0.2595	
38.0000	15.0000	2.2900	77.0000	18.3000	1.0168	
59.0000	18.0000	2.2900	66.0000	19.3000	1.1814	
332.0000	31.0000	1.7400	35.0000	15.2000	0.5064	
34.0000	13.2000	1.3400	43.0000	16.3000	0.6875	
101.0000	20.3000	1.2900	74.0000	16.5000	0.7204	
69.0000	14.3000	1.2300	10.0000	15.5000	0.5558	
60.0000	16.0000	1.2000	85.0000	23.4000	1.8564	
66.0000	17.0000	0.8400	3.0000	13.3000	0.1936	
120.0000	26.4000	0.7800	45.0000	26.4000	2.3503	
156.0000	12.7000	0.7700	37.0000	13.5000	0.2265	
55.0000	13.5000	0.7600	73.0000	14.9000	0.4570	
295.0000	26.9000	0.7100	31.0000	17.0000	0.8027	
124.0000	20.8000	0.7100	32.0000	15.2000	0.5064	
41.0000	14.5000	0.6500	28.0000	13.3000	0.1936	
48.0000	13.4000	0.6000	91.0000	14.5000	0.3912	
234.0000	20.6000	0.5600	41.0000	16.3000	0.6875	
223.0000	26.4000	0.5100	22.0000	16.0000	0.6381	
480.0000	17.5000	0.5100	68.0000	26.9000	2.4326	
49.0000	13.0000	0.4000	82.0000	20.8000	1.4284	
123.0000	16.5000	0.2200	76.0000	14.3000	0.3582	
480.0000	20.1000	0.1600	80.0000	14.9000	0.4570	
480.0000	23.7000	0.1600	65.0000	31.0000	3.1076	
181.0000	16.3000	0.1300	29.0000	24.4000	2.0210	
100.0000	14.7000	0.1300	93.0000	12.7000	0.0948	
480.0000	24.4000	0.1300	36.0000	13.5000	0.2265	
126.0000	16.0000	0.1200	51.0000	21.8000	1.5930	
107.0000	12.9000	0.1100	49.0000	13.7000	0.2595	
185.0000	14.2000	0.1000	88.0000	20.6000	1.3954	
175.0000	19.2000	0.0900	6.0000	13.0000	0.1442	
143.0000	14.9000	0.0900	34.0000	13.2000	0.1771	
98.0000	15.2000	0.0800	48.0000	18.8000	1.0991	
296.0000	16.3000	0.0600	70.0000	26.4000	2.3503	
83.0000	13.3000	0.0600	21.0000	13.7000	0.2595	
415.0000	21.3000	0.0600	8.0000	13.7000	0.2595	
93.0000	17.0000	0.0500	25.0000	15.2000	0.5064	
208.0000	13.5000	0.0500	23.0000	12.9000	0.1277	
480.0000	31.7000	0.0500	78.0000	23.9000	1.9387	
358.0000	24.6000	0.0500	72.0000	16.0000	0.6381	
437.0000	18.1000	0.0500	64.0000	27.2000	2.4820	

DAW

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Dur	P	RO	No	Ind5	Dep6	C7
455.0000	15.1000	0.0400	63.0000	18.8000	1.0991	
480.0000	27.2000	0.0400	52.0000	18.5000	1.0497	
234.0000	13.7000	0.0400	47.0000	23.6000	1.8893	
480.0000	17.5000	0.0300	61.0000	13.2000	0.1771	
154.0000	16.3000	0.0300	59.0000	18.0000	0.9674	
68.0000	14.7000	0.0300	58.0000	14.7000	0.4241	
333.0000	18.8000	0.0300	53.0000	16.3000	0.6875	
253.0000	18.8000	0.0300	44.0000	26.2000	2.3174	
114.0000	14.3000	0.0300	33.0000	17.5000	0.8851	
465.0000	25.6000	0.0300	5.0000	26.5000	2.3668	
91.0000	13.0000	0.0200	9.0000	15.1000	0.4899	
175.0000	14.0000	0.0200	2.0000	18.1000	0.9838	
91.0000	15.2000	0.0200	16.0000	23.7000	1.9058	
480.0000	22.6000	0.0200	79.0000	18.0000	0.9674	
387.0000	13.6000	0.0200	67.0000	13.6000	0.2430	
218.0000	20.4000	0.0200	1.0000	17.5000	0.8851	
222.0000	15.2000	0.0100	11.0000	15.0000	0.4735	
480.0000	16.0000	0.0100	30.0000	16.3000	0.6875	
174.0000	16.8000	0.0100	84.0000	13.5000	0.2265	
221.0000	17.5000	0.0100	75.0000	24.6000	2.0540	
480.0000	23.4000	0.0100	20.0000	13.5000	0.2265	ok
480.0000	18.0000	0.0050	57.0000	20.3000	1.3460	
446.0000	14.9000	0.0040	24.0000	17.5000	0.8851	
347.0000	18.3000	0.0040	14.0000	16.5000	0.7204	
480.0000	24.6000	0.0040	95.0000	15.0000	0.4735	
360.0000	15.2000	0.0040	26.0000	31.7000	3.2229	
480.0000	23.6000	0.0030	55.0000	22.6000	1.7247	
480.0000	15.0000	0.0020	69.0000	20.1000	1.3131	
480.0000	17.5000	0.0010	94.0000	15.3000	0.5229	
256.0000	13.2000	0.0000	56.0000	13.0000	0.1442	
356.0000	13.3000	0.0000	27.0000	23.9000	1.9387	
223.0000	13.7000	0.0000	40.0000	16.8000	0.7698	
402.0000	12.8000	0.0000	92.0000	16.0000	0.6381	
480.0000	15.3000	0.0000	81.0000	15.1000	0.4899	
480.0000	13.5000	0.0000	71.0000	19.8000	1.2637	
391.0000	13.5000	0.0000	38.0000	14.2000	0.3418	
456.0000	15.5000	0.0000	90.0000	25.4000	2.1857	
480.0000	19.3000	0.0000	15.0000	15.5000	0.5558	
480.0000	13.0000	0.0000	42.0000	13.4000	0.2101	
324.0000	15.1000	0.0000	86.0000	12.8000	0.1113	
350.0000	13.7000	0.0000	13.0000	14.7000	0.4241	
480.0000	23.9000	0.0000	12.0000	17.5000	0.8851	
455.0000	15.5000	0.0000	19.0000	24.6000	2.0540	

Dau

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Descriptive Statistics Report

Data File Name: B:\AVG50_2.PDW

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COLUMN NAME:	DUR
Number of rows:	95
Number of valid points:	95
Number of missing points:	0
Number of negative values:	0
Number of positive values:	95
Number of zero values:	0
Minimum value:	18.00000000
Maximum value:	480.00000000
Inter range value:	462.00000000
Median:	221.00000000
Sum of row value:	23802.0000000
Sum of absolute value:	23802.0000000
Arithmetric mean:	250.54736842
Geometric mean:	181.17776447
Quadratic mean:	301.62880639
Harmonic mean:	116.55740618
Absolute mean:	250.54736842
Sum of squares:	8643094.00000
Variance:	28506.0163494
Standard deviation:	168.83724811
Absolute deviation:	152.54759003
Standard error:	17.32233616

95 percent confidence interval:
□ □ [216.15346392, 284.94127292]

99 percent confidence interval:
□ □ [205.00437859, 296.09035825]

Coefficient of variance:	67.38735640
Skewness:	0.20306479
Coefficient of skewness:	0.28304498
Kurtosis:	-1.55695542
Coefficient of Kurtosis:	1.44304458

Percentiles:

10 percentile:	41.00000000
25 percentile:	91.50000000
50 percentile:	219.50000000
75 percentile:	452.75000000
90 percentile:	480.00000000

Quartiles:

First quartile:	91.50000000
Second quartile:	219.50000000

Third quartile:	452.75000000
Inter quartile:	361.25000000
COLUMN NAME:	P
Number of rows:	95
Number of valid points:	95
Number of missing points:	0
Number of negative values:	0
Number of positive values:	95
Number of zero values:	0
Minimum value:	12.70000000
Maximum value:	31.70000000
Inter range value:	19.00000000
Median:	16.50000000
Sum of row value:	1725.10000000
Sum of absolute value:	1725.10000000
Arithmetric mean:	18.15894737
Geometric mean:	17.60969472
Quadratic mean:	18.75706463
Harmonic mean:	17.12232285
Absolute mean:	18.15894737
Sum of squares:	33423.6100000
Variance:	22.31499888
Standard deviation:	4.72387541
Absolute deviation:	3.92163989
Standard error:	0.48465939

95 percent confidence interval:
[17.19664479, 19.12124995]

99 percent confidence interval:
[16.88470598, 19.43318876]

Coefficient of variance:	26.01403767
Skewness:	0.89958603
Coefficient of skewness:	0.36000000
Kurtosis:	-0.15882447
Coefficient of Kurtosis:	2.84117553

Percentiles:

10 percentile:	13.30000000
25 percentile:	14.30000000
50 percentile:	16.40000000
75 percentile:	21.17500000
90 percentile:	25.58000000

Quartiles:

First quartile:	14.30000000
Second quartile:	16.40000000
Third quartile:	21.17500000
Inter quartile:	6.87500000
COLUMN NAME:	RO
Number of rows:	95

DAW

Number of valid points:	95
Number of missing points:	0
Number of negative values:	0
Number of positive values:	81
Number of zero values:	14
Minimum value:	0
Maximum value:	11.10000000
Inter range value:	11.10000000
Median:	0.050000000
Sum of row value:	94.38700000 ← Av. R.O./yr = 94.387/50 = 1.89 mm
Sum of absolute value:	94.38700000
Arithmetic mean:	0.99354737
Geometric mean:	0
Quadratic mean:	2.33800163
Harmonic mean:	0
Absolute mean:	0.99354737
Sum of squares:	519.29390300
Variance:	4.52676540
Standard deviation:	2.12761966
Absolute deviation:	1.35240111
Standard error:	0.21828917

95 percent confidence interval:
□ □ [0.56012910, 1.42696563]

99 percent confidence interval:
□ □ [0.41963278, 1.56746196]

Coefficient of variance:	214.14375633
Skewness:	2.91262870
Coefficient of skewness:	0.89152542
Kurtosis:	8.67689619
Coefficient of Kurtosis:	11.67689619

Percentiles:

10 percentile:	0
25 percentile:	0.010000000
50 percentile:	0.050000000
75 percentile:	0.74750000
90 percentile:	3.63600000

Quartiles:

First quartile:	0.010000000
Second quartile:	0.050000000
Third quartile:	0.74750000
Inter quartile:	0.73750000

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(c) Poly Software International

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DAW

```
==========================================================
          Straight Line: y=ax+b

          Data File Name: B:\AVG50_2.PDW

==========================================================

Save Data
                  Independent:                P
                    Dependent:               RO
               Weight factor:                0
                            a:       0.16463439
                            b:      -1.99603993
                     Sum Sqrs:     368.66131408
Covaraince Matrix
                     cvm[1,1]:    0.00047673307
                     cvm[2,1]:   -0.0086569707
                     cvm[2,2]:       0.16772779

Goodness of Fit Statistics ...

                      __ C O D:       0.13361340
                      __ Corrl:       0.36553167
                      __ M S C:       0.10131879

Parameter Statistics
__ 95 % Confidence Intervals

                  Parameter b:      -1.99603993
                       StdDev:       0.81540773
__ Uninvariant ...

                          LOW:      -3.61527808
                         HIGH:      -0.37680179
Supporting Plane:

                          LOW:      -4.02453369
                         HIGH:      0.032453817
                  Parameter a:       0.16463439
                       StdDev:      0.043472033
__ Uninvariant ...

                          LOW:      0.078307553
                         HIGH:       0.25096124
Supporting Plane:

                          LOW:      0.056488808
                         HIGH:       0.27277998


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     (c) Poly Software International

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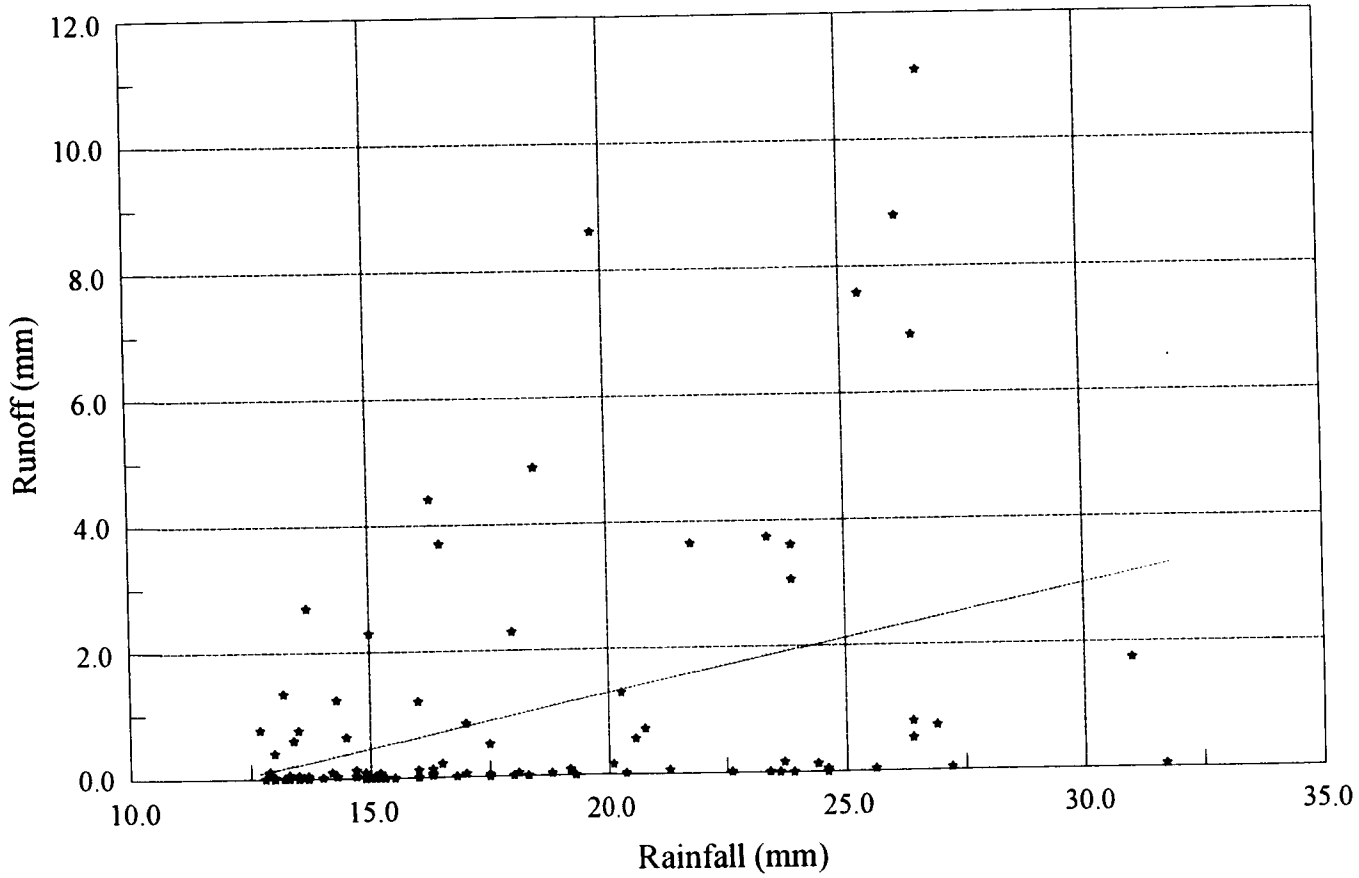
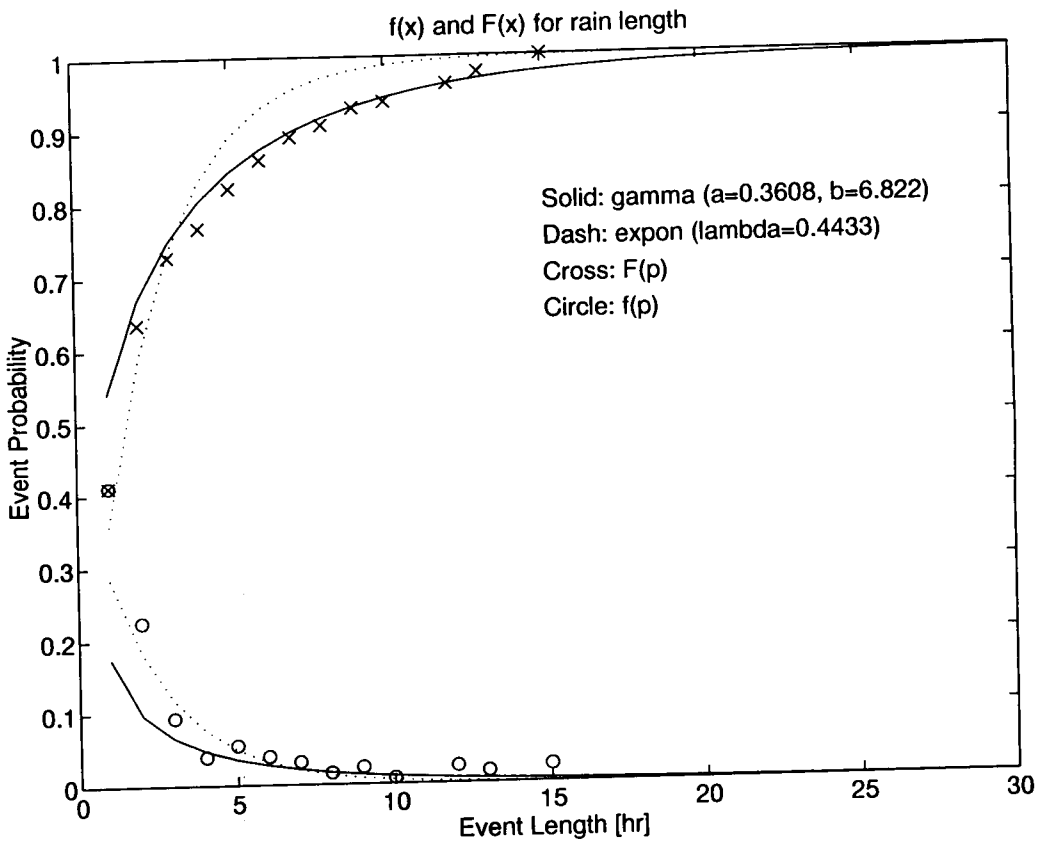
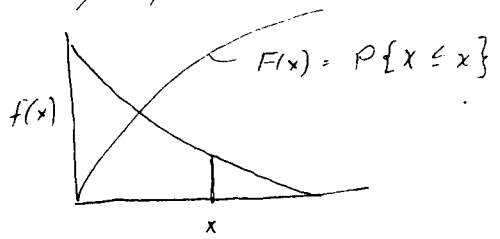
AVG50_2.PDW



412


f(x) and F(x) for rain length
Solid: gamma (a=0.3608, b=6.822)
Dash: expon (lambda=0.4433)
Cross: F(p)
Circle: f(p)
Event Probability
Event Length [hr]
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
5
10
15
20
25
30

In Table 3-2 of U.S. Dept. of Energy (1988) Site Characterization Plan, Peak runoff rates obtained from maximum stage gage over a 15 year period for several regional stations are presented



The distribution of the largest of 15 flood peaks observed is $G(m) = P\{M \le m\} = P\{X_1 < m\} \cdot P\{X_2 < m\} \cdot P\{X_3 < m\} \cdots P\{X_{15} < m\}$

$= F(m)^{15}$

If our hypothesis is that the ~~PALVTC~~ 4th largest storm provides the $F(x) = 0.9216$ ie $1 - F(x) = 0.0784$ or $T = 12.75$ yrs

then the non exceedance probability $= (0.9216)^{15} = 0.2937$

15 / 6 / 90

Unfortunately we cannot consider all stations as independent if we could the non-exceedance prob $= 0.2937^6 = 0.0006$ which is highly unlikely. 1/1,666

Site Number	Date of Peak
1	8/6/68
4	8/4/70
5	8/1/68
8	7/7/69
9	6/16/69
11	8/13/72

Actually we can - all peak rates occurred on different dates. However there still can be some dependence because of the type of storm systems (2 in 69, 2 in 68, 1 in 70, 1 in 79)

For the 3rd largest $T = 17$ yr $p = 0.0588 = 1 - F(x)$ non exceedance $p = (0.9412)^{15} = 0.41$

Peak discharge (mm/hr) — DAW

Watershed Area (Km²)	PAUG54	PAUG60	PJUL87	PNOV89
			27.5	14.1
			26.1	13.6
			23.3	12.6
			13.6	9.2
			11.3	8.0

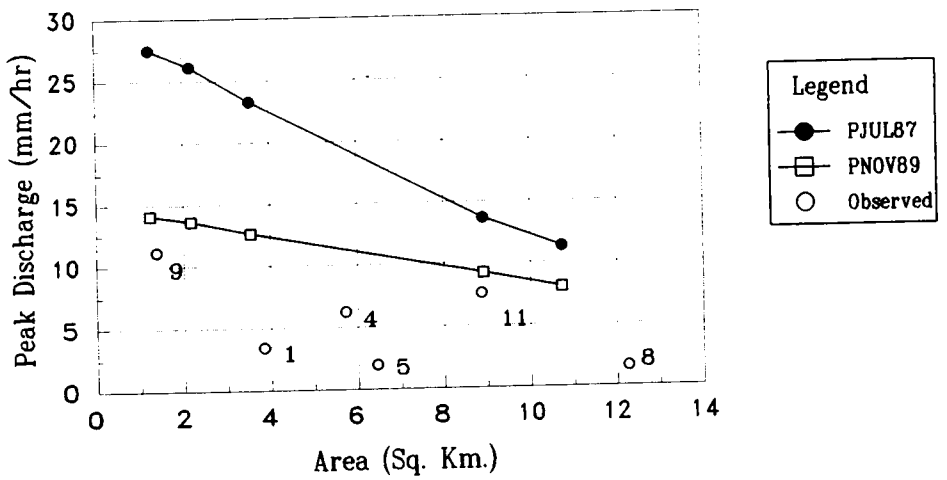
FMIN for channels 45, 71, 115, 147, 161, 183 and 194 changed from 61. to 91. mm/hr. based on the field observation that the gravels in the stream bed were not closely underlain by fine sands *

AREA (Km²)	PAUG54	PAUG 4	PAUG60	T=17 yr PJUL 87	12.75 yr PNOV89	PNOV67	
1.23	11.34	29.8	12.1	27.4	14.0	14.33	45
2.18	10.69	28.3	11.5	25.8	13.4	13.56	71
3.55	9.28	25.2	10.8	22.8	12.2	12.15	115
8.90	5.26	16.9	8.3	13.1	8.9	8.29	154
10.72	4.47	14.7	7.6	10.9	7.8	7.2	184

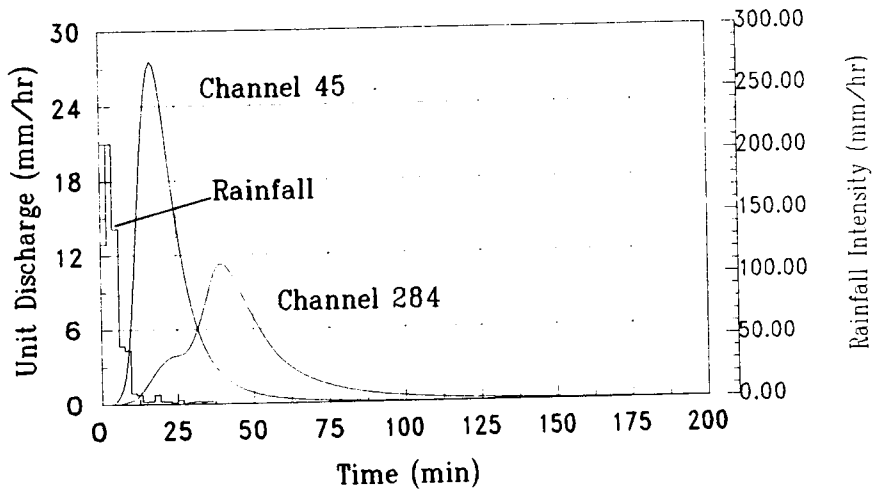
* Parameter files are SOLJ_OC.PAR, SOLNC.PAR } KS = 8.95, G = 80.

output files are: S502_87.OUT
S502_89.OUT
SOL97\SOLAUG4.OUT
SOL97\SOLAUG60.OUT } Run 2/5/98 USING KINEROZB — DAW

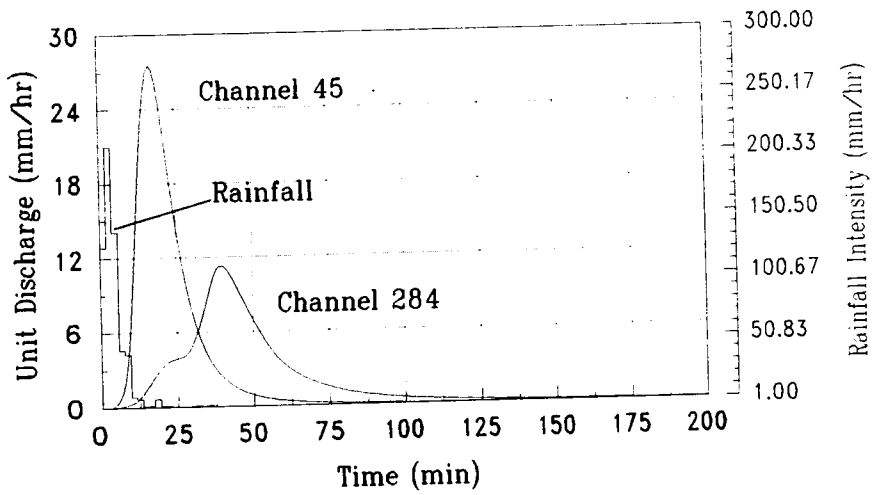
Note: This data uses G=80 and old Ks values
DAW 3/25/98



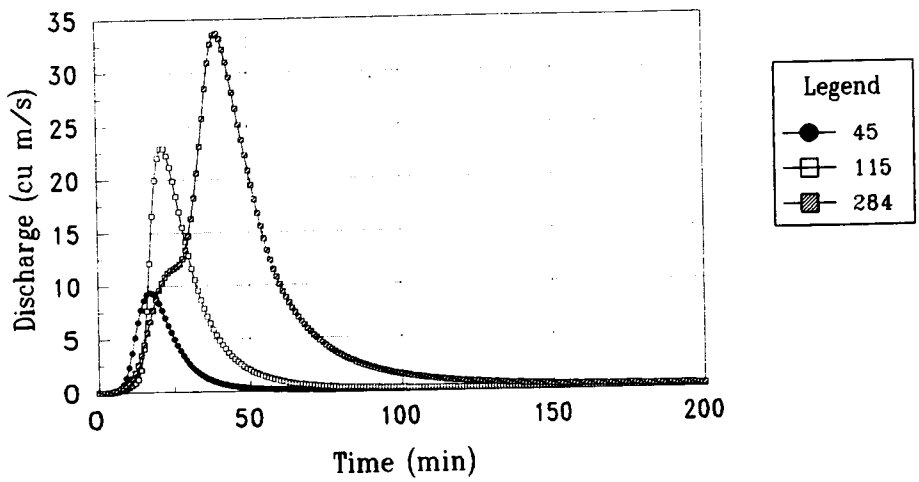
and 50 yr. simulation



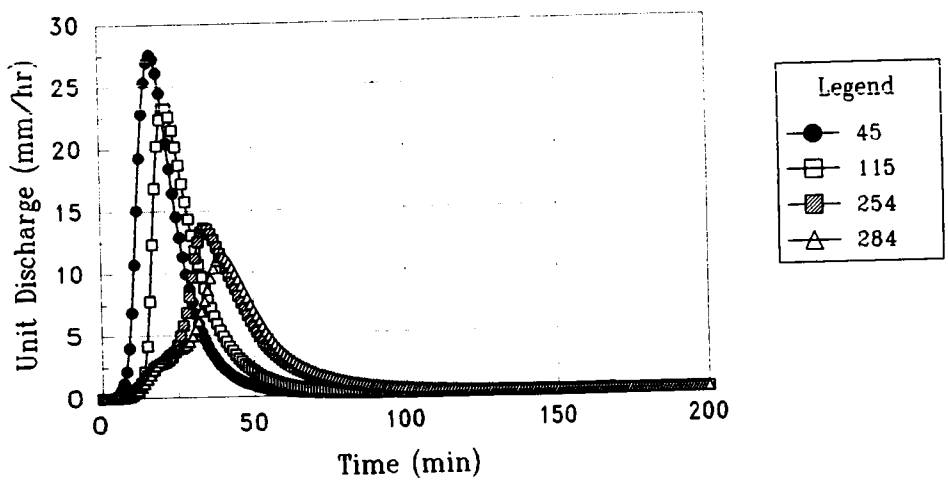
Hydrographs – storm PJUL87 2nd 50 yrs.



Hydrographs – storm PJUL87 2nd 50 yrs.



Hydrographs - storm PJUL87 2nd 50 yrs.



Hydrographs - storm PJUL87 2nd 50 yrs.

B:\AVG50_2.PDW

Dur	P	RO	No	Ind5	Dep6	Ind7
40.0000	26.7000	11.1000	4.0000	20.4000	1.3625	26.7000
41.0000	26.2000	8.8000	60.0000	14.0000	0.3088	26.2000
39.0000	19.8000	8.6100	87.0000	17.0000	0.8027	19.8000
64.0000	25.4000	7.5800	89.0000	26.7000	2.3997	25.4000
216.0000	26.5000	6.9100	62.0000	25.6000	2.2186	26.5000
35.0000	18.5000	4.9000	54.0000	19.2000	1.1649	18.5000
18.0000	16.3000	4.4100	17.0000	23.4000	1.8564	16.3000
80.0000	23.4000	3.7300	7.0000	21.3000	1.5107	23.4000
26.0000	16.5000	3.7000	18.0000	13.0000	0.1442	16.5000
120.0000	21.8000	3.6400	39.0000	14.3000	0.3582	21.8000
132.0000	23.9000	3.6000	50.0000	15.2000	0.5064	23.9000
104.0000	23.9000	3.0500	83.0000	23.9000	1.9387	23.9000
34.0000	13.7000	2.7000	46.0000	13.7000	0.2595	13.7000
38.0000	15.0000	2.2900	77.0000	18.3000	1.0168	15.0000
59.0000	18.0000	2.2900	66.0000	19.3000	1.1814	18.0000
332.0000	31.0000	1.7400	35.0000	15.2000	0.5064	31.0000
34.0000	13.2000	1.3400	43.0000	16.3000	0.6875	13.2000
101.0000	20.3000	1.2900	74.0000	16.5000	0.7204	20.3000
69.0000	14.3000	1.2300	10.0000	15.5000	0.5558	14.3000
60.0000	16.0000	1.2000	85.0000	23.4000	1.8564	16.0000
66.0000	17.0000	0.8400	3.0000	13.3000	0.1936	17.0000
120.0000	26.4000	0.7800	45.0000	26.4000	2.3503	26.4000
156.0000	12.7000	0.7700	37.0000	13.5000	0.2265	12.7000
55.0000	13.5000	0.7600	73.0000	14.9000	0.4570	13.5000
295.0000	26.9000	0.7100	31.0000	17.0000	0.8027	26.9000
124.0000	20.8000	0.7100	32.0000	15.2000	0.5064	20.8000
41.0000	14.5000	0.6500	28.0000	13.3000	0.1936	14.5000
48.0000	13.4000	0.6000	91.0000	14.5000	0.3912	13.4000
234.0000	20.6000	0.5600	41.0000	16.3000	0.6875	20.6000
223.0000	26.4000	0.5100	22.0000	16.0000	0.6381	26.4000
480.0000	17.5000	0.5100	68.0000	26.9000	2.4326	17.5000
49.0000	13.0000	0.4000	82.0000	20.8000	1.4284	13.0000
123.0000	16.5000	0.2200	76.0000	14.3000	0.3582	16.5000
480.0000	20.1000	0.1600	80.0000	14.9000	0.4570	20.1000
480.0000	23.7000	0.1600	65.0000	31.0000	3.1076	23.7000
181.0000	16.3000	0.1300	29.0000	24.4000	2.0210	16.3000
100.0000	14.7000	0.1300	93.0000	12.7000	0.0948	14.7000
480.0000	24.4000	0.1300	36.0000	13.5000	0.2265	24.4000
126.0000	16.0000	0.1200	51.0000	21.8000	1.5930	16.0000
107.0000	12.9000	0.1100	49.0000	13.7000	0.2595	12.9000
185.0000	14.2000	0.1000	88.0000	20.6000	1.3954	14.2000
175.0000	19.2000	0.0900	6.0000	13.0000	0.1442	19.2000
143.0000	14.9000	0.0900	34.0000	13.2000	0.1771	14.9000
98.0000	15.2000	0.0800	48.0000	18.8000	1.0991	15.2000
296.0000	16.3000	0.0600	70.0000	26.4000	2.3503	16.3000
83.0000	13.3000	0.0600	21.0000	13.7000	0.2595	13.3000
415.0000	21.3000	0.0600	8.0000	13.7000	0.2595	21.3000
93.0000	17.0000	0.0500	25.0000	15.2000	0.5064	17.0000
208.0000	13.5000	0.0500	23.0000	12.9000	0.1277	13.5000
480.0000	31.7000	0.0500	78.0000	23.9000	1.9387	31.7000
358.0000	24.6000	0.0500	72.0000	16.0000	0.6381	24.6000
437.0000	18.1000	0.0500	64.0000	27.2000	2.4820	18.1000

B:\AVG50_2.PDW

Dur	P	RO	No	Ind5	Dep6	Ind7
455.0000	15.1000	0.0400	63.0000	18.8000	1.0991	15.1000
480.0000	27.2000	0.0400	52.0000	18.5000	1.0497	27.2000
234.0000	13.7000	0.0400	47.0000	23.6000	1.8893	13.7000
480.0000	17.5000	0.0300	61.0000	13.2000	0.1771	17.5000
154.0000	16.3000	0.0300	59.0000	18.0000	0.9674	16.3000
68.0000	14.7000	0.0300	58.0000	14.7000	0.4241	14.7000
333.0000	18.8000	0.0300	53.0000	16.3000	0.6875	18.8000
253.0000	18.8000	0.0300	44.0000	26.2000	2.3174	18.8000
114.0000	14.3000	0.0300	33.0000	17.5000	0.8851	14.3000
465.0000	25.6000	0.0300	5.0000	26.5000	2.3668	25.6000
91.0000	13.0000	0.0200	9.0000	15.1000	0.4899	13.0000
175.0000	14.0000	0.0200	2.0000	18.1000	0.9838	14.0000
91.0000	15.2000	0.0200	16.0000	23.7000	1.9058	15.2000
480.0000	22.6000	0.0200	79.0000	18.0000	0.9674	22.6000
387.0000	13.6000	0.0200	67.0000	13.6000	0.2430	13.6000
218.0000	20.4000	0.0200	1.0000	17.5000	0.8851	20.4000
222.0000	15.2000	0.0100	11.0000	15.0000	0.4735	15.2000
480.0000	16.0000	0.0100	30.0000	16.3000	0.6875	16.0000
174.0000	16.8000	0.0100	84.0000	13.5000	0.2265	16.8000
221.0000	17.5000	0.0100	75.0000	24.6000	2.0540	17.5000
480.0000	23.4000	0.0100	20.0000	13.5000	0.2265	23.4000
480.0000	18.0000	0.0050	57.0000	20.3000	1.3460	18.0000
446.0000	14.9000	0.0040	24.0000	17.5000	0.8851	14.9000
347.0000	18.3000	0.0040	14.0000	16.5000	0.7204	18.3000
480.0000	24.6000	0.0040	95.0000	15.0000	0.4735	24.6000
360.0000	15.2000	0.0040	26.0000	31.7000	3.2229	15.2000
480.0000	23.6000	0.0030	55.0000	22.6000	1.7247	23.6000
480.0000	15.0000	0.0020	69.0000	20.1000	1.3131	15.0000
480.0000	17.5000	0.0010	94.0000	15.3000	0.5229	17.5000
256.0000	13.2000	0.0000	56.0000	13.0000	0.1442	
356.0000	13.3000	0.0000	27.0000	23.9000	1.9387	
223.0000	13.7000	0.0000	40.0000	16.8000	0.7698	
402.0000	12.8000	0.0000	92.0000	16.0000	0.6381	
480.0000	15.3000	0.0000	81.0000	15.1000	0.4899	
480.0000	13.5000	0.0000	71.0000	19.8000	1.2637	
391.0000	13.5000	0.0000	38.0000	14.2000	0.3418	
456.0000	15.5000	0.0000	90.0000	25.4000	2.1857	
480.0000	19.3000	0.0000	15.0000	15.5000	0.5558	
480.0000	13.0000	0.0000	42.0000	13.4000	0.2101	
324.0000	15.1000	0.0000	86.0000	12.8000	0.1113	
350.0000	13.7000	0.0000	13.0000	14.7000	0.4241	
480.0000	23.9000	0.0000	12.0000	17.5000	0.8851	
455.0000	15.5000	0.0000	19.0000	24.6000	2.0540	

$\Sigma = 94.387$

81 positive values

mean of positive = $= 41.2$

sum of squares = 519.29

B:\AVG50_2.PDW

Dep8	ChannelF	Ind10	Dep11	Ind12	Dep13	Param14
0.3229	2.3100	11.1000	2.5134	11.1000	2.5134	0.4728
0.3104	2.1000	8.8000	2.1392	8.8000	2.1392	0.6941
0.1731	2.0800	8.6100	2.1071	8.6100	2.1071	
0.2910	1.8500	7.5800	1.9287	7.5800	1.9287	
0.3178	1.8400	6.9100	1.8087	6.9100	1.8087	
0.1502	1.3600	4.9000	1.4248	4.9000	1.4248	
0.1154	1.3500	4.4100	1.3243	4.4100	1.3243	
0.2452	1.2500	3.7300	1.1790	3.7300	1.1790	
0.1183	1.2300	3.7000	1.1724	3.7000	1.1724	
0.2115	1.2100	3.6400	1.1592	3.6400	1.1592	
0.2563	1.2000	3.6000	1.1503	3.6000	1.1503	
0.2563	1.1000	3.0500	1.0253	3.0500	1.0253	
0.0803	0.9500	2.7000	0.9421	2.7000	0.9421	
0.0970		1.2300	0.5459	1.2300	0.5459	
0.1419		0.7600	0.3908	0.7600	0.3908	
0.4408						
0.0743						
0.1823						
0.0878	0.5500					
0.1110						
0.1259						
0.3153						
0.0686						
0.0779	0.3500					
0.3279						
0.1918						
0.0904						
0.0767	0.31					
0.1880						
0.3153						
0.1338						
0.0720						
0.1183	0.17					
0.1786						
0.2518						
0.1154						
0.0930						
0.2676						
0.1110						
0.0708						
0.0865						
0.1623						
0.0957						
0.0997						
0.1154						
0.0755						
0.2016						
0.1259						
0.0779						
0.4618						
0.2722						
0.1435						

B:\AVG50_2.PDW

Dep8	ChannelF	Ind10	Dep11	Ind12	Dep13	Param14
0.0984						
0.3356						
0.0803						
0.1338						
0.1154						
0.0930						
0.1554						
0.1554						
0.0878						
0.2957						
0.0720						
0.0840						
0.0997						
0.2281						
0.0791						
0.1842						
0.0997						
0.1110						
0.1229						
0.1338						
0.2452						
0.1419						
0.0957						
0.1469						
0.2722						
0.0997						
0.2496						
0.0970						
0.1338						

DAW

B:\AVG50_2.PDW

CALCULATEDF	ΣF C16	C17	C18	C19	C20	C21
2.5133						
2.1392	4.059					
2.1070	6.76					
1.9287	8.69					
1.8087	10.5					
1.4248	11.97					
1.3243	13.25					
1.1790	14.42					
1.1724	15.6					
1.1591	16.76					
1.1503	17.91					
1.0253	18.93					
0.9421	19.87	17 storms	75%			
0.8403	20.71					
0.8403	21.55					
0.6945	22.25					
0.5793	22.83	75%				
0.5642	23.37					
0.5459	23.94					
0.5366	24.48					
0.4189	24.89					
0.3979	25.29					
0.3944	25.67					
0.3908	26.05					
0.3728	26.45					
0.3728	26.82					
0.3506	27.18					
0.3317	27.51					
0.3162	27.82					
0.2963	28.12					
0.2963	28.41					
0.2503	28.66					
0.1653	28.83					
0.1325	28.96					
0.1325	29.09					
0.1147	29.21					
0.1147	29.32					
0.1147	29.44					
0.1085	29.54					
0.1022	29.65					
0.0956						
0.0889						
0.0889						
0.0819						
0.0671						
0.0671						
0.0671						
0.0591						
0.0591						
0.0591						
0.0591						
0.0591						

B:\AVG50_2.PDW

CALCULATEDF	C16	C17	C18	C19	C20	C21
0.0506						
0.0506						
0.0506						
0.0415						
0.0415						
0.0415						
0.0415						
0.0415						
0.0415						
0.0415						
0.0313						
0.0313						
0.0313						
0.0313						
0.0313						
0.0313						
0.0193						
0.0193						
0.0193						
0.0193						
0.0193						
0.0120						
0.0102						
0.0102						
0.0102						
0.0102						
0.0084						
0.0063						
0.0039						
0.0000						
0.0000						
0.0000						
0.0000						
0.0000						
0.0000						
0.0000						
0.0000						
0.0000						
0.0000						
0.0000						
0.0000						
0.0000						
0.0000						

Runs with revised Manning's n in 1st and 2nd order channels n=0.0651 and with revised channel Geometry based upon field studies

Seasonal SI + KS

DAW

Storm	Channel F (mm)	R.O. (mm)	Ster	ΣF	ΣRO
PAUG4 ✓	2.31	8.13.		2.31	8.13
PAUG60 ✓	2.10	6.01	0.14	4.41	14.14
PJUL87 ✓	2.08	5.75	0.09	6.49	19.89
PNOV89 ✓	1.85	5.14		8.34	25.03
PNOV62 ✓	1.87	4.62	0.03	10.18	29.65
PAUG54	1.36	2.81	0.12	11.54	32.46
PJUL17	1.35	2.56	0.11	12.89	35.02
PJUL7	1.25	2.05	0.01	14.14	37.07
PAUG18	1.23	2.05	0.06	15.46	39.12
PAUG39	~~1.14~~	2.36*	0.03*	16.67	41.12
PMAY50	1.20	1.96	0.03	17.87	43.08
PAUG83	1.10	1.61	0.04	18.97	44.69
PAUG46	0.95	1.30	0.10	19.92	45.99
PAUG10	0.55	0.48	0.03		
PAUG73	0.35	0.21	0.09		

— 0.7706 of Ave plane R.O

Estimate Total ~~Yr~~ of 25.85 mm or 0.52 mm/yr

* with KINERZN

$F = 0.4728\ RO^{0.674}$ $R^2 = 0.99$

$\sigma_a = 0.0314$ $\sigma_b = 0.0000$ Est. Total 59.62 or 1.19 mm/yr

PARAMETER FILES ARE SOLJ_OC.PAR
SOLNC.PAR

.PAR files

Output Files are ~~SOL~~ ~~SOL~~ S502_XXC.OUT

output files

No. 5505 Engineer's Computation Pad
ALVIN

Power Function: y=ax^b

Data File Name: B:\AVG50_2.PDW

DAW

Save Data
Save Parameter

Independent:	RO (mm)
Dependent:	ChannelF Infiltration (mm)
Weight factor:	0
a:	0.47279642
b:	0.69412118
Sum Sqrs:	0.038776361

Covaraince Matrix

cvm[1,1]:	0.33115271
cvm[2,1]:	-0.18887504
cvm[2,2]:	0.13487964

Goodness of Fit Statistics ...

C O D:	0.98926125
Corrl:	0.99461613
M S C:	4.26722966

Parameter Statistics
95 % Confidence Intervals

Parameter a:	0.47279642
StdDev:	0.031428670

Uninvariant ...

LOW:	0.40489891
HIGH:	0.54069393

Supporting Plane:

LOW:	0.38609013
HIGH:	0.55950270
Parameter b:	0.69412118
StdDev:	0.020057881

Uninvariant ...

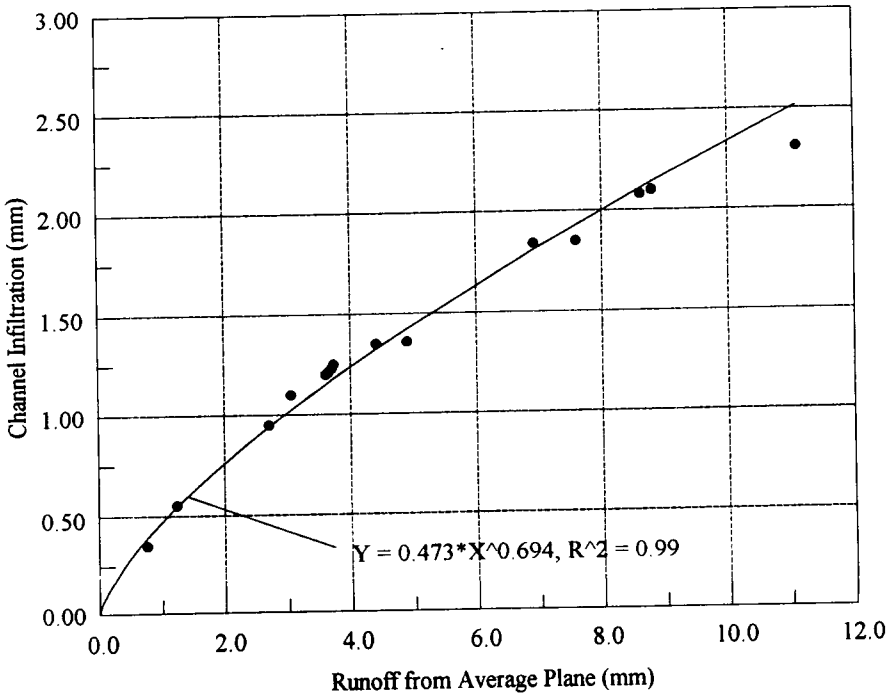
LOW:	0.65078876
HIGH:	0.73745360

Supporting Plane:

LOW:	0.63878494
HIGH:	0.74945742

(c) Poly Software International

AVG50_2.PDW


3.00
2.50
2.00
1.50
1.00
0.50
0.00
Channel Infiltration (mm)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Runoff from Average Plane (mm)
Y = 0.473*X^0.694, R^2 = 0.99

The regression equation shown in Fig. 9, p. 20 of the Phase 2-B report has a flaw. — DAW

ie: $I = 0.473 * X^{0.694}$

for small values of X leads to infiltration > runoff. The threshold of validity is

$$X = 0.473 X^{0.694}$$

$$X^{0.306} = 0.473$$

$$X = 0.473^{\frac{1}{.306}} = 0.473^{3.268}$$

$$\underline{X = 0.0866 \text{ mm}}$$

This will result in an overestimate of channel infiltration.

One reasonable adjustment would be to equate channel infiltration to plane runoff for all plane runoff events < 0.0866 mm.

When this is done, the decrease is only 0.34 mm in 50 yrs or 0.0068 mm/yr which is negligible considering the accuracy of the model.

No. 5505 Engineer's Computation Pad

==========

Descriptive Statistics Report

Data File Name: B:\AVG50_2.PDW with revised infiltration estimates by regression — DAW

==========

COLUMN NAME:	CALCULATEDF
Number of rows:	95
Number of valid points:	95
Number of missing points:	0
Number of negative values:	0
Number of positive values:	81
Number of zero values:	14
Minimum value:	0
Maximum value:	2.51325264
Inter range value:	2.51325264
Median:	0.059106133
Sum of row value:	31.29904127
Sum of absolute value:	31.29904127
Arithmetric mean:	0.32946359
Geometric mean:	0
Quadratic mean:	0.63508545
Harmonic mean:	0
Absolute mean:	0.32946359
Sum of squares:	38.31668545
Variance:	0.29792331
Standard deviation:	0.54582351
Absolute deviation:	0.38483557
Standard error:	0.056000311

95 percent confidence interval:
□ □ [0.21827366, 0.44065352]

99 percent confidence interval:
□ □ [0.18223047, 0.47669671]

Coefficient of variance:	165.67035803
Skewness:	2.22294230
Coefficient of skewness:	0.78326493
Kurtosis:	4.58910957
Coefficient of Kurtosis:	7.58910957

Percentiles:

10 percentile:	0
25 percentile:	0.019340935
50 percentile:	0.059106133
75 percentile:	0.38628846
90 percentile:	1.15825983

Quartiles:

First quartile:	0.019340935
Second quartile:	0.059106133

Third quartile:	0.38628846
Inter quartile:	0.36694753

(c) Poly Software International

Avg. Plant Runoff calculated with revised* seasonal values of Ks + G = 50 mm

Volume in drive B has no label
Directory of B:\

					(mm)	(mm/hr)	Vol change (mm)
L50_2	DAY	127750	08-21-96	4:18p			
SOL50_2	CON	1599	01-24-97	4:04p			
SOL50_2	DUR	17520	01-27-97	12:03p			
SOL50_2	MAX	5960	01-27-97	12:34p			
PNOV1	PRE	447	02-04-97	10:42a			
PAPR2	PRE	446	02-03-97	2:14p			
PJUL3	PRE	448	01-30-97	12:03p			
*PAUG4	PRE	451	01-29-97	3:29p			
PNOV5	PRE	448	02-04-97	10:44a			
PFEB6	PRE	446	02-03-97	12:29p			
*PJUL7	PRE	443	01-30-97	11:51a	[illegible]	[illegible]	[illegible]
PNOV8	PRE	443	02-04-97	10:47a			
PMAY9	PRE	443	02-03-97	2:29p			
PAUG10	PRE	456	01-29-97	3:39p			
PDEC11	PRE	446	02-04-97	10:10a			
PFEB12	PRE	343	02-03-97	1:54p			
PNOV13	PRE	447	02-04-97	10:51a			
PNOV14	PRE	442	02-04-97	10:53a			
PFEB15	PRE	340	02-03-97	12:33p			
PJUN16	PRE	446	02-03-97	2:55p			
*PJUL17	PRE	446	01-30-97	11:56a	[illegible]	[illegible]	[illegible]
*PAUG18	PRE	443	01-29-97	3:45p	4.9	10.83	[illegible]
PJAN19	PRE	448	01-31-97	11:41a			
PFEB20	PRE	342	02-03-97	12:36p			
PAUG21	PRE	446	01-29-97	3:49p			
B22	PRE	445	02-03-97	1:56p	[illegible]	[illegible]	[illegible]
PNOV23	PRE	447	02-04-97	10:56a			
PNOV24	PRE	448	02-04-97	10:58a			
PJUN25	PRE	444	02-03-97	3:15p			
PNOV26	PRE	441	02-04-97	11:02a			
PDEC27	PRE	447	02-04-97	10:13a			
PJUN28	PRE	446	02-03-97	3:17p			
PNOV29	PRE	441	02-06-97	10:00a			
PJAN30	PRE	342	02-06-97	12:09p			
PAUG31	PRE	446	01-29-97	3:52p			
PAUG32	PRE	440	01-29-97	3:57p			
PAUG33	PRE	448	01-29-97	4:02p			
PAUG34	PRE	446	01-29-97	4:04p			
PNOV35	PRE	445	02-06-97	10:08a			
PNOV36	PRE	343	02-06-97	10:17a			
PNOV37	PRE	446	02-06-97	10:22a			
PFEB38	PRE	444	02-03-97	12:39p			
*PAUG39	PRE	446	01-29-97	4:07p	4.04	12.83	[illegible]
PJAN40	PRE	447	01-31-97	11:45a			
PNOV41	PRE	445	02-06-97	10:28a			
PFEB42	PRE	345	02-03-97	12:41p			
PAUG43	PRE	446	01-29-97	4:11p			
PNOV44	PRE	446	02-06-97	10:57a			
PFEB45	PRE	439	02-03-97	12:45p			
*PAUG46	PRE	445	01-30-97	10:22a	[illegible]	10.53	[illegible]
JAN47	PRE	447	01-31-97	11:48a			
MAY48	PRE	444	02-03-97	2:33p			
PMAY49	PRE	439	02-03-97	2:36p			
*PMAY50	PRE	444	02-03-97	2:42p	3.6	9.9	[illegible]
PJUL51	PRE	445	01-30-97	12:09p			
PNOV52	PRE	445	02-06-97	11:03a			

* Revised by fitting hydrograph for Mercury New Rainfall simulator studies

Runoff for average plane

DAW

PDEC53	PRE	448	02-04-97	10:16a			
*PAUG54	PRE	443	01-30-97	10:32a	5.36	17.11	4.46
PNOV55	PRE	342	02-06-97	11:08a			
[illegible]AY56	PRE	446	02-03-97	2:49p			
[illegible]OV57	PRE	342	02-06-97	11:14a			
PJUN58	PRE	446	02-03-97	3:20p			
PSEP59	PRE	445	01-31-97	11:18a			
*PAUG60	PRE	445	01-30-97	10:46a	9.42	16.02	[illegible]
PNOV61	PRE	343	02-06-97	11:17a			
*PNOV62	PRE	450	02-06-97	11:21a	~~5.49~~ 7.3	~~[illegible]~~ 18.2 ~~[illegible]~~	7.39
PNOV63	PRE	447	02-06-97	11:28a			
PNOV64	PRE	448	02-06-97	11:31a			
PDEC65	PRE	345	02-04-97	10:18a			
PJUL66	PRE	445	01-30-97	12:15p			
PJUL67	PRE	443	01-30-97	12:20p			
PNOV68	PRE	342	02-06-97	11:36a			
PDEC69	PRE	340	02-04-97	10:21a			
PDEC70	PRE	447	02-04-97	10:24a			
PNOV71	PRE	343	02-06-97	11:41a			
PJAN72	PRE	446	01-31-97	11:51a			
PAUG73	PRE	446	01-30-97	11:01a			
PAUG74	PRE	446	01-30-97	11:07a			
PMAR75	PRE	443	02-03-97	2:04p			
PSEP76	PRE	425	01-31-97	11:22a			
PNOV77	PRE	446	02-06-97	11:44a			
PDEC78	PRE	346	02-04-97	10:27a			
PDEC79	PRE	344	02-04-97	10:30a			
PJAN80	PRE	343	01-31-97	11:55a			
P[illegible]EB81	PRE	344	02-03-97	1:47p			
[illegible]Y82	PRE	447	02-03-97	2:45p	8.41 ~~8.59~~	[illegible]47 9.56	[illegible]
*PAUG83	PRE	426	01-30-97	11:35a			
PMAR84	PRE	446	02-03-97	2:06p			
PSEP85	PRE	439	01-31-97	11:28a			
PMAR86	PRE	449	02-03-97	2:09p			
*PJUL87	PRE	443	01-30-97	12:25p	9.11	37.14	[illegible]
PNOV88	PRE	441	02-06-97	11:48a	~~5.87~~ 7.92	13.71	~~[illegible]~~ [illegible] ~~[illegible]~~ [illegible]
*PNOV89	PRE	446	02-06-97	11:54a			
PNOV90	PRE	446	02-06-97	12:01p			
PAUG91	PRE	447	01-30-97	11:42a			
PJAN92	PRE	448	01-31-97	12:04p			
PSEP93	PRE	443	01-31-97	11:31a			
PNOV94	PRE	345	02-06-97	12:05p			
PJAN95	PRE	341	01-31-97	12:06p			
PSOL50_2	DAT	5960	01-27-97	12:34p			
PSOL50_2	PDW	9603	02-13-97	12:48p			
PSOL_2A	PGW	12798	01-28-97	12:07p			
PSOL_2B	PGW	16384	01-28-97	12:57p			
AVG50_2	PDW	21980	07-16-97	5:09p			
5MIN	PGW	7041	02-13-97	12:49p			
SOL50_2B	PDW	8252	02-12-97	5:25p			
10MIN	PGW	7192	02-13-97	11:03a			
20MIN	PGW	7037	02-13-97	11:55a			
15MIN	PGW	7227	02-13-97	12:49p			
30MIN	PGW	7417	02-13-97	12:15p			
[illegible]0MIN	PGW	7038	02-13-97	12:46p			
[illegible]MIN	PGW	6854	02-13-97	12:48p			
PJUL87	DAT	377	02-19-97	4:21p			
S2_45_87	DAT	9238	02-19-97	4:29p			
S2115_87	DAT	9238	02-19-97	4:32p			
S2254_87	DAT	9248	02-19-97	4:36p			

In the most recent 50 yr. Simulations (Report Phase 2 pg 3) the channel saturated hydraulic conductivities have been set at 61 mm/hr for all channels except 45, 77, 115, 147, 161, 183 and 194 which were set to 91 mm/hr - the top of the range suggested by Flint et al (1997). However Bostick (1990) estimated saturated hydraulic conductivities of 130 mm/hr in Fagany Wash

Because the channel infiltration is very sensitive to this parameter value, it is appropriate to examine the effect of this upper bound on total channel infiltration

Accordingly set FKUN for channels 45, 77, 115, 147, 161, 183 and 194 to 130 mm/hr and set FKUN for the other channels to 91 mm/hr

Use the seasonally-varied FKUN values for the planes

Create a new subdirectory SCHANHIK

Copy new KINEROS to this subdirectory

KINEROS2 dated 10/3/97

Set up PROSTAT Summary Sheet

SCHANHIK\SUMCHAHI.PDW

Parameter files: SOLJ_OD.PAR, SOLND.PAR, SOLM_JD.PAR

Output files: CHANHIXX.OUT

storm no

.DAT files ~~SHIK~~ S XXX_YY.DAT XXX = Chan No YY = Storm #

Run the largest 13 + 2, get channel infiltration, runoff and storage

Enter in summary output sheet

Use PROSTAT to get correlation between average plane runoff and channel infiltration.

.DAT file created for storms PNOV99

CHECK: that this version of KINEROS2 gives the same answers with SOLJ-OC.PAR as the previous version 6-13-97

Run PAL64 with DUR = 100 min

Get SOLRO = 8.25 CHANINF = 2.17 STOR = 0.118

CHANGING CHANNEL INFILTRATION RATES

We have a discrepancy. The question is: Is this due to changes in KINEROS2 or didn't use a different parameter file than the ones resulting in the outputs on the summary sheet dated 2/7/97

DAW

Now the dates on the .PAR files are:

SOLTC.PAR 2-18-97 Note .PAR for solo 1 have same [illegible] values set at 600 mm/hr with C Ksat 61 and 91 mm/hr
SOLJ_OC.PAR 4-24-97
SOLM-JC.PAR 3-16-97

TRY PJOL87 DUR = 200 min

Get. SOLRO = 5.95 (5.75) CHANINF = 1.84 (2.08) STCR = 0.10 (2.29)

free.

Now repeat with KINEROS2 version 6/13/97

SOLRO = 6.02 CHANINF = STCR = 0.10

From the following printouts from the .OUT files I conclude that the version of KINEROS2 (6/13/97) is different from the earlier version in that runoff from the planes is higher and the vol balance error is lower

DAW 11/28/97

10/2/97

PJUL87 2ND 50 YRS KINEROS2B HIGH CHANNEL K SCLJ-CO.PAR

DAW

(PLANE)

Contributing area = 2.047500 ha

Peak flow = .1793515 cu m /s (31.53433 mm/hr) at 9.6 min

Water balance

Rain:	405.6507 cu m	19.81200 mm
Inflow:	.0000 cu m	.00000 mm
Infilt:	232.9157 cu m	11.37562 mm
Stored:	.2291 cu m	.01119 mm
Out:	171.6990 cu m	8.38579 mm
Error:	.20 %	

2 (PLANE)

Contributing area = 3.870000 ha

Peak flow = .6268947 cu m /s (58.31578 mm/hr) at 8.0 min

Water balance

Rain:	766.7244 cu m	19.81200 mm
Inflow:	.0000 cu m	.00000 mm
Infilt:	403.3430 cu m	10.42230 mm
Stored:	.1708 cu m	.00441 mm
Out:	361.7630 cu m	9.34788 mm
Error:	.19 %	

K_s = [illegible]

[illegible] = 0.8

PAR FILE SCLJ-CO.PAR was created from SCLJ-CC.PAR by changing only channel Ks. Note there is a difference in the plane input for this version of KINEROS2. Higher runoff and lower error terms

SOLJ_0 .PAP

PJUL87 2ND 50 YRS KINEROS2 6/13/97

438

(PLANE)

Contributing area = 2.047500 ha

Peak flow = .1768250 cu m /s at 10.0 min

Water balance

In:	405.6507 cu m
Infiltrated:	232.9272 cu m
Stored:	.2249 cu m
Out:	171.0970 cu m
Error:	.35 %

2 (PLANE)

Contributing area = 3.870000 ha

Peak flow = .6268947 cu m /s at 8.0 min

Water balance

In:	766.7244 cu m
Infiltrated:	403.4499 cu m
Stored:	.1685 cu m
Out:	358.6869 cu m
Error:	.58 %

4 (CHANNEL)

Contributing area = 9.179500 ha

Peak flow = 1.286864 cu m /s (50.46800 mm/hr) at 9.0 min

Water balance

Rain:	.0000 cu m	.000000 mm
Inflow:	836.0753 cu m	9.108070 mm
Infilt:	38.2830 cu m	.417049 mm
Stored:	.0948 cu m	.001033 mm
Out:	798.5486 cu m	8.699260 mm
Error:	-.10 %	

5 (PLANE)

Contributing area = 4.840000 ha

Peak flow = .6283938 cu m /s (46.74004 mm/hr) at 9.6 min

Water balance

Rain:	958.9008 cu m	19.81200 mm
Inflow:	.0000 cu m	.00000 mm
Infilt:	519.6943 cu m	10.73748 mm
Stored:	.2984 cu m	.00616 mm
Out:	437.9073 cu m	9.04767 mm
Error:	.10 %	

4 (CHANNEL)

Contributing area = 9.179500 ha

Peak flow = 1.286882 cu m /s at 9.0 min

Water balance

In:	835.9979 cu m
Infiltrated:	36.7817 cu m
Stored:	.0921 cu m
Out:	799.9407 cu m
Error:	-.10 %

5 (PLANE)

Contributing area = 4.840000 ha

Peak flow = .6201273 cu m /s at 10.0 min

Water balance

In:	958.9008 cu m
Infiltrated:	519.7674 cu m
Stored:	.2987 cu m
Out:	435.1544 cu m
Error:	.38 %

441

What are the percentage increases in channel infiltration

Storm	% Increase
4	14.7
60	9.05
57	7.21
59	9.73
62	7.61
54	8.09
17	8.89
7	10.40
18	7.37
39	6.61
52	9.17
85	7.27
~~46~~ 46	8.47
10	5.45
73	14.29 * RUNOFF INCREASED

Comparisons with summary dated 3/15/97

DAW

Thus the channel infiltration rates were increased by 49% for 61 mm/hr. and 44% for 91 mm/hr. but channel infiltration only increased by ~10%

Compare peak flow rates

Area (km²)	PJUL87 61 + 91	PJUL87 91 and 131	PNOV89 61 and 91	PNOV89 91 and 131
1.23	37.6 37.4	25.88	14.6	13.42
2.18	26.1 25.8	24.41	13.7	12.68
3.55	23.3 22.8	21.37	12.2	11.43
8.71	13.6 13.1	14.18	8.9	8.24
10.72	11.3 10.7	11.92	7.8	7.28

Increase due to changes in Kinematic

CW 11/20/97

C:\consult\swri\SCHANHIK\SUMCHANHI.PDW * DW

STORM	DEPTH	RUNDUR	AVGRO	SOLRO	CHANINF	STOR
PAUG4	26.7000	200.0000	11.1000	7.7900	2.6500	0.0960
PAUG60	26.2000	200.0000	8.8000	5.8200	2.2900	0.1200
PJUL87	19.8000	200.0000	8.6100	5.5700	2.2300	0.0790
PNOV89	25.4000	320.0000	7.5800	5.0000	2.0300	0.0400
PNOV62	26.5000	340.0000	6.9100	4.4600	1.9800	0.0350
PAUG54	18.5000	200.0000	4.9000	2.6900	1.4700	0.1000
PJUL17	16.3000	200.0000	4.4100	2.4600	1.4700	0.0920
PJUL7	23.4000	280.0000	3.7300	1.9200	1.3800	0.0630
PAUG18	16.5000	260.0000	3.7000	1.9400	1.3200	0.0500
PAUG39	21.8000	320.0000	3.6400	1.9600	1.2900	0.0340
PMAY50	23.9000	340.0000	3.6000	1.8300	1.3100	0.0310
PAUG83	23.9000	310.0000	3.0500	1.5100	1.1800	0.0400
PAUG46	13.7000	200.0000	2.7000	1.2200	1.0300	0.0830
PAUG10	14.3000	200.0000	1.2300	0.4100	0.5800	0.0700
PAUG73	13.5000	260.0000	0.7600	0.1900	0.4000	0.0570
77.0000			2.2900			
66.0000			2.2900			
35.0000			1.7400			
43.0000			1.3400			
74.0000			1.2900			
85.0000			1.2000			
3.0000			0.8400			
45.0000			0.7800			
37.0000			0.7700			
31.0000			0.7100			
32.0000			0.7100			
28.0000			0.6500			
91.0000			0.6000			
41.0000			0.5600			
22.0000			0.5100			
68.0000			0.5100			
82.0000			0.4000			
76.0000			0.2200			
80.0000			0.1600			
65.0000			0.1600			
29.0000			0.1300			
93.0000			0.1300			
36.0000			0.1300			
51.0000			0.1200			
49.0000			0.1100			
88.0000			0.1000			

Runs for 2nd 50 yr simulation with channel [illegible] 21 and [illegible] mm/in
CINEDOS version of 9/3/97

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STORM	DEPTH	RUNDUR	AVGRO	SOLRO	CHANINF	STOR
6.0000			0.0900			
34.0000			0.0900			
48.0000			0.0800			
70.0000			0.0600			
21.0000			0.0600			
8.0000			0.0600			
25.0000			0.0500			
23.0000			0.0500			
78.0000			0.0500			
72.0000			0.0500			
64.0000			0.0500			
63.0000			0.0400			
52.0000			0.0400			
47.0000			0.0400			
61.0000			0.0300			
59.0000			0.0300			
58.0000			0.0300			
53.0000			0.0300			
44.0000			0.0300			
33.0000			0.0300			
5.0000			0.0300			

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DAW

Ind8	Dep9	CALCINF	Sum11
11.1000	2.6540	2.6534	2.6534
8.8000	2.2805	2.2800	4.9334
8.6100	2.2482	2.2477	7.1810
7.5800	2.0687	2.0682	9.2493
6.9100	1.9473	1.9469	11.1961
4.9000	1.5557	1.5554	12.7515
4.4100	1.4522	1.4519	14.2034
3.7300	1.3017	1.3015	15.5049
3.7000	1.2948	1.2946	16.7995
3.6400	1.2811	1.2809	18.0804
3.6000	1.2719	1.2717	19.3520
3.0500	1.1413	1.1411	20.4932
2.7000	1.0540	1.0538	21.5470
1.2300	0.6306	0.6306	22.1775
0.7600	0.4604	0.4604	22.6379
		0.9463	23.5843
		0.9463	24.5306
		0.7909	25.3215
		0.6668	25.9883
		0.6505	26.6388
		0.6205	27.2593
		0.4915	27.7508
		0.4683	28.2191
		0.4644	28.6834
		0.4404	29.1238
		0.4404	29.5642
		0.4157	29.9799
		0.3945	30.3744
		0.3771	30.7516
		0.3548	31.1064
		0.3548	31.4612
		0.3027	31.7639
		0.2049	31.9688
		0.1664	32.1351
		0.1664	32.3015
		0.1453	32.4468
		0.1453	32.5921
		0.1453	32.7374
		0.1379	32.8753
		0.1303	33.0055
		0.1224	33.1279

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DAW

Ind8	Dep9	CALCINF	Sum11
		0.1143	33.2422
		0.1143	33.3565
		0.1058	33.4623
		0.0877	33.5499
		0.0877	33.6376
		0.0877	33.7253
		0.0778	33.8031
		0.0778	33.8810
		0.0778	33.9588
		0.0778	34.0366
		0.0778	34.1145
		0.0673	34.1817
		0.0673	34.2490
		0.0673	34.3163
		0.0558	34.3720
		0.0558	34.4278
		0.0558	34.4835
		0.0558	34.5393
		0.0558	34.5950
		0.0558	34.6508
		0.0558	34.7065

CALCINF = 0.3565*AVGRO^-1 0.6532

34.7065 ÷ 56 = 0.69 mm/yr²

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Power Fitting Report

Data File Name: C:\consult\swri\SCHANHIK\SUMCHANHI.PDW

DAW

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Model Equation(s):
CHANINF=A*(AVGRO^B)

Initial Parameters:

A=	0.51453525
B=	0.69472447

Save Options:

Save Data

Number of Function Calls: 4

Parameters After Fitting:

A=	0.55084953
B=	0.65326258
SumSqr:	0.027237904
StdDev:	0.012695315

Covariance Matrix:

cvm[1,1]:	0.11905849
cvm[2,1]:	-0.10908718
cvm[2,2]:	0.10683512

Goodness of Fit Statistics ...

__ C O D:	0.99504630
__ Corrl:	0.99756686
__ M S C:	5.04095320

Parameter Statistics...

Parameter: A= 0.55084953

StdDev:	0.015794117
Coeff. of Variance:	2.86722894

__95 % Confidence Interval

__ Uninvariant ...

LOW:	0.51672842
HIGH:	0.58497065

__ Supporting Plane ...

LOW:	0.50727629
HIGH:	0.59442278

DAW

Parameter: B= 0.65326258

StdDev:	0.014961399
Coeff. of Variance:	2.29025800

95 % Confidence Interval

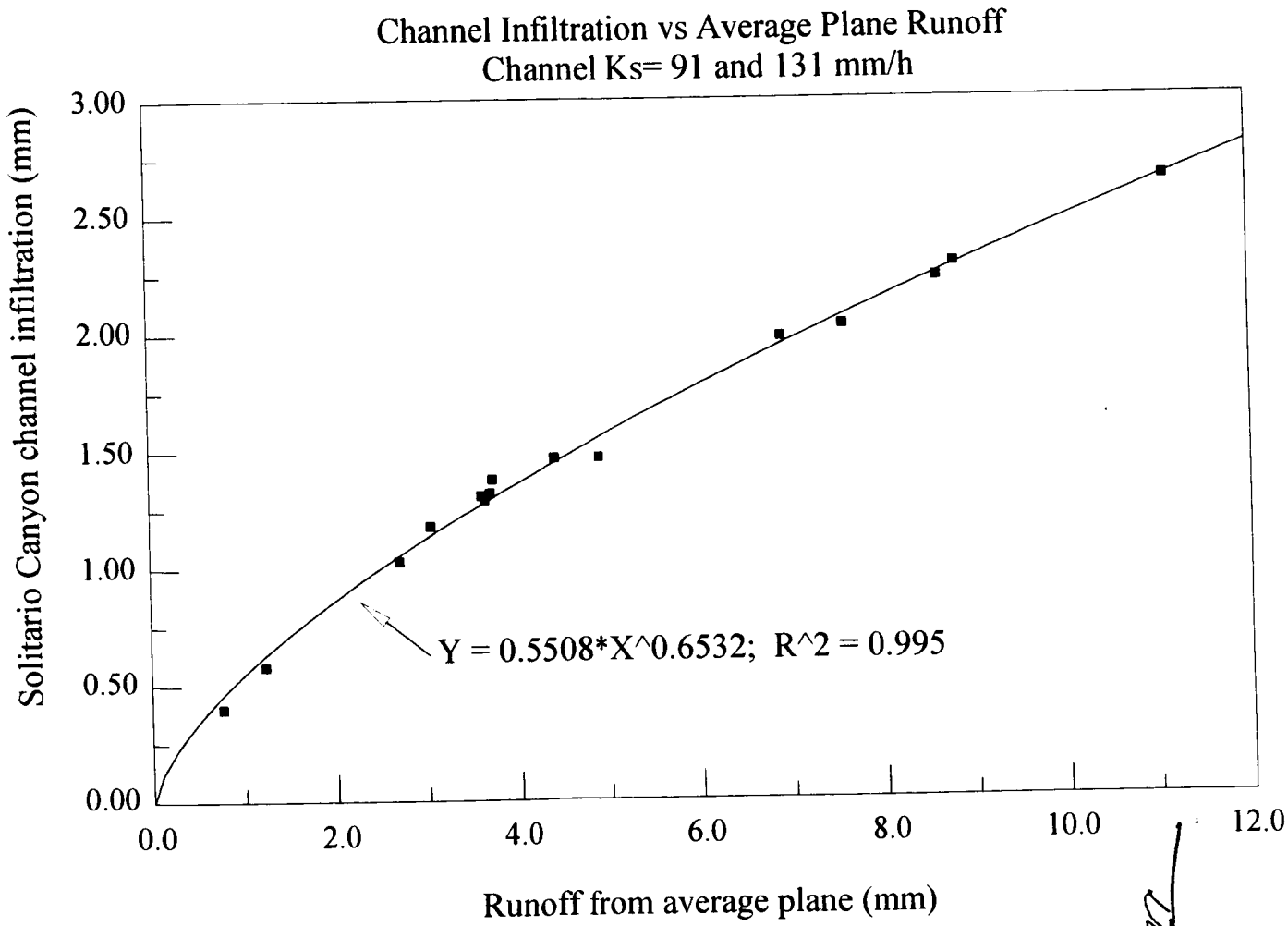
Uninvariant ...

LOW:	0.62094045
HIGH:	0.68558472

Supporting Plane ...

LOW:	0.61198666
HIGH:	0.69453850

----Created by D. A. Woolhiser with ProStat
----Tue Nov 25 16:28:06 1997


Channel Infiltration vs Average Plane Runoff
Channel Ks= 91 and 131 mm/h
Solitario Canyon channel infiltration (mm)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Runoff from average plane (mm)
Y = 0.5508*X^0.6532; R^2 = 0.995

Descriptive Statistics Report

Data File Name: C:\consult\swri\SCHANHIK\SUMCHANHI.PDW

DAW

COLUMN NAME:	CALCINF
Number of rows:	62
Number of valid points:	62
Number of missing points:	0
Number of negative values:	0
Number of positive values:	62
Number of zero values:	0
Minimum value:	0.055750599
Maximum value:	2.65337664
Inter range value:	2.59762604
Median:	0.32876444
Sum of row value:	34.70654665
Sum of absolute value:	34.70654665
Arithmetic mean:	0.55978301
Geometric mean:	0.28034875
Quadratic mean:	0.85592077
Harmonic mean:	0.15349694
Absolute mean:	0.55978301
Sum of squares:	45.42122220
Variance:	0.42611618
Standard deviation:	0.65277575
Absolute deviation:	0.50332864
Standard error:	0.082902603

95 percent confidence interval:
[0.39400901, 0.72555701]

99 percent confidence interval:
[0.33935682, 0.78020921]

Coefficient of variance:	116.61228345
Skewness:	1.57053209
Coefficient of skewness:	0.26876134
Kurtosis:	1.76350071
Coefficient of Kurtosis:	4.76350071

Percentiles:

10 percentile:	0.055750599
25 percentile:	0.080293477
50 percentile:	0.32876444
75 percentile:	0.75988271
90 percentile:	1.43687057

Quartiles:

First quartile:	0.080293477
Second quartile:	0.32876444

Third quartile:	0.75988271
Inter quartile:	0.67958923

DAW

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----Created by D. A. Woolhiser with ProStat
----Wed Nov 26 15:29:05 1997

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Volume in drive B has no label
Directory of B:\

FUTURE1	DAY	127750	02-27-97	12:12p				
FUTURE1	CON	3852	02-27-97	12:22p				
FUTURE1	DUR	44225	02-27-97	12:32p				
FUTURE1	MAX	13910	02-27-97	4:27p				
PMAR1	PRE	352	02-27-97	3:39p	480	41.7	0.39	prog. stop
~~PAPR2~~	PRE	350	02-27-97	3:39p	481	16.6	0	" "
PAPR3	PRE	351	02-27-97	3:39p	[illegible]	[illegible]	1.05	" "
PNOV4	PRE	353	02-27-97	3:40p	480	[illegible]	0.5	
PNOV5	PRE	452	02-27-97	3:40p	[illegible]	[illegible]	0.37	
PDEC6	PRE	454	02-27-97	3:40p	[illegible]	26.7	0.37	
PMAR7	PRE	452	02-27-97	3:40p	[illegible]	16.0	[illegible]	prog. stop
~~PAPR8~~	PRE	353	02-27-97	3:40p	[illegible]	[illegible]	0	
PMAY9	PRE	450	02-27-97	3:41p	[illegible]	19.1	0.229	
PJUL10	PRE	450	02-27-97	3:41p	[illegible]	[illegible]	1.87	
PJUL11	PRE	459	02-27-97	3:41p	[illegible]	15.[illegible]	0.317	
PAUG12	PRE	452	02-27-97	3:42p	[illegible]	[illegible]	0.760	
PNOV13	PRE	354	02-27-97	3:42p	480	[illegible]	0.23	
~~PJAN14~~	PRE	354	02-27-97	3:42p	[illegible]	[illegible]	0	
PAUG15	PRE	456	02-27-97	3:42p	168	14.1	0.680	
PAUG16	PRE	457	02-27-97	3:43p	[illegible]	[illegible]	0.882	
PSEP17	PRE	458	02-27-97	3:43p	[illegible]	[illegible]	0.439	
PSEP18	PRE	456	02-27-97	3:43p	[illegible]	[illegible]	0.794	
PNOV19	PRE	456	02-27-97	3:43p	146	26.4	3.57	
~~PFEB20~~	PRE	449	02-27-97	3:43p	435	15.[illegible]	0	
PFEB21	PRE	444	02-27-97	3:43p	115	21.8	0.69	
[illegible]G22	PRE	457	02-27-97	3:44p	321	8.3	0.044	
PSEP23	PRE	459	02-27-97	3:44p	37	[illegible]	4.84	
PMAY24	PRE	456	02-27-97	3:44p	[illegible]	26.7	0.067	
PJUN25	PRE	457	02-27-97	3:45p	187	35.7	0.442	
PAUG26	PRE	459	02-27-97	3:45p	48	7.4	2.65	
PSEP27	PRE	456	02-27-97	3:45p	37	9.6	2.08	
PSEP28	PRE	459	02-27-97	3:45p	39	14.3	1.39	
PNOV29	PRE	357	02-27-97	3:46p	480	[illegible]	0.18	
PMAR30	PRE	456	02-27-97	3:46p	[illegible]	16.51	0.37	
~~PMAR31~~	PRE	351	02-27-97	3:46p	[illegible]	[illegible]	0	
~~PAPR32~~	PRE	456	02-27-97	3:46p	395	23.6	0	
PAUG33	PRE	356	02-27-97	3:46p	480	13.9	0.033	
PAUG34	PRE	457	02-27-97	3:47p	20	15.2	3.90	
PAUG35	PRE	457	02-27-97	3:47p	25	16.7	3.32	
PNOV36	PRE	457	02-27-97	3:47p	201	[illegible]	0.49	
PDEC37	PRE	458	02-27-97	3:47p	390	[illegible]	2.78	
~~PDEC38~~	PRE	355	02-27-97	3:47p	480	[illegible]	0.0[illegible]	
~~PDEC39~~	PRE	457	02-27-97	3:47p	232	[illegible]	0	
~~PMAR40~~	PRE	354	02-27-97	3:48p	[illegible]	[illegible]	0	
~~PMAR41~~	PRE	454	02-27-97	3:48p	398	[illegible]	[illegible]	
PNOV42	PRE	456	02-27-97	3:48p	[illegible]	[illegible]	2.5	
~~PDEC43~~	PRE	459	02-27-97	3:48p	44	[illegible]	3.01	
~~PMAR44~~	PRE	354	02-27-97	3:48p	[illegible]	[illegible]	0	
PAUG45	PRE	455	02-27-97	3:49p	20	[illegible]	10.06	
PNOV46	PRE	353	02-27-97	3:49p	480	[illegible]	3.18	
[illegible]V47	PRE	457	02-27-97	3:49p	[illegible]	[illegible]	[illegible]	
[illegible]C48	PRE	354	02-27-97	3:49p	480	[illegible]	[illegible]	
PMAY49	PRE	436	02-27-97	3:49p	27	[illegible]	0.67	
~~PDEC50~~	PRE	355	02-27-97	3:50p	[illegible]	[illegible]	[illegible]	
PJUL51	PRE	453	02-27-97	3:50p	19	18.3	6.86	
PJUL52	PRE	356	02-27-97	3:50p	480	19.6	0.05	

					DUR (min)	DEPTH (mm)	AVG R.O (mm)
PAUG53	PRE	455	02-27-97	3:50p	62	23.6	4.16
PNOV54	PRE	454	02-27-97	3:50p	441	24.6	0.27
~~PDEC55~~	PRE	453	02-27-97	3:51p	413	20.6	0.04
~~PC56~~	PRE	355	02-27-97	3:51p	480	14.9	.002
~~PC57~~	PRE	355	02-27-97	3:51p	[illegible]	14.2	0
~~PFEB58~~	PRE	454	02-27-97	3:51p	[illegible]	14.2	[illegible]
~~PFEB59~~	PRE	355	02-27-97	3:51p	480	[illegible]	0.0
PAUG60	PRE	459	02-27-97	3:51p	23	[illegible]	1.33
PSEP61	PRE	454	02-27-97	3:51p	[illegible]	[illegible]	11.84
~~PFEB62~~	PRE	357	02-27-97	3:52p	[illegible]	[illegible]	0.0
~~PMAY63~~	PRE	450	02-27-97	3:52p	[illegible]	[illegible]	0.001
PNOV64	PRE	451	02-27-97	3:52p	19.6	14.9	4.5
PFEB65	PRE	354	02-27-97	3:52p	480	32.5	0.44
~~PFEB66~~	PRE	455	02-27-97	3:53p	127	14.5	0.02
~~PJUL67~~	PRE	456	02-27-97	3:53p	306	13	0.00
PAUG68	PRE	459	02-27-97	3:53p	58	13.8	0.63
PSEP69	PRE	456	02-27-97	3:53p	24[illegible]	23.7	0.125
~~PJAN70~~	PRE	354	02-27-97	3:53p	480	13	0
~~PAPR71~~	PRE	351	02-27-97	3:53p	480	14	0
PMAY72	PRE	449	02-27-97	3:54p	382	[illegible]	0.056
PAUG73	PRE	453	02-27-97	3:54p	123	22.[illegible]	3.41
~~PDEC74~~	PRE	459	02-27-97	3:54p	[illegible]	21.[illegible]	[illegible]
~~PJAN75~~	PRE	456	02-27-97	3:54p	152	13.[illegible]	[illegible]
PAUG76	PRE	455	02-27-97	3:54p	72	12.[illegible]	0.965
PAUG77	PRE	454	02-27-97	3:55p	282	15.2	0.063
PSEP78	PRE	458	02-27-97	3:55p	224	20.2	1.56
PSEP79	PRE	454	02-27-97	3:55p	90	37.3	11.17
~~PNOV80~~	PRE	455	02-27-97	3:55p	[illegible]	15.7	0.002
~~PNOV81~~	PRE	353	02-27-97	3:55p	[illegible]	[illegible]	0.007
~~PC82~~	PRE	460	02-27-97	3:55p	[illegible]	[illegible]	0.0008
PAPR83	PRE	456	02-27-97	3:56p	[illegible]	15.2	0.03
PSEP84	PRE	457	02-27-97	3:56p	194	35.1	5.09
PSEP85	PRE	457	02-27-97	3:56p	257	14.0	0.692
~~PNOV86~~	PRE	355	02-27-97	3:56p	[illegible]	15.5	0.013
PJAN87	PRE	352	02-27-97	3:56p	480	37.3	0.22
~~PJAN88~~	PRE	457	02-27-97	3:56p	98	12.3	0.01
~~PFEB89~~	PRE	357	02-27-97	3:57p	480	32.7	0.02
~~PFEB90~~	PRE	357	02-27-97	3:57p	480	23.1	0.00
PMAR91	PRE	452	02-27-97	3:57p	31	19.3	0.05
PAUG92	PRE	452	02-27-97	3:57p	108	25.4	2.08
PAUG93	PRE	452	02-27-97	3:57p	136	23.8	1.95
~~PNOV94~~	PRE	354	02-27-97	3:57p	[illegible]	[illegible]	0.001
PNOV95	PRE	355	02-27-97	3:58p	480	49.3	4.16
PJUN96	PRE	459	02-27-97	3:58p	36	13.4	0.40
PSEP97	PRE	454	02-27-97	3:58p	19	18.2	1.93
PJAN98	PRE	454	02-27-97	3:58p	30	17.5	0.09
PJUL99	PRE	453	02-27-97	3:58p	340	22.9	0.180
~~PJAN100~~	PRE	460	02-27-97	3:58p	439	21.6	0.003
~~PMAR101~~	PRE	459	02-27-97	3:59p	36	17.4	0.00
PAPR102	PRE	452	02-27-97	3:59p	51	14.7	1.03
PSEP103	PRE	461	02-27-97	3:59p	23	16.0	0.044
PSEP104	PRE	459	02-27-97	3:59p	22	13.0	0.087
PSEP105	PRE	457	02-27-97	3:59p	[illegible]	18.0	2.74
~~PNOV106~~	PRE	355	02-27-97	3:59p	480	23.0	0.014
~~PNOV107~~	PRE	353	02-27-97	3:59p	480	20.1	0.095
~~PC108~~	PRE	356	02-27-97	4:00p	[illegible]	14.0	0.00017
PFEB109	PRE	455	02-27-97	4:00p	[illegible]	[illegible]	0.150
PNOV110	PRE	459	02-27-97	4:00p	18[illegible]	18.[illegible]	0.49
PDEC111	PRE	459	02-27-97	4:00p	198	14.2	0.1
~~PNOV112~~	PRE	352	02-27-97	4:01p	480	13.7	0.04

					Nur (mm)	DEPTH (cm)	AVG (mm)
~~PNOV113~~	PRE	456	02-27-97	4:01p	38	14.1	[illegible]
PNOV114	PRE	458	02-27-97	4:01p	115	18.8	[illegible]
~~PDEC115~~	PRE	456	02-27-97	4:01p	213	20.8	[illegible]
~~PDEC116~~	PRE	356	02-27-97	4:01p	180	14	0
~~PAPR117~~	PRE	456	02-27-97	4:01p	[illegible]	[illegible]	0.002
PAPR118	PRE	458	02-27-97	4:01p	[illegible]	[illegible]	0.012
PMAY119	PRE	461	02-27-97	4:02p	250	[illegible]	0.022
PJUL120	PRE	448	02-27-97	4:02p	[illegible]	[illegible]	12.66
~~PNOV121~~	PRE	457	02-27-97	4:02p	329	[illegible]	[illegible]
PNOV122	PRE	454	02-27-97	4:02p	[illegible]	[illegible]	0.001
~~PFEB123~~	PRE	459	02-27-97	4:02p	[illegible]	[illegible]	[illegible]
~~PFEB124~~	PRE	353	02-27-97	4:03p	[illegible]	[illegible]	[illegible]
~~PFEB125~~	PRE	458	02-27-97	4:03p	[illegible]	[illegible]	0.00
~~PAPR126~~	PRE	457	02-27-97	4:03p	[illegible]	[illegible]	0.04
PJUL127	PRE	457	02-27-97	4:03p	225	[illegible]	[illegible]
~~PNOV128~~	PRE	355	02-27-97	4:08p	[illegible]	[illegible]	[illegible]
~~PNOV129~~	PRE	350	02-27-97	4:08p	750	[illegible]	[illegible]
~~PJAN130~~	PRE	355	02-27-97	4:08p	[illegible]	[illegible]	0.00
~~PMAR131~~	PRE	355	02-27-97	4:08p	[illegible]	13.3	0.033
PJUL132	PRE	452	02-27-97	4:09p	275	[illegible]	0.565
PJUL133	PRE	459	02-27-97	4:09p	35	[illegible]	0.63
~~PNOV134~~	PRE	454	02-27-97	4:09p	329	[illegible]	[illegible]
~~PFEB135~~	PRE	353	02-27-97	4:09p	480	[illegible]	0.10
PAUG136	PRE	456	02-27-97	4:09p	[illegible]	15	[illegible]
PNOV137	PRE	452	02-27-97	4:09p	264	24.1	[illegible]
~~PNOV138~~	PRE	355	02-27-97	4:09p	430	21.1	[illegible]
PJUN139	PRE	458	02-27-97	4:10p	77	14.5	0.084
PNOV140	PRE	455	02-27-97	4:10p	291	15.3	[illegible]
PMAY141	PRE	452	02-27-97	4:10p	169	56	2.42
[illegible]G142	PRE	458	02-27-97	4:10p	[illegible]	51	0.664
PAUG143	PRE	455	02-27-97	4:10p	215	[illegible]	[illegible]
~~PNOV144~~	PRE	454	02-27-97	4:10p	260	13.2	[illegible]
~~PJAN145~~	PRE	355	02-27-97	4:10p	480	13.2	[illegible]
~~PMAY146~~	PRE	459	02-27-97	4:11p	97	12.9	0.005
PJUL147	PRE	453	02-27-97	4:11p	104	13.5	2.54
PJUL148	PRE	460	02-27-97	4:11p	240	[illegible]	0.076
PAUG149	PRE	456	02-27-97	4:11p	54	16.3	0.282
PAUG150	PRE	449	02-27-97	4:12p	67	3.5	1.20
PSEP151	PRE	460	02-27-97	4:12p	37	26.1	10.33
PJAN152	PRE	457	02-27-97	4:12p	179	[illegible]	[illegible]
~~PFEB153~~	PRE	456	02-27-97	4:12p	435	[illegible]	[illegible]
PFEB154	PRE	355	02-27-97	4:12p	480	24.7	0.01
~~PMAR155~~	PRE	356	02-27-97	4:12p	480	3.7	2.00
PMAY156	PRE	458	02-27-97	4:12p	32	[illegible]	0.22
PJUN157	PRE	457	02-27-97	4:13p	73	[illegible]	0.437
~~PJAN158~~	PRE	460	02-27-97	4:13p	32	12.9	[illegible]
PFEB159	PRE	355	02-27-97	4:13p	480	20.8	[illegible]
~~PFEB160~~	PRE	357	02-27-97	4:13p	480	[illegible]	[illegible]
PFEB161	PRE	455	02-27-97	4:13p	104	18.9	[illegible]
~~PFEB162~~	PRE	459	02-27-97	4:14p	340	[illegible]	[illegible]
PJUL163	PRE	455	02-27-97	4:14p	26	[illegible]	2.975
PSEP164	PRE	457	02-27-97	4:14p	328	45.1	1.069
~~PDEC165~~	PRE	356	02-27-97	4:14p	480	32.8	[illegible]
PJAN166	PRE	460	02-27-97	4:14p	261	31	[illegible]
~~[illegible]B167~~	PRE	354	02-27-97	4:14p	480	[illegible]	[illegible]
[illegible]AR168	PRE	456	02-27-97	4:15p	75	[illegible]	0.20
PJUL169	PRE	456	02-27-97	4:15p	[illegible]	[illegible]	0.120
PSEP170	PRE	453	02-27-97	4:15p	[illegible]	15.[illegible]	0.065
PNOV171	PRE	463	02-27-97	4:15p	[illegible]	[illegible]	[illegible]
PNOV172	PRE	456	02-27-97	4:15p	425	20.8	[illegible]

					DUR	DEPTH	AVG
PJUL173	PRE	461	02-27-97	4:15p	122	13.1	0.034
PAUG174	PRE	454	02-27-97	4:16p	[illegible]	23.6	8.34
~~PNOV175~~	PRE	459	02-27-97	4:16p	[illegible]	7.3	0.03
[illegible]V176	PRE	354	02-27-97	4:16p	480	14.2	[illegible]
[illegible]C177	PRE	357	02-27-97	4:16p	[illegible]	14.3	[illegible]
~~PAPR178~~	PRE	455	02-27-97	4:16p	459	[illegible]	0.002
PMAY179	PRE	458	02-27-97	4:17p	53	18.5	3.79
PJUN180	PRE	457	02-27-97	4:17p	108	16.2	0.112
PJUN181	PRE	456	02-27-97	4:17p	33	[illegible]	0.102
PJUL182	PRE	459	02-27-97	4:17p	201	13.4	0.022
~~PNOV183~~	PRE	457	02-27-97	4:17p	193	14.[illegible]	[illegible]
PNOV184	PRE	457	02-27-97	4:17p	28	[illegible]	[illegible]
~~PNOV185~~	PRE	457	02-27-97	4:17p	[illegible]	10.5	[illegible]
~~PNOV186~~	PRE	454	02-27-97	4:18p	[illegible]	14.5	[illegible]
~~PDEC187~~	PRE	459	02-27-97	4:18p	420	[illegible]	0
PDEC188	PRE	458	02-27-97	4:18p	57	[illegible]	4.12
~~PDEC189~~	PRE	454	02-27-97	4:18p	193	[illegible]	[illegible]
PFEB190	PRE	351	02-27-97	4:18p	480	52.1	0.368
PMAY191	PRE	456	02-27-97	4:19p	227	16.3	0.024
PNOV192	PRE	454	02-27-97	4:19p	12[illegible]	13.5	0.14
PNOV193	PRE	454	02-27-97	4:19p	117	16.[illegible]	0.18
PNOV194	PRE	358	02-27-97	4:19p	480	25.[illegible]	[illegible]
~~PMAR195~~	PRE	349	02-27-97	4:19p	[illegible]	13.5	0.00
PAUG196	PRE	456	02-27-97	4:19p	4[illegible]	17.3	2.37
PSEP197	PRE	459	02-27-97	4:19p	50	[illegible]	0.373
~~PNOV198~~	PRE	358	02-27-97	4:20p	480	[illegible]	[illegible]
~~PNOV199~~	PRE	357	02-27-97	4:20p	480	20.[illegible]	[illegible]
~~PDEC200~~	PRE	356	02-27-97	4:20p	480	25.5	[illegible]
PDEC201	PRE	454	02-27-97	4:20p	38	27.[illegible]	0.79
~~N202~~	PRE	460	02-27-97	4:20p	274	17.1	[illegible]
~~PFEB203~~	PRE	354	02-27-97	4:21p	480	4.6	0.00
~~PFEB204~~	PRE	356	02-27-97	4:21p	480	[illegible]	0.00
~~PFEB205~~	PRE	354	02-27-97	4:21p	480	25.1	[illegible]
PFEB206	PRE	457	02-27-97	4:21p	438	16.5	0.01
~~PMAR207~~	PRE	464	02-27-97	4:21p	299	15.7	0.00
PNOV208	PRE	458	02-27-97	4:21p	57	11.9	5.37
PNOV209	PRE	455	02-27-97	4:21p	38	14	[illegible]
PFEB210	PRE	455	02-27-97	4:21p	30	18.5	0.036
~~PFEB211~~	PRE	448	02-27-97	4:22p	192	13.7	0.00
PSEP212	PRE	460	02-27-97	4:22p	113	17.6	0.551
PSEP213	PRE	458	02-27-97	4:22p	56	15.1	1.38
~~PNOV214~~	PRE	458	02-27-97	4:22p	220	14.2	[illegible]
PDEC215	PRE	449	02-27-97	4:22p	192	27.9	0.70
PDEC216	PRE	455	02-27-97	4:22p	480	13	0
PFEB217	PRE	353	02-27-97	4:22p	480	16.5	0.027
~~PFEB218~~	PRE	354	02-27-97	4:22p	480	6.3	0.005
PFEB219	PRE	456	02-27-97	4:23p	285	22.6	0.158
PAUG220	PRE	454	02-27-97	4:23p	182	17.3	2.35

224 file(s) 283619 bytes

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Volume in drive A has no label
Directory of A:\

					DUR(min)	DEPTH(mm)	(AVG) R.O mm
. .	OUT	14761	03-06-97	12:58p			
FUTURE1B	DUR	6567	03-06-97	3:46p			
FUTURE1B	MAX	2466	03-06-97	3:55p			
PNOV221	PRE	356	03-06-97	3:49p	480	15.5	0
PNOV222	PRE	464	03-06-97	3:49p	280	13.4	0
PMAR223	PRE	456	03-06-97	3:49p	56	15	.15
PMAR224	PRE	461	03-06-97	3:49p	81	14.4	.12
PAUG225	PRE	459	03-06-97	3:50p	118	34.3	9.52
PSEP226	PRE	455	03-06-97	3:50p	259	13.2	.01
PNOV227	PRE	352	03-06-97	3:50p	480	32.3	1.56
PJAN228	PRE	454	03-06-97	3:50p	284	26.9	0.29
PMAY229	PRE	457	03-06-97	3:50p	386	24.8	0.04
PSEP230	PRE	455	03-06-97	3:50p	35	17.3	3.68
PNOV231	PRE	356	03-06-97	3:51p	480	23	.04
PNOV232	PRE	448	03-06-97	3:51p	229	16.7	0
PFEB233	PRE	453	03-06-97	3:51p	204	22.6	.03
PJUN234	PRE	458	03-06-97	3:51p	121	19.6	.32
PAUG235	PRE	457	03-06-97	3:51p	55	17.3	1.97
PSEP236	PRE	459	03-06-97	3:52p	230	16.9	.02
PNOV237	PRE	457	03-06-97	3:52p	211	22.4	.31
PNOV238	PRE	454	03-06-97	3:52p	269	13.5	0
PDEC239	PRE	459	03-06-97	3:52p	326	15.4	.02
PFEB240	PRE	454	03-06-97	3:52p	321	29.7	.10
PAPR241	PRE	460	03-06-97	3:52p	217	21.1	.20
PMAY242	PRE	454	03-06-97	3:52p	36	20.3	1.93
P[illegible]P243	PRE	460	03-06-97	3:52p	115	28.3	6.68
PDEC244	PRE	460	03-06-97	3:53p	136	18.1	.16
PFEB245	PRE	352	03-06-97	3:53p	480	13.1	0
PFEB246	PRE	461	03-06-97	3:53p	315	8.6	0
PMAR247	PRE	460	03-06-97	3:53p	389	18.9	.01
PJUL248	PRE	459	03-06-97	3:53p	375	17.5	0
PNOV249	PRE	460	03-06-97	3:53p	105	18.6	1.
PJUN250	PRE	458	03-06-97	3:54p	102	33.8	3.09
PJUL251	PRE	454	03-06-97	3:54p	105	17	.83
PJAN252	PRE	352	03-06-97	3:54p	480	17.5	0
PFEB253	PRE	356	03-06-97	3:54p	480	33.5	.57
PFEB254	PRE	356	03-06-97	3:54p	480	35.1	.45
PFEB255	PRE	458	03-06-97	3:54p	158	13.6	0
PMAR256	PRE	455	03-06-97	3:55p	334	20.3	.02
PJUN257	PRE	455	03-06-97	3:55p	109	28	.90
PFEB258	PRE	457	03-06-97	3:55p	352	30.5	0
PFEB259	PRE	356	03-06-97	3:55p	480	13	0

42 file(s) 40801 bytes
1169920 bytes free

Proofed by KW + DW 3/9/97

B:\FUTSTAT.PDW

Relief from average plane

Column1 N (Station Number)	DUR (min)	DEPTH (mm)	AVGRO (mm)	Column5	C6	C7
1.0000	480.0000	41.7000	0.3800			
2.0000	480.0000	16.6000	0.0000			
3.0000	480.0000	42.9000	1.0500			
4.0000	480.0000	20.0000	0.5000			
5.0000	159.0000	18.3000	0.3700			
6.0000	190.0000	26.9000	0.3700			
7.0000	105.0000	16.0000	0.0900			
8.0000	480.0000	13.2000	0.0000			
9.0000	309.0000	19.1000	0.2300			
10.0000	191.0000	31.2000	1.8700			
11.0000	88.0000	15.7000	0.3200			
12.0000	299.0000	16.8000	0.7600			
13.0000	480.0000	19.0000	0.2300			
14.0000	480.0000	13.2000	0.0000			
15.0000	168.0000	14.1000	0.6800			
16.0000	53.0000	13.8000	0.8800			
17.0000	209.0000	18.8000	0.4400			
18.0000	363.0000	23.4000	0.7900			
19.0000	146.0000	26.4000	3.5100			
20.0000	435.0000	15.2000	0.0000			
21.0000	115.0000	21.8000	0.6900			
22.0000	321.0000	18.3000	0.0440			
23.0000	57.0000	22.7000	4.8400			
24.0000	232.0000	26.7000	0.0670			
25.0000	187.0000	30.7000	0.4420			
26.0000	48.0000	17.4000	2.6500			
27.0000	137.0000	19.6000	2.0800			
28.0000	69.0000	14.3000	1.3900			
29.0000	480.0000	25.2000	0.1800			
30.0000	40.0000	16.5100	0.9900			
31.0000	480.0000	16.7600	0.0000			
32.0000	395.0000	23.6000	0.0000			
33.0000	480.0000	13.9000	0.0330			
34.0000	20.0000	15.2000	3.9000			
35.0000	25.0000	16.4000	3.3200			
36.0000	261.0000	22.6000	0.4900			
37.0000	300.0000	20.8000	0.2800			
38.0000	480.0000	26.4000	0.0200			
39.0000	282.0000	12.8000	0.0000			
40.0000	480.0000	12.9500	0.0000			
41.0000	398.0000	17.7800	0.0200			
42.0000	165.0000	20.0000	2.5000			
43.0000	244.0000	17.6000	0.0100			
44.0000	480.0000	19.5100	0.0000			
45.0000	90.0000	28.2000	10.0600			
46.0000	480.0000	29.2000	3.1800			
47.0000	260.0000	18.0000	0.2700			
48.0000	480.0000	23.9000	0.2200			
49.0000	107.0000	23.0000	0.6700			
50.0000	480.0000	26.8000	0.0200			
51.0000	19.0000	18.3000	6.8600			
52.0000	480.0000	19.6000	0.0500			

DW

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Column1	DUR	DEPTH	AVGRO	Column5	C6	C7
53.0000	62.0000	23.6000	4.1600			
54.0000	441.0000	24.6000	0.2700			
55.0000	413.0000	20.6000	0.0400			
56.0000	480.0000	14.9000	0.0020			
57.0000	480.0000	14.2000	0.0000			
58.0000	279.0000	14.2000	0.0020			
59.0000	480.0000	13.9000	0.0000			
60.0000	63.0000	17.1000	1.3300			
61.0000	62.0000	29.7000	11.8400			
62.0000	480.0000	16.1000	0.0000			
63.0000	418.0000	14.7000	0.0010			
64.0000	19.6000	14.9000	4.5000			
65.0000	480.0000	32.5000	0.4400			
66.0000	129.0000	14.5000	0.0200			
67.0000	306.0000	13.0000	0.0000			
68.0000	58.0000	13.8000	0.6300			
69.0000	246.0000	23.7000	0.1250			
70.0000	480.0000	13.0000	0.0000			
71.0000	480.0000	14.0000	0.0000			
72.0000	380.0000	31.0000	0.0560			
73.0000	123.0000	22.6000	3.4100			
74.0000	250.0000	21.8000	0.0300			
75.0000	152.0000	13.5000	0.0200			
76.0000	72.0000	14.5000	0.9650			
77.0000	282.0000	15.2000	0.0630			
78.0000	224.0000	26.2000	1.5600			
79.0000	190.0000	37.3000	11.1700			
80.0000	342.0000	15.7000	0.0020			
81.0000	480.0000	19.0000	0.0070			
82.0000	418.0000	18.4000	0.0008			
83.0000	204.0000	15.2000	0.0300			
84.0000	194.0000	35.1000	5.0900			
85.0000	257.0000	24.6000	0.6920			
86.0000	480.0000	15.5000	0.0130			
87.0000	480.0000	37.3000	0.2000			
88.0000	198.0000	16.3000	0.0100			
89.0000	480.0000	32.7000	0.0300			
90.0000	480.0000	23.1000	0.0000			
91.0000	131.0000	19.3000	0.0500			
92.0000	108.0000	25.4000	2.0800			
93.0000	136.0000	23.8000	1.9500			
94.0000	480.0000	13.2000	0.0010			
95.0000	480.0000	49.3000	4.1600			
96.0000	136.0000	13.4000	0.4000			
97.0000	119.0000	18.8000	1.9300			
98.0000	139.0000	17.5000	0.0900			
99.0000	340.0000	22.9000	0.1800			
100.0000	439.0000	21.6000	0.0030			
101.0000	361.0000	17.4000	0.0000			
102.0000	51.0000	14.7000	1.0300			
103.0000	183.0000	16.6000	0.0440			
104.0000	122.0000	13.6000	0.0870			

B:\FUTSTAT.PDW

Column1	DUR	DEPTH	AVGRO	Column5	C6	C7
105.0000	59.0000	16.8000	2.7400			
106.0000	480.0000	23.0000	0.0140			
107.0000	480.0000	20.1000	0.0850			
108.0000	480.0000	14.0000	0.0002			
109.0000	165.0000	23.1000	0.1500			
110.0000	180.0000	18.8000	0.4900			
111.0000	198.0000	14.2000	0.1000			
112.0000	480.0000	13.2000	0.0400			
113.0000	438.0000	14.1000	0.0030			
114.0000	118.0000	18.8000	3.5000			
115.0000	313.0000	20.8000	0.0040			
116.0000	480.0000	14.0000	0.0000			
117.0000	261.0000	14.2000	0.0020			
118.0000	171.0000	13.3000	0.0120			
119.0000	250.0000	22.4000	0.0230			
120.0000	53.0000	29.2000	12.6600			
121.0000	328.0000	14.7000	0.0020			
122.0000	230.0000	25.9000	2.7300			
123.0000	281.0000	13.1000	0.0010			
124.0000	480.0000	16.5000	0.0050			
125.0000	347.0000	13.2000	0.0000			
126.0000	444.0000	13.2000	0.0000			
127.0000	325.0000	16.7000	0.0400			
128.0000	480.0000	16.3000	0.0010			
129.0000	480.0000	13.7000	0.0002			
130.0000	480.0000	27.9000	0.0030			
131.0000	480.0000	15.5000	0.0000			
132.0000	275.0000	18.3000	0.0330			
133.0000	95.0000	13.5000	0.5650			
134.0000	329.0000	15.2000	0.0300			
135.0000	480.0000	20.1000	0.0300			
136.0000	216.0000	15.0000	0.1000			
137.0000	264.0000	24.1000	0.2100			
138.0000	480.0000	21.1000	0.0070			
139.0000	77.0000	14.5000	0.0840			
140.0000	291.0000	15.7000	0.0900			
141.0000	169.0000	19.3000	0.0600			
142.0000	217.0000	36.0000	2.4200			
143.0000	215.0000	31.0000	0.6640			
144.0000	260.0000	13.2000	0.0000			
145.0000	480.0000	13.2000	0.0000			
146.0000	97.0000	12.9000	0.0050			
147.0000	104.0000	18.8000	2.5400			
148.0000	240.0000	16.9000	0.0760			
149.0000	104.0000	16.3000	0.2820			
150.0000	67.0000	13.5000	1.2000			
151.0000	39.0000	26.1000	10.3300			
152.0000	179.0000	17.5000	0.1400			
153.0000	435.0000	16.8000	0.0000			
154.0000	480.0000	24.4000	0.0100			
155.0000	480.0000	13.7000	0.0000			
156.0000	82.0000	14.9000	0.2200			

B:\FUTSTAT.PDW

Column1	DUR	DEPTH	AVGRO	Column5	C6	C7
157.0000	73.0000	21.3000	0.4370			
158.0000	132.0000	12.9000	0.0000			
159.0000	480.0000	20.8000	0.0480			
160.0000	480.0000	12.8000	0.0000			
161.0000	104.0000	18.9000	0.0680			
162.0000	240.0000	16.3000	0.0000			
163.0000	96.0000	22.1000	2.9750			
164.0000	328.0000	40.1000	1.0690			
165.0000	480.0000	32.8000	0.0030			
166.0000	261.0000	31.0000	0.1700			
167.0000	480.0000	14.7000	0.0000			
168.0000	95.0000	14.0000	0.2000			
169.0000	160.0000	18.5000	0.1200			
170.0000	118.0000	15.0000	0.0650			
171.0000	211.0000	16.5000	0.0800			
172.0000	425.0000	20.8000	0.0800			
173.0000	122.0000	13.1000	0.0340			
174.0000	45.0000	23.6000	8.3400			
175.0000	274.0000	17.3000	0.0300			
176.0000	480.0000	14.2000	0.1000			
177.0000	480.0000	14.3000	0.0000			
178.0000	459.0000	16.3000	0.0020			
179.0000	53.0000	18.5000	3.7900			
180.0000	108.0000	16.2000	0.1120			
181.0000	133.0000	16.3000	0.1020			
182.0000	201.0000	13.2000	0.0220			
183.0000	193.0000	14.7000	0.0200			
184.0000	88.0000	27.2000	5.1300			
185.0000	291.0000	16.5000	0.0020			
186.0000	174.0000	14.5000	0.0040			
187.0000	400.0000	13.7000	0.0000			
188.0000	57.0000	17.0000	1.1200			
189.0000	193.0000	13.5000	0.0030			
190.0000	480.0000	52.1000	0.3680			
191.0000	227.0000	16.8000	0.0240			
192.0000	128.0000	13.5000	0.1400			
193.0000	117.0000	16.5000	0.1800			
194.0000	480.0000	25.4000	0.2600			
195.0000	480.0000	18.5000	0.0000			
196.0000	41.0000	17.3000	2.3700			
197.0000	80.0000	14.7000	0.3730			
198.0000	480.0000	13.1000	0.0000			
199.0000	480.0000	20.9000	0.0400			
200.0000	480.0000	25.4000	0.0200			
201.0000	98.0000	27.9000	9.7800			
202.0000	279.0000	17.1000	0.0030			
203.0000	480.0000	19.6000	0.0000			
204.0000	480.0000	15.5000	0.0000			
205.0000	480.0000	25.1000	0.0000			
206.0000	438.0000	16.5000	0.0100			
207.0000	299.0000	15.7000	0.0000			
208.0000	157.0000	21.9000	5.8800			

DAW

B:\FUTSTAT.PDW

Column1	DUR	DEPTH	AVGRO	Column5	C6	C7
209.0000	38.0000	14.0000	2.7500			
210.0000	80.0000	18.5000	0.6960			
211.0000	192.0000	13.7000	0.0000			
212.0000	113.0000	17.6000	0.5510			
213.0000	56.0000	15.1000	1.3800			
214.0000	200.0000	14.2000	0.0200			
215.0000	192.0000	27.9000	0.2000			
216.0000	480.0000	13.0000	0.0000			
217.0000	480.0000	16.5000	0.0270			
218.0000	480.0000	16.8000	0.0050			
219.0000	285.0000	22.6000	0.1580			
220.0000	122.0000	17.3000	2.3500			
221.0000	480.0000	15.5000	0.0000			
222.0000	280.0000	13.4000	0.0000			
223.0000	156.0000	15.0000	0.1500			
224.0000	81.0000	14.4000	0.1200			
225.0000	118.0000	34.3000	9.5200			
226.0000	259.0000	13.2000	0.0100			
227.0000	480.0000	32.3000	1.5600			
228.0000	284.0000	26.9000	0.2900			
229.0000	386.0000	24.8000	0.0400			
230.0000	35.0000	17.3000	3.6800			
231.0000	480.0000	23.0000	0.0400			
232.0000	229.0000	16.7000	0.0000			
233.0000	204.0000	22.6000	0.0300			
234.0000	121.0000	19.6000	0.3200			
235.0000	55.0000	17.3000	1.9700			
236.0000	230.0000	16.9000	0.0200			
237.0000	211.0000	22.4000	0.3100			
238.0000	269.0000	13.5000	0.0000			
239.0000	326.0000	15.4000	0.0200			
240.0000	321.0000	29.7000	0.1000			
241.0000	217.0000	21.1000	0.2000			
242.0000	36.0000	20.3000	1.9300			
243.0000	115.0000	28.3000	6.6800			
244.0000	196.0000	18.1000	0.1600			
245.0000	480.0000	13.1000	0.0000			
246.0000	315.0000	18.6000	0.0000			
247.0000	389.0000	18.9000	0.0100			
248.0000	375.0000	17.5000	0.0000			
249.0000	105.0000	18.6000	1.0000			
250.0000	102.0000	33.8000	3.0900			
251.0000	105.0000	17.0000	0.8300			
252.0000	480.0000	17.5000	0.0000			
253.0000	480.0000	33.5000	0.5700			
254.0000	480.0000	35.1000	0.4500			
255.0000	158.0000	13.6000	0.0000			
256.0000	334.0000	20.3000	0.0200			
257.0000	109.0000	28.0000	0.9000			
258.0000	352.0000	30.5000	0.0000			
259.0000	480.0000	13.0000	0.0000			

3/10/97

1/3

461

Descriptive Statistics Report

Data File Name: B:\FUTSTAT2.PDW

COLUMN NAME:	DUR
Number of rows:	259
Number of valid points:	259
Number of missing points:	0
Number of negative values:	0
Number of positive values:	259
Number of zero values:	0
Minimum value:	19.00000000
Maximum value:	480.00000000
Inter range value:	461.00000000
Median:	260.00000000
Sum of row value:	71659.6000000
Sum of absolute value:	71659.6000000
Arithmetic mean:	276.67799228
Geometric mean:	+INF
Quadratic mean:	319.31887066
Harmonic mean:	151.39065727
Absolute mean:	276.67799228
Sum of squares:	26408816.1600
Variance:	25512.3329634
Standard deviation:	159.72580557
Absolute deviation:	142.26474859
Standard error:	9.92487864

95 percent confidence interval:
[257.13390750, 296.22207705]

99 percent confidence interval:
[250.92274712, 302.43323743]

Coefficient of variance:	57.72985565
Skewness:	0.062816110
Coefficient of skewness:	0.22905028
Kurtosis:	-1.49171460
Coefficient of Kurtosis:	1.50828540

Percentiles:

10 percentile:	63.40000000
25 percentile:	122.00000000
50 percentile:	260.00000000
75 percentile:	480.00000000
90 percentile:	480.00000000

Quartiles:

First quartile:	122.00000000
Second quartile:	260.00000000

Third quartile:	480.00000000
Inter quartile:	358.00000000
COLUMN NAME:	DEPTH
Number of rows:	259
Number of valid points:	259
Number of missing points:	0
Number of negative values:	0
Number of positive values:	259
Number of zero values:	0
Minimum value:	12.80000000
Maximum value:	52.10000000
Inter range value:	39.30000000
Median:	17.50000000
Sum of row value:	5113.31000000
Sum of absolute value:	5113.31000000
Arithmetric mean:	19.74250965
Geometric mean:	+INF
Quadratic mean:	20.86958111
Harmonic mean:	18.05928272
Absolute mean:	19.74250965
Sum of squares:	112804.708700
Variance:	45.95014213
Standard deviation:	6.77865342
Absolute deviation:	5.16174982
Standard error:	0.42120503

95 percent confidence interval:
[18.91307213, 20.57194718]

99 percent confidence interval:
[18.64947475, 20.83554456]

Coefficient of variance:	34.33531772
Skewness:	1.66514966
Coefficient of skewness:	0.32326284
Kurtosis:	3.44310061
Coefficient of Kurtosis:	6.44310061

Percentiles:

10 percentile:	13.40000000
25 percentile:	14.70000000
50 percentile:	17.45000000
75 percentile:	22.97500000
90 percentile:	29.20000000

Quartiles:

First quartile:	14.70000000
Second quartile:	17.45000000
Third quartile:	22.97500000
Inter quartile:	8.27500000
COLUMN NAME:	AVGRO
Number of rows:	259

Number of valid points:	259
Number of missing points:	0
Number of negative values:	0
Number of positive values:	209
Number of zero values:	50
Minimum value:	0
Maximum value:	12.66000000
Inter range value:	12.66000000
Median:	0.080000000
Sum of row value:	243.89217000
Sum of absolute value:	243.89217000
Arithmetric mean:	0.94166861
Geometric mean:	0
Quadratic mean:	2.31023613
Harmonic mean:	0
Absolute mean:	0.94166861
Sum of squares:	1382.33245771
Variance:	4.46770100
Standard deviation:	2.11369369
Absolute deviation:	1.27510083
Standard error:	0.13133854

95 percent confidence interval:
□ □ [0.68303658, 1.20030064]

99 percent confidence interval:
□ □ [0.60084266, 1.28249456]

Coefficient of variance:	224.46258301
Skewness:	3.39218897
Coefficient of skewness:	0.76971492
Kurtosis:	12.43258123
Coefficient of Kurtosis:	15.43258123

Percentiles:

10 percentile:	0
25 percentile:	0.0022500000
50 percentile:	0.078000000
75 percentile:	0.67750000
90 percentile:	3.07850000

Quartiles:

First quartile:	0.0022500000
Second quartile:	0.078000000
Third quartile:	0.67750000
Inter quartile:	0.67525000

(c) Poly Software International

```
E:\CONSULT\SWRI\SOL97>
```

Dave

```
SOLNC.PAR
B:\PNOV95.PRE
SFUT_95.OUT
FUTURE CLIMATE, INCREASED FMIN UPPER CHANNELS
600
2
```

control file

```
Event Volume Summary:

            Rainfall    49.27600 mm        528374.0 cu m
  Plane infiltration    45.34000           486169.2
Channel infiltration     1.33381            14302.1
             Storage      .11946             1280.9
             Outflow     2.46124            26391.2

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .0000, .0800, .1429 min

Total watershed area = 1072.274 ha

E:\CONSULT\SWRI\SOL97>
```

```
SOLJ_O.PAR
B:\PJUL163.PRE
SFUT_163.OUT
FUTURE CLIMATE, INCREASED FMIN UPPER CHANNELS
300
```

```
Event Volume Summary:

            Rainfall    22.09800 mm        236951.2 cu m
  Plane infiltration    19.45656           208627.7
Channel infiltration     .99968            10719.3
             Storage     .03799              407.3
             Outflow    1.57956            16937.3

Error (Volume in - Volume out - Storage) < 1 percent
```

SOLJ_OC.PAR
B:\PJUL163.PRE
SFUT_163.OUT

Event Volume Summary:

Rainfall	22.09800 mm	236951.2 cu m
Plane infiltration	19.45656	208627.7
Channel infiltration	1.05159	11275.9
Storage	.03621	388.3
Outflow	1.52968	16402.4

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .07143, .10000 min

Total watershed area = 1072.274 ha

E:\CONSULT\SWRI\SOL97>

SOLJ_OC.PAR
B:\PJUL10.PRE
SFUT_10.OUT
FUTURE CLIMATE, INCREASED FMIN UPPER CHANNELS
340

Event Volume Summary:

Rainfall	31.24200 mm	334999.9 cu m
Plane infiltration	29.63124	317728.3
Channel infiltration	.70829	7594.8
Storage	.08955	960.2
Outflow	.79954	8573.2

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .12500, .12500 min

Total watershed area = 1072.274 ha

E:\CONSULT\SWRI\SOL97>

SOLJ_O.PAR
B:\Pjul10.PRE
SFUT_10.OUT

Event Volume Summary:

Rainfall	31.24200 mm	334999.9 cu m
Plane infiltration	29.63124	317728.3
Channel infiltration	.66262	7105.1
Storage	.09891	1060.6
Outflow	.83581	8962.1

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .12500, .12500 min

Total watershed area = 1072.274 ha

E:\CONSULT\SWRI\SOL97>

SOLDC.PAR
B:\PDEC188.PRE
SFUT_188.OUT

Event Volume Summary:

Rainfall	17.01800 mm	182479.7 cu m
Plane infiltration	16.05951	172202.0
Channel infiltration	.47774	5122.6
Storage	.05688	610.0
Outflow	.34645	3714.9

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .11111, .14286 min

Total watershed area = 1072.274 ha

E:\CONSULT\SWRI\SOL97>

```
SOLJ_OC.PAR
B:\PAUG34.PRE
SFUT_34.OUT
FUTURE CLIMATE, INCREASED FMIN UPPER CHANNELS
  )

SOLJ_OC.PAR
B:\PAUG34.PRE
SFUT_34.OUT
FUTURE CLIMATE, INCREASED FMIN UPPER CHANNELS
300


Event Volume Summary:

            Rainfall    15.24221 mm        163438.3 cu m
  Plane infiltration    11.77645           126275.9
Channel infiltration     1.27573            13679.3
             Storage      .03695               396.2
             Outflow     2.14156            22963.4

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .06250, .09091 min

Total watershed area = 1072.274 ha


E:\CONSULT\SWRI\SOL97>edit kin.fil

E:\CONSULT\SWRI\SOL97>
```

LJ_OC.PAR
B:\PSEP23.PRE
SFUT_23.OUT
FUTURE CLIMATE, INCREASED FMIN UPPER CHANNELS
300

Event Volume Summary:

Rainfall	22.72688 mm	243694.5 cu m
Plane infiltration	18.24869	195676.0
Channel infiltration	1.36093	14593.0
Storage	.05593	599.7
Outflow	3.03276	32519.6

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .05882, .05882 min

Total watershed area = 1072.274 ha

F·\CONSULT\SWRI\SOL97>

SOLJ_OC.PAR
B:\PAUG53.PRE
SFUT_53.OUT
FUTURE CLIMATE, INCREASED FMIN UPPER CHANNELS
300

Event Volume Summary:

Rainfall	23.62200 mm	253292.6 cu m
Plane infiltration	19.78384	212137.1
Channel infiltration	1.30999	14046.7
Storage	.05759	617.5
Outflow	2.52252	27048.3

Error (Volume in - Volume out - Storage) < 1 percent

..me step distribution (100,75,50%) = .00000, .07143, .07143 min

Total watershed area = 1072.274 ha

Total watershed area = 1072.274 ha

\CONSULT\SWRI\SOL97>

SOLJ_OC.PAR
b:\PAUG225.PRE
SFUT_225.OUT
FUTURE CLIMATE, INCREASED FMIN UPPER CHANNELS
400

Event Volume Summary:

Rainfall	34.28923 mm	367674.7 cu m
Plane infiltration	25.23816	270622.3
Channel infiltration	2.30137	24677.0
Storage	.02015	216.0
Outflow	6.71122	71962.7

:or (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .04348, .10000 min

Total watershed area = 1072.274 ha

E:\CONSULT\SWRI\SOL97>

SOLJ_OC.PAR
B:\PAUG174.PRE
SFUT_174.OUT
FUTURE CLIMATE, INCREASED FMIN UPPER CHANNELS
300

Event Volume Summary:

Rainfall	23.62200 mm	253292.6 cu m
Plane infiltration	15.72667	168633.1
Channel infiltration	1.99896	21434.3
Storage	.04710	505.1
Outflow	5.72775	61417.2

SOLDC.PAR
B:\PDEC201.PRE
SFUT_201.OUT
FUTURE CLIMATE, INCREASED FMIN UPPER CHANNELS
0

Event Volume Summary:

Rainfall	27.94001 mm	299593.6 cu m
Plane infiltration	18.99005	203625.5
Channel infiltration	2.25238	24151.7
Storage	.02595	278.2
Outflow	6.63844	71182.3

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .04167, .10000 min

Total watershed area = 1072.274 ha

E:\CONSULT\SWRI\SOL97>

SOLNC.PAR
B:\PNOV208.PRE
SFUT_208.OUT
FUTURE CLIMATE, INCREASED FMIN UPPER CHANNELS
400

Event Volume Summary:

Rainfall	21.85920 mm	234390.6 cu m
Plane infiltration	16.43377	176215.1
Channel infiltration	1.65753	17773.3
Storage	.02309	247.6
Outflow	3.72082	39897.3

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .05263, .09091 min

Total watershed area = 1072.274 ha

E:\CONSULT\SWRI\SOL97>

LNC.PAR
B:\PNOV184.PRE
SFUT_184.OUT
FUTURE CLIMATE, INCREASED FMIN UPPER CHANNELS
360

Event Volume Summary:

Rainfall	27.17800 mm	291422.8 cu m
Plane infiltration	22.36270	239789.5
Channel infiltration	1.66913	17897.7
Storage	.04028	432.0
Outflow	3.08142	33041.2

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .06667, .09091 min

Total watershed area = 1072.274 ha

F:\CONSULT\SWRI\SOL97>

SOLNC.PAR
B:\PNOV64.PRE
SFUT_64.OUT
FUTURE CLIMATE, INCREASED FMIN UPPER CHANNELS
300

Event Volume Summary:

Rainfall	14.85600 mm	159297.1 cu m
Plane infiltration	10.59631	113621.5
Channel infiltration	1.42463	15275.9
Storage	.03833	411.0
Outflow	2.70982	29056.7

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .05556, .07692 min

Total watershed area = 1072.274 ha

B:\FUTSTAT2.PDW

Number	DUR	DEPTH	AVGRO	Column5	accumV	Column7
120.0000	53.0000	29.2000	12.6600	1.0000	12.6600	0.0519
61.0000	62.0000	29.7000	11.8400	2.0000	24.5000	0.1005
79.0000	190.0000	37.3000	11.1700	3.0000	35.6700	0.1463
151.0000	39.0000	26.1000	10.3300	4.0000	46.0000	0.1886
45.0000	90.0000	28.2000	10.0600	5.0000	56.0600	0.2299
201.0000	98.0000	27.9000	9.7800	6.0000	65.8400	0.2700
225.0000	118.0000	34.3000	9.5200	7.0000	75.3600	0.3090
174.0000	45.0000	23.6000	8.3400	8.0000	83.7000	0.3432
51.0000	19.0000	18.3000	6.8600	9.0000	90.5600	0.3713
243.0000	115.0000	28.3000	6.6800	10.0000	97.2400	0.3987
208.0000	157.0000	21.9000	5.8800	11.0000	103.1230	0.4228
184.0000	88.0000	27.2000	5.1300	12.0000	108.2500	0.4438
84.0000	194.0000	35.1000	5.0900	13.0000	113.3400	0.4647
23.0000	57.0000	22.7000	4.8400	14.0000	118.1800	0.4846
64.0000	19.6000	14.9000	4.5000	15.0000	122.3680	0.5017
95.0000	480.0000	49.3000	4.1600	16.0000	126.8400	0.5201
53.0000	62.0000	23.6000	4.1600	17.0000	131.0000	0.5371
34.0000	20.0000	15.2000	3.9000	18.0000	134.9000	0.5531
179.0000	53.0000	18.5000	3.7900	19.0000	138.6900	0.5687
230.0000	35.0000	17.3000	3.6800	20.0000	142.3700	0.5837
19.0000	146.0000	26.4000	3.5100	21.0000	145.8800	0.5981
114.0000	118.0000	18.8000	3.5000	22.0000	149.3800	0.6125
73.0000	123.0000	22.6000	3.4100	23.0000		
35.0000	25.0000	16.4000	3.3200	24.0000		
46.0000	480.0000	29.2000	3.1800	25.0000		
250.0000	102.0000	33.8000	3.0900	26.0000		
163.0000	96.0000	22.1000	2.9750	27.0000		
209.0000	38.0000	14.0000	2.7500	28.0000		
105.0000	59.0000	16.8000	2.7400	29.0000		
122.0000	230.0000	25.9000	2.7300	30.0000		
26.0000	48.0000	17.4000	2.6500	31.0000		
147.0000	104.0000	18.8000	2.5400	32.0000		
42.0000	165.0000	20.0000	2.5000	33.0000		
142.0000	217.0000	36.0000	2.4200	34.0000		
196.0000	41.0000	17.3000	2.3700	35.0000		
220.0000	122.0000	17.3000	2.3500	36.0000		
92.0000	108.0000	25.4000	2.0800	37.0000		
27.0000	137.0000	19.6000	2.0800	38.0000		
235.0000	55.0000	17.3000	1.9700	39.0000		
93.0000	136.0000	23.8000	1.9500	40.0000		
97.0000	119.0000	18.8000	1.9300	41.0000		
242.0000	36.0000	20.3000	1.9300	42.0000		
10.0000	191.0000	31.2000	1.8700	43.0000		
78.0000	224.0000	26.2000	1.5600	44.0000		
227.0000	480.0000	32.3000	1.5600	45.0000		
28.0000	69.0000	14.3000	1.3900	46.0000		
213.0000	56.0000	15.1000	1.3800	47.0000		
60.0000	63.0000	17.1000	1.3300	48.0000		
150.0000	67.0000	13.5000	1.2000	49.0000		
188.0000	57.0000	17.0000	1.1200	50.0000		
164.0000	328.0000	40.1000	1.0690	51.0000		
3.0000	480.0000	42.9000	1.0500	52.0000		

DAW

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Descriptive Statistics Report

Data File Name: B:\FUTSTAT2.PDW

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COLUMN NAME:	CALCULATEDF - by power func.
Number of rows:	259
Number of valid points:	259
Number of missing points:	0
Number of negative values:	0
Number of positive values:	209
Number of zero values:	50
Minimum value:	0
Maximum value:	2.73350867
Inter range value:	2.73350867
Median:	0.085839852
Sum of row value:	82.90595462
Sum of absolute value:	82.90595462
Arithmetric mean:	0.32010021
Geometric mean:	0
Quadratic mean:	0.61868507
Harmonic mean:	0
Absolute mean:	0.32010021
Sum of squares:	99.13774602
Variance:	0.28139354
Standard deviation:	0.53046540
Absolute deviation:	0.36663932
Standard error:	0.032961516

95 percent confidence interval:
□ □ [0.25519235, 0.38500807]

99 percent confidence interval:
□ □ [0.23456446, 0.40563596]

Coefficient of variance:	165.71854009
Skewness:	2.44228702
Coefficient of skewness:	0.56711631
Kurtosis:	6.16335804
Coefficient of Kurtosis:	9.16335804

Percentiles:

10 percentile:	0
25 percentile:	0.0074506418
50 percentile:	0.084361408
75 percentile:	0.36962280
90 percentile:	1.04002137

Quartiles:

First quartile:	0.0074506418
Second quartile:	0.084361408

Third quartile: 0.36962280

Inter quartile: 0.36217216

DAW 474

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(c) Poly Software International

==========

```
==========================================================
          Power Function: y=ax^b

          Data File Name: B:\FUTSTAT2.PDW
==========================================================

                   Independent:          AVGRO
                     Dependent:       channelF
                Weight factor:              0
                             a:      0.48228246
                             b:      0.68336377
                      Sum Sqrs:     0.055839508
Covaraince Matrix
                      cvm[1,1]:      0.43822529
                      cvm[2,1]:     -0.22349027
                      cvm[2,2]:      0.12787277

Goodness of Fit Statistics ...

                       __ C O D:     0.98493998
                       __ Corrl:     0.99244142
                       __ M S C:     4.00523560

Parameter Statistics
__ 95 % Confidence Intervals

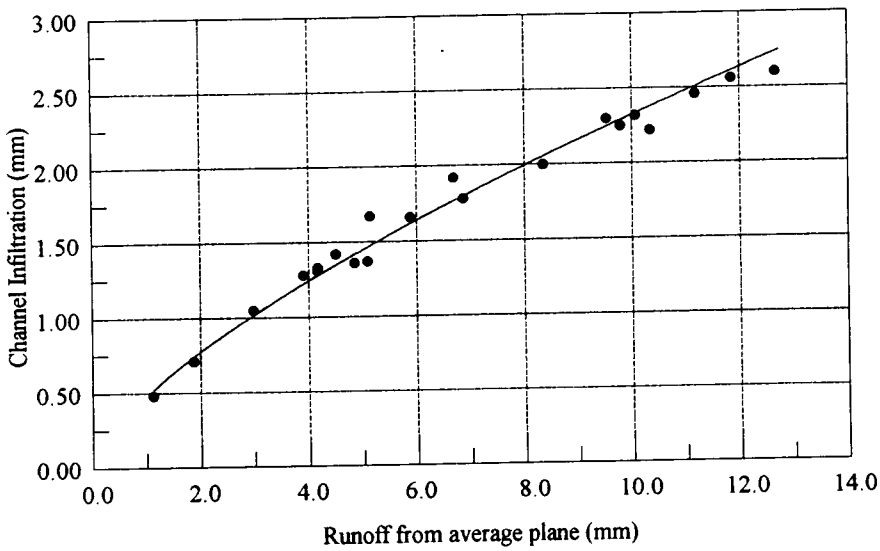
                  Parameter a:       0.48228246
                       StdDev:      0.035887459
__ Uninvariant ...
                          LOW:       0.40716915
                         HIGH:       0.55739578
Supporting Plane:
                          LOW:       0.38703667
                         HIGH:       0.57752826
                  Parameter b:       0.68336377
                       StdDev:      0.019385769
__ Uninvariant ...
                          LOW:       0.64278889
                         HIGH:       0.72393865
Supporting Plane:
                          LOW:       0.63191368
                         HIGH:       0.73481385


==========================================================

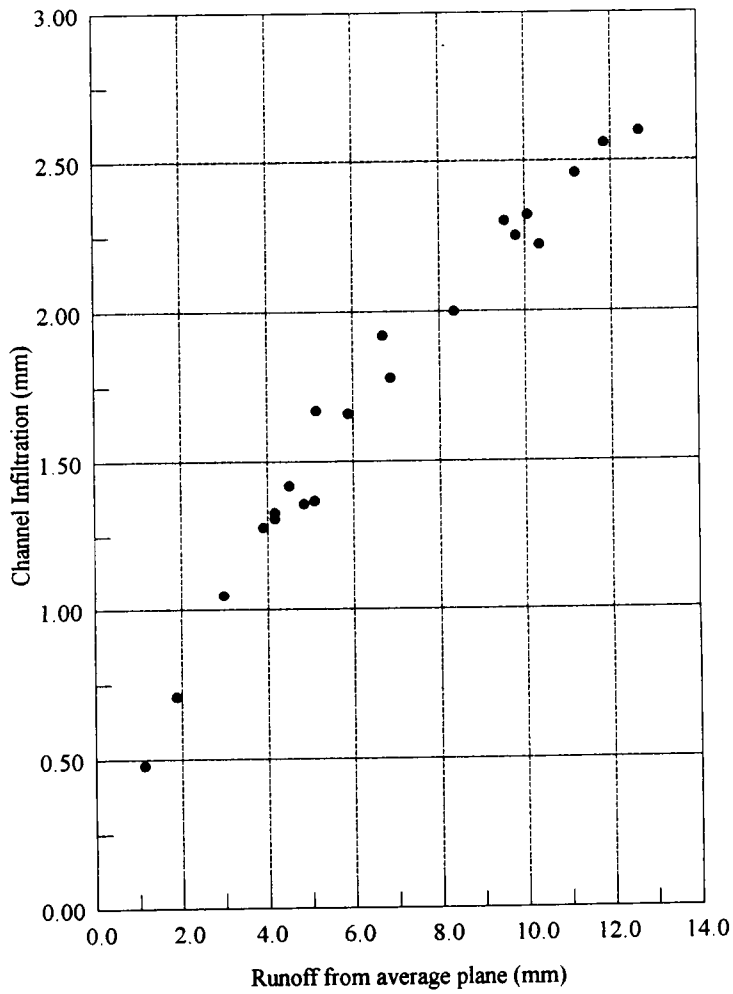
     (c) Poly Software International

==========================================================
```

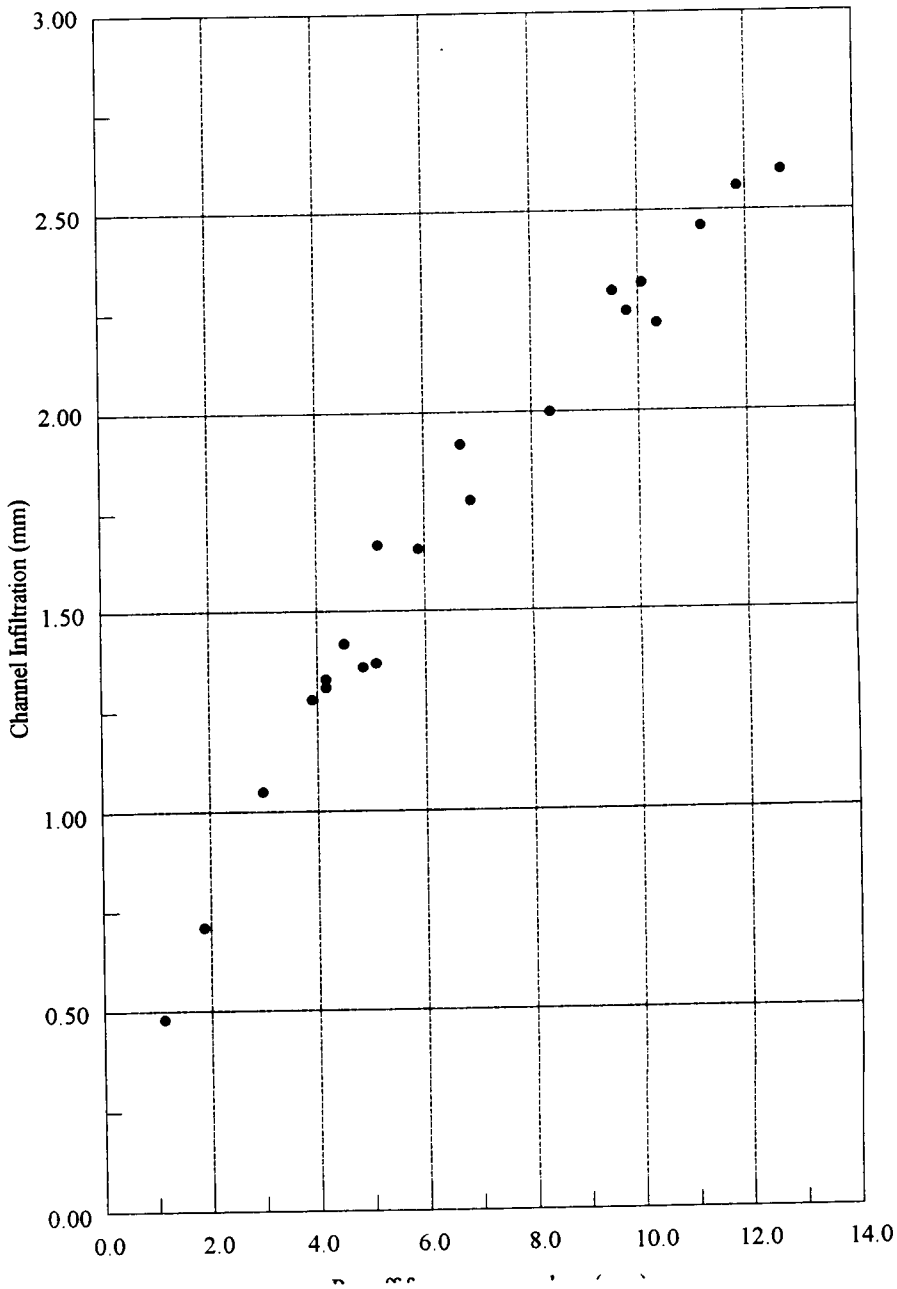
Solitario Canyon, Future Climate



Solitario Canyon, Future Climate



Solitario Canyon, Future Climate



Future 3/20/97 1/2

Descriptive Statistics Report

Data File Name: B:\FUTSTAT2.PDW

DAW 479

COLUMN NAME:	SOLRO
Number of rows:	50
Number of valid points:	21
Number of missing points:	29
Number of negative values:	0
Number of positive values:	21
Number of zero values:	0
Minimum value:	0.35000000
Maximum value:	9.33000000
Inter range value:	8.98000000
Median:	3.72000000
Sum of row value:	93.80000000
Sum of absolute value:	93.80000000
Arithmetric mean:	4.46666667
Geometric mean:	3.50842434
Quadratic mean:	5.17054386
Harmonic mean:	2.28436266
Absolute mean:	4.46666667
Sum of squares:	561.42500000
Variance:	7.12258333
Standard deviation:	2.66881684
Absolute deviation:	2.27587302
Standard error:	0.58238358

Runoff from 21 storms
50 ordered

Sv = 134.2 / 143.5 = 0.55

total of plane R.O.

91.12 / 55.2 = 165.0

= 3.30 mm

non ordered

95 percent confidence interval:
[3.25183581, 5.68149752]

99 percent confidence interval:
[2.80958712, 6.12374621]

93.8 - 2.68 = 91.12

Coefficient of variance:	59.74963078
Skewness:	0.34175714
Coefficient of skewness:	0.40960285
Kurtosis:	-1.06674647
Coefficient of Kurtosis:	1.93325353

Percentiles:

10 percentile:	0.87300000
25 percentile:	2.47500000
50 percentile:	3.51000000
75 percentile:	6.69250000
90 percentile:	8.13900000

Quartiles:

First quartile:	2.47500000
Second quartile:	3.51000000

Third quartile:	6.69250000
Inter quartile:	4.21750000

DAW

1/7

480

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Future 3/30/97 1/1

48i

DAW

==========

Straight Line: y=ax+b

Data File Name: B:\FUTSTAT2.PDW

==========

Save Data

Independent:	AVGRO - Runoff from plane
Dependent:	SOLRO - R.O. from Solitario Canyon
Weight factor:	0
a:	0.78627587
b:	-0.80755954
Sum Sqrs:	0.47222106

Covaraince Matrix

cvm[1,1]:	0.0043543609
cvm[2,1]:	-0.029208431
cvm[2,2]:	0.24354503

Goodness of Fit Statistics ...

__ C O D:	0.99668504
__ Corrl:	0.99834115
__ M S C:	5.51883462

Parameter Statistics
__ 95 % Confidence Intervals

Parameter b:	-0.80755954
StdDev:	0.077801059

__ Uninvariant ...

LOW:	-0.97039903
HIGH:	-0.64472005

Supporting Plane:

LOW:	-1.01404458
HIGH:	-0.60107450
Parameter a:	0.78627587
StdDev:	0.010402988

__ Uninvariant ...

LOW:	0.76450217
HIGH:	0.80804957

Supporting Plane:

LOW:	0.75866620
HIGH:	0.81388554

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(c) Poly Software International

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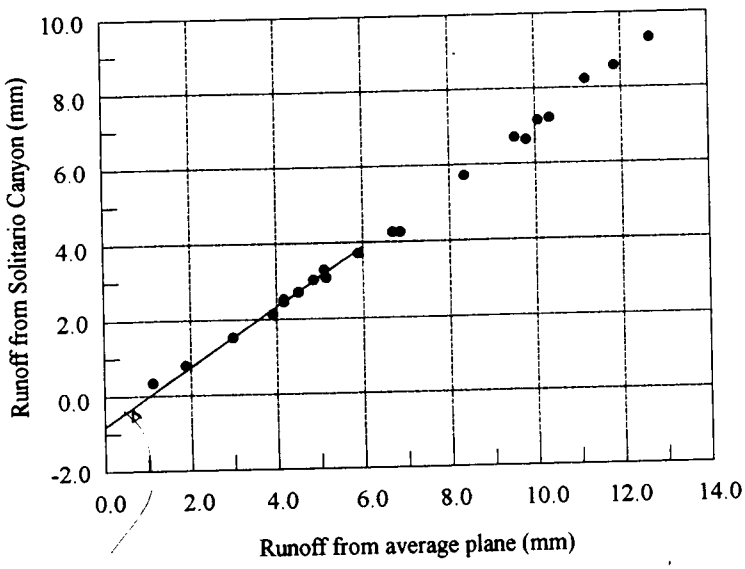
FUTSTAT2.PDW



would cause negative runoff !!

LINEAR REGRESSION

Future 3/31/97 1/1

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==========

Power Function: y=ax^b

Data File Name: B:\FUTSTAT2.PDW

==========

Save Data

Independent:	AVGRO
Dependent:	SOLRO
Weight factor:	0
a:	0.35704277
b:	1.30742966
Sum Sqrs:	0.075064694

Covaraince Matrix

cvm[1,1]:	0.43822529
cvm[2,1]:	-0.22349027
cvm[2,2]:	0.12787277

Goodness of Fit Statistics ...

__ C O D:	0.99441600
__ Corrl:	0.99720409
__ M S C:	4.99737415

Parameter Statistics
__ 95 % Confidence Intervals

Parameter a:	0.35704277
StdDev:	0.041609240

__ Uninvariant ...

LOW:	0.26995363
HIGH:	0.44413191

Supporting Plane:

LOW:	0.24661129
HIGH:	0.46747424
Parameter b:	1.30742966
StdDev:	0.022476573

__ Uninvariant ...

LOW:	1.26038565
HIGH:	1.35447367

Supporting Plane:

LOW:	1.24777654
HIGH:	1.36708278

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Future 3/10/97

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Descriptive Statistics Report

Data File Name: B:\FUTSTAT2.PDW

==========

COLUMN NAME:	CALRO1 - Calculated by linear regression
Number of rows:	259
Number of valid points:	259
Number of missing points:	0
Number of negative values:	206
Number of positive values:	53
Number of zero values:	0
Minimum value:	-0.80755000
Maximum value:	9.14321000
Inter range value:	9.95076000
Median:	-0.74467000
Sum of row value:	-17.45620438 — predicts many ny values
Sum of absolute value:	269.68499238
Arithmetric mean:	-0.067398473
Geometric mean:	0.73022642
Quadratic mean:	1.65952207
Harmonic mean:	1.20807912
Absolute mean:	1.04125480
Sum of squares:	713.28949509
Variance:	2.76012780
Standard deviation:	1.66136324
Absolute deviation:	1.00222925
Standard error:	0.10323209

95 percent confidence interval:
□ □ [-0.27068324, 0.13588630]

99 percent confidence interval:
□ □ [-0.33528767, 0.20049072]

Coefficient of variance:	-2464.98648253
Skewness:	3.39218897
Coefficient of skewness:	0.76971492
Kurtosis:	12.43258123
Coefficient of Kurtosis:	15.43258123

Percentiles:

10 percentile:	-0.80755000
25 percentile:	-0.80578150
50 percentile:	-0.74624200
75 percentile:	-0.27503500
90 percentile:	1.61215100

Quartiles:

First quartile:	-0.80578150
Second quartile:	-0.74624200

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Third quartile:	-0.27503500
Inter quartile:	0.53074650
COLUMN NAME:	CALRO2 ← calculated by power funct.
Number of rows:	259
Number of valid points:	259
Number of missing points:	0
Number of negative values:	0
Number of positive values:	209
Number of zero values:	50
Minimum value:	0
Maximum value:	9.85255957
Inter range value:	9.85255957
Median:	0.013152455
Sum of row value:	137.80222045 } Av. R.O = 7.76 mm.
Sum of absolute value:	137.80222045
Arithmetic mean:	0.53205491
Geometric mean:	0
Quadratic mean:	1.56725289
Harmonic mean:	0
Absolute mean:	0.53205491
Sum of squares:	636.17693884
Variance:	2.18162245
Standard deviation:	1.47703163
Absolute deviation:	0.78978611
Standard error:	0.091778280

95 percent confidence interval:
□ □ [0.35132499, 0.71278482]

99 percent confidence interval:
□ □ [0.29388856, 0.77022125]

Coefficient of variance:	277.60887447
Skewness:	4.14296351
Coefficient of skewness:	0.87852438
Kurtosis:	18.44846870
Coefficient of Kurtosis:	21.44846870

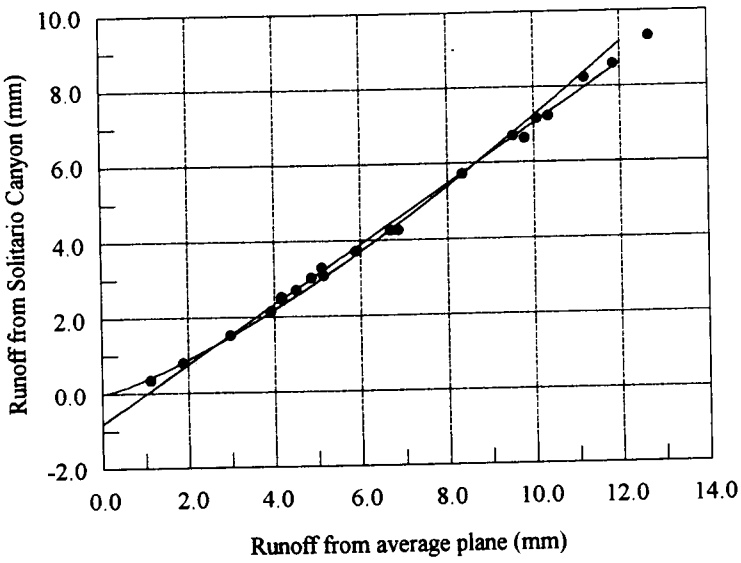
Percentiles:

10 percentile:	0
25 percentile:	0.00012446426
50 percentile:	0.012726036
75 percentile:	0.21462002
90 percentile:	1.55216725

Quartiles:

First quartile:	0.00012446426
Second quartile:	0.012726036
Third quartile:	0.21462002
Inter quartile:	0.21449556

FUTSTAT2.PDW



Background

In considering possibilities for future climate modeling, DAW seemed appropriate to do further checking of the seasonal precipitation patterns generated by the MCME model for Solitario Canyon. From Fig. G2-2 p G2-5 from the Expert Elicitation, Diaz presents monthly averages for several stations in S. Nevada. The simulated 50 yr record has 60% of the annual precip. in the period Oct-Mar. which is consistent with observations for the region. However precip depths for Oct and Nov. are overestimated while Dec. and Mar. are underestimated.

This is probably due to underfitting of harmonics in USCLIMATE because the logit transform was not used for p_{00} and p_{10}.

7/22.

When the monthly averages of 2 50yr simulations are compared with values for S. Central and extreme Southern Nevada presented by H.F. Diaz (p G2-5, Fig 62-2)

$$0.5\,(6.74 + 6.35) = 6.54'' \quad \text{Simulated average}$$

The sum of the error terms $\sum_{i=1}^{12}(P_{si} - P_{ai}) = 0.08$

The mean squared error is 0.03

The std. deviation of error terms was 0.185 in

The std. deviations of the annual simulated rainfall are too low (i.e. the coefficients of variation are too low) for the 2 - 50yr. simulations (1st & 2nd) CVs were: 0.26 and 0.30 whereas Diaz states that data show CVs approaching 0.50. There appears to be greater variability in winter rainfall, possibly due to ENSO.

Note: From STATE Program, Durations were increased for period Oct-Apr.

Creation of Climate Simulator for Future Climates

The structure of the USCLIMATE model appears to be appropriate for generating future possible sequences of precipitation, maximum and minimum temperature and radiation, except that the logit transform should be used for p_{00} and p_{10}. To do this

Check to see how changes in $\bar{p}_{00}$ and $\bar{p}_{10}$ as well as $\bar{\mu}$ as function of increase in annual precipitation for future climate compare with those that would be obtained by the regression relations of Hanson, et al 1989. DAW

For Solitario Canyon the estimated change in annual precipitation was 150 mm The changes in parameter values were (see DAW Future Climate)

$$\Delta p_{10} = -0.0302$$

$$\Delta p_{10} = -0.0302$$

$$\Delta \mu = 0.0649 \text{ inches}$$

The equations from Hanson, et al are

$$\theta_1 = \ln\left[\frac{\bar{p}_{00}}{1-\bar{p}_{10}}\right] = 2.506 - 0.165(\ln X) \qquad X = \text{mean annual precip (mm)}$$

$$\theta_2 = \ln\left[\frac{\bar{p}_{10}}{1-\bar{p}_{10}}\right] = 2.866 - 0.497(\ln X)$$

$$\bar{\mu} = 1.644 + 0.00531\,X \qquad \mu = 0.1576 \text{ inches} = 4.00 \text{ mm}$$

$$\frac{d\theta_1}{dx} = -0.165\frac{1}{X}$$

$$\frac{d\theta_2}{dx} = -\frac{0.497}{X}$$

Note $\frac{d\theta_i}{dx}$ could be evaluated at $x = 165 + \frac{150}{2} = 240$ mm DAW 8/10/98

$$\frac{d\bar{\mu}}{dx} = 0.00531 \text{ mm/mm} \qquad \text{or } 0.796 \text{ mm for } 150 \text{ mm} = 0.0313 \text{ inches} \leftarrow \Delta\mu$$

$$\Delta\theta_1 = \frac{\partial\theta_1}{\partial x}\Delta x = \frac{-0.165}{165}(150) = -0.15 \qquad -0.1037$$

$$\Delta\theta_2 = \frac{\partial\theta_2}{\partial x}\Delta x = \frac{-0.497}{165}(150) = -0.452 \qquad -0.3706$$

$$\frac{\hat{\bar{p}}_{00}}{1-\hat{\bar{p}}_{00}} = \cancel{e^{(\bar{p}_{00}-0.15)}}$$

$$\hat{\theta}_1 = \theta_1 + \Delta\theta_1$$

$$= \ln\left[\frac{p_{00}}{1-p_{00}}\right] - 0.15$$

$$= \ln\left[\frac{0.9284}{1-.9284}\right] - 0.15 = 2.4124 \quad 2.4587$$

2.5624

Daw

$$\frac{\hat{\bar{p}}_{10}}{1-\hat{\bar{p}}_{10}} = \cancel{e^{(\bar{p}_{10}-0.452)}}$$

$$\frac{p_{00}}{1-p_{00}} = e^{2.4124} = 11.160 \quad 11.6896$$

$$\cancel{\frac{\hat{\bar{p}}_{00}}{1-\hat{\bar{p}}_{00}}}$$

$$\hat{\theta}_2 = \theta_2 + \Delta\theta_2 = \ln\left[\frac{0.654}{1-0.654}\right] - 0.452 = \cancel{2.11}\ 0.1847 \quad 0.2661$$

1.89 ~~1.707~~

.6367

$$\frac{p_{10}}{1-p_{10}} = 1.202 \quad 1.3049$$

$$p_{00} = 11.160 - 11.16 * p_{00} = 0.9178 \qquad \Delta p_{00} = 0.9284 - 0.9178 = .0106 \quad .0072$$

$$12.16\, p_{00} = 11.16 \qquad \boxed{p_{00} = 0.9178} \quad 0.9312 \qquad \Delta p_{10} = 0.654 - 0.5459 = 0.108 \quad .0879$$

$$p_{10} = 1.202 - p_{10}(1.202)$$

$$2.202\, p_{10} = 1.202 \qquad \boxed{p_{10} = 0.5459} \quad 0.5661$$

$$\left(\frac{.313}{-.313}\right)$$

$$\hat{\mu} = 4.00 + 0.796 = 4.796 \text{ mm} = 0.1888''$$

<u>Comments</u> Thus the arbitrary corrections in $\bar{p}_{00}$, $\bar{p}_{10}$ and μ made by Daw in Future climate are not consistent with the relationships shown in Hanson et al., 1989. Hanson et al. would suggest much greater persistence

	Daw	Hanson
Δp_{00}	-0.0302	-0.0106
Δp_{10}	-0.0302	-0.108
$\Delta\mu$	0.0649 inches	0.0313
$\Delta\alpha$	0	+0.07

$$\Delta\theta_3 = -.00115(150) = 0.1725$$

$$\theta_3 = -0.7861 - 0.1725 = -.9586$$

$$\alpha = 0.383$$

$$\Delta\alpha = 0.383 - 0.313 = 0.07$$

Use equations of Hansen et al (1989) and annual precipitation at Yucca Mtn (Present and future) to see how regression relationship compare with parameters used in present and future simulations

490

$$\ln\left[\frac{\bar{p}_{00}}{1-\bar{p}_{00}}\right] = 2.506 - 0.165(\ln X) = 1.66$$

DAW

if $X = 165$ mm

$$\frac{\bar{p}_{00}}{1-\bar{p}_{00}} = 5.278 \qquad \bar{p}_{00} = 5.278 - 5.278\bar{p}_{00}$$

$$6.278\bar{p}_{00} = 5.278 \qquad \bar{p}_{00} = 0.8407$$

For YM $\bar{p}_{00} = 0.9284$

if $X = 315$ mm

$$\frac{\bar{p}_{00}}{1-\bar{p}_{00}} = 4.744 \qquad \bar{p}_{00} = 4.744 - 4.744\bar{p}_{00}$$

$$5.744\bar{p}_{00} = 4.744 \qquad \bar{p}_{00} = 0.826$$

Adj for YM $\bar{p}_{00}$ 0.9176

$$\ln\left[\frac{\bar{p}_{10}}{1-\bar{p}_{10}}\right] = 2.866 - 0.497(\ln X)$$

.0497

if $X = 165$ mm. $\ln\left[\frac{\bar{p}_{10}}{1-\bar{p}_{10}}\right] = 0.328$; $\frac{\bar{p}_{10}}{1-\bar{p}_{10}} = 1.388$

-1.04

$$\bar{p}_{10} = \cancel{0.328} \; 1.388 - \cancel{0.328}\; 1.388\,\bar{p}_{10} \qquad \bar{p}_{10} = \cancel{0.447}\; 0.5813$$

YM $\bar{p}_{10} = 0.654$

if $X = 315$ mm $\ln\left[\frac{\bar{p}_{10}}{1-\bar{p}_{10}}\right] = 0.0070$

$$\frac{\bar{p}_{10}}{1-\bar{p}_{10}} = 1.007 \qquad \bar{p}_{10} = 1.007 - 1.007\bar{p}_{10} \qquad \bar{p}_{10} = 0.502$$

YM adjusted $\bar{p}_{10} = 0.546$

$$\bar{\mu} = 1.644 + 0.00531X$$

$\bar{\mu} = 2.52$ mm for $X = 165$ mm

YM $\mu = 2.94$ mm

$\bar{\mu} = 3.32$ mm for $X = 315$ mm

YM adj $\mu = 4.78$ mm

Conclusions:

DAW

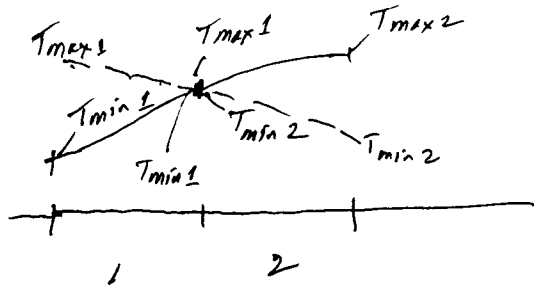
Using the regression equations for Idaho gives $\bar{p}_{00}$ that is lower than YM, $\bar{p}_{10}$ that is lower than YM and μ that is lower than YM. There are more wet days in Idaho and the mean amount / wet day is lower.

From Hanson et al. (1989) there was also a change in $\bar{\alpha}$, amplitude of the first harmonic of p_{00}, C_{p001} the amplitude of the first harmonic of p_{10}, C_{p101}, the phase ∠ of the first harmonic of μ, $\phi_{\mu 1}$; and the amplitude of the first harmonic of μ, $C_{\mu 1}$.

8/25 From a review of Johnson, et al 1996, the following improvements should be made in USCLIMATE — Dow

Solar radiation generator

Reformulate max + min temp. routine so that models generated negative $T_{max_1} - T_{min_2}$ and $T_{max_2} - T_{min_1}$ values



the minimum for these statistics should be zero

Daw

HILLSLOPE STUDIES

CNWRA STUDY SOLITARIO CANYON	Comparison of Drainage Structures 30m vs 10ft Contour Interval Map	D. A. Woolhiser 1/10/97	1/2

494

Dave

Channel Reach (4) → (24)

No effect

(28) - (40) - No effect

(49) - 66 - No effect

(75) - (96) - No effect

(106) - (110) - Some change - would have more channels

(119) - (147) " " " " some change in drainage pattern

(151) - (157) - would add channels

(165) - (179) - would add channels

(198) - (211) - would add channels (Not a good candidate for study because of road & drill pad)

(187) - (190) - would lengthen upper channel

(219) - No change

(227) - changes drainage pattern

(237) - (240) - changes drainage pattern - adds channel.

(248) - (251) - adds channels

small side channel missed between 251 & 281 - probably incorporated into plane 266

* (278) - (281) - adds many channels

(259) - (267) - May change pattern & increase number of channels

(271) increase number of channels

Plane sequence 263 - 265 - channels would be added

" " 241 - 242 " " "

" " 111 - 113 " " "

Plane sequence 67-69 - channels added

Plane sequence 42-43 " "

495

DAW

For "Hillslope" study build link at 278-281 channel area and possibly hillslope sequence 42-43 or examine the slope of channel sequence 241-242 through 263-265.

Need copy of maps at 10' contours, Yucca Mountain Site Characterization Project by EG&G.

Revisions based upon field visit

1. Increase Mannings n for side channels
2. Increase channel FMIN for upper main channel
3. Decrease channel bottom width for a few channels

Other

1. Review USGS report carefully estimates of FMIN
2. Review USGS Flood Report
3. Call or write Flynt re: max stage gage records & any flows at Solitario canyon gaging station. Any info on # of years with zero runoff.
4. Set up spatially varied precip. case
5. Run with FMIN based on texture or 20 mm/hr?
6. More thought needed for precip. data
7. Find parameters for winter disaggregation
8. Check Woolhiser function using X-Sect data

Climate Change

Get report from expert panel

CNWRA SOLITARIO CANYON	HILLSLOPE STUDY	D.A. Woolhiser 3/7/97	✓

Objective: To determine if the simplification involved in segmenting the watershed into planes and channels using the map with a 20 m contour interval will bias the results of estimating total channel infiltration.

DAW

Procedure

1. Obtained a map with a contour interval of 10 ft (m)

2. The map was analyzed to locate a portion of the Solitario Canyon watershed where the more detailed map will identify many side channels that were not apparent in the 20 m contour map.

The area so identified is on the west flank of Yucca Mtn near the lower end of the watershed. It includes the following plane and channel elements.

Plane: 241, 242, 255, 256, 257, 258, 260, 261, 252

Channel: Main channel: 244, 254
Side channel: 259, 262

3. Procedure for comparison

a. A more detailed geometry file will be prepared for this portion of the watershed based on the 10' contour map. The channel properties will be based on the regression relation WIDTH = 4.14 A developed for Solitario Canyon

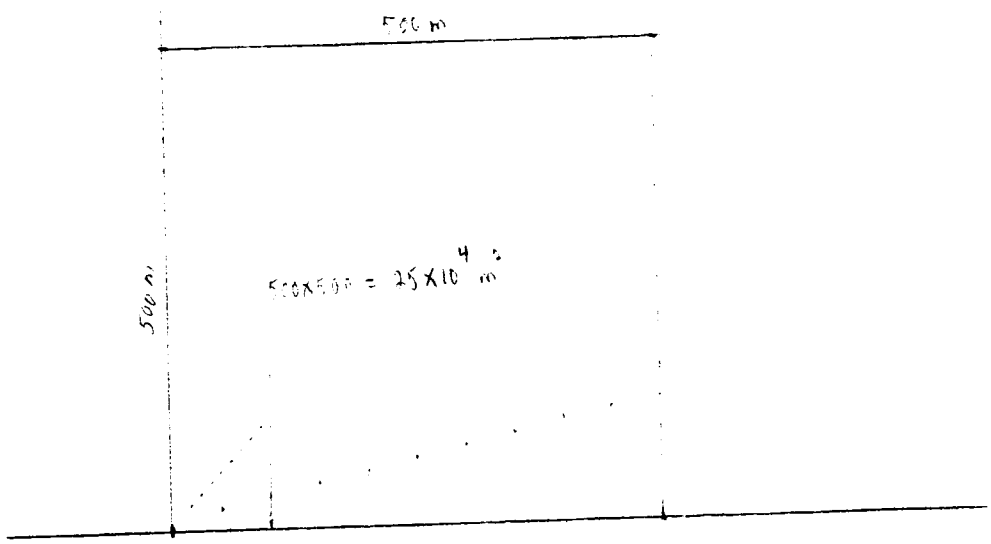
No. 5505 Engineer's Computation Pad ALVIN

CNWRA Hillslope Study	Planimeter Calibration	DAW w/JW 3/11/97	1

DAW

3.25" = 50 m

No. 5505 Engineer's Computation Pad ALVIN



1X = 763 737 2X = 1500 750 732 3X = 2232 744 734 4X = 2966 741.5

1X = 745 746 3X 1485 742 731 2X 2216 738.7

745 planimeter = 25x10^4 m^2 = Average of 745 & 738.7

$\boxed{\text{1 plan unit} = 337.8\ m^2}$

725 planimeter units = 2x10^4 = Avg. of 5 differences

$\boxed{\text{1 planimeter unit} = 240.1\ m^2}$ ← Use

CNWRA Hillslope Study | Plane + Channel Geometry | LW 3/11/97 | 1/6

HILLGEOM.SSF

498

Element No.	Area Planimeter Units	Length (m)	ΔR (ft)
	1x 2x 54,107 = 53.5	290	105
2			
1		60	9
3	32, 65 = 32.5	185	[illegible]
4	6, 12 = 6	33	[illegible]
5	5, 9 = 4.5	25	70
6	21, 41 = 20.5	130	160
7	8, 16 = 8	[illegible]	60
8	20, 39 = 19.5	50	[illegible]
9		160	110
10	21, 41 = 20.5	70	50
11	40, 80 = 40	180	[illegible]
12		260	[illegible]
23	81, 163 = 81.5	180	60
24		190	20
13	89, 179 = 89.5	160	210
14	16, 33 = 16.5	30	40
15	14, 28 = 14	25	[illegible]
16	76, 151 = 75.5	150	130
17	18, 37 = 18.5	120	[illegible]
18	21, 43 = 21.5	135	[illegible]
19		[illegible]	[illegible]
20	25, 49 = 24.5	[illegible]	[illegible]
21	81, 161 = 80.5	170	100
22		320	130

CNWRAEN

.BAT FILE

DAW

.065

No. 5505 Engineer's Computation Pad ALVIN

CAWRA Hillslope Study | Plane + Channel Geometry | DAW 3/11/97 | 2/6

DAW

499

Element No.	Area planimeter units (x, y)	Length m	ΔR (ft)
25	70, 141 = 70.5	[illegible]	[illegible]
		[illegible]	[illegible]
27	20, 39 = 19.5	[illegible]	[illegible]
28	31, 63 = 31.5	[illegible]	[illegible]
29	41, 81 = 40.5	[illegible]	[illegible]
		[illegible]	[illegible]
31	19, 38 = 19	[illegible]	[illegible]
32	27, 53 = 26.5	[illegible]	[illegible]
		[illegible]	[illegible]
39	36, 72 = 36	[illegible]	[illegible]
40	28, 57 = 28.5	[illegible]	[illegible]
41	21, 43 = 21.5	[illegible]	[illegible]
		[illegible]	[illegible]
43	30, 59 = 29.5	[illegible]	[illegible]
44	19, 39 = 19.5	[illegible]	[illegible]
		[illegible]	[illegible]
34	22, 45 = 22.5	70	40
35	30, 58 = 29	[illegible]	[illegible]
		[illegible]	70
37	22, 42 = 21	[illegible]	[illegible]
		[illegible]	[illegible]
98	31, 62 = 31	[illegible]	[illegible]
99	9, 19 = 9.5	50	[illegible]
100	11, 23 = 11.5	40	20

No. 5505 Engineer's Computation Pad

500

DAW

Element No.	Area Planimeter Units	Length (m)	ΔR (A)
99 98			
101	1x 2x	160	
56	28, 56 = 28	100	
57		300	
46	41, 81 = 40.5	170	330
47	23, 47 = 23.5	[illegible]	[illegible]
48	39, 79 = 39.5	90	[illegible]
49		190	[illegible]
50	29, 59 = 29.5	[illegible]	40
51	66, 133 = 66.5	[illegible]	[illegible]
52		[illegible]	[illegible]
53	18, 35 = 17.5	[illegible]	[illegible]
54	51, 103 = 51.5	[illegible]	[illegible]
55		[illegible]	[illegible]
75	47, 94 = 47	[illegible]	[illegible]
76	40, 79 = 39.5	[illegible]	[illegible]
77		[illegible]	[illegible]
78	29, 59 = 29.5	[illegible]	[illegible]
79	18, 37 = 18.5	[illegible]	[illegible]
80		350	[illegible]
81	38, 75 = 37.5	120	[illegible]
82		300	[illegible]
58	35, 71 = 35.5	[illegible]	[illegible]
59	14, 26 = 13.5	[illegible]	[illegible]

H-34

57

94

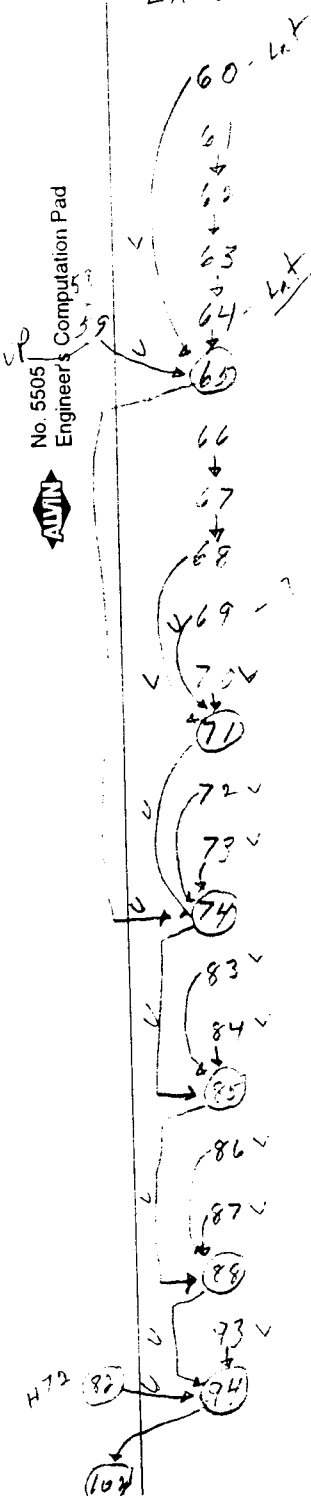
101

No. 5505 Engineer's Computation Pad ALVIN

501

DAW

Element No	Area Planimeter Units 1x, 2x	Length (m)	Δℓ (ft)
60	42, 82 = 41.5	90	90
61	43, 87 = 43.5	155	330
62	11, 20 = 10.5	40	60
63	6, 12 = 6	20	50
64	58, 115 = 57.5	150	170
65		250	200
66	64, 127 = 63.5	160	320
67	31, 63 = 31.5	90	130
68	51, 102 = 51	170	140
69	41, 83 = 41.5	160	330
70	35, 68 = 34.5	110	110
71		270	210
72	32, 65 = 32.5	120	80
73	47, 92 = 46.5	140	90
74		380	140
83	39, 78 = 39	160	70
84	8, 16 = 8	40	20
85		110	40
86	24, 50 = 24.5	50	10
87	28, 56 = 28	90	40
88		250	48
93	10, 22 = 10.5	100	12
94		230	28
107			



No. 5505 Engineer's Computation Pad ALVIN

502

DAW

Element No.	Area Planimeter Units	Length (m)	ΔR (ft)
89	11, 22 = 11	130	50
90	31, 62 = 31	140	70
91	32, 64 = 32	180	70
92		170	80
95	23, 47 = 23.5	110	12
96	100, 200 = 100	180	85
97		270	35

94 → 97 → 103

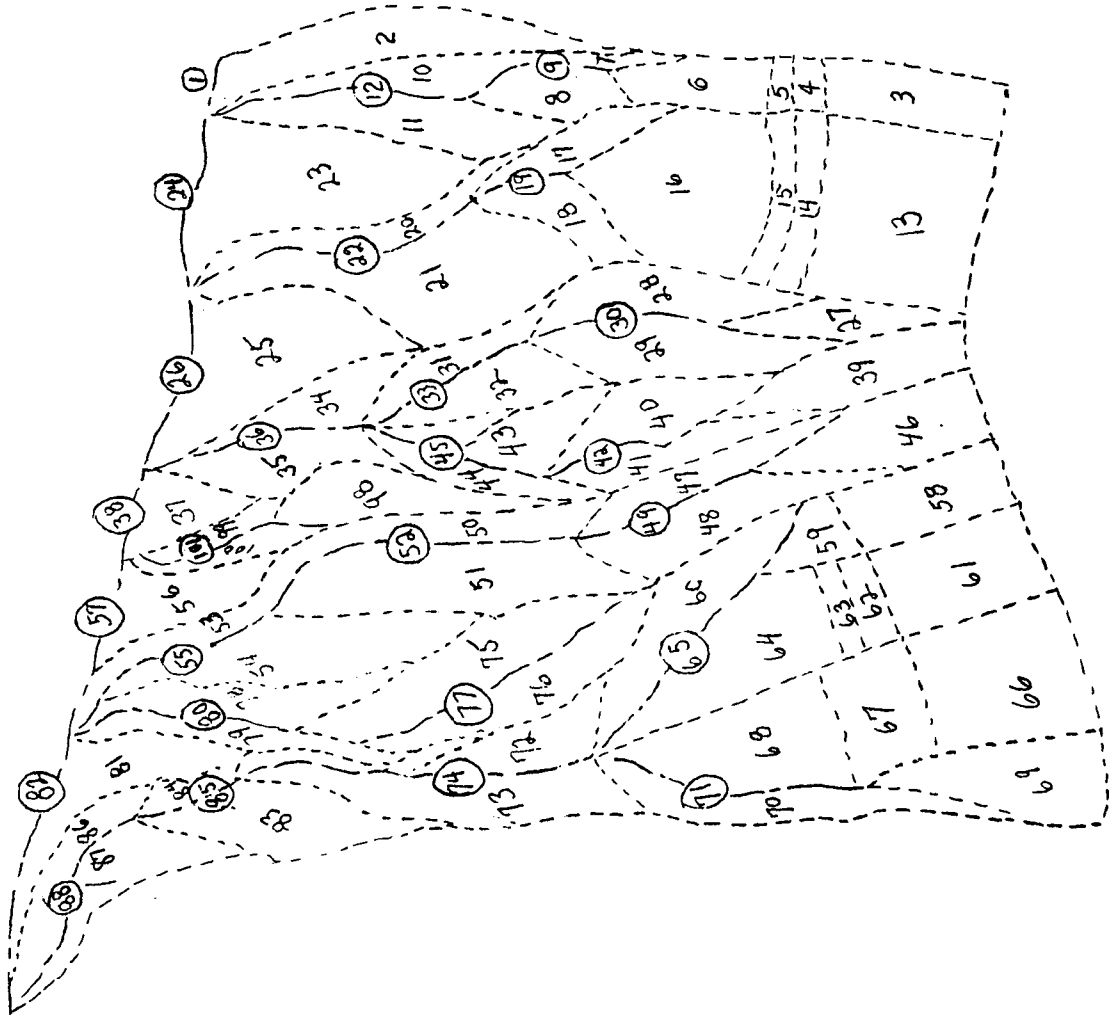
1, 24, 26, 38 → 44 (R = 1.5)

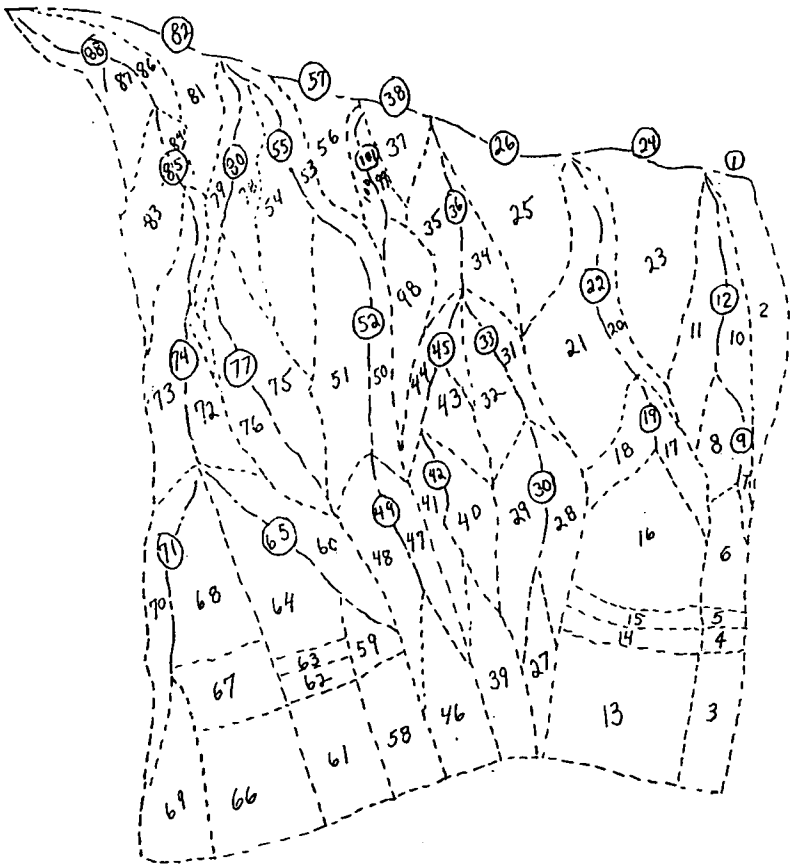
57, 22, 24 → 254

} Correspondence between hillslope and solitario canyon

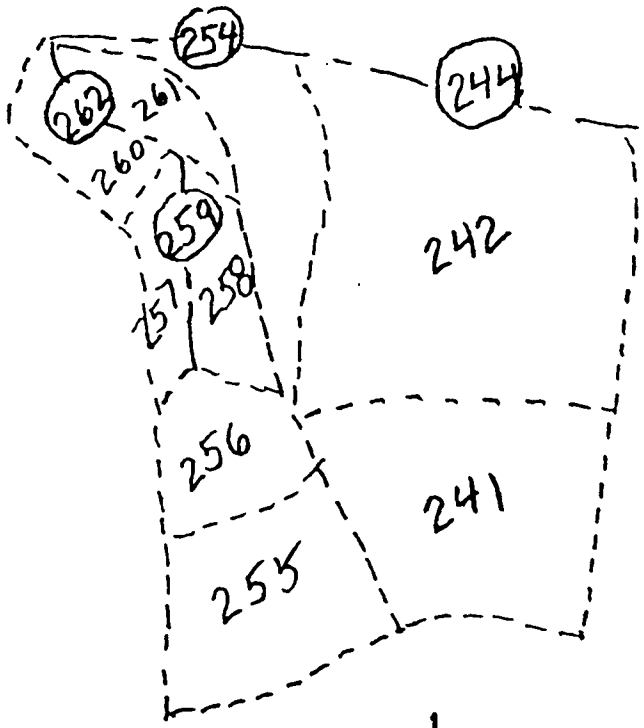
ALVIN No. 5505 Engineer's Computation Pad

HILLSLOPE STUDY - COMPLEX REPRESENTATION





COMPLEX



SIMPLE

CNWRA Solitario Canyon	Hillslope Study	DAW 3/14/97

505

Comparison of lengths of Solitario Canyon main channel

	Simple	Detailed	
244	570	1	60
		24	190
		26	180
		38	100
			530
254	390	57	200
		82	300
		94	230
			730
	960		1,260 m
Total Area	73.4 ha.		80.9 ha.

DAW

For simple watershed, decrease length of 244 to 530 m.
" " " increase length of 254 to 500 m

For detailed watershed, eliminate 89, 90, 91, 92, 93, 94, 95, 96, 97

88 → 102
82

Name new files:

SIMJ02.PAR HILLJOC2.PAR

Season July-Oct.

No. 5505 Engineer's Computation Pad ALVIN

730
300
1,030

COMPLEX GEOMETRY

Element No.	Area Plan Unit	Area M**2	Length M	Width M	Delta H Ft.	Slope	Contr. Area m**2	BW m
2	53.5	18195	290	62.7	105	0.11		
1		0	60	0.0	8	0.04	18195	
3	32.5	11053	185	59.7	340	0.56		
4	6.0	2041	32	63.8	50	0.48		
5	4.5	1530	25	61.2	70	0.85		
6	20.5	6972	130	53.6	160	0.38		
7	8.0	2721	50	54.4	60	0.37		
8	19.5	6632	60	110.5	80	0.41		
9		0	160	0.0	110	0.21	30949	0.13
10	20.5	6972	70	99.6	50	0.22		
11	40.0	13604	180	75.6	100	0.17		
12		0	260	0.0	100	0.12	51525	0.21
23	81.5	27718	180	154.0	60	0.10		
24		0	190	0.0	20	0.03	97439	0.40
13	89.5	30439	160	190.2	310	0.59		
14	16.5	5612	30	187.1	40	0.41		
15	14.0	4761	25	190.5	70	0.85		
16	75.5	25678	150	171.2	180	0.37		
17	18.5	6292	120	52.4	90	0.23		
18	21.5	7312	135	54.2	150	0.34		
19		0	90	0.0	60	0.20	80094	0.33
20	24.5	8332	100	83.3	50	0.15		
21	80.5	27378	170	161.0	100	0.18		
22		0	320	0.0	130	0.12	115804	0.48
25	70.5	23977	125	191.8	60	0.15		
26		0	180	0.0	20	0.03	237220	0.98
27	19.5	6632	170	39.0	360	0.65		
28	31.5	10713	100	107.1	110	0.34		
29	40.5	13774	110	125.2	130	0.36		
30		0	190	0.0	190	0.30	31119	0.13
31	19.0	6462	100	64.6	50	0.15		

506

32	26.5	9013	110	81.9	130	0.36		
33		0	190	0.0	140	0.22	46594	0.19
39	36.0	12244	190	64.4	360	0.58		
40	28.5	9693	90	107.7	100	0.34		
41	21.5	7312	50	146.2	50	0.30		
42		0	170	0.0	170	0.30	29249	0.12
43	29.5	10033	120	83.6	90	0.23		
44	19.5	6632	100	66.3	100	0.30		
45		0	210	0.0	140	0.20	45914	0.19
34	22.5	7652	70	109.3	40	0.17		0.00
35	29.0	9863	70	140.9	40	0.17		0.00
36		0	220	0.0	70	0.10	110022	0.46
37	21.0	7142	60	119.0	25	0.13		0.00
38		0	100	0.0	13	0.04	354384	1.47
98	31.0	10543	150	70.3	70	0.14		0.00
99	9.5	3231	50	64.6	30	0.18		0.00
100	11.5	3911	40	97.8	20	0.15		0.00
101		0	160	0.0	65	0.12	17685	0.07
56	28.0	9523	100	95.2	40	0.12		0.00
57		0	200	0.0	22	0.03	381592	1.58
46	40.5	13774	170	81.0	330	0.59		0.00
47	23.5	7992	100	79.9	80	0.24		0.00
48	39.5	13434	90	149.3	110	0.37		0.00
49		0	190	0.0	180	0.29	35200	0.15
50	29.5	10033	90	111.5	40	0.14		0.00
51	66.5	22617	120	188.5	80	0.20		0.00
52		0	330	0.0	200	0.18	67850	0.28
53	17.5	5952	60	99.2	20	0.10		0.00
54	51.5	17515	190	92.2	120	0.19		0.00
55		0	270	0.0	65	0.07	91317	0.38
75	47.0	15985	140	114.2	100	0.22		0.00
76	39.5	13434	160	84.0	100	0.19		0.00
77		0	300	0.0	160	0.16	29419	0.12
78	29.5	10033	75	133.8	30	0.12		0.00

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507

79	18.5	6292	100	62.9	40	0.12		0.00
80		0	250	0.0	75	0.09	45743	0.19
81	37.5	12754	120	106.3	45	0.11		0.00
82		0	300	0.0	34	0.03	531406	2.20
58	35.5	12074	170	71.0	330	0.59		0.00
59	13.5	4591	170	27.0	330	0.59		0.00
60	41.5	14114	90	156.8	90	0.30		0.00
61	43.5	14794	155	95.4	330	0.65		0.00
62	10.5	3571	40	89.3	60	0.46		0.00
63	6.0	2041	20	102.0	50	0.76		0.00
64	57.5	19556	150	130.4	170	0.35		0.00
65		0	250	0.0	200	0.24	70741	0.29
66	63.5	21596	160	135.0	320	0.61		0.00
67	31.5	10713	90	119.0	130	0.44		0.00
68	51.0	17345	170	102.0	140	0.25		0.00
69	41.5	14114	160	88.2	320	0.61		0.00
70	34.5	11733	110	106.7	110	0.30		0.00
71		0	275	0.0	210	0.23	75502	0.31
72	32.5	11053	120	92.1	80	0.20		0.00
73	46.5	15815	140	113.0	90	0.20		0.00
74		0	380	0.0	140	0.11	173111	0.72
83	39.0	13264	160	82.9	70	0.13		0.00
84	8.0	2721	40	68.0	20	0.15		0.00
85		0	110	0.0	40	0.11	189096	0.78
86	24.5	8332	50	166.6	10	0.06		0.00
87	28.0	9523	90	105.8	40	0.14		0.00
88		0	250	0.0	48	0.06	206951	0.86
93	10.5	3571	100	35.7	12	0.04		0.00
94		0	230	0.0	28	0.04	741928	3.07
89	11.0	3741	130	28.8	50	0.12		0.00
90	31.0	10543	140	75.3	70	0.15		0.00
91	32.0	10883	120	90.7	70	0.18		0.00
92		0	170	0.0	80	0.14	25167	0.10
95	23.5	7992	110	72.7	12	0.03		0.00

3/4

503

96	100.0	34010	180	188.9	85	0.14		0.00
97		0	270	0.0	35	0.04	67170.	0.28
102		0	ERR		ERR		809098	3.35
		0	ERR		ERR			0.00
		0	ERR		ERR			0.00
		0	ERR		ERR			0.00
		0	ERR		ERR			0.00
		0	ERR		ERR			0.00
		0	ERR		ERR			0.00
		0	ERR		ERR			0.00
		0	ERR		ERR			0.00
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		0	ERR		ERR			0.00
		0	ERR		ERR			0.00
		0	ERR		ERR			0.00
		0	ERR		ERR			0.00

4/4

509

510

As one should expect from D. Goodrich's work, the simple topography has a greater amount of steady state storage than the more complex system, with the same Manning's n. The system storage can be reduced (moderately) by increasing RELIEF, but a greater change can be achieved by decreasing n. — DAW

Continuing Strategy

✓ 1. Run another storm PAUG60.PRE

2. Consider a run (or runs) with flow injection at the upper end of main channel elements.

✓ 3. Prepare a summary of all channel infiltration (with both simple and complex models) Use a spreadsheet similar to that used for channel infiltration on Solitario Canyon.

Computer Run PAUG60.PRE

Complex: Output HILL60.OUT		Simple
Rainfall	26.16 mm	26.16
Infil.	18.45	19.13
Ster.	0.028	0.069
Outflow	7.67	6.839
Q_p = 12.9 mm/hr.		Q_p = 9.3 mm/hr

Channel	Infil. ~~mm~~. m^3	BW (m)	Channel	Infil (~~mm~~) m^3
1	3.4	10.	244	90.5
24	23.9	10.	254	155.1
26	42.3	10.	Total	245.6 m^3
38	28.1	10. ✓		
57	69.9	9.5 ✓		
82	130.9	9.5		0.3 mm ✓
Total	296.5 m^3			
	= 0.4 mm ✓			

No. 5505 Engineer's Computation Pad ALVIN

ent Volume Summary:

Rainfall	21.32376 mm	17250.74 cu m
Plane infiltration	20.28776	16412.62
Channel infiltration	.30341	245.45
Storage	.52751	426.75
Outflow	.20193	163.36

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .02439, .04545 min

Total watershed area = 80.89911 ha

E:\CONSULT\SWRI\HILL>

HILLJ_OC.PAR
B:\PJUL10.PRE
HILLTEST.OUT
LSLOPE, DETAILED
100
1

Event Volume Summary:

Rainfall	21.32376 mm	15646.21 cu m
Plane infiltration	20.56551	15089.84
Channel infiltration	.07654	56.16
Storage	.53346	391.42
Outflow	.13833	101.50

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .08333, .09091 min

Total watershed area = 73.37450 ha

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SIMPLEJO.PAR

Daw

ent Volume Summary:

Rainfall	31.24200 mm	23060.82 cu m
Plane infiltration	29.25373	21593.21
Channel infiltration	.71127	525.01
Storage	.01783	13.16
Outflow	1.25424	925.80

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .02381, .02500 min

Total watershed area = 73.81351 ha

E:\CONSULT\SWRI\HILL>

Main channel F

ent Volume Summary:

Rainfall	31.24200 mm	22923.66 cu m
Plane infiltration	29.98384	22000.50
Channel infiltration	.31798	233.32
Storage	.04268	31.31
Outflow	.88341	648.20

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .07143, .08333 min

Total watershed area = 73.37450 ha

Δ Plane F = 29.98 − 29.25 = 0.73 mm (simple, complex)

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m^3 ← main channel F

Main Channel F Ratio $\frac{\text{Complex}}{\text{Simple}} = \frac{172}{153} = 1.12$

Runoff R = $\frac{1.25}{0.88} = 1.42$

Peak ratio = $\frac{1.34}{0.40} = 3.35$

513

Two storms have been run as inputs to the simple and complex partial watersheds. Parameter files

HILLJOC2.PAR and SIMJC2.PAR

The storms were PJUL16.PRE - FUTURE SIMULATION
PAUG4.PRE - 2nd 50yr. " "

DAW

Although runoff volumes and main channel infiltration were greater for the complex system, the question arises - would the differences be significant if upstream inflow were included? Much of the difference in main channel ~~infiltr~~ infiltration may be due to the higher peak rates (and stages) generated by the concentrated inflow for the complex representation. In turn, these greater peak flows may be due to the increased hydraulic efficiency of the complex representation.

To test the hypothesis of increased hydraulic efficiency create parameter files with impervious planes + channels + calculate response times from steady state storage and rainfall rate.

Impervious Tests

Complex Hillslope HILLIMP.PAR 2hr. run @ 50.8 mm/hr.

Watershed area = 73.81 ha.
Storage = 14.53 mm
CLEN = 100 m

$T_0 = \frac{14.53}{50.8} \times 60 = 17.16$ min.

Simple Hillslope SIMIMP.PAR 2hr. run @ 50.8 mm/hr

Watershed area = 73.37
Storage = 20.98
CLEN = 300 m

$T_0 = \frac{20.98}{50.8} \times 60 = 24.8$ min

{ Changed to 100 m, storage = 21.0
~~did not change~~
Negligible change

Question - Can an increase in RELIEF in simple model ~~increase~~ decrease storage?

RELIEF was changed from 50 to 150 mm for all planes in SIMIMP.PAR - Storage was slightly reduced - to 19.43 mm thus $T_0 = 22.9$ min.

514

RELIEF was changed from 150 to 300 mm. (11.81 in.)

storage = 18.87 mm T_0 = 22.2 min

DAW

Preliminary Conclusion: The complex representation is more efficient (hydraulically) than the simple system. Increasing RELIEF from 50mm to 300mm changed T_0 from 24.8 min to 22.2 min.

Try changing the spacing!

Decreasing spacing to 0.5m, storage = 19.66 mm - an increase!

It appears that Mannings n must be decreased to get a close match of response times.

Increase spacing to 1 m, RELIEF = 300 mm

Mannings n = 0.101 storage = 15.5 mm T_0 = 18.3 min

This is about 1 min greater than T_0 for complex watershed.

Try running PAUG4.PRE with simple geometry with n = 0.101 and RE = 300

400 min Run. INFIL = 16.36 mm
OUTFLOW = 10.26 mm
Q_p = 18.97 mm/hr.

Channel	F (m^3)
244	133.4
254	239.3
	372.7 m^3

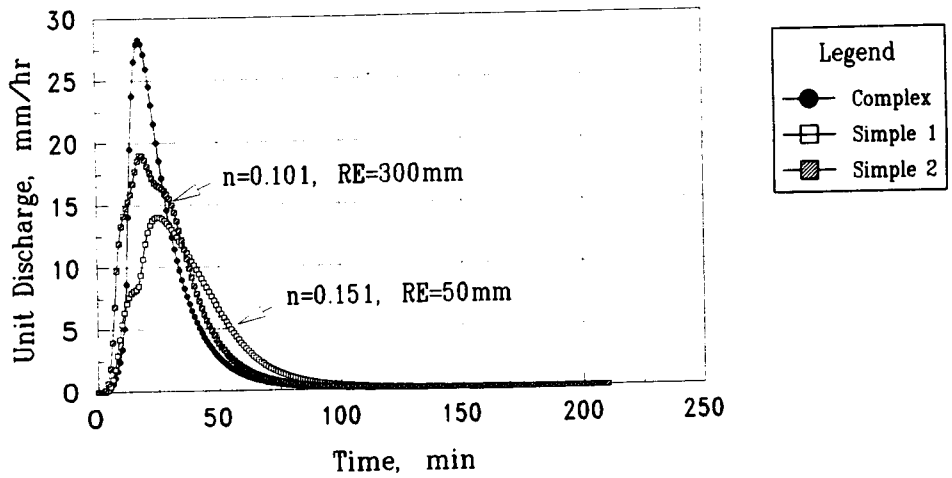
Thus runoff was increased from 9.09 + 10.26 mm
channel F " " from 332.1 to 372.7 m^3
Q_p " " from 14.02 to 18.97 mm/hr

Q_p @ (244) = 23.7 mm/hr @ 24 mm Q_p @ (38) (complex) = ~~23.7 mm~~ 30.8 mm/hr @ 15 min

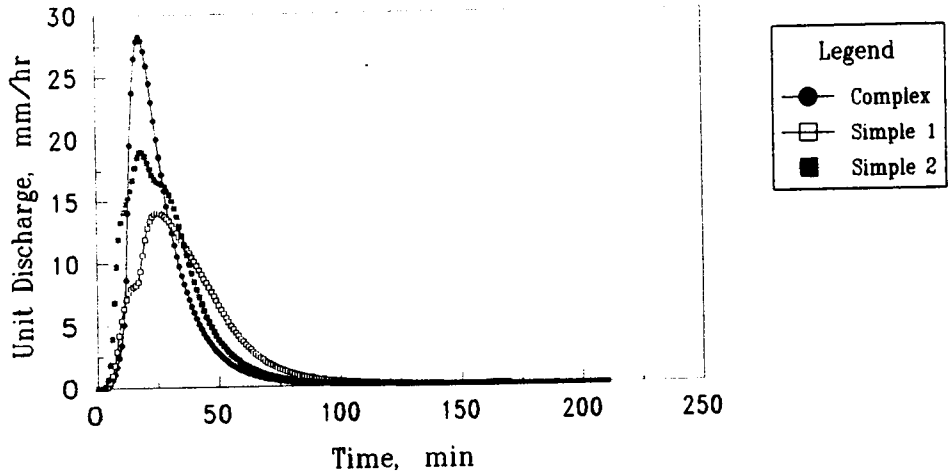
A Figure was created showing the 3 hydrographs.

SINTEST.OUT

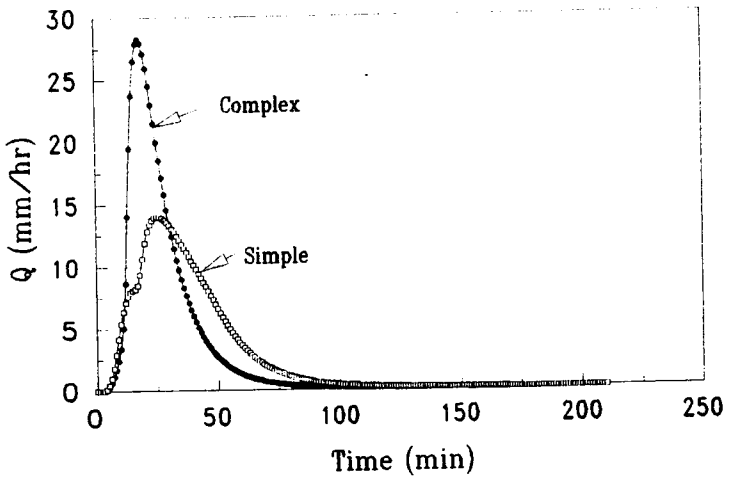
No. 5505 Engineer's Computation Pad ALVIN



Hillslope Hydrographs Aug4, 2nd 50 yrs



Hillslope Hydrographs Aug4, 2nd 50 yrs



Hydrograph Comparisons, Storm AUG4

HILLSLOPE, SIMPLE, PJUL10, FUTURE

Event Volume Summary:

Rainfall	31.24200 mm	22923.66 cu m
Plane infiltration	29.98384	22000.50
Channel infiltration	.31798	233.32
Storage	.04268	31.31
Outflow	.88341	648.20

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .07143, .08333 min

Total watershed area = 73.37450 ha

HILLSLOPE, COMPLEX, PJUL10, FUTURE

Event Volume Summary:

Rainfall	31.24200 mm	23060.82 cu m
Plane infiltration	29.25373	21593.21
Channel infiltration	.71127	525.01
Storage	.01783	13.16
Outflow	1.25424	925.80

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00000, .02381, .02500 min

Total watershed area = 73.81351 ha

Dw 4/21/97

HILLSLOPE, SIMPLE, PAUG4, 2ND 50 YR SIMJ02.PAR

Event Volume Summary:

Rainfall	26.67000 mm	19568.98 cu m
Infiltration	17.50843	12846.72
Storage	.02899	21.27
Outflow	9.09221	6671.36

DW

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .01449, .05882, .33333 min

Total watershed area = 73.37450 ha

HILLSLOPE, COMPLEX, PAUG4, 2ND 50 YR HILLJ0C2.PAR

Event Volume Summary:

Rainfall	26.67001 mm	19686.07 cu m
Infiltration	16.95147	12512.47
Storage	.01340	9.89
Outflow	9.69155	7153.67

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00680, .05263, .20000 min

Total watershed area = 73.81351 ha

Complex

Channel	F (m³)
1	2.96
24	29.2
26	55.9
38	38.3
57	97.0
82	191.
Total	414.4

Simple

Channel	F (m³)
244	120.5
254	211.6
	332.1

~~Δ Plane F = 17.51 - 16.95 = 0.56~~ DW

Main Channel F Ratio $\frac{\text{Complex}}{\text{Simple}} = 1.25$

Runoff Ratio $\frac{\text{Complex}}{\text{Simple}} = \frac{9.69}{9.09} = 1.07$

DW

Peak ratio = ~~[illegible] mm/hr~~ $= \frac{30.8}{14.02} = 2.2$

```
hillJOC2.PAR
B:\PAUG60.PRE
HILL60.OUT
HILLSLOPE, COMPLEX PAUG60.PRE ORIGINAL N AND RE
1
N
N
```

Kinires Control file

DAW

Event Volume Summary:

Rainfall	26.16200 mm	19311.09 cu m
Infiltration	18.45496	13622.25
Storage	.02862	21.13
Outflow	7.67381	5664.31

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .00909, .00952, .03846 min

Total watershed area = 73.81351 ha

```
SIMJO2.PAR
B:\PAUG60.PRE
SIMJO260.OUT
HILLSLOPE, SIMPLE PAUG60.PRE ORIGINAL N AND RE
200
1
N
```

Control

Event Volume Summary:

Rainfall	26.16200 mm	19196.24 cu m
Infiltration	19.13474	14040.02
Storage	.06915	50.74
Outflow	6.83950	5018.45

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .01695, .01695, .04167 min

Total watershed area = 73.37450 ha

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HILLSLOPE, COMPLEX, CHANNEL INFILTRATION SUMMARY

STORM FILE PAUG4
HILLAUG4.SSF

Element No.	Length M	Delta H Ft.	Slope	Channel Area m**2	BW m	Infil m**3	Infil H cm
1	60			600.00	10	3.0	0.50
9	160	110	0.21	20.80	0.13	17.5	84.13
12	260	100	0.12	54.60	0.21	40.8	74.73
24	190	20	0.03	1900.00	10.00	29.2	1.54
19	90	60	0.20	29.70	0.33	16.9	56.90
22	320	130	0.12	153.60	0.48	76.0	49.48
26	180	20	0.03	1800.00	10.00	55.9	3.11
30	190	190	0.30	24.70	0.13	15.3	61.94
33	190	140	0.22	36.10	0.19	24.8	68.70
42	170	170	0.30	20.40	0.12	14.4	70.59
45	210	140	0.20	39.90	0.19	27.8	69.67
36	220	70	0.10	101.20	0.46	55.2	54.55
38	100	13	0.04	1000.00	10.00	38.3	3.83
101	160	65	0.12	11.20	0.07	16.0	142.86
57	200	22	0.03	1900.00	9.50	97.0	5.11
49	190	180	0.29	28.50	0.15	18.2	63.86
52	330	200	0.18	92.40	0.28	51.2	55.41
55	270	65	0.07	102.60	0.38	64.4	62.77
77	300	160	0.16	36.00	0.12	24.7	68.61
80	250	75	0.09	47.50	0.19	39.3	82.74
82	300	34	0.03	2850.00	9.50	191.1	6.71
65	250	200	0.24	72.50	0.29	33.0	45.52
71	275	210	0.23	85.25	0.31	38.0	44.57
74	380	140	0.11	273.60	0.72	115.5	42.21
85	110	40	0.11	85.80	0.78	34.4	40.09
88	250	48	0.06	215.00	0.86	95.5	44.42
		TOTAL		11581.35		1233.4	

Non-main channels 818.9

521

HILLSLOPE, SIMPLE, PAUG60, CHANNEL INFILTRATION SUMMARY SIMAUG4.SSF

Element No.	Length M	Delta H Ft.	Slope	Channel Area m**2	BW m	Infil m**3	Infil H cm
244	530			5300	10	120.50	2.27
254	500			4750	9.50	211.60	4.45
259	350			315	0.90	107.00	33.97
262	290			319	1.10	111.70	35.02
			TOTAL	10684		550.80	

AVERAGE DEPTH OF INFIL (CM) 5.16

[illegible] = [illegible] m³

Dau

522

HILLSLOPE, SIMPLE, PAUG60, CHANNEL INFILTRATION SUMMARY SIM60.SSF

Element No.	Length M	Delta H Ft.	Slope	Channel Area m**2	BW m	Infil m**3	Infil H cm
244	530			5300	10	90.50	1.71
254	500			4750	9.50	155.10	3.27
259	350			315	0.90	90.00	28.57
262	290			319	1.10	95.40	29.91
			TOTAL	10684		431.00	

AVERAGE DEPTH OF INFIL (CM) 4.03407

HILLSLOPE, COMPLEX, PAUG 60

Element No.	Length M	Delta H Ft.	Slope	Contr. Area m**2	BW m	Infil m**3	Infil H cm
1	60				10	3.4	0.57
9	160	110	0.21		0.13	16.6	79.81
12	260	100	0.12		0.21	13.6	24.91
24	190	20	0.03		10.00	23.9	1.26
19	90	60	0.20		0.33	15.1	50.84
22	320	130	0.12		0.48	67.3	43.82
26	180	20	0.03		10.00	42.3	2.35
30	190	190	0.30		0.13	15.3	61.94
33	190	140	0.22		0.19	23	63.71
42	170	170	0.30		0.12	14.5	71.08
45	210	140	0.20		0.19	25.7	64.41
36	220	70	0.10		0.46	49.2	48.62
38	100	13	0.04		10.00	28.1	2.81
101	160	65	0.12		0.07	15.4	137.50
57	200	22	0.03		9.50	67.9	3.57
49	190	180	0.29		0.15	17.7	62.11
52	330	200	0.18		0.28	46.6	50.43
55	270	65	0.07		0.38	57.3	55.85
77	300	160	0.16		0.12	23.4	65.00
80	250	75	0.09		0.19	35.7	75.16
82	300	34	0.03		9.50	130.9	4.59
65	250	200	0.24		0.29	30.1	41.52
71	275	210	0.23		0.31	34	39.88
74	380	140	0.11		0.72	101.4	37.06
85	110	40	0.11		0.78	29.9	34.85
88	250	48	0.06		0.86	82.5	38.37
					TOTAL	1010.8	

DMW

524

SWRI - CNWRA Solitario Canyon	Hillslope Study	DAW 4/25/97	4

525

Spreadsheets have been prepared to summarize the channel infiltration for the simple and complex hillslopes.

Spreadsheets are in ENABLE. Forms are

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DAW

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Hillslope with injection of hydrograph at upstream end of main channel.

A revised parameter file, HILLINJ.PAR was prepared. The hydrograph in m^3/sec from channel 231 for the storm PAV64.PRE was prepared. ~~CHANINJ~~ CHAN231.INJ was injected at the upper end of CHANNEL 1. DAW

A revised parameter file SIMINJ.PAR was prepared. CHAN231.INJ was injected at the upper end of CHANNEL 244.

Complex					Simple			
Channel	Qp	Infil m^3	IN	Cont A	Channel	Qp	Infil m^3	in
1		216.5	65708	39.15	244	41.50	2145.8	69262
24		767.5	66312		254	40.08	2184.3	67737
26		698.0	67022					
38	40.65 m^3/s	358.0	(5040) 67556				4330.1 m^3	
57		771.1	67489					
82		1175.3	68028 } 1,946.4					
	39.63	3986.4 m^3						

~ an 8% diff in main channel

Bottom area 1, 24, 26, 38 = 5,300 m^2

Bottom area 244 = 5,300

Bottom area 57, 82 = 4,750

Bottom area 254 = 4750

This is a 5% increase in total channel Infiltration.

The complex representation leads to lower infiltration in the main channels (IN THIS REACH). This apparent difference in behavior is probably due to the inflow to the main reaches of channel appearing lower in the network for the complex case. The higher (concentrated) peak rates do not affected the wetted perimeter because of the injected flow. A comparison of the outflow hydrographs shows that the simple case leads to slightly higher peak flows (except for the period < 25 min)

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527

Injection study (Con't.) DAW

For the injection study, the channel infiltration for the main channel reaches will be different from the Hillslope runs without injection, but infiltration for the lateral channels will be the same.

Thus for the main channel elements - Storm PAU64.

Complex (1,24,26,38,57,82)	Simple (244,254)
3,986.4 m^3	4,330.1 m^3

For the tributary channels

818.9	218.7 m^3	
4805.3 m^3	4548.8	Total

5% less for the simple

but 8.67% more in main channel for the simple

Thus it appears that there will be more channel infiltration with more complex representation of topography but that there will be less infiltration in the main channel reaches.

One relevant issue is: Is there a difference in the proportion of water infiltrated into channels that becomes ground water recharge, depending on the channel size?

I anticipate that streamside vegetation may have greater opportunity to withdraw water from the alluvium in smaller channels. However there may also be an opportunity for water infiltrated into smaller channels to flow into rock fractures.

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8:45-9:15
11:00-

CHANNEL INFILTRATION WITH INJECTED HYDROGRAPH

HILLSLOPE, COMPLEX, CHANNEL INFILTRATION SUMMARY

STORM PAUG4 ~~DAN~~
FILE ~~CLMINJ4.SSF~~ HILLINJ4.SSF

Element No.	Length M	Delta H Ft.	Slope	Channel Area m**2	BW m	Infil m**3	Infil H cm
1	60			600.00	10	216.5	36.08
9	160	110	0.21	20.80	0.13	17.4	83.65
12	260	100	0.12	54.60	0.21	40.7	74.54
24	190	20	0.03	1900.00	10.00	767.5	40.39
19	90	60	0.20	29.70	0.33	16.8	56.57
22	320	130	0.12	153.60	0.48	75.7	49.28
26	180	20	0.03	1800.00	10.00	698	38.78
30	190	190	0.30	24.70	0.13	15.3	61.94
33	190	140	0.22	36.10	0.19	24.8	68.70
42	170	170	0.30	20.40	0.12	14.4	70.59
45	210	140	0.20	39.90	0.19	27.8	69.67
36	220	70	0.10	101.20	0.46	55.2	54.55
38	100	13	0.04	1000.00	10.00	358	35.80
101	160	65	0.12	11.20	0.07	15.9	141.96
57	200	22	0.03	1900.00	9.50	771.1	40.58
49	190	180	0.29	28.50	0.15	18.2	63.86
52	330	200	0.18	92.40	0.28	51.2	55.41
55	270	65	0.07	102.60	0.38	64.3	62.67
77	300	160	0.16	36.00	0.12	24.6	68.33
80	250	75	0.09	47.50	0.19	39.2	82.53
82	300	34	0.03	2850.00	9.50	1175.3	41.24
65	250	200	0.24	72.50	0.29	32.9	45.38
71	275	210	0.23	85.25	0.31	37.7	44.22
74	380	140	0.11	273.60	0.72	115.3	42.14
85	110	40	0.11	85.80	0.78	34.4	40.09
88	250	48	0.06	215.00	0.86	95.3	44.33
		TOTAL		11581.35		4803.5	

DAW

HILLSLOPE, SIMPLE, PAUG4 SIMINJ4.SSF

INJECTION OF CHANNEL 231

Element No.	Length M	Delta H Ft.	Slope	Channel Area m**2	BW m	Infil m**3	Infil H cm
244	530			5300	10	2145.80	40.49
254	500			4750	9.50	2184.30	45.99
259	350			315	0.90	111.20	35.30
262	290			319	1.10	116.80	36.61
			TOTAL	10684		4558.10	

AVERAGE DEPTH OF INFIL (CM)42.66286

AUG4 Storm with Injection

Element No.	Length M	Delta H Ft.	Slope	Contr. Area m**2	BW m	Infil m**3	Infil H cm	AUG4 IND.
1	60				10	3.4 3.0	0.00	216.5
9	160	110	0.21		0.13	16.6 17.5	0.00	17.4
12	260	100	0.12		0.21	13.6 40.8	0.00	40.7
24	190	20	0.03		10.00	29.2	0.00	767.5
19	90	60	0.20		0.33	16.9	0.00	16.8
22	320	130	0.12		0.48	76.0	0.00	75.7
26	180	20	0.03		10.00	55.9	0.00	698.0
30	190	190	0.30		0.13	15.3	0.00	15.3
33	190	140	0.22		0.19	24.8	0.00	24.8
42	170	170	0.30		0.12	14.4	0.00	14.4
45	210	140	0.20		0.19	27.8	0.00	27.8
36	220	70	0.10		0.46	55.2	0.00	55.2
38	100	13	0.04		10.00	38.3	0.00	358.0
101	160	65	0.12		0.07	16.0	0.00	15.9
57	200	22	0.03		9.50	97.0	0.00	771.1
49	190	180	0.29		0.15	18.2	0.00	18.2
52	330	200	0.18		0.28	51.2	0.00	51.2
55	270	65	0.07		0.38	64.4	0.00	64.3
77	300	160	0.16		0.12	24.7	0.00	24.6
80	250	75	0.09		0.19	39.3	0.00	39.2
82	300	34	0.03		9.50	191.1	0.00	1175.3
65	250	200	0.24		0.29	33.0	0.00	32.9
71	275	210	0.23		0.31	38.0	0.00	37.7
74	380	140	0.11		0.72	115.5	0.00	115.3
85	110	40	0.11		0.78	34.4	0.00	34.4
88	250	48	0.06		0.86	95.5	0.00	95.3
94	230	28	0.04		3.07		0.00	
92	170	80	0.14		0.10		0.00	
97	270	35	0.04		0.28		0.00	
102			ERR		3.35	ERR		
						ERR		

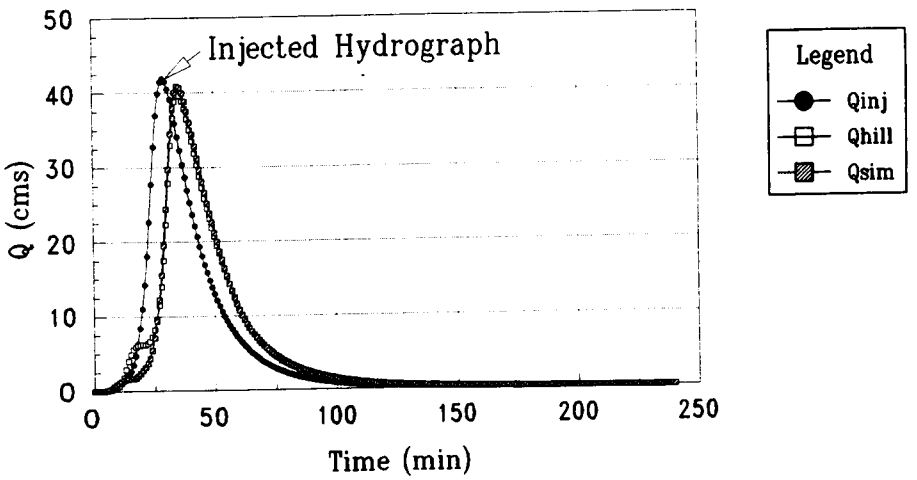
AUG 4 11D

Element No.	Length M	Delta H Ft.	Slope	Contr. Area m**2	BW m	Infil m**3	Infil H cm	
244	530				10.	90.5	120.5	145.8
254	500				9.5	155.1	211.6	184.3
259	350				0.9	90.0	107.0	111.2
262	290				1.1	95.4	111.7	116.8

EXIT to return

TOTAL 0

DAW



PAUG4 Hillslope and Simple Hydrographs

HILINJ4.PSG - PSIPLOT .DAT DISK 2
" .PSG -SHEET

DAW 5/24/97

533

The initial proposal for the hillslope study* envisioned two cases: a) Hillslope with nearly straight, parallel contour lines (approximately parallel rills) and b) hillslope approximating a conical section (converging rill structure). DAW

* Letter D. A. Woolhiser to Stuart Stathoff Apr. 22, 1996.

However, subsequent experience in Phase II of the project and developments in the KINEROS2 model have made the steps outlined for Phase 3 obsolete. First, I had envisioned rather short hillslopes when I outlined the procedure, but given the 20 m contour interval map used in Phase 2, short hillslopes could not be defined and visits to the site show that rills are poorly defined if visible at all. The availability of a map with 10 foot contour interval showed that the original definition of plane and channel elements underestimated the drainage density, and a study of an area on the west side of Yucca Mt. showed that a model determined from the 10' map had greater channel lengths and shorter overland flow lengths, both of which affect runoff response and channel infiltration. However the characteristics (topographic) of the W. side of Yucca Mtn are quite different from the tributaries entering Solitario Canyon from the west. I propose to do a second study modeling in detail 3 tributaries. The ratios of channel infiltration for simple and detailed models should be more

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representative of the area on the west side of the main channel.

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In addition, all modeling so far has not included the shallow soils found on part of the area. Therefore a study of the sensitivity of surface runoff to depth of soil over rock would be helpful. I have completed a brief investigation of the effect of initial relative saturation and thickness of the soil layer on runoff for a summer storm and a winter storm.

This study would also help in the interpretation of 1-D water balance models

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CNWRA Solitario Canyon	2 Layer System Average Plane	D.A.W. 6/10/97

DAW 535

From previous studies and visual observations during the field trip to Yucca Mtn 6/7/97, there are many areas of shallow bedrock on steep slopes in the area. These areas could give rise to saturated surface runoff during long wet periods and could also cause saturated lateral flow. The objective of this test is to determine if the 2-layer system will affect runoff for the major runoff producing storms in the summer season, — and to see if winter storms produce saturated overland flow.

Procedure:

Use the average plane with depth to rock of 0.5 m. (According to Flint, Hevesi & Flint, 40% of the area above the repository has soil depth < 0.5 m.

For the saturated hydraulic conductivity of bedrock use K_s = 0.322 mm/day (Flint et al p 68) and 8 mm/day (.33 mm/hr)
0.0134 mm/hr

(THI)CKNESS = 0.5 m = 500 mm

Use porosity of 0.2 (from Fig 33 Flint et al)

Use G of 60 mm (No reference - check sensitivity for sat. flow cases)

Create file AVGJ_02L.PAR (500 mm) in subdirectory SEASON
AVJ_02LB.PAR - THI = 300 mm

P = 13.359 mm plane F = 0.6311 OUT = 12.67

To test sensitivity of Hortonian surface runoff to thickness of soil layer.

	THI (mm)		PAUG4	PAUG60	PJUL87	PNOV89	PNOV62	PAUG54
			Storm runoff					
A	500	19.7"	11.04 q_0 = 37.9			7.50	6.85	
B	300	11.8"	11.04 q_0 = 37.9	8.71	8.56	7.50	6.85	4.78
	No Layer		11.1 ✓ q_0 = 37.9	8.8	8.61	7.58	6.91	4.9
	Precip		26.67	26.2	19.8	25.4	26.5	18.5
C	150							
	OUT FILE		AV~~[illegible]~~ 2L4A.OUT B.OUT	8.71	8.56	7.50		4.78
D	75		11.10	9.10	8.57	8.85	8.45	4.83

Insig. Diff.

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DAW

File Edit Search Options Help

AVGD2L.PAR

```
BEGIN GLOBAL!  2 layer avg plane

 CLEN = 300.,  UNITS = METRIC
END GLOBAL
!-----------------------------------------------------
BEGIN PLANE

 ID = 1,  LEN = 223.,  WID = 100.,  SL = .25,  MANNING = .151

 CV =0.8,   SAT = .8,  THICK = 300.,    PR = 2

 RELIEF = 50,  SPACING = 1

 KS        G       DIST    POR      ROCK
16.35     80.      0.25    .34      0       ! upper layer
0.0134    60       0.25    0.2      0       ! LOWER LAYER

END PLANE
!-----------------------------------------------------
```

MS-DOS Editor <F1=Help> Press ALT to activate menus | CN 00001:001

Also will need to check some winter storms with large depth that didn't create runoff.

	D Thi (mm) 75 R.O.	No layer R.O.
~~PAUG4~~ PJUL17	4.36	4.41
PJUL7	6.49 ✓	3.73
PAUG18	3.64	3.7
PAUG39	5.11 ✓	3.64
PMAY50	5.57 ✓	3.6
PAUG53	7.02 ✓	3.05
PAUG46	2.66	2.7

Conclusion: For the summer storms with seasonal initial water content thickness of the surface soil is not a factor in Hortonian runoff generation if it is greater than 150 mm. A depth of 75 mm causes greater runoff for 8 out of 13 storms. (Note: 2 in Nov. + have higher SI)

Now the occurrence of saturated overland flow will be dependent on:

1) Thickness of surface layer
2) Initial water content

3/11/95 Note: another factor to consider for shallow soils is two phase flow. Compression of air in the shallow soil could lead to reduced infiltration rates and greater surface runoff.

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CNWRA Solitario Canyon	2-Layer System Response Surface	Date 6/16/97

538

Objective: To create a 3-D plot (response surface) for increase in surface runoff, $\Delta Q = Q(\text{THICKNESS}, SAT)$ for each of 2 storms PAUG4 (26.7 mm in 40 min) and ~~PDEC~~ PDEC78 (31.7 mm in 480 min). Baseline will be the runoff for each storm with seasonal SAT and KS.

	SAT	KS
Aug	0.155	8.95 mm/hr
Dec.	0.235	16.35 "

Rather than using SAT directly, will use 1−SAT (available fraction)

STORM PAUG4

Runoff (mm) and ΔQ (mm)

SAT	X=75		150		300		500		1−SAT	X
0.8			15.80	4.49			17.79	6.48	0.7	100
0.6	17.75	6.44	14.89	3.58	14.88	3.57	14.88	3.57	0.4	200
0.4	13.43	2.12	12.84	1.53	12.84	1.53	12.84	1.53	0.6	
0.2	11.41	0.10	11.31	0	11.31	0	11.31	0	0.8	

ΔQ = RO − RO_AV

$R_0 = 11.31$

STORM PDEC78

DUR = 600 sec.

Runoff (mm) and ΔQ (mm)

SAT	75		150		300		500		1−SAT
0.7	0.04	−0.05	19.76	19.71	7.09	7.04	0.71	0.66	0.3
0.6	22.81	22.8	14.46	14.41	0.92	0.87	0.39	0.34	
0.5	20.38	20.3	9.12	9.07	0.22	0.17	0.22	0.17	0.5
0.3	15.13	15.08	1.23	1.18	0.10	.05	0.10	.05	0.7
0.1	10.08	10.03	0.05	0	0.05	0	0.05	0	0.9

R_0 = 0.05

CNWRA Solitario Canyon	2-Layer Study	Dave 6/18/97

GVJ_02LB.par — DAW

539

PAUG4 — 27.7 mm

THICKNESS

SAT	0	50	100	150	200	250	300
			21.35				
0.8		23.90	19.02	19.01	18.01	17.82	17.78
0.7		22.13	3[illegible]	16.29	16.13	16.12	16.12
0.6		20.42	15.41	14.89	14.88	14.88	14.88
0.5		18.86	13.97	13.78	13.78	13.78	13.78
0.4		17.09	12.88	12.84	12.84	12.84	12.84
0.3		15.61	11.97	11.97	11.97	11.97	11.97
0.2		14.40	11.31	11.31	11.31	11.31	11.31

Sheet: SEASON\AUG42L1.PDW PROSTAT
Fig: SEASON\AUG42L1.PGW

PDEC78 — 31.7 mm — AVGDEC.par

Thickness

SAT	0	50	100	150	200	250	300
0.8		28.8	26.3	24.1	22.35	20.56	18.09
0.7		27.1	23.24	19.76	15.66	11.38	7.09
0.6		25.59	*20.05	14.46	8.46	4.55	0.92
0.5		23.83	16.53	9.12	3.72	0.22	0.22
0.4		22.20	13.30	5.03	0.14	0.14	0.14
0.3		20.67	9.74	1.23	0.10	0.10	0.10
0.2		18.99	6.29	0.07	0.07	0.07	0.07
0.1		17.25	4.13	0.05	0.05	0.05	0.05

KINERZN AVGDEC AVG2[illegible]

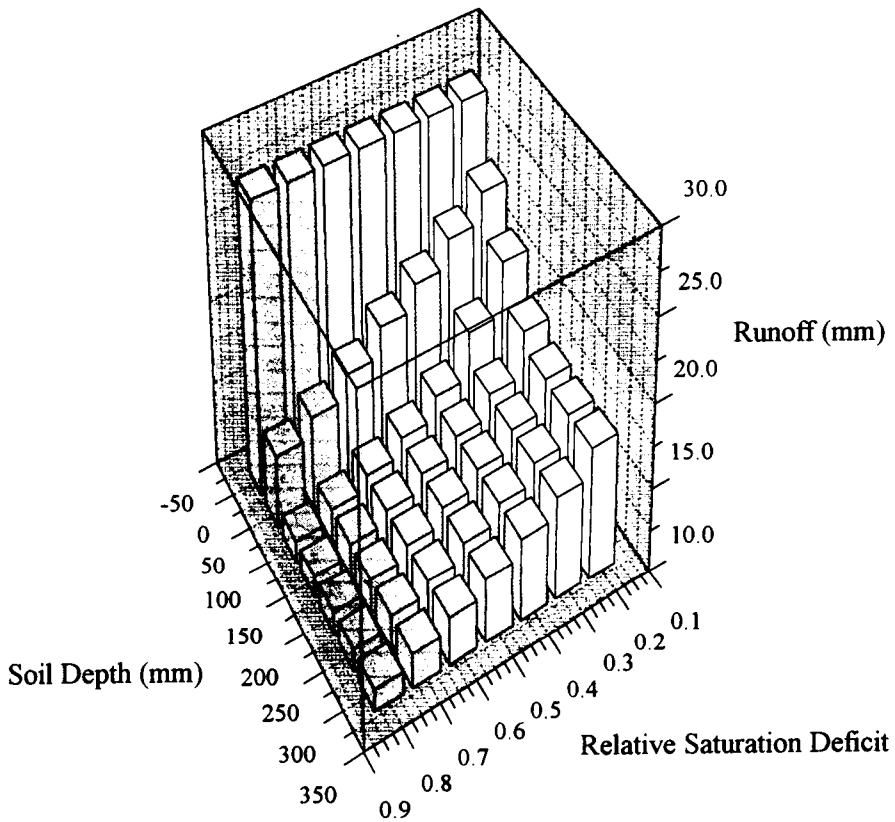
.0448

* [illegible] error

SHEET: SEASON\DEC78 2L1.PDW
PLOT: " \ " .PGW

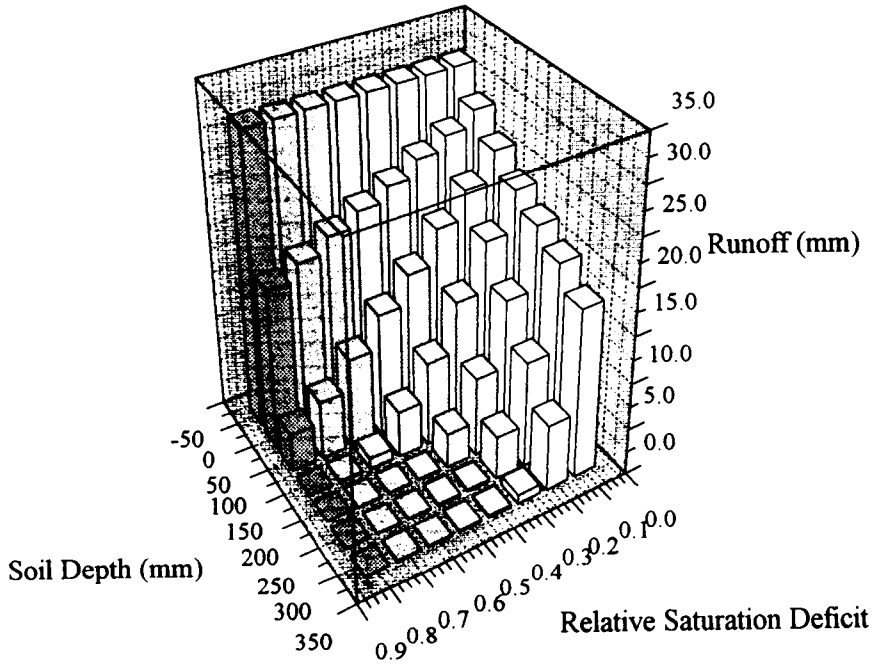
Note: Decided to use relative saturation deficit

No. 5505 Engineer's Computation Pad ALVIN


30.0
25.0
Runoff (mm)
20.0
15.0
10.0
-50
0
50
100
150
Soil Depth (mm)
200
250
300
350
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Relative Saturation Deficit

AUG 4

DAW


35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Runoff (mm)
-50
0
50
100
150
200
250
300
350
Soil Depth (mm)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Relative Saturation Deficit

DEC78

Daw

CUMULATIVE DISTRIBUTION FUNCTION FOR 7 DAYS
BEGINNING 8 - 15

X(INCHES)	F(X)
0.000	0.558
0.050	0.624
0.100	0.681
0.150	0.729
0.200	0.771
0.250	0.806
0.300	0.837
0.350	0.862
0.400	0.884
0.450	0.903
0.500	0.918
0.550	0.931
0.600	0.943
0.650	0.952
0.700	0.960
0.750	0.966
0.800	0.972
0.850	0.977
0.900	0.981
0.950	0.984
1.000	0.987
1.050	0.989
1.100	0.991

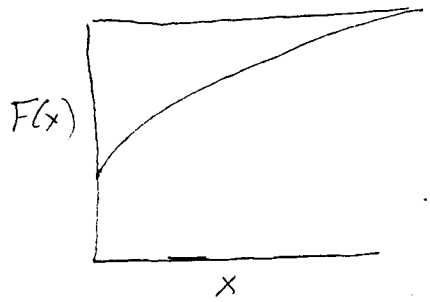
From: USCLIMAT.BAS

CUMULATIVE DISTRIBUTION FUNCTION FOR 7 DAYS
BEGINNING 12 - 15

X(INCHES)	F(X)
0.000	0.631
0.050	0.689
0.100	0.738
0.150	0.780
0.200	0.815
0.250	0.845
0.300	0.871
0.350	0.892
0.400	0.910
0.450	0.925
0.500	0.938
0.550	0.948
0.600	0.957
0.650	0.964
0.700	0.970
0.750	0.976
0.800	0.980
0.850	0.983
0.900	0.986
0.950	0.989
1.000	0.991

544

No. 5505 Engineer's Computation Pad ALVIN



Try an equation of the form:

$$F(x) = 1 - a\exp^{bx}$$

if $x = 0$, $F(x) = 1 - a = 0.63$ $\therefore a = 0.37$

if $x = 0.5$, $F(x) = 0.94$

$$1 - 0.37e^{b(0.5)} = 0.94$$

$$0.37e^{b/2} = 0.06$$

$$e^{b/2} = 0.1622$$

$b/2 = -1.8192$ } inch units

$b = -3.6383$

$$F(x) = 1 - 0.37e^{-3.6383x}$$

Try $x = 0.7$

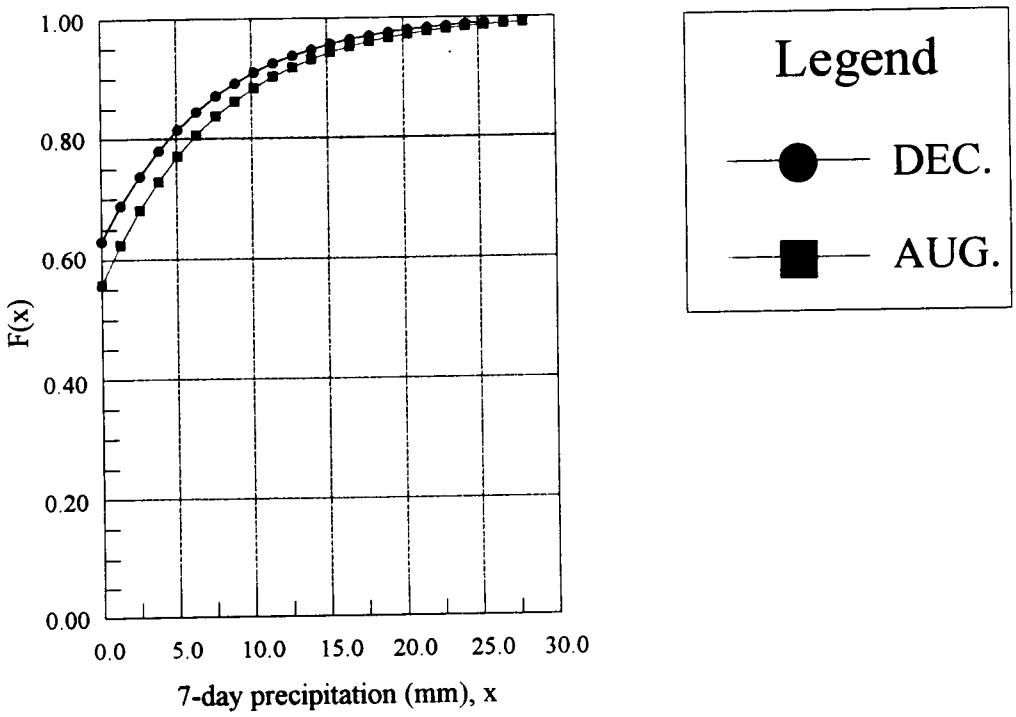
$$F(x) = 1 - 0.37e^{-3.6383(0.7)} = 0.971$$

<u>For 7 day period beginning Dec 15</u>

$$F(x) = 1 - 0.37e^{(-0.14x)} \qquad COD = R^2 = 0.9998$$

<u>For 7 day period beginning Aug 15</u>

$F(x) = 1 -$


1.00
0.80
0.60
0.40
0.20
0.00
F(x)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
7-day precipitation (mm), x
Legend
DEC.
AUG.

```
==========================================================
            User Defined Fitting Report

            Data File Name: Sheet: Untitled1

==========================================================

  Initial Parameters:

                      Param[1]:      0.37000000
                      Param[2]:     -0.14000000
  Save Data

       Number of Function Calls:              4

  Parameters After Fitting:

                      Param[1]:      0.44566973
                      Param[2]:     -0.13300796

                        SumSqr:   0.00007688036
  Covariance Matrix:

                      cvm[1,1]:      0.49516821
                      cvm[2,1]:     -0.14853345
                      cvm[2,2]:      0.10588677
  Goodness of Fit Statistics ...

                      __ C O D:      0.99978232
                      __ Corrl:      0.99991694
                      __ M S C:      8.25857453

  Parameter Statistics...

  __95 % Confidence Interval

  Parameter P[1]: 0.44566973

                        StdDev:   0.0013464010
    __ Uninvariant ...
                           LOW:      0.44286974
                          HIGH:      0.44846973
    __ Supporting Plane ...
                           LOW:      0.44212443
                          HIGH:      0.44921504

  __95 % Confidence Interval

  Parameter P[2]: -0.13300796

                        StdDev:   0.00062261405
    __ Uninvariant ...
                           LOW:     -0.13430276
                          HIGH:     -0.13171316
      Supporting Plane
```

$F(x) = 1 - Ae^{Bx}$

A

B

Avg.

LOW: -0.13464741
HIGH: -0.13136851

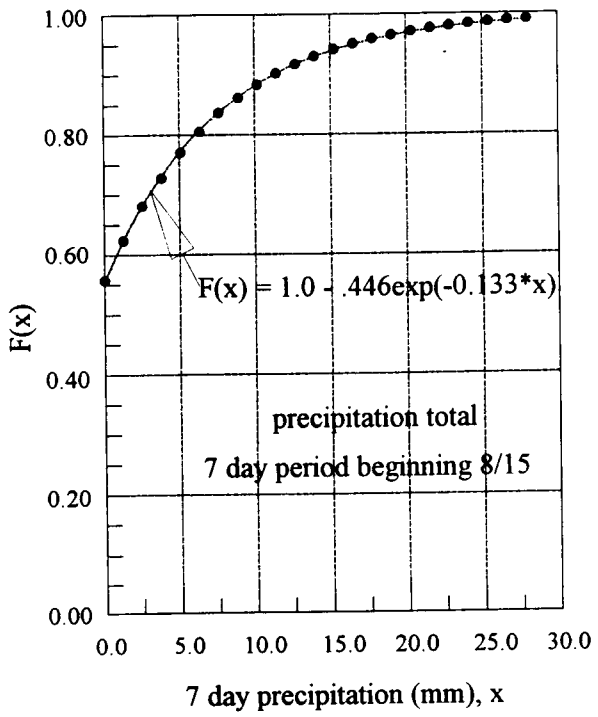
DAW

==========

(c) Poly Software International

==========

DAW


1.00
0.80
0.60
0.40
0.20
0.00
F(x)
F(x) = 1.0 - .446exp(-0.133*x)
precipitation total
7 day period beginning 8/15
0.0
5.0
10.0
15.0
20.0
25.0
30.0
7 day precipitation (mm), x

```
==========================================================
          User Defined Fitting Report

          Data File Name: Sheet: Untitled1
==========================================================

 Initial Parameters:

                    Param[1]:      0.37000000
                    Param[2]:     -3.64000000
 Save Data

     Number of Function Calls:            12

 Parameters After Fitting:

                    Param[1]:      0.37176757
                    Param[2]:     -0.13970039

                      SumSqr:   0.00004290662
 Covariance Matrix:

                    cvm[1,1]:      0.51331275
                    cvm[2,1]:     -0.19445689
                    cvm[2,2]:      0.17634779
 Goodness of Fit Statistics ...

                   __ C O D:       0.99981128
                   __ Corrl:       0.99992585
                   __ M S C:       8.38475782

 Parameter Statistics...

 __95 % Confidence Interval

 Parameter P[1]: 0.37176757

                      StdDev:   0.0010766546
   __ Uninvariant ...
                        LOW:      0.36951411
                       HIGH:      0.37402103
   __ Supporting Plane ...
                        LOW:      0.36891011
                       HIGH:      0.37462502

 __95 % Confidence Interval

 Parameter P[2]: -0.13970039

                      StdDev:   0.00063105960
   __ Uninvariant ...
                        LOW:     -0.14102121
                       HIGH:     -0.13837956
      Supporting Plane
```

$F(x) = 1 - A e^{Bx}$

DAW

7 days

Dec 15

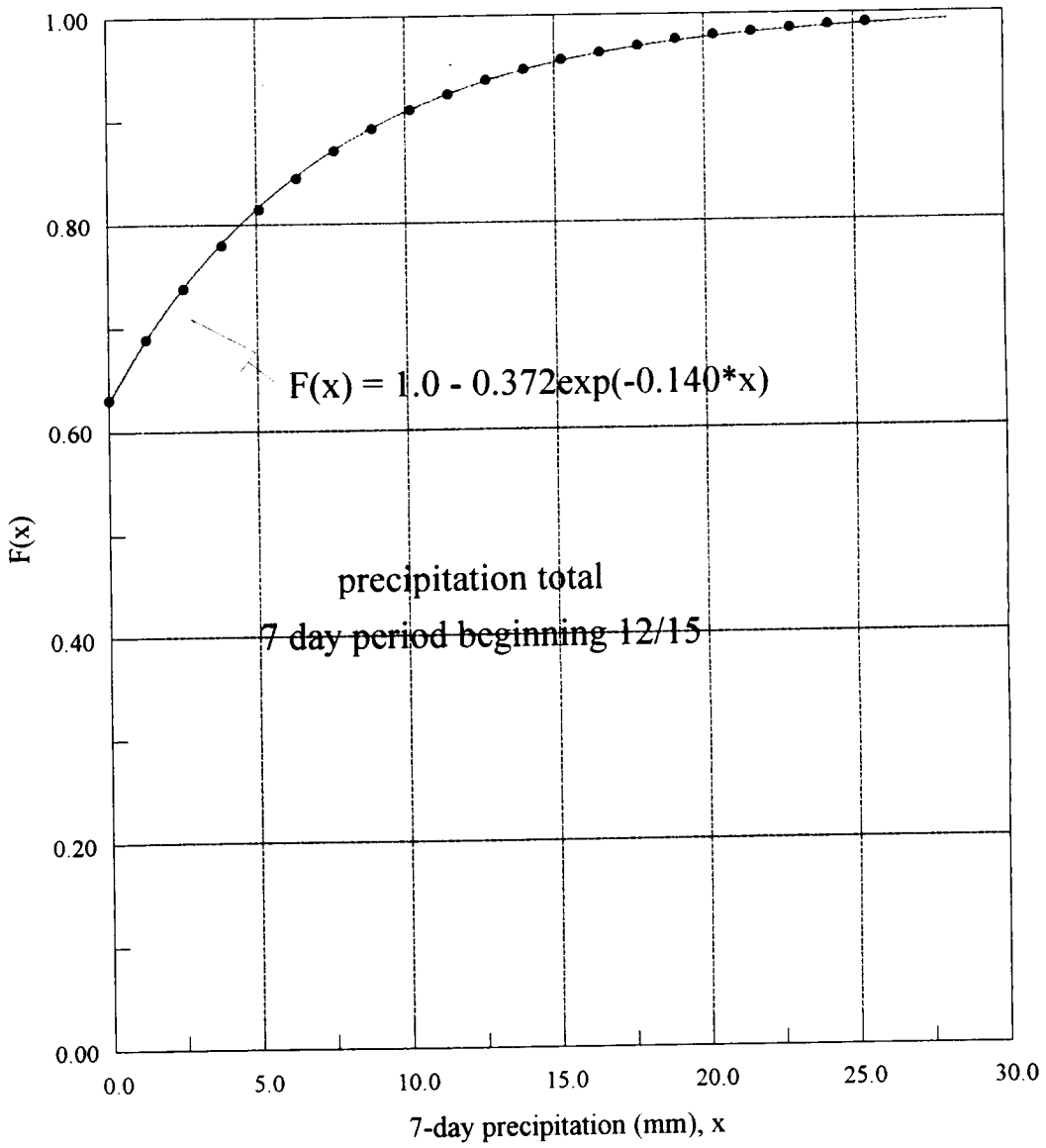
```
LOW:     -0.14137523
HIGH:    -0.13802555

==========================================================

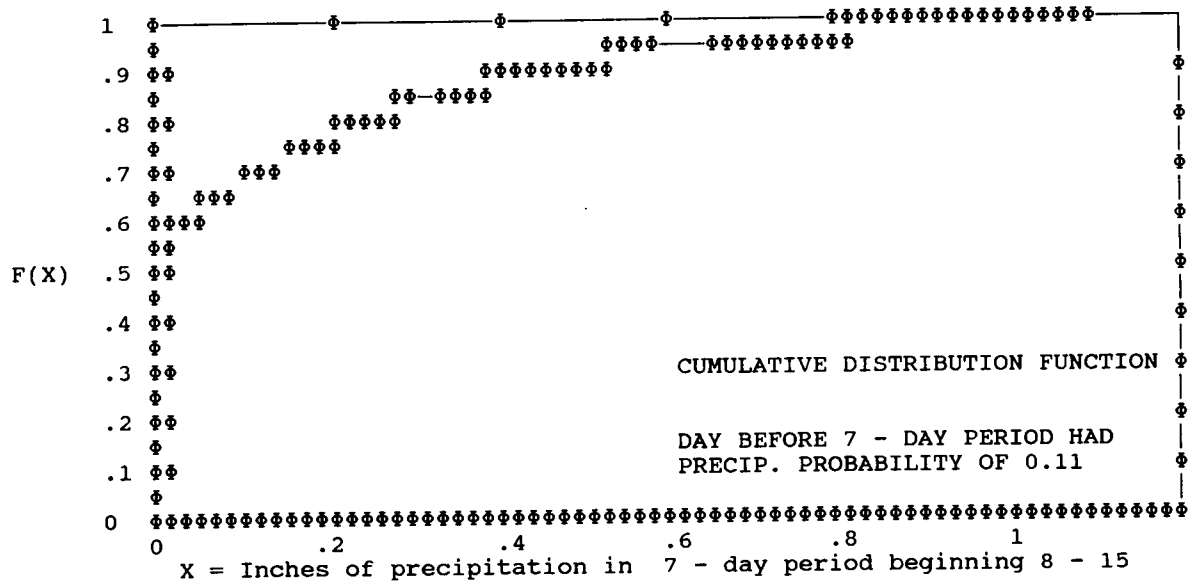
(c) Poly Software International

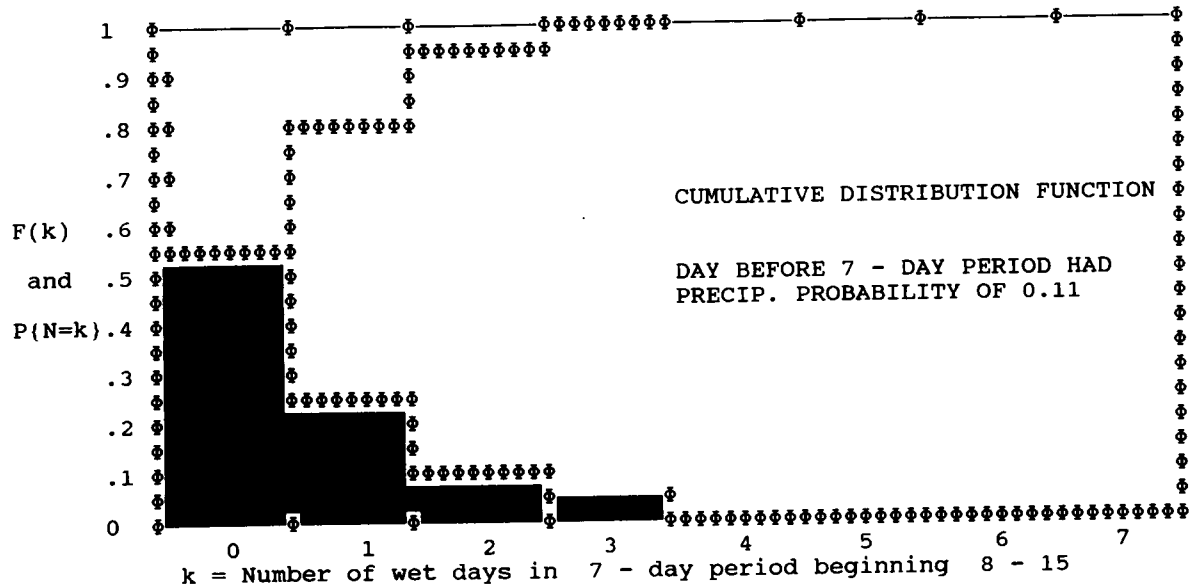
==========================================================
```

Daw


1.00
0.80
0.60
0.40
0.20
0.00
F(x)
F(x) = 1.0 - 0.372exp(-0.140*x)
precipitation total
7 day period beginning 12/15
0.0
5.0
10.0
15.0
20.0
25.0
30.0
7-day precipitation (mm), x

Daus


F(X)
1
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
0
.2
.4
.6
.8
1
CUMULATIVE DISTRIBUTION FUNCTION
DAY BEFORE 7 - DAY PERIOD HAD
PRECIP. PROBABILITY OF 0.11
X = Inches of precipitation in 7 - day period beginning 8 - 15


CUMULATIVE DISTRIBUTION FUNCTION
DAY BEFORE 7 - DAY PERIOD HAD
PRECIP. PROBABILITY OF 0.11
F(k)
and
P{N=k}
1
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
0
1
2
3
4
5
6
7
k = Number of wet days in 7 - day period beginning 8 - 15

Calculate the probabilities of SAT * THICKNESS or more rainfall occurring in the 7 days prior to the event. DAW

Procedure: Use USCLIMATE for AUG 15 and DEC 15

Assume day before the 7 day sequence was unknown re: wet or dry.

( )mm of rain to bring soil depth (THICK) to this initial cond.
PAUG4 Rainfall depth in mm

SAT	75	150	300	500
0.8	60/20.4	120 40.8	240 81.6	400 136
0.6	45/15.3	90 30.6	180 61.2	300 102
0.4	30/10.2	60 20.4	120 40.8	200 68
0.2	15/5.1	30 10.2	60 20.4	100 34

Entry in red is the profile water depth in mm.

Porosity = 0.34

mm of precip = porosity * thickness * SAT

No. 5505 Engineer's Computation Pad
ALVIN

DAW 555

In the study of the 2 layer system, initial relative saturation and soil depth were varied to determine the effect on runoff. The question arises: "what is the probability of having enough rainfall before the storm to attain the relative saturation?"

To achieve a relative soil water saturation of SI, given a soil with THICKNESS = THI and porosity = PCR, requires a rain depth, P of

$$P = SI * PCR * THI \quad (mm)$$

$$PCR = 0.34$$

SAT	THICKNESS (mm) 0	50	100	150	200	250	300
0.8		13.6	27.2	40.8	54.4	68	81.6
0.7		11.9	23.8	35.7	47.6	[illegible]	71.4
0.6		10.2	20.4	30.6	40.8	51.	[illegible]
0.5		8.5	17.0	25.5	34.0	42.5	51.0
0.4		6.8	13.6	20.4	27.2	34.	40.8
0.3		5.1	10.2	15.3	20.4	25.5	30.6
0.2		3.4	6.8	10.	13.6	17	20.4
0.1		1.7	3.4	5.0	6.8	8.5	10.2

The probability of having

No. 5505 Engineer's Computation Pad ALVIN

CNWRA Solitario Canyon	2 Layer Study	DAW 6/19/97

No. 5505 Engineer's Computation Pad

Comments on results — DAW

The results show some interesting comparisons of the differences in surface runoff response to soil thickness between short, intense summer storms and longer, low intensity winter storms. For example for PALE 4 soil depth has no effect on surface runoff for depths ranging from 300mm to 100 mm for initial water contents (relative sat. of 0.2 and 0.3 and for SAT = 0.4, 0.5, 0.6 no effect for depths from 300 mm to 150mm and at SAT = 0.8 from 300 to 200 mm. Of course runoff increases with increasing SAT for all depths studied 300mm – 50 mm

For the 480 min winter storm (peak intensity =) SAT had no effect (0.1 to 0.2) for depths from 300 to 150 mm and there is a region of negligible runoff which shows that at average SAT there is virtually no Hortonian runoff, but when the soil depth is 100mm or smaller, some Dunne mechanism runoff occurs.

A crude estimate of the probability of saturated overland flow given a rainfall like AUG78 can be obtained by estimating the probability of THICK * SAT * POR in the previous 7 days

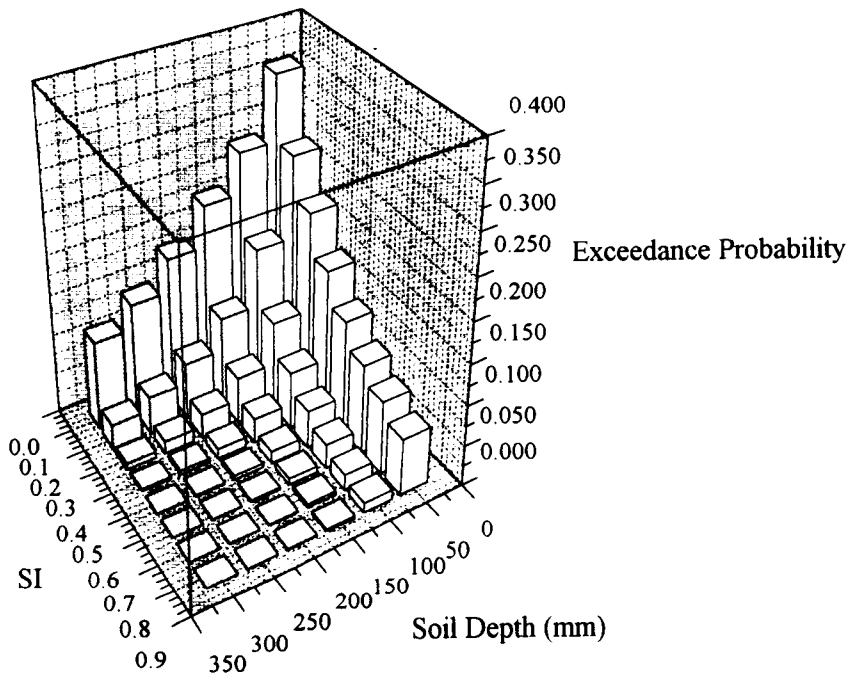
Depth (mm)	Rel. Sat 0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
~~300~~								
50	1.7 0.36	3.4 0.25	5.1 0.13	6.8 0.18	8.5 0.14	10.2 0.11	11.9 0.09	13.6 0.07
100	3.4 0.28	6.8 0.18	10.2 0.11	13.6 0.07	17.0 0.046	20.4 0.03	23.8 0.09	27.2 0.012
150	5.1 0.23	10.2 0.11	15.3 0.08	20.4 0.03	25.5 0.012	30.6 0.016	35.7 0.004	40.8 0.002
200	6.8 0.18	13.6 0.07	20.4 0.03	27.2 0.012	34.0 0.048	40.8 0.007	47.6 0.008	54.4 0.0003
250	8.5 0.14	17.0 0.046	25.5 0.018	34.0 0.048	42.5 0.014	51.0 0.003	59.5 0.002	68.0 0.0001
300	10.2 0.11	20.4 0.03	30.6 0.014	40.8 0.02	51.0 0.003	61.2 0.001	71.4 3.4×10^{-5}	81.6 8.5×10^{-6}

POR = 0.34

For Dec. The probability of exceedence = $0.773e^{-0.133X}$

Red figures are exceedence probabilities

DAW


0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Exceedance Probability
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
SI
0
50
100
150
200
250
300
350
Soil Depth (mm)

CNWRA
Solitario Canyon

2-Layer System

DAW 7/24/97

558

Test of 2-layer system with higher K_s for rock layers. Flint et al. p68 calculated a maximum flux out of the soil layer of 8 mm/day (0.333 mm/hr) — DAW

The calculated K_s based upon fracture conductivity, area of fractures and conductivity of fractures and rocks. This low value was used in the studies reported in June. The objective of this exercise is to see if the higher K_s makes much difference. In subdirectory SEASON create a new iper file, AV02LHI.PAR for Dec. and AJ_02LHI.PAR.

DUR=600 sec. POEC78 31.7 mm AV02LHI.PAR + .OUT

SAT	0	50	100 THICK	150	200	250	300
0.8							
0.7		24.0	20.5	+	11.11*	10.59	6.89
0.6							
0.5							
0.4							
0.3							
0.2							
0.1							

Adj DUR=900

* hydrograph [illegible]

+ File name missing or blank — please enter file name [illegible] 99

No. 5505 Engineer's Computation Pad ALVIN

Objective: The purpose of this investigation is to see if the 2-D model can be useful (or can provide insight) surface runoff processes in Solitario Canyon.

DAW

7/24

The model to be used is 'HILLS' (Hebert and Smith, 1996)

For the first test, use the HILLS model to examine the hydrologic response of the hillslope (scale - elements 67, 68 and 69 - in the Solitario Canyon model in CINERGS).

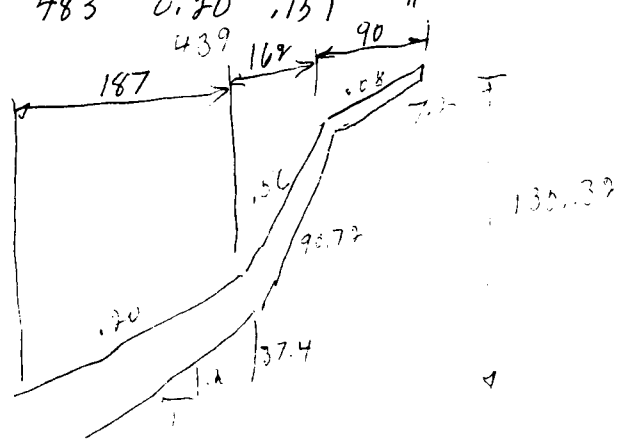
The section will have a width of 1 meter with parallel sides

The profile will be described by

YHL(1)	SHL(1)	XHL(1)
YHL(2)	SHL(2)	(m)
⋮		
YHL(N≤10)	SHL(N≤10)	XHL(N)

Depth of surface soil — surface slope — segment length

Plane	LEN	WID	SL	N	SAT	KS	G	DIST	POR
67	90	608	0.08	0.151	.155	8.95	80	0.25	.34
68	162	608	0.56	.151	.155	8.95	80	0.25	.34
69	187	483	0.20	.151	"	"	"	"	"



Av. slope = 0.3087

DAW 560

```
HILLSLOPE IN SOLITARIO CANYON
ELEMENTS 67, 68 & 69
KHOUT  KSUBF   UNITS    JPRNT   JIMIOS  JIDEP  HINIT[Option and Init. Data]
1      0       1        1       1       0      0
IQP    IPR     JPLO     JPROF   JCHAN   JBAL   JEVAP  JSALT  jlin
1      5       0        0       0       1      0      0      0
 DS    NDX     DXL      DRAT    SURF    YU     YB     HOUT   DWDX[Geometry Data]
439    40      10.975   1.0     0.3082  0.15   10.    0.01   0.
 CPC   PHI     SWmx     SWmn    ALAM    CF     QINI(M2/h) TINC [Soil Hydrology]
.10    0.34    0.95     0.07    .322    .45    0.0001     20.0
NCK    PU      PL       QWT     FISOT   CFHD   CSKL
1      .02     0.0003   0.0003  1.0     1.     1.0
 DTR   ALPHA   TEMP     RFMAN   CVF     ITERMX [Other Control Parameters]
0.1    0.8     15.0     0.151   .005    50
Nodes N1,N2 at which GW depths are followed in output:
 4   21
NGP [no. locations at which profile slope and depth are given (below):]
 6
XHL(I),YHL(I),SHL(I), on NGP cards following:
0.      0.15    .08
89.     0.20    .08
91.     0.20    0.56
250     0.50    0.56
254     0.50    0.20
439     10.0    0.20
```

```
BEGIN STORM 78: 31.7 MM RAIN IN 8 HRS
START DEC ? 00 HRS (SIMULATED)
1 1995 12 1 001 0.0
  1995 12 1 025 5.0
3 1995 12 1 049 3.2
4 1995 12 1 113 1.0
5 1995 12 1 137 0.12
6 1995 12 1 201 0.06
7 1995 12 1 225 0.18
8 1995 12 1 249 0.40
9 1995 12 1 313 0.83
10 1995 12 1 0337 0.57
11 1995 12 1 0401 0.79
12 1995 12 1 0425 2.00
13 1995 12 1 0449 3.04
14 1995 12 1 0513 4.43
15 1995 12 1 0537 4.44
16 1995 12 1 0601 1.44
17 1995 12 1 0625 1.58
18 1995 12 1 0649 1.24
19 1995 12 1 0713 0.39
20 1995 12 1 0737 0.39
21 1995 12 1 0801 0.46
22 1995 12 1 0901 0.0
23 1995 12 1 1201 0.0
24 1995 12 1 1401 0.0
25 1995 12 1 1601 0.0
```

```
**Descriptive Data Title: 2 Lines of 40 characters each
  Special level box Data File
  skeleton trial data file
  HOUT  KSUBF   UNITS   JPRNT   JIMIOS  JIDEP  HINIT[Option and Init. Data]
  0     0       1       1       0       0
  IQP   IPR     JPLO    JPROF   JCHAN   JBAL   JEVAP  JSALT  jlin
  1     5       0       0       0       1      2      0      0
   DS   NDX     DXL     DRAT    SURF    YU     YB     HOUT   DWDX[Geometry Data]
  20.   20      1.0     1.5     0.02    1.0    1.0    0.1    0.
   CPC  PHI     SWmx    SWmn    ALAM    CF     QINI(M2/h) TINC [Soil Hydrology]
  .10   0.45    0.9     0.5     .322    .45    0.0001     20.0
  NCK   PU      PL      QWT     FISOT   CFHD   CSKL
  1     .04     0.0000  -0.0000 2.0     1.     1.0
   DTR  ALPHA   TEMP    RFMAN   CVF     ITERMX [Other Control Parameters]
  0.5   0.6     15.0    0.25    .005    50
  Nodes N1,N2 at which GW depths are followed in output:
  4   21
  NGP [no. locations at which profile slope and depth are given (below):]
  26
  XHL(I),YHL(I),SHL(I), on NGP cards following:
  0.    1.0    .02
  20.   1.0    .02
   CIN  CPRK   CGW     CRO     INITIAL Concentrations, IF JSALT > 0
  100.  100.   1000.   0.0
  TEV   ZROOT  PSIC    PSIM    [Profile Evap. control parameters]
  2.    0.4    .333    15.
 12 monthly mean pan Evap. values:
 1.33  1.36  2.01  2.86  4.77  4.71  4.74  4.23  3.27  1.83  1.03  1.0
 The Following are Only read for catchment simulation Option:
  JPL
   2
 ACAT   CHRF   CHSL   C1   C2
 10000  .02    .02   2    0.
 NGC (No. of channel slope data pairs following)
 2
 XCH(i)    SCH(i)   [NGC pairs of distance and channel slope:]
 0    .02
 100    .02
```

SCX.PAR
RAIND.PRC

BEGIN STORM 78

~~N = 21~~

TIME (min)	DEPTH (mm)
0,0	
24,4.983169	
48,8.16067	
72,9.162613	
96,9.488737	
120,9.542884	
144,9.729751	
168,10.12459	
192,10.95495	
216,11.51721	
240,12.30036	
264,14.30461	
288,17.34725	
312,21.77482	
336,26.21272	
360,27.65591	
384,29.23723	
408,30.47288	
432,30.86674	
456,31.25084	
480,31.71335	

END

CNWRA Solitario Canyon	Hillslope Model 2-D	DAW 7/24/97	2/

DAW

563

7/25

8/25/97 - The Smith-Hebbert Model will not work with the sequencing of runoff from Solitario Canyon hillslopes, which leads to the runoff - runon phenomenon. The alternate approach is to model this complex hillslope with the KINEROS model.

No. 5505 Engineer's Computation Pad ALVIN

CNWRA Solitario Canyon	Complex Hillslope with 2 Layers	DAW 8/8/97	1/

First, create file HILL67.PAR - This is the cascade 67, 68, 69 with Dec. parameters DIR HILL2D

Second create file HILD672L.PAR, putting in a layered system, with 67 depth = 150 mm, 68 depth = 200 mm and 69 depth = one layer.

Third: Compare runoff volumes and hydrographs for the PDEC78 storm for the complex hillslope and the average hillslope. Also for the PAUG4 storm

Dur = 500 min

	2LAYER R.O.	SIMPLE R.O	AVG. PLANE	R.O. vol m^3 2L	SIMPLE
PDEC78	0.029 mm.	0.0295	0.05		

	Peak Rate m^3/sec.		Time			
67	.0035	.00195	336	336	5.97/.1	3.75/.33
68	.0084	.0060	336	336	16.0/.33	10.3/1.22
69	.0028	.0031	339	339	7.0/1.72	7.2/2.6

PAUG4 DUR = 700

	2 Layer Peak	Vol.	Stor.	error	SIMPLE (1 Layer) Peak	Vol.	Stor	error
67	.551	437	.071	.78	.55	4429	.397	.77%
68	1.496	1222	.179	.12	1.496	1237	1.53	.10
69	1.763	1825	1.707	.16	1.76	1832	5.15	.15
Runoff(mm)	7.49/.008				7.52/.03			

Note RUN with PAUG4!

These runs with KINEROS2. Tentative conclusion: No significant difference in hillslope runoff with these 2 storms.

TRY PAUG60 - 2nd in Rank DUR = 700

	2 Layer Peak	Vol	stor	error	SIMPLE (1 LAYER) Peak	Vol.	Stor.	error
67	.295	493.	.095	.66	.295	496	.471	.96
68	.787	1370	.165	.14	.787	1380	1.80	.12
69	.996	2082	2.12	.26	.996	2085	5.94	.25
	8.55 mm/.01				8.56 mm/.034			

.PAR FILE is HJ_0~~20~~67.PAR HJ_067.PAR

Ave. plane R.O. = 8.8 mm. (This is consistent because this cascade is much longer)

Tentative conclusion: For high intensity storms 2 Layers doesn't make a difference in runoff

DAW

For this Cascade

Plane	Area (ha)	Contribution
67	5.47	22% ≤ 150 mm
68	15.32	63% ≤ 200 mm
69	24.35	

Initiation of saturation overland flow

If the initial water content is set at the seasonal average, the occurrence of saturation overland flow depends upon the depth of soil over bedrock as well as the depth of rainfall. For example, the porosity is set at 0.34 for all plane elements. In Nov-Dec., the initial soil water content (rel. sat.) is 0.235 and in Jan-Apr. it is 0.325. The depth of rain required to saturate the soil is then a function of the depth of soil, d.

$$P_{crit} = d(.34)(1-SI)$$ should be $\theta_{max} - SI$

d (mm)	P_{crit} (mm) Nov.-Dec	Jan - Apr.
100	26	22.9
150	39	34.4
200	52	45.8

If we refer to the spreadsheet printout AVG50_2.PDW in the 2nd 50 year simulation section we see that there are relatively few winter storms that would trigger saturation overland flow. If the soil depth is 100 mm, the following storms would cause saturation overland flow if there were no Hortonian runoff.

PNOV62(26.5), PNOV35(31), PFEB45(26.4), PFEB22(26.4), PDEC78(31.7) PJAN72(24.6), PNOV52(27.2), PFEB20(23.4), ~~PNOV51~~ PJAN95(24.6) PFEB12(23.9)

It should be noted that there will be considerable variability in soil depth and some variability in porosity and SI. The effect of this spatial variability should be similar to the effects of spatially-varied saturated hydraulic conductivity. The effects

DAW

566

of ignoring the spatial variability of these factors should lead to the same results, i.e. if the true mean depth of soil is 100 mm, but is spatially variable, the model will tend to underestimate runoff from small storms and overestimate runoff from large storms.

When the runoff is generated at the upper portion of hillslopes and then runs on to lower elements, there is considerable uncertainty regarding infiltration into lower elements, when neither saturated overland flow nor Hortonian runoff is occurring without the added water from the upper element.

Other factors that may be important with shallow soils over bedrock are:

1) Reduction of infiltration rates due to air pressurization
2) Spatial variation of SI due to unsaturated flow between rainfall events.

<u>Procedure</u>:

For the storms that <u>could</u> cause saturated overland flow, runs will be made with the two layer system and the one layer system for the cascade 67, 68, 69. Seasonal values of SI and FMIN will be used. A comparisons of the peak rates volumes, storage and errors for each plane for each event for 2 layer and 1-layer cases are shown in the following tables.

No. 5505 Engineer's Computation Pad ALVIN

CNWRA COMPLEX HILLSLOPE DAW 8/26/97

SOLITARIO CANYON 2 LAYERS C:\CONSULT\SWRI\HILL2D

DAW

567

STORM	PDEC78	(31.7mm)			DUR =	600 min		
		2-LAYER	HILD67	2L.PAR		NO LAYER	HILL067.	PAR
PLANE	Qpm³/s	V m³	STORE	ERROR	Qp m³/s	V m³	STORE	ERROR
67	0.106	412	0.68	0.08	0.0019	3.9	.183	.02
68	0.05	274	2.5	0.03	0.006	11.0	.696	.01
69	0.006	48.6	8.6	-0.08	0.003	8.4	2.22	-.01
RO mm=	0.2mm				0.034mm			
STORM	[illegible]62	(36.2mm)			DUR =	400 min		
		2-LAYER	HILN67	2L.PAR		NO LAYER	HILLN67	PAR
PLANE	Qpm³/s	V m³	STORE	ERROR	Qp m³/s	V m³	STORE	ERROR
67	0.331	386.3	.035	.08	0.331	387.9	.146	.08
68	0.868	1062.	0	.05	0.868	1069.	.211	.07
69	1.16	1625	.465	.04	1.16	1628	1.74	.05
RO mm=	6.67				6.69 mm			
STORM	PNOV35	(31.0)			DUR =	500 min		
		2-LAYER	HILN67	2L.PAR		NO LAYER	HILLN67	PAR
PLANE	Qpm³/s	V m³	STORE	ERROR	Qp m³/s	V m³	STORE	ERROR
67	.209	596	.39	.06	.048	101.4	.279	.02
68	.278	662	.19	.01	.118	279	1.07	.01
69	.325	734	1.64	.02	.169	403	3.52	.01
RO mm=	3.01				1.66 mm			
	1.61				0.67			
STORM	PNOV52	(27.2)			DUR =	600		
		2-LAYER	HILN67	2L.PAR		NO LAYER	HILLN67	PAR
PLANE	Qpm³/s	V m³	STORE	ERROR	Qp m³/s	V m³	STORE	ERROR
67	.044	214	.714	.01	.0008	2.59	.293	.01
68	.010	34.4	.420	-.07	.002	6.96	.856	0
69	.001	9.93	3.41	-.10	.002	4.85	1.602	0
RO mm=	.041				.020 mm			
	.05				.031			
STORM	PJAN72	(24.6)			DUR =	600		
		2-LAYER	HJAG67	2L.PAR		NO LAYER	HILJAG	7.PAR
PLANE	Qpm³/s	V m³	STORE	ERROR	Qp m³/s	V m³	STORE	ERROR
67	.082	200	.192	.02	.001	3.73	.121	0
68	.016	28.6	.042	-.07	.004	10.1	.492	-.03
69	.003	15.9	.802	-.06	.003	9.79	1.64	-.04
RO mm=	.065				.040mm			
	.071				[illegible]			
STORM					DUR			
		2-LAYER				NO LAYER		
PLANE	Qpm³/s	V m³	STORE	ERROR	Qp m³/s	V m³	STORE	ERROR
67								
68								

DAW

STORM	PJAN95	(24.6)			DUR =	600		
		2-LAYER	HJA672	L.PAR		NO LAYER	HILJA6	7.PAR
PLANE	Qpm³/s	V m³	STORE	ERROR	Qp m³/s	V m³	STORE	ERROR
67					.0001	.368	0	0
68					.0002	.901	0	.02
69					.0001	.745	.135	.03
RO mm=					.003 mm			
STORM	PFEB45	(26.4)			DUR =	400		
		2-LAYER	HJA672	L.PAR		NO LAYER	HILJA6	7.PAR
PLANE	Qpm³/s	V m³	STORE	ERROR	Qp m³/s	V m³	STORE	ERROR
67	.311	377	.188	-.10	.054	53.7	.207	.35
68	.375	348	.043	.10	.178	164	.797	0
69	.244	303	.908	.08	.111	187	2.69	.01
RO mm=	1.25				.769 mm			
	0.54				0.29			
STORM	PFEB22	(26.4)			DUR =	400		
		2-LAYER	HJA672	L.PAR		NO LAYER	HILJA6	7.PAR
PLANE	Qpm³/s	V m³	STORE	ERROR	Qp m³/s	V m³	STORE	ERROR
67	.106	432	.367	-1.11	.047	40.5	.100	-1.17
68	.143	375	1.26	-.02	.143	109	.094	.03
69	.087	153	442	-.3	.087	112	.836	-.01
RO mm=	.630				.460 mm			
	0.34				0.28			
STORM	PFEB20	(23.4)			DUR =	600		
		2-LAYER	HJA672	L.PAR		NO LAYER	HILJA6	7.PAR
PLANE	Qpm³/s	V m³	STORE	ERROR	Qp m³/s	V m³	STORE	ERROR
67	0.024	154	0.44	0.15	0.0001	.453	.066	.03
68	0.0048	9.11	0.16	-0.15	0.00045	1.75	.030	.01
69	0.0072	10.95	1.19	-0.15	0.0007	1.63	0.15	.00
RO mm=	0.045				0.007			
	.055				0.055			
STORM	PFEB17	(23.9)			DUR =	600		
		2-LAYER	HJA672	L.PAR		NO LAYER	HILJA6	7.PAR
PLANE	Qpm³/s	V m³	STORE	ERROR	Qp m³/s	V m³	STORE	ERROR
67	0.0395	149	.676	.47	Ny	.036	0	0
68	0.0034	7.33	.385	-.09	"	.003	0	.05
69	0.0019	7.86	2.32	-.09	"	.002	0	.06
RO mm=	0.032				0.0006			
	0.04				0.09 %			
STORM					DUR			
		2-LAYER				NO LAYER		
PLANE	Qpm³/s	V m³	STORE	ERROR	Qp m³/s	V m³	STORE	ERROR
67								
68								

7.77 mm
1.44
9.74
÷ 50
20 cm/yr

Σ w. PJAN95 = 12.30
Σ w. est. PJAN95 = 12.06
Σ w. PFEB95 = 12.30
Σ w. est. PFEB95 = 12.06

If all additional runoff became channel in all basins it would be increased by 0.146 mm/yr

DAW

STORM					DUR			
		2-LAYER				NO LAYER		
PLANE	Qpm^3/s	V m^3	STORE	ERROR	Qp m^3/s	V m^3	STORE	ERROR
67								
68								
69								
RO mm=								
STORM					DUR			
		2-LAYER				NO LAYER		
PLANE	Qpm^3/s	V m^3	STORE	ERROR	Qp m^3/s	V m^3	STORE	ERROR
67								
68								
69								
RO mm=								
STORM					DUR			
		2-LAYER				NO LAYER		
PLANE	Qpm^3/s	V m^3	STORE	ERROR	Qp m^3/s	V m^3	STORE	ERROR
67								
68								
69								
RO mm=								
STORM					DUR			
		2-LAYER				NO LAYER		
PLANE	Qpm^3/s	V m^3	STORE	ERROR	Qp m^3/s	V m^3	STORE	ERROR
67								
68								
69								
RO mm=								
STORM					DUR			
		2-LAYER				NO LAYER		
PLANE	Qpm^3/s	V m^3	STORE	ERROR	Qp m^3/s	V m^3	STORE	ERROR
67								
68								
69								
RO mm=								
STORM					DUR			
		2-LAYER				NO LAYER		
PLANE	Qpm^3/s	V m^3	STORE	ERROR	Qp m^3/s	V m^3	STORE	ERROR
67								
68								

```
**
HILLSLOPE IN SOLITARIO CANYON
ELEMENTS 67, 68 & 69
KHOUT  KSUBF    UNITS    JPRNT   JIMIOS  JIDEP  HINIT[Option and Init. Data]
-       0        1        1       1       0       0
IQP    IPR     JPLO    JPROF  JCHAN   JBAL   JEVAP  JSALT  jlin
1       5       0       0       0       1       0       0       0
 DS    NDX      DXL      DRAT   SURF    YU     YB    HOUT  DWDX[Geometry Data]
439    40      10.975    1.0   0.3082  0.15  10.    0.01   0.
 CPC    PHI     SWmx     SWmn   ALAM   CF  QINI(M2/h) TINC [Soil Hydrology]
.10     0.34    0.95    0.07   .322   .45    0.000001    20.0
NCK    PU       PL       QGW      FISOT    CFHD    CSKL
1      .02    0.0003    -0.0003    1.0      1.      1.0
 DTR    ALPHA    TEMP      RFMAN    CVF   ITERMX  [Other Control Parameters]
0.1      0.8      15.0      0.151   .005    50
Nodes N1,N2 at which GW depths are followed in output:
 4   39
NGP [no. locations at which profile slope and depth are given (below):]
 6
XHL(I),YHL(I),SHL(I), on NGP cards following:
0.      0.15    .08
89.     0.20    .08
91.     0.20    0.56
250     0.50    0.56
254     0.50    0.20
439     10.0    0.20
CIN   CPRK     CGW     CRO   INITIAL Concentrations, IF JSALT > 0
 100.    100.     1000.    0.0
 TEV   ZROOT   PSIC    PSIM  [Profile Evap. control parameters]
 ?.    0.4    .333     15.
12 monthly mean pan Evap. values:
1.33  1.36  2.01  2.86  4.77  4.71  4.74  4.23  3.27  1.83  1.03  1.0
The Following are Only read for catchment simulation Option:
NOPL
  2
ACAT    CHRF    CHSL    C1    C2
10000     .02    .02    2    0.
NGC (No. of channel slope data pairs following)
2
XCH(i)     SCH(i)   [NGC pairs of distance and channel slope:]
0    .02
100    .02
```

DAW

BEGIN STORM 78: 31.7 MM RAIN IN 8 HRS
START DEC ? 00 HRS (SIMULATED)

1	1995	12	1	001	0.0
2	1995	12	1	025	5.0
	1995	12	1	049	3.2
.	1995	12	1	113	1.0
5	1995	12	1	137	0.12
6	1995	12	1	201	0.06
7	1995	12	1	225	0.18
8	1995	12	1	249	0.40
9	1995	12	1	313	0.83
10	1995	12	1	0337	0.57
11	1995	12	1	0401	0.79
12	1995	12	1	0425	2.00
13	1995	12	1	0449	3.04
14	1995	12	1	0513	4.43
15	1995	12	1	0537	4.44
16	1995	12	1	0601	1.44
17	1995	12	1	0625	1.58
18	1995	12	1	0649	1.24
19	1995	12	1	0713	0.39
20	1995	12	1	0737	0.39
21	1995	12	1	0801	0.46
22	1995	12	1	0901	0.0
23	1995	12	1	1201	0.0
24	1995	12	1	1401	0.0
25	1995	12	1	1601	0.0

3

THIRD 50 YEAR SIMULATION

DMS

THIRD 50 YEAR SIMULATION

This notebook provides supplementary information to the watershed work described in Scientific Notebook No. 294.

English
Peery
10/29/99

Temp worksheet? — DAW

C:\consult\swri\THIRD50\S3RD50HI.PDW

FILE	API7	PRECIP	DUR	RUND	AVRO	SOLRO	CHANF
A:\1NOV10A.PRE	0.00	27.94	106	600	7.96	1.03	0.79
A:\1NOV10B.PRE	27.94	25.65	480		0.02		
A:\1NOV21A.PRE	0.00	16.26	480		0.01		
A:\2APR8A.PRE	10.16	19.05	100		0.30		
A:\2NOV20A.PRE	7.62	21.59	480		0.02		
A:\2NOV21A.PRE	29.21	16.26	480		0.00		
A:\4NOV21A.PRE	0.51	22.10	278		0.09		
A:\5OCT24A.PRE	3.30	13.46	480		0.00		
A:\5JAN3A.PRE	4.57	13.46	470		0.00		
A:\6APR26A.PRE	1.27	16.00	480		0.00		
A:\6NOV2A.PRE	2.79	17.53	480		0.14		
A:\6NOV4A.PRE	26.42	13.97	471		0.00		
A:\6FEB6A.PRE	15.49	18.54	408		0.00		
A:\7OCT15A.PRE	6.35	28.96	480		0.12		
A:\7FEB6A.PRE	11.43	19.30	360		0.03		
A:\8JUL18A.PRE	12.95	19.81	324		0.17		
A:\8AUG27A.PRE	0.00	14.22	42	600	1.76		— 37% Comple 13 (Chann. -log: SING error
A:\8OCT24A.PRE	0.51	25.91	396		0.04		
A:\8JAN16A.PRE	7.62	13.21	229		0.01		
A:\9NOV10A.PRE	9.91	13.97	230		0.03		
A:\10OCT28A.PRE	5.59	26.16	167	700	0.50	0.00	0.02
A:\10OCT30A.PRE	37.59	13.21	480		0.00		
A:\11JUL12A.PRE	0.00	14.22	292		0.01		
A:\11AUG4A.PRE	11.18	16.76	104	600	0.84	0.01	0.13
A:\11SEP5A.PRE	9.14	37.34	175	600	6.03		— 57% Comple 234 (Chan.
A:\11NOV7A.PRE	7.11	14.22	480		0.00		
A:\11JAN31A.PRE	0.76	16.26	480		0.00		
A:\12OCT16A.PRE	2.79	26.92	480		0.08		
A:\12OCT18A.PRE	31.24	13.46	342		0.00		
A:\12NOV23A.PRE	11.43	15.49	102	500	1.14	—	→ 48% Comple 258 (Channel) -log: Sing error
A:\12DEC4A.PRE	8.89	14.73	480		0.00		
A:\12JAN31A.PRE	6.35	14.22	77		0.48		
A:\13DEC30A.PRE	26.42	12.70	236		0.04		
A:\13FEB17A.PRE	7.87	25.15	480		0.00		
A:\14OCT11A.PRE	3.56	26.67	218	700	2.14	0.00	0.10
A:\14OCT12A.PRE	30.23	13.97	480		0.00		
A:\14NOV27A.PRE	0.00	15.75	480		0.05		
A:\14DEC25A.PRE	1.27	14.99	480		0.00		
A:\14FEB9A.PRE	11.94	23.62	480		0.10		
A:\15AUG19A.PRE	8.38	14.99	8	400	5.40	1.34	0.93
A:\15JAN21A.PRE	11.43	18.80	480		0.00		

DAW 4/22+23/98

with plan 7 rorams DAW 2/11/98

C:\consult\swri\THIRD50\S3RD50HI.PDW

FILE	API7	PRECIP	DUR	RUND	AVRO	SOLRO	CHANF
A:\16NOV12A.PRE	2.03	14.48	480		0.01		
A:\16JAN21A.PRE	19.30	13.97	273		0.00		
A:\18MAY14A.PRE	9.65	14.48	31	600	0.62	0.14	0.30
A:\19AUG21A.PRE	2.54	18.80	112	600	0.90	0.00	0.06
A:\19NOV27A.PRE	0.00	14.73	252		0.03		
A:\19FEB15A.PRE	0.00	13.21	106		0.06		
A:\20AUG3A.PRE	0.00	21.08	102	600	0.72	0.00	0.02
A:\20NOV3A.PRE	26.42	16.00	480		0.01		
A:\20JAN29A.PRE	16.51	13.21	275		0.00		
A:\21AUG18A.PRE	4.57	14.48	224		0.05		
A:\21DEC16A.PRE	0.00	21.08	480		0.01		
A:\21DEC30A.PRE	8.89	20.07	277		0.01		
A:\21JAN29A.PRE	0.00	12.95	480		0.00		
A:\22FEB17A.PRE	1.27	24.38	480		0.00		
A:\23SEP12A.PRE	0.00	13.46	24	600	2.25	0.05	0.21
A:\24AUG21A.PRE	0.00	21.08	79	600	3.32	0.12	0.28
A:\24JAN2A.PRE	0.00	17.78	480		0.02		
A:\25OCT3A.PRE	11.43	14.99	480		0.00		
A:\27SEP12A.PRE	5.59	12.70	103		0.04		
A:\27FEB19A.PRE	10.67	22.35	296		0.10		
A:\28MAR23A.PRE	1.02	14.73	117		0.01		
A:\28JUL24A.PRE	5.59	20.57	111	700	3.36		
A:\28NOV11A.PRE	0.76	13.72	141		0.03		
A:\29APR2A.PRE	0.00	16.51	480		0.03		
A:\29OCT29A.PRE	0.00	15.49	480		0.00		
A:\29NOV10A.PRE	0.00	42.67	480	700	1.14	0.00	0.05
A:\29NOV15A.PRE	69.85	20.83	480		0.00		
A:\29NOV16A.PRE	90.68	20.57	480		0.00		
A:\30SEP12A.PRE	0.00	14.99	258		0.01		
A:\30OCT12A.PRE	0.00	16.26	79	600	0.62		
A:\30JAN30A.PRE	20.57	13.97	480		0.00		
A:\31MAY12A.PRE	0.00	16.00	80		0.28		
A:\31AUG14A.PRE	6.60	16.00	37	600	4.18		
A:\31JAN20A.PRE	8.64	16.51	70		0.40		
A:\31FEB10A.PRE	35.31	19.30	167		0.05		
A:\31FEB17A.PRE	28.70	15.75	460		0.00		
A:\31FEB18A.PRE	25.65	16.51	480		0.00		
A:\31FEB19A.PRE	38.61	15.49	373		0.00		
A:\32JAN29A.PRE	13.46	12.95	67		0.05		
A:\33MAR20A.PRE	2.79	14.22	356		0.00		
A:\33MAY23A.PRE	0.00	14.73	22	600	1.03	0.28	0.40

DAW 575

C:\consult\swri\THIRD50\S3RD50HI.PDW

FILE	API7	PRECIP	DUR	RUND	AVRO	SOLRO	CHANF
A:\33OCT14A.PRE	0.00	31.24	234	700	2.07 2.41		
A:\33FEB9A.PRE	0.76	18.54	185		0.21 0.20		
A:\34APR26A.PRE	2.29	23.37	480		0.00 0.00		
A:\34SEP6A.PRE	1.78	13.21	83		0.22 0.11		
A:\34NOV6A.PRE	26.16	14.73	480		0.00 0.00		
A:\34JAN11A.PRE	13.21	16.26	480		0.00 0.00		
A:\35FEB25A.PRE	1.78	12.95	148		0.01 0.01		
36 A:\37AUG1A.PRE	10.67	17.02	74	600	0.94 0.84		
A:\37JAN21A.PRE	23.11	15.75	480		0.00 0.01		
A:\38SEP21A.PRE	5.84	32.77	400	700	0.65 0.61		
A:\38NOV1A.PRE	15.49	13.21	480		0.00 0.00		
A:\38DEC9A.PRE	0.00	22.86	480		0.00 0.02		
A:\38FEB12A.PRE	1.78	13.97	480		0.00 0.00		
A:\39JAN31A.PRE	0.00	12.95	480		0.00 0.00		
A:\40JAN18A.PRE	3.56	15.24	286		0.00 0.00		
41 A:\42SEP13A.PRE	0.00	19.56	78	600	2.62 2.24		
A:\42OCT28A.PRE	14.73	14.73	480		0.00 0.01		
A:\43JAN29A.PRE	2.54	26.67	480		0.11 0.06		
44 A:\43FEB16A.PRE	0.00	16.76	111		0.21 0.21		
A:\45SEP27A.PRE	0.51	14.48	126		0.17 0.14		
A:\45JAN29A.PRE	0.00	15.49	480		0.00 0.00		
A:\46OCT12A.PRE	6.60	13.21	304		0.02 0.02		
A:\46FEB6A.PRE	0.00	12.95	99		0.03 0.03		
A:\47JUL16A.PRE	8.13	14.99	24	600	3.48 3.01		
A:\47OCT26A.PRE	0.00	21.34	345		0.04 0.03		
A:\47FEB20A.PRE	15.75	20.57	426		0.04 0.04		
49 A:\49MAR1A.PRE	6.86	18.54	480		0.00 0.00		
A:\49NOV24A.PRE	21.08	22.35	480		0.05 0.05		
A:\50OCT20A.PRE	28.45	18.54	409		0.05 0.03		
A:\50OCT30A.PRE	0.00	12.95	480		0.00 0.00		
A:\50FEB21A.PRE	16.76	25.91	480		0.00 0.00		

AV73RD50.PDW
2 postal

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Daw

Frequency of showers > 0.5" by months

			R.C. events ≥ 0.1 mm G=80		G=50	≥ 0.75 mm
Jan	18	11	2	111	3	11 2
Feb	18	111	3	111	3	0
Mar	3		0		0	0
Apr	4	1	1	1	1	1 1
May	3	111	3	111	3	111 3
June	0		0		0	0
July	4	111	3	111	3	11 2
Aug	9	111 111	8	111 111	8	111 111 8
Sept	8	111 1	6	111 1	6	1111 4
Oct	18	111	5	111	5	1111 4
Nov	22	111	4	111	5	111 3
Dec.	6		0			
Total	113		35		37	27

No. of R.C. events ≥ 0.10 mm per yr.

	G=80	G=50	
0		111 111 111 111 11	22
1		111 111 111 111 11	22
2		111	3
3		111	3
4			

22
6
9
37

113
-27
86

No. 5505 Engineer's Computation Pad ALVIN

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A:\THIRD50.API

FILE	API7	PRECIP	DUR	RUND	AVRO	SOLRO	CHANF
A:\1NOV10A.PRE	0.00	27.94	106			5.84	1.73
A:\1NOV10B.PRE	27.94	25.65	480				
A:\1NOV21A.PRE	0.00	16.26	480				
A:\2APR8A.PRE	10.16	19.05	100				
A:\2NOV20A.PRE	7.62	21.59	480				
A:\2NOV21A.PRE	29.21	16.26	480		0		
A:\4NOV21A.PRE	0.51	22.10	278				
A:\5OCT24A.PRE	3.30	13.46	480		0.00	0.00	0.000
A:\5JAN3A.PRE	4.57	13.46	470				
A:\6APR26A.PRE	1.27	16.00	480				
A:\6NOV2A.PRE	2.79	17.53	480				
A:\6NOV4A.PRE	26.42	13.97	471		0		
A:\6FEB6A.PRE	15.49	18.54	408				
A:\7OCT15A.PRE	6.35	28.96	480				
A:\7FEB6A.PRE	11.43	19.30	360				
A:\8JUL18A.PRE	12.95	19.81	324				
A:\8AUG27A.PRE	0.00	14.22	42			0.83	0.65
A:\8OCT24A.PRE	0.51	25.91	396				
A:\8JAN16A.PRE	7.62	13.21	229				
A:\9NOV10A.PRE	9.91	13.97	230				
A:\10OCT28A.PRE	5.59	26.16	167			0.12	0.30
A:\10OCT30A.PRE	37.59	13.21	480				
A:\11JUL12A.PRE	0.00	14.22	292				
A:\11AUG4A.PRE	11.18	16.76	104	600		0.30	0.36
A:\11SEP5A.PRE	9.14	37.34	175			4.14	1.52
A:\11NOV7A.PRE	7.11	14.22	480		0		
A:\11JAN31A.PRE	0.76	16.26	480				
A:\12OCT16A.PRE	2.79	26.92	480				
A:\12OCT18A.PRE	31.24	13.46	342				
A:\12NOV23A.PRE	11.43	15.49	102		1.14	0.48	0.46
A:\12DEC4A.PRE	8.89	14.73	480				
A:\12JAN31A.PRE	6.35	14.22	77				
A:\13DEC30A.PRE	26.42	12.70	236				
A:\13FEB17A.PRE	7.87	25.15	480				
A:\14OCT11A.PRE	3.56	26.67	218	700		1.11	0.75
A:\14OCT12A.PRE	30.23	13.97	480				
A:\14NOV27A.PRE	0.00	15.75	480				
A:\14DEC25A.PRE	1.27	14.99	480		0		
A:\14FEB9A.PRE	11.94	23.62	480				
A:\15AUG19A.PRE	8.38	14.99	8				1.45
A:\15JAN21A.PRE	11.43	18.80	480		0		

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DAW

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A:\THIRD50.API

FILE	API7	PRECIP	DUR	RUND	AVRO	SOLRO	CHANF
A:\16NOV12A.PRE	2.03	14.48	480		0.01		
A:\16JAN21A.PRE	19.30	13.97	273		0.0		
A:\18MAY14A.PRE	9.65	14.48	31	600	0.62	0.22	0.35
A:\19AUG21A.PRE	2.54	18.80	112	600		0.32	0.43
A:\19NOV27A.PRE	0.00	14.73	252				
A:\19FEB15A.PRE	0.00	13.21	106				
A:\20AUG3A.PRE	0.00	21.08	102	600			0.35
A:\20NOV3A.PRE	26.42	16.00	480				
A:\20JAN29A.PRE	16.51	13.21	275		0		
A:\21AUG18A.PRE	4.57	14.48	224				
A:\21DEC16A.PRE	0.00	21.08	480		0.01		
A:\21DEC30A.PRE	8.89	20.07	277		0.01		
A:\21JAN29A.PRE	0.00	12.95	480		0		
A:\22FEB17A.PRE	1.27	24.38	480		0		
A:\23SEP12A.PRE	0.00	13.46	24	600		1.16	0.76
A:\24AUG21A.PRE	0.00	21.08	79	600		1.97	0.99
A:\24JAN2A.PRE	0.00	17.78	480		0.02		
A:\25OCT3A.PRE	11.43	14.99	480				
A:\27SEP12A.PRE	5.59	12.70	103				
A:\27FEB19A.PRE	10.67	22.35	296				
A:\28MAR23A.PRE	1.02	14.73	117				
A:\28JUL24A.PRE	5.59	20.57	111	700		1.74	1.03
A:\28NOV11A.PRE	0.76	13.72	141		0.03		
A:\29APR2A.PRE	0.00	16.51	480				
A:\29OCT29A.PRE	0.00	15.49	480				
A:\29NOV10A.PRE	0.00	42.67	480	700	1.14	0.39	0.54
A:\29NOV15A.PRE	69.85	20.83	480		0		
A:\29NOV16A.PRE	90.68	20.57	480		0		
A:\30SEP12A.PRE	0.00	14.99	259				
A:\30OCT12A.PRE	0.00	16.26	79	600		0.19	0.33
A:\30JAN30A.PRE	20.57	13.97	480		0		
A:\31MAY12A.PRE	0.00	16.00	80		0.28		
A:\31AUG14A.PRE	6.60	16.00	37	600		2.51	1.19
A:\31JAN20A.PRE	8.64	16.51	70		0.40		
A:\31FEB10A.PRE	35.31	19.30	167				
A:\31FEB17A.PRE	28.70	15.75	460		0		
A:\31FEB18A.PRE	25.65	16.51	480		0		
A:\31FEB19A.PRE	38.61	15.49	373		0		
A:\32JAN29A.PRE	13.46	12.95	67		0.05		
A:\33MAR20A.PRE	2.79	14.22	356		0		
A:\33MAY23A.PRE	0.00	14.73	22	600	1.03	0.40	1.46

5 peaks AMT

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A:\THIRD50.API

FILE	API7	PRECIP	DUR	RUND	AVRO	SOLRO	CHANF
A:\33OCT14A.PRE	0.00	31.24	234	700	2.41	1.35	0.86
A:\33FEB9A.PRE	0.76	18.54	185		[illegible]		
A:\34APR26A.PRE	2.29	23.37	480		[illegible]		
A:\34SEP6A.PRE	1.78	13.21	83		[illegible]		
A:\34NOV6A.PRE	26.16	14.73	480		[illegible]		
A:\34JAN11A.PRE	13.21	16.26	480		0		
A:\35FEB25A.PRE	1.78	12.95	148		[illegible]		
A:\37AUG1A.PRE	10.67	17.02	74	600	[illegible]	0.31	0.37
A:\37JAN21A.PRE	23.11	15.75	480		[illegible]		
A:\38SEP21A.PRE	5.84	32.77	400	700	[illegible]	0.18	0.31
A:\38NOV1A.PRE	15.49	13.21	480		[illegible]		
A:\38DEC9A.PRE	0.00	22.86	480		0.02		
A:\38FEB12A.PRE	1.78	13.97	480		[illegible]		
A:\39JAN31A.PRE	0.00	12.95	480		0		
A:\40JAN18A.PRE	3.56	15.24	286		0		
A:\42SEP13A.PRE	0.00	19.56	78	600	[illegible]	1.18	0.80
A:\42OCT28A.PRE	14.73	14.73	480		[illegible]		
A:\43JAN29A.PRE	2.54	26.67	480		0.06		
A:\43FEB16A.PRE	0.00	16.76	111		[illegible]		
A:\45SEP27A.PRE	0.51	14.48	126		[illegible]		
A:\45JAN29A.PRE	0.00	15.49	480		0		
A:\46OCT12A.PRE	6.60	13.21	304		[illegible]		
A:\46FEB6A.PRE	0.00	12.95	99		[illegible]		
A:\47JUL16A.PRE	8.13	14.99	24	600	[illegible]	1.65	0.97
A:\47OCT26A.PRE	0.00	21.34	345		[illegible]		
A:\47FEB20A.PRE	15.75	20.57	426		[illegible]		
A:\49MAR1A.PRE	6.86	18.54	480		0		
A:\49NOV24A.PRE	21.08	22.35	480		[illegible]		
A:\50OCT20A.PRE	28.45	18.54	409				
A:\50OCT30A.PRE	0.00	12.95	480		0		
A:\50FEB21A.PRE	16.76	25.91	480		[illegible]		

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Peak Discharge versus Area — DAW

Peak rate (mm/hr) for storms

Area (Km^2)	~~11NOV11A~~ 24AUG71A	31AUG14A	11SEP5A	15AUG19A	1NOV10A	23SEP12A
1.23			7.53	16.2	17.6	4.16
2.18			7.14	15.5	16.8	3.95
3.55			6.58	13.27	15.1	3.40
7.70			5.39	8.43		1.96
8.91			4.81	6.98	10.15	1.58
10.72			4.29	5.88	8.99	1.29
Runoff			4.14	5.40	5.84	1.16

T

AREA (Km^2)	101 PAUG4	50.5 ~~PAUG60~~ JUL87	33.7 1NOV10A	25.2 15AUG19A	20.2 * PNOV02 PNOV89	16.8	14.4 PAUG60
1.23	29.8	27.4	17.6	16.2	14.33 *	14.0	12.1
2.18	28.3	25.8	16.8	15.5	15.50 *	13.4	11.5
3.55	25.2	22.8	15.1	13.4	12.2	12.15	10.8
8.91	16.9	13.1	10.15	6.98	8.9	8.20	8.3
10.72	14.7	10.9	8.99	5.88	7.8	7.2	7.6
Runoff	8.13	5.87	5.84	5.40			6.01

1 – 101
2 – 50.5
3 – 33.7
4 – 25.2
5 – 20.2
6 – 16.8
7 – 14.4
8 – 12.6
9 – 11.2
10 – 10.1

Squires & Young Flood Peaks are in Book 2, Literature Review

Other peak flow rates from 3rd 50 sheet dated 2/8/97

Create a new spreadsheet file QVA100. with PSIPLOT

QVSA100.PDW sheet in THIRD50\ — [illegible] (Dr. [illegible])
QVSA100.PGW PLOT

No. 5505 Engineer's Computation Pad
ALVIN

DAW

```
==========================================================
            Power Fitting Report

            Data File Name: A:\GRAPHICS\S3RD50CF.PDW

==========================================================

  Model Equation(s):
    CHANF=A*(AVRO^B)


  Initial Parameters:
                                A=       0.44997540
                                B=       0.67481653
  Save Options:
                        Save Data


  Number of Function Calls:                 3

  Parameters After Fitting:
                                A=       0.45694474
                                B=       0.66089008

                           SumSqr:     0.020864497
                           StdDev:    0.0065657036
  Covariance Matrix:

                         cvm[1,1]:     0.059998556
                         cvm[2,1]:    -0.079253433
                         cvm[2,2]:      0.13281761

  Goodness of Fit Statistics ...

                         __ C O D:      0.99532933
                         __ Corrl:      0.99768142
                         __ M S C:      5.19978651

  Parameter Statistics...


  Parameter: A= 0.45694474

                           StdDev:    0.0075433284
              Coeff. of Variance:       1.65081853

  __95 % Confidence Interval

    __ Uninvariant ...
                               LOW:      0.44130083
                              HIGH:      0.47258864
    __ Supporting Plane ...
                               LOW:      0.43714912
                              HIGH:      0.47674035
```

Daw 2/9/98

FROM A:\GRAPHICS\S3RD50CF.PDW

Parameter: B= 0.66089008

StdDev:	0.011223297
Coeff. of Variance:	1.69820925

__95 % Confidence Interval

__ Uninvariant ...

LOW:	0.63761439
HIGH:	0.68416578

__ Supporting Plane ...

LOW:	0.63143729
HIGH:	0.69034288

DAW

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----Created by D. A. Woolhiser with ProStat
----Mon Feb 09 15:15:50 1998

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Daw 2/9/98

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Descriptive Statistics Report

Data File Name: A:\GRAPHICS\S3RD50CF.PDW

DAW

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COLUMN NAME:	F
Number of rows:	113
Number of valid points:	113
Number of missing points:	0
Number of negative values:	0
Number of positive values:	74
Number of zero values:	39
Minimum value:	0
Maximum value:	1.80023685
Inter range value:	1.80023685
Median:	0.045024162
Sum of row value:	20.70825676
Sum of absolute value:	20.70825676
Arithmetric mean:	0.18325891
Geometric mean:	0
Quadratic mean:	0.38662031
Harmonic mean:	0
Absolute mean:	0.18325891
Sum of squares:	16.89070524
Variance:	0.11692618
Standard deviation:	0.34194471
Absolute deviation:	0.22976388
Standard error:	0.032167452

F — calculated Channel Infiltration

÷50 = 0.71 mm/yr.

95 percent confidence interval:
[0.11952323, 0.24699459]

99 percent confidence interval:
[0.098966052, 0.26755177]

Coefficient of variance:	186.59104277
Skewness:	2.63939030
Coefficient of skewness:	0.41425416
Kurtosis:	7.18936337
Coefficient of Kurtosis:	10.18936337

Percentiles:

10 percentile:	0
25 percentile:	0
50 percentile:	0.039732231
75 percentile:	0.15373276
90 percentile:	0.64744411

Quartiles:

First quartile:	0
Second quartile:	0.039732231

DJW 7/9/98

From A:\GRAPHICS\S3RD50CF.PDW

DAW

Third quartile:	0.15373276
Inter quartile:	0.15373276

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----Created by D. A. Woolhiser with ProStat
----Mon Feb 09 15:25:03 1998

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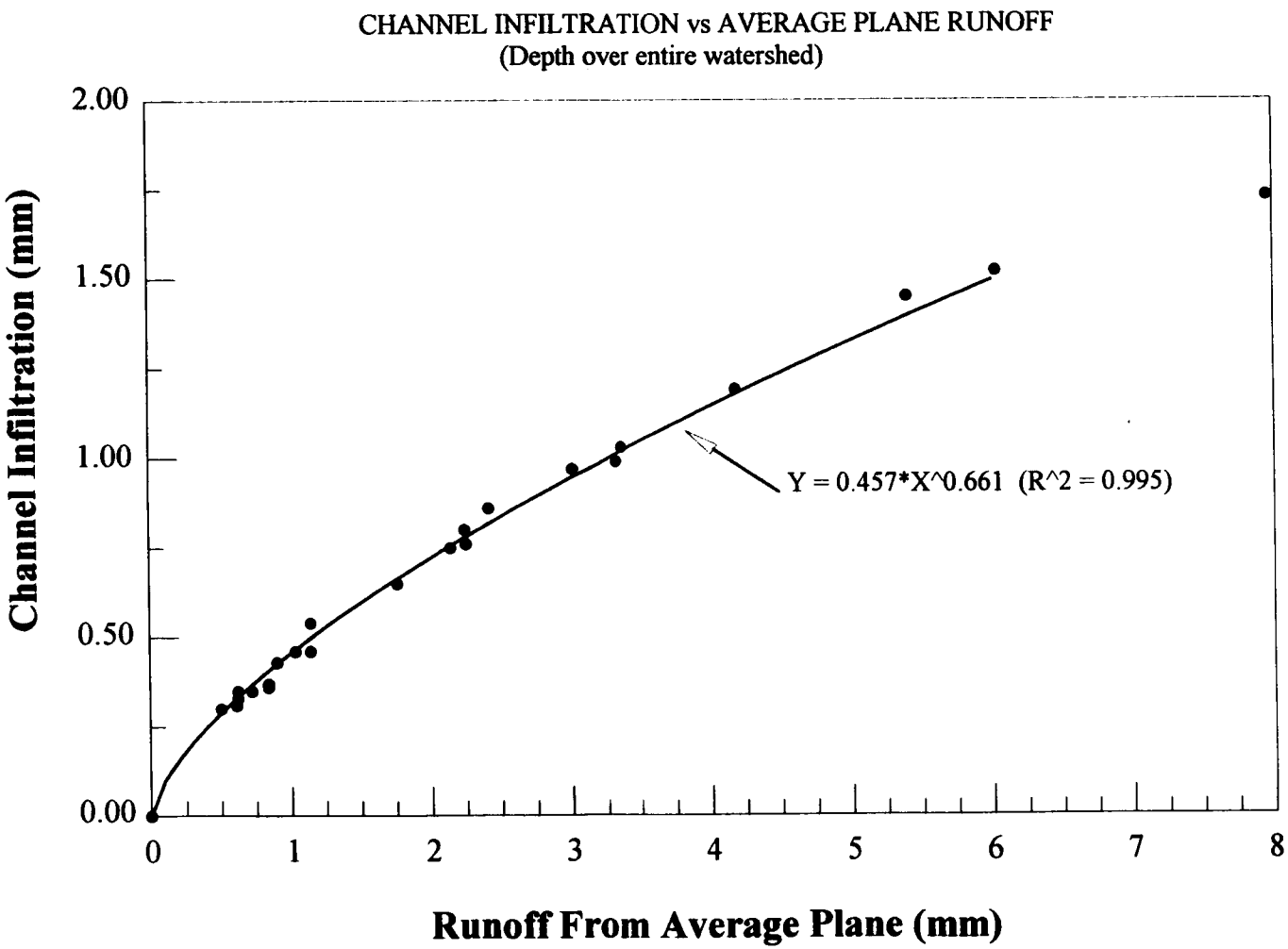
DAW 2/9/98


CHANNEL INFILTRATION vs AVERAGE PLANE RUNOFF
(Depth over entire watershed)
Channel Infiltration (mm)
2.00
1.50
1.00
0.50
0.00
0
1
2
3
4
5
6
7
8
Runoff From Average Plane (mm)
Y = 0.457*X^0.661 (R^2 = 0.995)

585

A:\GRAPHICS\S3rd50stat.PDW

FILE	API7	PRECIP	DUR	RUND	AVRO	SOLRO	CHANF
A:\1NOV10A.PRE	0.00	27.94	106	600	7.96	5.84	1.730
A:\1NOV10B.PRE	27.94	25.65	480		0.02		
A:\1NOV21A.PRE	0.00	16.26	480		0.01		
A:\2APR8A.PRE	10.16	19.05	100		0.30		
A:\2NOV20A.PRE	7.62	21.59	480		0.02		
A:\2NOV21A.PRE	29.21	16.26	480		0.00		
A:\4NOV21A.PRE	0.51	22.10	278		0.09		
A:\5OCT24A.PRE	3.30	13.46	480		0.00	0.00	0.000
A:\5JAN3A.PRE	4.57	13.46	470		0.00		
A:\6APR26A.PRE	1.27	16.00	480		0.00		
A:\6NOV2A.PRE	2.79	17.53	480		0.14		
A:\6NOV4A.PRE	26.42	13.97	471		0.00		
A:\6FEB6A.PRE	15.49	18.54	408		0.00		
A:\7OCT15A.PRE	6.35	28.96	480		0.12		
A:\7FEB6A.PRE	11.43	19.30	360		0.03		
A:\8JUL18A.PRE	12.95	19.81	324		0.17		
A:\8AUG27A.PRE	0.00	14.22	42	600	1.76	0.83	0.650
A:\8OCT24A.PRE	0.51	25.91	396		0.04		
A:\8JAN16A.PRE	7.62	13.21	229		0.01		
A:\9NOV10A.PRE	9.91	13.97	230		0.03		
A:\10OCT28A.PRE	5.59	26.16	167	700	0.50	0.12	0.300
A:\10OCT30A.PRE	37.59	13.21	480		0.00		
A:\11JUL12A.PRE	0.00	14.22	292		0.01		
A:\11AUG4A.PRE	11.18	16.76	104	600	0.84	0.30	0.360
A:\11SEP5A.PRE	9.14	37.34	175	600	6.03	4.14	1.520
A:\11NOV7A.PRE	7.11	14.22	480		0.00		
A:\11JAN31A.PRE	0.76	16.26	480		0.00		
A:\12OCT16A.PRE	2.79	26.92	480		0.08		
A:\12OCT18A.PRE	31.24	13.46	342		0.00		
A:\12NOV23A.PRE	11.43	15.49	102	500	1.14	0.48	0.460
A:\12DEC4A.PRE	8.89	14.73	480		0.00		
A:\12JAN31A.PRE	6.35	14.22	77		0.48		
A:\13DEC30A.PRE	26.42	12.70	236		0.04		
A:\13FEB17A.PRE	7.87	25.15	480		0.00		
A:\14OCT11A.PRE	3.56	26.67	218	700	2.14	1.11	0.750
A:\14OCT12A.PRE	30.23	13.97	480		0.00		
A:\14NOV27A.PRE	0.00	15.75	480		0.05		
A:\14DEC25A.PRE	1.27	14.99	480		0.00		
A:\14FEB9A.PRE	11.94	23.62	480		0.10		
A:\15AUG19A.PRE	8.38	14.99	8	400	5.40	3.58	1.450
A:\15JAN21A.PRE	11.43	18.80	480		0.00		

A:\GRAPHICS\S3rd50stat.PDW

FILE	API7	PRECIP	DUR	RUND	AVRO	SOLRO	CHANF
A:\16NOV12A.PRE	2.03	14.48	480		0.01		
A:\16JAN21A.PRE	19.30	13.97	273		0.00		
A:\18MAY14A.PRE	9.65	14.48	31	600	0.62	0.22	0.350
A:\19AUG21A.PRE	2.54	18.80	112	600	0.90	0.32	0.430
A:\19NOV27A.PRE	0.00	14.73	252		0.03		
A:\19FEB15A.PRE	0.00	13.21	106		0.06		
A:\20AUG3A.PRE	0.00	21.08	102	600	0.72	0.26	0.350
A:\20NOV3A.PRE	26.42	16.00	480		0.01		
A:\20JAN29A.PRE	16.51	13.21	275		0.00		
A:\21AUG18A.PRE	4.57	14.48	224		0.05		
A:\21DEC16A.PRE	0.00	21.08	480		0.01		
A:\21DEC30A.PRE	8.89	20.07	277		0.01		
A:\21JAN29A.PRE	0.00	12.95	480		0.00		
A:\22FEB17A.PRE	1.27	24.38	480		0.00		
A:\23SEP12A.PRE	0.00	13.46	24	600	2.25	1.16	0.760
A:\24AUG21A.PRE	0.00	21.08	79	600	3.32	1.97	0.990
A:\24JAN2A.PRE	0.00	17.78	480		0.02		
A:\25OCT3A.PRE	11.43	14.99	480		0.00		
A:\27SEP12A.PRE	5.59	12.70	103		0.04		
A:\27FEB19A.PRE	10.67	22.35	296		0.10		
A:\28MAR23A.PRE	1.02	14.73	117		0.01		
A:\28JUL24A.PRE	5.59	20.57	111	700	3.36	1.94	1.030
A:\28NOV11A.PRE	0.76	13.72	141		0.03		
A:\29APR2A.PRE	0.00	16.51	480		0.03		
A:\29OCT29A.PRE	0.00	15.49	480		0.00		
A:\29NOV10A.PRE	0.00	42.67	480	700	1.14	0.39	0.540
A:\29NOV15A.PRE	69.85	20.83	480		0.00		
A:\29NOV16A.PRE	90.68	20.57	480		0.00		
A:\30SEP12A.PRE	0.00	14.99	259		0.01		
A:\30OCT12A.PRE	0.00	16.26	79	600	0.62	0.19	0.330
A:\30JAN30A.PRE	20.57	13.97	480		0.00		
A:\31MAY12A.PRE	0.00	16.00	80		0.28		
A:\31AUG14A.PRE	6.60	16.00	37	600	4.18	2.51	1.190
A:\31JAN20A.PRE	8.64	16.51	70		0.40		
A:\31FEB10A.PRE	35.31	19.30	167		0.05		
A:\31FEB17A.PRE	28.70	15.75	460		0.00		
A:\31FEB18A.PRE	25.65	16.51	480		0.00		
A:\31FEB19A.PRE	38.61	15.49	373		0.00		
A:\32JAN29A.PRE	13.46	12.95	67		0.05		
A:\33MAR20A.PRE	2.79	14.22	356		0.00		
A:\33MAY23A.PRE	0.00	14.73	22	600	1.03	0.40	0.460

DAW

A:\GRAPHICS\S3rd50stat.PDW

FILE	API7	PRECIP	DUR	RUND	AVRO	SOLRO	CHANF
A:\33OCT14A.PRE	0.00	31.24	234	700	2.41	1.35	0.860
A:\33FEB9A.PRE	0.76	18.54	185		0.20		
A:\34APR26A.PRE	2.29	23.37	480		0.00		
A:\34SEP6A.PRE	1.78	13.21	83		0.11		
A:\34NOV6A.PRE	26.16	14.73	480		0.00		
A:\34JAN11A.PRE	13.21	16.26	480		0.00		
A:\35FEB25A.PRE	1.78	12.95	148		0.01		
A:\37AUG1A.PRE	10.67	17.02	74	600	0.84	0.31	0.370
A:\37JAN21A.PRE	23.11	15.75	480		0.01		
A:\38SEP21A.PRE	5.84	32.77	400	700	0.61	0.18	0.310
A:\38NOV1A.PRE	15.49	13.21	480		0.00		
A:\38DEC9A.PRE	0.00	22.86	480		0.02		
A:\38FEB12A.PRE	1.78	13.97	480		0.00		
A:\39JAN31A.PRE	0.00	12.95	480		0.00		
A:\40JAN18A.PRE	3.56	15.24	286		0.00		
A:\42SEP13A.PRE	0.00	19.56	78	600	2.24	1.18	0.800
A:\42OCT28A.PRE	14.73	14.73	480		0.01		
A:\43JAN29A.PRE	2.54	26.67	480		0.06		
A:\43FEB16A.PRE	0.00	16.76	111		0.21		
A:\45SEP27A.PRE	0.51	14.48	126		0.14		
A:\45JAN29A.PRE	0.00	15.49	480		0.00		
A:\46OCT12A.PRE	6.60	13.21	304		0.02		
A:\46FEB6A.PRE	0.00	12.95	99		0.03		
A:\47JUL16A.PRE	8.13	14.99	24	600	3.01	1.65	0.970
A:\47OCT26A.PRE	0.00	21.34	345		0.03		
A:\47FEB20A.PRE	15.75	20.57	426		0.04		
A:\49MAR1A.PRE	6.86	18.54	480		0.00		
A:\49NOV24A.PRE	21.08	22.35	480		0.05		
A:\50OCT20A.PRE	28.45	18.54	409		0.03		
A:\50OCT30A.PRE	0.00	12.95	480		0.00		
A:\50FEB21A.PRE	16.76	25.91	480		0.00		

A:\GRAPHICS\S3RD50STAT.PDW

Σ — sorted plane runoff

589

F	SORTF	SORTAV	ROSORT	Σ
1.8002	1.8002	7.96	7.96	
0.0344	1.4984	6.03	6.03	13.99
0.0218	1.3930	5.40	5.40	19.39
0.2062	1.1761	4.18	4.18	23.57
0.0344	1.0181	3.36	3.36	26.99
0.0000	1.0100	3.32	3.32	30.25
0.0931	0.9467	3.01	3.01	33.26
0.0000	0.8173	2.41	2.41	35.67
0.0000	0.7810	2.25	2.25	37.92
0.0000	0.7787	2.24	2.24	40.16
0.1246	0.7556	2.14	2.14	42.30 — 11 gave 75%
0.0000	0.6640	1.76	1.76	44.06
0.0000	0.4983	1.14	1.14	
0.1126	0.4983	1.14	1.14	
0.0450	0.4660	1.03	1.03	
0.1417	0.4263	0.90	0.90	
0.6640	0.4073	0.84	0.84	
0.0545	0.4073	0.84	0.84	
0.0218	0.3678	0.72	0.72	
0.0450	0.3332	0.62	0.62	
0.2890	0.3332	0.62	0.62	
0.0000	0.3296	0.61	0.61	
0.0218	0.2890	0.50	0.50	
0.4073	0.2814	0.48	0.48	
1.4984	0.2494	0.40	0.40	
0.0000	0.2062	0.30	0.30	
0.0000	0.1970	0.28	0.28	
0.0861	0.1629	0.21	0.21	
0.0000	0.1577	0.20	0.20	
0.4983	0.1417	0.17	0.17	
0.0000	0.1246	0.14	0.14	
0.2814	0.1246	0.14	0.14	
0.0545	0.1126	0.12	0.12	
0.0000	0.1063	0.11	0.11	
0.7556	0.0998	0.10	0.10	
0.0000	0.0998	0.10	0.10	
0.0631	0.0931	0.09	0.09	
0.0000	0.0861	0.08	0.08	
0.0998	0.0712	0.06	0.06	
1.3930	0.0712	0.06	0.06	
0.0000	0.0631	0.05	0.05	

A:\GRAPHICS\S3RD50STAT.PDW

DAW

F	SORTF	SORTAV	ROSORT
0.0218	0.0631	0.05	0.05
0.0000	0.0631	0.05	0.05
0.3332	0.0631	0.05	0.05
0.4263	0.0631	0.05	0.05
0.0450	0.0545	0.04	0.04
0.0712	0.0545	0.04	0.04
0.3678	0.0545	0.04	0.04
0.0218	0.0545	0.04	0.04
0.0000	0.0450	0.03	0.03
0.0631	0.0450	0.03	0.03
0.0218	0.0450	0.03	0.03
0.0218	0.0450	0.03	0.03
0.0000	0.0450	0.03	0.03
0.0000	0.0450	0.03	0.03
0.7810	0.0450	0.03	0.03
1.0100	0.0450	0.03	0.03
0.0344	0.0344	0.02	0.02
0.0000	0.0344	0.02	0.02
0.0545	0.0344	0.02	0.02
0.0998	0.0344	0.02	0.02
0.0218	0.0344	0.02	0.02
1.0181	0.0218	0.01	0.01
0.0450	0.0218	0.01	0.01
0.0450	0.0218	0.01	0.01
0.0000	0.0218	0.01	0.01
0.4983	0.0218	0.01	0.01
0.0000	0.0218	0.01	0.01
0.0000	0.0218	0.01	0.01
0.0218	0.0218	0.01	0.01
0.3332	0.0218	0.01	0.01
0.0000	0.0218	0.01	0.01
0.1970	0.0218	0.01	0.01
1.1761	0.0218	0.01	0.01
0.2494	0.0000	0.00	0.00
0.0631	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00
0.0631	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00
0.4660	0.0000	0.00	0.00

DAW

A:\GRAPHICS\S3RD50STAT.PDW

F	SORTF	SORTAV	ROSORT
0.8173	0.0000	0.00	0.00
0.1577	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00
0.1063	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00
0.0218	0.0000	0.00	0.00
0.4073	0.0000	0.00	0.00
0.0218	0.0000	0.00	0.00
0.3296	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00
0.0344	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00
0.7787	0.0000	0.00	0.00
0.0218	0.0000	0.00	0.00
0.0712	0.0000	0.00	0.00
0.1629	0.0000	0.00	0.00
0.1246	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00
0.0344	0.0000	0.00	0.00
0.0450	0.0000	0.00	0.00
0.9467	0.0000	0.00	0.00
0.0450	0.0000	0.00	0.00
0.0545	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00
0.0631	0.0000	0.00	0.00
0.0450	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00
0.0000	0.0000	0.00	0.00

$\Sigma = 56.93$ 42.7 = 75%

74 positive values

mean of r.v. event = 0.7693 mm

SS = 209.89

DW 8/13/98

3rd [illegible]

A:\GRAPHICS\S3rd50stat.PDW

DAW

Column9	Column10	ROAV	FCHAN	F	SORTF	
5.84	1.730	7.96	1.730	1.8002	1.8002	
4.14	1.520	6.03	1.520	0.0344	1.4984	3.2980
3.58	1.450	5.40	1.450	0.0218	1.3930	4.69
2.51	1.190	4.18	1.190	0.2062	1.1761	5.57
1.94	1.030	3.36	1.030	0.0344	1.0181	6.3858
1.97	0.990	3.32	0.990	0.0000	1.0100	7.3958
1.65	0.970	3.01	0.970	0.0931	0.9467	8.84
1.35	0.860	2.41	0.860	0.0000	0.8173	9.66
1.18	0.800	2.24	0.800	0.0000	0.7810	10.44
1.16	0.760	2.25	0.760	0.0000	0.7787	11.22
1.11	0.750	2.14	0.750	0.1246	0.7556	11.97
0.83	0.650	1.76	0.650	0.0000	0.6640	12.64
0.39	0.540	1.14	0.540	0.0000	0.4983	13.14
0.40	0.460	1.03	0.460	0.1126	0.4983	13.64
0.48	0.460	1.14	0.460	0.0450	0.4660	14.10
0.32	0.430	0.90	0.430	0.1417	0.4263	14.53
0.31	0.370	0.84	0.370	0.6640	0.4073	14.94 — 18 storms
0.30	0.360	0.84	0.360	0.0545	0.4073	15.34 — 75%
0.26	0.350	0.72	0.350	0.0218	0.3678	15.71
0.22	0.350	0.62	0.350	0.0450	0.3332	16.04
0.19	0.330	0.62	0.330	0.2890	0.3332	16.38
0.18	0.310	0.61	0.310	0.0000	0.3296	16.71
0.12	0.300	0.50	0.300	0.0218	0.2890	16.99
0.00	0.000	0.00	0.000	0.4073	0.2814	17.28
				1.4984	0.2494	17.53
				0.0000	0.2062	17.73
				0.0000	0.1970	17.92
				0.0861	0.1629	18.09
				0.0000	0.1577	18.25
				0.4983	0.1417	18.39
				0.0000	0.1246	18.52
				0.2814	0.1246	18.64 — 90%
				0.0545	0.1126	18.75
				0.0000	0.1063	18.86
				0.7556	0.0998	18.96
				0.0000	0.0998	19.06
				0.0631	0.0931	19.15
				0.0000	0.0861	
				0.0998	0.0712	
				1.3930	0.0712	
				0.0000	0.0631	

18 events caused 75% of total infiltration
32 " 90% " "

A:\GRAPHICS\S3rd50stat.PDW

Column9	Column10	ROAV	FCHAN	F	SORTF
				0.0218	0.0631
				0.0000	0.0631
				0.3332	0.0631
				0.4263	0.0631
				0.0450	0.0545
				0.0712	0.0545
				0.3678	0.0545
				0.0218	0.0545
				0.0000	0.0450
				0.0631	0.0450
				0.0218	0.0450
				0.0218	0.0450
				0.0000	0.0450
				0.0000	0.0450
				0.7810	0.0450
				1.0100	0.0450
				0.0344	0.0344
				0.0000	0.0344
				0.0545	0.0344
				0.0998	0.0344
				0.0218	0.0344
				1.0181	0.0218
				0.0450	0.0218
				0.0450	0.0218
				0.0000	0.0218
				0.4983	0.0218
				0.0000	0.0218
				0.0000	0.0218
				0.0218	0.0218
				0.3332	0.0218
				0.0000	0.0218
				0.1970	0.0218
				1.1761	0.0218
				0.2494	0.0000
				0.0631	0.0000
				0.0000	0.0000
				0.0000	0.0000
				0.0000	0.0000
				0.0631	0.0000
				0.0000	0.0000
				0.4660	0.0000

A:\GRAPHICS\S3rd50stat.PDW

Column9	Column10	ROAV	FCHAN	F	SORTF
				0.8173	0.0000
				0.1577	0.0000
				0.0000	0.0000
				0.1063	0.0000
				0.0000	0.0000
				0.0000	0.0000
				0.0218	0.0000
				0.4073	0.0000
				0.0218	0.0000
				0.3296	0.0000
				0.0000	0.0000
				0.0344	0.0000
				0.0000	0.0000
				0.0000	0.0000
				0.0000	0.0000
				0.7787	0.0000
				0.0218	0.0000
				0.0712	0.0000
				0.1629	0.0000
				0.1246	0.0000
				0.0000	0.0000
				0.0344	0.0000
				0.0450	0.0000
				0.9467	0.0000
				0.0450	0.0000
				0.0545	0.0000
				0.0000	0.0000
				0.0631	0.0000
				0.0450	0.0000
				0.0000	0.0000
				0.0000	0.0000

CREATE 100 YR STATISTICS

INTENSITY - DURATION - FREQUENCY OF RAINFALL

Procedure: After corrections are made, create a new file for SOL50-2.MAX and THIRD50.MAX by importing them using PROSTAT. File will be named SOL100-1.

	SOL100-1						THIRD50.						
First	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	5	10	15	20	30	60	120	5	10	15	20	30	60	120

Then order each column from max down (descending order)

Then retain only the top 50

Then cut or copy col. 8 and add it to 1

" " 9 " " 2

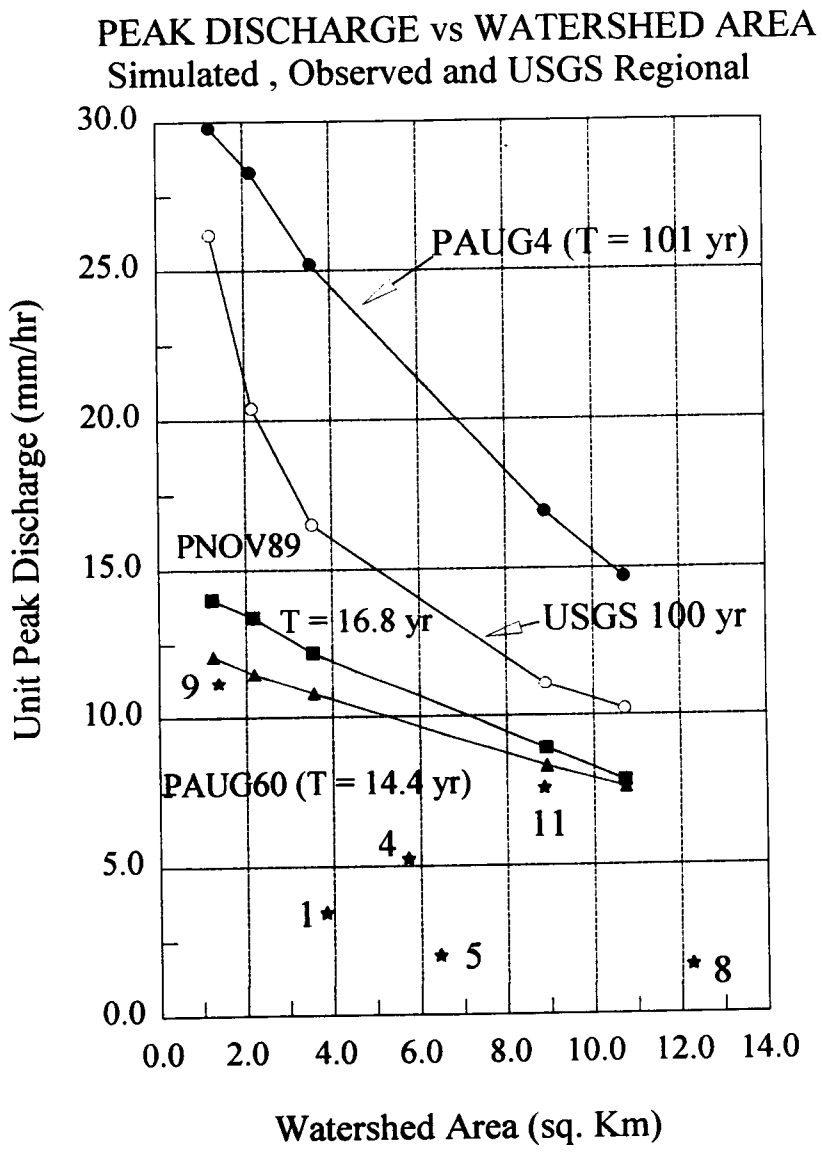
etc

Then order columns again

PEAK FLOW VS AREA

Peak rates for each of the major storms for each of the 5 watershed sizes were obtained from the .OUT files, ordered and the recurrence interval calculated. The rates were plotted versus area for the 101 yr, the 16.8 yr and the 14.4 yr events. The USGS (Squires and Young) regional 100 yr curve was also plotted as were the peak rates from the maximum stage gages. Simulated peak rates are 18% higher than the 100 yr USGS curve at $A = 1.23\ km^2$ and 38% high at $10.72\ km^2$. The curves for PNOV89 ($T = 16.8$) and PAUG60 ($T = 14.4$) are slightly above the maxima for 9 and 11 from the 19 yr. record.

9 = Stonewall Flat Tributary near Goldfield, NV
11 = San Antonio Wash nr. Tonopah, NV.


PEAK DISCHARGE vs WATERSHED AREA
Simulated , Observed and USGS Regional
Unit Peak Discharge (mm/hr)
Watershed Area (sq. Km)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
PAUG4 (T = 101 yr)
PNOV89
T = 16.8 yr
USGS 100 yr
PAUG60 (T = 14.4 yr)
9
11
4
1
5
8

Of the maximum stage locations shown in the Figure 9 and 11 are ~~in northern Nevada~~ Esmeralda Co north of Solitario Canyon, 4 + 5 are tributaries of the Amargosa River south of Mercury, NV. Nye Co. DTW

1 is a tributary of Penoyer Valley, Lincoln Co. North of the Test Site and 8 is a tributary of Palmetto wash ~~in N. Nevada~~ north of Vulcan (Esmeralda Co)

It appears that the peak runoff rates are somewhat high (Simulated) Because peaks and volumes are closely related and channel infiltration and volumes are also closely related, we can assume that these estimates of mean annual channel infiltration (0.41 mm/yr for the 3rd 50 yrs) are also high.

For the 100 yr period, the mean channel infiltration

$$= \frac{0.69 + 0.41}{2} = 0.55 \text{ mm/yr}$$

.69
.41
1.10

ALVIN No. 5505 Engineer's Computation Pad

ALVIN No. 5505 Engineer's Computation Pad

Lisa, I want you to make runs for the Solitario Canyon watershed with high saturated conductivity. The runoff volume and channel infiltration can be entered in Cols 7 and 8 (SOLRO + CHANF) in the attached 3 page form. Only run those cases where there is an entry in the RUND (run duration) column. ie 18MAY14A.PRE, 19AUG21A.PRE, 20AUG3A.PRE etc. The RUND value is the duration of the run in minutes. There will be 23 runs and some will no doubt have zero runoff.

PROCEDURE.

1. Turn on computer
2. when Windows 95 comes up, click on START
   The click on Programs
   and MSDOS Prompt.

   You will then see: C:\WINDOWS>

   Enter CD$_{sp}$..

   see C:\>

   Then enter THIRD

   Get C:\CONSULT\SWRI\THIRD50

   You will work in this directory

3. Put the 3½ disk labeled CNWRA 3rd 50yr Simulation in drive A. This disk contains the rainfall files with names shown in Col. 1 of the tabulation sheet
4. Edit KIN.FIL and run each storm.

Note the parameter files to use are: DAW

SJ_OCHI.PAR for storms in period July–Oct

SM_JCHI.PAR " " " " May + June

SOLNCHI.PAR for storms in November

The output files will be of the form:

18MAY14A.KHI

from col 1 — to distinguish them from .OUT files

I have prepared KIN.FIL for 18MAY14A

The program is KINERO2B

I have run this case and entered

It will be most convenient to run 33MAY23A next

before changing parameter files.

It is possible that some runs will not be completed as you will get an error message. Make a note of these – show which channel was involved and the % completion of that channel.

When you have finished the runs enter EXIT

That will bring you back to Windows 95

Then click on START

and SHUTDOWN

You may not be able to finish everything in 2 hrs.

Good luck!

2/18 Lisa: after (or if) you finish the Solitario Canyon runs with the high K, you can run the AVG .PAR runs. Use the duration shown in the table, output file can be TEST.OUT (don't save it) just write the runoff amount ahead of AVRO. ~~I have the time book, so email your hours (or call)~~

– I made new AVG*HI files Ks = 20.2

No. 5505 Engineer's Computation Pad ALVIN

DAW 600

C:\consult\swri\THIRD50\S3RD50HI.PDW

FILE	API7	PRECIP	DUR	RUND	AVRO	SOLRO	CHANF
A:\1NOV10A.PRE	0.00	27.94	106	2.16 600	2.16 7.96	1.02	[illegible]
A:\1NOV10B.PRE	27.94	25.65	480		0.02		
A:\1NOV21A.PRE	0.00	16.26	480		0.01		
A:\2APR8A.PRE	10.16	19.05	100	[illegible]	0.18 0.30		
A:\2NOV20A.PRE	7.62	21.59	480		0.02		
A:\2NOV21A.PRE	29.21	16.26	480		0.00		
A:\4NOV21A.PRE	0.51	22.10	278		0.09		
A:\5OCT24A.PRE	3.30	13.46	480		0.00		
A:\5JAN3A.PRE	4.57	13.46	470		0.00		
A:\6APR26A.PRE	1.27	16.00	480		0.00		
A:\6NOV2A.PRE	2.79	17.53	480		0.01 0.14		
A:\6NOV4A.PRE	26.42	13.97	471		0.00		
A:\6FEB6A.PRE	15.49	18.54	408		0.00		
A:\7OCT15A.PRE	6.35	28.96	480		0 0.12		
A:\7FEB6A.PRE	11.43	19.30	360		0.03		
A:\8JUL18A.PRE	12.95	19.81	324		0.08 0.17		
A:\8AUG27A.PRE	0.00	14.22	42	600	0.24 1.76	0.04	0.19
A:\8OCT24A.PRE	0.51	25.91	396		0.04		
A:\8JAN16A.PRE	7.62	13.21	229		0.01		
A:\9NOV10A.PRE	9.91	13.97	230		0.03		
A:\10OCT28A.PRE	5.59	26.16	167	700	[illegible] 0.50	0.00	0.02
A:\10OCT30A.PRE	37.59	13.21	480		0.00		
A:\11JUL12A.PRE	0.00	14.22	292		0.01		
A:\11AUG4A.PRE	11.18	16.76	104	600	0.15 0.84	0.01	0.13
A:\11SEP5A.PRE	9.14	37.34	175	600	0.32 6.03	[illegible]	0.23
A:\11NOV7A.PRE	7.11	14.22	480		0.00		
A:\11JAN31A.PRE	0.76	16.26	480		0.00		
A:\12OCT16A.PRE	2.79	26.92	480		0.08		
A:\12OCT18A.PRE	31.24	13.46	342		0.00		
A:\12NOV23A.PRE	11.43	15.49	102	0.09 500	[illegible] 1.14	0	0.08
A:\12DEC4A.PRE	8.89	14.73	480		0.00		
A:\12JAN31A.PRE	6.35	14.22	77		0.29 0.48		
A:\13DEC30A.PRE	26.42	12.70	236		0.04		
A:\13FEB17A.PRE	7.87	25.15	480		0.00		
A:\14OCT11A.PRE	3.56	26.67	218	700	0.13 2.14	[illegible]	0.10
A:\14OCT12A.PRE	30.23	13.97	480		0.00		
A:\14NOV27A.PRE	0.00	15.75	480		0.05		
A:\14DEC25A.PRE	1.27	14.99	480		0.00		
A:\14FEB9A.PRE	11.94	23.62	480		0.04 0.10		
A:\15AUG19A.PRE	8.38	14.99	8	400	2.51 5.40	1.34	0.93
A:\15JAN21A.PRE	11.43	18.80	480		0.00		

✓ [illegible]

DCW 2/11/98
3/6/98

Daw 601

C:\consult\swri\THIRD50\S3RD50HI.PDW

FILE	API7	PRECIP	DUR	RUND	AVRO	SOLRO	CHANF
A:\16NOV12A.PRE	2.03	14.48	480		0.01		
A:\16JAN21A.PRE	19.30	13.97	273		0.00		
A:\18MAY14A.PRE	9.65	14.48	31	600	0.49 0.62	0.14	0.30
✓ A:\19AUG21A.PRE	2.54	18.80	112	600	0.67 0.90	0.00	0.06
A:\19NOV27A.PRE	0.00	14.73	252		0.03		
A:\19FEB15A.PRE	0.00	13.21	106		0.04 0.06		
✓ A:\20AUG3A.PRE	0.00	21.08	102	600	0.04 0.72	0.00	0.02
A:\20NOV3A.PRE	26.42	16.00	480		0.01		
A:\20JAN29A.PRE	16.51	13.21	275		0.00		
A:\21AUG18A.PRE	4.57	14.48	224		0.05		
A:\21DEC16A.PRE	0.00	21.08	480		0.01		
A:\21DEC30A.PRE	8.89	20.07	277		0.01		
A:\21JAN29A.PRE	0.00	12.95	480		0.00		
A:\22FEB17A.PRE	1.27	24.38	480		0.00		
✓ A:\23SEP12A.PRE	0.00	13.46	24	600	0.27 2.25	0.05	0.21
✓ A:\24AUG21A.PRE	0.00	21.08	79	600	0.46 3.32	0.12	0.28
A:\24JAN2A.PRE	0.00	17.78	480		0.02		
A:\25OCT3A.PRE	11.43	14.99	480		0.00		
A:\27SEP12A.PRE	5.59	12.70	103		0.04		
A:\27FEB19A.PRE	10.67	22.35	296		0.09 0.10		
A:\28MAR23A.PRE	1.02	14.73	117		0.01		
✓ A:\28JUL24A.PRE	5.59	20.57	111	700	0.51 3.36	0.15	0.30
A:\28NOV11A.PRE	0.76	13.72	141		0.03		
A:\29APR2A.PRE	0.00	16.51	480		0.03		
A:\29OCT29A.PRE	0.00	15.49	480		0.00		
✓ A:\29NOV10A.PRE	0.00	42.67	480	700	0.07 1.14	0.00	0.05
A:\29NOV15A.PRE	69.85	20.83	480		0.00		
A:\29NOV16A.PRE	90.68	20.57	480		0.00		
A:\30SEP12A.PRE	0.00	14.99	259		0.01		
✓ A:\30OCT12A.PRE	0.00	16.26	79	600	0.06 0.62	[illegible]	[illegible]
A:\30JAN30A.PRE	20.57	13.97	480		0.00		
X A:\31MAY12A.PRE	0.00	16.00	80		0.22 0.28		
✓ A:\31AUG14A.PRE	6.60	16.00	37	600	1.29 4.18	0.34	0.57
X A:\31JAN20A.PRE	8.64	16.51	70		0.17 0.40		
A:\31FEB10A.PRE	35.31	19.30	167		0.03 0.05		
A:\31FEB17A.PRE	28.70	15.75	460		0.00		
A:\31FEB18A.PRE	25.65	16.51	480		0.00		
A:\31FEB19A.PRE	38.61	15.49	373		0.00		
A:\32JAN29A.PRE	13.46	12.95	67		0.02 0.05		
A:\33MAR20A.PRE	2.79	14.22	356		0.00		
A:\33MAY23A.PRE	0.00	14.73	22	600	0.89 1.03	0.29	[illegible]

DAW 602

C:\consult\swri\THIRD50\S3RD50HI.PDW

FILE	API7	PRECIP	DUR	RUND	AVRO	SOLRO	CHANF
A:\33OCT14A.PRE	0.00	31.24	234	700	0.06 2.41		0.05
A:\33FEB9A.PRE	0.76	18.54	185		0.13 0.20		
A:\34APR26A.PRE	2.29	23.37	480		0.00		
A:\34SEP6A.PRE	1.78	13.21	83		0.01 0.11		
A:\34NOV6A.PRE	26.16	14.73	480		0.00		
A:\34JAN11A.PRE	13.21	16.26	480		0.00		
A:\35FEB25A.PRE	1.78	12.95	148		0.01		
A:\37AUG1A.PRE	10.67	17.02	74	600	0.15 0.84	[illegible]	[illegible]
A:\37JAN21A.PRE	23.11	15.75	480		0.01		
A:\38SEP21A.PRE	5.84	32.77	400	700	0.02 0.61	0	0.01
A:\38NOV1A.PRE	15.49	13.21	480		0.00		
A:\38DEC9A.PRE	0.00	22.86	480		0.02		
A:\38FEB12A.PRE	1.78	13.97	480		0.00		
A:\39JAN31A.PRE	0.00	12.95	480		0.00		
A:\40JAN18A.PRE	3.56	15.24	286		0.00		
A:\42SEP13A.PRE	0.00	19.56	78	600	0.33 2.24	[illegible]	0.21
A:\42OCT28A.PRE	14.73	14.73	480		0.01		
A:\43JAN29A.PRE	2.54	26.67	480		0.03 0.06		
A:\43FEB16A.PRE	0.00	16.76	111		0.17 0.21		
A:\45SEP27A.PRE	0.51	14.48	126		0.01 0.14		
A:\45JAN29A.PRE	0.00	15.49	480		0.00		
A:\46OCT12A.PRE	6.60	13.21	304		0.02		
A:\46FEB6A.PRE	0.00	12.95	99		0.03		
A:\47JUL16A.PRE	8.13	14.99	24	600	0.44 3.01	[illegible]	0.[illegible]
A:\47OCT26A.PRE	0.00	21.34	345		0.03		
A:\47FEB20A.PRE	15.75	20.57	426		0.04		
A:\49MAR1A.PRE	6.86	18.54	480		0.00		
A:\49NOV24A.PRE	21.08	22.35	480		0.05		
A:\50OCT20A.PRE	28.45	18.54	409		0.03		
A:\50OCT30A.PRE	0.00	12.95	480		0.00		
A:\50FEB21A.PRE	16.76	25.91	480		0.00		

5 [illegible] 3.92

CHANF [illegible] AVRO 0.71175 R^2 [illegible] DAW [illegible]

13 [illegible]

DAW

Descriptive Statistics Report

Data File Name: C:\consult\swr1\THIRD50\S3rd50h1.pdw

COLUMN NAME:	F
Number of rows:	113
Number of valid points:	38
Number of missing points:	75
Number of negative values:	0
Number of positive values:	38
Number of zero values:	0
Minimum value:	0.017827301
Maximum value:	0.91002511
Inter range value:	0.89219780
Median:	0.11657746
Sum of row value:	6.64086927
Sum of absolute value:	6.64086927
Arithmetric mean:	0.17475972
Geometric mean:	0.10500468
Quadratic mean:	0.26588528
Harmonic mean:	0.065270280
Absolute mean:	0.17475972
Sum of squares:	2.68640924
Variance:	0.041239265
Standard deviation:	0.20307453
Absolute deviation:	0.13357060
Standard error:	0.032943039

- calculated by power regression from AVGRO

$F = 0.4727\ AVGRO^{0.71175}$

$R^2 = 0.794$

$\div 50 = 0.13$ mm/yr

95 percent confidence interval:
[0.10801078, 0.24150865]

99 percent confidence interval:
[0.085305902, 0.26421353]

Coefficient of variance:	116.20213917
Skewness:	2.40527949
Coefficient of skewness:	0.047211178
Kurtosis:	6.03605965
Coefficient of Kurtosis:	9.03605965

Percentiles:

10 percentile:	0.018964308
25 percentile:	0.041178669
50 percentile:	0.11657746
75 percentile:	0.19944835
90 percentile:	0.42083908

Quartiles:

First quartile:	0.041178669
Second quartile:	0.11657746

Third quartile:	0.19944835
Inter quartile:	0.15826968

DAW
604

----Created by D. A. Woolhiser with ProStat
----Sat Mar 07 11:42:52 1998

	Area (Km^2)	101 (PAUG4)	T=16.8 1NOV10A	T 5JUL87	14.4 ~~16.8~~ (PNOV89)	25.25 ~~14.4~~ (PAUG60)	33.67 15AUG19
			Q_p (mm/hr)				
45	1.23	14.0	3.78	12.4	2.70	3.43 5	6.10
71	2.18	13.0	3.49	11.6	2.40	3.18 5	5.71
115	3.55	11.2	2.94	9.68	2.00	2.85 5	4.86
234	8.91	6.2	1.30	4.58	0.89	1.50 4	2.02
254	10.72	5.2	1.05	3.73	0.71	1.21 4	1.60
	Runoff	3.22 mm	~~5.84~~ 1.03 *	~~3.32~~ 2.74	~~0.95~~ 0.82	1.21	1.34
		(1)	(5) (6)	(2)	(7)	(4)	(3)

Check to see if PAUG4 is still the largest with K_s = 20.2 mm/hr

1NOV10A runoff = ~~5.84~~ 1.03 mm (largest for 3rd 50 yr) *

PAUG4 runoff vol = 3.22 mm

* I used the wrong summary table. The 5.84 mm total was for seasonally varied K_s.

	PMAY50
1.23	4.07 4
2.18	3.73 4
3.55	3.18 4
8.91	1.39 5
10.72	1.07 5
Runoff	

5) 20.2 (HI, PAN)

5 20.2

6 16.8

The probability that at least 1 of 6 independent stations will exceed the 100 yr storm in 15 yrs.

$$1-\left[\left(1-\frac{0.01}{1}\right)^{15}\right]^6 = 1-0.40 = 0.60$$

this that no stations ~~does not~~ exceed the 100 yr.

0.40 = prob that there will be no exceedences

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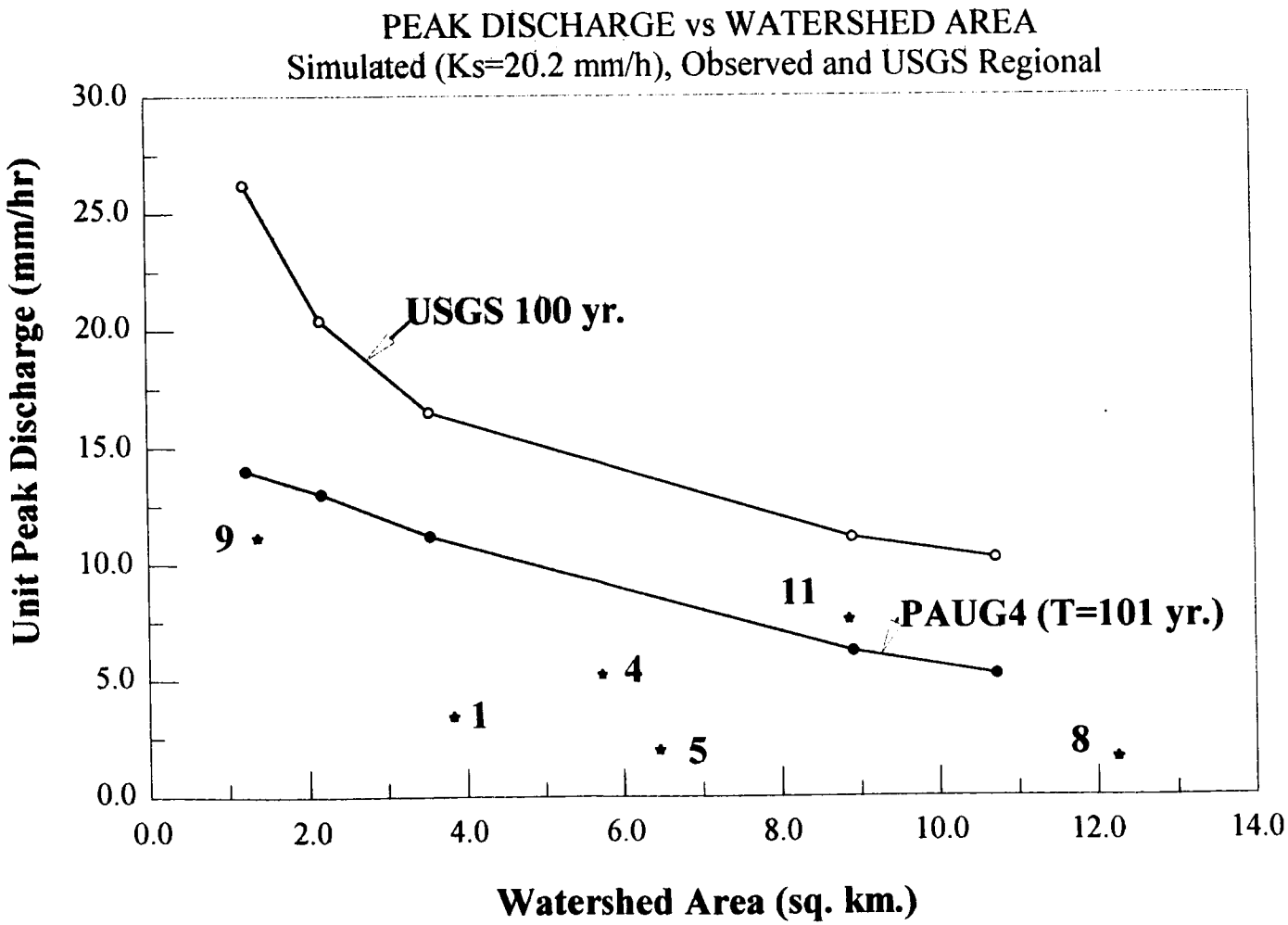
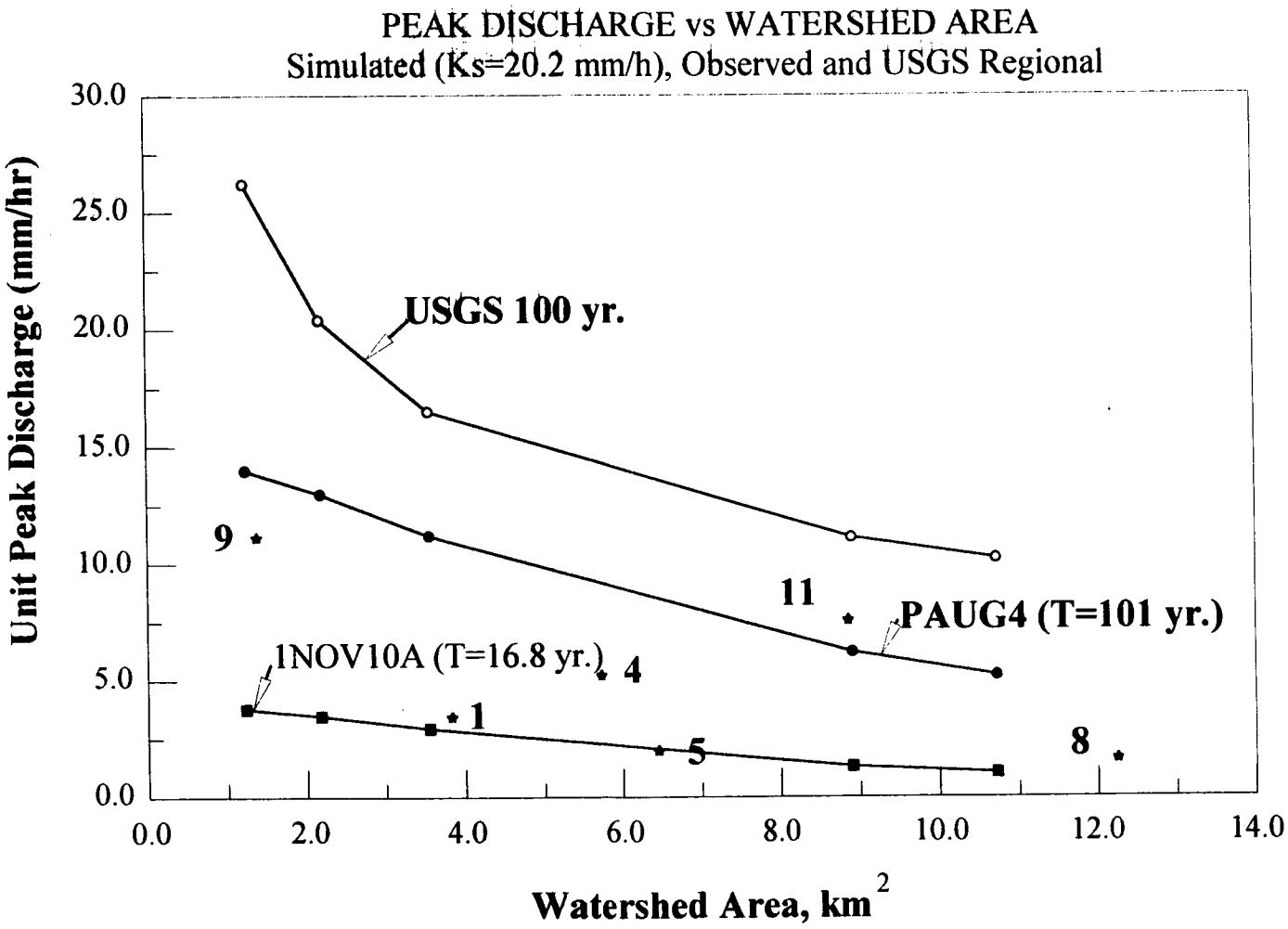
ALVIN


PEAK DISCHARGE vs WATERSHED AREA
Simulated (Ks=20.2 mm/h), Observed and USGS Regional
Unit Peak Discharge (mm/hr)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Watershed Area (sq. km.)
USGS 100 yr.
PAUG4 (T=101 yr.)
9
11
4
1
5
8

606


PEAK DISCHARGE vs WATERSHED AREA
Simulated (Ks=20.2 mm/h), Observed and USGS Regional
Unit Peak Discharge (mm/hr)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Watershed Area, km2
USGS 100 yr.
PAUG4 (T=101 yr.)
1NOV10A (T=16.8 yr.)
9
11
4
1
5
8

Dwg 607

Summary of runoff events.

DAW

No. of events on Aug plane ≥ 0.10 mm	Number of years, Seasonal K_s	Number of years High K_s
0	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ II	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ III
1	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ II	~~IIII~~ ~~IIII~~ IIII
2	~~IIII~~	II
3	I	I
4	I	

$E(N) = 14/30 = 0.48$
$T = 2.08$ yrs.

$E(N) = 0.34$
$T = 2.94$ yrs

7 Day antecedent rainfall statistics

Days with AS7 > 25.4 mm = 8 (16 times in 50 yrs)
> 30 mm 7 times
> 40 mm 2 times

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ALVIN

Summary of results. DAW

The average planes and Solitario Canyon parameter files were run for high Ks (30.2 mm/hr) using rainfall patterns for the 3rd 50 yr. Simulation.

Runs were made for the average plane and Solitario Canyon for 23 events and the following power regression was obtained

$$CHANF = 0.4727\ AVRO^{0.71175} \quad ; \quad R^2 = 0.994$$

This compares with

$$Y = 0.457X^{0.661}\begin{cases}0.637\\0.684\end{cases} \qquad A\begin{cases}0.441\\0.472\end{cases}$$

for the runs with seasonally varying Ks

40 runs were made for the average plane. The regression relation was then used to estimate channel infiltration for all of these events resulting in a total infiltration of 0.641 mm for the 50 yr period. This is an average of 0.13 mm/yr.

For the 100 yr period we have

$$\bar{F} = \frac{0.23 + 0.13}{2} = 0.18\ mm/yr$$

DAW 3/10/98

When we consider the peak rates the maxima for the 100 yr period are associated with PAUG4. However the peak rates are all considerably smaller than the 100 yr. regional USGS curve and one of the observed peak rates is greater (for Station 11). The 6th largest event (1 NOV10A) has T=16.8 yrs, but plots below all of the observed peak rates. This suggests that the calculated peaks (and volumes) are too low. Thus it appears that the seasonally varied Ks and the high Ks runs bracket values for the region.

No. 5505 Engineer's Computation Pad ALVIN

CNWRA Solitario Canyon	3rd 50 yr. Sim. Avg. Plane runs with Merc Plot 7 parameters	DAW 4/22/98	610

Objective: To run average plane with seasonally varied SAT and KS, with KS and G as estimated from analysis of Plot 7 Mercury NV. — DAW

Parameter file	SAT	KS (mm/h)	G
AV7N.PAR	0.235	11.25	50.
AV7O.PAR	0.235	22.25	50.
AV7J_A.PAR	0.325	22.25	50
AV7M_J.PAR	0.155	22.25	50.
AV7J_O.PAR	0.155	11.25	50.

Runoff values from AV7 are entered in spreadsheet AV73RD50.PDW C:\CONSULT\SWRI\THIRD50

Runoff values were calculated for each of 113 storms giving 70 values > 0 (43 zero values)
Using the same regression equation for the G=80 and seasonal values of KS + SAT get total channel infiltration of 22.28 mm or 22.28/50 = 0.45 mm/yr — chan
which compares with previous estimate of 0.41 mm/yr

No. 5505 Engineer's Computation Pad ALVIN

DAW

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Descriptive Statistics Report

Data File Name: A:\GRAPHICS\S3rd50stat.PDW

==========

COLUMN NAME:	AVRO — runoff from average plane
Number of rows:	113
Number of valid points:	113
Number of missing points:	0
Number of negative values:	0
Number of positive values:	74
Number of zero values:	39
Minimum value:	0
Maximum value:	7.96000000
Inter range value:	7.96000000
Median:	0.030000000
Sum of row value:	56.93000000
Sum of absolute value:	56.93000000 ÷ 50 = 1.1386 mm/yr.
Arithmetric mean:	0.50380531
Geometric mean:	0
Quadratic mean:	1.36288184
Harmonic mean:	0
Absolute mean:	0.50380531
Sum of squares:	209.89150000
Variance:	1.61794521
Standard deviation:	1.27198475
Absolute deviation:	0.73338554
Standard error:	0.11965826

95 percent confidence interval:
□ □ [0.26671781, 0.74089281]

99 percent confidence interval:
□ □ [0.19024810, 0.81736252]

Coefficient of variance:	252.47545597
Skewness:	3.65206858
Coefficient of skewness:	0.68831169
Kurtosis:	14.89586720
Coefficient of Kurtosis:	17.89586720

Percentiles:

10 percentile:	0
25 percentile:	0
50 percentile:	0.025000000
75 percentile:	0.19250000
90 percentile:	1.69800000

Quartiles:

First quartile:	0
Second quartile:	0.025000000

Third quartile:	0.19250000
Inter quartile:	0.19250000

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----Created by D. A. Woolhiser with ProStat
----Wed Aug 12 15:52:47 1998

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Descriptive Statistics Report

Data File Name: C:\consult\swri\THIRD50\S3rd50hi.pdw

==========

COLUMN NAME:	AVROHI
Number of rows:	113
Number of valid points:	113
Number of missing points:	0
Number of negative values:	0
Number of positive values:	39
Number of zero values:	74
Minimum value:	0
Maximum value:	2.51000000
Inter range value:	2.51000000
Median:	0
Sum of row value:	12.22000000
Sum of absolute value:	12.22000000
Arithmetic mean:	0.10814159
Geometric mean:	0
Quadratic mean:	0.36429104
Harmonic mean:	0
Absolute mean:	0.10814159
Sum of squares:	14.99600000
Variance:	0.12209384
Standard deviation:	0.34941929
Absolute deviation:	0.16281463
Standard error:	0.032870601

12.22 ÷ 50 = 0.24 mm/y

15 % = 9.165

95 percent confidence interval:
□ □ [0.043012710, 0.17327048]

99 percent confidence interval:
□ □ [0.022006176, 0.19427701]

Coefficient of variance:	323.11275970
Skewness:	5.27412171
Coefficient of skewness:	1.00000000
Kurtosis:	30.67609788
Coefficient of Kurtosis:	33.67609788

Percentiles:

10 percentile:	0
25 percentile:	0
50 percentile:	0
75 percentile:	0.040000000
90 percentile:	0.26700000

Quartiles:

First quartile:	0
Second quartile:	0

DAW

Third quartile:	0.040000000
Inter quartile:	0.040000000

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----Created by D. A. Woolhiser with ProStat
----Fri Aug 14 11:00:04 1998

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CNWRA
Solitario Canyon

Fractions of a year at month mid point

DAW

Jan	.5	0.04
Feb	1.5	0.125
Mar	2.5	0.20
Apr	3.5	0.29
May	4.5	0.375
June	5.5	0.458
July	6.5	0.54
Aug	7.5	0.625
Sept	8.5	0.71
Oct	9.5	0.79
Nov	10.5	0.875
Dec	11.5	0.96

Contact w Dani for 2D or 2 layer modeling

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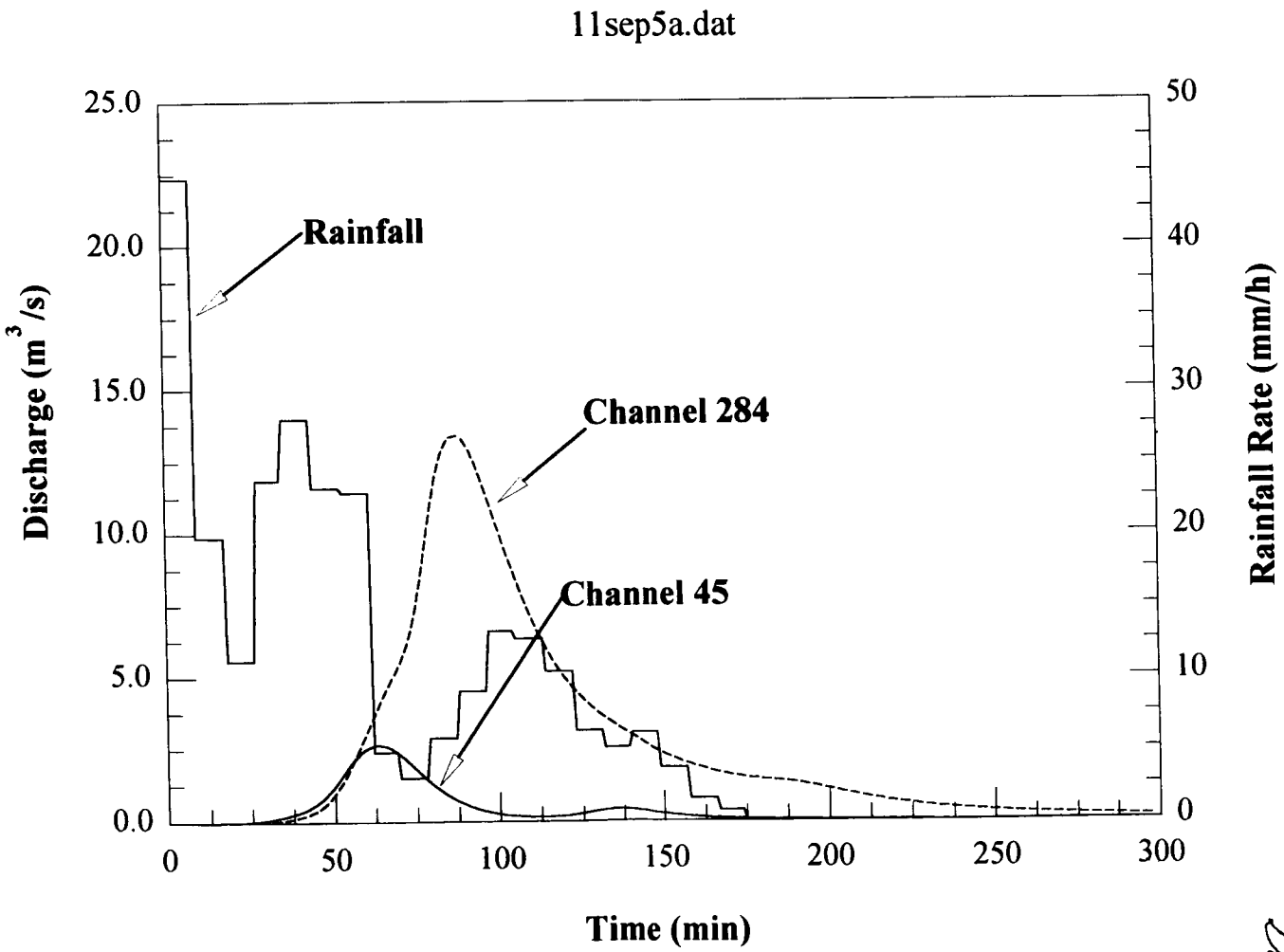
ALVIN


11sep5a.dat
Rainfall
Channel 284
Channel 45
Discharge (m3/s)
Rainfall Rate (mm/h)
Time (min)
25.0
20.0
15.0
10.0
5.0
0.0
50
40
30
20
10
0
0
50
100
150
200
250
300

616

CNWRA	Revised Figure 5 for ASCE Paper	DWW 7/27/99	1/

617

The figures 6-2a + 6-2b in the report "Estimating Channel Infiltration from Surface Runoff in the Solitario Canyon Watershed, Yucca Mountain, Nevada" prepared for the Nuclear Regulatory Commission Contract NRC-02-97-009 by Woolhiser et al. Dec. 1998 show peak rates of flow for Solitario Canyon and subwatersheds using infiltration parameter values obtained prior to the detailed analysis of the Mercury New rainfall simulator plots 7 and 11. so are not consistent with the parameter values shown in Table 6-2

Fig 5 in the ASCE paper will be revised so that the parameters in Table 3 (ASCE paper) will be used to calculate the hydrographs.

Computer runs for the storms PAUG4, PNOV89, and PAUG60 with the most recent parameter set as shown in Table 3 (ASCE paper) were completed on 3-27-99 and the output files are in the directory c:\consult\swri\KINDOC with file names:

SOLAUG4C.OUT
SNOV89C.OUT
SAUG60C.OUT

PAUG4 2ND 50 YRS KIN G=50
Note: G is not = 50. for this set.

The peak flow rates are tabulated for each storm below

Area Km²	Peak Discharge (mm/h) PAUG4	PNOV89	PAUG60	Channel Number
1.23	29.80	13.97	12.09	45
2.18	28.26	13.31 *	11.54	71
3.55	25.23	12.12 *	10.79	115
8.91	16.86	8.88	8.28	264
10.72	14.75	7.84	7.64	284
Runoff (mm)	8.30	5.39	6.29	
Parameter file	SJ_OC.PAR	SNC.PAR	SJ_OC.PAR	

Runoff vol. with SJ_OC.PAR 8.79

A comparison of the above Table with the HSIPLOT sheet c:\CONSULT\THIRD50\QVSA100.POW, shows exact agreement except for the two * entries which have a difference of 0.1 mm/sec
File is dated 3/10/98

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The file QVSA100.PDW was copied to QVSA100B.PDW DAW
and file QVSA100.PGW was copied to QVSA100B.PGW

The graph QVSA100.PGW is identical to Fig. 5 in the ASCE paper. The revised data for PNOV89 was entered into QVSA100B.PDW and was plotted on QVSA100B.PGW. The difference could not be detected at the scale of the graph.

To check again, ran PAUG4 with SJ_OD.PAR.

	Peak Runoff Rate (mm/h)			
Area Km²	PAUG4	PNOV89	PAUG60	Channel No
1.23	31.7	14.7	12.6	45
2.18	30.1	14.1	12.1	71
3.55	26.9	12.8	11.3	115
8.71	18.0	9.4	8.9	254
10.72	15.8	8.3	8.3	284
Runoff Vol. (mm)	8.79	5.68	6.78	
Program	KIN.EXE	KIN.EXE	KIN.EXE	
File:	SAUG4D.OUT	SNOV89D.OUT	SAUG60D.OUT	
Parameter file:	SJ_OD.PAR	SND.PAR	SJ_OD.PAR	

copy file C:\CONSULT\SWRI\THIRD50\QVSA100.PDW to QVSA100D.PDW ✓
" " " " " " QVSA100.PGW to QVSA100D.PGW ✓

Enter above values in QVSA100D.PDW ✓

Pull up QVSA100D.PGW + delete old curves for PAUG4, PAUG60 + PNOV89 ✓
Plot new curves and correct labels ✓
Print out for reference ✓
Export as FIG5.EPS

7/28/99 Recalculate PAUG4 and INOV10A with G=50 and KS=20.2.
1. Create parameter files ~~SND.PAR~~ SNDHI.PAR and SJ_ODHI.PAR ✓

2. Run with rainfall inputs 1NOV10A and PAUG4

DAW

Area Km²	Channel No	Peak Flow (mm/h) PAUG4	1NOV10A	PNOV89	PMAY50	PJUL87	PAUG60
1.23	45	21.4	8.2	5.8 6	8.9	18.0	6.4
2.18	71	20.0	7.6	5.3 6	8.2	17.0	6.0
3.55	115	17.6	6.6	4.6 6	7.1	14.6	5.5
8.91	254	10.5	3.6	2.7 6	4.0	7.4	3.6
10.72	284	8.9	3.0	2.2 6	3.4	6.1	3.1
.PAR File .OUT File Program	KIN.EXE	SJ_0DHI SAUG4DHI KIN	SNDHI SN10ADHI KIN	SNDHI SN89DHI KIN	SM_JDHI SM50DHI KIN	SJ_0DHI SJ87DHI KIN	SJ_0DHI SA60DHI KIN
R.O. Vol (mm)		5.29	2.29	1.87	2.44	3.67	2.80

Create new graph similar to Fig 6b in early version of paper.

1. QVSA100B.PDW has columns for PAUG4HI and 1NOV10AHI
~~2. Copy QVSA100B to~~
2. Add two columns to QVSA100D.PDW for PAUG4HI and 1NOV10AHI ✓
3. Copy QVA100D.PGW TO QVA100DHI.PGW ✓
4. Remove curves for PAUG4 + 1NOV10A ✓
5. Plot new values for " " ✓

Now the curve for PAUG4 is very close to Squires & Young (1984) 100 yr. curve and the curve for 1NOV10A is exceeded by 2 of the 6 maximum stage observations.

Need to verify that the peaks for 1NOV10A are still ranked 6th in magnitude.
→ PNOV89 is the 6th largest and has recurrence interval of 16.8 yrs. !!

6. Try composite plot

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DAW

```
        2 dir(s)   2,208,894,976 bytes free

consult\swri\KINDOC>dir *.par

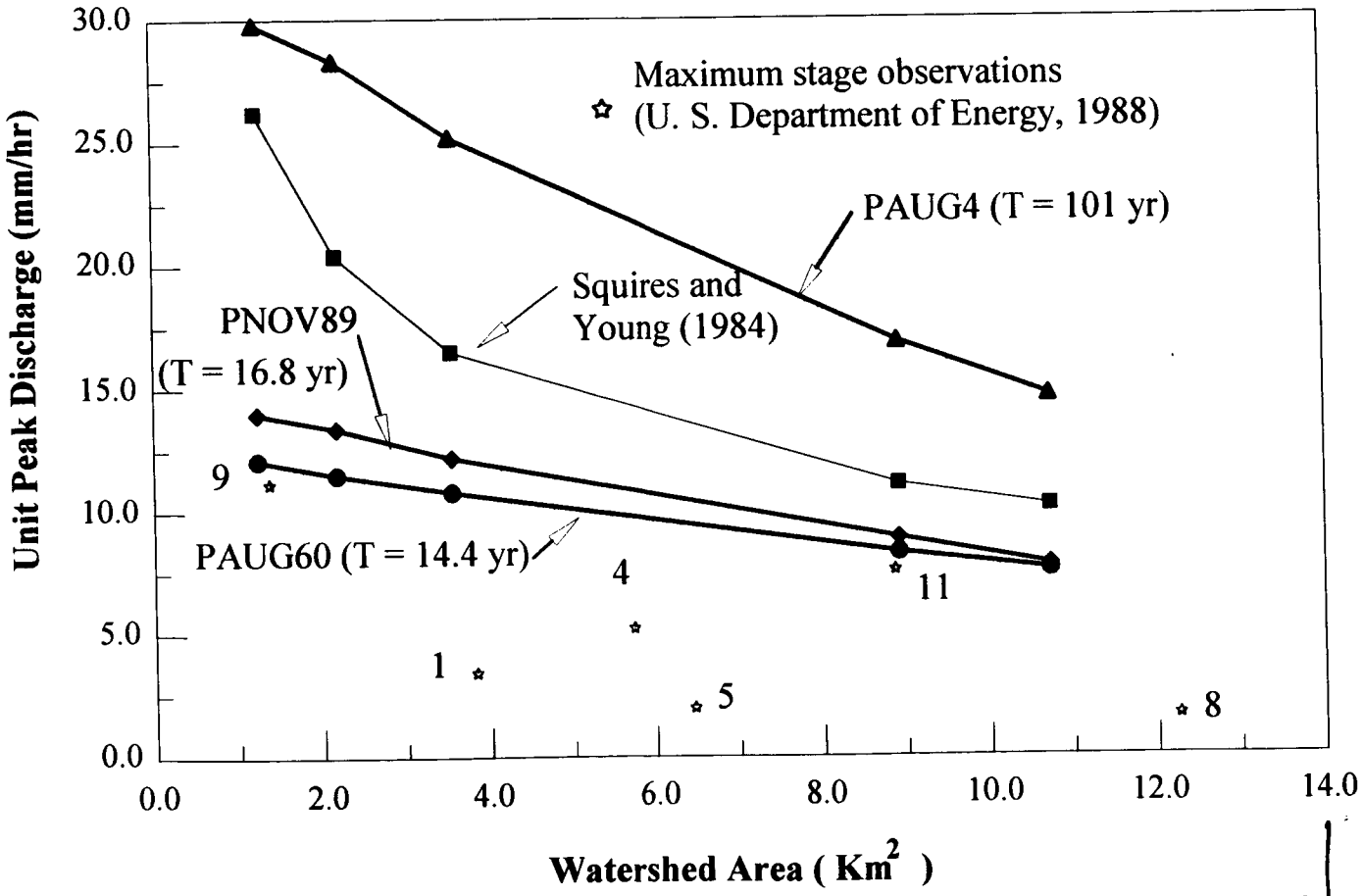
 Volume in drive C is SER#T031079
 Volume Serial Number is 2B6E-1207
 Directory of C:\consult\swri\KINDOC

SOLDD   PAR        93,351  11-05-98 10:05a SOLDD.PAR
SJ_AD   PAR        93,385  10-28-98  2:48p SJ_AD.par
SJ_OD   PAR        93,350  11-05-98 10:03a SJ_OD.PAR
SM_JD   PAR        93,140  11-05-98 10:02a SM_JD.PAR
SND     PAR        93,351  11-05-98 10:04a SND.PAR
AVGJ_OD PAR           481  11-05-98 11:25a AVGJ_OD.PAR
SOLJ_OC PAR        93,142  04-24-97  9:21a SOLJ_OC.PAR
SOLNC   PAR        93,143  02-18-97  9:49a SOLNC.PAR
SOLNCHI PAR        92,935  05-21-97 11:25a SOLNCHI.PAR
SJ_OCHI PAR        92,934  05-22-97  2:23p SJ_OCHI.PAR
SJ_ODHI PAR        92,934  07-28-99  8:24a SJ_ODHI.PAR
SNDHI   PAR        92,935  07-28-99  8:26a SNDHI.PAR
SM_JDHI PAR        93,140  07-28-99  3:31p SM_JDHI.PAR
       13 file(s)      1,118,221 bytes
        0 dir(s)   2,208,894,976 bytes free

C:\consult\swri\KINDOC>
```

KS=22.25 G=50, SAT=.235
" " " " =.335
KS=11.25, G=50, SAT=.155
" 22.25 " " .235
" 11.25 " " .155
KS=11.25, G=50, SAT=.155
KS=20.2, G=80 SAT=.235
KS=20.2, G=80 SAT=.155
" " G=50 "
" " " .235
" " " .155

File: C; consult swri third50 QVSA100B.PGW 7-27-99



PART OF SND. PAR
DAW 7/27/99 DAW

```
BEGIN GLOBAL Solitario Canyon, Woolhiser Func., av. SAT & KS, n=0.0651 in small

 CLEN = 300,  UNITS = METRIC

END GLOBAL
!-----------------------------------------------------
BEGIN PLANE

 ID = 1,  LEN = 225,  WID = 91.0, SL = .20,  MANNING = .151

 SAT = .235, CV = 0.8,  PR = 1

 RELIEF = 50,  SPACING = 1.

 KS       G       DIST    POR      ROCK
 11.25     50.     0.25    .34      0

END PLANE
!-----------------------------------------------------
BEGIN PLANE

 ID = 2,  LEN = 150,  WID = 258., SL = .33,  MANNING = .151

 SAT = .235, CV = 0.8,  PR = 1

 RELIEF = 50,  SPACING = 1.

 KS       G       DIST    POR      ROCK
 11.25     50.     0.25    .34      0

END PLANE
!-----------------------------------------------------
BEGIN PLANE

 ID = 3,  LEN = 140,  WID = 233., SL = .36,  MANNING = .151

 SAT = .235, CV = 0.8,  PR = 1

 RELIEF = 50,  SPACING = 1.

 KS       G       DIST    POR      ROCK
 11.25     50.     0.25    .34      0

END PLANE
!-----------------------------------------------------
BEGIN CHANNEL

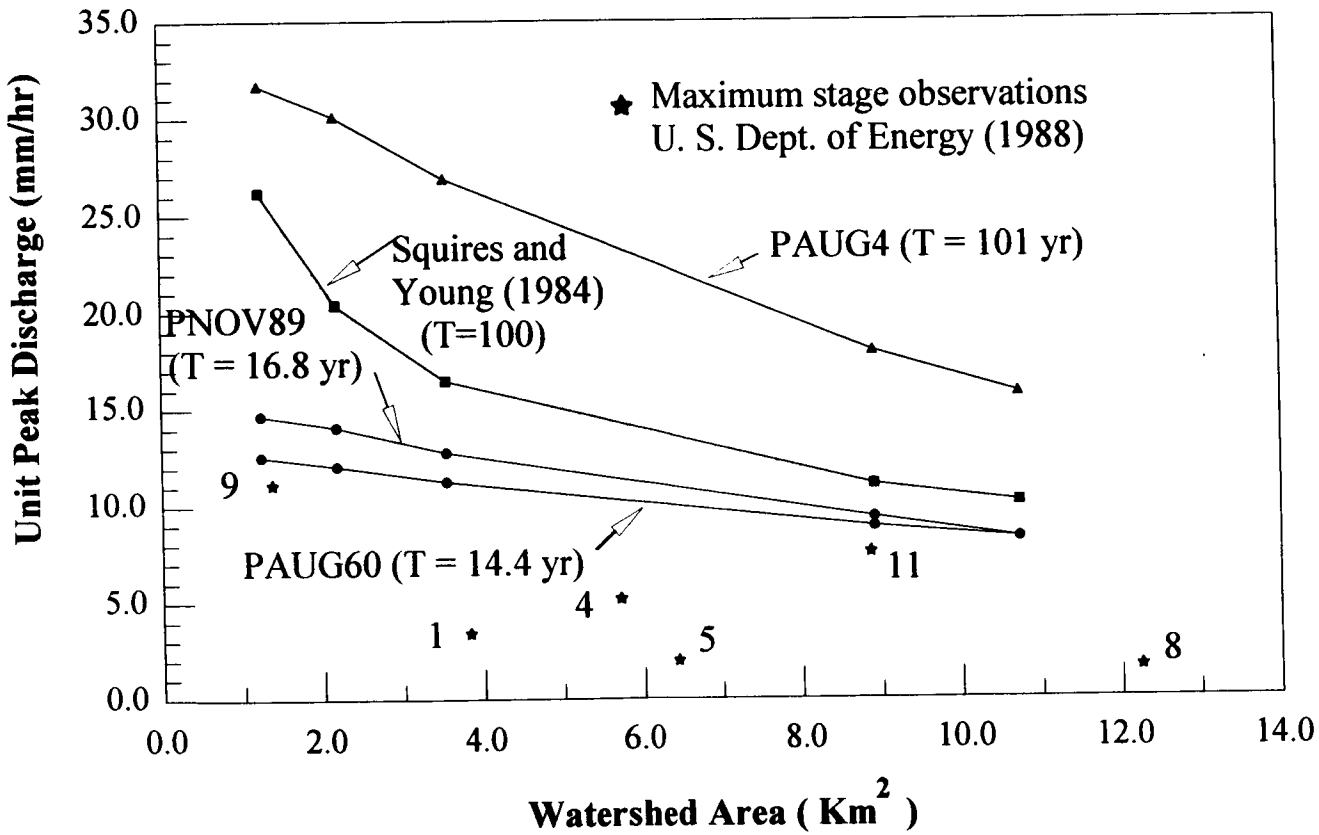
 ID = 4,  UP = 1,  LEN = 270.0,  PR = 1,  LAT = 2,3

 WIDTH    SLOPE    MANNING    SS1    SS2
   0.3    .19       .0651    0.26   0.27

 SAT = .13   DEPTH = 0.5   WO = YES

 KS       G       POR      ROCK     DIST
 61.      63.     .44       0        .7

END CHANNEL
!-----------------------------------------------------
```


Maximum stage observations
U. S. Dept. of Energy (1988)
PAUG4 (T = 101 yr)
Squires and
Young (1984)
(T=100)
PNOV89
(T = 16.8 yr)
PAUG60 (T = 14.4 yr)
9
1
4
5
11
8
Unit Peak Discharge (mm/hr)
Watershed Area (Km^2)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0

623

DAW 7/28/99 624

```
NOTE: THIS IS PART OF SJ_ODHI.PAR
BEGIN GLOBAL Solitario Canyon, W Func., SAT & KS seasonal, n=0.0651 in small ch

  LEN = 300,  UNITS = METRIC

END GLOBAL
!-------------------------------------------------------
BEGIN PLANE

  ID = 1,  LEN = 225,  WID = 91.0, SL = .20,  MANNING = .151

  SAT = .155, CV = 0.8,  PR = 1

  RELIEF = 50,  SPACING = 1.

  KS       G       DIST    POR      ROCK
  20.2    50.     0.25    .34       0

END PLANE
!-------------------------------------------------------
BEGIN CHANNEL

  ID = 4,  UP = 1,  LEN = 270.0,  PR = 1,  LAT = 2,3

  WIDTH    SLOPE    MANNING    SS1    SS2
    0.3    .19       .0651    0.26   0.27

  SAT = .13   DEPTH = 0.5   WO = YES

  KS       G       POR      ROCK     DIST
  61.     63.     .44       0        .7

END CHANNEL
!-------------------------------------------------------
BEGIN CHANNEL

  ID = 45,  UP = 24,40,  LEN = 315.0,  PR = 2,  LAT = 43,44

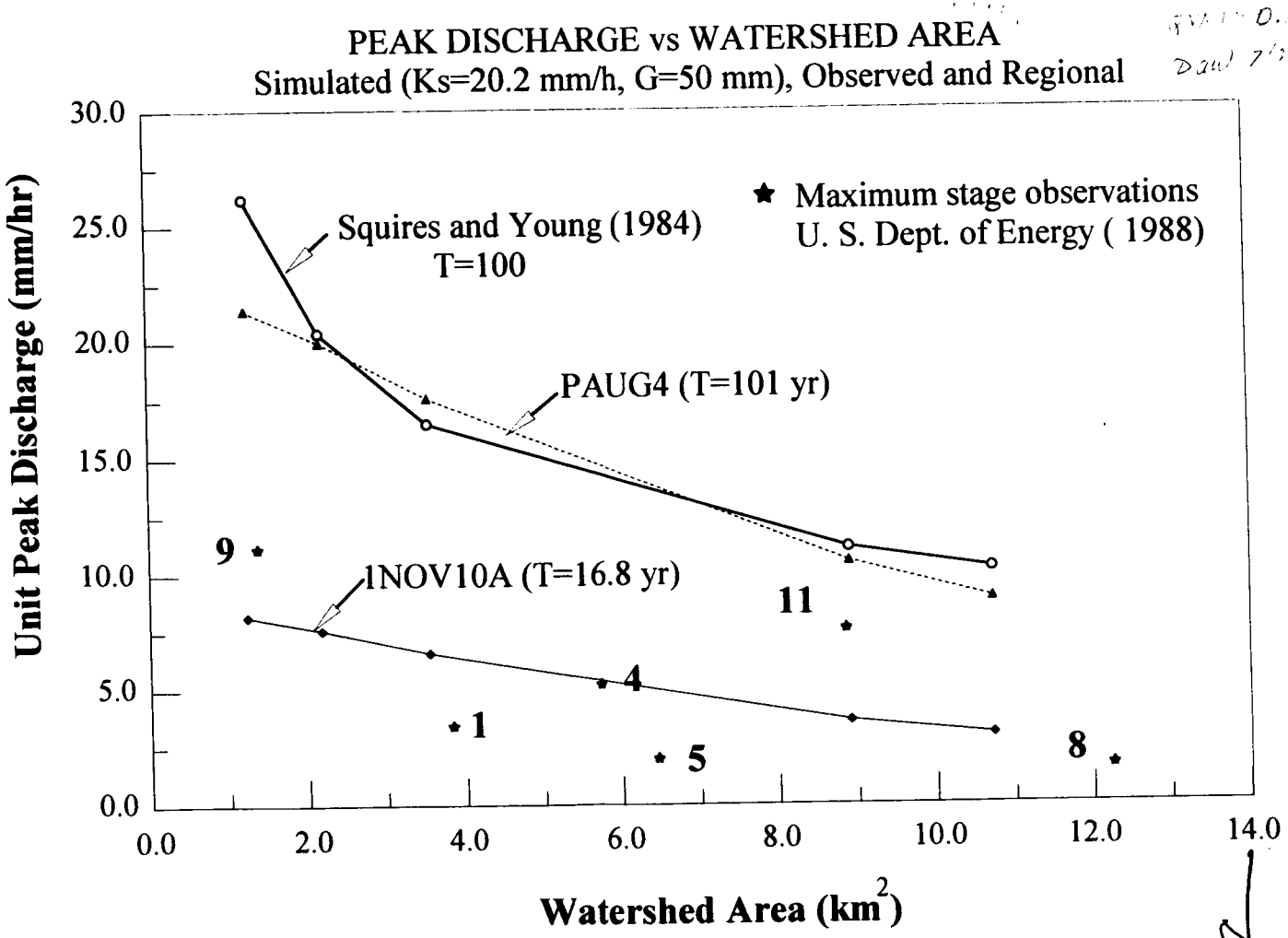
  WIDTH    SLOPE    MANNING    SS1    SS2
    5.8    .048      .0651    0.26   0.27

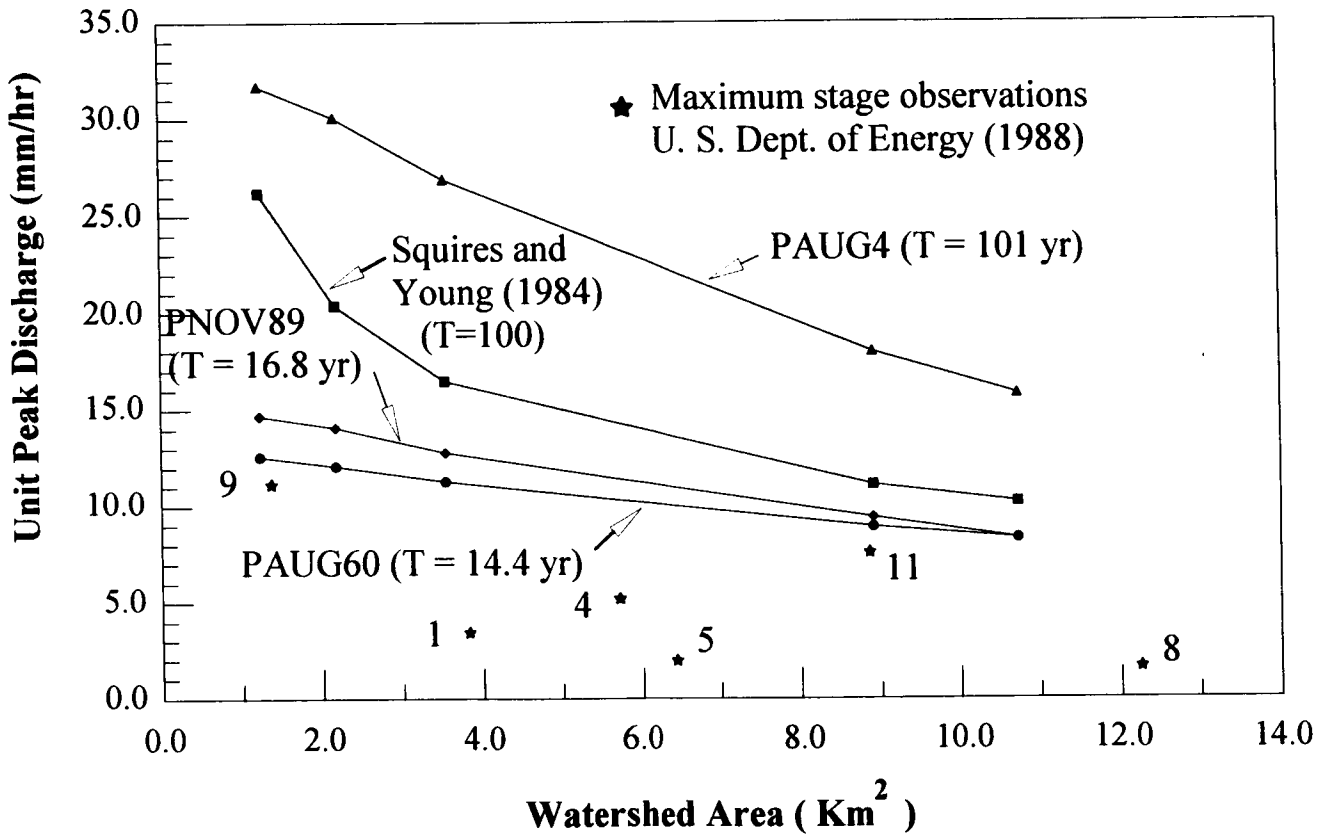
  SAT = .13   DEPTH = 0.5     WO = YES

  KS       G       POR      ROCK     DIST
  91.     63.     .44       0        .7

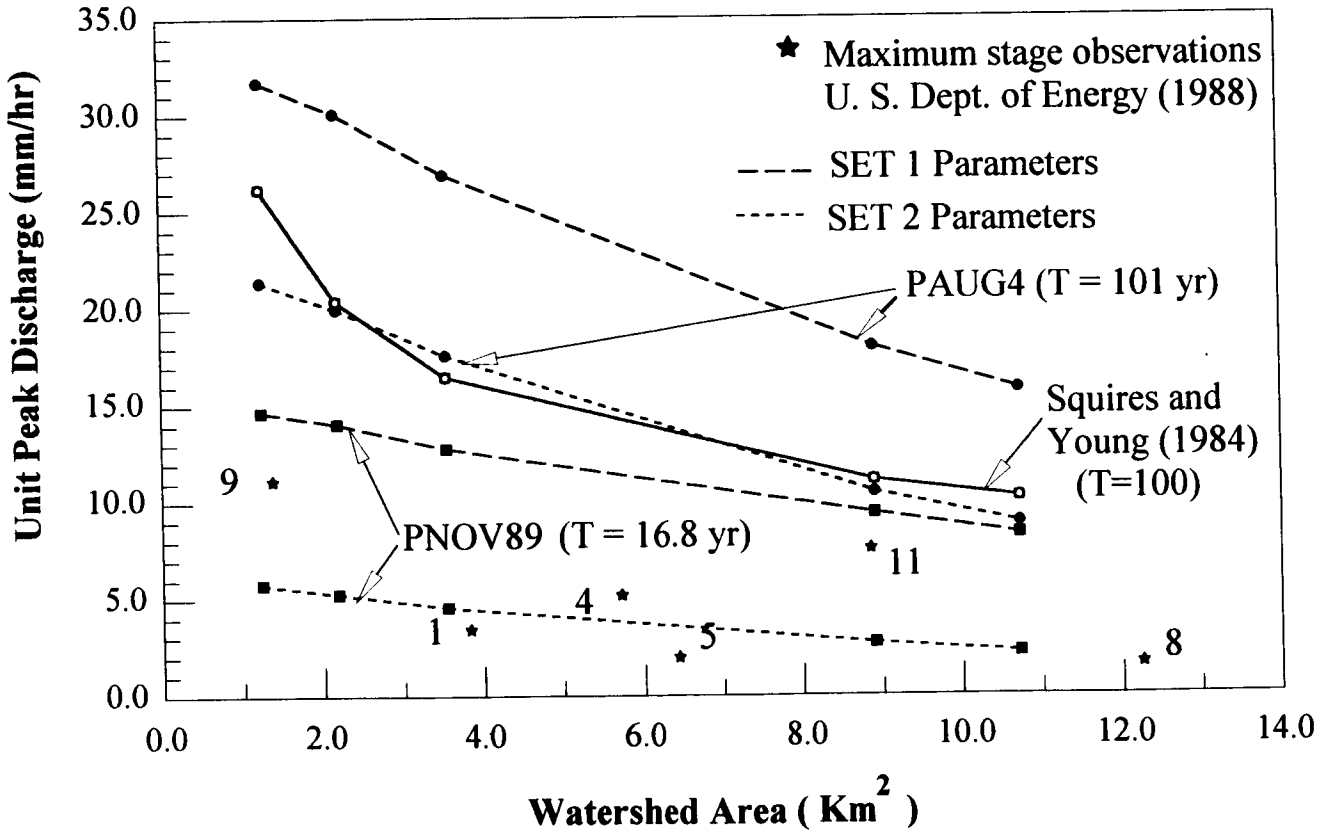
END CHANNEL
!-------------------------------------------------------
```

DAW


PEAK DISCHARGE vs WATERSHED AREA
Simulated (Ks=20.2 mm/h, G=50 mm), Observed and Regional
Unit Peak Discharge (mm/hr)
Watershed Area (km2)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Squires and Young (1984)
T=100
PAUG4 (T=101 yr)
1NOV10A (T=16.8 yr)
Maximum stage observations
U. S. Dept. of Energy (1988)
9
11
4
1
5
8


Maximum stage observations
U. S. Dept. of Energy (1988)
PAUG4 (T = 101 yr)
Squires and
Young (1984)
(T=100)
PNOV89
(T = 16.8 yr)
PAUG60 (T = 14.4 yr)
9
1
4
5
11
8
Unit Peak Discharge (mm/hr)
Watershed Area (Km^2)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0

File:THIRD50 QVA100COM.PGW
DAW 7-28-99



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CNWRA
Solitario Canyon

Summary of Channel Infiltration Estimates

DAW 6/4/97

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	Runoff mm/yr	Channel F (mm/yr)
First 50yr Simulation Average Ks	2.57	0.88 DAW
Second 50yr Simulation Improved estimates of Ks & Mannings n Seasonal var of Ks & SI	1.19	0.52 (0.63 - regression)
~~Second~~ First 50 yr. Simulation Improved estimates of Ks & Mannings n Seasonal variation of Ks and SI	2.88	0.84
Future Climate Simulation Seasonal Ks & SI	2.76	1.66
Second 50yr. Sim. Ks = 20.2 mm/hr.	0.72	0.23
(Based on Kwicklis + Rousseau (1996)		0.5 (based on 10mm/yr in 50)
Hudson + Flint (1996)	5.07 — channel flow	← (Flint et al p 87)

Gross Infiltration

Hevesi + Flint (1996)	0.2 to 1.4 mm/yr
Czarnecki (1984)	0 - 2 mm/yr.
Scott et al (1983)	6 mm/yr
Montazer + Wilson (1984)	4.5 mm/yr.
Fabryka-Martin et al (1994)	0 - 5.4 mm/yr 14 balance

$10a = .5A$

$\frac{a}{A} = \frac{.5}{10} = .05$

No. 5505 Engineer's Computation Pad

Set G = 50.0

FMIN OR KS

Jul Aug Sept Oct Nov = 11.25 mm/hr

Dec Jan Feb Mar Apr May June = 22.25 mm/hr

DAW

For display purposes:

Get output files .DAT for PAUG60 – greatest increase
~~PMAY50 – greatest decrease~~

The regression eq. to estimate channel infiltration is

$X = 0.473\,y^{0.694}$. G = 50 mm
Channel Infiltration Ks as above

	old (mm)	New (mm)	
PAUG4	2.51	2.61	+.10
PJUL7	~~1.18~~ OK	1.26	+.08
PJUL17	1.32	1.44	+.12
60	2.14	2.24	+.10
87	2.11	2.19	+.08
89	1.93	1.99	+.06
62	1.81	1.88	+.07
54	1.42	1.52	+.10
18	1.17	1.28	+.11
39	1.16	1.25	+.09
50	1.15	1.15	0
83	1.02	1.15	+.13
46	0.94	1.03	+.09

+1.13

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DAW

SUMMARY STATISTICS:

SECOND AND THIRD 50 YEAR SIMULATIONS

8/13/98 For seasonally varied KS (Set 1)

For the 2nd 50 yr simulation (95 storms > 12.7 mm)

17 storms gave 75% of infiltration

For the 3rd 50 yr simulation (113 storms > 12.7 mm)

18 storms gave 75% of infiltration

For the 100 yr period estimate that 35 storms gave 75% of infiltration

For the 100 yr period there were 208 storms > 12.7 mm

For the average plane:

2nd 50 yr period: There were 81 non zero r.o. events

3rd 50 yr. period: There were 74 non zero r.o. events

155 r.o events.

2nd 50yr period 54 < 0.10 mm or 41 > 0.10 mm

3rd 50yr period 77 < 0.10 mm or 36 > 0.10mm

from file on disk Graphics\S3RD50STAT.PDW (Prostat)

113
- 36
77

35/155 22% of non-zero runoff events gave 75% of channel infiltration

For 2nd 50 yr. 13 storms gave 75% of r.o.

For 3rd 50yr. 11 storms gave 75% of r.o

24

24/155 = 15% of storms (non zero r.o. events) gave 75% of runoff

for 2nd 50yr Av. plane R.O. = 1.89 mm } 1.51 mm

3rd 50yr. Av plane R.O. = ~~0.11~~ 1.14

2nd 50yr Av Chan. infil = 0.63 } 0.52 mm

3rd 50yr Av Chan infil = 0.41

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DAW 632

For KS = 20.2 mm/h

For the 2nd 50 yr. Simulation

17 storms gave 75% of infiltration

For the 3rd 50 yr. Simulation

14 storms gave 75% of infiltration

For the 100 yr period estimate that 31 storms gave 75% of infiltration

For the 100 yr. period there were 208 storms >12.7mm

For the Average Plane

2nd 50 yr: 41 non-zero

3rd 50 yr: 39 " "

80

2nd 50 yr: 23 ≥ 0.10 mm

3rd 50 yr: 21 ≥ 0.10

44

2nd 50 yr: 7 storms gave 75% of runoff

3rd 50 yr: 9 storms " " " "

16 storms

2nd 50 Avg. R.O. for plane = 0.52 mm/yr } 0.38 mm/yr

3rd 50 Avg R.O. " " 0.24 mm/y

.38
2).76

National Brand
13 782 500 SHEETS FILLER 5 SQUARE
42 381 50 SHEETS EYE-EASE® 5 SQUARE
42 382 100 SHEETS EYE-EASE® 5 SQUARE
42 389 200 SHEETS EYE-EASE® 5 SQUARE
42 392 100 RECYCLED WHITE 5 SQUARE
42 399 200 RECYCLED WHITE 5 SQUARE
Made in U.S.A.

Table 5 in paper

# Rain fall >12.7		Average Plane Ave RO. mm/y	No. of Ro Events	No of Ro Events ≥0.10mm	No events for 75% r.o.	Solitario Canyon Ave Chan Infil (mm)	No of events for 75% Infiltration
208	SET 1	1.51	155	77	24	~~0.41~~ 0.57	35
208	SET 2	0.38	80	44	16	0.18	31

FOR SET 1 38% of plane runoff infiltrated in the channels

FOR SET 2 47% of plane runoff infiltrated in the channels

Set #1 24/155 = 15.5% of storms caused 75% of runoff

Set #2 16/80 = 20% " r.o. producing storms caused 75% of r.o.

CNWRA

Runoff Statistics Summary Table

Dan 8/14/98

3/3

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SPATIAL VARIABILITY OF RAINFALL

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Plane No	X	Y
1	6.9	1.5
2	6.8	1.3
3	6.7	1.4
4		
5	6.5	1.1
6	6.6	1.3
7		
8	6.3	0.9
9	6.2	1.1
10		
11	6.0	0.7
12	5.9	0.8
13		
14	5.8	0.5
15	5.7	0.6
16		
17	5.5	0.3
18	5.5	0.4
19	5.5	0.5
20		
21	5.2	0.2
22	5.2	0.4
23	5.2	0.5
24		
25	6.4	1.4
26	6.3	1.3
27	6.2	1.4
28		
29	6.1	1.2
30	6.0	1.2
31		
32	5.9	0.9
33	5.8	1.0
34		
35	5.6	0.7
36	5.5	0.9
37		
38	5.3	0.5
39	5.2	0.7
40		
41		
42	4.8	0.2
43	4.8	0.4
44	4.9	0.6
45		
46	6.3	1.6
47	6.0	1.4

Note: To use spatially variable [illegible] as input must have [illegible] coordinate for each plane element. These are arbitrary. DWT

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CN WRA
Solitario Canyon | Coordinate System | JW 3/15/97 | 2/6

Dau 836

Plane #	x	y
48	6.0	1.5
49		
50	5.85	1.6
51	5.9	1.5
52	5.8	1.5
53		
54	5.7	1.1
55	5.65	1.3
56		
57	5.7	1.65
58	5.65	1.4
59	5.5	1.4
60		
61	5.3	1.0
62	5.3	1.15
63		
64	5.0	0.8
65	4.8	0.85
66		
67	4.3	0.2
68	4.3	0.3
69	4.35	0.5
70	4.5	0.65
71		
72	5.5	1.65
73	5.3	1.4
74	5.2	1.4
75		
76	5.35	1.65
77	5.2	1.5
78	5.2	1.55
79		
80	5.15	1.7
81	5.2	1.7
82	5.1	1.6
83		
84	5.1	1.4
85	5.0	1.4
86		
87	4.9	1.05
88	4.9	1.15
89		
90	4.9	1.4
91	4.85	1.2
92	4.7	1.3
93		
94	4.7	0.8
95	4.6	0.9

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CNWRA Solitario Canyon | Coordinate System | RW 3/15/97 | 3/6

DAW

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Plane #	x	y
96 –		
97	5.0	1.75
98	4.9	1.6
99	4.85	1.7
100 –		
101	4.8	1.85
102	4.8	1.7
103	4.65	1.7
104 –		
105	4.5	1.3
106	4.4	1.4
107 –		
108	4.5	1.0
109	4.2	0.9
110 –		
111	3.7	0.2
112	3.7	0.4
113	3.7	0.6
114	3.8	0.8
115 –		
116	4.65	1.9
117	4.5	1.65
118	4.5	1.7
119 –		
120	4.5	2.0
121	4.4	1.7
122	4.35	1.8
123 –		
124	4.2	1.2
125	4.15	1.3
126 –		
127	4.3	2.1
128	4.3	1.9
129	4.2	1.9
130 –		
131	4.1	1.3
132	4.0	1.4
133 –		
134	3.9	0.95
135	3.8	1.0
136 –		
137	3.8	1.3
138	3.7	1.05
139	3.65	1.1
140 –		
141	3.5	0.9
142 –		

No. 5505 Engineer's Computation Pad

CNWRA Solitario Canyon | Coordinate System | EW 3/15/97 | 4/6

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DAW

Plane #	X	Y
143	3.3	0.2
144	3.3	0.3
145	3.3	0.7
146	3.4	0.9
147 –		
148	4.1	2.1
149	3.9	1.6
150	3.8	1.8
151 –		
152	3.6	1.3
153	3.6	1.45
154 –		
155	3.4	1.05
156	3.3	1.1
157 –		
158	3.0	0.3
159	3.0	0.7
160	3.1	1.0
161 –		
162	3.75	2.3
163	3.8	2.1
164	3.5	2.0
165 –		
166	3.9	2.1
167	3.6	1.75
168	3.65	1.85
169 –		
170	3.3	1.5
171	3.25	1.7
172 –		
173	3.5	1.6
174	3.45	1.5
175	3.35	1.4
176 –		
177	3.2	1.2
178	3.1	1.2
179 –		
180	2.7	0.4
181	2.7	0.7
182	2.85	1.0
183 –		
184	3.1	1.7
185	3.1	1.5
186	3.0	1.5
187 –		
188	3.0	1.25
189	2.9	1.3
190 –		

No. 5505 Engineer's Computation Pad

CNWRA Solitario Canyon | Coordinate System | 5/6

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plane #	x	y
191	2.3	0.5
192	2.4	0.8
193	2.5	1.1
194 –		
195	3.15	2.4
196	3.2	2.3
197	3.0	2.25
198 –		
199	2.75	2.2
200	2.9	2.3
201	2.8	2.1
202 –		
203	3.2	2.0
204	2.9	1.9
205 –		
206	2.8	1.5
207	2.7	1.7
208 –		
209	2.7	1.3
210	2.5	1.3
211 –		
212	2.2	0.6
213	2.2	0.9
214	2.25	1.15
215 –		
216	2.45	1.75
217	2.4	1.5
218	2.3	1.5
219 –		
220	2.0	0.5
221	2.1	1.0
222	2.1	1.2
223 –		
224	2.2	1.5
225	2.1	1.3
226	2.05	1.4
227 –		
228	1.9	0.7
229	1.95	1.0
230	1.95	1.3
231 –		
232	2.5	2.0
233	2.3	2.0
234 –		
235	2.1	2.0
236	2.0	1.7

DAW

No. 5505 Engineer's Computation Pad

NWRA
Solitario Canyon

Coordinate System

6/6

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DAW

plane #	x	y
237 –		
238	2.0	1.4
239	1.95	1.5
240 –		
241	1.5	0.7
242	1.5	1.0
243	1.7	1.5
244 –		
245	1.8	1.9
246	1.6	1.7
247	1.5	1.8
248 –		
249	1.45	1.55
250	1.35	1.55
251 –		
252	1.3	1.2
253	1.2	1.5
254 –		
255	1.3	0.5
256	1.2	0.7
257	1.1	1.0
258	1.2	1.0
259 –		
260	1.0	1.25
261	1.0	1.35
262 –		
263	0.9	0.5
264	0.8	0.8
265	0.7	1.2
266	0.8	1.6
267 –		
268	0.5	0.5
269	0.3	1.0
270	0.4	1.0
271 –		
272	0.3	1.5
273	0.5	1.6
274 –		
275	1.5	2.0
276	1.1	1.7
277	1.1	1.9
278 –		
279	0.6	1.7
280	0.7	1.8
281 –		
282	0.2	1.6
283	0.3	1.8
284 –		

No. 5505 Engineer's Computation Pad
ALVIN

641

Thunderstorm Rainfall

If we assume that the spatial characteristics of thunderstorm rainfall in Nevada are similar to those in Arizona we can use the area-depth relationship proposed by Woolhiser and Schwalen (1960)

$$\log_{10} Y = 1.574 \log_{10} X + 1.08 \qquad (1)$$

where Y = area enclosed by isohyet (square miles)

X = Depth at storm center - depth of isohyet (inches)

Converting to units of Km^2 and mm and solving for the radius, r we obtain.

$$r = 0.2657\, X^{0.787} \qquad (2)$$

or

$$r_i = 0.2657\,(P_{max} - p_i)^{0.787} \qquad (3)$$

where P_{max} is the depth at the storm center (mm)

p is the depth for the ith isohyet (mm)

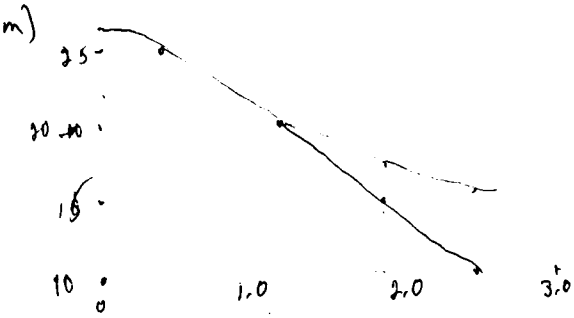
r_i = radius of circle of ith isohyet (Km)

Woolhiser, D.A. and H.C. Schwalen, 1960, Area-Depth-Frequency Relations for Thunderstorm Rainfall in Southern Arizona. Agricultural Engineering Dept. Tech. Paper 527, University of Arizona, Tucson, AZ. 7p.

PAUG4 26.7mm

As an example use the storm PAUG4 from the 2nd 50 yr. sequence. The total depth is 26.7 mm which we assume is at the storm center.

Isohyet (mm)	radius (km)
25	0.40
20	1.19
15	1.84
10	2.43
5	2.99



x = 3
y = 1

642

Assume that we have 5 rain gages located at the following coordinates

DAW

	X	Y	Distance from RG002
RG001	0.5	1.5	2.6
RG002	3.0	1.0	0
RG003	4.0	2.0	1.41
RG004	5.0	1.0	2.0
RG005	7.0	1.5	4.03

If we let the storm center be located at RG002 $P_{max} = 26.7$ mm

Given a radius, r we can solve for p.

$$(P_{max} - p_i) = \left(\frac{r}{0.2657}\right)^{\frac{1}{0.787}}$$

or $$p = P_{max} - \left(\frac{r}{0.2657}\right)^{1.27} \longleftarrow (4)$$

for storm PAV64 at RG002 $\qquad p_i/26.7$

$$p_1 = 26.7 - \left(\frac{2.6}{0.2657}\right)^{1.27} = 8.58 \qquad 0.32$$

$$p_2 = 26.7$$

$$p_3 = 26.7 - \left(\frac{1.41}{.2657}\right)^{1.27} = 18.37 \qquad 0.69$$

$$p_4 = 26.7 - \left(\frac{2.0}{.2657}\right)^{1.27} = 13.7 \qquad 0.51$$

$$p_5 = 26.7 - \left(\frac{4.03}{.2657}\right)^{1.27} = 0 \qquad 0.$$

Rainfall file:

Par. file SOLXYJ_0.PAR SCL 97

out file. VARTEST.OUT

No. 5505 Engineer's Computation Pad ALVIN

To create a Rainfall file

1. Decide on Location of storm cell center — DAW
   get x-y coordinate

2. Calculate the total depth at each raingage location by calculating the distance to maximum raingage
   Use eq (4) to calculate depth.

3. Copy only the time-depth data to a file on disk B. use format PXXY##.DAT
   Use WORD

4. Run program CONVERT.BAS E:\CONSULT\SWRI
   Using the above file as input. Enter the ratios for raingage 1 - N as requested. A new file SCRATCH.PRE will be created on Disk B.

5. Use word to copy T-P data from SCRATCH to new Precip file.
   For new file use convention ~~PVARMON~~ VARAVGXX.PRE

No. 5505 Engineer's Computation Pad ALVIN

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DAW

Computer runs

1. Used DAUG4.PRE as rainfall at RG002
The calculated depth at RG005 is < 0 so was set at 0.

t	P
0,	0
40,	0

The program ran for 20 min TFIN but got a run time error on plane 1 if I used TFIN of 50. Changed the depth to 5m at t=40 – still floating point error.
When I used t-P data from gage 1 at gage 5, program ran O.K.

RAINFALL = 13.95 mm
PLANE F = 11.19
CHANNEL F = 0.995

STOR = 0.05
OUTFLOW = 1.63 mm

Hydrograph files:
E:\CONSULT\SWRI\SOL97\

VAR245_4.DAT
VAR271_4.DAT
VA2115_4.DAT
VA2254-4.DAT
VA2254_4.DAT

} mm/hr hyd: VarUhyd4.psq
m³/s: VARhyd4.psq
DATA FILE: VARHYD4.PSD

No. 5505 Engineer's Computation Pad ALVIN

DAW

LOWER BOUND ON CHANNEL INFILTRATION:

HIGH KS ON PLANE ELEMENTS

646

Simulations carried out to date have been based on saturated hydraulic conductivities estimated from rainfall simulator runs at Mercury, N.V. using either the global average (FMIN = 12.66 mm/hr) or seasonal values FMIN (Dec-June) = 16.35 mm/hr.; FMIN (July-Nov) = 8.95 mm/hr. (See phase 1 Report and phase 2B Report) — DAW

These values lead to runoff peak rates that seem high and, by inference, lead to estimates of channel infiltration that may be too high.

Alternative - Lower bound for channel infiltration?

1) Use the Fmin value estimated from soil textural measurements by Schmidt (1988). range (19.3 to 21.1 mm/hr) mid range = 20.2 mm/hr. (Uncorrected for rock)

Procedure

1. Create new files for the average plane. Use the same seasonal SI, but replace the hydraulic conductivity with 20.2 mm/yr.

   · PAR files will have HI added. Thus

   AVGJ_0.PAR → AVGJ_0HI.PAR

21.1
19.3
1.8

19.3
.9
20.2

No. 5505 Engineer's Computation Pad ALVIN

TASKS FOR LISA

Daw 647

1. Complete runs of average plane with saturated conductivity = 20.2 mm/hr.

Parameter files are:

E:\CONSULT\SWRI\SEASON

AVGJ_OHI.PAR	July - Oct	AVGOHI.PAR
AVGM-JHI.PAR	MAY-JUNE	
AVGNHI.PAR	November	
AVGJ_AHI.PAR	Jan-Apr.	

Use listing on clipboard + run significant events.

(With a little experimentation you will find how much runoff with the lower Ks is required to give runoff with Ks = 20.2 mm/hr) Note - During winter months there isn't much change - 16.35 → 20.2

Show computed runoff (in red) on sheets on clipboard

Use KINEROS2.

(Many will be zero)

2. Enter runoff amounts in ProStat sheet

B:\AVSO_2HI.PDW - see printout

3. Run the Solitario Canyon model

(Parameter Files:

E:\CONSULT\SWRI\SOL97\

SJ_OCHI.PAR	July-Oct
SOLNCHI.PAR	Nov.
SM-JCHI.PAR	May-June

I have run PAUL87 + PNOV89

	ro	ChanF	
PAUG4	2.35	1.35 mm	(storage > 1mm)
PMAY 50			
PAUG54			
PAUG60			

Our 64

CNWRA Solitario Canyon	Effect of increased Ks	DAW 5/22/97	2/

Solitario Canyon Model – Runs with Ks = 20.2 mm/hr
2nd 50 yr. Simulation

648

Channel	Area (Km^2)	Peak Rate (mm/hr) PNOV 89 T=10.75	PJUL 87 T=25.5
45	1.23	2.74	12.5 — DAW
71	2.18	2.46	11.7
115	3.55	2.08	9.9
254	8.91	0.92	4.7
284	10.72	0.71	3.75

50L97

SNCHI89.OUT SJ_OHI87.OUT

Runs made with KINEROS2

Parameter files created from seasonal-C files by changing KS to 20.2 mm/hr

With this change, the storm PNOV 89 (approx recurrence interval = 12.75) leads to peak rates that are all lower than the peak rates estimated from 15 yr peak stage measurements. T ≈ 15 - 16 yrs. The storm PJUL 87 (T = 17 yrs) led to peak rates that are greater than the max. stage data

sheet D:\PSIPLOT\QDVSAREA.PSD

Note: PNOV 89 now has T of 10.75 yrs for vol - avg Plane } DAW 6/4/97
PNOV 87 " " " 25.5 " " " "

No. 5505 Engineer's Computation Pad

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Consider $T = 17$ yrs $\quad 1 - F(x) = 0.0588$

$F(x) = P\{G \le x\} = 0.9412$

DAW

If we have a 15 yr period

$P\{N_e = 0\} = (0.9412)^{15} = 0.4029$

$P\{N_e = 1\} = (0.9412)^{14}(.0588)(15) = 0.3776$

$P\{N_e = 2\} = (0.9412)^{13}(.0588)^2 \frac{15!}{2!\,13!} = \cancel{0.0148}\ 0.1651$

$P\{N_e = 3\} = (0.9412)^{12}(.0588)^3 (455) = 0.0447 \qquad 0.9903$

$P\{N_e = 4\} = (0.9412)^{11}(.0588)^4 (1365) = 0.0084$

If we have 6 independent stations

P of nonexceedence $= 0.4029$

P of exactly 1 exceedance $= 6(0.4029)^5(0.3776) = 0.0241$

P of 1 or more exceedances for 1 location

$= 6(0.4029)^5(1 - .4029) = 0.038$

Consider $T = 25.5$ years $\quad 1 - F(x) = 0.0392$

$F(x) = 0.9608$

$P\{N_e = 0\} = (0.9608)^{15} = 0.5489$

For 6 independent stations

$P\{N_e = 0\} = \binom{6}{0}(0.5489)^6 = \cancel{0.116}\ 0.0274$

$P\{N_e = 1\} = \binom{6}{1}(0.5489)^5(.4511)^1 = 0.1349$

$P\{N_e = 2\} = \binom{6}{2}(0.5489)^4(.4511)^2 = 0.2771$

$\frac{6!}{2!\,4!}$

$m = 6$

$\binom{m}{n} p^n (1-p)^{m-n}$

$\frac{15!}{2!\,13!}$

$\frac{15!}{3!\,12!}$

$15 \cdot 14 \cdot 13$

$3 \cdot 2 \cdot 1$

$\frac{6!}{4!\,2!}$

$\frac{15 \cdot 14 \cdot 13 \cdot 12}{4 \cdot 3 \cdot 2}$

$\frac{6!}{2!\,4!}$

No. 5505 Engineer's Computation Pad ALVIN

CNWRA
Solitario Canyon

Average Plane Runoff
High Ks
2nd 50 yrs.

DAW
JW 5/22/97

2

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Storm	Avg. Plane RO. ~~Channel F~~ High Ks (mm)	Av. Plane R.O. with Seasonal Ks (mm)
PAUG4	5.44	11.1
PAUG60		
PJUL87		
PNOV89		
PNOV62		
PAUG54		
PJUL17	0.88	4.41
PJUL7	0.10	3.73
PAUG18	0.46	3.70
PAUG39	0.41	3.64
PMAY50		
PAUG83		
PAUG46		

DAW

No. 5505 Engineer's Computation Pad
ALVIN

B:\AV50_2HI.PDW

Stormno	Dur	PDepth	Avrokhi	SOLRO	CHANF	C7
1.0000	40.0000	20.4000	0			
2.0000	41.0000	14.0000	0			
3.0000	39.0000	17.0000	0.07			
4.0000	64.0000	26.7000	5.4400	3.22 ~~3.44~~	1.56 ~~1.56~~	0.04
5.0000	216.0000	25.6000	0			
6.0000	35.0000	19.2000	0			
7.0000	18.0000	23.4000	0.1000			
8.0000	80.0000	21.3000	0			
9.0000	26.0000	13.0000	0			
10.0000	120.0000	14.3000	0.06			
11.0000	132.0000	15.2000	0			
12.0000	104.0000	23.9000	0			
13.0000	34.0000	13.7000	0			
14.0000	38.0000	18.3000	0			
15.0000	59.0000	19.3000	0			
16.0000	332.0000	15.2000	0			
17.0000	34.0000	16.3000	0.8800	0.26	0.39	0.12
18.0000	101.0000	16.5000	0.4600			
19.0000	69.0000	15.5000	0			
20.0000	60.0000	23.4000	0			
21.0000	66.0000	13.3000	0			
22.0000	120.0000	26.4000	0.28			
23.0000	156.0000	13.5000	0			
24.0000	55.0000	14.9000	0			
25.0000	295.0000	17.0000	0			
26.0000	124.0000	15.2000	0			
27.0000	41.0000	13.3000	0			
28.0000	48.0000	14.5000	0.37			
29.0000	234.0000	16.3000	0.01			
30.0000	223.0000	16.0000	0			
31.0000	480.0000	26.9000	0.04			
32.0000	49.0000	20.8000	0.23			
33.0000	123.0000	14.3000	0			
34.0000	480.0000	14.9000	0			
35.0000	480.0000	31.0000	0.09			
36.0000	181.0000	24.4000	0			
37.0000	100.0000	12.7000	0.14			
38.0000	480.0000	13.5000	0			
39.0000	126.0000	21.8000	0.4100			
40.0000	107.0000	13.7000	0			
41.0000	185.0000	20.6000	0.05			
42.0000	175.0000	13.0000	0			
43.0000	143.0000	13.2000	0.34			
44.0000	98.0000	18.8000	0			
45.0000	296.0000	26.4000	0.51			
46.0000	83.0000	13.7000	0.63	0.17	0.40	0.06
47.0000	415.0000	13.7000	0			
48.0000	93.0000	15.2000	0.10			
49.0000	208.0000	12.9000	0.06			
50.0000	480.0000	23.9000	3.17	0.77	0.34	0.03
51.0000	358.0000	16.0000	0.01			
52.0000	437.0000	27.2000	0			

DAW 652

B:\AV50_2HI.PDW

Stormno	Dur	PDepth	Avrokhi	SOLRO	CHANF	stor C7
53.0000	455.0000	18.8000	0			
54.0000	480.0000	18.5000	1.32	1.52	0.57	0.08
55.0000	234.0000	23.6000	0			
56.0000	480.0000	13.2000	0			
57.0000	154.0000	18.0000	0			
58.0000	68.0000	14.7000	0			
59.0000	333.0000	16.3000	0			
60.0000	253.0000	26.2000	2.58	1.21	0.91	0.10
61.0000	114.0000	17.5000	0			
62.0000	465.0000	26.5000	1.60	0.52	0.67	[illegible]
63.0000	91.0000	15.1000	0			
64.0000	175.0000	18.1000	0.01			
65.0000	91.0000	23.7000	0.08			
66.0000	480.0000	18.0000	0.33			
67.0000	387.0000	13.6000	0			
68.0000	218.0000	17.5000	0.08			
69.0000	222.0000	15.0000	0			
70.0000	480.0000	16.3000	0			
71.0000	174.0000	13.5000	0			
72.0000	221.0000	24.6000	0			
73.0000	480.0000	13.5000	0.09			
74.0000	480.0000	20.3000	0.07			
75.0000	446.0000	17.5000	0			
76.0000	347.0000	16.5000	0.06			
77.0000	480.0000	15.0000	0.38			
78.0000	360.0000	31.7000	0			
79.0000	480.0000	22.6000	0			
80.0000	480.0000	20.1000	0.06			
81.0000	480.0000	15.3000	0			
82.0000	256.0000	13.0000	0.23			
83.0000	356.0000	23.9000	0.28			
84.0000	223.0000	16.8000	0			
85.0000	402.0000	16.0000	0.05			
86.0000	480.0000	15.1000	0			
87.0000	480.0000	19.8000	4.37	2.32	1.34	0.19
88.0000	391.0000	14.2000	0.02			
89.0000	456.0000	25.4000	1.85	[illegible]	0.71	0.12
90.0000	480.0000	15.5000	0			
91.0000	480.0000	13.4000	~~1.71~~ 0.56			
92.0000	324.0000	12.8000	0			
93.0000	350.0000	14.7000	0			
94.0000	480.0000	17.5000	0			
95.0000	455.0000	24.6000	0			

[illegible] 0.1 mm

[illegible]

CNWRA Solitario Canyon	Effect of Increased K_s	DAW 6/4/97	1

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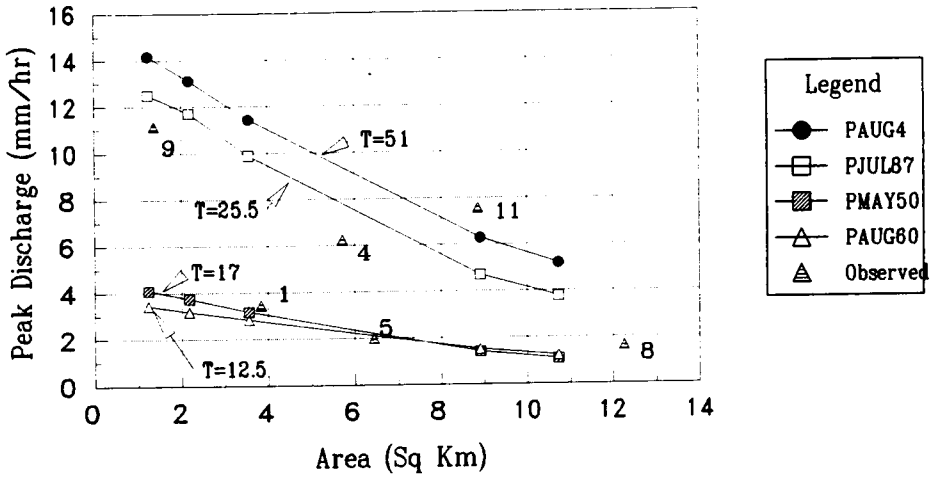
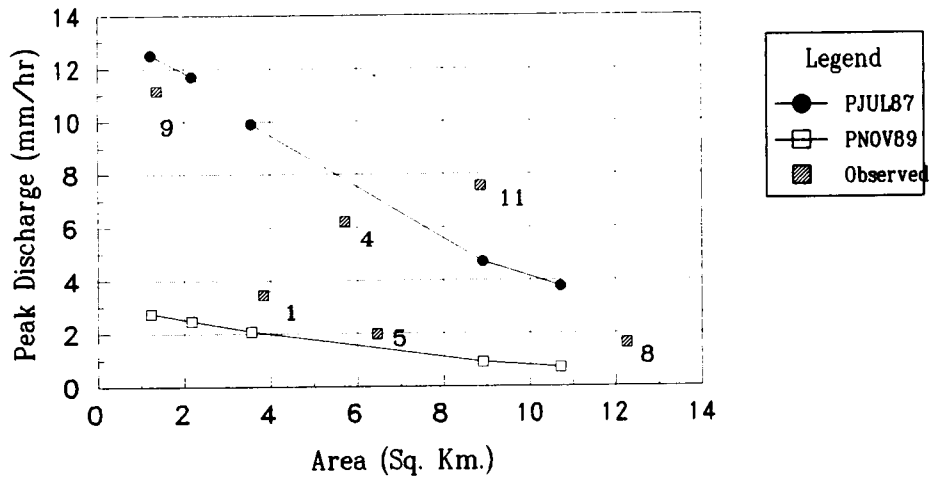
$K_s = 20.2$ DAW

Channel	Area (Km^2)	Peak Rate (mm/hr) T=17.75 PAUG60	T=17 PMAY50	T=51 PAUG4
45	1.73	3.43	4.07	14.17
71	2.18	3.18	3.73	13.12
115	3.55	2.85	3.18	11.42
254	8.91	T=17 1.50	T=17.75 1.39	6.29
284	10.72	1.21	1.07	5.20

File SM_JHI50.OUT

No. 5505 Engineer's Computation Pad
ALVIN


Peak Discharge (mm/hr)
Area (Sq Km)
T=51
T=25.5
T=17
T=12.5
9
11
4
1
5
8
Legend
PAUG4
PJUL87
PMAY50
PAUG60
Observed



Kp = 20.2 mm/hr 9: BVSAKHI.PSG — PSIPLOT
CHECK D:\PSIPLOT\BPVSAREA.PSS

1/2

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B:\A50_2HIR.PDW

Stormno	Dur	PDepth	Avrokhi	C5	C6	C7
4.0000	64.0000	26.7000	5.4400			
87.0000	480.0000	19.8000	4.3700			
60.0000	253.0000	26.2000	2.5800			
50.0000	480.0000	23.9000	2.1700			
89.0000	456.0000	25.4000	1.8500			
62.0000	465.0000	26.5000	1.6000			
54.0000	480.0000	18.5000	1.3200			
17.0000	34.0000	16.3000	0.8800			
46.0000	83.0000	13.7000	0.6300			
45.0000	296.0000	26.4000	0.5100			
18.0000	101.0000	16.5000	0.4600			
39.0000	126.0000	21.8000	0.4100			
77.0000	480.0000	15.0000	0.3800			
28.0000	48.0000	14.5000	0.3700			
43.0000	143.0000	13.2000	0.3400			
66.0000	480.0000	18.0000	0.3300			
83.0000	356.0000	23.9000	0.2800			
22.0000	120.0000	26.4000	0.2800			
32.0000	49.0000	20.8000	0.2300			
82.0000	256.0000	13.0000	0.2300			
37.0000	100.0000	12.7000	0.1400			
48.0000	93.0000	15.2000	0.1000			
7.0000	18.0000	23.4000	0.1000			
35.0000	480.0000	31.0000	0.0900			
73.0000	480.0000	13.5000	0.0900			
65.0000	91.0000	23.7000	0.0800			
68.0000	218.0000	17.5000	0.0800			
74.0000	480.0000	20.3000	0.0700			
3.0000	39.0000	17.0000	0.0700			
76.0000	347.0000	16.5000	0.0600			
80.0000	480.0000	20.1000	0.0600			
10.0000	120.0000	14.3000	0.0600			
91.0000	480.0000	13.4000	0.0600			
49.0000	208.0000	12.9000	0.0600			
41.0000	185.0000	20.6000	0.0500			
85.0000	402.0000	16.0000	0.0500			
31.0000	480.0000	26.9000	0.0400			
88.0000	391.0000	14.2000	0.0300			
64.0000	175.0000	18.1000	0.0100			
51.0000	358.0000	16.0000	0.0100			
29.0000	234.0000	16.3000	0.0100			
55.0000	234.0000	23.6000	0.0000			
27.0000	41.0000	13.3000	0.0000			
53.0000	455.0000	18.8000	0.0000			
52.0000	437.0000	27.2000	0.0000			
12.0000	104.0000	23.9000	0.0000			
25.0000	295.0000	17.0000	0.0000			
6.0000	35.0000	19.2000	0.0000			
24.0000	55.0000	14.9000	0.0000			
47.0000	415.0000	13.7000	0.0000			
23.0000	156.0000	13.5000	0.0000			
44.0000	98.0000	18.8000	0.0000			

Days

— 75% 7 events

41 non-zero events

$\frac{7}{41} = 17\%$

23 events ≥ 0.10 mm

2/2

657

Daw

B:\A50_2HIR.PDW

Stormno	Dur	PDepth	Avrokhi	C5	C6	C7
81.0000	480.0000	15.3000	0.0000			
5.0000	216.0000	25.6000	0.0000			
78.0000	360.0000	31.7000	0.0000			
40.0000	107.0000	13.7000	0.0000			
84.0000	223.0000	16.8000	0.0000			
19.0000	69.0000	15.5000	0.0000			
21.0000	66.0000	13.3000	0.0000			
79.0000	480.0000	22.6000	0.0000			
86.0000	480.0000	15.1000	0.0000			
8.0000	80.0000	21.3000	0.0000			
20.0000	60.0000	23.4000	0.0000			
16.0000	332.0000	15.2000	0.0000			
38.0000	480.0000	13.5000	0.0000			
75.0000	446.0000	17.5000	0.0000			
15.0000	59.0000	19.3000	0.0000			
93.0000	350.0000	14.7000	0.0000			
14.0000	38.0000	18.3000	0.0000			
13.0000	34.0000	13.7000	0.0000			
26.0000	124.0000	15.2000	0.0000			
95.0000	455.0000	24.6000	0.0000			
11.0000	132.0000	15.2000	0.0000			
1.0000	40.0000	20.4000	0.0000			
33.0000	123.0000	14.3000	0.0000			
2.0000	41.0000	14.0000	0.0000			
67.0000	387.0000	13.6000	0.0000			
71.0000	174.0000	13.5000	0.0000			
92.0000	324.0000	12.8000	0.0000			
36.0000	181.0000	24.4000	0.0000			
72.0000	221.0000	24.6000	0.0000			
9.0000	26.0000	13.0000	0.0000			
63.0000	91.0000	15.1000	0.0000			
94.0000	480.0000	17.5000	0.0000			
34.0000	480.0000	14.9000	0.0000			
90.0000	480.0000	15.5000	0.0000			
42.0000	175.0000	13.0000	0.0000			
70.0000	480.0000	16.3000	0.0000			
69.0000	222.0000	15.0000	0.0000			
57.0000	154.0000	18.0000	0.0000			
30.0000	223.0000	16.0000	0.0000			
61.0000	114.0000	17.5000	0.0000			
59.0000	333.0000	16.3000	0.0000			
56.0000	480.0000	13.2000	0.0000			
58.0000	68.0000	14.7000	0.0000			

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```
==========================================================
            Power Function: y=ax^b

            Data File Name: B:\A50_2HIR.PDW

==========================================================

  Save Data
  Save Parameter
                    Independent:          Avrokhi
                      Dependent:            Solro
                  Weight factor:                0
                              a:       0.32973340
                              b:       1.35596365
                       Sum Sqrs:      0.018766170
  Covaraince Matrix
                       cvm[1,1]:       0.21308336
                       cvm[2,1]:      -0.16203187
                       cvm[2,2]:       0.25746540

  Goodness of Fit Statistics ...

                      __ C O D:       0.99737905
                      __ Corrl:       0.99868867
                      __ M S C:       5.49977415

  Parameter Statistics
   __ 95 % Confidence Intervals


                   Parameter a:       0.32973340
                        StdDev:      0.023900862
   __ Uninvariant ...

                           LOW:       0.27321684
                          HIGH:       0.38624995
  Supporting Plane:

                           LOW:       0.25616365
                          HIGH:       0.40330314
                   Parameter b:       1.35596365
                        StdDev:      0.026272309
   __ Uninvariant ...

                           LOW:       1.29383951
                          HIGH:       1.41808779
  Supporting Plane:

                           LOW:       1.27509431
                          HIGH:       1.43683299


  ========================================================

      (c) Poly Software International
```

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DAW

==========

Power Function: y=ax^b

Data File Name: B:\A50_2HIR.PDW

==========

Save Data
Save Parameter

Independent:	Avrokhi
Dependent:	Chaninf
Weight factor:	0
a:	0.48217540
b:	0.68786045
Sum Sqrs:	0.036503956

Covaraince Matrix

cvm[1,1]:	0.21308336
cvm[2,1]:	-0.16203187
cvm[2,2]:	0.25746540

Goodness of Fit Statistics ...

__ C O D:	0.98052327
__ Corrl:	0.99021375
__ M S C:	3.49409044

Parameter Statistics
_ 95 % Confidence Intervals

Parameter a:	0.48217540
StdDev:	0.033334636

__ Uninvariant ...

LOW:	0.40335152
HIGH:	0.56099929

Supporting Plane:

LOW:	0.37956737
HIGH:	0.58478344
Parameter b:	0.68786045
StdDev:	0.036642102

__ Uninvariant ...

LOW:	0.60121565
HIGH:	0.77450525

Supporting Plane:

LOW:	0.57507163
HIGH:	0.80064927

==========

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6/5/97

Relation between ap plane P.C

1/2

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Daw

==========

Descriptive Statistics Report

Data File Name: B:\A50_2HIR.PDW

==========

COLUMN NAME:	CHANINF
Number of rows:	9
Number of valid points:	9
Number of missing points:	0
Number of negative values:	0
Number of positive values:	9
Number of zero values:	0
Minimum value:	0.39000000
Maximum value:	1.60000000
Inter range value:	1.21000000
Median:	0.71000000
Sum of row value:	7.43000000
Sum of absolute value:	7.43000000
Arithmetric mean:	0.82555556
Geometric mean:	0.74337624
Quadratic mean:	0.91161030
Harmonic mean:	0.67263958
Absolute mean:	0.82555556
Sum of squares:	7.47930000
Variance:	0.16817778
Standard deviation:	0.41009484
Absolute deviation:	0.30839506
Standard error:	0.13669828

95 percent confidence interval:
□ □ [0.51032877, 1.14078235]

99 percent confidence interval:
□ □ [0.36687986, 1.28423125]

Coefficient of variance:	49.67501426
Skewness:	0.97764436
Coefficient of skewness:	-0.18888889
Kurtosis:	0.19806651
Coefficient of Kurtosis:	3.19806651

Percentiles:

10 percentile:	0.39100000
25 percentile:	0.44250000
50 percentile:	0.69000000
75 percentile:	0.89250000
90 percentile:	1.57400000

Quartiles:

First quartile:	0.44250000
Second quartile:	0.69000000

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DAW

Third quartile:	0.89250000
Inter quartile:	0.45000000
COLUMN NAME:	CALSRO
Number of rows:	95
Number of valid points:	95
Number of missing points:	0
Number of negative values:	0
Number of positive values:	41
Number of zero values:	54
Minimum value:	0
Maximum value:	3.30315112
Inter range value:	3.30315112
Median:	0
Sum of row value:	11.26732995
Sum of absolute value:	11.26732995
Arithmetric mean:	0.11860347
Geometric mean:	0
Quadratic mean:	0.46617036
Harmonic mean:	0
Absolute mean:	0.11860347
Sum of squares:	20.64490642
Variance:	0.20541023
Standard deviation:	0.45322206
Absolute deviation:	0.19299965
Standard error:	0.046499602

÷ 50 = 0.22 mm/yr

Calculated Criteria Pounds

95 percent confidence interval:
[0.026277423, 0.21092952]

99 percent confidence interval:
[-0.0036508741, 0.24085782]

Coefficient of variance:	382.13219690
Skewness:	5.50454777
Coefficient of skewness:	1.00000000
Kurtosis:	33.07590455
Coefficient of Kurtosis:	36.07590455

Percentiles:

10 percentile:	0
25 percentile:	0
50 percentile:	0
75 percentile:	0.012481988
90 percentile:	0.13034238

Quartiles:

First quartile:	0
Second quartile:	0
Third quartile:	0.012481988
Inter quartile:	0.012481988

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Descriptive Statistics Report

Data File Name: B:\A50_2HIR.PDW

COLUMN NAME:	CHANINF
Number of rows:	9
Number of valid points:	9
Number of missing points:	0
Number of negative values:	0
Number of positive values:	9
Number of zero values:	0
Minimum value:	0.39000000
Maximum value:	1.60000000
Inter range value:	1.21000000
Median:	0.71000000
Sum of row value:	7.43000000
Sum of absolute value:	7.43000000
Arithmetric mean:	0.82555556
Geometric mean:	0.74337624
Quadratic mean:	0.91161030
Harmonic mean:	0.67263958
Absolute mean:	0.82555556
Sum of squares:	7.47930000
Variance:	0.16817778
Standard deviation:	0.41009484
Absolute deviation:	0.30839506
Standard error:	0.13669828

- 7.43 ÷ 50 = 0.15 mm/yr

95 percent confidence interval:
[0.51032877, 1.14078235]

99 percent confidence interval:
[0.36687986, 1.28423125]

Coefficient of variance:	49.67501426
Skewness:	0.97764436
Coefficient of skewness:	-0.18888889
Kurtosis:	0.19806651
Coefficient of Kurtosis:	3.19806651

Percentiles:

10 percentile:	0.39100000
25 percentile:	0.44250000
50 percentile:	0.69000000
75 percentile:	0.89250000
90 percentile:	1.57400000

Quartiles:

First quartile:	0.44250000
Second quartile:	0.69000000

Calculation of Channel F 6/5/97

Third quartile:	0.89250000
Inter quartile:	0.45000000
COLUMN NAME:	CALINF
Number of rows:	95
Number of valid points:	95
Number of missing points:	0
Number of negative values:	0
Number of positive values:	41
Number of zero values:	54
Minimum value:	0
Maximum value:	1.54548759
Inter range value:	1.54548759
Median:	0
Sum of row value:	11.40140649
Sum of absolute value:	11.40140649
Arithmetic mean:	0.12001481
Geometric mean:	0
Quadratic mean:	0.29111893
Harmonic mean:	0
Absolute mean:	0.12001481
Sum of squares:	8.05127211
Variance:	0.071095048
Standard deviation:	0.26663655
Absolute deviation:	0.15889600
Standard error:	0.027356333

2nd 50 Hi KS

11.40 / 50 = 0.23 mm/yr

Calculated Channel

KS = [illegible] mm/h

2nd 50 yrs

95 percent confidence interval:
[0.065698166, 0.17433144]

99 percent confidence interval:
[0.048090951, 0.19193866]

Coefficient of variance:	222.16971200
Skewness:	3.43721440
Coefficient of skewness:	1.00000000
Kurtosis:	13.13725609
Coefficient of Kurtosis:	16.13725609

Percentiles:

10 percentile:	0
25 percentile:	0
50 percentile:	0
75 percentile:	0.091975141
90 percentile:	0.30123022

Quartiles:

First quartile:	0
Second quartile:	0
Third quartile:	0.091975141
Inter quartile:	0.091975141

DAW 6/4/96

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Descriptive Statistics Report Ks = 20.7 mm/hr Average Plane

Data File Name: B:\A50_2HIR.PDW — ordered data

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DAW

COLUMN NAME:	AVROKHI
Number of rows:	95
Number of valid points:	95
Number of missing points:	0
Number of negative values:	0
Number of positive values:	41
Number of zero values:	54
Minimum value:	0
Maximum value:	5.44000000
Inter range value:	5.44000000
Median:	0
Sum of row value:	25.98000000
Sum of absolute value:	25.98000000
Arithmetic mean:	0.27347368
Geometric mean:	0
Quadratic mean:	0.86123779
Harmonic mean:	0
Absolute mean:	0.27347368
Sum of squares:	70.46440000
Variance:	0.67403781
Standard deviation:	0.82099805
Absolute deviation:	0.40584155
Standard error:	0.084232623

T=1.99 yrs

T=2.79 yrs

95 percent confidence interval:
□ □ [0.10622784, 0.44071953]

99 percent confidence interval:
□ □ [0.052013630, 0.49493374]

Coefficient of variance:	300.21098983
Skewness:	4.55838297
Coefficient of skewness:	1.00000000
Kurtosis:	23.01781596
Coefficient of Kurtosis:	26.01781596

Percentiles:

10 percentile:	0
25 percentile:	0
50 percentile:	0
75 percentile:	0.090000000
90 percentile:	0.50500000

Quartiles:

First quartile:	0
Second quartile:	0

Third quartile: 0.090000000

Inter quartile: 0.090000000

==========

(c) Poly Software International

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DAW

A:\A50_2hir.pdw

Dep8	Param9	CALINF	Ind11	Dep12	Param13	CALSRO	Colu
1.5459	0.4822	1.5455	5.4400	3.2780	0.3297	3.3032	
1.3297	0.6879	1.3293	4.3700	2.4357	1.3560	2.4523	
0.9254		0.9251	2.5800	1.1921		1.1976	
0.8216		0.8213	2.1700	0.9427		0.9465	
0.7362		0.7359	1.8500	0.7593		0.7618	
0.6662		0.6660	1.6000	0.6237		0.6253	
0.5836		0.5834	1.3200	0.4805		0.4814	
0.4416		0.4414	0.8800	0.2773		0.2773	
0.3509		0.3508	0.6300	0.1762		0.1760	
		0.3033				0.1321	
		0.2825				0.1148	
		0.2610				0.0982	
		0.2477				0.0885	
		0.2432				0.0854	
		0.2295	8.144			0.0761	
		0.2248	8.36			0.0731	
		0.2008	8.57			0.0584	
		0.2008				0.0584	
		0.1754				0.0447	
		0.1754				0.0447	
		0.1246				0.0228	
		0.0989				0.0144	
		0.0989				0.0144	
		0.0920				0.0125	
		0.0920				0.0125	
		0.0848				0.0106	
		0.0848				0.0106	
		0.0774				0.0089	
		0.0774				0.0089	
		0.0696				0.0072	
		0.0696				0.0072	
		0.0696				0.0072	
		0.0696				0.0072	
		0.0696				0.0072	
		0.0614				0.0056	
		0.0614				0.0056	
		0.0527				0.0041	
		0.0432				0.0028	
		0.0203				0.0006	
		0.0203				0.0006	
		0.0203				0.0006	

8.55 = 75%

DAW 8/14/98

Daw

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Descriptive Statistics Report

Data File Name: A:\Avg50_2.pdw

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COLUMN NAME:	COLUMN27
Number of rows:	39
Number of valid points:	39
Number of missing points:	0
Number of negative values:	0
Number of positive values:	39
Number of zero values:	0
Minimum value:	0.017827301
Maximum value:	0.91002511
Inter range value:	0.89219780
Median:	0.11064576
Sum of row value:	6.68868842
Sum of absolute value:	6.68868842
Arithmetric mean:	0.17150483
Geometric mean:	0.10290809
Quadratic mean:	0.26256603
Harmonic mean:	0.064665179
Absolute mean:	0.17150483
Sum of squares:	2.68869591
Variance:	0.040567198
Standard deviation:	0.20141300
Absolute deviation:	0.13214872
Standard error:	0.032251893

95 percent confidence interval:
□ □ [0.10621429, 0.23679537]

99 percent confidence interval:
□ □ [0.084051966, 0.25895770]

Coefficient of variance:	117.43867663
Skewness:	2.44116885
Coefficient of skewness:	0.12216803
Kurtosis:	6.23953071
Coefficient of Kurtosis:	9.23953071

Percentiles:

10 percentile:	0.018964308
25 percentile:	0.041178669
50 percentile:	0.11064576
75 percentile:	0.19944835
90 percentile:	0.42083908

Quartiles:

First quartile:	0.041178669
Second quartile:	0.11064576

DAW

Third quartile:	0.19944835
Inter quartile:	0.15826968

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----Created by D. A. Woolhiser with ProStat
----Fri Aug 14 11:53:06 1998

==========

3rd 50 simulation

C:\consult\swri\THIRD50\S3rd50hi.pdw

DAW

ROSORT	CF	Column10	Σ
2.5100	0.9100	0.9100	
2.1600	0.8178	0.8178	1.728
1.2900	0.5666	0.5666	
0.8900	0.4351	0.4351	
0.5100	0.2927	0.2927	
0.4900	0.2845	0.2845	
0.4600	0.2720	0.2720	
0.4400	0.2635	0.2635	
0.3200	0.2101	0.2101	
0.3000	0.2006	0.2006	5.016 = 75%
0.2900	0.1959	0.1959	
0.2700	0.1861	0.1861	
0.2400	0.1712	0.1712	
0.2200	0.1609	0.1609	4.967
0.1800	0.1395	0.1395	5.10 — 14 events
0.1700	0.1339	0.1339	
0.1700	0.1339	0.1339	
0.1500	0.1225	0.1225	
0.1500	0.1225	0.1225	
0.1300	0.1106	0.1106	
0.1300	0.1106	0.1106	
0.0900	0.0852	0.0852	
0.0900	0.0852	0.0852	
0.0900	0.0852	0.0852	
0.0700	0.0712	0.0712	
0.0600	0.0638	0.0638	
0.0500	0.0561	0.0561	
0.0400	0.0478	0.0478	
0.0400	0.0478	0.0478	
0.0400	0.0478	0.0478	
0.0300	0.0390	0.0390	
0.0300	0.0390	0.0390	
0.0300	0.0390	0.0390	
0.0200	0.0292	0.0292	
0.0200	0.0292	0.0292	
0.0200	0.0292	0.0292	
0.0100	0.0178	0.0178	
0.0100	0.0178	0.0178	
0.0100	0.0178	0.0178	

DAW 8/14/98

DAW 8/14/98 75% = 9.165

C:\consult\swri\THIRD50\S3rd50hi.pdw DAW = 20.2

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FILE	API7	PRECIP	DUR	RUND	AVRO	AVROHI	ROSORT	Σ
A:\1NOV10A.PRE	0.00	27.94	106	600	7.96	2.1600	2.5100	~~4.6~~
A:\1NOV10B.PRE	27.94	25.65	480		0.02	0.0000	2.1600	4.67
A:\1NOV21A.PRE	0.00	16.26	480		0.01	0.0000	1.2900	5.96
A:\2APR8A.PRE	10.16	19.05	100		0.30	0.1800	0.8900	6.85
A:\2NOV20A.PRE	7.62	21.59	480		0.02	0.0000	0.5100	7.36
A:\2NOV21A.PRE	29.21	16.26	480		0.00	0.0000	0.4900	7.85
A:\4NOV21A.PRE	0.51	22.10	278		0.09	0.0000	0.4600	8.31
A:\5OCT24A.PRE	3.30	13.46	480		0.00	0.0000	0.4400	8.75
A:\5JAN3A.PRE	4.57	13.46	470		0.00	0.0000	0.3200	9.07
A:\6APR26A.PRE	1.27	16.00	480		0.00	0.0000	0.3000	9.37
A:\6NOV2A.PRE	2.79	17.53	480		0.14	0.0100	0.2900	
A:\6NOV4A.PRE	26.42	13.97	471		0.00	0.0000	0.2700	
A:\6FEB6A.PRE	15.49	18.54	408		0.00	0.0000	0.2400	
A:\7OCT15A.PRE	6.35	28.96	480		0.12	0.0000	0.2200	
A:\7FEB6A.PRE	11.43	19.30	360		0.03	0.0000	0.1800	
A:\8JUL18A.PRE	12.95	19.81	324		0.17	0.0200	0.1700	
A:\8AUG27A.PRE	0.00	14.22	42	600	1.76	0.2400	0.1700	
A:\8OCT24A.PRE	0.51	25.91	396		0.04	0.0000	0.1500	
A:\8JAN16A.PRE	7.62	13.21	229		0.01	0.0000	0.1500	
A:\9NOV10A.PRE	9.91	13.97	230		0.03	0.0000	0.1300	
A:\10OCT28A.PRE	5.59	26.16	167	700	0.50	0.0300	0.1300	
A:\10OCT30A.PRE	37.59	13.21	480		0.00	0.0000	0.0900	
A:\11JUL12A.PRE	0.00	14.22	292		0.01	0.0000	0.0900	
A:\11AUG4A.PRE	11.18	16.76	104	600	0.84	0.1500	0.0900	
A:\11SEP5A.PRE	9.14	37.34	175	600	6.03	0.3200	0.0700	
A:\11NOV7A.PRE	7.11	14.22	480		0.00	0.0000	0.0600	
A:\11JAN31A.PRE	0.76	16.26	480		0.00	0.0000	0.0500	
A:\12OCT16A.PRE	2.79	26.92	480		0.08	0.0000	0.0400	
A:\12OCT18A.PRE	31.24	13.46	342		0.00	0.0000	0.0400	
A:\12NOV23A.PRE	11.43	15.49	102	500	1.14	0.0900	0.0400	
A:\12DEC4A.PRE	8.89	14.73	480		0.00	0.0000	0.0300	
A:\12JAN31A.PRE	6.35	14.22	77		0.48	0.2900	0.0300	
A:\13DEC30A.PRE	26.42	12.70	236		0.04	0.0000	0.0300	
A:\13FEB17A.PRE	7.87	25.15	480		0.00	0.0000	0.0200	
A:\14OCT11A.PRE	3.56	26.67	218	700	2.14	0.1300	0.0200	
A:\14OCT12A.PRE	30.23	13.97	480		0.00	0.0000	0.0200	
A:\14NOV27A.PRE	0.00	15.75	480		0.05	0.0000	0.0100	
A:\14DEC25A.PRE	1.27	14.99	480		0.00	0.0000	0.0100	
A:\14FEB9A.PRE	11.94	23.62	480		0.10	0.0400	0.0100	
A:\15AUG19A.PRE	8.38	14.99	8	400	5.40	2.5100	0.0000	
A:\15JAN21A.PRE	11.43	18.80	480		0.00	0.0000	0.0000	

39 events
31 ≥ 0.10

9 gave 75%

C:\consult\swri\THIRD50\S3rd50hi.pdw

FILE	API7	PRECIP	DUR	RUND	AVRO	AVROHI	ROSORT
A:\16NOV12A.PRE	2.03	14.48	480		0.01	0.0000	0.0000
A:\16JAN21A.PRE	19.30	13.97	273		0.00	0.0000	0.0000
A:\18MAY14A.PRE	9.65	14.48	31	600	0.62	0.4900	0.0000
A:\19AUG21A.PRE	2.54	18.80	112	600	0.90	0.0900	0.0000
A:\19NOV27A.PRE	0.00	14.73	252		0.03	0.0000	0.0000
A:\19FEB15A.PRE	0.00	13.21	106		0.06	0.0400	0.0000
A:\20AUG3A.PRE	0.00	21.08	102	600	0.72	0.0400	0.0000
A:\20NOV3A.PRE	26.42	16.00	480		0.01	0.0000	0.0000
A:\20JAN29A.PRE	16.51	13.21	275		0.00	0.0000	0.0000
A:\21AUG18A.PRE	4.57	14.48	224		0.05	0.0000	0.0000
A:\21DEC16A.PRE	0.00	21.08	480		0.01	0.0000	0.0000
A:\21DEC30A.PRE	8.89	20.07	277		0.01	0.0000	0.0000
A:\21JAN29A.PRE	0.00	12.95	480		0.00	0.0000	0.0000
A:\22FEB17A.PRE	1.27	24.38	480		0.00	0.0000	0.0000
A:\23SEP12A.PRE	0.00	13.46	24	600	2.25	0.2700	0.0000
A:\24AUG21A.PRE	0.00	21.08	79	600	3.32	0.4600	0.0000
A:\24JAN2A.PRE	0.00	17.78	480		0.02	0.0000	0.0000
A:\25OCT3A.PRE	11.43	14.99	480		0.00	0.0000	0.0000
A:\27SEP12A.PRE	5.59	12.70	103		0.04	0.0000	0.0000
A:\27FEB19A.PRE	10.67	22.35	296		0.10	0.0900	0.0000
A:\28MAR23A.PRE	1.02	14.73	117		0.01	0.0000	0.0000
A:\28JUL24A.PRE	5.59	20.57	111	700	3.36	0.5100	0.0000
A:\28NOV11A.PRE	0.76	13.72	141		0.03	0.0000	0.0000
A:\29APR2A.PRE	0.00	16.51	480		0.03	0.0000	0.0000
A:\29OCT29A.PRE	0.00	15.49	480		0.00	0.0000	0.0000
A:\29NOV10A.PRE	0.00	42.67	480	700	1.14	0.0700	0.0000
A:\29NOV15A.PRE	69.85	20.83	480		0.00	0.0000	0.0000
A:\29NOV16A.PRE	90.68	20.57	480		0.00	0.0000	0.0000
A:\30SEP12A.PRE	0.00	14.99	259		0.01	0.0000	0.0000
A:\30OCT12A.PRE	0.00	16.26	79	600	0.62	0.0500	0.0000
A:\30JAN30A.PRE	20.57	13.97	480		0.00	0.0000	0.0000
A:\31MAY12A.PRE	0.00	16.00	80		0.28	0.2200	0.0000
A:\31AUG14A.PRE	6.60	16.00	37	600	4.18	1.2900	0.0000
A:\31JAN20A.PRE	8.64	16.51	70		0.40	0.1700	0.0000
A:\31FEB10A.PRE	35.31	19.30	167		0.05	0.0300	0.0000
A:\31FEB17A.PRE	28.70	15.75	460		0.00	0.0000	0.0000
A:\31FEB18A.PRE	25.65	16.51	480		0.00	0.0000	0.0000
A:\31FEB19A.PRE	38.61	15.49	373		0.00	0.0000	0.0000
A:\32JAN29A.PRE	13.46	12.95	67		0.05	0.0200	0.0000
A:\33MAR20A.PRE	2.79	14.22	356		0.00	0.0000	0.0000
A:\33MAY23A.PRE	0.00	14.73	22	600	1.03	0.8900	0.0000

C:\consult\swri\THIRD50\S3rd50hi.pdw

FILE	API7	PRECIP	DUR	RUND	AVRO	AVROHI	ROSORT
A:\33OCT14A.PRE	0.00	31.24	234	700	2.41	0.0600	0.0000
A:\33FEB9A.PRE	0.76	18.54	185		0.20	0.1300	0.0000
A:\34APR26A.PRE	2.29	23.37	480		0.00	0.0000	0.0000
A:\34SEP6A.PRE	1.78	13.21	83		0.11	0.0100	0.0000
A:\34NOV6A.PRE	26.16	14.73	480		0.00	0.0000	0.0000
A:\34JAN11A.PRE	13.21	16.26	480		0.00	0.0000	0.0000
A:\35FEB25A.PRE	1.78	12.95	148		0.01	0.0000	0.0000
A:\37AUG1A.PRE	10.67	17.02	74	600	0.84	0.1500	0.0000
A:\37JAN21A.PRE	23.11	15.75	480		0.01	0.0000	0.0000
A:\38SEP21A.PRE	5.84	32.77	400	700	0.61	0.0200	0.0000
A:\38NOV1A.PRE	15.49	13.21	480		0.00	0.0000	0.0000
A:\38DEC9A.PRE	0.00	22.86	480		0.02	0.0000	0.0000
A:\38FEB12A.PRE	1.78	13.97	480		0.00	0.0000	0.0000
A:\39JAN31A.PRE	0.00	12.95	480		0.00	0.0000	0.0000
A:\40JAN18A.PRE	3.56	15.24	286		0.00	0.0000	0.0000
A:\42SEP13A.PRE	0.00	19.56	78	600	2.24	0.3000	0.0000
A:\42OCT28A.PRE	14.73	14.73	480		0.01	0.0000	0.0000
A:\43JAN29A.PRE	2.54	26.67	480		0.06	0.0300	0.0000
A:\43FEB16A.PRE	0.00	16.76	111		0.21	0.1700	0.0000
A:\45SEP27A.PRE	0.51	14.48	126		0.14	0.0100	0.0000
A:\45JAN29A.PRE	0.00	15.49	480		0.00	0.0000	0.0000
A:\46OCT12A.PRE	6.60	13.21	304		0.02	0.0000	0.0000
A:\46FEB6A.PRE	0.00	12.95	99		0.03	0.0000	0.0000
A:\47JUL16A.PRE	8.13	14.99	24	600	3.01	0.4400	0.0000
A:\47OCT26A.PRE	0.00	21.34	345		0.03	0.0000	0.0000
A:\47FEB20A.PRE	15.75	20.57	426		0.04	0.0000	0.0000
A:\49MAR1A.PRE	6.86	18.54	480		0.00	0.0000	0.0000
A:\49NOV24A.PRE	21.08	22.35	480		0.05	0.0000	0.0000
A:\50OCT20A.PRE	28.45	18.54	409		0.03	0.0000	0.0000
A:\50OCT30A.PRE	0.00	12.95	480		0.00	0.0000	0.0000
A:\50FEB21A.PRE	16.76	25.91	480		0.00	0.0000	0.0000

Daus

ESTIMATES OF FLOW DURATION IN CHANNELS

A review of the output files shows that the discharge holds up for a long time at the mouth of the watershed. It appears that we must define a threshold flow to define event duration. There are 3 options for this flow

1) Constant unit discharge (mm/hr)
2) Constant absolute discharge m^3/sec
3) Constant % of channel wetted

DAW

Try the third:

$$P_e = \min.\left[h/(0.0856\sqrt{BW}),\ 1 \right] P$$

when less than the full wetted perimeter is effective:

$$P_e/P = \left[h/(0.0856\sqrt{BW}) \right] = 0.05 \text{ — Try } 5\%$$

$$h = (0.05)(0.0856\sqrt{BW}) = 0.0043\sqrt{BW} - 5\%$$
$$.0086\sqrt{BW} - 10\%$$

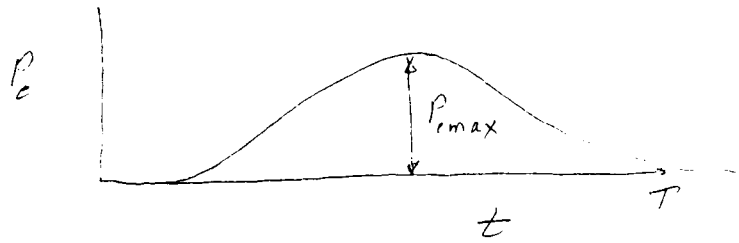
BW (m)	h (m) 5%	h (m) 10%
1	0.0043	0.0086
10	0.0136	0.0272
15	0.0167	0.0334
30	0.0236	0.0472
40	0.0272	0.0544

Try a few examples

Channel N_a	Slope	BW	n	Q (m^3/s)	Contrib. Area (km^2)	Q (mm/hr)	$h_{.05}$	$h_{.10}$	$h_{1.0}$
45	0.048	5.8	.0651	~~0.0062~~ 0.036 m^3/s	1.23	0.19	0.0104	0.0208	0.206
71	0.04	9.0	.0511	0.025	2.18	0.0413	0.0129		0.2564
115	0.04	14.7	.0511	0.0614	3.55	0.0623	0.0165		0.3264
254	0.03	9.5	.0511	0.0240	8.91	0.0096	0.0133		0.263
284	0.03	6.0	.0511	0.0104 0.0325	10.72	0.0034	0.0105	0.0210	0.2097

Another possibility is to calculate an average time of wetting for each event.

By running program CHANNEL.BAS we can calculate the effective wetted perimeter as a function of time for each event. DAW



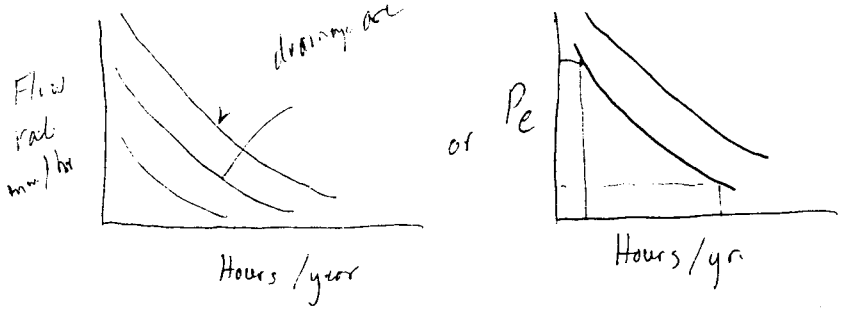
The average duration of flow is:

$$D_a = \int_0^T P_e(t)\,dt \Big/ P_{emax}$$

Procedure:

Modify program Channel.Bas to integrate P_e and divide by P_{max}

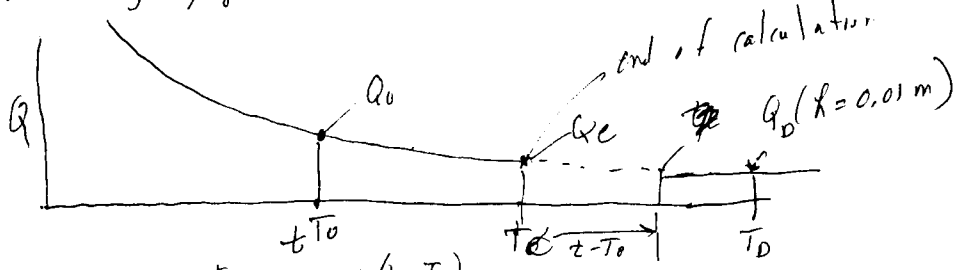
Discussion - This approach has some difficulties regarding interpretation. Perhaps a flow duration curve or a effective wetted perimeter duration curve would be as useful



DAW

Another alternative

If we assume that a depth of 1 cm = 0.01 m is effectively zero depth, given the bottom width, we can calculate the discharge for each channel that leads to this depth. Then we can fit an exponential decay through the recession hydrograph to estimate the added duration.



Assume: $Q(t) = Q_0 e^{-K(t_e - T_0)}$

$$\ln Q_e = \ln Q_0 - K(t_e - T_0)$$

$$K(t_e - T_0) = \ln Q_0 - \ln Q_e$$

$$K = \frac{\ln Q_0 - \ln Q_e}{t_e - T_0}$$ ← estimate K from known points

Calculate $Q_D = \frac{1}{n} h^{5/3} s^{1/2} \cdot BW = \frac{1}{n} (.01)^{5/3} s^{1/2} \cdot BW$

Given Q_D calculate T_D

$$T_D = T_e + \Delta T$$

$$Q_D = Q_e e^{-K(\Delta T)}$$

$$\ln Q_D = \ln Q_e - K \Delta T$$

$$\Delta T = \frac{\ln Q_e - \ln Q_D}{K}$$

$$D = T_e + \Delta T - T_B$$ where T_B = runoff start time

Create a Table for Channel 45 BW = 5.8 m., S = 0.048, n = .0651

$$Q_{h=0.01} = \frac{1}{.0651} (.01)^{5/3} (.048)^{1/2} 5.8 = 0.0096$$

.0101

Duration Calculations - Channel 45 DAW

677

Event	T_B (min)	Q_o	T_o	Q_c	T_c	ΔT	Duration	K
PAUG4	1	.00403	180	.00218	200			.039
PAUG60	2	.006341	180	.003629	200	9	17	.081
PJUL87	1	.001563	180	.000641	200			.446
PNOV89	11	.003682	220	.001952	240			.037

Engineer's Computation Pad

Duration Calculations - Channel 284

DAW 678

Event	T_B	Q_o	T_o	Q_c	T_c	ΔT	Dur	K
PAUG4	1	.19837 ~~.18~~ .18874	180 180	.13547 .12751	200 200	139	318 320	0.0191 K=0.01616
PAUG60	2	.2905	180	.19017	200	142	320	0.0242
PJUL87	2	.15902	180	.10923	200	130	~~130~~ 308 DAW	0.0188
PNOV 89	12	.19082	220	.13034	240	138	345	0.0191

7/14/87 The event PAUG4 was run for 320 minutes to see if the 2 point exponential fit is appropriate for estimating duration. For channel 284 the discharge $Q_{K=0.01}$ is 0.0094 m^3/sec (see below). Using a K of 0.0191 and the exponential decay a duration of 318 min was estimated. However, at 320 min. Q was 0.01616, so the flow is holding up longer than the exponential decay would predict.

Conclusion: Any procedure to estimate the duration of very low flows by extrapolation is probably subject to large errors

After several trials, it was decided to calculate an index duration based on the time the discharge was above 0.075 mm/hr. This rate is approximately 1/100 of the maximum calculated rates and ~~do~~ reflects a change in absolute discharge as basin size increases

$$Q_{K=0.01} = \frac{1}{.0511}(.01)^{5/3}(.03)^{1/2}\,6 = 20.337\,(.05)^{5/3} = 0.0094$$

Schlotan Canyon | Runoff > 0.075 mm/hr | 7/14/97

CHANNEL 45

Event	Time on Rise > 0.075 mm/hr	Time on Recession < 0.075 mm/hr	Duration minutes
PAUG4	3	108	105
PAUG60	7	125	118
PJUL 87	4	92	88
PNOV 89	38	146	108
PNOV 62	37	139	102
PAUG54	17	112	95
PJUL 17	4	105	99
PJUL 7 (2 peaks)	21	154	133
PAUG18	16	105	~~104~~ 99
PAUG 39	33 33	121 126*	88 93*
PMAY 50	13	103	90
PAUG 83	15	128	113
PAUG 46	11	99	88
PAUG 10	15	90	75
PAUG 73	46	122	76
PSEP 76	153	194	41
PAUG 91	45	114	69

DAW

* KINERZN

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Engineer's Computation Pad

CHANNEL 71

Event	TIME RISE	TIME RECESS	DUR
PAUG4	4	118	114
PAUG60	9	135	126
PJUL87	4	103	99
PNOV 89	40	155	115
PNOV 62	39	150	111
PAUG 54	19	121	102
PJUL 17	6	114	108
PJUL7	24	164	140
PAUG18	8	115	~~44~~ 107
PAUG39	35 ✓	132 136	97 101
PMAY 50	14	113	99
PAUG 83	17	140	123
PAUG 46	13	109	96
PAUG 10	19	100	81
PAUG 73	55	131	76
PSEP76	174	200	26
PAUG 91	54	123	69

DAW

680

Engineer's Computation Pad

> 0.075 mm/hr | 9AU 7/14 + 7/15 197

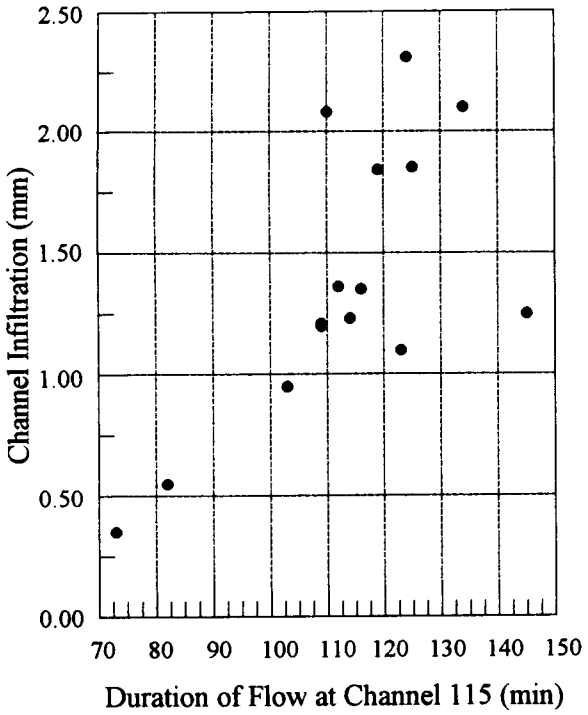
CHANNEL 115

DAW

681

Event	RISE	RECESSION	DUR (min)
PAUG4	5	129	124
PAUG60	12	146	134
PJUL87	6	116	110
PNOV89	42	167	125
PNOV62	42	161	119
PAUG54	21	133	112
PJUL17	10	126	116
PJUL7	30	175	145
PAUG18	11	125	~~124~~ 114
PAUG39	39 ✓	145 148	106 109
PMAY50	17	126	109
PAUG83	21	144	123
PAUG46	17	120	103
PAUG10	30	112	82
PAUG73	68	141	73
PSEP76			0 — predicted = 63 min
PAUG91	68	133	65

Engineer's Computation Pad


2.50
2.00
1.50
1.00
0.50
0.00
Channel Infiltration (mm)
70
80
90
100
110
120
130
140
150
Duration of Flow at Channel 115 (min)

Dan

```
==========================================================
          Power Function: y=ax^b

          Data File Name: B:\AVG50_2.PDW

==========================================================

Save Data
                  Independent:          Dur115
                    Dependent:        ChannelF
                Weight factor:               0
                            a:   0.00001350510
                            b:      2.42487165
                     Sum Sqrs:      1.11540584
Covaraince Matrix
                     cvm[1,1]:     52.46836760
                     cvm[2,1]:    -11.11180982
                     cvm[2,2]:      2.35626545

Goodness of Fit Statistics ...

                     __ C O D:      0.69109872
                     __ Corrl:      0.83132348
                     __ M S C:      0.90806687

Parameter Statistics
__ 95 % Confidence Intervals


                  Parameter a:   0.00001350510
                       StdDev:      2.12174681
__ Uninvariant ...

                          LOW:     -4.58374174
                         HIGH:      4.58376875
Supporting Plane:

                          LOW:     -5.85352045
                         HIGH:      5.85354746
                  Parameter b:      2.42487165
                       StdDev:      0.44963166
__ Uninvariant ...

                          LOW:      1.45350150
                         HIGH:      3.39624179
Supporting Plane:

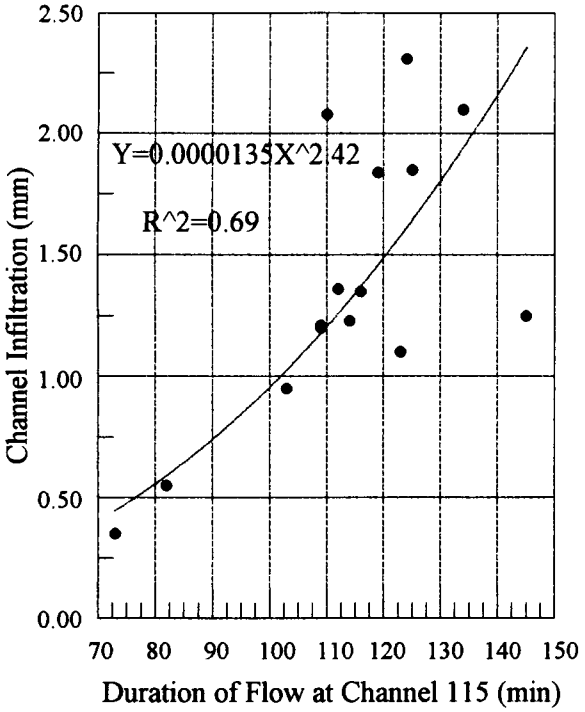
                          LOW:      1.18441533
                         HIGH:      3.66532796


==========================================================

    (c) Poly Software International

==========================================================
```

DAW


Y=0.0000135X^2.42
R^2=0.69
Channel Infiltration (mm)
2.50
2.00
1.50
1.00
0.50
0.00
70
80
90
100
110
120
130
140
150
Duration of Flow at Channel 115 (min)

Dan 7/10/97

Dan

```
==========================================================
          Power Function: y=ax^b

          Data File Name: B:\AVG50_2.PDW
==========================================================

Save Data
                   Independent:        ChannelF
                     Dependent:          Dur115
                Weight factor:               0
                            a:     104.82875611
                            b:       0.28500425
                     Sum Sqrs:       0.13109783
Covaraince Matrix
                     cvm[1,1]:      0.080426719
                     cvm[2,1]:     -0.061731019
                     cvm[2,2]:       0.27694070

Goodness of Fit Statistics ...

                     __ C O D:       0.69109872
                     __ Corrl:       0.83132348
                     __ M S C:       0.90806687

Parameter Statistics
__ 95 % Confidence Intervals


                  Parameter a:     104.82875611
                       StdDev:      0.028479099
__ Uninvariant ...

                          LOW:     104.76723075
                         HIGH:     104.89028146
Supporting Plane:

                          LOW:     104.75018718
                         HIGH:     104.90732503
                  Parameter b:       0.28500425
                       StdDev:      0.052846894
__ Uninvariant ...

                          LOW:       0.17083548
                         HIGH:       0.39917302
Supporting Plane:

                          LOW:       0.13920877
                         HIGH:       0.43079973


==========================================================

    (c) Poly Software International

==========================================================
```

EPS 7/11/97

DAW

==========

Power Function: y=ax^b

Data File Name: B:\AVG50_2.PDW

==========

Independent:	CALCULATEDF	
Dependent:	Dur115	Regression with
Weight factor:	0	7 additional runs)
a:	103.30778393	
b:	0.31650310	
Sum Sqrs:	0.17619697	PAVG73 + PAVG91

Covaraince Matrix

cvm[1,1]:	0.066252218
cvm[2,1]:	-0.026806671
cvm[2,2]:	0.19151276

Goodness of Fit Statistics ...

__ C O D:	0.74802549
__ Corrl:	0.86488467
__ M S C:	1.12842735

Parameter Statistics
__ 95 % Confidence Intervals

Parameter a:	103.30778393
StdDev:	0.028875892

__ Uninvariant ...

LOW:	103.24585131
HIGH:	103.36971656

Supporting Plane:

LOW:	103.22882126
HIGH:	103.38674661
Parameter b:	0.31650310
StdDev:	0.049094638

__ Uninvariant ...

LOW:	0.21120558
HIGH:	0.42180063

Supporting Plane:

LOW:	0.18225118
HIGH:	0.45075502

==========

(c) Poly Software International

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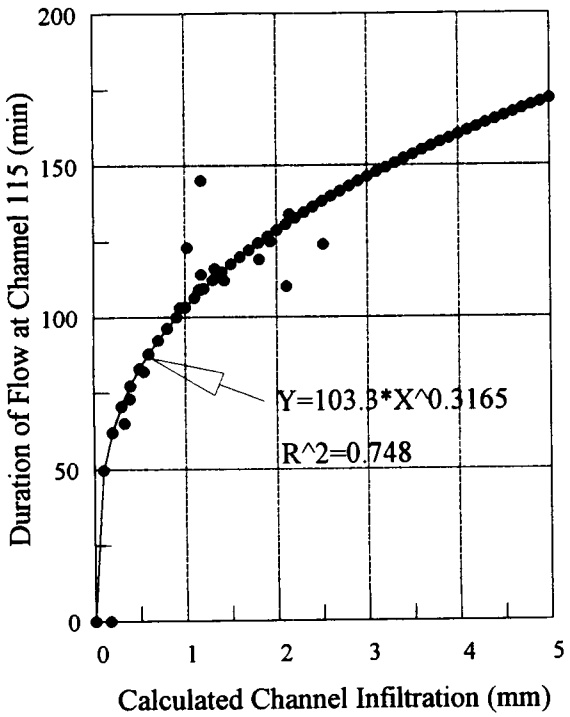
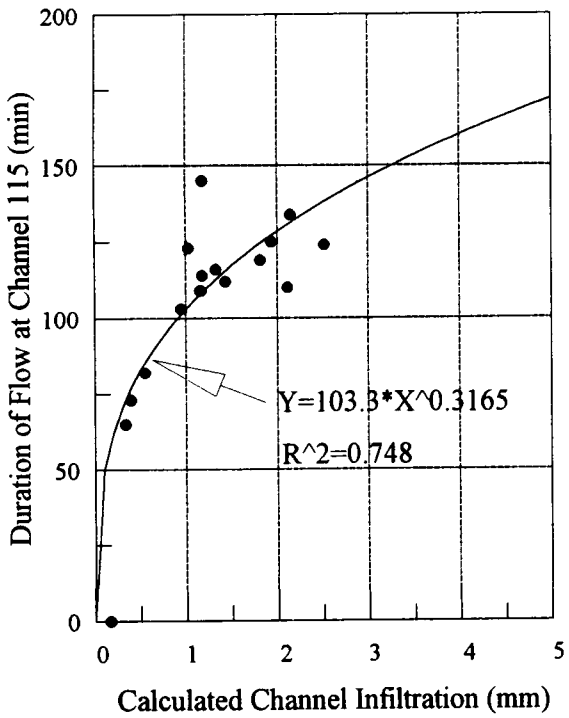

200
150
100
50
0
0
1
2
3
4
5
Duration of Flow at Channel 115 (min)
Calculated Channel Infiltration (mm)
Y=103.3*X^0.3165
R^2=0.748

Daus


200
150
100
50
0
0
1
2
3
4
5
Duration of Flow at Channel 115 (min)
Calculated Channel Infiltration (mm)
Y=103.3*X^0.3165
R^2=0.748

Dan 7/16/97

DAW

==========

Descriptive Statistics Report

Data File Name: B:\AVG50_2.PDW

==========

COLUMN NAME:	COLUMN28
Number of rows:	95
Number of valid points:	95
Number of missing points:	0
Number of negative values:	0
Number of positive values:	81
Number of zero values:	14
Minimum value:	0
Maximum value:	138.28499623
Inter range value:	138.28499623
Median:	42.20093011
Sum of row value:	4920.30296666
Sum of absolute value:	4920.30296666
Arithmetric mean:	51.79266281
Geometric mean:	0
Quadratic mean:	63.17988940
Harmonic mean:	0
Absolute mean:	51.79266281
Sum of squares:	379211.350396
Variance:	1323.14636102
Standard deviation:	36.37507885
Absolute deviation:	29.31609505
Standard error:	3.73200435

← Calculated Duration based upon regression with 2 more Solitario Canyon runs PAVC73 + PAVC91

÷50 = 98 min/yr

> 0.075 mm/hr.

95 percent confidence interval:
[44.38268070, 59.20264492]

99 percent confidence interval:
[41.98067011, 61.60465551]

Coefficient of variance:	70.23210794
Skewness:	0.50510506
Coefficient of skewness:	0.46301410
Kurtosis:	-0.44654940
Coefficient of Kurtosis:	2.55345060

Percentiles:

10 percentile:	0
25 percentile:	29.63264650
50 percentile:	42.20093011
75 percentile:	76.44312594
90 percentile:	108.21679585

Quartiles:

First quartile:	29.63264650
Second quartile:	42.20093011

Date 7/14/97

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Descriptive Statistics Report

Data File Name: B:\AVG50_2.PDW

DMW

COLUMN NAME:	CALCULATEDD — calculated flow duration in min.
Number of rows:	95
Number of valid points:	95
Number of missing points:	0
Number of negative values:	0
Number of positive values:	81
Number of zero values:	14
Minimum value:	0
Maximum value:	136.27888909
Inter range value:	136.27888909
Median:	46.80330900
Sum of row value:	5202.42835468 ← 104 min/yr.
Sum of absolute value:	5202.42835468
Arithmetic mean:	54.76240373
Geometric mean:	0
Quadratic mean:	65.46402152
Harmonic mean:	0
Absolute mean:	54.76240373
Sum of squares:	407126.120847
Variance:	1300.30466908
Standard deviation:	36.05973751
Absolute deviation:	28.85928831
Standard error:	3.69965101

95 percent confidence interval:
□ □ [47.41665994, 62.10814753]

99 percent confidence interval:
□ □ [45.03547276, 64.48933471]

Coefficient of variance:	65.84761634
Skewness:	0.32650289
Coefficient of skewness:	0.44357079
Kurtosis:	-0.52972709
Coefficient of Kurtosis:	2.47027291

Percentiles:

10 percentile:	0
25 percentile:	34.04139594
50 percentile:	46.80330900
75 percentile:	79.91214781
90 percentile:	109.28127607

Quartiles:

First quartile:	34.04139594
Second quartile:	46.80330900

> 0.075 mm/hr | 8AM 7/14 7/15/97

CHANNEL 254

691

Event	RISE (min)	RECES (min)	DUR (min)
DAUG ~~40~~	8	168	160
DAUG60	15	186	171
DJUL87	8	157	149
DNOV89	~~6~~ 46	~~163~~ 206	~~157~~ 160
DAUG62	45	201	156
DAUG54	25	172	147
DJUL17	14	164	150
DJUL7	31	213	182
DAUG18	15	163	148
DAUG39	42	192	150
DMAY50	21	164	143
DAUG83	24	173	149
DAUG46	20	158	138
DAUG10	28	151	123
DAUG73	< 0.075		0
DAUG91	128	167	39

DAW

opd 250 → 320

Engineer's Computation Pad

> 0.075 mm/hr | Dan 7/14 + 7/15/97 | 7

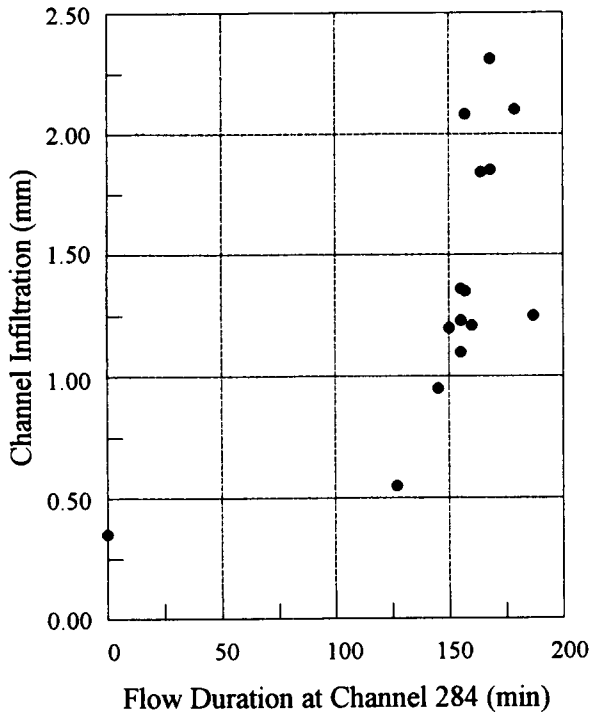
CHANNEL 284

692

DAW

Event	RISE (min)	RECESS (min)	DUR (min)
PAUG 4	6	174	168
PAUG 60	13	192	179
PJUL 87	6	163	157
PJUL 89	44	212	168
PNOV 62	43	207	164
PAUG 54	23	178	155
PJUL 17	13	170	157
PJUL 7	32	219	187
PAUG 18	14	169	155
PAUG 39	40	200	160
PMAY 50	20	170	150
PAUG 83	23	178	155
PAUG 46	19	164	145
PAUG 10	30	157	127
PAUG 73		< 0.075	0
PAUG 91	151	172	21

ALVIN Engineer's Computation Pad


2.50
2.00
1.50
1.00
0.50
0.00
Channel Infiltration (mm)
0
50
100
150
200
Flow Duration at Channel 284 (min)

DAW

```
==========================================================
          Power Function: y=ax^b

          Data File Name: B:\AVG50_2.PDW

==========================================================

Save Data
                 Independent:          Dur284  - Duration of flow (min)
                   Dependent:        ChannelF    in channel 284
              Weight factor:               0
                          a:   0.00000029181
                          b:      3.03252388
                    Sum Sqrs:      0.84633871
Covaraince Matrix
                    cvm[1,1]:    229.37908233
                    cvm[2,1]:    -45.26928836
                    cvm[2,2]:      8.93693880

Goodness of Fit Statistics ...

                   __ C O D:      0.54870333
                   __ Corrl:      0.74074512
                   __ M S C:      0.50991607

Parameter Statistics
__ 95 % Confidence Intervals


                Parameter a:   0.00000029181
                     StdDev:      4.02215112
__ Uninvariant ...

                       LOW:     -8.76351406
                      HIGH:      8.76351465
Supporting Plane:

                       LOW:    -11.21205741
                      HIGH:     11.21205800
                Parameter b:      3.03252388
                     StdDev:      0.79391841
__ Uninvariant ...

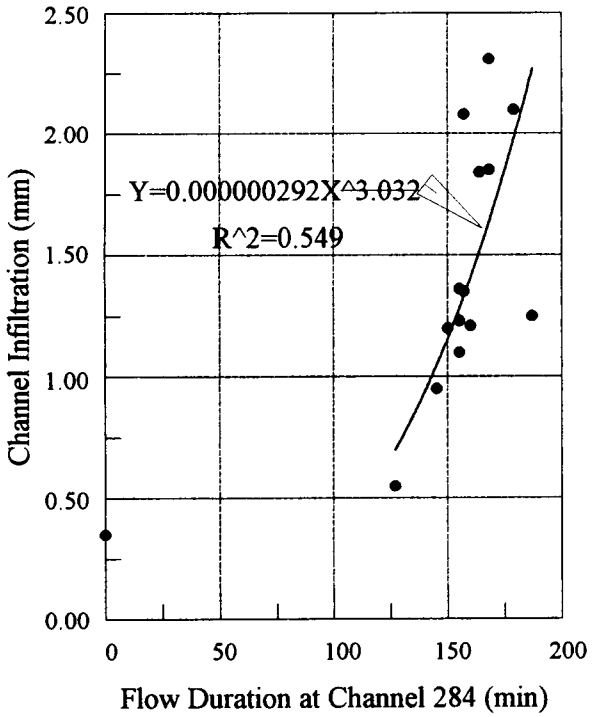
                       LOW:      1.30272429
                      HIGH:      4.76232346
Supporting Plane:

                       LOW:      0.81941484
                      HIGH:      5.24563291


==========================================================

    (c) Poly Software International

==========================================================
```


2.50
2.00
1.50
1.00
0.50
0.00
Channel Infiltration (mm)
Y=0.000000292X^3.032
R^2=0.549
0
50
100
150
200
Flow Duration at Channel 284 (min)

The durations of runoff > 0.075 mm/hr were entered into the PROSTAT file AVE50-2.PDW and plots and regressions were made between:

* 1. Total Channel Infiltration vs. Duration at 284
2. Vol. of runoff v.s. Duration at 284 — DAW
* 3. Total Channel Infiltration vs. Duration at 115
4. Vol. of runoff vs Duration at 115

* Completed 7/15/97

It is clear that the relationship between total channel infiltration (over the watershed) and duration of flow shows much more scatter than the relationship between channel infiltration and total runoff from the average plane. This is probably due to the fact that total channel infiltration is related to the magnitude of the event because at greater infiltrating areas when flow rates are high. Because there isn't a good relationship between duration of flow and flow volume ~~rate~~ and peak rates, flow duration above a low threshold is not very useful. The long tails on the recession are also probably an artifact due to the method used in FINERIS to reduce the effective infiltrating area.

In order to estimate the total time in a 50 yr period that the flow is above 0.075 mm/hr., a regression relationship between duration and channel infiltration was developed for Channel 115. The relationship is:

$$\text{Duration} = 104.8 * \text{ChannelF}^{0.285} \qquad R^2 = 0.69$$

This relationship was used along with the <u>Calculated</u> channel infiltration to calculate the duration for all storms. PROSTAT was used to calculate the functional relationship and the sum of the calculated durations was 5202 minutes or an average of 104 min/yr. This relationship was checked by running storm PSEP76 - resulting in duration = 0. The calculated duration for this storm was 56 minutes, so the above relation is obviously biased at the smaller ChannelF. Consequently another storm was run PAUG91

7/18/97 With the two added storms, the regression relation is

$$\text{Duration} = 103.3 * \text{ChannelF}^{0.3165} \qquad R^2 = 0.748$$

When this relationship was used to calculate durations for all runoff events based upon the calculated Channel E, the sum of the calculated durations was 4920 minutes or 98 min/yr. ← DUR

At a discharge of 0.075 mm/yr. for channel 115 ~~DAW~~ the absolute discharge is 0.074 m^3/sec

(for an area of 3.55 km^2, 1mm/hr = 0.986 m^3/sec)

For the parameters for 115

$S = 0.04$, $BW = 14.7$, $n = 0.0511$, $R = 0.0184$ m.

and $\frac{P_e}{P} = \left[R / (0.0856\sqrt{14.7}) \right] = 0.0561$

Thus $P_e = 0.82$ m ← effective wetted width

Check for reasonableness

The channel sat. hydraul cond. is 91 mm/hr. ← Highest used

∴ the average annual infiltration is approximately

$91 \times \frac{98}{60} = 148.6$ mm/yr for the area below 0.82m effective width.

The total channel area is 1.48% of the basin area

If 0.075 mm/hr represents 5.61% of the channel area then the channel infiltration in this portion is

$(0.056)(0.0148)\,148.6 = 0.1232$ mm/yr (over the entire basin)

This is the right order of magnitude

One must keep in mind that the highest rates of infiltration occur during high flow rates which, for this size watershed, are usually summer storms. Winter runoff is likely to be more prolonged (ie the Pagany Wash runoff of 3/11/95 had a duration of from 5-15 hours, Flint, et al 1996), but the channel wetted area is likely to be smaller

Daus

LITERATURE REVIEW NOTES

699

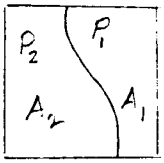
The chloride mass-balance approach can be used to estimate groundwater recharge over long time periods

$$P C_0 = I_n C_p$$

where P = a.e. annual precipitation, C_0 = average conc. of chloride in rainfall, I_n = net groundwater recharge and C_p = concentration of chloride in pore water

Thus: $I_n = \frac{P C_0}{C_p}$

First let us consider what happens due to spatial variability of rainfall and infiltration. Consider a unit area $A_1 + A_2 = 1$, with the proportions of $A_1 = P_1$ and $A_2 = P_2$. The total rainfall is $P = P_1 A_1 + P_2 A_2$. But the chloride concentration is independent of P and so the total chloride is $(P_1 A_1 + P_2 A_2) C_0$



Now $A_2 = 1 - A_1$

$$[P_1 A_1 + P_2 (1 - A_1)] C_0 = [P_2 + A_1 (P_1 - P_2)] C_0$$

Now let us suppose that $P_1 = 2 P_2$ and that there is no recharge under P_2. Also let $I_n = K P_1 A_1$

Thus: $[P_2 + A_1 (P_1 - P_2)] C_0 = K P_1 A_1 C_p$

$[P_2 + A_1 (2P_2 - P_2)] C_0 = K 2P_2 A_1 C_p$

$[P_2 + P_2 A_1] C_0 = K 2 P_2 A_1 C_p$

$[1 + A_1] C_0 = K 2 A_1 C_p$

$$K = \frac{(1 + A_1)}{2A_1} \frac{C_0}{C_p}$$

Suppose that $A_1 = 0.5$ Thus $K = 1.5 \frac{C_0}{C_p}$

and $I_n = 1.5 \frac{C_0}{C_p} P_1 (0.5) = 0.75 \frac{C_0}{C_p} P_1$

But the Av. precip is $0.5 P_1 + 0.5 P_2 = 0.75 P_1$

But the 1st eq. is invalid if C_0 is stored!

If [illegible] is closed

$$PC_0 = I_n C_p + SC_0$$

$$I_n = \frac{PC_0 - SC_0}{C_p} = (P-S)\frac{C_0}{C_p}$$

DAW

$$S = P_2 A_2 \qquad (P_1 A_1 - P_2 A_2 - P_3 A_3)\frac{C_0}{C_p}$$

$$P_1 A_1 C_0 = I_n C_p$$

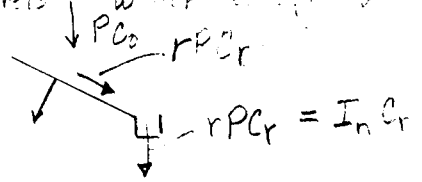
$$I_n = \frac{P_1 A_1 C_0}{C_p} = [illegible]$$

This then would be [illegible]

$$I_n = K P_1 A_1 = [illegible] =$$

$$K = \frac{C_0}{C_p}$$

Now let us [illegible] the [illegible] of the [illegible] is through channels [illegible] what [illegible]



Now if one [illegible] changes [illegible] but uses the [illegible]

$$I_n = P\frac{C_0}{C_p}$$ the estimate will be [illegible]

because $R > P$ and $C_r > C_0$

From Squires + Young. (1984)

Regression Relations for flood peaks

100 yr:

$Q = 482A^{0.565}$

A = tributary drainage area (mi²)

Q = peak discharge cfs.

500 yr:

$Q = 2,200A^{0.571}$

To convert:

multiply cfs X 0.02832 → m³/sec

sq miles X 2.59 = Km².

Area (Km²)	Area (mi²)	Q (cfs)	Q (m³/sec)	Q (mm/hr) 100 yr.
1.23	0.4749 ✓	~~1,438~~ 316	~~40.7~~ 8.96	26.23 mm/hr.
2.18	0.84 ✓	437	12.38	20.4
3.55	1.37 ✓	576	16.31	16.53
8.91	3.44 ✓	968	27.4	11.08
10.72	4.14 ✓	1075	30.45	10.22

500 yr.

1.23	0.475	1438	40.7
2.18	0.84	1992	56.4
3.55	1.37	2633	
8.91	3.44	4454	
10.72	4.14	4951	

Engineer's Computation Pad

Walters, M.O. 1990. Transmission Losses in an Arid Region Journ. Hydraul Engineering. ASCE Vol. 116, No. 1. 129–138.

Used measured data from wadis in Saudi Arabia to estimate parameters of a regression equation.

Calculated transmission loss for the first mile as shown by Jordan (1977) — DAW

Jordan, P.R. 1977. Streamflow transmission losses in western Kansas. J. Hydr. Div. ASCE, (8), 905–918.

$$V_1 = V_A\left[1-\left(\frac{V_x}{V_A}\right)^{1/x}\right]$$

This can be applied in increments for longer channels

V_1 = loss in first mile, V_A = flow volume at the upper station, V_x = volume at distance x

Vols were in Ac-ft.

x in mi.

Active channel width in ft.

(7) $V_1 = 0.05\,V_A$ $R^2 = 0.91$ std error = 15.8 Ac-ft

(8) $V_1 = 0.0006225\,W^{1.216}\,V_A^{0.507}$

(9) $V_1 = 0.103\,V_A^{0.872}$

Walters, M.O. 1989 A unique flood event in an arid zone. Hydrological Processes 3 15–24.

Lane, L.J. 1983 Transmission Losses U.S. Dept. Agr. Wash D.C.

Data Walnut Gulch	Reach ID	Length x (mi)	No. of events	Mean upstream flow vol Ac-ft	Mean downstream flow vol. Ac-ft	Mean first mile trans loss ac-ft
	11-8	4.1	11	16.5	8.7	2.4
	8-6	0.9	3	13.7	11.4	2.5
	8-1	7.8	3	16.3	1.6	4.2
	6-2	2.7	30	75.1	59.9	6.0
	6-1	6.9	19	48.3	17.1	6.7
	2-1	4.2	32	49.3	24.4	7.6

Tyler et al. 1996 WRR. (32) 6 1481-1499 Dan

Watson & Sinclair Waggoner 1976 J. Hydrol. 31 335-357 recharge

Dettinger 1989 J. Hydrol. 106 55-78 Cl-Balance

Engineer's Computation Pad

Solitario Canyon

Check:

Proceedings 4th & 5th International High-Level Radioactive Waste Management Conferences

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Hevesi et al 1991a Precipitation Estimation in Mountainous Terrain using multivariate geostatistics Journ. Appl. Met. 31 No 7 661-676

DAW

Lichty, R.W. and McKinley, P.W., 1995 Est. of Ga recharge rates for 2 small basins

order from GS.

Tyler et al. 1996 WRR 32(6) 1481-1499. Soil Water Flux on the Nevada Test Site

Watson et al 1976 Journ. of Hydrol. Vol 31, 335-357

Dettinger, M.D. 1986 Pl Basin J. Hydrol. 106 53-78

Engineer's Computation Pad

WRR 11 (6) 929–937

3:15 – 4:00

Rainfall simulator studies of Nevada range sites — DAW

705

Duckwater Watershed 30 mi s.e. of Eureka, White Pine Co
Ann Precip = 7.8 – 13.7 in mostly snow

Geol + Soils: Volcanics + sedimentaries, – tuff, basalt, andesites and limestone. Aridisols and Entisols, – Torrifluvents, Durorthids, Haplargids, Durargids + Natrargids

Vegetation: Black sagebrush, big sagebrush, shadscale, winter fat, green rabbitbrush, Utah juniper, single leaf pinyon.

basin outlet is at 4600 ft.

Dry

$$Y_1 = 2.808 - 0.00470 X_9 + 0.00738 X_{13} - 0.178 X_{18} - 0.033 X_{27} + 0.123 X_{36} \qquad R^2 = 0.723$$

Using above eq. with ave. or measured X_{ss} get $Y = 37$ mm/hr

Y_1 = mean infil rate after 30 min in/hr

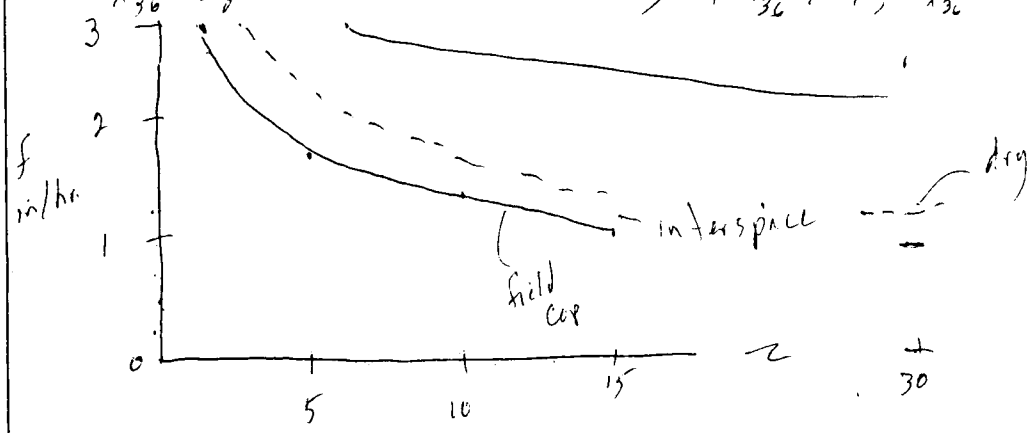
X_9 = bare ground percent ($\bar{X}_9 = 32.82$, $\sigma_{X_9} = 19.45$)

X_{13} = Plant cover, % ($\bar{X}_{13} = 23.25$, $\sigma_{X_{13}} = 22.06$)

X_{18} = Soil Surface horizontal Morphological rating 1–5

X_{27} = Silt fraction in soil surface horizon ($\bar{X}_{27} = 23.95$, $\sigma_{X_{27}} = 9.01$)

X_{36} = Depth of soil surface horizon (in) ($\bar{X}_{36} = 4.21$, $\sigma_{X_{36}} = 1.49$)



sand fraction = 56.54% $\sigma = 15.81$

bulk density = 1.42

706

Melching, C. S. 1995 Reliability Estimation, Chapt. 3 In Computer Models of Watershed Hydrology, Singh, V. P. (ed) Water Resources Publications Highlands Ranch, Colorado

Sources of uncertainties:

(1) Natural randomness - temporal and spatial fluctuations

(2) Data errors - may be propagated into parameters during calibration.

(3) Model parameters

(4) Model structure

See Tung, Y.-K. 1987 Uncertainty of National Weather Service Rainfall Frequency Atlas, Journ. Hydraul. Engr. ASCE 113(4) 179-189

"For watersheds with no data (runoff), need physical-simulation models for which all of the parameters can be determined based on field measurements, physical principles and past experience on similar catchments"

Rainfall Input

Annual, Seasonal, daily, temporal, spatial

For effects of spatial variability, I could use thunderstorm isohyets from Arizona & consider a point depth at the center of gravity of the watershed then put larger storms at an appropriate distance up and downstream and at right angles. If there is no bias, then uniform rainfall amounts should be O.K.

For uncalibrated models, parameter statistics must be obtained from physical measurements, information in the literature, and transfer of calibration results from hydrologically similar watersheds.

Might assume a triangular distribution or uniform distribution

See Goldman, D. M., Marino, M. A. and Feldman, A. D. 1990 Runoff Prediction Uncertainty for Ungaged Watersheds. Journ. Irrig and Drainage Engr. ASCE. 116(6), 752-768.
- est mean + std. dev. of Green + Ampt parameters

see Krajewski, W. F., Lakshmi, V., Georgakakos, K. P. and Jain, S. C 1991 A Monte Carlo Study of Rainfall Sampling Effect on A Distributed Catchment Model WRR 27(1), 119-128.

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Reliability Analysis Methods

1. Monte Carlo Simulation — DAW

Possibly only method for complicated non-linear models, but requires many simulations.

I could possibly select 3 storms (large, medium and small), make MC simulation with combinations of parameters and get an estimate of mean and S.D. of channel infiltration for these events. Then inferences could be made regarding entire sample.
This would not address rainfall input, channel geometry, shallow soils

2 Latin Hypercube

3. Mean-Value, First-Order Second-Moment Method MFOSM

4. Advanced First-Order Second-Moment Method. AFOSM

See: Rogers, C.C.M., Beven, K.J., Morris, E.M. and Anderson, M.G. 1985. Sensitivity Analysis, Calibration and Predictive Uncertainty of the Institute of Hydrology Distributed Model, Journ. Hydrol. 81, 179–191.

5. Rosenblueth's Point Estimation Method

= Y

$\sigma Y = X$

6. Harr's Point Estimation Method

Comparison of Methods

MFOSM works quite well if CV of most important parameter are less than 0.75

Monte Carlo method is considered to be the standard of comparison

Sensitivity coefficients may be misleading. A highly sensitive parameter that is well-known may have much less effect on the reliability of a model than a less-sensitive, but highly uncertain parameter.

708

Engineer's Computation Pad

Ting, Y-K. 1987. Sensitivity Analysis of National Weather Service Rainfall Frequency Atlas. Journ. of Hydraulic Engineering, (113) No. 2 179–189

Does an error analysis of rainfall frequency maps. Sensitivity analysis

Uses Chicago, IL as an example

Some selected mean depths and std deviations rainfall depth for various durations

Duration (min)	10 yr	50 yr	100 yr
5	0.667 (0.157)	0.783 (0.203) ~~0.767 (0.154)~~ 0.26	0.859 (0.223) 0.26
10	0.947 (0.248)	1.221 (0.320) 0.26	1.339 (0.352) 0.26
15	1.074 (0.311)	1.514 (0.402) 0.26	1.661 (0.442) 0.27
30	1.581 (0.434)	2.397 (0.561) 0.23	2.736 (0.616) 0.23
60	1.985 (0.572)	2.561 (0.739) 0.29	2.809 (0.811) 0.29

Goldman, D.M., M.R. Marino and J.C. Goldman. 1990. Effect of infiltration uncertainty in unsaged watersheds. Jour. Irrig. and Drainage Engineering ASCE 116(6) 752–768.

Using estimates of variability of soil texture estimate coefficient of variation of saturated conductivity ranges from 0.74–0.84 with skew = 1.6 to 8

They used regression relationships between API indices and measured soil moisture to calculate initial moisture content for months 4 – 10. The mean pred. moisture content ranged from 0.21 to 0.40 the std error ranged from 0.07 to 0.13

Assumed normal distribution. Note: Used Hastings, Neb. data

Used 101 events. Req. 5000 simulations for vol. + peak discharge however std dev. skew + Kurtosis 50,000 sim.

Rogers, C.C.M., K.J. Beven, E.M. Morris and M.G. Anderson 1985 Sensitivity Analysis, Calibration and Predictive Uncertainty of the Institute of Hydrology Distributed Model. Journ Hydrol. 81, 179-191

Found that Chezy C and sat. hydraul Cond were most sensitive. Fitted hydrographs for 5 storms.

DAW

got. mean Chezy C = 0.642 with std dev = 0.235; cv = 0.366

mean K_{sat} = 0.013×10^{-5} m/s std dev = 0.009; cv = 0.69

Watershed 0.9 km² peak flows 1.06 to 3.51 m³/sec.

Maximum rainfall intensities 7.1 to 11.7 mm/hr

$1.06\ m^3/sec = 1.06 \times 60 \times 60\ m^3/hr = 3.816 \times 10^3\ m^3/hr$

$\frac{3.816 \times 10^3}{0.9 \times 10^6} = 4.24 \times 10^{-3}\ m/hr = 4.24\ mm/hr$

$3.51\ m^3/sec = 10.04\ mm/hr$

K_{sat} of $0.013 \times 10^{-5} \frac{m}{s} \times 60 \frac{s}{m} \times 60 \frac{m}{hr} \times 1000 \frac{mm}{m} = 0.468\ mm/hr$!

DAW: When several events are fit, it is difficult to interpret variations in K_{sat}. Is it seasonal? due to model structure, Rainfall error?

$\times 10^{-5}$ m/sec

Krajewski, W.F., V. Lakshmi, K.P. Georgakakos and S.C. Jain. 1991. A Monte Carlo Study of Rainfall Sampling Effect on a Distributed Catchment Model. Water Resources Research 27(1). 119–128.

DAW

Used a kinematic runoff model with plane & channel configurations similar to KINEROS. Model of Ralston Creek Watershed 7.5 km² 210 stream tubes

Infiltration based on SCS model

Precipitation generated by a stochastic rainfall model

Studied effect of varying numbers of rain gages (max 87) and different time resolutions.

Output with maximum no. of gages & 5 min resolution assumed to be "true" response (case 1)

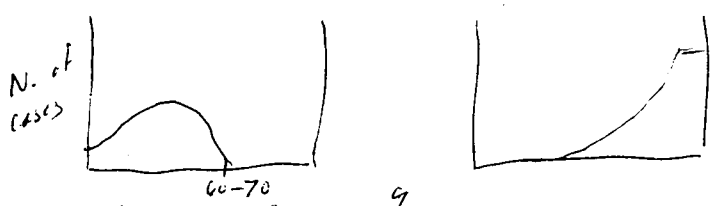
Case 2 – 1 gage in center of watershed $\Delta t = 1$ hr.
– lumped (~~unit hydrograph model~~)

Case 3. 5 gages

Case 4 87 gages – hourly Δt

Case 5 Lumped (unit hydrograph) with case 2 rainfall identified on dist. model output.

Compared flood peaks and time-to-peak (100 realizations)

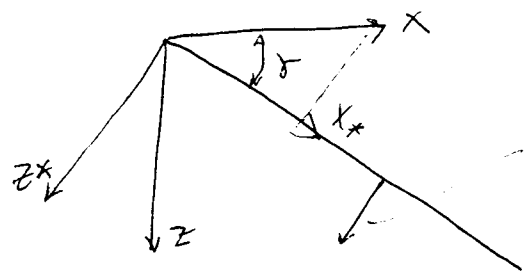


Time series correlations (individual hydrographs)

	Min	Max	Ave (100 storms)
2	0.431	0.995	.927
3	0.755	0.997	.936
4	0.833	.997	.944
5	0	.989	.779 – Showed bias toward lower peak

Philip, J. R. 1991 Hillslope Infiltration: Planar Slopes
WRR 27(1) 109-117.

For slope $\angle s$ less than 30° infiltration normal to the slope differs relatively little from infiltration from a horizontal surface.



$$i_n(t) = S t^{1/2} + A t \cos\gamma$$

$$X_* = X\cos\gamma + Z\sin\gamma$$
$$Z_* = -X\sin\gamma + Z\cos\gamma$$

K is replaced by $K\cos\gamma$

$$\lim_{t\to\infty} \frac{i_n(\gamma)}{i_n(0)} = \cos\gamma$$

infiltration normal to slope when $\gamma = 0$

$$\lim_{t\to 0} \frac{i_n(\gamma)}{i_n(0)} = 1$$

So using horizontal projection will underestimate infiltration at small time but will be correct under wet conditions (large time with gravity dominating)

713

Savard, C.S. 1998. Estimated Ground-water recharge from streamflow in Fortymile Wash near Yucca Mountain, Nevada. U.S.G.S. Water-Resources Investigations Report 97-4273 8pp.

From Abstract: Items relevant to paper

1.) Expected Annual Recharge rate in mm/yr.

2.) Relation between streamflow infiltration loss and groundwater recharge

3) Relation between winter/spring & summer fall recharge

Drillhole Wash

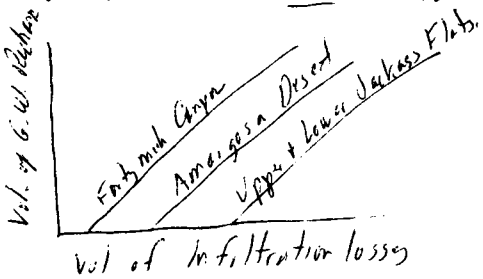
Date	Peak flow rate (m^3/s)
Mar 3, 1983	no evidence of flow but water in Fortymile Canyon p 5
July 21-23, 1984	22 m^3/s
Aug 18-20, 1984	1.2 m^3/s
July 19-20, 1985	0.48

1) From Table 5 p 24 if we take the total main channel recharge (Upper Jackass Flats + Lower Jackass Flats)

$$\frac{1,100 + 16,400}{150 \times 10^6} = 0.117 \text{ mm/yr.}$$

Now this would not include recharge in tributary channels.

2)



p. 22.

3) Ratios $\frac{\text{summer/fall}}{\text{winter spring}}$ from Table 5. pg 24

Fortymile Canyon	0.59
Upper Jackass	1.0
Lower Jackass	1.0
Amargosa Desert	0.62

Daus

[illegible] 21.9 km²

[illegible]

[illegible]

Drill Hole Creek

[illegible]

Single storm representing the 2 yr 24 hr rainfall event

channel morphology → runoff volume → 2 yr 24 hr rainfall

For Yucca Wash and Drillhole Wash.

Yucca, Site 16 Area = 21.9 km^2

Av annual a.m. recharge = $0.14 \times 10^6\ m^3$

$$\frac{0.14 \times 10^6}{21.9 \times 10^6} = 0.006\ m = 6\ mm/yr$$

Av an channel loss = $0.13 \times 10^6\ m^3$

$$\frac{0.13 \times 10^6}{21.9 \times 10^6}\ \frac{m^3}{m^2} = 0.00593\ \frac{m}{yr} = 5.93\ mm/yr$$

Drillhole wash Area = 39.9 Km^2

Av an. channel loss = $0.05 \times 10^6\ m/yr$

$$\frac{.05\ m^3/yr \times 10^6}{39.9 \times 10^6\ m^2} = 0.00125\ m/yr = 1.25\ mm/yr$$

Assume Correct an. precip is 165 mm/yr = .165 m/yr

$.165 \times 21.9 \times 10^6 = 3.6 \times 10^6\ m/yr$

$\frac{.84}{3.6} = 0.232$ = ratio of storm to annual precip Yucca Wash Site 16

$.165 \times 39.9 = 6.58 \times 10^6\ m/yr$

$\frac{1.02}{6.58} = 0.155$ = ratio of storm to annual precip.

$\frac{.06}{6.58} = 0.9\%$ of precip is total recharge for Drillhole site 21

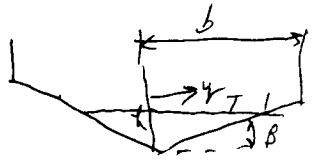
$\frac{.05}{6.58} = 0.76\%$ of precip is channel infiltration

TCW 8/28/98

Freyberg, D.L. 1983 Modeling the effects of a time-dependent wetted perimeter on infiltration from ephemeral channels. Water Resources Research 19(2):559-561 716

Studied the effect of varied wetted perimeter on infiltration in a simple ephemeral channel with a triangular bottom and vertical sides using the Green-Ampt vertical infiltration model. He found that the direct effects of water pressure at the soil surface are overshadowed by the effects of variation in the wetted perimeter

Cross sectional infiltration rate



$$f_y(t) = r \int_0^{h(0,t)/\sin\beta} f(\xi, t)\, d\xi$$

$f_y(t)$: x-sect rate $L^3 T^{-1}/L^2$

$f(\xi, t)$: point infil rate $L^3 T^{-1}/L^2$

$h(0,t)$: surface water depth at channel center line

β = side slope $\angle$ of channel bottom

if $\beta < 8°$ $\quad \xi \approx y$

$$f_y(t) = r \int_0^{T(t)} f(y,t)\, dy$$

$$f(y,t) = \frac{dF}{dt} + K_i$$

$$\frac{dF}{dt} = K_r \left[1 - K_{r_0} + \frac{\Delta\theta (h_c + h(y,t))}{F(y,t)} \right]$$

K_r = relative permeability at initial water content = K_i / K_r

et Yair Erosion, Transport & Deposition Processes, IAHS Pub 189, 1987

Roels 1984 Earth Surf. Processes Landf. 9, 371-381

Romero-Diaz et al 1988 - Catena 13 (Suppl.) 1-11

Scoging & Thornes 1979 The Hydrology of Areas with low precipitation IAHS Pub. 128 159-168.

Sutherland & Bryan 1990. Appl. Geog. 10, 91-109

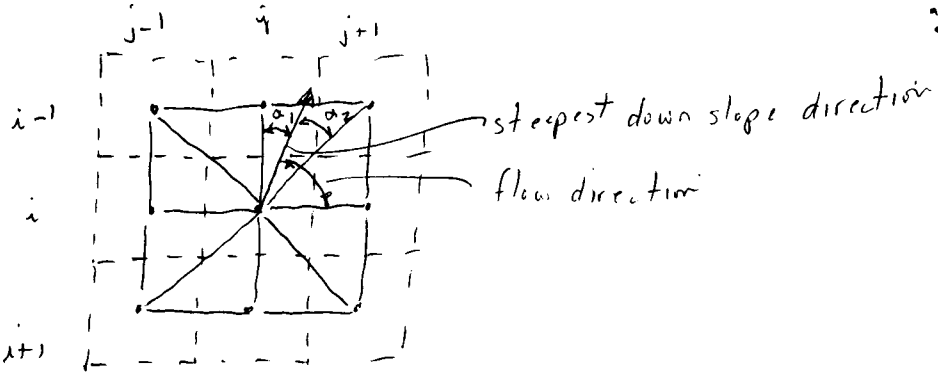
Wheater et al. 1991 J. Hydrol. 123 163-199

Yair & Klein 1973 Catena 1 1-18.

Yair & Lavee 1976 Earth Surf. Process Landf. 5 205-225

Yair & Lavee Hydrological Forecasting Wiley 1985 Anderson & Burt, Eds.

Tarboton, D. G. 1997, A new method for the determination of flow directions and upslope areas in grid digital elevation models, Water Resour. Res., 33, 309-319



proportion of flow to pixel $(i-1, j)$ is $\alpha_2 / (\alpha_1 + \alpha_2)$

Proportion of flow to pixel $(i-1, j+1)$ is $\alpha_1 / (\alpha_1 + \alpha_2)$

Availability - software

dtarb@cc.usu.edu, http://www.engineering.usu.edu/dtarb/
anonymous ftp fox.cee.usu.edu

Dan

Hughes, D.A. 1995. Monthly rainfall-runoff models applied to arid and semiarid catchment for water resource estimation purposes. Hydrol. Sci. J. 40(6), 751-770.

Kemp, P.R., J.F. Reynolds, Y. Pachepsky, and J-L Chen, 1997 A comparative study of soil water dynamics in a desert ecosystem. Water Resour. Res. 33 No1 73-90.

Study in Jornada 3 models, measured data.

Daw 1-7-99 720

Jackson, C.R. 1992 Hillslope Infiltration and Lateral Downslope Unsaturated Flow. WRR. Vol. 28, No. 9 2533-2539

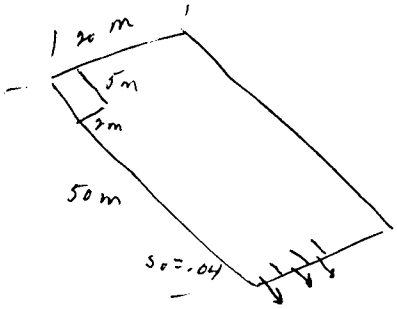
DAW

ALVIN Engineer's Computation Pad

Corradini, C., R. Morbidelli and F. Melone, 1998, On the interaction between infiltration and Hortonian runoff. Journ. Hydrol 204, 52-67

Dave

Studied surface runoff from a plane



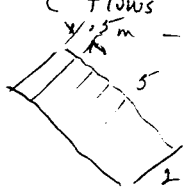
used a 5 x 2 m grid to generate a random K_s field

Fields generate mean $\overline{K_s}$

Cov. of var $C_v(K_s)$

Correlation lengths L_x and L_y

flows summed to get $Q(t)$



comp grid

50 realizations

$\overline{Q(t)}$ = averaging discharges over 50 simulations

Soils: Sandy loan $K_s = 20.0$ mm/h

Clay loan $K_s = 0.75$ mm/h

→ It would be interesting to do this with microtopography

Conclusions:

1. Run-on process is important - ignoring run-on leads to overestimate of runoff

2. Run-on reduces effect of spatial correlation of K_s
- supports the development of experimental investigations directed to quantify the conditions which lead to flow concentration in rills!

pbb

2. Spatial correlation of K_s is of minor importance

Daw

REFERENCES

See p. 748 Dwr 9/20/99

Excellent 95% daily within 5%
good " " 10%
7/11/99 2:00 – fair " " 15%
Poor do not meet above criteria

Water Resources Data Nevada

DAW

USGS Water-Data Report NV-92-1 (water yr 1992)
" Yucca Mtn. Stations listed in max. stage gages
" " " " " 1991
" " " " 1990
" " " 1989
" 1988

Objective: To summarize USGS Data for nearby stations of similar size and elevation to provide a basis for comparison with simulated runoff.

References. Pabst et. al USGS open File Report 93-438 Water Years 1983-85 DAW

Kane III et al. USGS Open File Report 94-312 1986-90

Relevant Stations: Continuous (Complete Record stations)

Name	Area (mi^2)	Quality	Period of record
10251248 - Unnamed Tributary to Stockade Wash	3.90	Poor	May 23, 1984

Crest-stage, partial-record stations

10251252	Yucca Wash near mouth	17
10251254	Drillhole Wash at mouth	16.3
10251256	Dune Wash near Busted Butte	6.77
10251265	Cane Spring Wash	8.36
10251271	Amargosa River Trib. No 1. near Johnnie	2.71
10251272	Amargosa River Trib No 2 near Johnnie	2.34

Miscellaneous Sites

10247890	KP's Wash at Tippipah	1.08
10251744	Stockade Wash	3.86
102512532	Pagany Wash #2	0.73
102512533	Pagany Wash #1	0.82

Engineer's Computation Pad

Misc. Sites (Cont)

10251253 5 Drill Hole Wash above Well UZ-1, NTS 0.53

10251253 6 Drill Hole Wash above Well UE-25, NTS, NV 2.78 — Dave

10251253 7 Split Wash below Quac Canyon 0.33

~~10251255~~
10251266 Frenchman Lake Tributary at old Mercury Hwy 6.34

10251269 Gas Station Wash at Mercury 6.52

Set up spreadsheet to make conversions — Spreadsheet

$mi^2 \rightarrow Km^2$ ~~$mi^2 \times 2.59$~~ $mi^2 \times 2.59 = Km^2$

peak discharge $ft^3/sec \rightarrow mm/hr.$

R.O. Vol. Ac-ft $\rightarrow$ mm

Col. Headings ~~10251252 Yucca Wash~~ Station # Yucca Wash

~~Year R.O. Vol Ac Ft~~

Station #	Area mi^2	Area Km^2	Year 1983 Ro vol Ac ft	Ro vol mm	Year 1984 Peak flow cfs	Qp mm/hr

$$1 \frac{ft^3}{sec} \times 0.02832 \frac{m^3}{ft^3} \times 3600 \frac{sec}{hr} \times \frac{1}{1,000,000} \frac{Km^2}{m^2} \times 1000 \frac{mm}{m} \times \frac{1}{A, Km^2} = \frac{mm}{hr} \quad (0.102)$$

so $\frac{cfs}{Area\ (Km^2)} \times 0.102 = \frac{mm}{hr}$ (peak flow)

$$Ac\text{-}ft \times 1,233 \frac{m^3}{Ac\text{-}ft} \frac{1}{A(Km^2)} \times \frac{1}{1,000,000} \frac{Km^2}{m^2} \times 1000 \frac{mm}{m} = 1.233$$

$$1.233 \times \frac{Ac\text{-}ft}{Area\ (Km^2)} = mm\ depth$$

MS WORKS CONSULT\SWRI99\USGSRODATA

Records for small watersheds draining Yucca Mtn are very short (for both continuous and peak flow stations). Some of the peak flow stations used by Squires and Young (1984) and shown in Table 3-2, U.S. Dept. of Energy (1988) have longer records now, but there is no published update of the 100 yr runoff peak vs area curve.

There are some interesting data available for Split wash below Quac Canyon. In 1984 there was a very large peak flow (34.5 mm/hr) on 7-21-84 (Pabst et al., 1993, p. 27). This was certainly Hortonian runoff (or mostly so). In water year 1995 there were continuous records at this site and there was 8.7 mm of runoff on Mar 11 (USGS Water Resources Data - Nevada, water year 1995). This runoff was due to saturated overland flow because the rainfall had low intensity.

Engineer's Computation Pad

CNWRA Runoff Data DAW 4/28/99

727

Glancy, P.A. and D.A. Beck Modern Flooding and Runoff of the Amargosa River, Nevada-California, Emphasizing Contributions of Fortymile Wash.

J. Appl. Met. 9C 887 J6

DAW

Dates mentioned

Fortymile Wash: Mar 3, 1983 Before installation of streamflow gaging

Aug, 1983

July 21, 1984 } Convective storms

Aug 19, 1984 }

July–Aug 1990 Convective storms were severe

Mar. 11, 1995

Feb. 22–23, 1998

USGS OPEN FILE REPORTS

1986–90 (requested inter Library loan.) 83–85 (microfiche in Library) 83–90 published

1995 p 712

Pagany Wash 1993 – 0

Stockade Wash 1992 – 0 1993

1994 YM p 748

Pagany 2, Drill hole, Wren, 2 split { 0 0

Pagany at Prow – 0, Near Well UZ – 0, Drill hole – 0, Wren – 0

Note: From Site Characterization Plan (1988) Peak flow stations were in place on Busted Butte Wash, Drill Hole Wash, Yucca Wash at that time.

WATSTORE info on CDROM USGS Info. Services Fed. Ctr. Box 25286 Denver 80225-0046

1996 YM 594 — not shown
Split Wash at Antler Ridge — 0 2.35 mm²

1997 YM surface water 619 — DAW
Only Fortymile Wash Shown
Fortymile at narrows - no R.O.

1997 - Discontinued Stations
Stockade Wash

DAW 7/7/99

In reviewing Table 3-2 in The Site Characterization Plan DOE, 1988 we find that there is a range of periods of record for the max. stage gages

Location	Period of Record	# of yrs	Wash
1	1964-80	17	Penoyer Valley Trib.
4	1967-80	14	Amargosa Trib #1 } reactivated
5	1968-80	13	Amargosa R. Trib #2 } reactivated
8	1967-80	14	Palmetto Wash
9	1964-79	16	Stonewall Flat
11	1965-80	16	San Antonio Wash
		15.0	

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(Search History)

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You searched: TITLE | Water Resources data, Nevada | Search

Title	**Water resources data. Nevada.**
Publisher	Carson City, Nev. : Water Resources Division, U.S. Geological Survey ; [Springfield, VA : National Technical Information Service, distributor,

LOCATION	CALL #	STATUS
DOCS REF	I 19.53/2:NV-	LIB USE ONLY
MICROTEXT FICHE	I 19.53/2:NV-	LIB USE ONLY

Description	v. : ill., maps ; 28 cm.
Frequency	Annual
Series	U.S. Geological Survey water-data report
Subject	Water quality -- Nevada -- Periodicals.
	Stream measurements -- Nevada -- Periodicals.
	Water resources development -- Nevada -- Periodicals.
Other corp	Geological Survey (U.S.). Water Resources Division.
Continues	Water resources data for Nevada 0364-4391
Link	U.S. Geological Survey water-data report
Call #	I 19.53/2:NV-
Note	Description based on: Water year 1982.
	Vols. for <1982-> distributed to depository libraries in microfiche.
	Vols. for <1982-> prepared in cooperation with the state of Nevada and other agencies.
Gpo item #	619-E-28 (microfiche)

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.t

			Water	Year											
				1983				1984				1985			
	Area (sq mi)	Area (sq. Km)	V (ac-ft)	V (mm)	Qp (cfs)	Qp (mm.h)	V (ac-ft)	V (mm)	Qp (cfs)	Qp (mm.h)	V (ac-ft)	V (mm)	Qp (cfs)	Qp (mm.h)	V (ac-ft)
		0.00													
sh	3.9	10.10		0			0	0		0	1.5	0.1831007	10	0.1009801	0.5
		0.00													
	17	44.03			100	0.2316602			940	2.1776062			0.01	2.317E-05	
		0.00													
	16.3	42.22			0	0			790	1.9085741			17	0.0410706	
		0.00													
	6.77	17.53			0	0			14	0.0814604			94	0.5469481	
		0.00													
	8.36	21.65				0			0.5	0.0023557			0	0	
		0.00													
nni	2.21	5.72				0			95	1.6940559			0	0	
		0.00													
nni	2.34	6.06				0			2	0.0336634			0	0	
		0.00													
		0.00													
		0.00													
	1.08	2.80				0			300	10.928571					
		0.00													
	3.86	10.00				0			20	0.204					
		0.00													
	0.73	1.89				0			150	8.0952381					
		0.00													
	0.82	2.12				0			100	4.8113208					
		0.00													
Z-1	0.53	1.37				0			42	3.1270073					
		0.00													
E-2	2.78	7.20				0			17	1.2656934					
		0.00													
on	0.33	0.85				0			290	34.8					
		0.00													
erc	6.34	16.42				0			1100	6.8331303					
		0.00													
	0.52	1.35				0			100	0.6211937					

	1987				1988				1989	
V (ac-ft)	V (mm)	Qp (cfs)	Qp (mm.h)	V (ac-ft)	V (mm)	Qp (cfs)	Qp (mm.h)	V (ac-ft)	V (mm)	Qp (cfs)
0.12	0.0146481	0.28	0.0028274	0.7	0.085447	0.57	0.0057559	0	0	0.03
		0.1	0.0002317			0	0			0
		0	0			0	0			0
		0	0			0	0			0
		10	0.0471132			6	0.0282679			0
		0.1	0.0017832			0.1	0.0017832			0
		0.1	0.0016832			0.5	0.0084158			50

		1990				1991				1992
Qp (mm.h)	V (ac-ft)	V (mm)	Qp (cfs)	Qp (mm.h)	V (ac-ft)	V (mm)	Qp (cfs)	Qp (mm.h)	V (ac-ft)	V (mm)
0.0003029	0	0	0.19	0.0019186		0		0		0
0			0	0				0		
0			0	0				0		
0			0	0				0		
0			15	0.0706697				0		
0			18	0.320979				0		
0.8415842			1.8	0.030297				0		

DMA

			1993		
Qp (cfs)	Qp (mm.h)	V (ac-ft)	V (mm)	Qp (cfs)	Qp (mm.h)
	0		0		0
	0				0
	0				0
	0				0
	0				0
	0				0
	0				0

733

CREST-STAGE PARTIAL-RECORD STATIONS

Daw 734

ie following table contains annual maximum discharges at crest-stage stations during water year 1995. A crest-stage gage is a device that reg- ; the peak stage occurring between inspections of the gage. A stage-discharge relation for each gage is developed from discharges determined ie basis of current-meter or indirect measurements. The date of maximum discharge, which is usually determined by comparison with data for ıv continuous-record stations, weather records, or by local inquiry, is not published herein. "Period of record" indicates the water years for he annual maximums have been determined. The following sites are shown in figures 27 and 28.

Station Name and Number	Location and Drainage Area	Period of Record	1995 Measurements: Date	Gage Height (feet)	Discharge (ft^3)
	Colorado River basin				
n Springs Valley Tributary ar Indian Springs, NV)248490)	Lat 36°34'00", long 115°48'40", in NW1/4 NW1/4 sec. 16, T.16 S., R.55 E., Clark County, Hydrologic Unit 16060014, at culvert on U.S. Hwy 95, 8 mi west of Indian Springs, and 12 mi east-southeast of Mercury. Drainage area is about 29 mi^2.	1964-82 1984-95	1995	--	*
gosa River near Beatty, NV 251220)	Lat 36°52'06", long 116°45'34", in NW1/4 NE1/4 sec. 30, T.12 S., R.47 E., Nye County, Hydrologic Unit 18090202, on left bank, 170 feet downstream from Airport Road, 2.8 mi south of Beatty, and 43 mi west-northwest of Mercury. Drainage area is about 472 mi^2.	1963-68 1969-81 1983-85 1987-95	03-11-95	2.88	1,300
Wash near Mouth, Nevada t Site, NV (Formerly lished as Yucca Wash) 251252)	Lat 36°51'58", long 116°23'38", in SE1/4 NE1/4 sec. 28, T.12 S., R.50 E., Nye County, Hydrologic Unit 18090202, on left bank, 0.35 mi above confluence with Fortymile Wash, and 26 mi northwest of Mercury. Drainage area is 17 mi^2.	1982-95 14	01-26-95	7.06	185 10.9 cfs/mi
ole Wash at Mouth, Nevada : Site, NV (Formerly lished as Drill Hole Wash) 251254)	Lat 36°49'13", long 116°23'52", in SW1/4 NW1/4 sec. 18, T.13 S., R.50 E., Nye County, Hydrologic Unit 18090202, on left bank, 0.15 mi above confluence with Fortymile Wash, and 25 mi west-northwest of Mercury. Drainage area is 16.3 mi^2.	1983-95	03-11-95	--	.1[E]
Wash near Busted Butte, ada Test Site, NV (Formerly lished as Busted Butte h) (10251256)	Lat 36°47'16", long 116°23'57", in NE1/4 SE1/4 sec. 25, T.13 S., R.49 E., Nye County, Hydrologic Unit 18090202, on left bank, 0.8 mi above confluence with Fortymile Wash, and 24.5 mi west-northwest of Mercury. Drainage area is 6.77 mi^2.	1982-95	12-25-94 01-25-95 03-11-95	--	3[E]
ah Wash at Little Skull ntain, Nevada Test Site, (Formerly published as opah Wash near Lathrop ls) (10251260)	Lat 36°46'06", long 116°19'23", in SE1/4 SE1/4 sec. 35, T.13 S., R.50 E., Nye County, Hydrologic Unit 18090202, on right bank, at base of Little Skull Mountain, 0.23 mi south of Lathrop Wells Road, and 19 mi west-northwest of Mercury. Drainage area is 104 mi^2.	1984-95	12-25-94	--	5[E]
pring Wash near Cane ng, Nevada Test Site, NV merly published as Cane ngs Tributary near Mercury Cane Spring Wash utary near Cane Spring) 1265)	Lat 36°48'27", long 116°05'41", in NW1/4 SW1/4 sec. 24, T.13 S., R.52 E., Nye County, Hydrologic Unit 16060014, on left bank, 20 feet upstream of Cane Spring Road Crossing, 0.55 mi north of Cane Spring, and 11.5 mi northwest of Mercury. Drainage area is 8.36 mi^2.	1984-95	03-11-95	--	5[E]
pring Wash Tributary w Skull Mountain, Nevada Site, NV (102512654)	Lat 36°48'23", long 116°05'43", in SW1/4 SW1/4 sec. 24, T.13 S., R.52 E., Nye County, Hydrologic Unit 16060014, on right bank, 200 feet upstream of confluence with Cane Spring Wash, and 11.5 mi northwest of Mercury. Drainage area is 2.29 mi^2.	1992-95	01-26-95 03-11-95	--	15[E]

TABLE [illegible] Gage-height and streamflow data at [illegible]

[Abbreviations: Hwy, Highway; lat, latitude; long, longitude; NTS, Nevada Test Site; NV, Nevada]

Station number	Station name	Location	Drainage area (square miles)	Period of record	Measurements: Date	Measurements: Gage height (feet)	Measurements: Peak streamflow (cubic feet per second)
10248490	Indian Springs Valley Tributary near Indian Springs, NV	Lat 36°34'00", Long 115°46'40", in Clark County, at culvert on U.S. Hwy 95, 8 miles west of Indian Springs, and 12 miles east-southeast of Mercury	[illegible]	[illegible]-82 1982-85	[illegible] 06-19-84 1985	2.6[illegible] 3.67 --	[illegible] [illegible] [illegible]
10251220	Amargosa River near Beatty, NV	Lat 36°52'00", long 116°45'34", in Nye County, on left bank 170 feet downstream from Airport Road, 2.8 miles south of Beatty and 43 miles west-northwest of Mercury	[illegible]	[illegible] 1969-81 1983-85	[illegible] 1984 07-16-85	-- -- --	[illegible] [illegible] 5[illegible]
10251252	Yucca Wash near mouth, NTS, NV (formerly published as Yucca Wash)	(Revised) Lat 36°51'58", long 116°23'35", Nye County, on left bank 0.35 mile above confluence with Fortymile Wash, 26 miles northwest of Mercury	[illegible]	1982-85	03-03-83 07-21-84 08-19-84 07-19-85	2.72 -- -- --	[illegible] [illegible] 31 <0.1
10251254	Drillhole Wash at mouth, NTS, NV (formerly published as Drill Hole Wash)	(Revised) Lat 36°49'13", long 116°23'52", Nye County, on left bank 0.15 mile above confluence with Fortymile Wash, 25 miles west-northwest of Mercury	[illegible]	1983-85	1983 07-23-84 08-19-84 07-19-85	-- 3.38 -- --	[illegible] [illegible] 43 [illegible]
10251256	Dune Wash near Busted Butte, NTS, NV (formerly published as Busted Butte Wash)	(Revised) Lat 36°47'35", long 116°24'29", Nye County, on left bank 0.5 mile above confluence with Fortymile Wash, 24.5 miles west-northwest of Mercury	[illegible]	1982-85	1983 08-19-84 07-19-85	-- 2.05 --	[illegible] [illegible] [illegible]
10251260	Topopah Wash at Little Skull Mountain, NTS, NV (formerly published as Topopah Wash near Lathrop Wells)	(Revised) Lat 36°46'06", long 116°19'23", Nye County, on right bank, at base of Little Skull Mountain, 0.23 mile south of Lathrop Wells road, 19 miles west-northwest of Mercury	[illegible]	1984-85	07-21-84 07-31-84 08-15-84 08-19-84 11-22-84 12-19-84	3.6[illegible] 3.70 -- -- -- --	131 120 [illegible] [illegible] [illegible] [illegible]
10251265	Cane Spring Wash Tributary near Cane Spring, NTS, NV (formerly published as Cane Spring Wash Tributary near Mercury)	(Revised) Lat 36°45'27", long 116°15'41", Nye County, on left bank 25 feet upstream of Cane Spring Road Crossing, 0.55 mile north of Cane Spring and 11.5 miles northwest of Mercury	[illegible]	1984-85	07-24-84 1985	-- --	[illegible] --
10251270	Amargosa River Tributary near Mercury, NV	Lat 36°33'14", long 116°[illegible]", Nye County, on left bank at upstream side of highway culvert at U.S. Highway 95, [illegible] miles southwest of Mercury	[illegible]	[illegible] 1984-85	07-15-84 08-15-84 08-16-84 1985	3.03 -- 5.45 --	[illegible] [illegible] [illegible] --

DAW

TABLE 3.--Discharge at U.S. Geological Survey crest-stage partial-record stations--Continued

Station number	Station name	Location	Drainage area (square miles)	Period of record	Measurements		
					Date	Gage height (feet)	Peak discharge (cubic feet per second)
10251271	Amargosa River Tributary No. 1 near Johnnie, NV	Lat 36°27'36", long 116°06'28", in Nye County, at culvert on State Route 160, 3.5 miles northwest of Johnnie and 15 miles southwest of Mercury	2.21	[b]1967-81 1984-85	08-84 1985	7.23 --	165 [c] (d)
10251272	Amargosa River Tributary No. 2 near Johnnie, NV	Lat 36°26'09", long 116°04'28", in Nye County, at culvert on State Route 160, 1.2 miles north of Johnnie and 16 miles south-southwest of Mercury	2.34	[b]1968-81 1984-85	08-84 1985	3.45 --	120 [c] (d)

[a] Approximate.
[b] Records prior to reporting period published by U.S. Geological Survey (1964-85) for appropriate water years, and Moosburner (1978).
[c] Revised. Revises Squires and Young (1984) and U.S. Geological Survey for water years 1953, 1954, and 1955.
[d] No evidence of flow during water year.
[e] Estimated.

DAU

TABLE 4.—Discharge at U.S. [illegible] not [illegible]

[Abbreviations: NTS, Nevada Test Site; NV, Nevada]

Station number	Station name	Latitude (degrees, minutes, seconds)	Longitude (degrees, minutes, seconds)	Drainage area (square miles)	Measurement: Date	Measurement: Peak discharge (cubic feet per second)	cfs/mi²
10247890	KP's Wash at Tippipah Highway, NTS, NV	37°10'07"	116°08'27"	1.05	07-19-84 08-19-84	[illegible] [illegible]	278
10251244	Stockade Wash below Stockade Road, NTS, NV	37°18'59"	116°14'45"	3.86	07-19-84	[illegible]	5.18
[4]10251250	Fortymile Wash at Narrows, NTS, NV (formerly published as Fortymile Wash cross-section [illegible])	[illegible]	116°22'57"	[2]256	[illegible]	[illegible]	
102512552	Pagany Wash #2 (Tributary to Drill Hole Wash), NTS, NV	36°51'42"	116°26'24"	.73	08-19-84	[illegible]	205
102512553	Pagany Wash #1 (Tributary to Drill Hole Wash), NTS, NV	36°51'39"	116°26'05"	.52	08-19-84	[illegible]	132
102512555	Drill Hole Wash above Well UZ-1, NTS, NV	36°52'16"	116°27'46"	.53	08-19-84	[illegible]	79
102512556	Drill Hole Wash above Well UE-25, NTS, NV	36°51'09"	116°26'25"	2.75	08-19-84	[illegible]	6.1
102512557	Split Wash below Quail Canyon, NTS, NV	36°51'57"	116°26'54"	.33	07-21-84	[illegible]	879
10251255	Fortymile Wash near Well J-13, NTS, NV	36°49'27"	116°24'01"	3.84	03-03-83	[illegible]	
[4]10251256	Fortymile Wash near Amargosa Valley, NV (formerly published as Fortymile Wash cross-section [illegible])	[illegible]	116°26'03"	[2]3.84	03-03-83	[illegible]	
10251260	Frenchman Lake Tributary at old Mercury Highway, NTS, NV	36°43'45"	115°56'56"	6.34	08-15-84	[illegible]	173
10251265	Gas Station Wash at Mercury, NTS, NV	36°36'[illegible]	116°[illegible]	.52	07-15-84	[illegible]	192

[1] Published as crest-stage gage in U.S. Geological Survey [illegible] p. 273, water year [illegible]
[2] Revised. Revises U.S. Geological Survey [illegible], water year [illegible]
[3] Estimated

Note: Peak rates from small watersheds in summer
from large watersheds in Mar.

68.2 mi²

AMARGOSA DESERT BASIN

10251249 STOCKADE WASH NEAR FORTYMILE WASH, NEVADA TEST SITE—Continued

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
3	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
4	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
5	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
6	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
7	.00	e.00	.00	e.36	.00	.00	.00	.00	.00	.00
8	.00	e.00	.00	e.07	.00	.00	.00	.00	.00	.00
9	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
10	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
11	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
12	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
13	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
14	.00	e.00	.00	e2.6	.00	.00	.00	.00	.00	.00
15	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
16	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
17	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
18	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
19	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
20	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
21	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
22	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
23	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
24	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
25	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29	.00	.00	.00	.00	---	.00	.00	.00	.00	.00
30	.00	.00	.00	.00	---	.00	---	.00	---	.00
31	.00	---	.00	.00	---	.00	---	.00	---	.00
TOTAL	0.00	0.00	0.00	3.03	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	.000	.000	.000	.098	.000	.000	.000	.000	.000	.000
MAX	.00	.00	.00	2.6	.00	.00	.00	.00	.00	.00
MIN	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
AC-FT	.00	.00	.00	6.0	.00	.00	.00	.00	.00	.00

CAL YR 1992 TOTAL 0.00 MEAN .000 MAX .00 MIN .00 AC-FT .00
WTR YR 1993 TOTAL 3.03 MEAN .008 MAX 2.6 MIN .00 AC-FT 6.0

e Estimated

TABLE 3.—[illegible] of U.S. Geological Survey [illegible]

[Abbreviations: Hwy, Highway; lat, latitude; long, longitude; NTS, Nevada Test Site; NV, Nevada]

Station number	Station name	Location	Drainage area, square miles	Period of record	Measurements: Date	Peak discharge, height, feet	Peak discharge, discharge, cubic feet per second per square mile
10248495	Indian Springs Valley Tributary near Indian Springs, NV	Lat 36°34'[illegible], long 115°4'[illegible], in Clark County, at culvert on U.S. Hwy 95, 8 miles west of Indian Springs, and 12 miles east-southeast of Mercury	[illegible]	[illegible] 1982-85 1982-85	[illegible] [illegible] 1985	2.6 3.47	[illegible] [illegible] d
10251220	Amargosa River near Beatty, NV	Lat 36°52'[illegible], long 116°45'34", in Nye County, on left bank 170 feet downstream from Airport Road, 2.5 miles south of Beatty and 43 miles west-northwest of Mercury	[illegible]	[illegible] 1980-81 1983-85	[illegible] 1984 07-16-85	-- -- --	[illegible] d [illegible]
10251252	Yucca Wash near mouth, NTS, NV (formerly published as Yucca Wash)	(Revised) Lat 36°51'55", long 116°23'35", Nye County, on left bank 0.35 mile above confluence with Fortymile Wash, 26 miles northwest of Mercury	[illegible]	1982-85	[illegible] 07-21-84 08-16-84 07-16-85	2.72 -- -- --	[illegible] [illegible] [illegible] < 0.1
10251254	Drillhole Wash at mouth, NTS, NV (formerly published as Drill Hole Wash)	(Revised) Lat 36°49'13", long 116°23'52", Nye County, on left bank 0.15 mile above confluence with Fortymile Wash, 25 miles west-northwest of Mercury	[illegible]	1983-85	1983 07-23-84 08-16-84 07-16-85	-- 3.38 -- --	nd [illegible] [illegible] [illegible]
10251256	Dune Wash near Busted Butte, NTS, NV (formerly published as Busted Butte Wash)	(Revised) Lat 36°47'35", long 116°24'24", Nye County, on left bank 0.5 mile above confluence with Fortymile Wash, 24.5 miles west-northwest of Mercury	[illegible]	1982-85	1983 08-16-84 07-16-85	-- 2.05 --	nd [illegible] [illegible]
10251260	Topopah Wash at Little Skull Mountain, NTS, NV (formerly published as Topopah Wash near Lathrop Wells)	(Revised) Lat 36°40'[illegible], long 116°16'23", Nye County, on right bank, at base of Little Skull Mountain, 0.25 mile south of Lathrop Wells road, 18 miles west-northwest of Mercury	[illegible]	1984-85	07-21-84 07-31-84 08-15-84 08-16-84 11-22-84 12-16-84	3.63 3.71 -- -- -- --	[illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
10251265	Cane Spring Wash Tributary near Cane Spring, NTS, NV (formerly published as Cane Spring Wash Tributary near Mercury)	(Revised) Lat 36°45'27", long 116°15'41", Nye County, on left bank 20 feet upstream of Cane Spring Road crossing, 0.55 mile north of Cane Spring and 11.5 miles northwest of Mercury	[illegible]	1984-85	07-24-84 1985	-- --	[illegible] d
10251270	Amargosa River Tributary near Mercury, NV	Lat 36°33'4[illegible], long 116°[illegible], Nye County, on left bank at upstream side of highway culvert at U.S. Highway 95, 5 miles southwest of Mercury	11	[illegible] 1984-85	07-15-84 08-15-84 08-16-84 1985	[illegible] -- 5.45 --	[illegible] [illegible] [illegible] d

740

JACKASS FLATS

102512531 PAGANY WASH NEAR THE PROW, NEVADA TEST SITE, NV

LOCATION (REVISED).--Lat 36°52'06", long 116°26'50", in NE 1/4 NE 1/4 sec.25, T.12 S., R.49 E., Nye County, Hydrologic Unit 18090202, Nevada Test Site, on right bank, 12.9 mi northwest of Hydrologic Research Facility on Jackass Flats, and 35.5 mi northwest of Mercury.

DRAINAGE AREA.--0.47 mi². 1.22 km²

PERIOD OF RECORD.--August 1994 to September 1995 (discontinued).

GAGE.--Water-stage recorder. Storage rain gage at site. Elevation of gage is 4,280 ft above sea level, from topographic map.

REMARKS.--Records good except for estimated daily discharges, which are poor. No flow most days, most years.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1994 TO SEPTEMBER 1995
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
5	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
6	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
7	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
8	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
9	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
10	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
11	.00	.00	.00	.00	.00	e12	.00	.00	.00	.00	.00	.00
12	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
13	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
14	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
15	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
16	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
17	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
18	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
19	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
20	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
21	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
22	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
23	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
24	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
25	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26	.00	.00	.00	e1.7	.00	.00	.00	.00	.00	.00	.00	.00
27	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29	.00	.00	.00	.00	---	.00	.00	.00	.00	.00	.00	.00
30	.00	.00	.00	.00	---	.00	.00	.00	.00	.00	.00	.00
31	.00	---	.00	.00	---	.00	---	.00	---	.00	.00	---
TOTAL	0.00	0.00	0.00	1.70	0.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	.000	.000	.000	.055	.000	.39	.000	.000	.000	.000	.000	.000
MAX	.00	.00	.00	1.7	.00	12	.00	.00	.00	.00	.00	.00
MIN	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
AC-FT	.00	.00	.00	3.4	.00	24	.00	.00	.00	.00	.00	.00

= 29,592 m³ = 24.3 mm

Note: Hydrograph shown in Fig. 23 of Final rpt. was storage

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1994 - 1995, BY WATER YEAR (WY)

MEAN	.000	.000	.000	.055	.000	.39	.000	.000	.000	.000	.000	.000
MAX	.000	.000	.000	.055	.000	.39	.000	.000	.000	.000	.000	.000
(WY)	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1994
MIN	.000	.000	.000	.055	.000	.39	.000	.000	.000	.000	.000	.000
(WY)	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1994

SUMMARY STATISTICS	FOR 1995 WATER YEAR		WATER YEARS 1994 - 1995		
ANNUAL TOTAL	13.70				
ANNUAL MEAN	.038		.038		
HIGHEST ANNUAL MEAN			.038		1995
LOWEST ANNUAL MEAN			.038		1995
HIGHEST DAILY MEAN	12	Mar 11	12	Mar 11	1995
LOWEST DAILY MEAN	.00	Oct 1	.00	Aug 26	1994
ANNUAL SEVEN-DAY MINIMUM	.00	Oct 1	.00	Aug 26	1994
INSTANTANEOUS PEAK FLOW	60	Mar 11	60	Mar 11	1995
INSTANTANEOUS PEAK STAGE	4.72	Mar 11	4.72	Mar 11	1995
ANNUAL RUNOFF (AC-FT)	27		27		
10 PERCENT EXCEEDS	.00		.00		
50 PERCENT EXCEEDS	.00		.00		
90 PERCENT EXCEEDS	.00		.00		

e Estimated

DAW

JACKASS FLATS

102512533 PAGANY WASH #1 NEAR WELL UZ-4, NEVADA TEST SITE, NV

LOCATION.--Lat 36°51'39", long 116°26'08", in NE 1/4 SW 1/4 sec.30, T.12 S., R.50 E., Nye County, Hydrologic Unit 18090202, Nevada Test Site, on right bank, 0.3 mi upstream of Well UZ-4, and 12.4 mi northwest of the Hydrologic Research Facility.

DRAINAGE AREA.--0.82 mi². = 2.12 Km² =

PERIOD OF RECORD.--Water year 1993 to September 1995 (discontinued).

GAGE.--Water-stage recorder. Storage rain gage at site. Elevation of gage is 3,860 ft above sea level, from topographic map.

REMARKS.--Records fair except for March 11 and estimated daily discharges, which are poor. No flow most days, most years.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1994 TO SEPTEMBER 1995
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
5	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
6	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
7	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
8	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
9	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
10	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
11	.00	.00	.00	.00	.00	8.6	.00	.00	.00	.00	.00	.00
12	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
13	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
14	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
15	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
16	.00	.00	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
17	.00	.00	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
18	.00	.00	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
19	.00	.00	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
20	.00	.00	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
21	.00	.00	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
22	.00	.00	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
23	.00	.00	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
24	.00	.00	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
25	.00	.00	.00	e.00	.00	.00	.00	.00	.00	.00	.00	.00
26	.00	.00	.00	e.01	.00	.00	.00	.00	.00	.00	.00	.00
27	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29	.00	.00	.00	.00	---	.00	.00	.00	.00	.00	.00	.00
30	.00	.00	.00	.00	---	.00	.00	.00	.00	.00	.00	.00
31	.00	---	.00	.00	---	.00	---	.00	---	.00	.00	---
TOTAL	0.00	0.00	0.00	0.01	0.00	8.60	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	.000	.000	.000	.000	.000	.28	.000	.000	.000	.000	.000	.000
MAX	.00	.00	.00	.01	.00	8.6	.00	.00	.00	.00	.00	.00
MIN	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
AC-FT	.00	.00	.00	.02	.00	17	.00	.00	.00	.00	.00	.00

= 20,961 m³ = 9.9 mm Note: for upper Pagany USGS shows 24 Ac-ft. !!

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1993 - 1995, BY WATER YEAR (WY)

MEAN	.000	.000	.000	.000	.000	.092	.000	.000	.000	.000	.000	.000
MAX	.000	.000	.000	.000	.000	.28	.000	.000	.000	.000	.000	.000
(WY)	1993	1993	1993	1995	1993	1995	1993	1993	1993	1993	1993	1993
MIN	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
(WY)	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993

SUMMARY STATISTICS	FOR 1994 CALENDAR YEAR		FOR 1995 WATER YEAR		WATER YEARS 1993 - 1995		
ANNUAL TOTAL			8.61				
ANNUAL MEAN			.024		.008		
HIGHEST ANNUAL MEAN					.024		1995
LOWEST ANNUAL MEAN					.000		1993
HIGHEST DAILY MEAN			8.6	Mar 11	8.6	Mar 11	1995
LOWEST DAILY MEAN	.00	Jan 1	.00	Oct 1	.00	Oct 1	1992
ANNUAL SEVEN-DAY MINIMUM	.00	Jan 1	.00	Oct 1	.00	Oct 1	1992
INSTANTANEOUS PEAK FLOW			60	Mar 11	60	Mar 11	1995
INSTANTANEOUS PEAK STAGE			1.03	Mar 11	1.03	Mar 11	1995
ANNUAL RUNOFF (AC-FT)			17		5.7		
10 PERCENT EXCEEDS	.00		.00		.00		
50 PERCENT EXCEEDS	.00		.00		.00		
90 PERCENT EXCEEDS	.00		.00		.00		

e Estimated

93 - 95

JACKASS FLATS

102512537 SPLIT WASH BELOW QUAC CANYON WASH, NEVADA TEST SITE, NV

LOCATION.--Lat 36°50'57", long 116°26'54", in NW 1/4 SE 1/4 sec.36, T.12 S., R.49 E., Nye County, Hydrologic Unit 18090202, Nevada Test Site, on left bank, 13.1 mi northwest of Hydrolcgic Research Facility on Jackass Flats.

DRAINAGE AREA.--0.33 mi². = 0.8547 Km² = .8547 x 10⁶ m² ✓ = 854,700 m²

PERIOD OF RECORD.--September 1993 to September 1995 (discontinued).

GAGE.--Water-stage recorder. Storage rain gage at station. Elevation of gage is 4,180 ft above sea level, from topographic map.

REMARKS.--Records fair except for estimated daily discharges, which are poor. No flow most days, most years.

1 ft² = 0.0929 m²
1 ac-ft = 43,560 ft³ = 1,233 m³
1 mi² = 27,878,400 ft² = 2,589,903 m²

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1994 TO SEPTEMBER 1995
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
5	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
6	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
7	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
8	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
9	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
10	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
11	.00	.00	.00	.00	.00	e3.0	.00	.00	.00	.00	.00	.00
12	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
13	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
14	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
15	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
16	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
17	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
18	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
19	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
20	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
21	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
22	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
23	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
24	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
25	.00	.00	.00	e.1	.00	.00	.00	.00	.00	.00	.00	.00
26	.00	.00	.00	e1.5	.00	.00	.00	.00	.00	.00	.00	.00
27	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29	.00	.00	.00	.00	---	.00	.00	.00	.00	.00	.00	.00
30	.00	.00	.00	.00	---	.00	.00	.00	---	.00	.00	---
31	.00	---	.00	.00	---	.00	---	.00	---	.00	.00	---
TOTAL	0.00	0.00	0.00	1.60	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	.000	.000	.000	.052	.000	.097	.000	.000	.000	.000	.000	.000
MAX	.00	.00	.00	1.5	.00	3.0	.00	.00	.00	.00	.00	.00
MIN	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
AC-FT	.00	.00	.00	3.2	.00	6.0	.00	.00	.00	.00	.00	.00

~ 7,398 m³ = 8.7 mm

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1993 - 1995, BY WATER YEAR (WY)

MEAN	.000	.000	.000	.026	.000	.048	.000	.000	.000	.000	.000	.000
MAX	.000	.000	.000	.052	.000	.097	.000	.000	.000	.000	.000	.000
(WY)	1994	1994	1994	1995	1994	1995	1994	1994	1994	1994	1994	1994
MIN	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
(WY)	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994

SUMMARY STATISTICS	FOR 1994 CALENDAR YEAR		FOR 1995 WATER YEAR		WATER YEARS 1993 - 1995	
ANNUAL TOTAL			4.60		.006	
ANNUAL MEAN			.013		.013	1995
HIGHEST ANNUAL MEAN					.000	1994
LOWEST ANNUAL MEAN					3.0	Mar 11 1995
HIGHEST DAILY MEAN			3.0	Mar 11	.00	Sep 10 1993
LOWEST DAILY MEAN	.00	Jan 1	.00	Oct 1	.00	Sep 10 1993
ANNUAL SEVEN-DAY MINIMUM	.00	Jan 1	.00	Oct 1		
INSTANTANEOUS PEAK FLOW			(11) cfs	Mar 11	11	Mar 11 1995
ANNUAL RUNOFF (AC-FT)			9.1 — 13.2 mm		4.6	
10 PERCENT EXCEEDS	.00		.00		.00	
50 PERCENT EXCEEDS	.00		.00		.00	
90 PERCENT EXCEEDS	.00		.00		.00	

e Estimated

DMM

Water Resources Data, Nevada
Water Year 1993 U.S. Geological Survey
Water-Data Report NV-93-1
D. C. Emett, D. D. Hutchinson, N. A. Jonson and K. L. O'Hair

		91	92	93
Indian Springs Valley Trib	29 mi²			No flow

Stockade Wash	27.63 mi²	2-8-93	160 ft³/s e
		2-10-93	1.9
		3-16	1.1
		3-16	20

Yucca Wash	17 mi²	2-12-92	15 e
		2-13-92	3.5
		3-30-	<1 e
		1-18 93	20
		1-18-93	80 e

Drillhole Wash	16.3 mi²	—	No flow

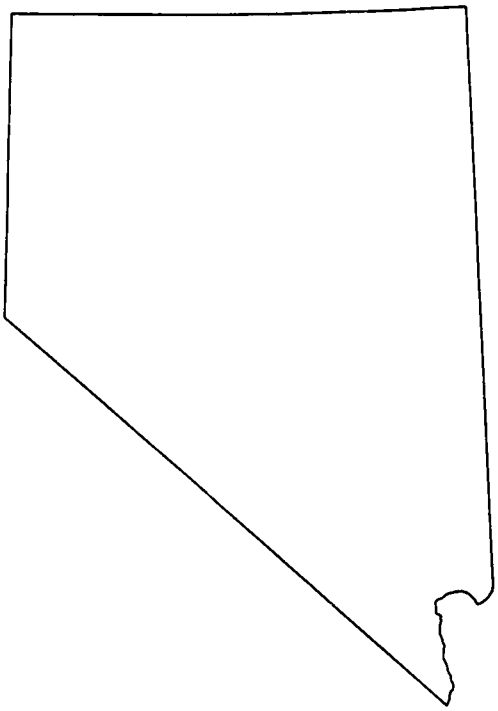
Dune Wash (Formerly Busted Butte)	6.77 mi²	9-7-91	4.4 e
		2-12-92	1.6 e
		3-30-92	1 e
		93	none

For 1992 No data shown
Need 1994, 5, 6, 7, 8, 9

Water Resources Data
Nevada
Water Year 1995

744

DAW



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT NV-95-1
Prepared in cooperation with the State of Nevada
and with other agencies

STREAMFLOW DATA

Records of streamflow data collected during water year [illegible] gaging stations (primary sites) are listed in table 2. [illegible] same period at 17 USGS crest-stage partial-record stations [illegible] records of streamflow data collected during the [illegible] in table 4.

PRECIPITATION DATA

Records of precipitation data collected during water year [illegible] information regarding the stations themselves are listed in table [illegible] stations is listed in table [illegible] and records of precipitation are listed in table [illegible]

SUMMARY OF STREAMFLOW AND PRECIPITATION DATA DURING WATER YEARS 1983-85

Records of streamflow were collected and compiled during water year [illegible] record gaging stations, 10 crest-stage, partial-record stations and 12 miscellaneous sites. A summary of maximum peak and maximum daily mean discharges during water years [illegible] gaging stations is given in table 1. Streamflow hydrographs for the [illegible] stations during July 21-23, 1984, and August 18-21, 1984, are shown in figures [illegible] These two periods were the only occurrences of appreciable flow during the overall period of record for the [illegible] stations. At the crest-stage, partial-record stations, the maximum peak discharge measured was [illegible] ft³/s on August 19, 1983, at Amargosa River Tributary near Mercury (1-25127). At the miscellaneous sites, the maximum peak discharge measured was 1,520 ft³/s on March 3, 1984, at Fortymile Wash at Nye (1-25125).

Precipitation data were collected and compiled during water years [illegible] 12 USGS precipitation stations and 17 WSNSC precipitation stations. [illegible] USGS precipitation [illegible] storage rain gages that were measured periodically; these gages were installed in support of [illegible] future precipitation networks near NTS. Cumulative precipitation measured during the periods July 21-23, 1984, and August 18-21, 1984, for USGS and WSNSC rain gages are shown in figures 7 and 8, respectively.

TABLE 1. [illegible]

Station number	Station name	[illegible]	[illegible]	[illegible]	[illegible]
1-25124	[illegible] Fortymile Wash [illegible] Kawich Range [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1-25125	Fortymile Wash at Nye [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

STREAMFLOW DATA

DAW

PRECIPITATION DATA

SUMMARY OF STREAMFLOW AND PRECIPITATION DATA DURING WATER YEARS 1983-85

1994-95

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JACKASS FLATS

1025125356 WREN WASH AT YUCCA MOUNTAIN, NEVADA TEST SITE, NV

LOCATION.--Lat 36°51'34", long 116°27'15", in NE 1/4 SW 1/4 sec.14, T.12 S., R.49 E., Nye County, Hydrologic Unit 18090202, Nevada Test Site, on left bank, 12.9 mi northwest of Hydrologic Research Facility on Jackass Flats, and 34.5 mi northwest of Mercury.

DRAINAGE AREA.--0.23 mi². = 595,678 m²

PERIOD OF RECORD.--August 1994 to September 1995 (discontinued).

GAGE.--Water-stage recorder. Storage rain gage at site. Elevation of gage is 4,220 ft above sea level, from topographic map.

REMARKS.--Records good except for January 25, 26, and March 11, which are fair. No flow most days, most years.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1994 TO SEPTEMBER 1995
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
5	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
6	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
7	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
8	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
9	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
10	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
11	.00	.00	.00	.00	.00	2.6	.00	.00	.00	.00	.00	.00
12	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
13	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
14	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
15	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
16	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
17	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
8	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
9	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
20	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
21	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
22	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
23	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
24	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
25	.00	.00	.00	.66	.00	.00	.00	.00	.00	.00	.00	.00
26	.00	.00	.00	.96	.00	.00	.00	.00	.00	.00	.00	.00
27	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29	.00	.00	.00	.00	---	.00	.00	.00	.00	.00	.00	.00
30	.00	.00	.00	.00	---	.00	.00	.00	.00	.00	.00	.00
31	.00	---	.00	.00	---	.00	---	.00	---	.00	.00	---
TOTAL	0.00	0.00	0.00	1.62	0.00	2.60	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	.000	.000	.000	.052	.000	.084	.000	.000	.000	.000	.000	.000
MAX	.00	.00	.00	.96	.00	2.6	.00	.00	.00	.00	.00	.00
MIN	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
AC-FT	.00	.00	.00	3.2	.00	5.2	.00	.00	.00	.00	.00	.00

— 6,412 m³ = 10.8 mm

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1994 - 1995, BY WATER YEAR (WY)

MEAN	.000	.000	.000	.052	.000	.084	.000	.000	.000	.000	.000	.000
MAX	.000	.000	.000	.052	.000	.084	.000	.000	.000	.000	.000	.000
(WY)	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1994
MIN	.000	.000	.000	.052	.000	.084	.000	.000	.000	.000	.000	.000
(WY)	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1994

SUMMARY STATISTICS	FOR 1995 WATER YEAR		WATER YEARS 1994 - 1995	
ANNUAL TOTAL	4.22			
ANNUAL MEAN	.012		.012	
HIGHEST ANNUAL MEAN			.012	1995
LOWEST ANNUAL MEAN			.012	1995
HIGHEST DAILY MEAN	2.6	Mar 11	2.6	Mar 11 1995
LOWEST DAILY MEAN	.00	Oct 1	.00	Aug 24 1994
ANNUAL SEVEN-DAY MINIMUM	.00	Oct 1	.00	Aug 24 1994
INSTANTANEOUS PEAK FLOW	30	Mar 11 30 cfs	30	Mar 11 1995
INSTANTANEOUS PEAK STAGE	96.60	Mar 11	96.60	Mar 11 1995
ANNUAL RUNOFF (AC-FT)	8.4 = 17.4 mm		8.4	
10 PERCENT EXCEEDS	.00		.00	
50 PERCENT EXCEEDS	.00		.00	
90 PERCENT EXCEEDS	.00		.00	

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APPENDIX A:

CONVERSION OF S.A.I.C. TIPPING BUCKET RAINFALL DATA

10/21/98 Science Applications International Corp.

From the coordinates on the e-mail from R. Fedors (10/7/98) only one of the tipping bucket stations (# 18) is within the Solitario Canyon Watershed. (or within the 20 m contour interval map.) (In meters)

#18 546,305. 4,077,750. Note: I checked the elevation of 18 on the map. Estimated it at 1287 m. or 4,222 ft. This compares with an elev. of 4,245 in the data file. This is acceptably close, given the topography DAW

$\frac{305}{500} = 0.61$

4,078,000
4,077,500 0.75

Gage #18 would be located on plane element 207 in the Solitario Canyon watershed geometry, but adjacent to channel 208. This is a reasonably centrally-located gage.

Procedure

1. Select largest (most intense) storm for gage 18
2. Create .pre file for KINEROS2. Assume uniform rainfall
3. Run average plane element
4. If average plane element has runoff, run Solitario Canyon
5. If runoff is predicted, repeat for 2nd largest, etc.

Progress

Two events have been identified 1) The event of 7/14/96 and 2) 12/24/94

Storm 1 had a maximum intensity of 83.68 mm/hr (but only for 12 sec!). The total depth was only 5.01 mm. The duration was 23.8 min, giving an average intensity of 12.63 mm/hr.

SAMPLE HEADING FROM DATA FILES
ON Floppy disks

ave, This file contains Sites 2 & 4 only. Rfedors 9/22/98 DAW

tart of Report...

NGRES REPORT Copyright (c) 1981, 1995 Computer Associates Intl, Inc.
eading report specifications and preparing query . . .
etrieving data . . .

ENVIRONMENTAL CHARACTERISTICS DATA REPOR

ABLE DESCRIPTION:
recipitation Rate data from 11 locations in Yucca Mountain area,
9/30/1994 to 09/30/1996.

DIF: 306056

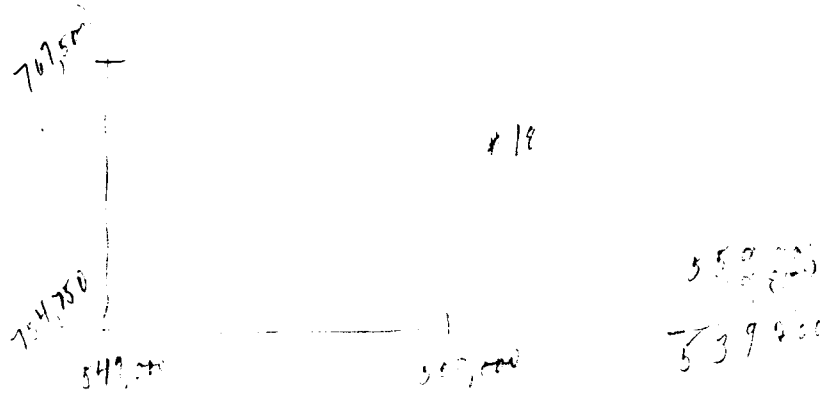
TN: GS970308312111.003

OOTNOTES: Data identified as -9., and -.990, is missing. The timing of ips and measured precipitation intensities and amounts can be considered ccurate to within 10 minutes. Locations are verified to within +/-300 eet for all locations. Elevations were verified to within +/-20 feet or all locations except Forty Mile Canyon (Site 19), which was verified o within +/-50 feet. If elapsed tip time is on the order of 2 seconds, he intensity accuracy is +/-25% and the precipitation accuracy is +/-7%.

DDNL FOOTNOTES: Locations are verified to within +/- 300 feet.
ocations in Nevada State Plane feet (Easting/Northing) are as follows:
ite #2 - 573385/766174; Site #4 - 570439/774155; Site #5 - 76910/769639; Site #6 - 541559/745277; Site #8 - 563353/781925; Site #10 577998/790941; Site #11 - 580416/750996; Site #13 - 566459/739662; Site 17 - 552015/750510; Site #18 - 554432/763080; Site #19 - 581933/778661

****

OW#	Q	PRECIPITATION R	LOCATION	DATE	TIME



DAW

ubj: **Re:Tipping Bucket Data**
Date: 10/7/98 6:02:45 PM Mountain Daylight Time
From: rfedors@swri.edu
To: WOOLHISERD@aol.com

File: RFC822.TXT (1108 bytes)
DL Time (31200 bps): < 1 minute

Dave,

Sorry it took so long, the conversion is not straightforward and the way I did it is approximate. It is not something that you can do readily (to make more accurate). I did the conversion using nad27 in ArcInfo and a simple rule of thumb for the area is that the stations should be shifted about 150 meters north (I did not shift them, you can if you want to). As you will notice, the stations are covering a large area around Yucca Mountain. I am not sure if these are the same stations that the USGS was monitoring. This data was from the SAIC people.

408,000

407,4000

543000 – 54,000

I am working on the topo map for the small watershed; I keep running into roadblocks. The best I can do is 10 foot contours. The files should have been here today, but ...

I will be out of the office for the next week.

Cor: Applications International Corp.

Cheers,
Randy

	station	meters	meters
	2	552077.0	4078713.0
	4	551170.8	4081141.7
	5	553147.5	4079772.5
	6	542401.4	4072311.5
†	8	549003.3	4083501.7
	10	553456.3	4086264.7
	11	554235.6	4074095.5
	13	549994.7	4070627.0
†	17	545581.9	4073917.2
† *	18	546305.0	4077750.0
	19	554668.5	4082527.0

18 is the only one on the 20 m contour sheet.

† on Solitario Canyon 20 m contour map

Reply Separator

Subject: Tipping Bucket Data
Author: <WOOLHISERD@aol.com >
Date: 10/1/98 5:48 PM

Randy,

The tiping bucket data you sent is O.K. Just one minor problem: the

BASIC Program to convert tipping bucket data to ASCII input file for KINEROS2

DAW

Tipping Bucket Data Format:

		Field				
1	2	3	4	5	6	7
Row ~~Count~~ No.	Alpha No.	Intensity	Site	Site #	Mo/day/Yr.	Time hrs min sec
4 digits	1 digit	mm/hr		#XX	XX/XX/XXXX	

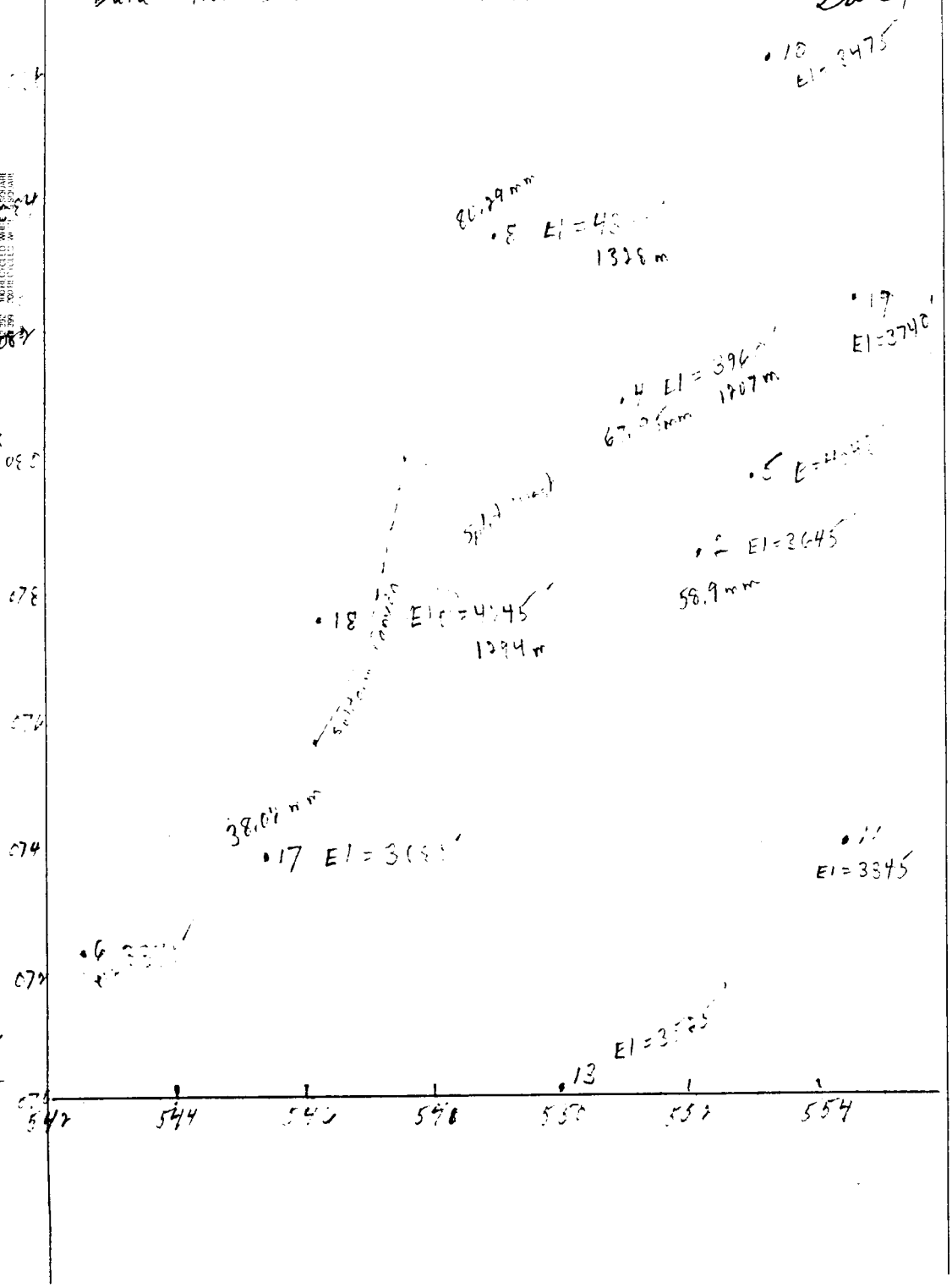
I will use the DOS editor to isolate the data

```
' PROGRAM TIPPING.BAS
' THIS program will read in tipping bucket data and convert it
' to an input file for KINEROS2.
OPTION BASE 1

INPUT "ENTER INPUT FILE NAME, Ext will be .DAT", INFILE$
OPEN INFILE$ FOR INPUT AS #1

INPUT "ENTER OUTPUT FILE NAME, Ext will be .MAE", OUTFILE$
OPEN OUTFILE$ FOR OUTPUT AS #2
DO WHILE NOT EOF(1) ' BEGIN LOOP
INPUT #1, COUNT%, A$, XINTEN, SITE$, SITENO$, DATE$, TIME$
```

Data from SAIC



SAIC — DAW — 700

```
PROGRAM TIPREAD.BAS by DAW 10/22/98
This program will read tipping bucket rainfall data and convert it to a
KINEROS2 precipitation input file. Because the date and time sequence must
be read as string variables, the program creates an intermediate file which
is then read and the appropriate calculations are made.
OPTION BASE 1
        INPUT "ENTER INPUT FILE NAME, EXT WILL BE .DAT", INFILE$
        OPEN INFILE$ FOR INPUT AS #1

        OPEN "SCRATCH.OUT" FOR OUTPUT AS #3

        DO WHILE NOT EOF(1)' BEGIN LOOP
                INPUT #1, A$
                INTEN$ = MID$(A$, 11, 6)          RATE = VAL(INTEN$)
                DELSEC$ = " " + MID$(A$, 88, 7)   DSEC = VAL(DELSEC$)
                PRINT #3, USING "&"; INTEN$, DELSEC$

        LOOP

                CLOSE #3
                CLOSE #1

This part of the program will read the output on SCRATCH.OUT and will
convert it to KINEROS2 input.
DAW 10/21/98
DIM TELAP(800), ACCUMP(800)

        OPEN "SCRATCH.OUT" FOR INPUT AS #1

Create file name for outfile
        N% = LEN(INFILE$) - 3
        OUTFILE$ = LEFT$(INFILE$, N%) + "PRE"
        OPEN OUTFILE$ FOR OUTPUT AS #2
Labels for KINEROS rain file
        LABEL2$ = "N="
        LABEL3$ = "   TIME      DEPTH"
        LABEL4$ = "! (min)       (mm)"
        LABEL5$ = "END"
Initialize
        TELAPT = 0! 'Elapsed time in minutes
        ACCUMPT = 0!'Accumulated rain in mm
        LCOUNT% = 1 ' Count of number of lines in input file
      DO WHILE NOT EOF(1)
        INPUT #1, RATE, DSEC' Rate in mm/hr, Dsec is time interval in seconds
                IF DSEC < .01 GOTO 100' Avoid zero time increment
                TELAP(LCOUNT%) = TELAPT + DSEC / 60!

                ACCUMP(LCOUNT%) = ACCUMPT + RATE * DSEC / 3600!
        IF LCOUNT% = 1 THEN TELAP(1) = 0
                TELAPT = TELAP(LCOUNT%)
                ACCUMPT = ACCUMP(LCOUNT%)
                LCOUNT% = LCOUNT% + 1

100     LOOP

        ND% = LCOUNT% - 1

        Create and print headings for rainfall file
```

intensity (mm/hr)

time interval (sec)

Part of 94_7_12.DAT

10/22/98

8697	Y	.000		Site #4		07/12/1996	14:19:23
1433963			3960				
8698	Y	2.013		Site #4		07/12/1996	14:23:15
232			3960				
8699	Y	6.921		Site #4		07/12/1996	14:24:23
68			3960				
8700	Y	20.012		Site #4		07/12/1996	14:24:47
24			3960				
8701	Y	45.261		Site #4		07/12/1996	14:24:58
11			3960				
8702	Y	35.065		Site #4		07/12/1996	14:25:12
14			3960				
8703	Y	19.188		Site #4		07/12/1996	14:25:37
25			3960				
8704	Y	20.012		Site #4		07/12/1996	14:26:01
24			3960				
8705	Y	9.851		Site #4		07/12/1996	14:26:49
48			3960				
8706	Y	22.972		Site #4		07/12/1996	14:27:10
21			3960				
8707	Y	10.762		Site #4		07/12/1996	14:27:54
44			3960				
8708	Y	11.858		Site #4		07/12/1996	14:28:34
40			3960				
8709	Y	14.431		Site #4		07/12/1996	14:29:07
33			3960				
8710	Y	25.484		Site #4		07/12/1996	14:29:26
19			3960				
8711	Y	24.163		Site #4		07/12/1996	14:29:46
20			3960				
8712	Y	30.483		Site #4		07/12/1996	14:30:02
16			3960				
8713	Y	30.483		Site #4		07/12/1996	14:30:18
16			3960				
8714	Y	87.485		Site #4		07/12/1996	14:30:24
6			3960				
8715	Y	50.111		Site #4		07/12/1996	14:30:34
10			3960				
8716	Y	87.485		Site #4		07/12/1996	14:30:40
6			3960				
8717	Y	63.755		Site #4		07/12/1996	14:30:48
8			3960				
8718	Y	73.773		Site #4		07/12/1996	14:30:55

Test Data Set

SAIC rainfall data

10/22/98 11:00 am 762/2

```
PROGRAM TIPREAD.BAS by DAW 10/22/98
This program will read tipping bucket rainfall data and convert it to a
KINEROS2 precipitation input file. Because the date and time sequence must
 : read as string variables, the program creates an intermediate file which
ıs then read and the appropriate calculations are made.
PTION BASE 1
        INPUT "ENTER INPUT FILE NAME, EXT WILL BE .DAT", INFILE$
        OPEN INFILE$ FOR INPUT AS #1

        OPEN "SCRATCH.OUT" FOR OUTPUT AS #3

        DO WHILE NOT EOF(1)' BEGIN LOOP
                INPUT #1, A$
                INTEN$ = MID$(A$, 11, 6)
                DELSEC$ = " " + MID$(A$, 88, 7)
                PRINT #3, USING "&"; INTEN$; DELSEC$

        LOOP

                CLOSE #3
                CLOSE #1
```

Note: (can eliminate need for SCRATCH.OUT by using VAL( ) DAW 11-17-98

```
 This part of the program will read the output on SCRATCH.OUT and will
convert it to KINEROS2 input.
DAW 10/21/98
IM TELAP(200), ACCUMP(200)

        OPEN "SCRATCH.OUT" FOR INPUT AS #1

Create file name for outfile
        N% = LEN(INFILE$) - 3
        OUTFILE$ = LEFT$(INFILE$, N%) + "PRE"
        OPEN OUTFILE$ FOR OUTPUT AS #2
Labels for KINEROS rain file
        LABEL2$ = "N="
        LABEL3$ = "   TIME      DEPTH"
        LABEL4$ = "! (min)       (mm)"
        LABEL5$ = "END"
Initialize
        TELAPT = 0! 'Elapsed time in minutes
        ACCUMPT = 0!'Accumulated rain in mm
        LCOUNT% = 1 ' Count of number of lines in input file
      DO WHILE NOT EOF(1)
        INPUT #1, RATE, DSEC' Rate in mm/hr, Dsec is time interval in seconds
                IF DSEC < .01 GOTO 100' Avoid zero time increment
                TELAP(LCOUNT%) = TELAPT + DSEC / 60!

                ACCUMP(LCOUNT%) = ACCUMPT + RATE * DSEC / 3600!
        IF LCOUNT% = 1 THEN TELAP(1) = 0
                TELAPT = TELAP(LCOUNT%)
                ACCUMPT = ACCUMP(LCOUNT%)
                LCOUNT% = LCOUNT% + 1

)     LOOP
00

        ND% = LCOUNT% - 1

        Create and print headings for rainfall file
```

```
    LABEL1$ = "BEGIN STORM " + LEFT$(INFILE$, N%)
PRINT #2, USING "&"; LABEL1$ 'The USING "&" form removes quotes from string
    LABEL2$ = "N=" + STR$(ND%)
PRINT #2, USING "&"; LABEL2$
PRINT #2, USING "&"; LABEL3$
PRINT #2, USING "&"; LABEL4$

FOR I% = 1 TO ND%
   WRITE #2, TELAP(I%), ACCUMP(I%)

NEXT I%
PRINT #2, USING "&"; LABEL5$
CLOSE #2

ND
```

```
PROGRAM TIPREAD.BAS by DAW 10/22/98      Revised version  DAW
This program will read SAIC tipping bucket rainfall data and convert it to a
KINEROS2 precipitation input file. The date and time sequence are
ead as string variables and converted to numeric quantities using the
.AL function. Input files were obtained from Science Applications
International Corp. by R. Fedors.
Input data is of form:
Row No.  Code Intensity  gage #  date  time  time increment elevation
Input files of form S18_7_14.DAT were obtained from the SAIC files for
individual storms using the MSDOS editor.
PTION BASE 1
       DIM TELAP(800), ACCUMP(800)

       INPUT "ENTER INPUT FILE NAME, EXT WILL BE .DAT", INFILE$
       OPEN INFILE$ FOR INPUT AS #1

Create file name for outfile. Name will be same as infile except extension
       N% = LEN(INFILE$) - 3
       OUTFILE$ = LEFT$(INFILE$, N%) + "PRE"
       OPEN OUTFILE$ FOR OUTPUT AS #2

Labels for KINEROS rain file
       LABEL2$ = "N="
       LABEL3$ = "   TIME     DEPTH"
       LABEL4$ = "! (min)      (mm)"
       LABEL5$ = "END"
Initialize
       TELAPT = 0! 'Elapsed time in minutes
       ACCUMPT = 0!'Accumulated rain in mm
       LCOUNT% = 1 ' Count of number of lines in input file


       DO WHILE NOT EOF(1)' BEGIN LOOP
              INPUT #1, A$
              INTEN$ = MID$(A$, 11, 6)'Extract intensity, mm/h
                      RATE = VAL(INTEN$)
              DELSEC$ = " " + MID$(A$, 88, 7)'Extract time increment, sec.
                      DSEC = VAL(DELSEC$)
               IF DSEC < .01 GOTO 100' Avoid zero time increment
               TELAP(LCOUNT%) = TELAPT + DSEC / 60!'Elapsed time, min

               ACCUMP(LCOUNT%) = ACCUMPT + RATE * DSEC / 3600!

       IF LCOUNT% = 1 THEN TELAP(1) = 0
               TELAPT = TELAP(LCOUNT%)
               ACCUMPT = ACCUMP(LCOUNT%)
               LCOUNT% = LCOUNT% + 1

00      LOOP

               CLOSE #1

               ND% = LCOUNT% - 1

       Create and print headings for rainfall file
        LABEL1$ = "BEGIN STORM " + LEFT$(INFILE$, N%)
     PRINT #2, USING "&"; LABEL1$ 'The USING "&" form removes quotes from string
        LABEL2$ = "N=" + STR$(ND%)
     PRINT #2, USING "&"; LABEL2$
```

```
PRINT #2, USING "&"; LABEL4$

FOR I% = 1 TO ND%
   WRITE #2, TELAP(I%), ACCUMP(I%)

NEXT I%
PRINT #2, USING "&"; LABEL5$
CLOSE #2

ND
```

DAW

1	2	3	4	5	6 — DAW	7
756	Y	16.473	Site #4		07/12/1996	15:24:38
757	Y	20.910	Site #4		07/12/1996	15:25:01
758	Y	22.972	Site #4		07/12/1996	15:25:22
59	Y	9.851	Site #4		07/12/1996	15:26:10
760	Y	6.626	Site #4		07/12/1996	15:27:21
761	Y	7.359	Site #4		07/12/1996	15:28:25
762	Y	14.431	Site #4		07/12/1996	15:28:58
763	Y	7.134	Site #4		07/12/1996	15:30:04
764	Y	7.134	Site #4		07/12/1996	15:31:10
765	Y	5.274	Site #4		07/12/1996	15:32:39
766	Y	4.147	Site #4		07/12/1996	15:34:32
767	Y	1.609	Site #4		07/12/1996	15:39:22
768	Y	2.568	Site #4		07/12/1996	15:42:24
	8		28	9	54	71

8

seconds in interval

88

2

4 digit No

105 – 108

71

refers to sites 2 through 4

10/5/98 S2_4~1.TIP

Copied S2_4.TIP TO PROGRAM FILES\BASIC PROGRAMS

with MSDOS EDITOR DEL ALL BUT SITE#4 7/17/96

RENAME FILE S4_7_12.DAT

$\frac{mm}{hr} \times sec \times \frac{1}{60}\frac{hr}{min} \times \frac{1}{60}\frac{min}{sec}$

[Note: Used MSDOS EDIT to get columns for MIDBL operations]

5

77

C:\PROGRA~1\BASICP~1\ S4_7_12.PRE 10/27/98 10:40A. 11/2

Dave

BEGIN STORM s4_7_12.
N= 73

Test Output

TIME (min)	DEPTH (mm)
0	0
3.866667	.1297267
5	.2604567
5.4	.39387
5.583333	.5321675
5.816667	.6685314
6.233333	.8017814
6.633333	.9351947
7.433333	1.066541
7.783333	1.200545
8.516666	1.33208
9.183333	1.463836
9.733334	1.59612
10.05	1.730619
10.38333	1.864858
10.65	2.000338
10.91667	2.135818
11.01667	2.281626
11.18333	2.420823
11.28333	2.566631
11.41667	2.708309
11.53333	2.851756
11.68333	2.992056
11.8	3.135504
11.95	3.275804
12.13333	3.414101
12.3	3.553298
12.46667	3.692496
12.7	3.82886
12.98333	3.963972
13.68333	4.095619
14.25	4.227813
14.96667	4.359405
15.5	4.491787
16.23333	4.623322
16.83333	4.755363
17.98333	4.886079
18.91667	5.017135
20.05	5.147865
21.48333	5.278298
30.86666	5.407788
32.68333	5.537983

Test output txt

55.7,5.66726
57.46666,5.797463
60.56666,5.927301
60.95,6.060893
61.13333,6.199191
61.33333,6.336734
61.58333,6.472625
61.83333,6.608517
62.08333,6.744408
62.51667,6.877506
63.05,7.009889
63.43333,7.14348
63.61667,7.281778
63.81667,7.419321
64.10001,7.554433
64.33334,7.690797
64.76667,7.823895
65.25,7.956594
65.63333,8.090186
65.98333,8.22419
66.78333,8.355536
67.96667,8.486216
69.03333,8.617043
69.58334,8.749327
70.68333,8.880116
71.78333,9.010906
73.26666,9.141292
75.14999,9.271461
79.98333,9.401075
83.01666,9.530902
~~83.01666,9.530902~~
END

Intermittent Precipitation [illegible] DAW 769

7118	Y	.024	Site #18	06/26/1996	12:06:51
7119	Y	.000	Site #18	06/27/1996	00:00:00
7120	Y	.000	Site #18	06/28/1996	00:00:00
121	Y	.000	Site #18	06/29/1996	00:00:00
122	Y	.000	Site #18	06/30/1996	00:00:00
7123	Y	.000	Site #18	07/01/1996	00:00:00
7124	Y	.000	Site #18	07/02/1996	00:00:00
7125	Y	.000	Site #18	07/03/1996	00:00:00
7126	Y	.000	Site #18	07/04/1996	00:00:00
7127	Y	.000	Site #18	07/05/1996	00:00:00
7128	Y	.000	Site #18	07/06/1996	00:00:00
7129	Y	.000	Site #18	07/07/1996	00:00:00
7130	Y	.000	Site #18	07/08/1996	00:00:00
7131	Y	.000	Site #18	07/09/1996	00:00:00
7132	Y	.000	Site #18	07/10/1996	00:00:00
7133	Y	.000	Site #18	07/11/1996	00:00:00
7134	Y	.000	Site #18	07/12/1996	15:18:16
7135	Y	2.510	Site #18	07/12/1996	15:21:04
7136	Y	2.777	Site #18	07/12/1996	15:23:36
7137	Y	.000	Site #18	07/13/1996	00:00:00
7138	Y	.002	Site #18	07/14/1996	14:36:01

5 min shower 2 days before otherwise nothing for 15 days

S18_7_14.dat

TIPPING BUCKET DATA FILE

DAW 770

37137	Y	.000	Site #18		07/13/1996
00:00:00		0		4245	
37138	Y	.002	Site #18		07/14/1996
14:36:01		225361		4245	
37139	Y	14.521	Site #18		07/14/1996
14:36:31		30		4245	
37140	Y	38.380	Site #18		07/14/1996
14:36:43		12		4245	
37141	Y	32.473	Site #18		07/14/1996
14:36:57		14		4245	
37142	Y	38.380	Site #18		07/14/1996
14:37:09		12		4245	
37143	Y	35.182	Site #18		07/14/1996
14:37:22		13		4245	
37144	Y	52.712	Site #18		07/14/1996
14:37:31		9		4245	
37145	Y	70.035	Site #18		07/14/1996
14:37:38		7		4245	
37146	Y	83.686*	Site #18		07/14/1996
14:37:44		6		4245	
37147	Y	83.686*	Site #18		07/14/1996
14:37:50		6		4245	
37148	Y	46.887	Site #18		07/14/1996
14:38:00		10		4245	
37149	Y	52.712	Site #18		07/14/1996
14:38:09		9		4245	
37150	Y	52.712	Site #18		07/14/1996
14:38:18		9		4245	
37151	Y	52.712	Site #18		07/14/1996
14:38:27		9		4245	
37152	Y	38.380	Site #18		07/14/1996
14:38:39		12		4245	
37153	Y	28.136	Site #18		07/14/1996
14:38:55		16		4245	
37154	Y	35.182	Site #18		07/14/1996
14:39:08		13		4245	
37155	Y	42.213	Site #18		07/14/1996
14:39:19		11		4245	
37156	Y	32.473	Site #18		07/14/1996
14:39:33		14		4245	
37157	Y	30.150	Site #18		07/14/1996
14:39:48		15		4245	
37158	Y	30.150	Site #18		07/14/1996
14:40:03		15		4245	
37159	Y	30.150	Site #18		07/14/1996
14:40:18		15		4245	

* Maximum intensity

DAW

771

37160	Y	28.136	14:40:34	16	Site #18 4245 07/14/1996
37161	Y	28.136	14:40:50	16	Site #18 4245 07/14/1996
37162	Y	24.817	14:41:08	18	Site #18 4245 07/14/1996
37163	Y	16.203	14:41:35	27	Site #18 4245 07/14/1996
37164	Y	32.473	14:41:49	14	Site #18 4245 07/14/1996
37165	Y	26.373	14:42:06	17	Site #18 4245 07/14/1996
37166	Y	17.558	14:42:31	25	Site #18 4245 07/14/1996
37167	Y	13.155	14:43:04	33	Site #18 4245 07/14/1996
37168	Y	9.345	14:43:50	46	Site #18 4245 07/14/1996
37169	Y	8.946	14:44:38	48	Site #18 4245 07/14/1996
37170	Y	12.024	14:45:14	36	Site #18 4245 07/14/1996
37171	Y	11.689	14:45:51	37	Site #18 4245 07/14/1996
37172	Y	6.270	14:46:59	68	Site #18 4245 07/14/1996
37173	Y	1.792	14:50:54	235	Site #18 4245 07/14/1996
37174	Y	2.742	14:53:28	154	Site #18 4245 07/14/1996
37175	Y	3.815	14:55:19	111	Site #18 4245 07/14/1996
37176	Y	2.453	14:58:11	172	Site #18 4245 07/14/1996
37177	Y	4.283	14:59:50	99	Site #18 4245 07/14/1996

SCRATCH-CUT to site 18 7/14/96 1/1

DAW

772

100	0
102	225361
.521	30
380	12
.473	14
.380	12
.182	13
.712	9
.035	7
.686	6
.686	6
.887	10
.712	9
.712	9
.712	9
.380	12
.136	16
.182	13
.213	11
.473	14
.150	15
.150	15
.150	15
.136	16
.136	16
.817	18
.203	27
.473	14
373	17
.558	25
.155	33
.345	46
.946	48
2.024	36
1.689	37
.270	68
.792	235
.742	154
.815	111
.453	172
.283	99

S18-7-14 FRE 11/19/98 11:52a 1/1

U 773

DAW

```
EGIN STORM S18_7_14.
= 40
 TIME      DEPTH
 min)       (mm)
,.1252006
5,.2462089
7,.3741422
9333333,.5004261
.133333,.6283594
.35,.7554055
.5,.8871856
.616667,1.023365
.716667,1.162841
.816667,1.302318
.983333,1.43256
.133333,1.56434
.283334,1.69612
.433334,1.8279
.633334,1.955833
.9,2.080882
.116667,2.207928
.3,2.336912
.533334,2.463196
.783334,2.588821
.033334,2.714446
.283334,2.840071
.550001,2.96512
.816668,3.090169
.116668,3.214254
.366668,3.335776
.800001,3.46206
.083334,3.586599
.5,3.70853
.050001,3.829117
.816668,3.948526
.616668,4.067806
.216668,4.188046
.833335,4.308183
0.96667,4.426616
4.88334,4.543594
7.45,4.660891
9.3,4.77852
2.16667,4.895719
3.81667,5.013501
END
```

This file was originally created with TIPREAD.EXE, then was edited with the DOS Editor to remove excessive detail.

AVGJ_C.PAR DW 6/23/98 1/6

DAW 774

```
BEGIN GLOBAL

 CLEN = 300.,  UNITS = METRIC
 ND GLOBAL
-----------------------------------------------------
BEGIN PLANE

 ID = 1,  LEN = 223.,  WID = 100.,  SL = .25,  MANNING = .151

 CV =0.8,   SAT = .155  PR = 2

 RELIEF = 50,  SPACING = 1

 KS       G       DIST    POR      ROCK
8.95     80.     0.25    .34      0       ! upper layer

END PLANE
-----------------------------------------------------
```

Parameter file for AVG plane for computer run. Tipping bucket data

:\CONSULT\SWRI\PARAMS\AVGJ_O.PAR
:\PROGRA~1\BASICP~1\S18_7_14.PRE
:\CONSULT\SWRI\THIRD50\AVG_7_14.OUT
ERAGE PLANE RAINFALL FROM TIPPING BUCKET GAGE 18 7/14/96
0

DAW 3/6

775

KIN. FIL

\TIPPDT\AVG.7-14.96

3/6

AVERAGE PLANE RAINFALL FROM TIPPING BUCKET GAGE 18 7/14/96

Daily

776

(PLANE)

Contributing area = 2.230000 ha

Peak flow = .0000657 cu m /s (.0106084 mm/hr) at 3.3 min

Water balance

Rain:	111.8011 cu m	5.013501 mm
Inflow:	.0000 cu m	.000000 mm
Infilt:	111.1549 cu m	4.984525 mm
Stored:	.1595 cu m	.007152 mm
Out:	.1975 cu m	.008856 mm
Error:	.26 %	

Elapsed Time min	Rainfall mm/hr	Outflow mm/hr	Outflow cu m /s
.0	29.54507	.0000000	.0000000
1.0	38.37999	.0000009	.0000000
2.0	32.47301	.0066769	.0000414
3.0	38.38005	.0058524	.0000363
4.0	35.18193	.0096148	.0000596
5.0	52.71204	.0078038	.0000483
6.0	70.03494	.0097223	.0000602
7.0	83.68555	.0084821	.0000525
8.0	83.68629	.0071051	.0000440
9.0	46.88729	.0053879	.0000334
10.0	52.71202	.0052067	.0000323
11.0	52.71162	.0046988	.0000291
12.0	52.71202	.0043870	.0000272
13.0	38.37995	.0041667	.0000258
14.0	28.13606	.0040242	.0000249
15.0	35.18190	.0037484	.0000232
16.0	42.21300	.0036567	.0000227
17.0	32.47295	.0035562	.0000220
18.0	30.14999	.0033169	.0000205
19.0	30.15007	.0031872	.0000197
20.0	30.14999	.0029494	.0000183
21.0	28.13601	.0028131	.0000174
22.0	28.13595	.0026759	.0000166
23.0	24.81695	.0024357	.0000151
24.0	16.20296	.0023160	.0000143
25.0	32.47306	.0022911	.0000142
26.0	26.37307	.0022697	.0000141
27.0	17.55806	.0022532	.0000140
28.0	13.15494	.0022423	.0000139
29.0	9.34503	.0022372	.0000139
30.0	8.94598	.0022377	.0000139
31.0	12.02403	.0022435	.0000139
32.0	11.68902	.0022540	.0000140
33.0	6.26998	.0022683	.0000141
34.0	1.79200	.0022857	.0000142
35.0	2.74201	.0023053	.0000143
36.0	3.81500	.0023261	.0000144
37.0	2.45300	.0023472	.0000145
38.0	4.28299	.0023678	.0000147

DAUS 777

39.0	.00000	.0023870	.0000148
40.0	.00000	.0024041	.0000149
41.0	.00000	.0024186	.0000150
42.0	.00000	.0024299	.0000151
43.0	.00000	.0024377	.0000151
44.0	.00000	.0024418	.0000151
45.0	.00000	.0024422	.0000151
46.0	.00000	.0024388	.0000151
47.0	.00000	.0024320	.0000151
48.0	.00000	.0024219	.0000150
49.0	.00000	.0024090	.0000149
50.0	.00000	.0023937	.0000148
51.0	.00000	.0023764	.0000147
52.0	.00000	.0023578	.0000146
53.0	.00000	.0023384	.0000145
54.0	.00000	.0023187	.0000144
55.0	.00000	.0022992	.0000142
56.0	.00000	.0022804	.0000141
57.0	.00000	.0022628	.0000140
58.0	.00000	.0022468	.0000139
59.0	.00000	.0022327	.0000138
60.0	.00000	.0022208	.0000138
61.0	.00000	.0022114	.0000137
62.0	.00000	.0022046	.0000137
63.0	.00000	.0022005	.0000136
64.0	.00000	.0021991	.0000136
65.0	.00000	.0022005	.0000136
66.0	.00000	.0022046	.0000137
67.0	.00000	.0022112	.0000137
68.0	.00000	.0022203	.0000138
69.0	.00000	.0022316	.0000138
70.0	.00000	.0022449	.0000139
71.0	.00000	.0022599	.0000140
72.0	.00000	.0022764	.0000141
73.0	.00000	.0022940	.0000142
74.0	.00000	.0023125	.0000143
75.0	.00000	.0023316	.0000144
76.0	.00000	.0023508	.0000146
77.0	.00000	.0023700	.0000147
78.0	.00000	.0023888	.0000148
79.0	.00000	.0024070	.0000149
80.0	.00000	.0024242	.0000150
81.0	.00000	.0024403	.0000151
82.0	.00000	.0024549	.0000152
83.0	.00000	.0024680	.0000153
84.0	.00000	.0024793	.0000154
85.0	.00000	.0024887	.0000154
86.0	.00000	.0024961	.0000155
87.0	.00000	.0025014	.0000155
88.0	.00000	.0025045	.0000155
89.0	.00000	.0025055	.0000155
90.0	.00000	.0025044	.0000155
91.0	.00000	.0025011	.0000155
92.0	.00000	.0024958	.0000155
93.0	.00000	.0024885	.0000154
94.0	.00000	.0024794	.0000154
95.0	.00000	.0024685	.0000153
96.0	.00000	.0024560	.0000152
97.0	.00000	.0024421	.0000151
98.0	.00000	.0024269	.0000150

.cvt cont

5/6

DAW

778

99.0	.00000	.0024106	.0000149
100.0	.00000	.0023933	.0000148
101.0	.00000	.0023754	.0000147
102.0	.00000	.0023569	.0000146
103.0	.00000	.0023380	.0000145
104.0	.00000	.0023190	.0000144
105.0	.00000	.0023000	.0000142
106.0	.00000	.0022812	.0000141
107.0	.00000	.0022627	.0000140
108.0	.00000	.0022447	.0000139
109.0	.00000	.0022274	.0000138
110.0	.00000	.0022110	.0000137
111.0	.00000	.0021954	.0000136
112.0	.00000	.0021809	.0000135
113.0	.00000	.0021676	.0000134
114.0	.00000	.0021555	.0000134
115.0	.00000	.0021447	.0000133
116.0	.00000	.0021353	.0000132
117.0	.00000	.0021274	.0000132
118.0	.00000	.0021209	.0000131
119.0	.00000	.0021160	.0000131
120.0	.00000	.0021126	.0000131
121.0	.00000	.0021108	.0000131
122.0	.00000	.0021104	.0000131
123.0	.00000	.0021116	.0000131
124.0	.00000	.0021143	.0000131
125.0	.00000	.0021184	.0000131
126.0	.00000	.0021239	.0000132
127.0	.00000	.0021308	.0000132
128.0	.00000	.0021390	.0000132
129.0	.00000	.0021484	.0000133
130.0	.00000	.0021590	.0000134
131.0	.00000	.0021706	.0000134
132.0	.00000	.0021833	.0000135
133.0	.00000	.0021968	.0000136
134.0	.00000	.0022112	.0000137
135.0	.00000	.0022264	.0000138
136.0	.00000	.0022421	.0000139
137.0	.00000	.0022585	.0000140
138.0	.00000	.0022753	.0000141
139.0	.00000	.0022924	.0000142
140.0	.00000	.0023099	.0000143
141.0	.00000	.0023276	.0000144
142.0	.00000	.0023453	.0000145
143.0	.00000	.0023631	.0000146
144.0	.00000	.0023808	.0000147
145.0	.00000	.0023984	.0000149
146.0	.00000	.0024158	.0000150
147.0	.00000	.0024329	.0000151
148.0	.00000	.0024497	.0000152
149.0	.00000	.0024660	.0000153
150.0	.00000	.0024819	.0000154
151.0	.00000	.0024973	.0000155
152.0	.00000	.0025121	.0000156
153.0	.00000	.0025263	.0000156
154.0	.00000	.0025399	.0000157
155.0	.00000	.0025528	.0000158
156.0	.00000	.0025649	.0000159
157.0	.00000	.0025763	.0000160
158.0	.00000	.0025870	.0000160

159.0	.00000	.0025969	.0000161
160.0	.00000	.0026060	.0000161
161.0	.00000	.0026142	.0000162
162.0	.00000	.0026217	.0000162
163.0	.00000	.0026284	.0000163
164.0	.00000	.0026342	.0000163
165.0	.00000	.0026392	.0000163
166.0	.00000	.0026434	.0000164
167.0	.00000	.0026468	.0000164
168.0	.00000	.0026494	.0000164
169.0	.00000	.0026512	.0000164
170.0	.00000	.0026522	.0000164
171.0	.00000	.0026525	.0000164
172.0	.00000	.0026520	.0000164
173.0	.00000	.0026508	.0000164
174.0	.00000	.0026489	.0000164
175.0	.00000	.0026463	.0000164
176.0	.00000	.0026431	.0000164
177.0	.00000	.0026392	.0000163
178.0	.00000	.0026346	.0000163
179.0	.00000	.0026295	.0000163
180.0	.00000	.0027606	.0000171
181.0	.00000	.0026210	.0000162
182.0	.00000	.0025468	.0000158
183.0	.00000	.0025154	.0000156
184.0	.00000	.0025105	.0000156
185.0	.00000	.0025204	.0000156
186.0	.00000	.0025371	.0000157
187.0	.00000	.0025551	.0000158
188.0	.00000	.0025708	.0000159
189.0	.00000	.0025821	.0000160
190.0	.00000	.0025878	.0000160
191.0	.00000	.0025876	.0000160
192.0	.00000	.0025818	.0000160
193.0	.00000	.0025709	.0000159
194.0	.00000	.0025556	.0000158
195.0	.00000	.0025367	.0000157
196.0	.00000	.0025151	.0000156
197.0	.00000	.0024916	.0000154
198.0	.00000	.0024670	.0000153
199.0	.00000	.0024419	.0000151
200.0	.00000	.0024169	.0000150

Event Volume Summary:

Rainfall	5.013501 mm	111.8011 cu m
Plane infiltration	4.984525	111.1549
Storage	.007152	.1595
Outflow	.008856	.1975

Error (Volume in - Volume out - Storage) < 1 percent

Total watershed area = 2.230000 ha

:\CONSULT\SWRI\PARAMS\SOLJ_OC.PAR
:\PROGRA~1\BASICP~1\S18_7_14.PRE
:\CONSULT\SWRI\THIRD50\SOL_7_14.OUT
LITARIO CANYON RAINFALL FROM TIPPING BUCKET GAGE 18 7/14/9
0

DAW 780

Copy of KIN.FILE for storm of 7/14/96

DAW 7/22/98

DAW 781

Event Volume Summary:

Rainfall	5.013501 mm	53758.49 cu m
Plane infiltration	4.997459	53586.48
Channel infiltration	.006519	69.90
Storage	.010912	117.01
Outflow	.000324	3.47

Error (Volume in - Volume out - Storage) < 1 percent

Total watershed area = 1072.274 ha

Copy of part of SOL-7-14.OUT

DAW 7/22/98

Antecedent Precipitation Search 12/04/94

4943	Y	.000	Site #18	12/06/1994	00:00:00
4944	Y	.000	Site #18	12/07/1994	00:00:00
4945	Y	.000	Site #18	12/08/1994	00:00:00
946	Y	.000	Site #18	12/09/1994	00:00:00
947	Y	.000	Site #18	12/10/1994	00:00:00
4948	Y	.000	Site #18	12/11/1994	00:00:00
4949	Y	.000	Site #18	12/12/1994	00:00:00
4950	Y	.000	Site #18	12/13/1994	13:49:24
4951	Y	.051	Site #18	12/13/1994	15:45:05
4952	Y	.563	Site #18	12/13/1994	15:55:35
4953	Y	.117	Site #18	12/13/1994	16:45:59
4954	Y	.006	Site #18	12/14/1994	08:39:31
4955	Y	.000	Site #18	12/15/1994	00:00:00
4956	Y	.000	Site #18	12/16/1994	00:00:00
4957	Y	.000	Site #18	12/17/1994	00:00:00
4958	Y	.000	Site #18	12/18/1994	00:00:00
4959	Y	.000	Site #18	12/19/1994	00:00:00
4960	Y	.000	Site #18	12/20/1994	00:00:00
4961	Y	.000	Site #18	12/21/1994	00:00:00
4962	Y	.000	Site #18	12/22/1994	00:00:00
4963	Y	.000	Site #18	12/23/1994	02:10:47
4964	Y	.004	Site #18	12/24/1994	02:23:22

A very minor shower 11 days before.

783

Daw

Date 12/24/1994

34964 Y .004 02:23:22	87155	Site #18	4245	12/24/1994
34965 Y .137 03:06:40	2598	Site #18	4245	12/24/1994
34966 Y .256 03:29:47	1387	Site #18	4245	12/24/1994
34967 Y .324 03:48:05	1098	Site #18	4245	12/24/1994
34968 Y .060 05:27:07	5942	Site #18	4245	12/24/1994
34969 Y .603 05:36:57	590	Site #18	4245	12/24/1994
34970 Y 2.040 05:39:52	175	Site #18	4245	12/24/1994
34971 Y .252 06:03:22	1410	Site #18	4245	12/24/1994
34972 Y .349 06:20:22	1020	Site #18	4245	12/24/1994
34973 Y .017 12:06:19	20757	Site #18	4245	12/24/1994
34974 Y .309 12:25:28	1149	Site #18	4245	12/24/1994
34975 Y .448 12:38:42	794	Site #18	4245	12/24/1994
34976 Y 1.070 12:44:15	333	Site #18	4245	12/24/1994
34977 Y 4.544 12:45:34	79	Site #18	4245	12/24/1994
34978 Y 3.896 12:47:06	92	Site #18	4245	12/24/1994
34979 Y 4.029 12:48:35	89	Site #18	4245	12/24/1994
34980 Y 7.528 12:49:23	48	Site #18	4245	12/24/1994
34981 Y 6.556 12:50:18	55	Site #18	4245	12/24/1994
34982 Y 6.212 12:51:16	58	Site #18	4245	12/24/1994
34983 Y 2.138 12:54:03	167	Site #18	4245	12/24/1994
34984 Y .508 13:05:43	700	Site #18	4245	12/24/1994
34985 Y 16.749 13:06:05	22	Site #18	4245	12/24/1994
34986 Y 23.339 13:06:21	16	Site #18	4245	12/24/1994

Daus

34987	Y	38.432		Site #18	12/24/1994
13:06:31			10	4245	
34988	Y	56.679 *		Site #18	12/24/1994
13:06:38			7	4245	
34989	Y	29.048		Site #18	12/24/1994
13:06:51			13	4245	
34990	Y	48.947		Site #18	12/24/1994
13:06:59			8	4245	
34991	Y	16.749		Site #18	12/24/1994
13:07:21			22	4245	
34992	Y	13.059		Site #18	12/24/1994
13:07:49			28	4245	
34993	Y	1.802		Site #18	12/24/1994
13:11:07			198	4245	
34994	Y	.246		Site #18	12/24/1994
13:35:11			1444	4245	
34995	Y	1.643		Site #18	12/24/1994
13:38:48			217	4245	
34996	Y	2.772		Site #18	12/24/1994
13:40:57			129	4245	
34997	Y	7.861		Site #18	12/24/1994
13:41:43			46	4245	
34998	Y	17.577		Site #18	12/24/1994
13:42:04			21	4245	
34999	Y	11.386		Site #18	12/24/1994
13:42:36			32	4245	
35000	Y	7.078		Site #18	12/24/1994
13:43:27			51	4245	
35001	Y	5.367		Site #18	12/24/1994
13:44:34			67	4245	
35002	Y	6.212		Site #18	12/24/1994
13:45:32			58	4245	
35003	Y	3.656		Site #18	12/24/1994
13:47:10			98	4245	
35004	Y	1.585		Site #18	12/24/1994
13:50:55			225	4245	
35005	Y	1.839		Site #18	12/24/1994
13:54:09			194	4245	
35006	Y	2.772		Site #18	12/24/1994
13:56:18			129	4245	
35007	Y	.600		Site #18	12/24/1994
14:06:11			593	4245	
35008	Y	1.325		Site #18	12/24/1994
14:10:40			269	4245	
35009	Y	.519		Site #18	12/24/1994
14:22:06			686	4245	

* maximum intensity

DAW

35010 Y 1.690		Site #18		12/24/1994
14:25:37	211		4245	
35011 Y 4.220		Site #18		12/24/1994
14:27:02	85		4245	
35012 Y 5.288		Site #18		12/24/1994
14:28:10	68		4245	
35013 Y 5.062		Site #18		12/24/1994
14:29:21	71		4245	
35014 Y .035		Site #18		12/24/1994
17:16:34	10033		4245	
35015 Y 3.582		Site #18		12/24/1994
17:18:14	100		4245	
35016 Y 15.308		Site #18		12/24/1994
17:18:38	24		4245	
35017 Y 3.694		Site #18		12/24/1994
17:20:15	97		4245	
35018 Y 1.606		Site #18		12/24/1994
17:23:57	222		4245	
35019 Y .201		Site #18		12/24/1994
17:53:28	1771		4245	
35020 Y .288		Site #18		12/24/1994
18:14:02	1234		4245	
35021 Y 1.858		Site #18		12/24/1994
18:17:14	192		4245	
35022 Y .908		Site #18		12/24/1994
18:23:46	392		4245	
35023 Y .370		Site #18		12/24/1994
18:39:48	962		4245	
35024 Y 5.135		Site #18		12/24/1994
18:40:58	70		4245	
35025 Y 2.260		Site #18		12/24/1994
18:43:36	158		4245	
35026 Y .106		Site #18		12/24/1994
19:39:16	3340		4245	
35027 Y 2.430		Site #18		12/24/1994
19:41:43	147		4245	
35028 Y .052		Site #18		12/24/1994
21:36:02	6859		4245	
35029 Y 1.000		Site #18		12/24/1994
21:41:58	356		4245	
35030 Y 1.455		Site #18		12/24/1994
21:46:03	245		4245	
35031 Y 1.149		Site #18		12/24/1994
21:51:13	310		4245	
35032 Y .129		Site #18		12/24/1994
22:37:02	2749		4245	

786

Daw

35033	Y	1.255	Site #18	12/24/1994	
22:41:46	284	4245			
35034	Y	4.854	Site #18	12/24/1994	
22:43:00	74	4245			
35035	Y	4.991	Site #18	12/24/1994	
22:44:12	72	4245			
35036	Y	3.167	Site #18	12/24/1994	
22:46:05	113	4245			
35037	Y	3.378	Site #18	12/24/1994	
22:47:51	106	4245			
35038	Y	2.366	Site #18	12/24/1994	
22:50:22	151	4245			
35039	Y	2.335	Site #18	12/24/1994	
22:52:55	153	4245			
35040	Y	2.729	Site #18	12/24/1994	
22:55:06	131	4245			
35041	Y	5.622	Site #18	12/24/1994	
22:56:10	64	4245			
35042	Y	.712	Site #18	12/24/1994	
23:04:30	500	4245			
35043	Y	.625	Site #18	12/24/1994	
23:13:59	569	4245			
35044	Y	1.811	Site #18	12/24/1994	
23:17:16	197	4245			
35045	Y	1.517	Site #18	12/24/1994	
23:21:11	235	4245			
35046	Y	.997	Site #18	12/24/1994	
23:27:08	357	4245			

DAW 787

```
EGIN STORM s1812_24.
= 83
  TIME      DEPTH
  min)       (mm)
,9.683889E-02
3.3,.1957072
6.41666,.2943383
4.71667,.3931583
83.75,.4921917
93.5833,.5910167
96.5,.6901833
20,.7888833
37,.8877667
82.95,.9857858
02.1,1.084408
15.3334,1.183217
20.8834,1.282192
22.2,1.381908
23.7333,1.481472
25.2167,1.581078
26.0167,1.681451
26.9333,1.781613
27.9,1.881695
30.6833,1.980874
42.35,2.079652
42.7167,2.182007
42.9833,2.285736
43.15,2.392492
 .2667,2.502701
3.4833,2.607596
43.6167,2.716367
43.9833,2.818722
44.45,2.920292
47.75,3.019402
71.8167,3.118076
75.4333,3.217112
77.5833,3.316442
78.35,3.416888
78.7,3.519421
79.2333,3.62063
80.0833,3.720901
81.1999,3.820787
82.1666,3.920869
83.7999,4.020394
87.5499,4.119456
90.7833,4.218558
92.9333,4.317888
02.8167,4.416721
07.3,4.515728
18.7333,4.614627
22.25,4.71368
23.6667,4.813319
24.8,4.913203
5.9834,5.013037
 .2001,5.11058
94.8668,5.210081
95.2668,5.312134
96.8834,5.411666
00.5834,5.510703
30.1001,5.609584
```

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```
50.6667,5.708304
53.8668,5.807397
60.4001,5.906269
  .4334,6.005141
,7.6001,6.104988
80.2335,6.204177
035.9,6.302521
038.35,6.401746
152.667,6.500821
158.6,6.59971
162.683,6.69873
167.85,6.797672
213.667,6.896178
218.4,6.995184
219.633,7.094961
220.833,7.194781
222.717,7.294189
224.483,7.393653
227,7.492894
229.55,7.592131
231.733,7.691436
232.8,7.791383
241.133,7.890272
250.617,7.989057
253.9,8.088159
257.817,8.187185
263.767,8.286055
ND
```

PAR File AVED PAR EM 10/23/98


```
BEGIN GLOBAL

 CLEN = 300.,  UNITS = METRIC
 ND GLOBAL
 ----------------------------------------------------
BEGIN PLANE

 ID = 1,  LEN = 223.,  WID = 100.,  SL = .25,  MANNING = .151

 CV =0.8,   SAT = .235  PR = 2

 RELIEF = 50,  SPACING = 1

 KS       G       DIST    POR      ROCK
16.35     80.     0.25    .34      0       ! upper layer

END PLANE
----------------------------------------------------
```

DAW

/

PART OF OUTPUT FILE EEM 10/23/98 790

File Edit Search View Options Help

C:\CONSULT\SWRI\THIRD50\AVG12_24.OUT

AVERAGE PLANE RAINFALL FROM TIPPING BUCKET GAGE 18 12/24/94

1 (PLANE)

Contributing area = 2.230000 ha

Peak flow = .0000002 cu m /s (.0000362 mm/hr) at 644.0 min

Water balance

Rain:	97.86475 cu m	4.388554 mm
Inflow:	.00000 cu m	.000000 mm
Infilt:	97.84414 cu m	4.387630 mm
Stored:	.00000 cu m	.000000 mm
Out:	.00001 cu m	.000000 mm
Error:	.02 %	

Elapsed Time min	Rainfall mm/hr	Outflow mm/hr	Outflow cu m /s
.0	.27119	.0000000	.0000000

F1=Help Line:18 Col:56

File Edit Search View Options Help

C:\CONSULT\SWRI\THIRD50\AVG12_24.OUT

658.0	13.05715	.0000000	.0000000
660.0	1.80200	.0000000	.0000000
662.0	.24600	.0000000	.0000000
664.0	.24600	.0000000	.0000000
666.0	.24600	.0000000	.0000000
668.0	.24600	.0000000	.0000000
670.0	.24600	.0000000	.0000000
672.0	1.64305	.0000000	.0000000
674.0	1.64305	.0000000	.0000000
676.0	2.77192	.0000000	.0000000
678.0	7.86099	.0000000	.0000000
680.0	17.57713	.0000000	.0000000
682.0	11.38739	.0000000	.0000000
684.0	7.07740	.0000000	.0000000
686.0	5.36763	.0000000	.0000000
688.0	6.21157	.0000000	.0000000
690.0	3.65602	.0000000	.0000000
692.0	1.58499	.0000000	.0000000
694.0	1.83897	.0000000	.0000000
696.0	2.77208	.0000000	.0000000
698.0	.59999	.0000000	.0000000
700.0	.59999	.0000000	.0000000

F1=Help Line:372 Col:56

Storm of Mar 9-11, 1995 — DAW

Procedure:

✓ a) Create a file for gage #8 for the same time period as gage 17.

✓ b) Plot both storms - if storm patterns and depths are similar, use the greatest depth. If not create a file with average accumulated depths

c) Calculate total antecedent rain for Mar 9 & 10 Assume that soil starts at Mar average saturation on Mar 9.

d) Use the 2 layer, complex hillslope parameter file
HILD672L.PAR - 2 layer

HILD67.PAR - semi-infinite

Storm of Mar 9-11, 1995 at Gage #8.
N = 752 Duration = 2467 min = 41.12 hr. Depth = 80.29

Clearly there is a major difference in depth. Duration at gage #8 is also 5.97 hrs longer. Max intensity = 13.03 mm/h

Files were created for gages 2 and 4 aswell. There is a definite gradient with rainfall increasing to the North.

Event No 2. had a total of 8.29 mm of rain in 1263 minutes for an average intensity of 0.39 mm/hr. Maximum intensity was

DAW

COMPUTER RUNS

For Event 1

Average plane (July parameters) Runoff = 0.008856 mm

Solitario Canyon (July parameters) Channel F = .0065 mm
Runoff = 0.000384 mm
= 3.47 m^3

Runoff for both the average plane and Solitario Canyon is insignificant.

For Event 2

Average plane (Dec. parameters) Ran for 700 mm which included highest intensity. No significant runoff.

CONCLUSIONS

No runoff would have been observed for either event

However Flint, Hevesi and Flint (Unpub. Manuscript) state that on Mar 9-11, 1995, approx 65 mm of precipitation occurred on Yucca Mtn and although the intensity was low (max of 14 mm/hr) widespread overland flow was observed in the region on the morning of Mar 11, 1995.

The data for this storm is missing for gage 18. The nearest gage to 18 is 17. The best average for the watershed would be an average of 17 and 8.

New Computer Runs

Created file S17_3995.PRE for gage 17 storm of 3/9/1995

N = 381 Duration = 2109.4 min Depth = 38.02 mm
35.15 hrs

Solitario Canyon Start at 3/9-11/93 Date 10/17/95

793

1. Copy file HILDO\HILD6722.PAR to HILM6722.PAR for March

2. Change KS to 22.25 mm/h - seasonal variation
   SAT to 0.325
   G to 50.

DAW

3. Try KINEROS2 run with all of rainfall input for gage 8 with run length = 9000 min, Δt = 2 min.
   - This generated an error - rainfall input block too big for data buffer.

   3a. Copy file 58_3995.PRE to 58_3995B.PRE
   Delete unnecessary detail
   This resulted in an outflow of 17.66 mm.

4. Try with gage 2
   4a Copy file 52_3995.PRE to 52_3995B.PRE
   Delete detail
   This resulted in runoff of 9.97 mm

5. Try with gage 17
   5a Copy file 517_3995.PRE to 17_3995B.PRE
   Delete detail
   This resulted in runoff of 2.8 mm

Discussion

Infiltration on plane 67 is the same 21.8 mm for gages 8 and 2 and only slightly lower 21.45 for gage 17. This shows that plane 67 reaches saturation for each storm.

DAW

Solitario Canyon Watershed

Objective: To see if any runoff is generated for the entire watershed with semi-infinite soil depth.

Procedure:

1. Create file \THIRD50\ SJ_AD.PAR

   KS = 22.75 mm/h G = 50. mm SAT = 0.325

2. Run with gage # 2 input.

   No significant runoff or channel infiltration. See next sheet. Any runoff that occurs is due to log normal dist of KS because intensities are all below 22.75 mm/hr

DAW 10/29/98

- Possibilities for including 2 layer systems for winter storms.

  Flint et al. (in review) state that 48% of Yucca Mtn has soils with depths < 0.5m (500mm). It would be possible to create parameter files with a 48%

of the area with depth < 0.5 m. The 1-month data for Wren Wash and Pagany Wash for this storm could give a "reality check".

The allocation of soil thickness could be based on the slope of the plane element. DAW

It would be useful to do a sensitivity study of the 3 plane cascade to the thickness of the soil layer.

Create a new parameter file for the 3 plane cascade

Edit HILM67ZL.PAR

Create ~~HILM67ZL~~ ~~HLM~~ PAR change THILK for plane 67 to 200 mm

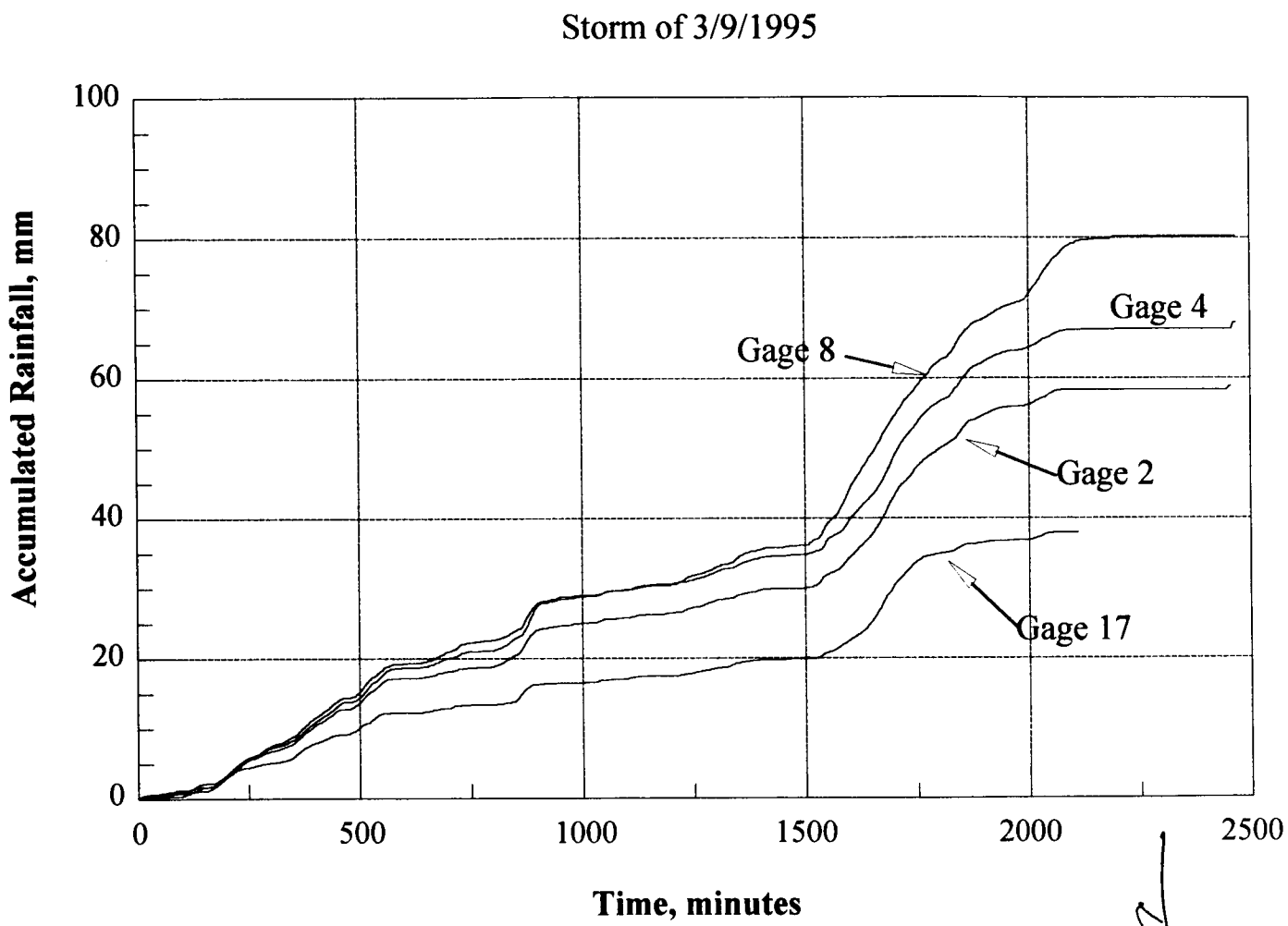
HL2M67ZL.PAR

square month

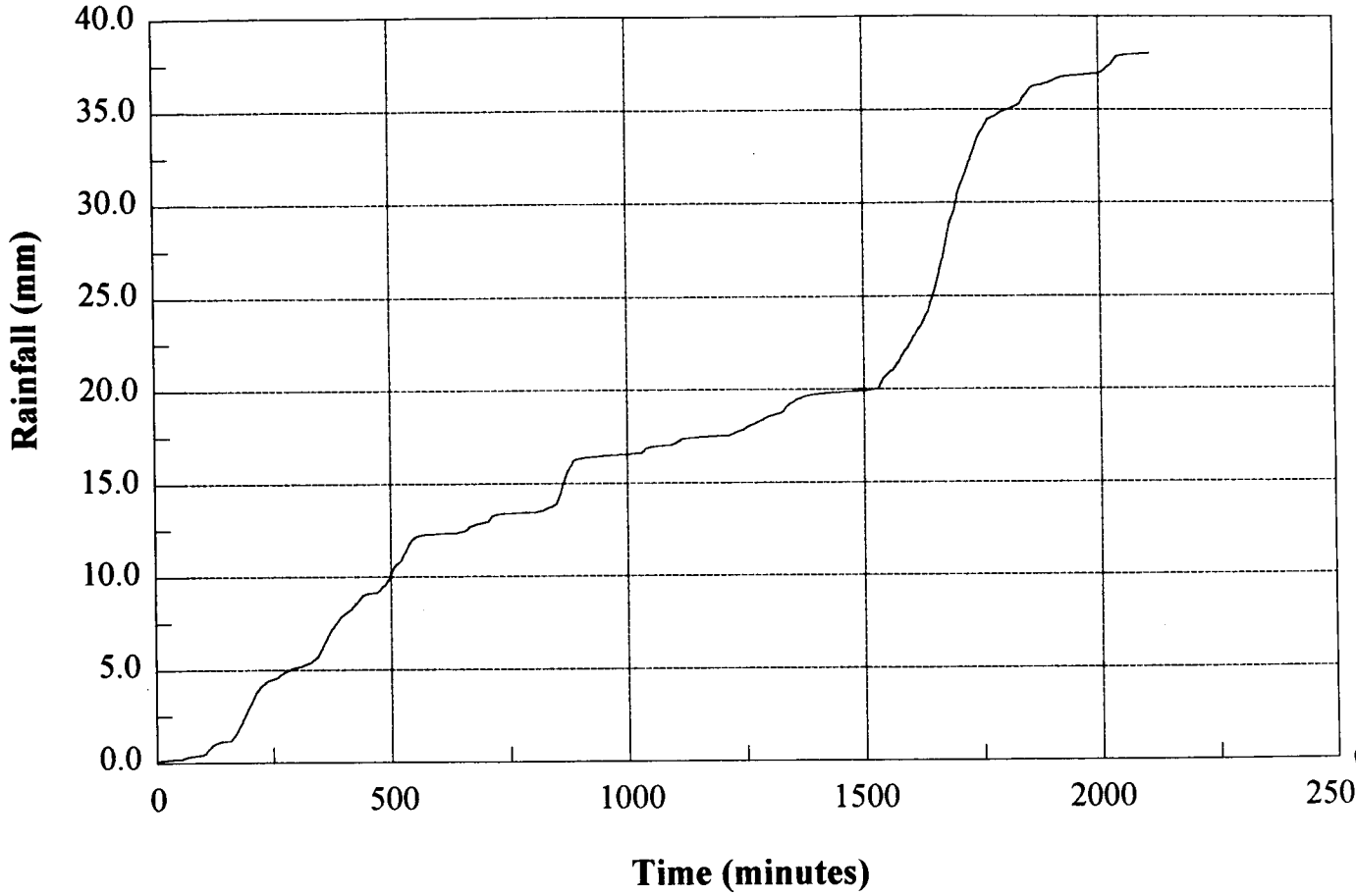
Run with gage 2 as input

Out file is HL223995.OUT

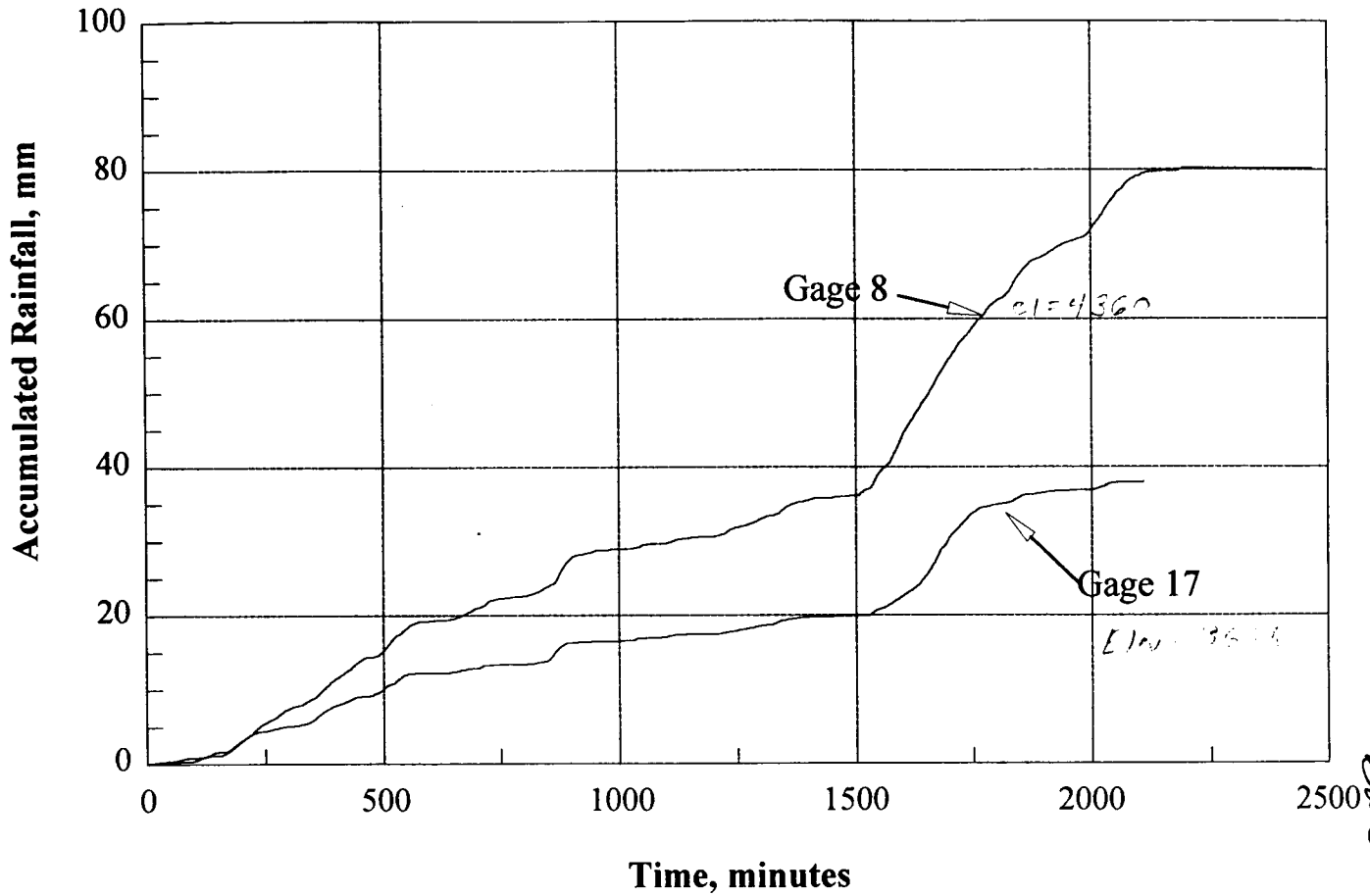
Runoff = 4.33 mm


Storm of 3/9/1995
Accumulated Rainfall, mm
100
80
60
40
20
0
0
500
1000
1500
2000
2500
Time, minutes
Gage 8
Gage 4
Gage 2
Gage 17

S17_3995.dat


Rainfall (mm)
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0
500
1000
1500
2000
2500
Time (minutes)

Storm of 3/9/1995



Storm of 3/9/1995

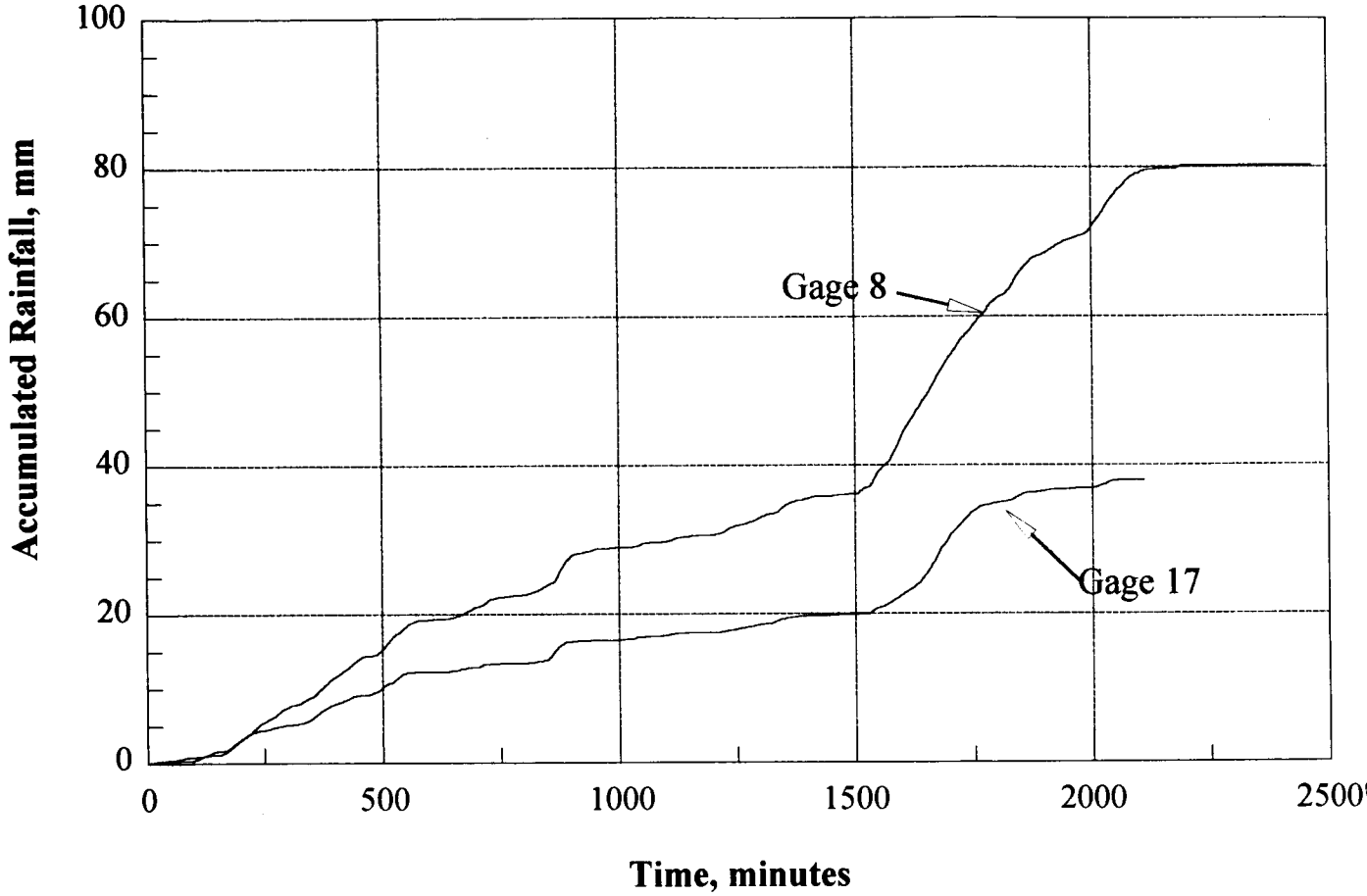


Fig. 7b9

Rcv 10/28/98 3:30 P

800

FILE:THIRD50\SOLD3995.OUT
SOLITARION CANYON WATERSHED
GAGE #2 STORM OF 3/9-11/1995

DAW

Event Volume Summary:

Rainfall	58.89663 mm	631533.4 cu m
Plane infiltration	58.88786	631439.4
Channel infiltration	.00020	2.2
Storage	.00488	52.3
Outflow	.00009	1.0

Error (Volume in - Volume out - Storage) < 1 percent

Total watershed area = 1072.274 ha

see overleaf for Rain. fil
Rev with semi-inf depth
Solitario Canyon

```
BEGIN GLOBAL Solitario Canyon hillslope, Woolhiser Func., seasonal. SAT & KS, n=
!2 LAYER ON UPPER TWO PLANES
 CLEN = 300,  UNITS = METRIC

END GLOBAL
!-------------------------------------------------------
BEGIN PLANE

 ID = 67, LEN = 90,   WID = 608   SL = .08,  MANNING = .151

 SAT = 0.375 ~~.235~~, CV = 0.8,  THICK = 100.,  PR = 1

 RELIEF = 50,  SPACING = 1.

 KS 22.25  G  50    DIST    POR      ROCK
 ~~16.35~~   ~~80.~~    0.25    .34      0
  0.0134   ~~60.~~50   0.25   0.20      0    ! Lower layer is fractured rock

END PLANE
!-------------------------------------------------------
BEGIN PLANE

 ID = 68, UP=67, LEN = 162,  WID = 608 , SL = .56,  MANNING = .151

 SAT = 0.375 ~~.235~~, CV = 0.8,  THICK = 200.,  PR = 1

 RELIEF = 100,  SPACING = 1.

 KS 22.25  G        DIST    POR      ROCK
 ~~16.35~~   ~~80.~~50   0.25    .34      0
 0.0134    ~~60.~~50   0.25   0.20      0 !Lower layer

END PLANE
!-------------------------------------------------------
BEGIN PLANE

 ID = 69  UP=68  LEN = 187,  WID = 483 , SL = .20,  MANNING = .151

 SAT = 0.375 ~~.235~~, CV = 0.8,  PR = 2

 RELIEF = 150,  SPACING = 1.

 KS        G        DIST    POR      ROCK
 ~~16.35~~   ~~80.~~    0.25    .34      0
 22.25     50.
END PLANE
!-------------------------------------------------------
```

Dan

Area = 54,720
22.47 %

Area = 99,496
= 40%

Area = 96,321

Revised file = HILM6722L.AA
- March

Total Area = 243,537 m²

RAIN GAGE 8

THREE PLANE CASCADE, 2 LAYER ON UPPER 2 PLANES,RAIN OF 3/9-11/95

HILMOTHL.PAF

7 (PLANE)

DAW

Contributing area = 5.472000 ha

Peak flow = .0973247 cu m /s (6.402940 mm/hr) at 1701.2 min

Water balance

Rain:	4393.705 cu m	80.29431 mm
Inflow:	.000 cu m	.00000 mm
Infilt:	1195.304 cu m	21.84400 mm
Stored:	.631 cu m	.01153 mm
Out:	3186.573 cu m	58.23415 mm
Error:	.25 %	

Saturated = 22.4

68 (PLANE)

Contributing area = 15.32160 ha

Peak flow = .2722477 cu m /s (6.396798 mm/hr) at 1701.2 min

Water balance

Rain:	7908.668 cu m	80.29431 mm
Inflow:	3186.556 cu m	32.35213 mm
Infilt:	2983.333 cu m	30.28888 mm
Stored:	1.550 cu m	.01574 mm
Out:	8088.733 cu m	82.12246 mm
Error:	.19 %	

Saturated = 45.8

69 (PLANE)

Contributing area = 24.35370 ha

Peak flow = .1767372 cu m /s (2.612556 mm/hr) at 1701.2 min

Water balance

Rain:	7252.26 cu m	80.2943 mm
Inflow:	8088.67 cu m	89.5547 mm
Infilt:	11051.63 cu m	122.3595 mm
Stored:	3.87 cu m	.0428 mm
Out:	4299.98 cu m	47.6078 mm
Error:	-.09 %	

Rain gage 8
storm of 3/7-11/95
HILMIG72L.PAK

10/27/98
1:05 AM

DAW

ent Volume Summary:

Rainfall	80.29432 mm	19554.64 cu m
Plane infiltration	62.53778	15230.26
Storage	.02483	6.05
Outflow	17.65638	4299.98

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .6500, .6667, .6667 min

Total watershed area = 24.35370 ha

C:\consult\swri\THIRD50>

Rain gage 2

THREE PLANE CASCADE, 2 LAYER ON UPPER 2 PLANES,RAIN OF 3/9-11/75

HILL2D\HILM6722.PAR

7 (PLANE)

Contributing area = 5.472000 ha

Peak flow = .1104424 cu m /s (7.265949 mm/hr) at 1700.2 min

Water balance

Rain:	3222.824 cu m	58.89663 mm
Inflow:	.000 cu m	.00000 mm
Infilt:	1194.386 cu m	21.82722 mm
Stored:	3.206 cu m	.05859 mm
Out:	2016.301 cu m	36.84761 mm
Error:	.28 %	

68 (PLANE)

Contributing area = 15.32160 ha

Peak flow = .3069719 cu m /s (7.212687 mm/hr) at 1700.2 min

Water balance

Rain:	5801.083 cu m	58.89663 mm
Inflow:	2016.290 cu m	20.47078 mm
Infilt:	2815.060 cu m	28.58045 mm
Stored:	13.274 cu m	.13477 mm
Out:	4975.099 cu m	50.51067 mm
Error:	.18 %	

69 (PLANE)

Contributing area = 24.35370 ha

Peak flow = .2022477 cu m /s (2.989655 mm/hr) at 1706.0 min

Water balance

Rain:	5319.603 cu m	58.89663 mm
Inflow:	4974.537 cu m	55.07619 mm
Infilt:	7847.793 cu m	86.88780 mm
Stored:	36.386 cu m	.40285 mm
Out:	2428.874 cu m	26.89158 mm
Error:	-.18 %	

Storm of 3/4-11/95

HILMOTOL PAP

DAW

Event Volume Summary:

Rainfall	58.89663 mm	14343.51 cu m
Plane infiltration	48.68763	11857.24
Storage	.21708	52.87
Outflow	9.97333	2428.87

Error (Volume in - Volume out - Storage) < 1 percent

Time step distribution (100,75,50%) = .6580, .6667, .8910 min

Total watershed area = 24.35370 ha

Raingage 17

THREE PLANE CASCADE, 2 LAYER ON UPPER 2 PLANES,RAIN OF 3/9-1

Storm of 3/9-11/95

HILM1672L.PAR

DAW

7 (PLANE)

Contributing area = 5.472000 ha

Peak flow = .1084630 cu m /s (7.135724 mm/hr) at 1680.6 min

Water balance

Rain:	2080.772	cu m	38.02581	mm
Inflow:	.000	cu m	.00000	mm
Infilt:	1174.011	cu m	21.45488	mm
Stored:	.087	cu m	.00159	mm
Out:	902.899	cu m	16.50034	mm
Error:	.18	%		

68 (PLANE)

Contributing area = 15.32160 ha

Peak flow = .2391798 cu m /s (5.619826 mm/hr) at 1700.5 min

Water balance

Rain:	3745.390	cu m	38.02581	mm
Inflow:	903.146	cu m	9.16937	mm
Infilt:	3054.604	cu m	31.01246	mm
Stored:	.194	cu m	.00197	mm
Out:	1590.489	cu m	16.14775	mm
Error:	.07	%		

69 (PLANE)

Contributing area = 24.35370 ha

Peak flow = .0964333 cu m /s (1.425492 mm/hr) at 1720.0 min

Water balance

Rain:	3434.529	cu m	38.02581	mm
Inflow:	1590.775	cu m	17.61246	mm
Infilt:	4352.454	cu m	48.18872	mm
Stored:	1.333	cu m	.01476	mm
Out:	679.015	cu m	7.51780	mm
Error:	-.15	%		

Gauge 17 3/9-11/95
HILM 6772 PAP

Event Volume Summary:

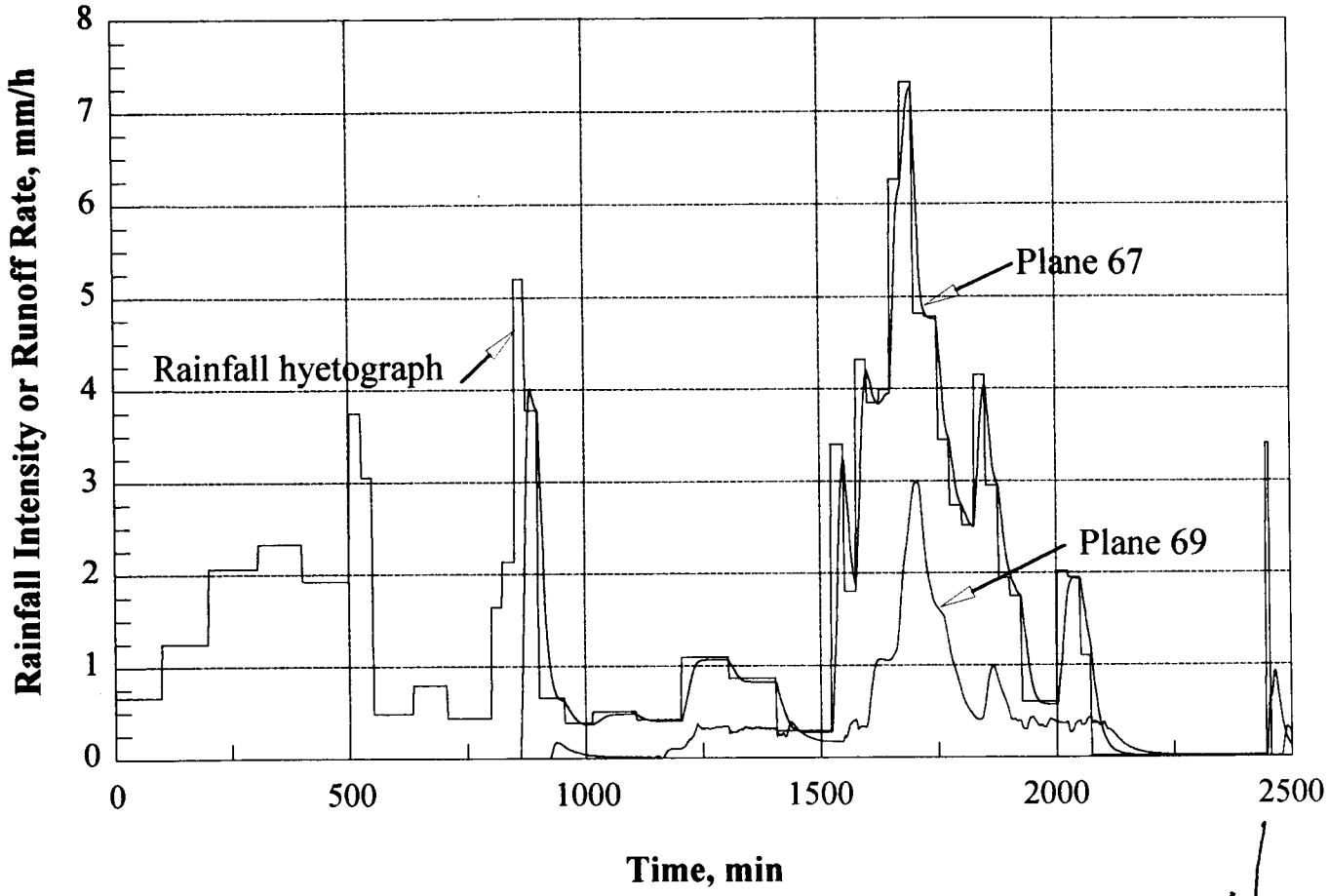
Rainfall	38.02581 mm	9260.692 cu m
Plane infiltration	35.23517	8581.068
Storage	.00663	1.614
Outflow	2.78814	679.015

Error (Volume in - Volume out - Storage) < 1 percent

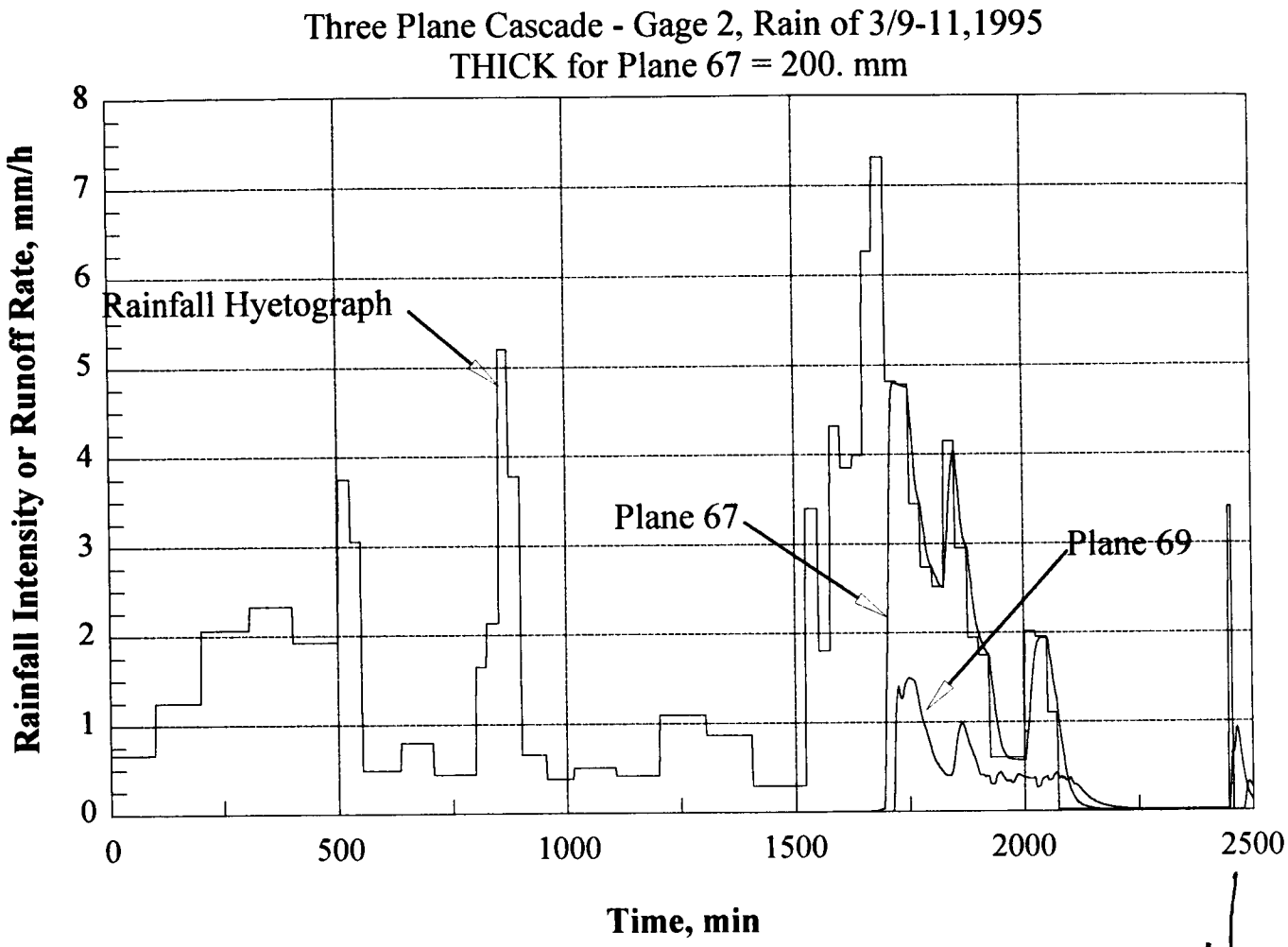
Time step distribution (100,75,50%) = .5000, .9250, 2.0000 min

Total watershed area = 24.35370 ha

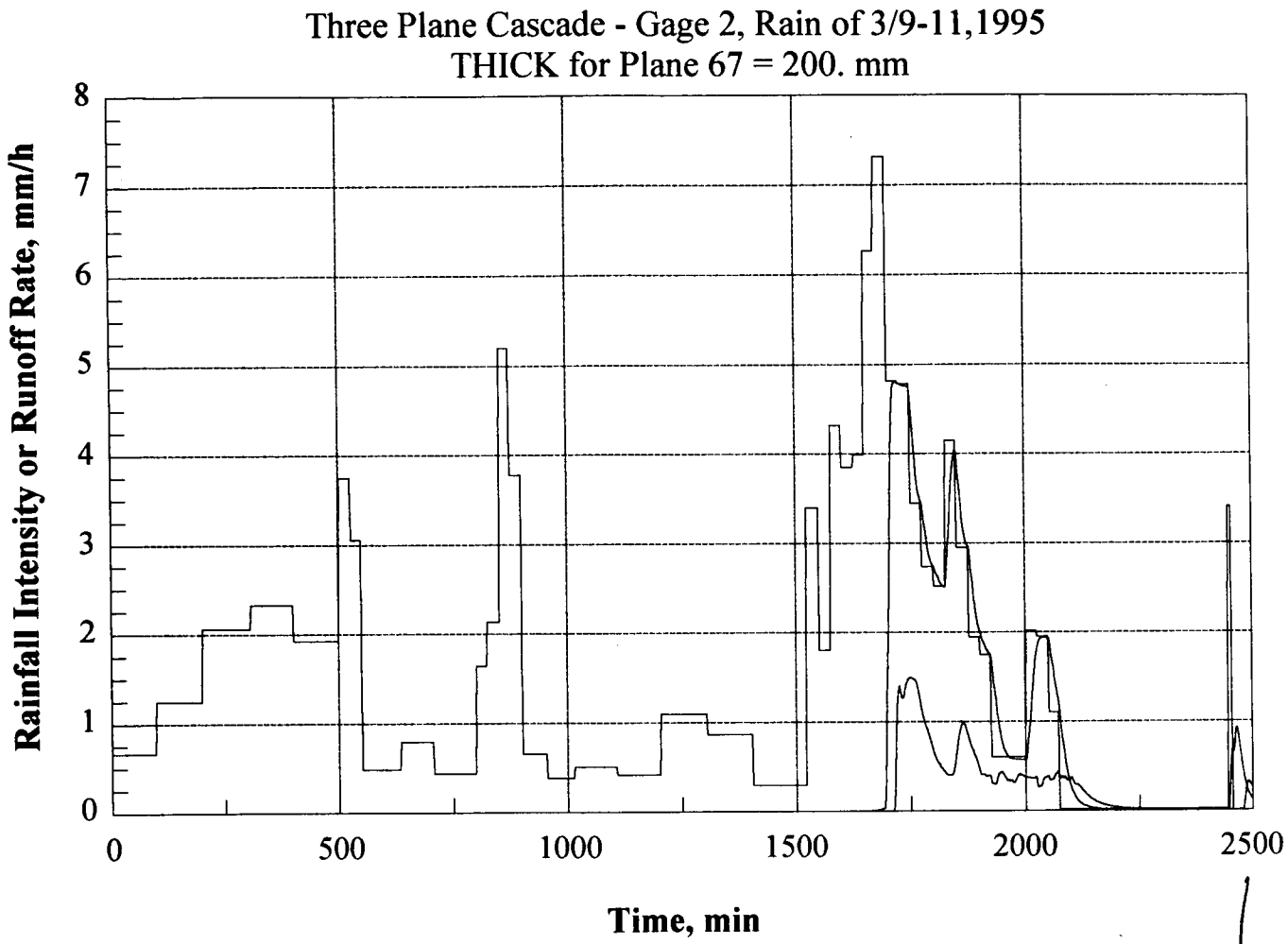
Three Plane Cascade - Gage 2 Rain 3/9-11/1995



808


Three Plane Cascade - Gage 2, Rain of 3/9-11,1995
THICK for Plane 67 = 200. mm
Rainfall Intensity or Runoff Rate, mm/h
Time, min
Rainfall Hyetograph
Plane 67
Plane 69
0
1
2
3
4
5
6
7
8
0
500
1000
1500
2000
2500

Dias


Three Plane Cascade - Gage 2, Rain of 3/9-11,1995
THICK for Plane 67 = 200. mm
Rainfall Intensity or Runoff Rate, mm/h
0
1
2
3
4
5
6
7
8
0
500
1000
1500
2000
2500
Time, min

ADDITIONAL INFORMATION FOR SCIENTIFIC NOTEBOOK #: 294

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Remarks: (computer runs, etc.)	Media contains: Watershed Modeling; Solitario Canyon-Splitwash