1016.29

Rosewood Wash Detention Basin
McCarran Blvd

Hydrology Report

Prepared by:

Codega & Fricke, inc.
3690 Grant Drive/Suite J
Reno. Nevada 89509
(702) 837-8833

November 1989

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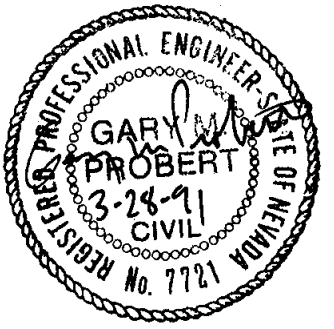

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Location

The Rosewood Wash Detention Basin at McCarran Boulevard is located in the south east portion of Section 28, T.19N.,R.19E., within the Caughlin Ranch in Reno, Nevada. The detention basin is located on the south side of McCarran where the Rosewood Wash channel crosses McCarran Boulevard. Adjacent developments include the proposed Eastgate apartments to the west and the Eastridge Subdivisions to the east.

Detention Basin Parameters

The detention basin is to be built adjacent to McCarran Boulevard. The basin will have a maximum depth of 9' with the size of the basin approximately 1 acre (plan view). The total volume of the pond is roughly 7 acre feet. The sides of the basin will have 2:1 slopes and will be hydro seeded per the erosion control notes as stated on the plans. The west bank of the basin is approximately 90' high with benches every 30'.

Detention Basic Concept

With the construction of McCarran Boulevard, the material generated will fill the Rosewood Wash Channel. The channel will be relocated above the fill in a 2' flat bottom ditch. The ditch will have 2:1 sides and be rip rapped. With future development, the ditch will include some ponds and basins.

The proposed Rosewood Wash Detention Basin plan will intercept the flow of the relocated channel at the top of the fill slope using a City of Reno's trash rack structure. The structure also has a built in emergency overflow manhole orifice adjacent to the structure. The water will be transported to the bottom of the slope via a 30" RCP pipe. At the bottom of the slope is a drop structure to dissipate the energy of the water. The water then enters the basin and works its way to the basin's outlet structure.

The outlet structure consist of a 2 stage outlet structure. The first stage is a 12" pipe located at the bottom of the basin. This provides for positive drainage after each storm without any standing water. The 12" pipe restricts the outflow to a maximum flow and then the pond begins to fill. The second stage is a pair of 30" pipes located 3.5' above the 12" pipe. Both pipes work together in metering the outflow. If one pipe becomes plugged, the second 30" pipe would be able to handle most of the flow of the 100 year storm. The basin will overtop its banks if a 30" pipe becomes plugged. Water will flow down McCarran Boulevard to Skyline Boulevard.

Once the water exits the pond, it is transported through a 48" pipe to the inlet of an existing storm drain inlet located in the Eastridge Unit One Subdivision at the rear of the Grand Teton Court.

The detention basin is provided with a 10' access road from McCarran Boulevard to the bottom of the basin. The City of Reno will maintain the basin, and inlet, outlet structures. The necessary easements will be provided to the City of Reno for its maintenance.

Existing Conditions

The existing watershed for the Rosewood Wash located above the detention basin consists of approximately 134 acres, (see map #1 for existing drainage area). The Rosewood Wash consists of area #1 - culvert A on the attached map. The land is steep with a fair amount of rocks and minimal but mature vegetation coverage. The existing peak flow for the 5 year and 100 year storms are as follows:

Area	C	TC (min)	I5 (in/hr)	I100 (in/hr)	Area (acres)	Q5 (cfs)	Q100 (cfs)
1	.55	26.3	.75	2.0	134	56.0	147.4

Detention Basin Design

The design of the detention basin is documented in the computer print out located in the appendix A. An inflow hydrography for the existing 5 year and 100 year storms has been prepared. Given the pond data relating to the size and volume of the pond, along with the outlet structure, the hydrography was run through the basin and peak outflows were generated.

The peak flows for the existing conditions (no development) for the 5 year and 100 year storms are as follows:

	Q5	Q100
Existing	36.0cfs	145.0cfs
W/detention basin	10.2cfs	69.8cfs

The maximum depth of the pond during the 100 year storm is 6.26 deep leaving 2.73' of headboard.

Proposed developments which will contributed to the Rosewood Wash are Eastgate apartments, South Pointe, an RV site and open space. Refer to Map #2, Proposed Developments, for the location of the above projects.

At the present time, it is impossible to predict the runoff's from the proposed projects but an attempt will be made to provide an accurate as possible prediction of the future runoffs. Eastgate apartments will contain the relocated Rosewood Wash. It has been suggested that the project will provide detention basins in the project and will relocate the drainage ditch to better accommodate the project as well as provided some landscaping features. It will be assumed that the time of concentration will be 30 minutes through the project (this should be conservative). The time of concentration for the existing channel is 26.3 minutes, thus it seems reasonable.

The following table suggests the predicted peak flows for the 5 year and 100 year storms for the proposed projects.

Proposed Area	C	TC (min)	I5 (in/hr)	I100 (in/hr)	Area (acres)	Q5 (cfs)	Q100 (cfs)
Open Space	.50	40	.55	1.5	61.8	17.0	46.4
RV Site	.90	35	.60	1.6	8.6	4.6	12.4
SSPCo	.55	40	.55	1.5	9.5	2.9	7.8
South Pointe	.55	20	.9	2.4	32.4	16.0	42.8
Eastgate	.70	20	.9	2.4	46.5	29.3	78.1
					159 acres	70cfs	188cfs

As can be seen above the C valve for the open space was reduced from its existing valve of .55. This is because some of the open spaces will be intensely landscaped (e.g. along the SPPCo area) as the common areas in the Caughlin Ranch are presently. The other factor is the steep rocky areas will have been deleted (filled) and the remainder areas are flatter with more vegetation and better soil.

The proposed peak flows have increased approx 28% over the present conditions. The computer print outs for the proposed conditions are in appendix B. The pond decreases peak flows as follows:

	Q5	Q100
Proposed	70	188
W/detention basin	30.3	115

As can be seen, the 100 year peak flow has been reduced for the existing condition of 145 cfs to the proposed conditions of 115 cfs.

A drop structure has been proposed at the basin to dissipate the energey from the flow descending the slope. Calculations for the structure are in appendix C.

Conclusion

As can be seen from the data presented, the proposed Rosewood Wash Detention Basin at McCarran Boulevard decreases peak flows for both the 5 year and 100 year storms. Not only does the basin decrease flows in it existing conditions but with the proposed developments, the peak flows will be decreased. Downstream users benefit greatly from the proposed basin because the existing down stream storm drain systems are inadequate in providing for the 100 year storms.

Appendix A

Existing Conditions

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* ROSEWOOD WASH AT McCARRAN BLVD - EXISTING CONDITIONS - 5 YEAR *
* CODEGA & FRICKE, INC
* 1016.10 2 - 30" PIPES
* GMP NOVEMBER 1989
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EXECUTED 11-10-1989 09:30:23
Disk Files: C:MCPOND .PND ; C:MCPOND5 .HYD

INITIAL CONDITIONS
Elevation = 41.00 ft
Outflow = 0.0 cfs

GIVEN POND DATA			COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
41.00	0.0	0.02	4.8	4.8
42.00	1.4	0.16	38.7	40.1
43.00	5.9	0.50	121.0	126.9
44.00	8.2	1.07	258.9	267.1
45.00	12.6	1.84	445.3	457.9
46.00	30.5	2.75	665.5	696.0
47.00	60.7	3.75	907.5	968.2
48.00	95.5	4.81	1164.0	1259.5
49.00	123.7	5.92	1432.6	1556.3

Time increment (t) = 0.100 hrs.

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPOND5 .HYD 09:30:23
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
11.000	1.0
11.100	1.0
11.200	1.0
11.300	1.0
11.400	1.0
11.500	1.0
11.600	1.0
11.700	2.0
11.800	2.0
11.900	3.0
12.000	5.0
12.100	10.0
12.200	19.0
12.300	30.0
12.400	36.0
12.500	35.0
12.600	30.0
12.700	24.0
12.800	18.0
12.900	14.0
13.000	11.0
13.100	9.0
13.200	7.0
13.300	6.0
13.400	5.0
13.500	5.0
13.600	5.0
13.700	4.0
13.800	4.0
13.900	4.0
14.000	4.0
14.100	4.0
14.200	4.0
14.300	4.0
14.400	4.0
14.500	3.0
14.600	3.0
14.700	3.0
14.800	2.0
14.900	2.0
15.000	2.0
15.100	2.0
15.200	2.0
15.300	2.0
15.400	2.0

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
-----	4.8	4.8	0.0	41.00
2.0	6.7	6.8	0.1	41.06
2.0	8.4	8.7	0.2	41.11
2.0	9.9	10.4	0.2	41.16
2.0	11.4	11.9	0.3	41.20
2.0	12.7	13.4	0.3	41.24
2.0	13.9	14.7	0.4	41.28
3.0	16.0	16.9	0.5	41.34
4.0	18.8	20.0	0.6	41.43
5.0	22.3	23.8	0.8	41.54
8.0	28.2	30.3	1.0	41.72
15.0	40.1	43.2	1.6	42.04
29.0	63.3	69.1	2.9	42.33
49.0	102.0	112.3	5.1	42.83
66.0	154.9	168.0	6.6	43.29
71.0	210.8	225.9	7.5	43.71
65.0	259.0	275.8	8.4	44.05
54.0	294.5	313.0	9.3	44.24
42.0	316.9	336.5	9.8	44.36
32.0	328.7	348.9	10.1	44.43
25.0	333.3	353.7	10.2	44.45
20.0	333.0	353.3	10.2	44.45
16.0	328.8	349.0	10.1	44.43
13.0	321.9	341.8	9.9	44.39
11.0	313.5	332.9	9.7	44.34
10.0	304.5	323.5	9.5	44.30
10.0	295.9	314.5	9.3	44.25
9.0	286.8	304.9	9.1	44.20
8.0	277.1	294.8	8.8	44.14
8.0	267.9	285.1	8.6	44.09
8.0	259.1	275.9	8.4	44.05
8.0	250.7	267.1	8.2	44.00
8.0	242.6	258.7	8.1	43.94
8.0	234.7	250.6	7.9	43.88
8.0	227.1	242.7	7.8	43.83
7.0	218.8	234.1	7.7	43.76
6.0	209.8	224.8	7.5	43.70
6.0	201.1	215.8	7.4	43.63
5.0	191.7	206.1	7.2	43.56
4.0	181.6	195.7	7.0	43.49
4.0	171.9	185.6	6.9	43.42
4.0	162.5	175.9	6.7	43.35
4.0	153.4	166.5	6.5	43.28
4.0	144.6	157.4	6.4	43.22
4.0	136.1	148.6	6.3	43.15

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPOND5 .HYD 09:30:23
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	2.0	4.0	127.8	140.1	6.1	43.09
15.600	2.0	4.0	119.9	131.8	6.0	43.04
15.700	2.0	4.0	112.4	123.9	5.7	42.97
15.800	2.0	4.0	105.7	116.4	5.4	42.88
15.900	2.0	4.0	99.7	109.7	5.0	42.80
16.000	2.0	4.0	94.3	103.7	4.7	42.73
16.100	2.0	4.0	89.4	98.3	4.4	42.67
16.200	2.0	4.0	85.1	93.4	4.2	42.61
16.300	1.0	3.0	80.3	88.1	3.9	42.55
16.400	1.0	2.0	75.2	82.3	3.6	42.49
16.500	1.0	2.0	70.5	77.2	3.3	42.43
16.600	1.0	2.0	66.4	72.5	3.1	42.37
16.700	1.0	2.0	62.6	68.4	2.9	42.33
16.800	1.0	2.0	59.3	64.6	2.7	42.28
16.900	1.0	2.0	56.3	61.3	2.5	42.24
17.000	1.0	2.0	53.6	58.3	2.3	42.21
17.100	1.0	2.0	51.2	55.6	2.2	42.18
17.200	1.0	2.0	49.0	53.2	2.1	42.15
17.300	1.0	2.0	47.1	51.0	2.0	42.13
17.400	1.0	2.0	45.4	49.1	1.9	42.10
17.500	1.0	2.0	43.8	47.4	1.8	42.08
17.600	1.0	2.0	42.4	45.8	1.7	42.07
17.700	1.0	2.0	41.2	44.4	1.6	42.05
17.800	1.0	2.0	40.1	43.2	1.6	42.04
17.900	1.0	2.0	39.1	42.1	1.5	42.02
18.000	1.0	2.0	38.2	41.1	1.4	42.01
18.100	1.0	2.0	37.4	40.2	1.4	42.00
18.200	1.0	2.0	36.6	39.4	1.4	41.98
18.300	1.0	2.0	35.9	38.6	1.3	41.96
18.400	1.0	2.0	35.3	37.9	1.3	41.94
18.500	1.0	2.0	34.7	37.3	1.3	41.92
18.600	1.0	2.0	34.2	36.7	1.3	41.90
18.700	1.0	2.0	33.7	36.2	1.2	41.89
18.800	1.0	2.0	33.3	35.7	1.2	41.88
18.900	1.0	2.0	32.9	35.3	1.2	41.86
19.000	1.0	2.0	32.5	34.9	1.2	41.85
19.100	1.0	2.0	32.1	34.5	1.2	41.84
19.200	1.0	2.0	31.8	34.1	1.2	41.83
19.300	1.0	2.0	31.5	33.8	1.1	41.82
19.400	1.0	2.0	31.2	33.5	1.1	41.81
19.500	1.0	2.0	31.0	33.2	1.1	41.80
19.600	1.0	2.0	30.7	33.0	1.1	41.80
19.700	1.0	2.0	30.5	32.7	1.1	41.79
19.800	1.0	2.0	30.3	32.5	1.1	41.78
19.900	1.0	2.0	30.1	32.3	1.1	41.78
20.000	1.0	2.0	30.0	32.1	1.1	41.77

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPOND5 .HYD 09:30:23
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	1.0	2.0	29.8	32.0	1.1	41.77
20.200	1.0	2.0	29.7	31.8	1.1	41.76
20.300	1.0	2.0	29.6	31.7	1.1	41.76
20.400	1.0	2.0	29.4	31.6	1.1	41.76
20.500	1.0	2.0	29.3	31.4	1.1	41.75
20.600	1.0	2.0	29.2	31.3	1.1	41.75
20.700	1.0	2.0	29.1	31.2	1.0	41.75
20.800	1.0	2.0	29.0	31.1	1.0	41.75
20.900	1.0	2.0	29.0	31.0	1.0	41.74
21.000	1.0	2.0	28.9	31.0	1.0	41.74
21.100	1.0	2.0	28.8	30.9	1.0	41.74
21.200	1.0	2.0	28.8	30.8	1.0	41.74
21.300	1.0	2.0	28.7	30.8	1.0	41.73
21.400	1.0	2.0	28.6	30.7	1.0	41.73
21.500	1.0	2.0	28.6	30.6	1.0	41.73
21.600	1.0	2.0	28.6	30.6	1.0	41.73
21.700	1.0	2.0	28.5	30.6	1.0	41.73
21.800	1.0	2.0	28.5	30.5	1.0	41.73
21.900	1.0	2.0	28.4	30.5	1.0	41.73
22.000	1.0	2.0	28.4	30.4	1.0	41.73
22.100	1.0	2.0	28.4	30.4	1.0	41.72
22.200	1.0	2.0	28.4	30.4	1.0	41.72
22.300	1.0	2.0	28.3	30.4	1.0	41.72
22.400	1.0	2.0	28.3	30.3	1.0	41.72
22.500	1.0	2.0	28.3	30.3	1.0	41.72
22.600	1.0	2.0	28.3	30.3	1.0	41.72
22.700	1.0	2.0	28.2	30.3	1.0	41.72
22.800	1.0	2.0	28.2	30.2	1.0	41.72
22.900	1.0	2.0	28.2	30.2	1.0	41.72
23.000	1.0	2.0	28.2	30.2	1.0	41.72
23.100	1.0	2.0	28.2	30.2	1.0	41.72
23.200	1.0	2.0	28.2	30.2	1.0	41.72
23.300	1.0	2.0	28.2	30.2	1.0	41.72
23.400	1.0	2.0	28.2	30.2	1.0	41.72
23.500	1.0	2.0	28.1	30.2	1.0	41.72
23.600	1.0	2.0	28.1	30.1	1.0	41.72
23.700	1.0	2.0	28.1	30.1	1.0	41.72
23.800	1.0	2.0	28.1	30.1	1.0	41.72
23.900	1.0	2.0	28.1	30.1	1.0	41.72
24.000	0.0	1.0	27.2	29.1	1.0	41.69
24.100	0.0	0.0	25.4	27.2	0.9	41.63
24.200	0.0	0.0	23.8	25.4	0.8	41.58
24.300	0.0	0.0	22.3	23.8	0.8	41.54
24.400	0.0	0.0	20.9	22.3	0.7	41.49
24.500	0.0	0.0	19.6	20.9	0.6	41.46
24.600	0.0	0.0	18.4	19.6	0.6	41.42

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPOND5 .HYD 09:30:23
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
24.700	0.0
24.800	0.0
24.900	0.0
25.000	0.0
25.100	0.0
25.200	0.0
25.300	0.0
25.400	0.0
25.500	0.0
25.600	0.0
25.700	0.0
25.800	0.0
25.900	0.0

ROUTING COMPUTATIONS

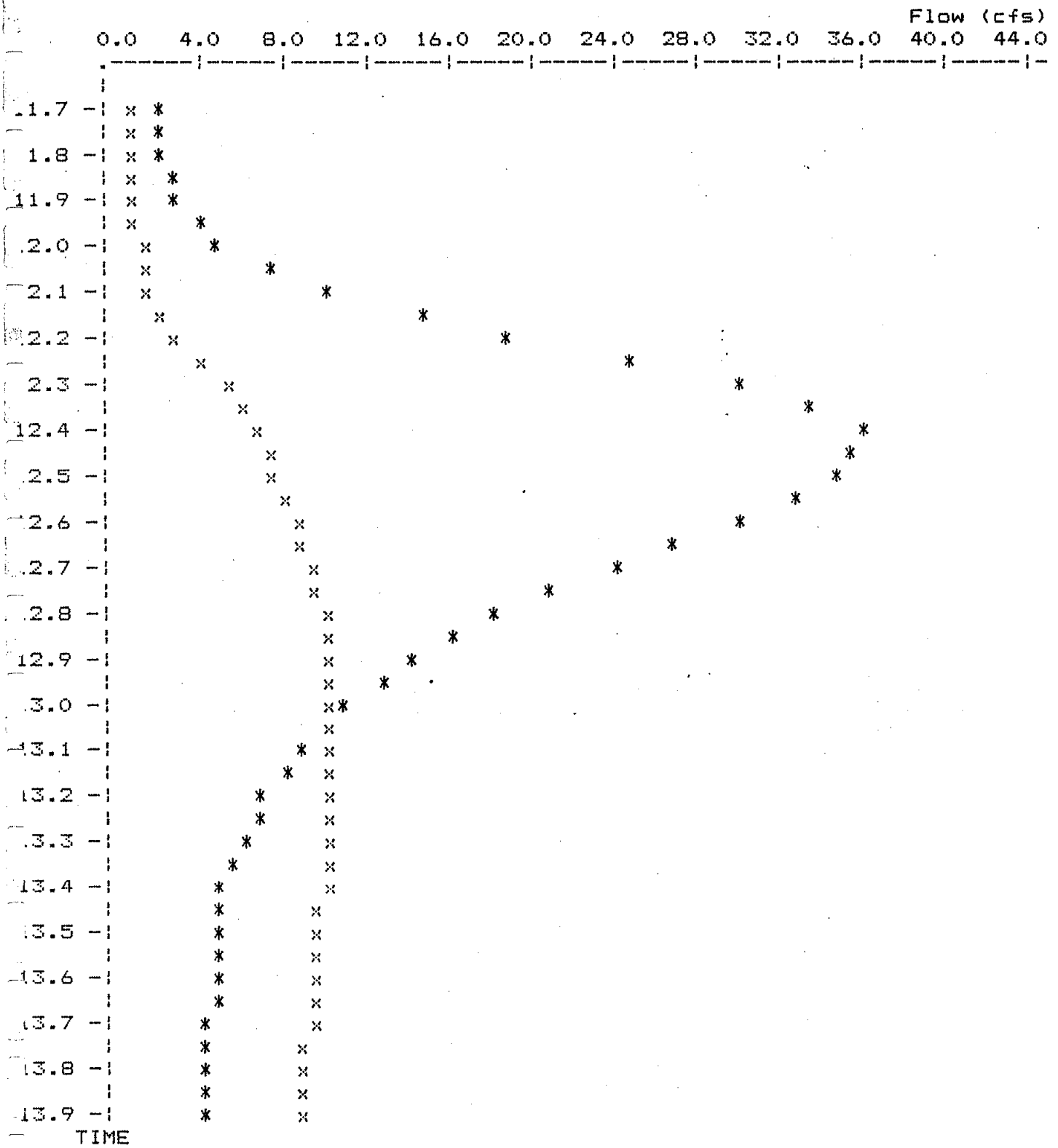
I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	17.4	18.4	0.5	41.39
0.0	16.4	17.4	0.5	41.36
0.0	15.5	16.4	0.5	41.33
0.0	14.6	15.5	0.4	41.30
0.0	13.8	14.6	0.4	41.28
0.0	13.1	13.8	0.4	41.26
0.0	12.5	13.1	0.3	41.23
0.0	11.9	12.5	0.3	41.22
0.0	11.3	11.9	0.3	41.20
0.0	10.8	11.3	0.3	41.18
0.0	10.3	10.8	0.2	41.17
0.0	9.9	10.3	0.2	41.16
0.0	9.5	9.9	0.2	41.14

Peak Inflow = 36.0 cfs
Peak Outflow = 10.2 cfs
Peak Elevation = 44.45 ft

Pond File: C:MCPOND .PND
Inflow Hydrograph: C:MCPOND5 .HYD
Outflow Hydrograph: C:NULL .HYD

EXECUTED: 11-10-1989
09:30:23

Peak Inflow = 36.0 cfs
Peak Outflow = 10.2 cfs
Peak Elevation = 44.45 ft



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* ROSEWOOD WASH AT McCARRRAN BLVD - EXISTING CONDITIONS - 100 YEAR *
* CODEGA & FRICKE, INC *
* 1016.10 2 - 30" PIPES *
* GMP NOVEMBER 1989 *
*
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EXECUTED 11-10-1989 09:32:38
Disk Files: C:MCPOND .PND ; C:MCPONDC .HYD

INITIAL CONDITIONS
Elevation = 41.00 ft
Outflow = 0.0 cfs

GIVEN POND DATA			COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
41.00	0.0	0.02	4.8	4.8
42.00	1.4	0.16	38.7	40.1
43.00	5.9	0.50	121.0	126.9
44.00	8.2	1.07	258.9	267.1
45.00	12.6	1.84	445.3	457.9
46.00	30.5	2.75	665.5	696.0
47.00	60.7	3.75	907.5	968.2
48.00	95.5	4.81	1164.0	1259.5
49.00	123.7	5.92	1432.6	1556.3

Time increment (t) = 0.100 hrs.

'ond File: C:MCPOND .PND EXECUTED: 11-10-1989
.nflow Hydrograph: C:MCPONDC .HYD 09:32:38
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	3.0	-----	4.8	4.8	0.0	41.00
11.100	4.0	7.0	11.3	11.8	0.3	41.20
11.200	5.0	9.0	19.1	20.3	0.6	41.44
11.300	6.0	11.0	28.1	30.1	1.0	41.71
11.400	7.0	13.0	38.2	41.1	1.4	42.01
11.500	8.0	15.0	49.0	53.2	2.1	42.15
11.600	9.0	17.0	60.5	66.0	2.7	42.30
11.700	12.0	21.0	74.4	81.5	3.5	42.48
11.800	14.0	26.0	91.4	100.4	4.5	42.69
11.900	17.0	31.0	111.0	122.4	5.7	42.95
12.000	32.0	49.0	147.2	160.0	6.4	43.24
12.100	62.0	94.0	225.6	241.2	7.8	43.81
12.200	112.0	174.0	377.1	399.6	11.3	44.69
12.300	145.0	257.0	582.4	634.1	25.8	45.74
12.400	137.0	282.0	766.0	864.4	49.2	46.62
12.500	101.0	238.0	874.1	1004.0	65.0	47.12
12.600	69.0	170.0	904.5	1044.1	69.8	47.26
12.700	51.0	120.0	889.7	1024.5	67.4	47.19
12.800	37.0	88.0	854.0	977.7	61.8	47.03
12.900	30.0	67.0	810.1	921.0	55.5	46.83
13.000	23.0	53.0	765.0	863.1	49.0	46.61
13.100	20.0	43.0	722.2	808.0	42.9	46.41
13.200	18.0	38.0	684.9	760.2	37.6	46.24
13.300	16.0	34.0	652.8	718.9	33.0	46.08
13.400	15.0	31.0	624.7	683.8	29.6	45.95
13.500	14.0	29.0	599.0	653.7	27.3	45.82
13.600	13.0	27.0	575.5	626.0	25.2	45.71
13.700	12.0	25.0	553.9	600.5	23.3	45.60
13.800	12.0	24.0	534.7	577.9	21.6	45.50
13.900	11.0	23.0	517.5	557.7	20.1	45.42
14.000	10.0	21.0	501.1	538.5	18.7	45.34
14.100	9.0	19.0	485.6	520.1	17.3	45.26
14.200	9.0	18.0	471.5	503.6	16.0	45.19
14.300	8.0	17.0	458.7	488.5	14.9	45.13
14.400	8.0	16.0	447.0	474.7	13.9	45.07
14.500	8.0	16.0	437.0	463.0	13.0	45.02
14.600	8.0	16.0	428.0	453.0	12.5	44.97
14.700	8.0	16.0	419.5	444.0	12.3	44.93
14.800	8.0	16.0	411.3	435.5	12.1	44.88
14.900	7.0	15.0	402.6	426.3	11.9	44.83
15.000	7.0	14.0	393.3	416.6	11.6	44.78
15.100	7.0	14.0	384.4	407.3	11.4	44.73
15.200	7.0	14.0	375.9	398.4	11.2	44.69
15.300	7.0	14.0	367.9	389.9	11.0	44.64
15.400	7.0	14.0	360.2	381.9	10.8	44.60

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPONDC .HYD 09:32:38
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	7.0	14.0	352.8	374.2	10.7	44.56
15.600	7.0	14.0	345.8	366.8	10.5	44.52
15.700	7.0	14.0	339.2	359.8	10.3	44.49
15.800	6.0	13.0	331.8	352.2	10.2	44.45
15.900	6.0	12.0	323.9	343.8	10.0	44.40
16.000	6.0	12.0	316.3	335.9	9.8	44.36
16.100	6.0	12.0	309.1	328.3	9.6	44.32
16.200	6.0	12.0	302.2	321.1	9.4	44.28
16.300	5.0	11.0	294.7	313.2	9.3	44.24
16.400	5.0	10.0	286.6	304.7	9.1	44.20
16.500	5.0	10.0	278.8	296.6	8.9	44.15
16.600	5.0	10.0	271.4	288.8	8.7	44.11
16.700	5.0	10.0	264.3	281.4	8.5	44.07
16.800	5.0	10.0	257.6	274.3	8.4	44.04
16.900	5.0	10.0	251.2	267.6	8.2	44.00
17.000	5.0	10.0	245.0	261.2	8.1	43.96
17.100	5.0	10.0	239.0	255.0	8.0	43.91
17.200	5.0	10.0	233.2	249.0	7.9	43.87
17.300	5.0	10.0	227.6	243.2	7.8	43.83
17.400	5.0	10.0	222.1	237.6	7.7	43.79
17.500	5.0	10.0	216.9	232.1	7.6	43.75
17.600	5.0	10.0	211.8	226.9	7.5	43.71
17.700	5.0	10.0	206.9	221.8	7.5	43.68
17.800	4.0	9.0	201.2	215.9	7.4	43.63
17.900	4.0	8.0	194.7	209.2	7.2	43.59
18.000	4.0	8.0	188.4	202.7	7.1	43.54
18.100	4.0	8.0	182.3	196.4	7.0	43.50
18.200	4.0	8.0	176.4	190.3	6.9	43.45
18.300	4.0	8.0	170.7	184.4	6.8	43.41
18.400	4.0	8.0	165.2	178.7	6.8	43.37
18.500	4.0	8.0	159.9	173.2	6.7	43.33
18.600	3.0	7.0	153.8	166.9	6.6	43.29
18.700	3.0	6.0	146.9	159.8	6.4	43.23
18.800	3.0	6.0	140.3	152.9	6.3	43.19
18.900	3.0	6.0	133.8	146.3	6.2	43.14
19.000	3.0	6.0	127.6	139.8	6.1	43.09
19.100	3.0	6.0	121.6	133.6	6.0	43.05
19.200	3.0	6.0	115.8	127.6	5.9	43.00
19.300	3.0	6.0	110.5	121.8	5.6	42.94
19.400	3.0	6.0	105.8	116.5	5.4	42.88
19.500	3.0	6.0	101.6	111.8	5.1	42.83
19.600	3.0	6.0	97.8	107.6	4.9	42.78
19.700	3.0	6.0	94.4	103.8	4.7	42.73
19.800	3.0	6.0	91.3	100.4	4.5	42.69
19.900	3.0	6.0	88.6	97.3	4.4	42.66
20.000	3.0	6.0	86.1	94.6	4.2	42.63

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPONDC .HYD 09:32:38
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	3.0	6.0	83.9	92.1	4.1	42.60
20.200	3.0	6.0	82.0	89.9	4.0	42.57
20.300	3.0	6.0	80.2	88.0	3.9	42.55
20.400	3.0	6.0	78.6	86.2	3.8	42.53
20.500	3.0	6.0	77.2	84.6	3.7	42.51
20.600	3.0	6.0	75.9	83.2	3.6	42.50
20.700	3.0	6.0	74.8	81.9	3.6	42.48
20.800	3.0	6.0	73.8	80.8	3.5	42.47
20.900	3.0	6.0	72.9	79.8	3.5	42.46
21.000	3.0	6.0	72.1	78.9	3.4	42.45
21.100	3.0	6.0	71.3	78.1	3.4	42.44
21.200	3.0	6.0	70.7	77.3	3.3	42.43
21.300	3.0	6.0	70.1	76.7	3.3	42.42
21.400	3.0	6.0	69.5	76.1	3.3	42.41
21.500	3.0	6.0	69.1	75.5	3.2	42.41
21.600	3.0	6.0	68.6	75.1	3.2	42.40
21.700	3.0	6.0	68.3	74.6	3.2	42.40
21.800	3.0	6.0	67.9	74.3	3.2	42.39
21.900	3.0	6.0	67.6	73.9	3.2	42.39
22.000	3.0	6.0	67.3	73.6	3.1	42.39
22.100	3.0	6.0	67.1	73.3	3.1	42.38
22.200	3.0	6.0	66.9	73.1	3.1	42.38
22.300	3.0	6.0	66.7	72.9	3.1	42.38
22.400	3.0	6.0	66.5	72.7	3.1	42.38
22.500	3.0	6.0	66.3	72.5	3.1	42.37
22.600	3.0	6.0	66.2	72.3	3.1	42.37
22.700	2.0	5.0	65.2	71.2	3.0	42.36
22.800	2.0	4.0	63.4	69.2	2.9	42.33
22.900	2.0	4.0	61.7	67.4	2.8	42.31
23.000	2.0	4.0	60.3	65.7	2.7	42.30
23.100	2.0	4.0	59.0	64.3	2.7	42.28
23.200	2.0	4.0	57.8	63.0	2.6	42.26
23.300	2.0	4.0	56.8	61.8	2.5	42.25
23.400	2.0	4.0	55.8	60.8	2.5	42.24
23.500	2.0	4.0	55.0	59.8	2.4	42.23
23.600	2.0	4.0	54.2	59.0	2.4	42.22
23.700	2.0	4.0	53.5	58.2	2.3	42.21
23.800	2.0	4.0	52.9	57.5	2.3	42.20
23.900	2.0	4.0	52.4	56.9	2.3	42.19
24.000	2.0	4.0	51.9	56.4	2.2	42.19
24.100	1.0	3.0	50.6	54.9	2.2	42.17
24.200	1.0	2.0	48.5	52.6	2.0	42.14
24.300	1.0	2.0	46.6	50.5	1.9	42.12
24.400	1.0	2.0	44.9	48.6	1.8	42.10
24.500	1.0	2.0	43.4	46.9	1.8	42.08
24.600	1.0	2.0	42.1	45.4	1.7	42.06

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPONDC .HYD 09:32:38
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
24.700	1.0
24.800	1.0
24.900	1.0
25.000	1.0
25.100	1.0
25.200	1.0
25.300	1.0
25.400	0.0
25.500	0.0
25.600	0.0
25.700	0.0
25.800	0.0
25.900	0.0

ROUTING COMPUTATIONS

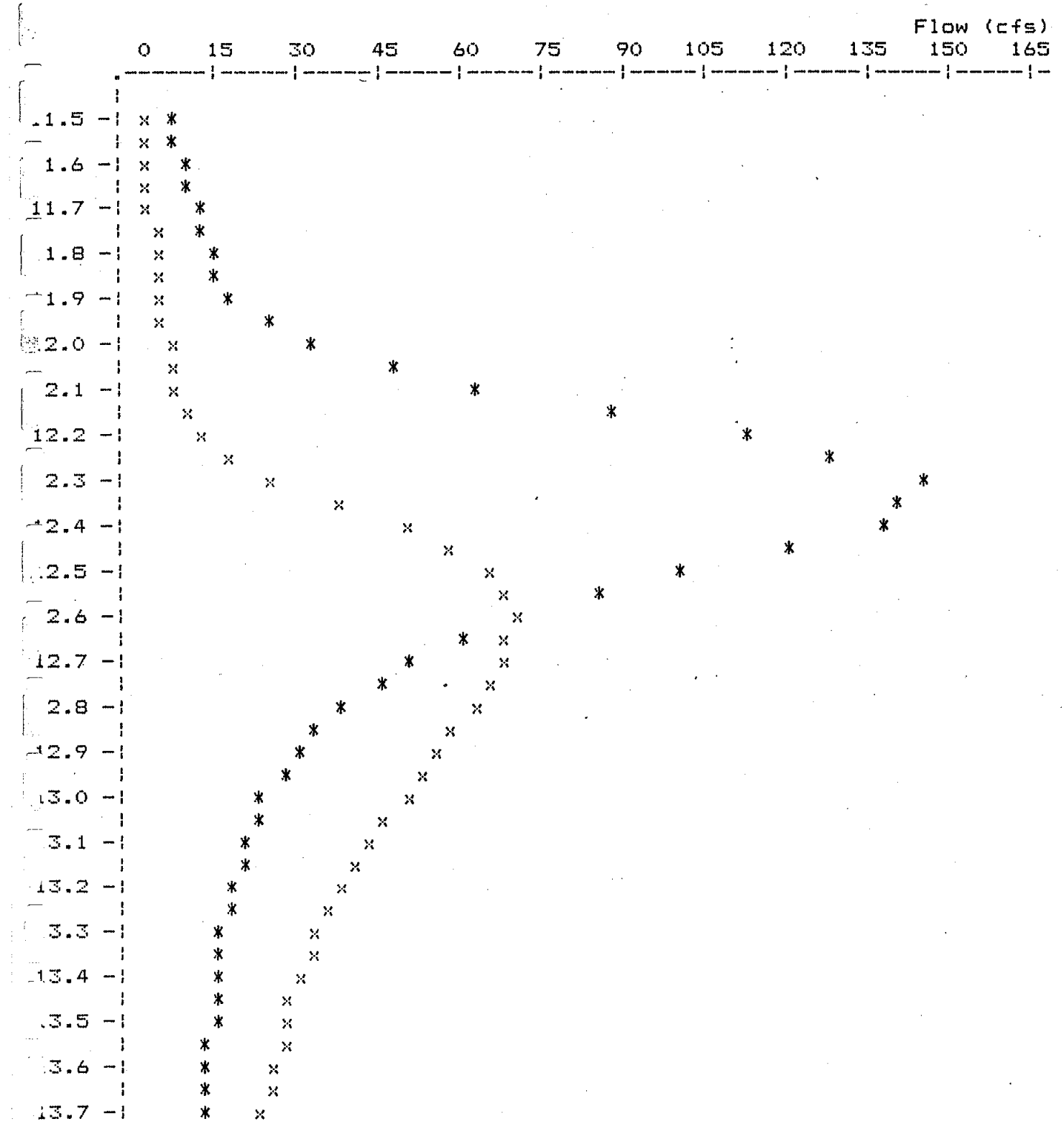
I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
2.0	40.9	44.1	1.6	42.05
2.0	39.8	42.9	1.5	42.03
2.0	38.8	41.8	1.5	42.02
2.0	37.9	40.8	1.4	42.01
2.0	37.1	39.9	1.4	41.99
2.0	36.4	39.1	1.4	41.97
2.0	35.8	38.4	1.3	41.95
1.0	34.2	36.8	1.3	41.90
0.0	31.9	34.2	1.2	41.83
0.0	29.7	31.9	1.1	41.77
0.0	27.8	29.7	1.0	41.71
0.0	26.0	27.8	0.9	41.65
0.0	24.3	26.0	0.8	41.60

Peak Inflow = 145.0 cfs
Peak Outflow = 69.8 cfs
Peak Elevation = 47.26 ft

Pond File: C:MCPOND .PND
Inflow Hydrograph: C:MCPONDC .HYD
Outflow Hydrograph: C:NULL .HYD

EXECUTED: 11-10-1989
09:32:38

Peak Inflow = 145.0 cfs
Peak Outflow = 69.8 cfs
Peak Elevation = 47.26 ft



Appendix B

Proposed Conditions

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*
* ROSEWOOD WASH AT McCARRAN BLVD - PROPOSED CONDITIONS - 5 YEAR *
* CODEGA & FRICKE, INC
* 1016.10 2 - 30" PIPES
* GMP NOVEMBER 1989
*
****

EXECUTED 11-10-1989 09:24:10
Disk Files: C:MCPOND .PND ; C:MCPOND5P.HYD

INITIAL CONDITIONS
Elevation = 41.00 ft
Outflow = 0.0 cfs

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
41.00	0.0	0.02
42.00	1.4	0.16
43.00	5.9	0.50
44.00	8.2	1.07
45.00	12.6	1.84
46.00	30.5	2.75
47.00	60.7	3.75
48.00	95.5	4.81
49.00	123.7	5.92

COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
4.8	4.8
38.7	40.1
121.0	126.9
258.9	267.1
445.3	457.9
665.5	696.0
907.5	968.2
1164.0	1259.5
1432.6	1556.3

Time increment (t) = 0.100 hrs.

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPOND5P.HYD 09:24:10
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	1.0	-----	4.8	4.8	0.0	41.00
11.100	1.0	2.0	6.7	6.8	0.1	41.06
11.200	2.0	3.0	9.3	9.7	0.2	41.14
11.300	2.0	4.0	12.6	13.3	0.3	41.24
11.400	2.0	4.0	15.7	16.6	0.5	41.33
11.500	3.0	5.0	19.4	20.7	0.6	41.45
11.600	3.0	6.0	23.8	25.4	0.8	41.58
11.700	4.0	7.0	28.7	30.8	1.0	41.74
11.800	4.0	8.0	34.2	36.7	1.3	41.90
11.900	5.0	9.0	40.1	43.2	1.6	42.04
12.000	7.0	12.0	48.0	52.1	2.0	42.14
12.100	11.0	18.0	60.6	66.0	2.7	42.30
12.200	21.0	32.0	84.3	92.6	4.1	42.60
12.300	40.0	61.0	132.9	145.3	6.2	43.13
12.400	61.0	101.0	218.6	233.9	7.7	43.76
12.500	70.0	131.0	329.4	349.6	10.1	44.43
12.600	70.0	140.0	442.5	469.4	13.5	45.05
12.700	62.0	132.0	531.7	574.5	21.4	45.49
12.800	51.0	113.0	591.4	644.7	26.6	45.78
12.900	40.0	91.0	623.5	682.4	29.5	45.94
13.000	30.0	70.0	632.9	693.5	30.3	45.99
13.100	24.0	54.0	627.2	686.9	29.8	45.96
13.200	19.0	43.0	613.1	670.2	28.6	45.89
13.300	16.0	35.0	594.3	648.1	26.9	45.80
13.400	14.0	30.0	574.1	624.3	25.1	45.70
13.500	13.0	27.0	554.4	601.1	23.4	45.60
13.600	11.0	24.0	535.0	578.4	21.7	45.51
13.700	10.0	21.0	516.1	556.0	20.0	45.41
13.800	9.0	19.0	498.3	535.1	18.4	45.32
13.900	9.0	18.0	482.3	516.3	17.0	45.25
14.000	9.0	18.0	468.7	500.3	15.8	45.18
14.100	8.0	17.0	456.3	485.7	14.7	45.12
14.200	7.0	15.0	444.1	471.3	13.6	45.06
14.300	6.0	13.0	431.9	457.1	12.6	45.00
14.400	6.0	12.0	419.4	443.9	12.3	44.93
14.500	6.0	12.0	407.4	431.4	12.0	44.86
14.600	6.0	12.0	396.0	419.4	11.7	44.80
14.700	6.0	12.0	385.1	408.0	11.4	44.74
14.800	6.0	12.0	374.7	397.1	11.2	44.68
14.900	6.0	12.0	364.8	386.7	11.0	44.63
15.000	6.0	12.0	355.3	376.8	10.7	44.57
15.100	6.0	12.0	346.3	367.3	10.5	44.53
15.200	6.0	12.0	337.7	358.3	10.3	44.48
15.300	6.0	12.0	329.5	349.7	10.1	44.43
15.400	6.0	12.0	321.7	341.5	9.9	44.39

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPOND5P.HYD 09:24:10
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	6.0	12.0	314.2	333.7	9.7	44.35
15.600	6.0	12.0	307.1	326.2	9.6	44.31
15.700	6.0	12.0	300.3	319.1	9.4	44.27
15.800	5.0	11.0	292.8	311.3	9.2	44.23
15.900	5.0	10.0	284.8	302.8	9.0	44.19
16.000	5.0	10.0	277.1	294.8	8.8	44.14
16.100	5.0	10.0	269.8	287.1	8.7	44.10
16.200	4.0	9.0	261.8	278.8	8.5	44.06
16.300	4.0	8.0	253.3	269.8	8.3	44.01
16.400	3.0	7.0	244.1	260.3	8.1	43.95
16.500	3.0	6.0	234.3	250.1	7.9	43.88
16.600	3.0	6.0	224.8	240.3	7.8	43.81
16.700	3.0	6.0	215.6	230.8	7.6	43.74
16.800	3.0	6.0	206.7	221.6	7.5	43.68
16.900	3.0	6.0	198.1	212.7	7.3	43.61
17.000	3.0	6.0	189.7	204.1	7.2	43.55
17.100	3.0	6.0	181.7	195.7	7.0	43.49
17.200	3.0	6.0	173.9	187.7	6.9	43.43
17.300	3.0	6.0	166.3	179.9	6.8	43.38
17.400	3.0	6.0	159.0	172.3	6.6	43.32
17.500	3.0	6.0	152.0	165.0	6.5	43.27
17.600	3.0	6.0	145.2	158.0	6.4	43.22
17.700	3.0	6.0	138.6	151.2	6.3	43.17
17.800	3.0	6.0	132.2	144.6	6.2	43.13
17.900	3.0	6.0	126.0	138.2	6.1	43.08
18.000	3.0	6.0	120.1	132.0	6.0	43.04
18.100	3.0	6.0	114.3	126.1	5.9	42.99
18.200	3.0	6.0	109.2	120.3	5.6	42.92
18.300	3.0	6.0	104.6	115.2	5.3	42.87
18.400	3.0	6.0	100.5	110.6	5.1	42.81
18.500	3.0	6.0	96.8	106.5	4.8	42.77
18.600	3.0	6.0	93.5	102.8	4.7	42.72
18.700	3.0	6.0	90.6	99.5	4.5	42.68
18.800	3.0	6.0	87.9	96.6	4.3	42.65
18.900	3.0	6.0	85.5	93.9	4.2	42.62
19.000	3.0	6.0	83.4	91.5	4.1	42.59
19.100	3.0	6.0	81.5	89.4	4.0	42.57
19.200	3.0	6.0	79.8	87.5	3.9	42.55
19.300	3.0	6.0	78.2	85.8	3.8	42.53
19.400	3.0	6.0	76.9	84.2	3.7	42.51
19.500	2.0	5.0	74.7	81.9	3.6	42.48
19.600	2.0	4.0	71.9	78.7	3.4	42.45
19.700	2.0	4.0	69.4	75.9	3.3	42.41
19.800	2.0	4.0	67.2	73.4	3.1	42.38
19.900	2.0	4.0	65.1	71.2	3.0	42.36
20.000	2.0	4.0	63.3	69.1	2.9	42.33

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPOND5P.HYD 09:24:10
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	2.0	4.0	61.7	67.3	2.8	42.31
20.200	2.0	4.0	60.3	65.7	2.7	42.29
20.300	2.0	4.0	59.0	64.3	2.7	42.28
20.400	2.0	4.0	57.8	63.0	2.6	42.26
20.500	2.0	4.0	56.7	61.8	2.5	42.25
20.600	2.0	4.0	55.8	60.7	2.5	42.24
20.700	2.0	4.0	55.0	59.8	2.4	42.23
20.800	2.0	4.0	54.2	59.0	2.4	42.22
20.900	2.0	4.0	53.5	58.2	2.3	42.21
21.000	2.0	4.0	52.9	57.5	2.3	42.20
21.100	2.0	4.0	52.4	56.9	2.3	42.19
21.200	2.0	4.0	51.9	56.4	2.2	42.19
21.300	2.0	4.0	51.5	55.9	2.2	42.18
21.400	2.0	4.0	51.1	55.5	2.2	42.18
21.500	2.0	4.0	50.7	55.1	2.2	42.17
21.600	2.0	4.0	50.4	54.7	2.2	42.17
21.700	2.0	4.0	50.1	54.4	2.1	42.16
21.800	2.0	4.0	49.9	54.1	2.1	42.16
21.900	2.0	4.0	49.6	53.9	2.1	42.16
22.000	2.0	4.0	49.4	53.6	2.1	42.16
22.100	2.0	4.0	49.3	53.4	2.1	42.15
22.200	2.0	4.0	49.1	53.3	2.1	42.15
22.300	2.0	4.0	49.0	53.1	2.1	42.15
22.400	2.0	4.0	48.8	53.0	2.1	42.15
22.500	2.0	4.0	48.7	52.8	2.1	42.15
22.600	2.0	4.0	48.6	52.7	2.1	42.15
22.700	2.0	4.0	48.5	52.6	2.0	42.14
22.800	2.0	4.0	48.4	52.5	2.0	42.14
22.900	2.0	4.0	48.3	52.4	2.0	42.14
23.000	2.0	4.0	48.3	52.3	2.0	42.14
23.100	1.0	3.0	47.3	51.3	2.0	42.13
23.200	1.0	2.0	45.6	49.3	1.9	42.11
23.300	1.0	2.0	44.0	47.6	1.8	42.09
23.400	1.0	2.0	42.6	46.0	1.7	42.07
23.500	1.0	2.0	41.3	44.6	1.6	42.05
23.600	1.0	2.0	40.2	43.3	1.6	42.04
23.700	1.0	2.0	39.2	42.2	1.5	42.02
23.800	1.0	2.0	38.3	41.2	1.5	42.01
23.900	1.0	2.0	37.5	40.3	1.4	42.00
24.000	1.0	2.0	36.7	39.5	1.4	41.98
24.100	1.0	2.0	36.0	38.7	1.3	41.96
24.200	1.0	2.0	35.4	38.0	1.3	41.94
24.300	1.0	2.0	34.8	37.4	1.3	41.92
24.400	1.0	2.0	34.3	36.8	1.3	41.91
24.500	1.0	2.0	33.8	36.3	1.2	41.89
24.600	1.0	2.0	33.3	35.8	1.2	41.88

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPOND5P.HYD 09:24:10
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
24.700	1.0
24.800	1.0
24.900	1.0
25.000	0.0
25.100	0.0
25.200	0.0
25.300	0.0
25.400	0.0
25.500	0.0
25.600	0.0
25.700	0.0
25.800	0.0
25.900	0.0

ROUTING COMPUTATIONS

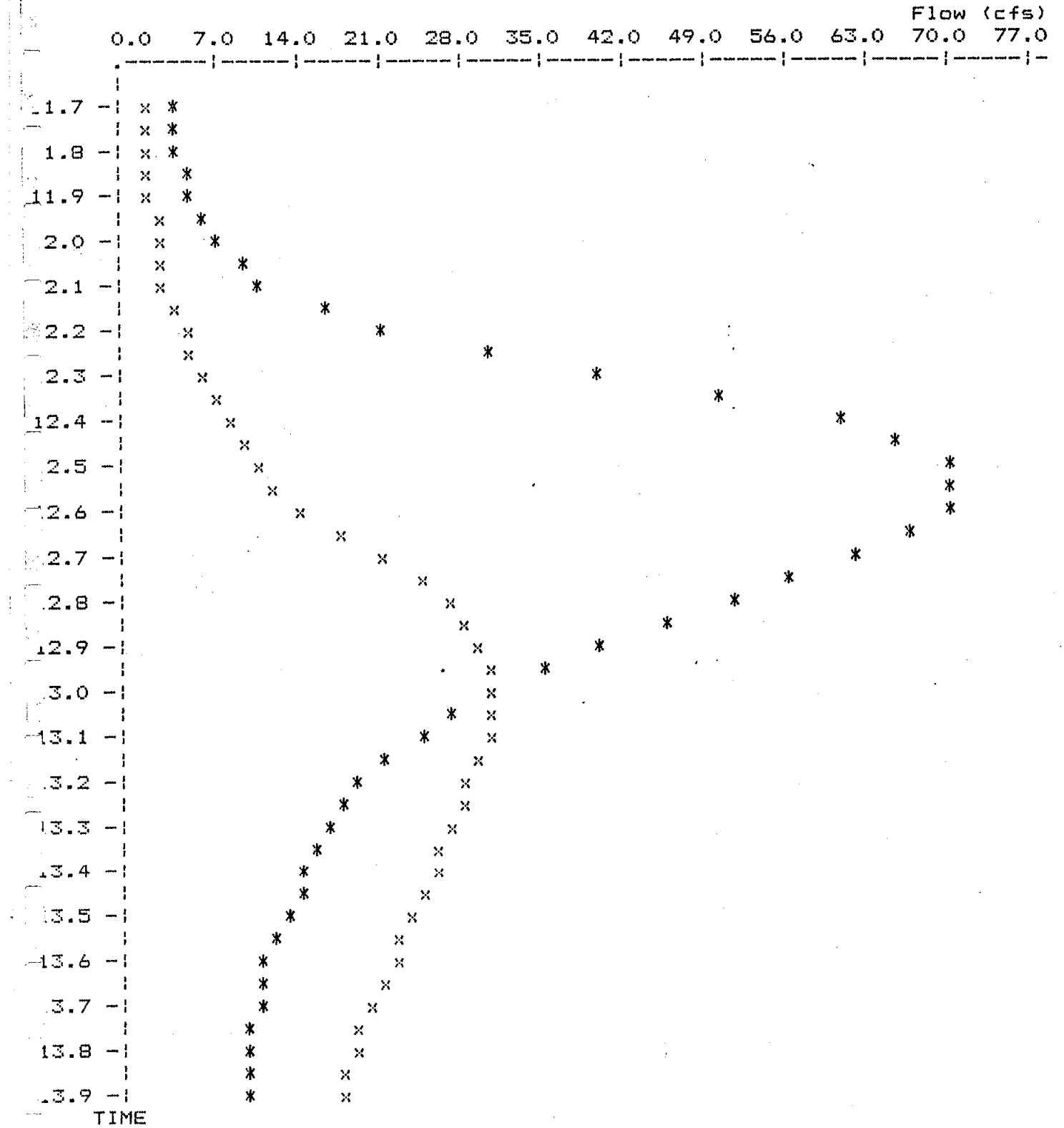
I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
2.0	32.9	35.3	1.2	41.86
2.0	32.5	34.9	1.2	41.85
2.0	32.2	34.5	1.2	41.84
1.0	30.9	33.2	1.1	41.80
0.0	28.8	30.9	1.0	41.74
0.0	26.9	28.8	1.0	41.68
0.0	25.2	26.9	0.9	41.63
0.0	23.6	25.2	0.8	41.58
0.0	22.1	23.6	0.7	41.53
0.0	20.7	22.1	0.7	41.49
0.0	19.5	20.7	0.6	41.45
0.0	18.3	19.5	0.6	41.41
0.0	17.2	18.3	0.5	41.38

Peak Inflow = 70.0 cfs
Peak Outflow = 30.3 cfs
Peak Elevation = 45.99 ft

Pond File: C:MCPOND .PND
Inflow Hydrograph: C:MCPOND5P.HYD
Outflow Hydrograph: C:NULL .HYD

EXECUTED: 11-10-1989
09:24:10

Peak Inflow = 70.0 cfs
Peak Outflow = 30.3 cfs
Peak Elevation = 45.99 ft



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*
* ROSEWOOD WASH AT McCARRAN BLVD - PROPOSED CONDITIONS - 100 YEAR *
* CODEGA & FRICKE, INC *
* 1016.10 2 - 30" PIPES *
* GMP NOVEMBER 1989 *
*
****

EXECUTED 11-10-1989 09:27:21
Disk Files: C:MCPOND .PND ; C:MCPONDCP.HYD

INITIAL CONDITIONS
Elevation = 41.00 ft
Outflow = 0.0 cfs

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
41.00	0.0	0.02
42.00	1.4	0.16
43.00	5.9	0.50
44.00	8.2	1.07
45.00	12.6	1.84
46.00	30.5	2.75
47.00	60.7	3.75
48.00	95.5	4.81
49.00	123.7	5.92

COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
4.8	4.8
38.7	40.1
121.0	126.9
258.9	267.1
445.3	457.9
665.5	696.0
907.5	968.2
1164.0	1259.5
1432.6	1556.3

Time increment (t) = 0.100 hrs.

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPONDCP.HYD 09:27:21
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	4.0	-----	4.8	4.8	0.0	41.00
11.100	5.0	9.0	13.1	13.8	0.4	41.26
11.200	7.0	12.0	23.5	25.1	0.8	41.57
11.300	8.0	15.0	35.8	38.5	1.3	41.95
11.400	9.0	17.0	48.7	52.8	2.1	42.15
11.500	9.0	18.0	61.2	66.7	2.8	42.31
11.600	10.0	19.0	73.2	80.2	3.5	42.46
11.700	12.0	22.0	86.7	95.2	4.3	42.63
11.800	14.0	26.0	102.4	112.7	5.2	42.84
11.900	16.0	30.0	120.4	132.4	6.0	43.04
12.000	20.0	36.0	143.6	156.4	6.4	43.21
12.100	32.0	52.0	181.6	195.6	7.0	43.49
12.200	57.0	89.0	254.0	270.6	8.3	44.02
12.300	102.0	159.0	389.9	413.0	11.6	44.76
12.400	157.0	259.0	595.0	648.9	27.0	45.80
12.500	188.0	345.0	824.8	940.0	57.6	46.90
12.600	185.0	373.0	1021.6	1197.8	88.1	47.79
12.700	162.0	347.0	1156.8	1368.6	105.9	48.37
12.800	132.0	294.0	1223.5	1450.8	113.7	48.64
12.900	106.0	238.0	1232.1	1461.5	114.7	48.68
13.000	79.0	185.0	1196.2	1417.1	110.5	48.53
13.100	63.0	142.0	1132.2	1338.2	103.0	48.26
13.200	47.0	110.0	1055.4	1242.2	93.4	47.94
13.300	39.0	86.0	978.6	1141.4	81.4	47.59
13.400	32.0	71.0	908.7	1049.6	70.4	47.28
13.500	29.0	61.0	848.0	969.7	60.9	47.01
13.600	26.0	55.0	796.0	903.0	53.5	46.76
13.700	24.0	50.0	751.8	846.0	47.1	46.55
13.800	22.0	46.0	714.2	797.8	41.8	46.37
13.900	20.0	42.0	681.8	756.2	37.2	46.22
14.000	19.0	39.0	654.3	720.8	33.3	46.09
14.100	18.0	37.0	631.0	691.3	30.1	45.98
14.200	18.0	36.0	610.4	667.0	28.3	45.88
14.300	17.0	35.0	592.0	645.4	26.7	45.79
14.400	16.0	33.0	574.7	625.0	25.2	45.70
14.500	15.0	31.0	558.2	605.7	23.7	45.62
14.600	14.0	29.0	542.6	587.2	22.3	45.54
14.700	14.0	28.0	528.4	570.6	21.1	45.47
14.800	14.0	28.0	516.4	556.4	20.0	45.41
14.900	13.0	27.0	505.4	543.4	19.0	45.36
15.000	13.0	26.0	495.1	531.4	18.1	45.31
15.100	13.0	26.0	486.4	521.1	17.4	45.27
15.200	12.0	25.0	478.2	511.4	16.6	45.22
15.300	12.0	24.0	470.3	502.2	15.9	45.19
15.400	11.0	23.0	462.8	493.3	15.3	45.15

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPONDCP.HYD 09:27:21
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	11.0	22.0	455.5	484.8	14.6	45.11
15.600	11.0	22.0	449.4	477.5	14.1	45.08
15.700	11.0	22.0	444.2	471.4	13.6	45.06
15.800	10.0	21.0	438.9	465.2	13.1	45.03
15.900	10.0	20.0	433.5	458.9	12.7	45.00
16.000	10.0	20.0	428.5	453.5	12.5	44.98
16.100	10.0	20.0	423.7	448.5	12.4	44.95
16.200	10.0	20.0	419.2	443.7	12.3	44.93
16.300	9.0	19.0	413.9	438.2	12.1	44.90
16.400	9.0	18.0	407.9	431.9	12.0	44.86
16.500	9.0	18.0	402.2	425.9	11.9	44.83
16.600	9.0	18.0	396.7	420.2	11.7	44.80
16.700	9.0	18.0	391.5	414.7	11.6	44.77
16.800	8.0	17.0	385.6	408.5	11.5	44.74
16.900	8.0	16.0	379.0	401.6	11.3	44.70
17.000	8.0	16.0	372.7	395.0	11.1	44.67
17.100	8.0	16.0	366.7	388.7	11.0	44.64
17.200	8.0	16.0	360.9	382.7	10.9	44.61
17.300	8.0	16.0	355.5	376.9	10.7	44.58
17.400	8.0	16.0	350.3	371.5	10.6	44.55
17.500	8.0	16.0	345.3	366.3	10.5	44.52
17.600	8.0	16.0	340.6	361.3	10.4	44.49
17.700	8.0	16.0	336.0	356.6	10.3	44.47
17.800	8.0	16.0	331.7	352.0	10.2	44.45
17.900	8.0	16.0	327.6	347.7	10.1	44.42
18.000	8.0	16.0	323.7	343.6	10.0	44.40
18.100	8.0	16.0	319.9	339.7	9.9	44.38
18.200	8.0	16.0	316.3	335.9	9.8	44.36
18.300	7.0	15.0	312.0	331.3	9.7	44.34
18.400	7.0	14.0	306.9	326.0	9.6	44.31
18.500	7.0	14.0	302.0	320.9	9.4	44.28
18.600	7.0	14.0	297.3	316.0	9.3	44.26
18.700	7.0	14.0	292.9	311.3	9.2	44.23
18.800	6.0	13.0	287.7	305.9	9.1	44.20
18.900	6.0	12.0	281.8	299.7	9.0	44.17
19.000	6.0	12.0	276.2	293.8	8.8	44.14
19.100	6.0	12.0	270.8	288.2	8.7	44.11
19.200	6.0	12.0	265.7	282.8	8.6	44.08
19.300	6.0	12.0	260.8	277.7	8.4	44.06
19.400	6.0	12.0	256.1	272.8	8.3	44.03
19.500	6.0	12.0	251.7	268.1	8.2	44.01
19.600	6.0	12.0	247.4	263.7	8.1	43.98
19.700	6.0	12.0	243.3	259.4	8.1	43.94
19.800	6.0	12.0	239.2	255.3	8.0	43.92
19.900	6.0	12.0	235.4	251.2	7.9	43.89
20.000	6.0	12.0	231.6	247.4	7.9	43.86

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPONDCP.HYD 09:27:21
Outflow Hydrograph: C:NULL .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	6.0	12.0	228.0	243.6	7.8	43.83
20.200	6.0	12.0	224.5	240.0	7.8	43.81
20.300	6.0	12.0	221.1	236.5	7.7	43.78
20.400	6.0	12.0	217.8	233.1	7.6	43.76
20.500	6.0	12.0	214.6	229.8	7.6	43.73
20.600	5.0	11.0	210.6	225.6	7.5	43.70
20.700	5.0	10.0	205.7	220.6	7.4	43.67
20.800	5.0	10.0	201.0	215.7	7.4	43.63
20.900	5.0	10.0	196.4	211.0	7.3	43.60
21.000	5.0	10.0	192.0	206.4	7.2	43.57
21.100	5.0	10.0	187.8	202.0	7.1	43.54
21.200	5.0	10.0	183.6	197.8	7.1	43.51
21.300	5.0	10.0	179.7	193.6	7.0	43.48
21.400	5.0	10.0	175.8	189.7	6.9	43.45
21.500	4.0	9.0	171.1	184.8	6.8	43.41
21.600	4.0	8.0	165.6	179.1	6.8	43.37
21.700	4.0	8.0	160.3	173.6	6.7	43.33
21.800	4.0	8.0	155.1	168.3	6.6	43.29
21.900	4.0	8.0	150.1	163.1	6.5	43.26
22.000	4.0	8.0	145.3	158.1	6.4	43.22
22.100	4.0	8.0	140.6	153.3	6.3	43.19
22.200	4.0	8.0	136.1	148.6	6.3	43.15
22.300	4.0	8.0	131.7	144.1	6.2	43.12
22.400	4.0	8.0	127.5	139.7	6.1	43.09
22.500	4.0	8.0	123.4	135.5	6.0	43.06
22.600	3.0	7.0	118.5	130.4	6.0	43.03
22.700	3.0	6.0	113.0	124.5	5.8	42.97
22.800	3.0	6.0	108.0	119.0	5.5	42.91
22.900	3.0	6.0	103.5	114.0	5.2	42.85
23.000	3.0	6.0	99.5	109.5	5.0	42.80
23.100	3.0	6.0	95.9	105.5	4.8	42.75
23.200	3.0	6.0	92.7	101.9	4.6	42.71
23.300	3.0	6.0	89.9	98.7	4.4	42.68
23.400	3.0	6.0	87.3	95.9	4.3	42.64
23.500	2.0	5.0	84.1	92.3	4.1	42.60
23.600	2.0	4.0	80.3	88.1	3.9	42.55
23.700	2.0	4.0	76.9	84.3	3.7	42.51
23.800	2.0	4.0	73.9	80.9	3.5	42.47
23.900	2.0	4.0	71.2	77.9	3.4	42.44
24.000	2.0	4.0	68.7	75.2	3.2	42.40
24.100	2.0	4.0	66.5	72.7	3.1	42.38
24.200	2.0	4.0	64.6	70.5	3.0	42.35
24.300	2.0	4.0	62.8	68.6	2.9	42.33
24.400	2.0	4.0	61.3	66.8	2.8	42.31
24.500	2.0	4.0	59.9	65.3	2.7	42.29
24.600	1.0	3.0	57.7	62.9	2.6	42.26

Pond File: C:MCPOND .PND EXECUTED: 11-10-1989
Inflow Hydrograph: C:MCPONDCP.HYD 09:27:21
Outflow Hydrograph: C:NULL .HYD

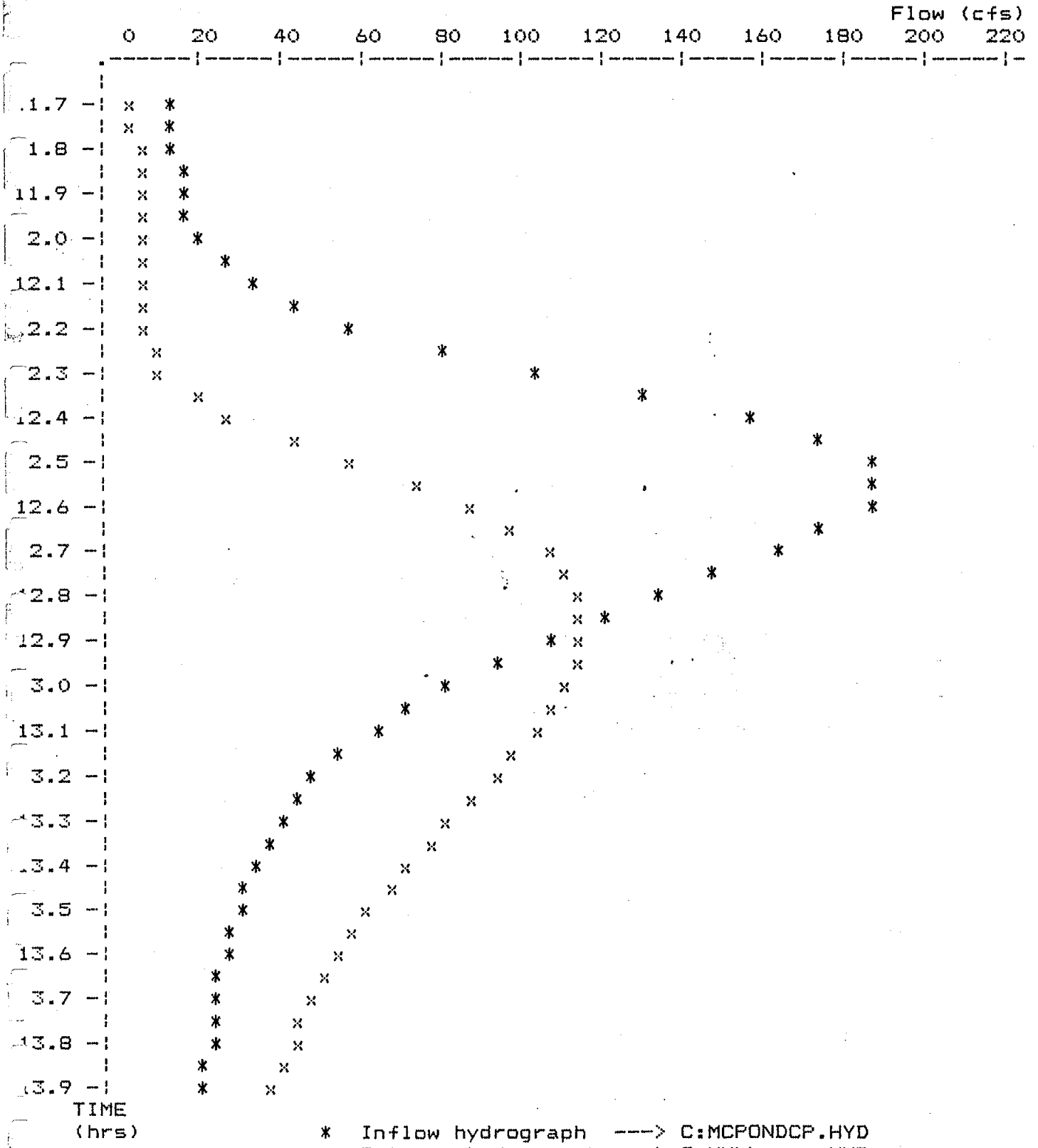
INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	1.0	2.0	54.9	59.7	2.4	42.23
24.800	1.0	2.0	52.3	56.9	2.3	42.19
24.900	1.0	2.0	50.1	54.3	2.1	42.16
25.000	1.0	2.0	48.0	52.1	2.0	42.14
25.100	1.0	2.0	46.2	50.0	1.9	42.11
25.200	1.0	2.0	44.6	48.2	1.8	42.09
25.300	1.0	2.0	43.1	46.6	1.7	42.07
25.400	1.0	2.0	41.8	45.1	1.7	42.06
25.500	0.0	1.0	39.7	42.8	1.5	42.03
25.600	0.0	0.0	36.9	39.7	1.4	41.99
25.700	0.0	0.0	34.4	36.9	1.3	41.91
25.800	0.0	0.0	32.0	34.4	1.2	41.84
25.900	0.0	0.0	29.9	32.0	1.1	41.77

Peak Inflow = 188.0 cfs
Peak Outflow = 114.7 cfs
Peak Elevation = 48.68 ft

Pond File: C:MCPOND .PND
Inflow Hydrograph: C:MCPONDCP.HYD
Outflow Hydrograph: C:NULL .HYD

EXECUTED: 11-10-1989
09:27:21

Peak Inflow = 188.0 cfs
Peak Outflow = 114.7 cfs
Peak Elevation = 48.68 ft



Appendix C

Design of Drop Spillway

DESIGN OF DROP SPILLWAY

$\Delta z = 6.0'$ $Y_c = 4.0$ - top of pipe

$$\frac{Y_1}{\Delta z} = 0.54\left(\frac{Y_c}{\Delta z}\right)^{1.275} \qquad \frac{Y_1}{6} = .54\left(\frac{4}{6}\right)^{1.275} \qquad Y_1 = 1.93$$

SAME

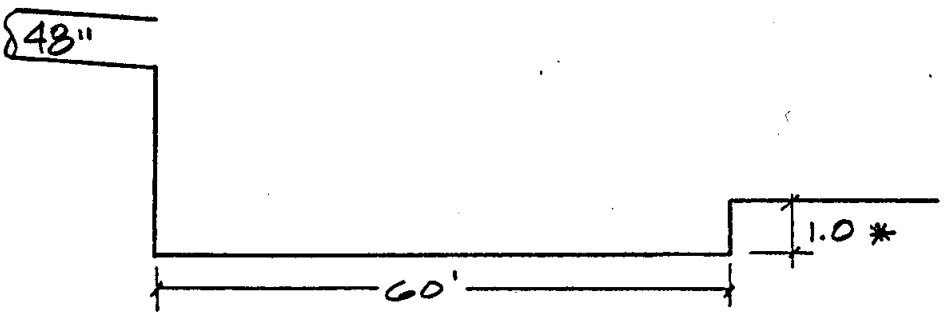
$$\frac{Y_1}{Y_c} = .54\left(\frac{Y_c}{\Delta z}\right)^{.275} \qquad \frac{Y_1}{4} = .54\left(\frac{4}{6}\right)^{.275} \qquad Y_1 = 1.93$$

$$\frac{Y_2}{\Delta z} = 1.66\left(\frac{Y_c}{\Delta z}\right)^{.81} \qquad \frac{Y_2}{6} = 1.66\left(\frac{4}{6}\right)^{.81} \qquad Y_2 = 7.17$$

$$\frac{L_d}{\Delta z} = 4.30\left(\frac{Y_c}{\Delta z}\right)^{0.09} \qquad \frac{L_d}{6} = 4.30\left(\frac{4}{6}\right)^{0.09} \qquad L_d = 24.88$$

$$L_j = 6.9\,(Y_2 - Y_1) \qquad L_j = 6.9\,(7.17 - 1.93) = \qquad L_j = 36.16$$

$$\frac{Y_2}{6} = \frac{7.17}{6} = 1.20'$$



Y_2 is considered to be the depth exiting the structure. The structure is 20' wide or roughly 5 times wider than the entrance channel (48" pipe). Thus $Y_2 = 7.17/5 = 1.4'$. (*: Make $Y_2/_{10} = 1.0'$)

Richard H. French

OPEN-CHANNEL HYDRAULICS

McGraw-Hill Book Company
New York St. Louis San Francisco Auckland Bogotá
Hamburg London Madrid Mexico Montreal
New Delhi Panama Paris São Paulo Singapore Sydney
Tokyo Toronto

length of the stilling basin is assumed to be equal to the length of a hydraulic jump in a horizontal stilling basin with no appurtenances. Figure 3.8 can be used to estimate this length. It should be noted that USBR Basin IV is applicable only to channels of rectangular cross section.

9.4 DROP SPILLWAYS

The drop spillway is commonly used in small drainage structures to dissipate energy. An aerated, free-falling nappe in a straight-drop spillway will reverse its curvature and result in a supercritical flow on the apron which will, in turn, result in a hydraulic jump (Fig. 9.34). If it is assumed that the depth of flow at the free overfall is critical, then Rand (1955) has demonstrated by analyzing experimental data that

$$\frac{y_1}{\Delta z} = 0.54\left(\frac{y_c}{\Delta z}\right)^{1.275} \tag{9.4.1}$$

$$\frac{y_1}{y_c} = 0.54\left(\frac{y_c}{\Delta z}\right)^{0.275} \tag{9.4.2}$$

$$\frac{y_2}{\Delta z} = 1.66\left(\frac{y_c}{\Delta z}\right)^{0.81} \tag{9.4.3}$$

$$\frac{L_d}{\Delta z} = 4.30\left(\frac{y_c}{\Delta z}\right)^{0.09} \tag{9.4.4}$$

$$L_j = 6.9\,(y_2 - y_1) \tag{9.4.5}$$

where y_c = critical depth and all other variables are defined in Fig. 9.34. The sill or upward step of $y_2/6$ at the end of the structure serves to locate the jump in the immediate vicinity of the drop structure. Equations (9.4.1) to (9.4.5) and Fig. 9.34 are completely satisfactory for proportioning a simple drop structure. Rand (1955) noted that the equations given above fitted the data with errors of 5 percent or less.

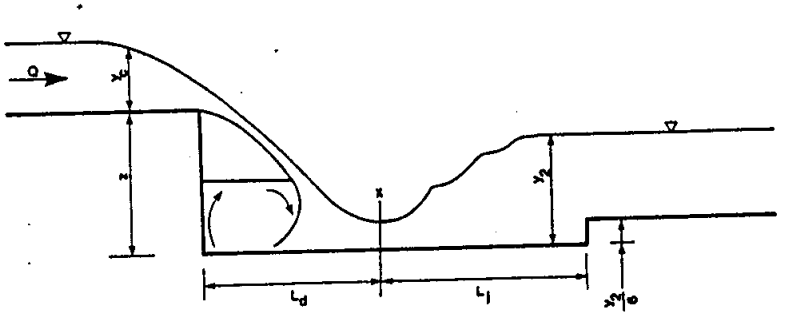


FIGURE 9.34 Schematic of the drop structure.

Appendix D

Outlet Structure

Outlet Structure File: MCPOND .STR

POND-2 Version: 4.10 S/N: 88021052
Date Executed: 11-10-1989 Time Executed: 09:35:09

****
MCCARRAN BLVD DETENTION POND - ROSEWOOD WASH
CODEGA & FRICKE, INC
1016.10
GMP
****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
41.00	0.0	1
42.00	1.4	1
43.00	5.9	1
44.00	8.2	1
45.00	12.6	1 +2 +3
46.00	30.5	1 +2 +3
47.00	60.7	1 +2 +3
48.00	95.5	1 +2 +3
49.00	123.7	1 +2 +3
50.00	0.0	

Outlet Structure File: MCPOND .STR

POND-2 Version: 4.10 S/N: 88021052
Date Executed: 11-10-1989 Time Executed: 09:35:09

****
MCCARRAN BLVD DETENTION POND - ROSEWOOD WASH
CODEGA & FRICKE, INC
1016.10
GMP
****

Outlet Structure File: C:MCPOND .STR
Planimeter Input File: C:MCPOND .VOL
Rating Table Output File: C:MCPOND .PND

Min. Elev.(ft) = 41 Max. Elev.(ft) = 50 Incr.(ft) = 1

Additional elevations (ft) to be included in table:
* *

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
CULVERT-CR	1		->	1
CULVERT-CR	2		->	2
CULVERT-CR	3		->	3

Outflow rating table summary was stored in file C:MCPOND .PND

Outlet Structure File: MCPOND .STR

POND-2 Version: 4.10 S/N: 88021052
Date Executed: 11-10-1989 Time Executed: 09:35:09

****
MCCARRAN BLVD DETENTION POND - ROSEWOOD WASH
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****

>>>>>> Structure No. 1 <<<<<<
(Input Data)

CULVERT-CR
Circular Culvert (With Inlet Control)

E1 elev.(ft)?	41.00
E2 elev.(ft)?	50.00
Diam. (ft)?	1.00
Inv. el.(ft)?	41.00
Slope (ft/ft)?	.020
T1 ratio?	.9
T2 ratio?	1.5
K Coeff.?	.534
M Coeff.?	.555
c Coeff.?	.0196
Y Coeff.?	.89
Form 1 or 2?	2
Slope factor?	-.5

Outlet Structure File: MCPOND .STR

POND-2 Version: 4.10 S/N: 88021052
Date Executed: 11-10-1989 Time Executed: 09:35:09

****
MCCARRAN BLVD DETENTION POND - ROSEWOOD WASH
CODEGA & FRICKE, INC
1016.10
GMP
****

>>>>>> Structure No. 2 <<<<<<
(Input Data)

CULVERT-CR
Circular Culvert (With Inlet Control)

E1 elev.(ft)?	44.50
E2 elev.(ft)?	50.00
Diam. (ft)?	2.50
Inv. el.(ft)?	44.50
Slope (ft/ft)?	.100
T1 ratio?	.9
T2 ratio?	1.5
K Coeff.?	.534
M Coeff.?	.555
c Coeff.?	.0196
Y Coeff.?	.89
Form 1 or 2?	2
Slope factor?	-.5

Outlet Structure File: MCPOND .STR

POND-2 Version: 4.10 S/N: 88021052
Date Executed: 11-10-1989 Time Executed: 09:35:09

****
MCCARRAN BLVD DETENTION POND - ROSEWOOD WASH
CODEGA & FRICKE, INC
1016.10
GMP
****

>>>>>> Structure No. 3 <<<<<<
(Input Data)

CULVERT-CR
Circular Culvert (With Inlet Control)

E1 elev.(ft)?	44.50
E2 elev.(ft)?	50.00
Diam. (ft)?	2.50
Inv. el.(ft)?	44.50
Slope (ft/ft)?	.100
T1 ratio?	.9
T2 ratio?	1.5
K Coeff.?	.534
M Coeff.?	.555
c Coeff.?	.0196
Y Coeff.?	.89
Form 1 or 2?	2
Slope factor?	-.5

Outlet Structure File: MCPOND .STR

POND-2 Version: 4.10 S/N: 88021052
Date Executed: 11-10-1989 Time Executed: 09:35:09

****
MCCARRAN BLVD DETENTION POND - ROSEWOOD WASH
CODEGA & FRICKE, INC
1016.10
GMP
****

Outflow Rating Table for Structure #1
CULVERT-CR Circular Culvert (With Inlet Control)

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
41.00	0.0	Unsubmerged (2): HW = 0.0
42.00	1.4	Transition flow: HW = 1.0
43.00	5.9	Submerged Flow: HW = 2.0
44.00	8.2	Submerged Flow: HW = 3.0
45.00	9.9	Submerged Flow: HW = 4.0
46.00	11.4	Submerged Flow: HW = 5.0
47.00	12.7	Submerged Flow: HW = 6.0
48.00	13.9	Submerged Flow: HW = 7.0
49.00	15.0	Submerged Flow: HW = 8.0
50.00	0.0	E = or > E2=50.00

Used Unsubmerged Equ. Form (2) for elev. less than 41.9 ft
Used Submerged Equation for elevations greater than 42.5 ft

Transition flows interpolated from the following values:
E1= 41.9 ft; Q1= .763 cfs; E2= 42.5 ft; Q2= 4.387 cfs

Outlet Structure File: MCPOND .STR

POND-2 Version: 4.10 S/N: 88021052
Date Executed: 11-10-1989 Time Executed: 09:35:09

****
MCCARRAN BLVD DETENTION POND - ROSEWOOD WASH
CODEGA & FRICKE, INC
1016.10
GMP
****

Outflow Rating Table for Structure #2
CULVERT-CR Circular Culvert (With Inlet Control)

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
41.00	0.0	E < Inv.El.= 44.5
42.00	0.0	E < Inv.El.= 44.5
43.00	0.0	E < Inv.El.= 44.5
44.00	0.0	E < Inv.El.= 44.5
45.00	1.3	Unsubmerged (2): HW = .5
46.00	9.5	Unsubmerged (2): HW = 1.5
47.00	24.0	Transition flow: HW = 2.5
48.00	40.8	Transition flow: HW = 3.5
49.00	54.4	Submerged Flow: HW = 4.5
50.00	0.0	E = or > E2=50.00

Used Unsubmerged Equ. Form (2) for elev. less than 46.75 ft
Used Submerged Equation for elevations greater than 48.25 ft

Transition flows interpolated from the following values:
E1= 46.75 ft; Q1= 19.836 cfs; E2= 48.25 ft; Q2= 45.013 cfs

Outlet Structure File: MCPOND .STR

POND-2 Version: 4.10 S/N: 88021052
Date Executed: 11-10-1989 Time Executed: 09:35:09

****
MCCARRAN BLVD DETENTION POND - ROSEWOOD WASH
CODEGA & FRICKE, INC
1016.10
GMP
****

Outflow Rating Table for Structure #3
CULVERT-CR Circular Culvert (With Inlet Control)

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
41.00	0.0	E < Inv.El.= 44.5
42.00	0.0	E < Inv.El.= 44.5
43.00	0.0	E < Inv.El.= 44.5
44.00	0.0	E < Inv.El.= 44.5
45.00	1.3	Unsubmerged (2): HW = .5
46.00	9.5	Unsubmerged (2): HW = 1.5
47.00	24.0	Transition flow: HW = 2.5
48.00	40.8	Transition flow: HW = 3.5
49.00	54.4	Submerged Flow: HW = 4.5
50.00	0.0	E = or > E2=50.00

Used Unsubmerged Equ. Form (2) for elev. less than 46.75 ft
Used Submerged Equation for elevations greater than 48.25 ft

Transition flows interpolated from the following values:
E1= 46.75 ft; Q1= 19.836 cfs; E2= 48.25 ft; Q2= 45.013 cfs

Appendix E

Pond Data

PRINTER OFF
* PRINTER HAS BEEN TURNED OFF
POND-2 Version: 4.10
S/N: 88021052

MCCARRAN BLVD DETENTION BASIN - ROSEWOOD WASH
CODEGA & FRICKE, INC
1016.10
GMP/ECT

CALCULATED 11-10-1989 15:35:12
DISK FILE : C:MCPOND .VOL

Planimeter scale: 1 inch = 40 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
40.00	0.00	0.00	0.00	0.00	0.00
42.00	6.68	0.25	0.25	0.16	0.16
44.00	19.16	0.70	1.36	0.91	1.07
46.00	26.64	0.98	2.51	1.67	2.75
50.00	32.55	1.20	3.26	4.34	7.09

$$IA = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))^2$$

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

* Incremental volume computed by the Conic Method for Reservoir Volumes.

$$Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))$$

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

P A R T I A L L Y F U L L P I P E

Manning's Equation for flow capacity in a circular pipe.

ROSEWOOD WASH - 48" RCP

Input variables:		Output variables:	
		Capacity at d	555.70 cfs
Normal depth, d	45 in	Normal velocity	45.40 fps
Pipe slope	0.1500 ft/ft	Critical depth	98.64 in
Pipe diameter	48 in	Critical velocity	ERR fps
Manning's n	0.014	Critical slope	ERR ft/ft

P A R T I A L L Y F U L L P I P E

Manning's Equation for flow capacity in a circular pipe.

ROSEWOOD WASH - 30" RCP

Input variables:		Output variables:	
		Capacity at d	231.73 cfs
Normal depth, d	28 in	Normal velocity	48.60 fps
Pipe slope	0.3200 ft/ft	Critical depth	75.03 in
Pipe diameter	30 in	Critical velocity	ERR fps
Manning's n	0.014	Critical slope	ERR ft/ft

P A R T I A L L Y F U L L P I P E

Manning's Equation for flow capacity in a circular pipe.

ROSEWOOD WASH - 48" RCP

Input variables:		Output variables:	
		Capacity at d	453.39 cfs
Normal depth, d	45.5 in	Normal velocity	36.81 fps
Pipe slope	0.1000 ft/ft	Critical depth	86.69 in
Pipe diameter	48 in	Critical velocity	ERR fps
Manning's n	0.014	Critical slope	ERR ft/ft

P A R T I A L L Y F U L L P I P E

Manning's Equation for flow capacity in a circular pipe.

ROSEWOOD WASH - AFTER POND - 48" RCP

Input variables:		Output variables:	
		Capacity at d	703.85 cfs
Normal depth, d	45.5 in	Normal velocity	57.15 fps
Pipe slope	0.2410 ft/ft	Critical depth	114.70 in
Pipe diameter	48 in	Critical velocity	ERR fps
Manning's n	0.014	Critical slope	ERR ft/ft

P A R T I A L L Y F U L L P I P E

Manning's Equation for flow capacity in a circular pipe.

ROSEWOOD WASH - AFTER POND - 30" RCP

Input variables:		Output variables:	
		Capacity at d	129.54 cfs
Normal depth, d	28 in	Normal velocity	27.17 fps
Pipe slope	0.1000 ft/ft	Critical depth	51.93 in
Pipe diameter	30 in	Critical velocity	ERR fps
Manning's n	0.014	Critical slope	ERR ft/ft

T R A P E Z O I D A L C H A N N E L

Normal depth and critical depth parameters

ROSEWOOD WASH - TRASH RACK INLET STRUCTURE

Input variables:		Output variables:	
Discharge	188 cfs	Normal depth	2.18 ft
Channel slope	0.04500 ft/ft	Normal velocity	21.56 fps
Manning's n	0.015	Froude number	2.57
Bottom width	4 ft	Critical depth	4.10 ft
Left side slope	0 H:1	Critical velocity	11.46 fps
Right side slope	0 H:1	Critical slope	0.002

T R A P E Z O I D A L C H A N N E L

Normal depth and critical depth parameters

ROSEWOOD WASH RELOCATED 2' FLAT BOTTOM DITCH **100 YEAR**

Input variables:		Output variables:	
Discharge	147 cfs	Normal depth	2.10 ft
Channel slope	0.06000 ft/ft	Normal velocity	11.29 fps
Manning's n	0.035	Froude number	1.78
Bottom width	2 ft	Critical depth	2.75 ft
Left side slope	2 H:1	Critical velocity	7.13 fps
Right side slope	2 H:1	Critical slope	0.015

T R A P E Z O I D A L C H A N N E L

Normal depth and critical depth parameters

ROSEWOOD WASH RELOCATED 2' FLAT BOTTOM DITCH **5 YEAR**

Input variables:		Output variables:	
Discharge	56 cfs	Normal depth	1.35 ft
Channel slope	0.06000 ft/ft	Normal velocity	8.83 fps
Manning's n	0.035	Froude number	1.68
Bottom width	2 ft	Critical depth	1.75 ft
Left side slope	2 H:1	Critical velocity	5.82 fps
Right side slope	2 H:1	Critical slope	0.017

Good!

Bob initiate letter to Tom Williams to set up discussion on this matter. We will probably have to offer engr. design [illegible] 4-16-89

City of Reno

Inter-Office Memo

Date: April 12, 1989

To: Steve Varela, P.E., City Engineer

From: Chris Robinson, Engineering Technician

~~Via:~~ To: Robert M. Gottsacker, P.E., Senior Civil Engineer

RE: POINT OF INFORMATION ON McCARRAN BOULEVARD EXTENSION ADJACENT TO EASTRIDGE UNIT 1

Ray Brown asked that I act as photographer of the infrastructure failures visible in Eastridge Unit 1 on April 11, 1989. In addition to that review, New Development met with Mr. Tom Williams of RTC to discuss the proposed McCarran Boulevard extension adjacent to Eastridge Unit 1, and to perform a field review of the proposed construction site. During the course of that review, a number of items where related which may prove of interest:

1) RTC intends to construct the extension to full final improvements (i.e., four lanes).

2) The earth filled embankment to be constructed for the proposed extension across the upper reaches of a previously identified deficient drainage area is currently designed to pass flows from the 100 year storm.

3) A powerline located within the proposed embankment area will require relocation.

In general, this area appears to provide similar possibilities to those currently being pursued for the Dant Boulevard Detention Dam, and could act in a similar fashion to mitigate the impact of storm flows downstream. A cursory review of information on this drainage in Winzler & Kelly's "Reno Drainage Study, Analysis of the Belford Road and Sharon Way Drainage Deficiency Area" (i.e., the "Rosewood Wash") indicates that the existing downstream storm drainage within the Eastridge Subdivision is inadequate to handle existing flows created within the subdivision and would be adversely impacted by the additional flows in the 100 year event. Additionally, downstream structures have been constructed to pass all storm flows rather than to detain them, creating the potential for extensive damage downstream. The report recommends that detention upstream needs to be provided to avoid adverse impacts. A photocopy of a section of the map from the Winzler-Kelly report is attached. The

indicated 100 year flood flows reflect coefficients calculated for the present undeveloped drainage area and for the future fully developed drainage area.

Because Mr. Williams has indicated that this project will be placed for bid some time after the start of the fiscal year (July 1), the possibility of modifying the fill embankment to act as a detention structure should be considered at this time. This conforms to recommendations indicated in the study, and should be accomplishable for minimal monetary investment on the part of the City if installed in conjunction with the construction of the embankment. Please advise as to your desires in this matter.

cc: Ray Brown, New Development

City of Reno

POST OFFICE BOX 1900 • RENO, NEVADA 89505

April 19, 1989

Mr. Thomas Williams
Regional Transportation Commission
P.O. Box 30002
Reno, Nevada 89520

RE: PROPOSED DETENTION BASIN ADJACENT TO McCARRAN BOULEVARD EXTENSION FROM SKYLINE BOULEVARD TOWARD MAYBERRY DRIVE

Dear Tom:

It has come to our attention that RTC is in the process of finalizing the plans for the extension of McCarran Boulevard from Skyline Drive north toward Mayberry Drive. A review of the area proposed for the road has disclosed that the road alignment will cross a major drainage channel, requiring deep fill. It is our understanding that RTC's current design would allow for the 100 year storm to pass through this fill. It has been suggested that this fill could be used to form a detention basin to assist in mitigating downstream storm flows, and we are requesting your assistance in developing this concept further.

A review of our records has indicated that in a study performed for the City of Reno by Winzler & Kelly, entitled "Reno Drainage Study: Analysis of the Belford Road and Sharon Way Drainage Deficiency Area", a recommendation is made that a significant reduction in the impact on downstream drainage facilities could be achieved through emplacement of upstream detention basins. The proposed construction of the earthen fill for McCarran Boulevard provides us with a possible opportunity to comply with that recommendation. A copy of the information from the Winzler & Kelly report regarding this drainage is enclosed.

We would like to schedule a meeting to discuss this proposal and to iron out some preliminary details. Our contact individual is Mr. Robert Gottsacker, who may be contacted at 785-2230, or at the above address. Please accept our thanks in advance for your cooperation.

Sincerely,

STEVE VARELA, P.E.
CITY ENGINEER

By: Robert M. Gottsacker
Robert M. Gottsacker, P.E.
Senior Civil Engineer

SV:RMG:cr

Enclosures

Table 1. Belford Road/Sharon Way Existing Drainage Facilities Summary

Node and Location	Existing Storm Drainage System	Existing Capacity (CFS)	Estimated Flows Present Land Use		Estimated Flows Future Land Use	
			Q_5 (CFS)	Q_{100} (CFS)	Q_5 (CFS)	Q_{100} (CFS)
a - Pipe inlet upstream of Grand Teton Court in Eastridge Subdivision	24" RCP	13-28	40	110	70	185
b - D.I.'s on Heavenly Valley Lane with pipe discharging to concrete ditch	15" RCP	4-6	45	115	55	145
c - Outlet of storm drain near Gibralter and Conifer	30" RCP with short final length of CMP	22-45	85	220	115	315
d - Culvert inlet on Cashill Blvd. near intersection with Gibralter Drive	60" CMP	120->300	90	230	120	315
e - Culvert inlet on Cashill Blvd. near intersection with Skyline View Drive	48" CMP	70->200	45	115	85	230

(E)48"CMP

(E)10"RCP

(E)12"RCP

(E)30"RCP

(E)60"CMP

(E)24"RCP

(E)27"RCP

(E)18"RCP

(E)15"RCP

(E)12"RCPs

(E)12"RCPs

a
$Q_{5P} = 40$ CFS
$Q_{100P} = 110$ CFS
$Q_{5F} = 70$ CFS
$Q_{100F} = 185$ CFS

b
Q_{5}
Q_{10}
Q_{5}
Q_{10}