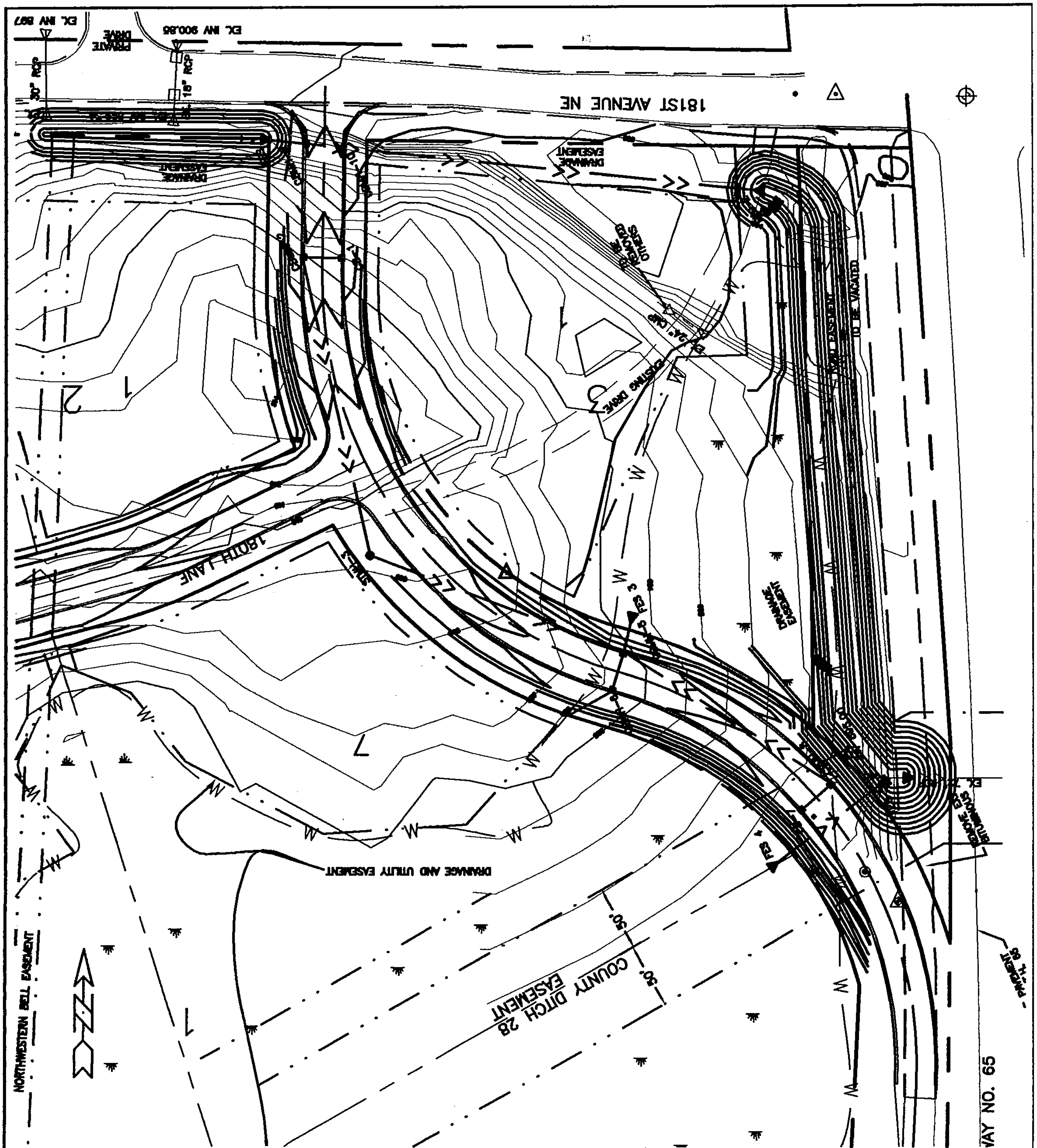


CITY OF HAM LAKE, MINNESOTA
EXHIBIT B
DITCH PLAN

RFC ENGINEERING, INC.

DWG:	0215 EXHIBIT B
DATE:	10/23/03
JOB NUMBER:	0215
SHEET:	1 of 1
SCALE:	1"=100'

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Type II 24-hr Rainfall=5.85"
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 1R: EXISTING CHANNEL
Length= 1,000.0' Max Vel= 0.0 fps Capacity= 73.06 cfs Outflow= 0.00 cfs 0.000 af

Reach 2R: EXISTING DRIVEWAY CULVERT
Length= 41.0' Max Vel= 0.0 fps Capacity= 7.65 cfs Outflow= 0.00 cfs 0.000 af

Reach 3R: PROPOSED CHANNEL
Length= 1,000.0' Max Vel= 0.0 fps Capacity= 157.51 cfs Outflow= 0.00 cfs 0.000 af

Reach 4R: PROPOSED STORM DRAIN
Length= 400.0' Max Vel= 0.0 fps Capacity= 19.87 cfs Outflow= 0.00 cfs 0.000 af

Reach 1R: EXISTING CHANNEL

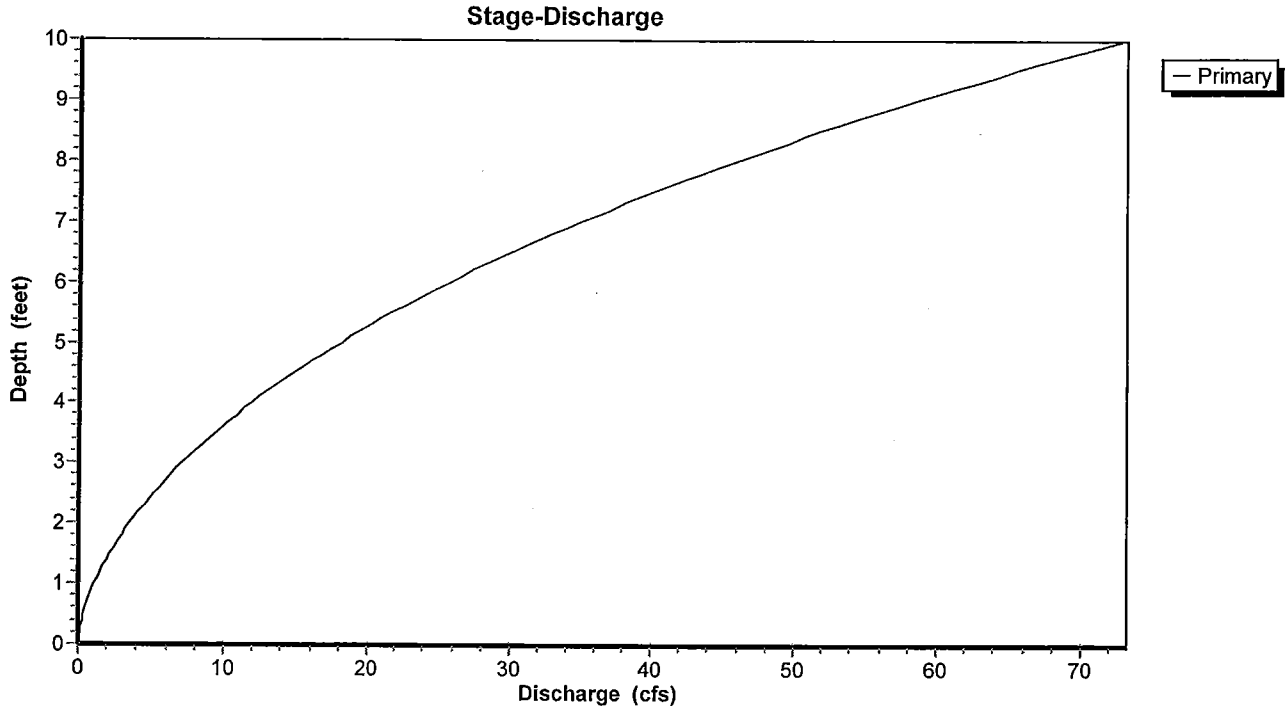
[43] Hint: Has no inflow (Outflow=Zero)

Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.0 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.0 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.00'
Capacity at bank full= 73.06 cfs
3.00' x 10.00' deep channel, n= 0.035 Length= 1,000.0' Slope= 0.0001 '/'
Side Slope Z-value= 0.5 '/'

Reach 1R: EXISTING CHANNEL



Reach 1R: EXISTING CHANNEL

Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)
0.00	0.00	1.04	1.21	2.08	3.80	3.12	7.65
0.02	0.00	1.06	1.25	2.10	3.86	3.14	7.74
0.04	0.01	1.08	1.29	2.12	3.92	3.16	7.83
0.06	0.01	1.10	1.33	2.14	3.99	3.18	7.92
0.08	0.02	1.12	1.37	2.16	4.05	3.20	8.00
0.10	0.03	1.14	1.41	2.18	4.11	3.22	8.09
0.12	0.04	1.16	1.45	2.20	4.18	3.24	8.18
0.14	0.05	1.18	1.49	2.22	4.24	3.26	8.27
0.16	0.06	1.20	1.53	2.24	4.31	3.28	8.36
0.18	0.07	1.22	1.57	2.26	4.37	3.30	8.46
0.20	0.08	1.24	1.61	2.28	4.44	3.32	8.55
0.22	0.10	1.26	1.65	2.30	4.51	3.34	8.64
0.24	0.11	1.28	1.70	2.32	4.57	3.36	8.73
0.26	0.13	1.30	1.74	2.34	4.64	3.38	8.82
0.28	0.15	1.32	1.78	2.36	4.71	3.40	8.92
0.30	0.16	1.34	1.83	2.38	4.78	3.42	9.01
0.32	0.18	1.36	1.87	2.40	4.85	3.44	9.11
0.34	0.20	1.38	1.92	2.42	4.92	3.46	9.20
0.36	0.22	1.40	1.97	2.44	4.99	3.48	9.30
0.38	0.24	1.42	2.01	2.46	5.06	3.50	9.40
0.40	0.26	1.44	2.06	2.48	5.13	3.52	9.49
0.42	0.28	1.46	2.11	2.50	5.20	3.54	9.59
0.44	0.30	1.48	2.15	2.52	5.27	3.56	9.69
0.46	0.32	1.50	2.20	2.54	5.34	3.58	9.79
0.48	0.35	1.52	2.25	2.56	5.42	3.60	9.88
0.50	0.37	1.54	2.30	2.58	5.49	3.62	9.98
0.52	0.40	1.56	2.35	2.60	5.56	3.64	10.08
0.54	0.42	1.58	2.40	2.62	5.64	3.66	10.18
0.56	0.45	1.60	2.45	2.64	5.71	3.68	10.29
0.58	0.47	1.62	2.50	2.66	5.79	3.70	10.39
0.60	0.50	1.64	2.55	2.68	5.86	3.72	10.49
0.62	0.53	1.66	2.60	2.70	5.94	3.74	10.59
0.64	0.55	1.68	2.66	2.72	6.02	3.76	10.69
0.66	0.58	1.70	2.71	2.74	6.09	3.78	10.80
0.68	0.61	1.72	2.76	2.76	6.17	3.80	10.90
0.70	0.64	1.74	2.82	2.78	6.25	3.82	11.01
0.72	0.67	1.76	2.87	2.80	6.33	3.84	11.11
0.74	0.70	1.78	2.92	2.82	6.41	3.86	11.22
0.76	0.73	1.80	2.98	2.84	6.49	3.88	11.32
0.78	0.76	1.82	3.03	2.86	6.57	3.90	11.43
0.80	0.79	1.84	3.09	2.88	6.65	3.92	11.54
0.82	0.82	1.86	3.15	2.90	6.73	3.94	11.65
0.84	0.86	1.88	3.20	2.92	6.81	3.96	11.76
0.86	0.89	1.90	3.26	2.94	6.89	3.98	11.86
0.88	0.92	1.92	3.32	2.96	6.97	4.00	11.97
0.90	0.96	1.94	3.38	2.98	7.06	4.02	12.08
0.92	0.99	1.96	3.44	3.00	7.14	4.04	12.19
0.94	1.03	1.98	3.50	3.02	7.22	4.06	12.31
0.96	1.06	2.00	3.55	3.04	7.31	4.08	12.42
0.98	1.10	2.02	3.61	3.06	7.39	4.10	12.53
1.00	1.14	2.04	3.68	3.08	7.48	4.12	12.64
1.02	1.17	2.06	3.74	3.10	7.57	4.14	12.76

Reach 1R: EXISTING CHANNEL (continued)

Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)
4.16	12.87	5.20	19.57	6.24	27.86	7.28	37.88
4.18	12.98	5.22	19.71	6.26	28.04	7.30	38.09
4.20	13.10	5.24	19.85	6.28	28.21	7.32	38.30
4.22	13.21	5.26	20.00	6.30	28.39	7.34	38.51
4.24	13.33	5.28	20.15	6.32	28.57	7.36	38.72
4.26	13.45	5.30	20.29	6.34	28.75	7.38	38.94
4.28	13.56	5.32	20.44	6.36	28.93	7.40	39.15
4.30	13.68	5.34	20.59	6.38	29.11	7.42	39.37
4.32	13.80	5.36	20.73	6.40	29.29	7.44	39.58
4.34	13.92	5.38	20.88	6.42	29.47	7.46	39.80
4.36	14.04	5.40	21.03	6.44	29.65	7.48	40.01
4.38	14.16	5.42	21.18	6.46	29.83	7.50	40.23
4.40	14.28	5.44	21.33	6.48	30.02	7.52	40.45
4.42	14.40	5.46	21.48	6.50	30.20	7.54	40.67
4.44	14.52	5.48	21.64	6.52	30.38	7.56	40.89
4.46	14.64	5.50	21.79	6.54	30.57	7.58	41.11
4.48	14.77	5.52	21.94	6.56	30.76	7.60	41.33
4.50	14.89	5.54	22.10	6.58	30.94	7.62	41.55
4.52	15.01	5.56	22.25	6.60	31.13	7.64	41.77
4.54	15.14	5.58	22.40	6.62	31.32	7.66	41.99
4.56	15.26	5.60	22.56	6.64	31.50	7.68	42.21
4.58	15.39	5.62	22.72	6.66	31.69	7.70	42.44
4.60	15.51	5.64	22.87	6.68	31.88	7.72	42.66
4.62	15.64	5.66	23.03	6.70	32.07	7.74	42.89
4.64	15.77	5.68	23.19	6.72	32.26	7.76	43.12
4.66	15.90	5.70	23.35	6.74	32.46	7.78	43.34
4.68	16.02	5.72	23.51	6.76	32.65	7.80	43.57
4.70	16.15	5.74	23.67	6.78	32.84	7.82	43.80
4.72	16.28	5.76	23.83	6.80	33.03	7.84	44.03
4.74	16.41	5.78	23.99	6.82	33.23	7.86	44.26
4.76	16.54	5.80	24.15	6.84	33.42	7.88	44.49
4.78	16.68	5.82	24.31	6.86	33.62	7.90	44.72
4.80	16.81	5.84	24.47	6.88	33.82	7.92	44.95
4.82	16.94	5.86	24.64	6.90	34.01	7.94	45.18
4.84	17.07	5.88	24.80	6.92	34.21	7.96	45.42
4.86	17.21	5.90	24.97	6.94	34.41	7.98	45.65
4.88	17.34	5.92	25.13	6.96	34.61	8.00	45.88
4.90	17.47	5.94	25.30	6.98	34.81	8.02	46.12
4.92	17.61	5.96	25.46	7.00	35.01	8.04	46.36
4.94	17.75	5.98	25.63	7.02	35.21	8.06	46.59
4.96	17.88	6.00	25.80	7.04	35.41	8.08	46.83
4.98	18.02	6.02	25.97	7.06	35.61	8.10	47.07
5.00	18.16	6.04	26.14	7.08	35.81	8.12	47.31
5.02	18.30	6.06	26.31	7.10	36.02	8.14	47.55
5.04	18.43	6.08	26.48	7.12	36.22	8.16	47.79
5.06	18.57	6.10	26.65	7.14	36.43	8.18	48.03
5.08	18.71	6.12	26.82	7.16	36.63	8.20	48.27
5.10	18.85	6.14	26.99	7.18	36.84	8.22	48.51
5.12	19.00	6.16	27.16	7.20	37.04	8.24	48.75
5.14	19.14	6.18	27.34	7.22	37.25	8.26	49.00
5.16	19.28	6.20	27.51	7.24	37.46	8.28	49.24
5.18	19.42	6.22	27.69	7.26	37.67	8.30	49.49

Reach 1R: EXISTING CHANNEL (continued)

Elevation (feet)	Discharge (cfs)
8.32	49.73
8.34	49.98
8.36	50.23
8.38	50.48
8.40	50.73
8.42	50.98
8.44	51.23
8.46	51.48
8.48	51.73
8.50	51.98
8.52	52.23
8.54	52.49
8.56	52.74
8.58	53.00
8.60	53.25
8.62	53.51
8.64	53.77
8.66	54.03
8.68	54.29
8.70	54.55
8.72	54.81
8.74	55.07
8.76	55.33
8.78	55.59
8.80	55.86
8.82	56.12
8.84	56.39
8.86	56.65
8.88	56.92
8.90	57.19
8.92	57.45
8.94	57.72
8.96	57.99
8.98	58.26
9.00	58.53
9.02	58.81
9.04	59.08
9.06	59.35
9.08	59.63
9.10	59.90
9.12	60.18
9.14	60.45
9.16	60.73
9.18	61.01
9.20	61.29
9.22	61.56
9.24	61.84
9.26	62.13
9.28	62.41
9.30	62.69
9.32	62.97
9.34	63.26
9.36	63.54
9.38	63.83
9.40	64.11
9.42	64.40
9.44	64.69
9.46	64.98
9.48	65.27
9.50	65.56
9.52	65.85
9.54	66.14
9.56	66.43
9.58	66.72
9.60	67.02
9.62	67.31
9.64	67.61
9.66	67.90
9.68	68.20
9.70	68.50
9.72	68.80
9.74	69.10
9.76	69.40
9.78	69.70
9.80	70.00
9.82	70.30
9.84	70.60
9.86	70.91
9.88	71.21
9.90	71.52
9.92	71.82
9.94	72.13
9.96	72.44
9.98	72.75
10.00	**73.06**

Reach 2R: EXISTING DRIVEWAY CULVERT

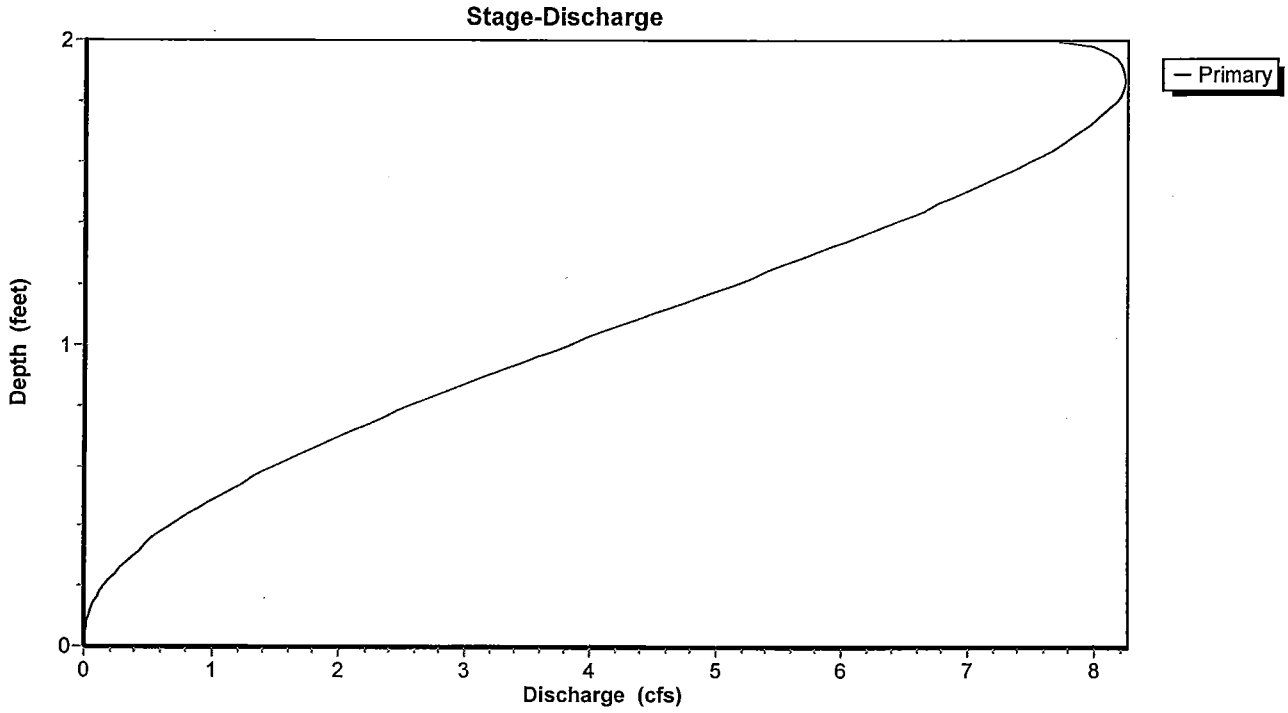
[43] Hint: Has no inflow (Outflow=Zero)

Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.0 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.0 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.00'
Capacity at bank full= 7.65 cfs
24.0" Diameter Pipe n= 0.024 Length= 41.0' Slope= 0.0039 '/'

Reach 2R: EXISTING DRIVEWAY CULVERT



Reach 2R: EXISTING DRIVEWAY CULVERT

Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)
0.00	0.00	0.52	1.13	1.04	4.09	1.56	7.29
0.01	0.00	0.53	1.18	1.05	4.15	1.57	7.34
0.02	0.00	0.54	1.22	1.06	4.22	1.58	7.39
0.03	0.00	0.55	1.27	1.07	4.29	1.59	7.44
0.04	0.01	0.56	1.31	1.08	4.35	1.60	7.48
0.05	0.01	0.57	1.36	1.09	4.42	1.61	7.53
0.06	0.01	0.58	1.40	1.10	4.48	1.62	7.57
0.07	0.02	0.59	1.45	1.11	4.55	1.63	7.62
0.08	0.02	0.60	1.50	1.12	4.62	1.64	7.66
0.09	0.03	0.61	1.55	1.13	4.68	1.65	7.70
0.10	0.04	0.62	1.60	1.14	4.75	1.66	7.74
0.11	0.05	0.63	1.65	1.15	4.81	1.67	7.78
0.12	0.05	0.64	1.70	1.16	4.88	1.68	7.82
0.13	0.06	0.65	1.75	1.17	4.95	1.69	7.85
0.14	0.08	0.66	1.80	1.18	5.01	1.70	7.89
0.15	0.09	0.67	1.85	1.19	5.08	1.71	7.92
0.16	0.10	0.68	1.91	1.20	5.14	1.72	7.95
0.17	0.11	0.69	1.96	1.21	5.21	1.73	7.99
0.18	0.13	0.70	2.01	1.22	5.27	1.74	8.02
0.19	0.14	0.71	2.07	1.23	5.34	1.75	8.04
0.20	0.16	0.72	2.12	1.24	5.40	1.76	8.07
0.21	0.18	0.73	2.18	1.25	5.47	1.77	8.09
0.22	0.20	0.74	2.23	1.26	5.53	1.78	8.12
0.23	0.21	0.75	2.29	1.27	5.60	1.79	8.14
0.24	0.23	0.76	2.35	1.28	5.66	1.80	8.16
0.25	0.25	0.77	2.40	1.29	5.73	1.81	8.18
0.26	0.28	0.78	2.46	1.30	5.79	1.82	8.19
0.27	0.30	0.79	2.52	1.31	5.85	1.83	8.20
0.28	0.32	0.80	2.58	1.32	5.92	1.84	8.22
0.29	0.35	0.81	2.64	1.33	5.98	1.85	8.22
0.30	0.37	0.82	2.70	1.34	6.04	1.86	8.23
0.31	0.40	0.83	2.76	1.35	6.10	1.87	8.23
0.32	0.43	0.84	2.82	1.36	6.17	1.88	**8.23**
0.33	0.45	0.85	2.88	1.37	6.23	1.89	8.23
0.34	0.48	0.86	2.94	1.38	6.29	1.90	8.23
0.35	0.51	0.87	3.00	1.39	6.35	1.91	8.22
0.36	0.54	0.88	3.06	1.40	6.41	1.92	8.20
0.37	0.57	0.89	3.13	1.41	6.47	1.93	8.18
0.38	0.60	0.90	3.19	1.42	6.53	1.94	8.16
0.39	0.64	0.91	3.25	1.43	6.59	1.95	8.13
0.40	0.67	0.92	3.31	1.44	6.64	1.96	8.09
0.41	0.70	0.93	3.38	1.45	6.70	1.97	8.04
0.42	0.74	0.94	3.44	1.46	6.76	1.98	7.98
0.43	0.78	0.95	3.50	1.47	6.82	1.99	7.89
0.44	0.81	0.96	3.57	1.48	6.87	2.00	7.65
0.45	0.85	0.97	3.63	1.49	6.93		
0.46	0.89	0.98	3.70	1.50	6.98		
0.47	0.93	0.99	3.76	1.51	7.03		
0.48	0.97	1.00	3.83	1.52	7.09		
0.49	1.01	1.01	3.89	1.53	7.14		
0.50	1.05	1.02	3.96	1.54	7.19		
0.51	1.09	1.03	4.02	1.55	7.24		

Reach 3R: PROPOSED CHANNEL

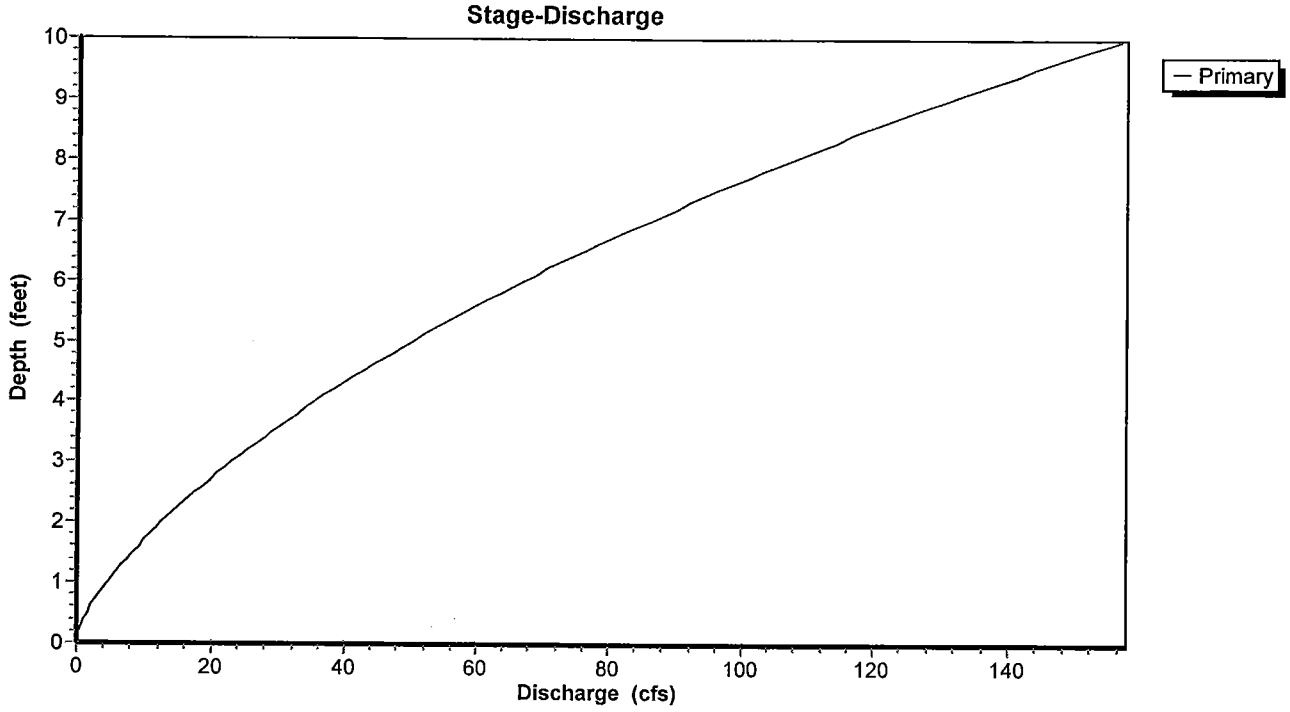
[43] Hint: Has no inflow (Outflow=Zero)

Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.0 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.0 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.00'
Capacity at bank full= 157.51 cfs
3.00' x 10.00' deep channel, n= 0.035 Length= 1,000.0' Slope= 0.0020 '/'
Side Slope Z-value= 0.2 '/'

Reach 3R: PROPOSED CHANNEL



Reach 3R: PROPOSED CHANNEL

Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)
0.00	0.00	1.04	4.76	2.08	13.32	3.12	24.34
0.02	0.01	1.06	4.90	2.10	13.51	3.14	24.58
0.04	0.03	1.08	5.04	2.12	13.70	3.16	24.82
0.06	0.05	1.10	5.18	2.14	13.89	3.18	25.05
0.08	0.08	1.12	5.32	2.16	14.09	3.20	25.29
0.10	0.12	1.14	5.46	2.18	14.28	3.22	25.53
0.12	0.16	1.16	5.61	2.20	14.47	3.24	25.77
0.14	0.21	1.18	5.75	2.22	14.67	3.26	26.00
0.16	0.26	1.20	5.90	2.24	14.86	3.28	26.25
0.18	0.31	1.22	6.04	2.26	15.06	3.30	26.49
0.20	0.37	1.24	6.19	2.28	15.26	3.32	26.73
0.22	0.43	1.26	6.34	2.30	15.46	3.34	26.97
0.24	0.49	1.28	6.49	2.32	15.66	3.36	27.22
0.26	0.56	1.30	6.64	2.34	15.86	3.38	27.46
0.28	0.63	1.32	6.79	2.36	16.06	3.40	27.71
0.30	0.70	1.34	6.95	2.38	16.26	3.42	27.95
0.32	0.77	1.36	7.10	2.40	16.46	3.44	28.20
0.34	0.85	1.38	7.26	2.42	16.67	3.46	28.45
0.36	0.93	1.40	7.41	2.44	16.87	3.48	28.70
0.38	1.02	1.42	7.57	2.46	17.08	3.50	28.95
0.40	1.10	1.44	7.73	2.48	17.29	3.52	29.20
0.42	1.19	1.46	7.89	2.50	17.49	3.54	29.45
0.44	1.28	1.48	8.05	2.52	17.70	3.56	29.70
0.46	1.37	1.50	8.21	2.54	17.91	3.58	29.95
0.48	1.46	1.52	8.38	2.56	18.12	3.60	30.21
0.50	1.56	1.54	8.54	2.58	18.33	3.62	30.46
0.52	1.66	1.56	8.70	2.60	18.54	3.64	30.72
0.54	1.76	1.58	8.87	2.62	18.76	3.66	30.98
0.56	1.86	1.60	9.04	2.64	18.97	3.68	31.23
0.58	1.96	1.62	9.20	2.66	19.18	3.70	31.49
0.60	2.07	1.64	9.37	2.68	19.40	3.72	31.75
0.62	2.17	1.66	9.54	2.70	19.61	3.74	32.01
0.64	2.28	1.68	9.71	2.72	19.83	3.76	32.27
0.66	2.39	1.70	9.88	2.74	20.05	3.78	32.53
0.68	2.50	1.72	10.06	2.76	20.27	3.80	32.79
0.70	2.62	1.74	10.23	2.78	20.49	3.82	33.06
0.72	2.73	1.76	10.41	2.80	20.71	3.84	33.32
0.74	2.85	1.78	10.58	2.82	20.93	3.86	33.59
0.76	2.97	1.80	10.76	2.84	21.15	3.88	33.85
0.78	3.08	1.82	10.93	2.86	21.37	3.90	34.12
0.80	3.21	1.84	11.11	2.88	21.60	3.92	34.39
0.82	3.33	1.86	11.29	2.90	21.82	3.94	34.66
0.84	3.45	1.88	11.47	2.92	22.05	3.96	34.92
0.86	3.58	1.90	11.65	2.94	22.27	3.98	35.19
0.88	3.70	1.92	11.83	2.96	22.50	4.00	35.47
0.90	3.83	1.94	12.02	2.98	22.73	4.02	35.74
0.92	3.96	1.96	12.20	3.00	22.96	4.04	36.01
0.94	4.09	1.98	12.38	3.02	23.18	4.06	36.28
0.96	4.22	2.00	12.57	3.04	23.42	4.08	36.56
0.98	4.35	2.02	12.76	3.06	23.65	4.10	36.83
1.00	4.49	2.04	12.94	3.08	23.88	4.12	37.11
1.02	4.62	2.06	13.13	3.10	24.11	4.14	37.39

Reach 3R: PROPOSED CHANNEL (continued)

Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)
4.16	37.66	5.20	53.29	6.24	71.28	7.28	91.73
4.18	37.94	5.22	53.61	6.26	71.65	7.30	92.15
4.20	38.22	5.24	53.93	6.28	72.02	7.32	92.57
4.22	38.50	5.26	54.26	6.30	72.39	7.34	92.99
4.24	38.78	5.28	54.59	6.32	72.77	7.36	93.41
4.26	39.06	5.30	54.91	6.34	73.14	7.38	93.83
4.28	39.35	5.32	55.24	6.36	73.51	7.40	94.26
4.30	39.63	5.34	55.57	6.38	73.89	7.42	94.68
4.32	39.92	5.36	55.90	6.40	74.27	7.44	95.10
4.34	40.20	5.38	56.23	6.42	74.64	7.46	95.53
4.36	40.49	5.40	56.56	6.44	75.02	7.48	95.96
4.38	40.77	5.42	56.89	6.46	75.40	7.50	96.38
4.40	41.06	5.44	57.23	6.48	75.78	7.52	96.81
4.42	41.35	5.46	57.56	6.50	76.16	7.54	97.24
4.44	41.64	5.48	57.90	6.52	76.54	7.56	97.67
4.46	41.93	5.50	58.23	6.54	76.93	7.58	98.10
4.48	42.22	5.52	58.57	6.56	77.31	7.60	98.53
4.50	42.51	5.54	58.91	6.58	77.69	7.62	98.97
4.52	42.81	5.56	59.24	6.60	78.08	7.64	99.40
4.54	43.10	5.58	59.58	6.62	78.47	7.66	99.84
4.56	43.40	5.60	59.92	6.64	78.85	7.68	100.27
4.58	43.69	5.62	60.26	6.66	79.24	7.70	100.71
4.60	43.99	5.64	60.61	6.68	79.63	7.72	101.15
4.62	44.29	5.66	60.95	6.70	80.02	7.74	101.59
4.64	44.58	5.68	61.29	6.72	80.41	7.76	102.03
4.66	44.88	5.70	61.64	6.74	80.80	7.78	102.47
4.68	45.18	5.72	61.98	6.76	81.20	7.80	102.91
4.70	45.48	5.74	62.33	6.78	81.59	7.82	103.35
4.72	45.79	5.76	62.68	6.80	81.98	7.84	103.80
4.74	46.09	5.78	63.03	6.82	82.38	7.86	104.24
4.76	46.39	5.80	63.37	6.84	82.78	7.88	104.69
4.78	46.70	5.82	63.72	6.86	83.17	7.90	105.13
4.80	47.00	5.84	64.08	6.88	83.57	7.92	105.58
4.82	47.31	5.86	64.43	6.90	83.97	7.94	106.03
4.84	47.61	5.88	64.78	6.92	84.37	7.96	106.48
4.86	47.92	5.90	65.13	6.94	84.77	7.98	106.93
4.88	48.23	5.92	65.49	6.96	85.17	8.00	107.38
4.90	48.54	5.94	65.84	6.98	85.58	8.02	107.83
4.92	48.85	5.96	66.20	7.00	85.98	8.04	108.29
4.94	49.16	5.98	66.56	7.02	86.39	8.06	108.74
4.96	49.47	6.00	66.91	7.04	86.79	8.08	109.19
4.98	49.79	6.02	67.27	7.06	87.20	8.10	109.65
5.00	50.10	6.04	67.63	7.08	87.61	8.12	110.11
5.02	50.42	6.06	67.99	7.10	88.01	8.14	110.57
5.04	50.73	6.08	68.36	7.12	88.42	8.16	111.03
5.06	51.05	6.10	68.72	7.14	88.83	8.18	111.49
5.08	51.36	6.12	69.08	7.16	89.25	8.20	111.95
5.10	51.68	6.14	69.45	7.18	89.66	8.22	112.41
5.12	52.00	6.16	69.81	7.20	90.07	8.24	112.87
5.14	52.32	6.18	70.18	7.22	90.49	8.26	113.34
5.16	52.64	6.20	70.55	7.24	90.90	8.28	113.80
5.18	52.96	6.22	70.91	7.26	91.32	8.30	114.27

Reach 3R: PROPOSED CHANNEL (continued)

Elevation (feet)	Discharge (cfs)
8.32	114.73
8.34	115.20
8.36	115.67
8.38	116.14
8.40	116.61
8.42	117.08
8.44	117.56
8.46	118.03
8.48	118.50
8.50	118.98
8.52	119.46
8.54	119.93
8.56	120.41
8.58	120.89
8.60	121.37
8.62	121.86
8.64	122.34
8.66	122.82
8.68	123.31
8.70	123.79
8.72	124.28
8.74	124.77
8.76	125.25
8.78	125.74
8.80	126.23
8.82	126.73
8.84	127.22
8.86	127.71
8.88	128.21
8.90	128.70
8.92	129.20
8.94	129.70
8.96	130.20
8.98	130.69
9.00	131.20
9.02	131.70
9.04	132.20
9.06	132.70
9.08	133.21
9.10	133.71
9.12	134.22
9.14	134.73
9.16	135.24
9.18	135.75
9.20	136.26
9.22	136.77
9.24	137.28
9.26	137.79
9.28	138.31
9.30	138.82
9.32	139.34
9.34	139.86
9.36	140.38
9.38	140.90
9.40	141.42
9.42	141.94
9.44	142.46
9.46	142.99
9.48	143.51
9.50	144.04
9.52	144.56
9.54	145.09
9.56	145.62
9.58	146.15
9.60	146.68
9.62	147.21
9.64	147.75
9.66	148.28
9.68	148.81
9.70	149.35
9.72	149.89
9.74	150.43
9.76	150.97
9.78	151.51
9.80	152.05
9.82	152.59
9.84	153.13
9.86	153.68
9.88	154.22
9.90	154.77
9.92	155.31
9.94	155.86
9.96	156.41
9.98	156.96
10.00	**157.51**

Reach 4R: PROPOSED STORM DRAIN

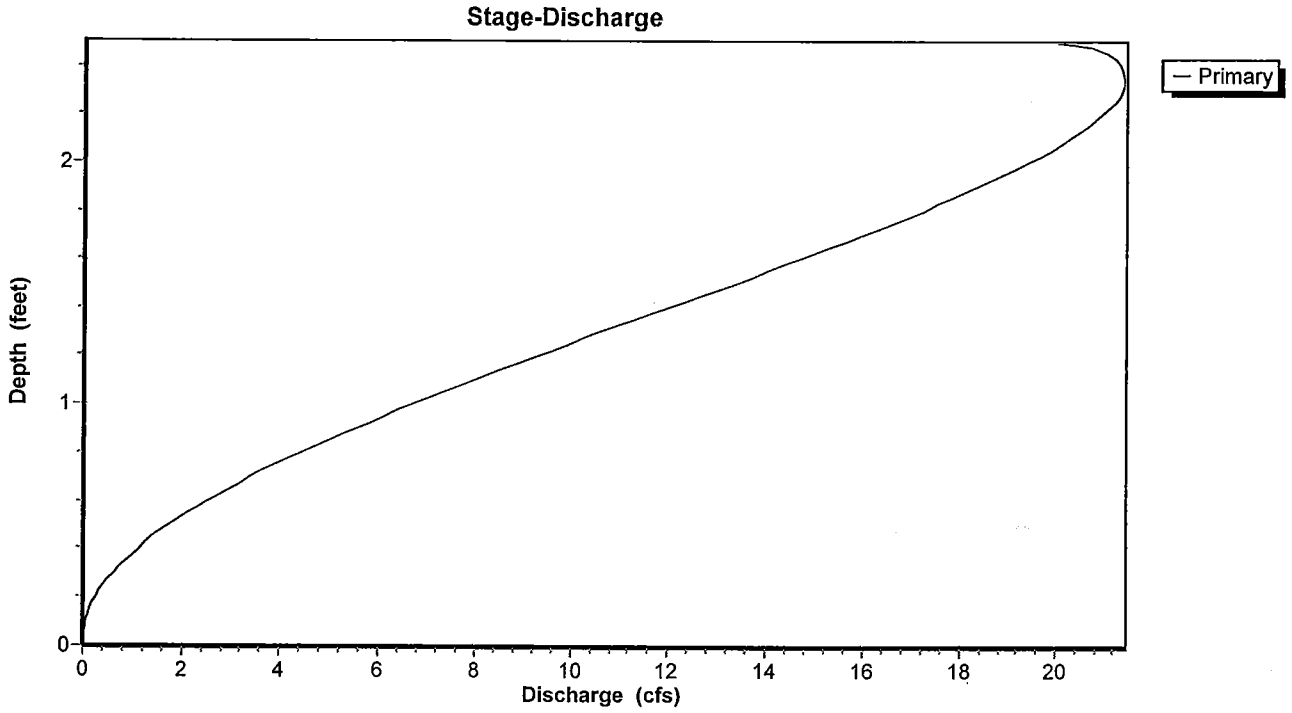
[43] Hint: Has no inflow (Outflow=Zero)

Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.0 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.0 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.00'
Capacity at bank full= 19.87 cfs
30.0" Diameter Pipe n= 0.012 Length= 400.0' Slope= 0.0020 '/'

Reach 4R: PROPOSED STORM DRAIN

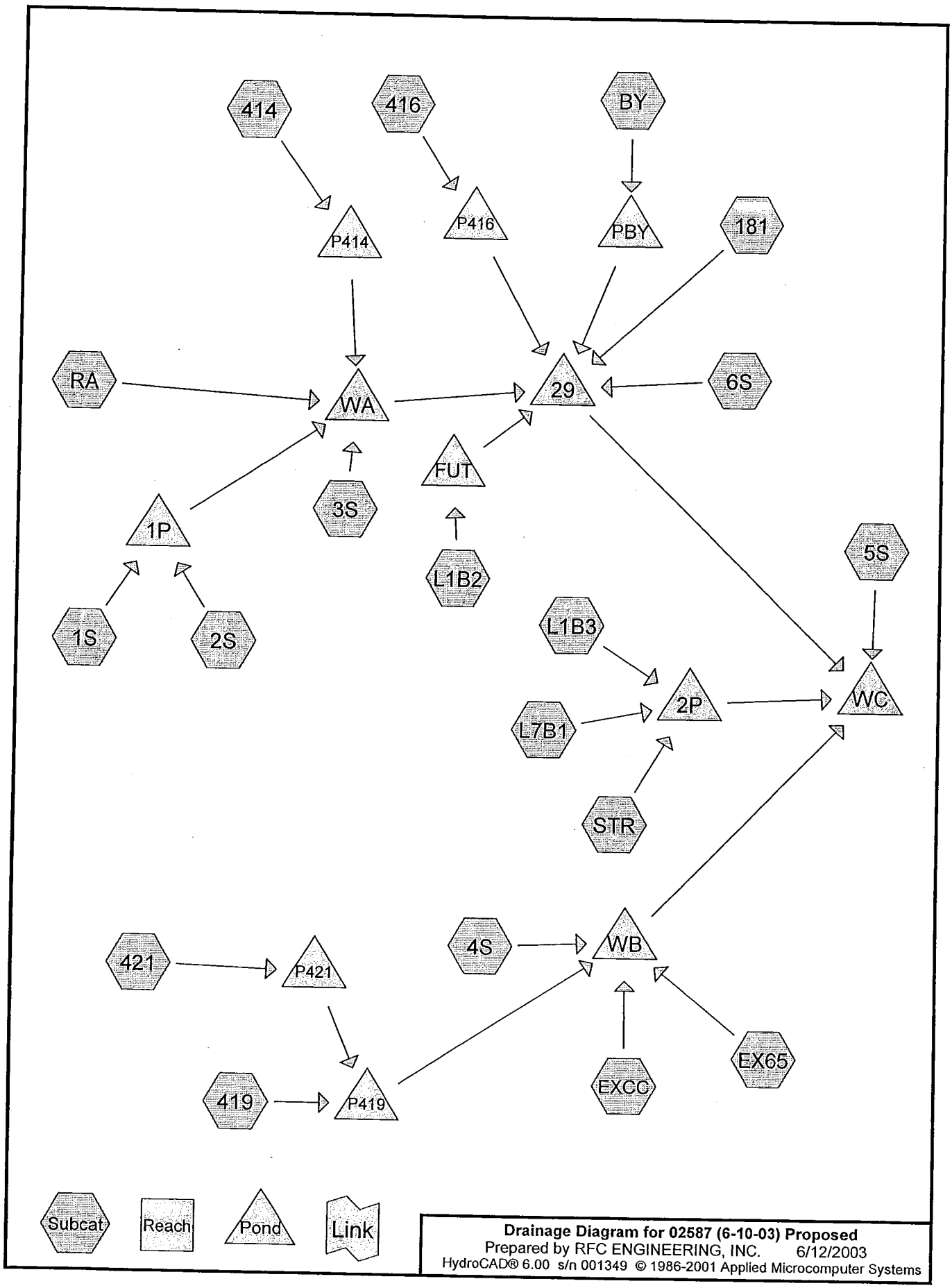


Reach 4R: PROPOSED STORM DRAIN

Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)	Elevation (feet)	Discharge (cfs)
0.00	0.00	0.52	1.88	1.04	7.19	1.56	14.16
0.01	0.00	0.53	1.96	1.05	7.32	1.57	14.30
0.02	0.00	0.54	2.03	1.06	7.44	1.58	14.43
0.03	0.00	0.55	2.11	1.07	7.57	1.59	14.57
0.04	0.01	0.56	2.19	1.08	7.70	1.60	14.70
0.05	0.01	0.57	2.27	1.09	7.83	1.61	14.83
0.06	0.02	0.58	2.35	1.10	7.95	1.62	14.97
0.07	0.03	0.59	2.43	1.11	8.08	1.63	15.10
0.08	0.04	0.60	2.51	1.12	8.21	1.64	15.23
0.09	0.05	0.61	2.59	1.13	8.34	1.65	15.36
0.10	0.06	0.62	2.68	1.14	8.47	1.66	15.49
0.11	0.07	0.63	2.77	1.15	8.60	1.67	15.62
0.12	0.09	0.64	2.85	1.16	8.74	1.68	15.75
0.13	0.10	0.65	2.94	1.17	8.87	1.69	15.88
0.14	0.12	0.66	3.03	1.18	9.00	1.70	16.01
0.15	0.14	0.67	3.12	1.19	9.13	1.71	16.13
0.16	0.16	0.68	3.21	1.20	9.27	1.72	16.26
0.17	0.18	0.69	3.31	1.21	9.40	1.73	16.39
0.18	0.21	0.70	3.40	1.22	9.53	1.74	16.51
0.19	0.23	0.71	3.50	1.23	9.67	1.75	16.64
0.20	0.26	0.72	3.59	1.24	9.80	1.76	16.76
0.21	0.29	0.73	3.69	1.25	9.94	1.77	16.88
0.22	0.32	0.74	3.79	1.26	10.07	1.78	17.01
0.23	0.35	0.75	3.89	1.27	10.21	1.79	17.13
0.24	0.38	0.76	3.99	1.28	10.34	1.80	17.25
0.25	0.41	0.77	4.09	1.29	10.48	1.81	17.37
0.26	0.45	0.78	4.20	1.30	10.61	1.82	17.49
0.27	0.49	0.79	4.30	1.31	10.75	1.83	17.60
0.28	0.53	0.80	4.41	1.32	10.89	1.84	17.72
0.29	0.57	0.81	4.51	1.33	11.02	1.85	17.84
0.30	0.61	0.82	4.62	1.34	11.16	1.86	17.95
0.31	0.65	0.83	4.73	1.35	11.30	1.87	18.06
0.32	0.70	0.84	4.84	1.36	11.43	1.88	18.18
0.33	0.74	0.85	4.95	1.37	11.57	1.89	18.29
0.34	0.79	0.86	5.06	1.38	11.71	1.90	18.40
0.35	0.84	0.87	5.17	1.39	11.84	1.91	18.51
0.36	0.89	0.88	5.28	1.40	11.98	1.92	18.61
0.37	0.94	0.89	5.39	1.41	12.12	1.93	18.72
0.38	0.99	0.90	5.51	1.42	12.26	1.94	18.83
0.39	1.05	0.91	5.62	1.43	12.39	1.95	18.93
0.40	1.10	0.92	5.74	1.44	12.53	1.96	19.03
0.41	1.16	0.93	5.86	1.45	12.67	1.97	19.13
0.42	1.22	0.94	5.97	1.46	12.80	1.98	19.23
0.43	1.28	0.95	6.09	1.47	12.94	1.99	19.33
0.44	1.34	0.96	6.21	1.48	13.08	2.00	19.42
0.45	1.40	0.97	6.33	1.49	13.21	2.01	19.52
0.46	1.47	0.98	6.45	1.50	13.35	2.02	19.61
0.47	1.53	0.99	6.57	1.51	13.49	2.03	19.70
0.48	1.60	1.00	6.70	1.52	13.62	2.04	19.79
0.49	1.67	1.01	6.82	1.53	13.76	2.05	19.88
0.50	1.74	1.02	6.94	1.54	13.89	2.06	19.97
0.51	1.81	1.03	7.07	1.55	14.03	2.07	20.05

Reach 4R: PROPOSED STORM DRAIN (continued)

Elevation (feet)	Discharge (cfs)
2.08	20.13
2.09	20.21
2.10	20.29
2.11	20.37
2.12	20.44
2.13	20.51
2.14	20.58
2.15	20.65
2.16	20.71
2.17	20.78
2.18	20.84
2.19	20.89
2.20	20.95
2.21	21.00
2.22	21.05
2.23	21.10
2.24	21.14
2.25	21.18
2.26	21.22
2.27	21.25
2.28	21.28
2.29	21.31
2.30	21.33
2.31	21.35
2.32	21.36
2.33	21.37
2.34	21.38
2.35	**21.38**
2.36	21.37
2.37	21.36
2.38	21.34
2.39	21.32
2.40	21.29
2.41	21.25
2.42	21.21
2.43	21.15
2.44	21.08
2.45	21.00
2.46	20.90
2.47	20.78
2.48	20.62
2.49	20.41
2.50	19.87



Drainage Diagram for 02587 (6-10-03) Proposed
Prepared by RFC ENGINEERING, INC. 6/12/2003
HydroCAD® 6.00 s/n 001349 © 1986-2001 Applied Microcomputer Systems

Time span=0.00-40.00 hrs, dt=0.01 hrs, 4001 points
Runoff by SCS TR-20 method, UH=SCS, Type II 24-hr Rainfall=5.85"
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1S: DIRECT RUNOFF TO POND 1
Tc=8.0 min CN=57 Area=92,650 sf Runoff= 5.39 cfs 0.281 af

Subcatchment 2S: AREA TO POND 1
Tc=9.2 min CN=58 Area=142,000 sf Runoff= 8.29 cfs 0.452 af

Subcatchment 3S: DIRECT RUNOFF TO WETLAND A
Tc=11.3 min CN=70 Area=6.132 ac Runoff= 24.24 cfs 1.373 af

Subcatchment 4S: DIRECT RUNOFF TO WETLAND B
Tc=13.3 min CN=67 Area=9.894 ac Runoff= 32.56 cfs 1.993 af

Subcatchment 5S: DIRECT RUNOFF TO WETLAND C
Tc=7.1 min CN=53 Area=69,184 sf Runoff= 3.25 cfs 0.170 af

Subcatchment 6S: DIRECT TO 29
Tc=12.0 min CN=49 Area=1.760 ac Runoff= 2.04 cfs 0.147 af

Subcatchment 181: 181ST AVENUE
Tc=3.9 min CN=98 Area=0.790 ac Runoff= 7.03 cfs 0.369 af

Subcatchment 414: 414S FROM CITY CALCS
Tc=43.3 min CN=72 Area=10.000 ac Runoff= 19.16 cfs 2.393 af

Subcatchment 416: 416S FROM CITY CALCS
Tc=40.0 min CN=75 Area=22.760 ac Runoff= 51.10 cfs 5.983 af

Subcatchment 419: 419S FROM CITY CALCS
Tc=85.4 min CN=65 Area=127.000 ac Runoff= 111.38 cfs 23.737 af

Subcatchment 421: 421S FROM CITY CALCS
Tc=36.2 min CN=67 Area=9.000 ac Runoff= 16.18 cfs 1.813 af

Subcatchment BY: STREET & BACKYARDS
Tc=12.4 min CN=77 Area=3.250 ac Runoff= 15.35 cfs 0.907 af

Subcatchment EX65: OFFSITE HWY 65
Tc=6.3 min CN=53 Area=347,918 sf Runoff= 16.95 cfs 0.854 af

Subcatchment EXCC: COUNTRY CREEK 1
Tc=33.9 min CN=70 Area=21.330 ac Runoff= 45.17 cfs 4.776 af

Subcatchment L1B2: COMMERCIAL AREA (L1B2)
Tc=6.0 min CN=83 Area=63,500 sf Runoff= 9.94 cfs 0.480 af

Subcatchment L1B3: COMMERICAL AREA (L1B3)
Tc=5.9 min CN=85 Area=106,408 sf Runoff= 17.40 cfs 0.847 af

Subcatchment L7B1: COMMERCIAL AREA (L7B1)
Tc=5.2 min CN=81 Area=56,500 sf Runoff= 8.71 cfs 0.405 af

Subcatchment RA: RUSTIC ACRES
Tc=19.2 min CN=51 Area=2.500 ac Runoff= 2.63 cfs 0.238 af

Subcatchment STR: FRONTAGE ROAD (TO POND 2)
Tc=5.3 min CN=76 Area=44,500 sf Runoff= 6.04 cfs 0.277 af

Pond 1P: PROPOSED POND 1
Peak Storage= 107,989 cf Inflow= 13.65 cfs 0.733 af
Primary= 0.83 cfs 0.698 af Outflow= 0.83 cfs 0.698 af

Pond 2P: PROPOSED POND 2
Peak Storage= 48,397 cf Inflow= 32.12 cfs 1.529 af
Primary= 8.48 cfs 1.526 af Outflow= 8.48 cfs 1.526 af

Pond 29: Ditch 29
Peak Storage= 17,570 cf Inflow= 46.02 cfs 11.684 af
Primary= 20.23 cfs 11.507 af Outflow= 20.23 cfs 11.507 af

Pond FUT: FUTURE POND (L1B2)
Peak Storage= 14,678 cf Inflow= 9.94 cfs 0.480 af
Primary= 5.57 cfs 0.480 af Outflow= 5.57 cfs 0.480 af

Pond P414: 414P FROM CITY CALCS
Peak Storage= 1.154 af Inflow= 19.16 cfs 2.393 af
Primary= 4.06 cfs 2.247 af Outflow= 4.06 cfs 2.247 af

Pond P416: 416P FROM CITY CALCS
Peak Storage= 2.148 af Inflow= 51.10 cfs 5.983 af
Primary= 17.78 cfs 5.663 af Outflow= 17.78 cfs 5.663 af

Pond P419: 419P FROM CITY CALCS
Peak Storage= 14.673 af Inflow= 116.02 cfs 25.507 af
Primary= 17.02 cfs 20.209 af Outflow= 17.02 cfs 20.209 af

Pond P421: 421P FROM CITY CALCS
Peak Storage= 0.716 af Inflow= 16.18 cfs 1.813 af
Primary= 4.64 cfs 1.770 af Outflow= 4.64 cfs 1.770 af

Pond PBY: BACKYARD POND
Peak Storage= 19,108 cf Inflow= 15.35 cfs 0.907 af
Primary= 3.22 cfs 0.884 af Outflow= 3.22 cfs 0.884 af

Pond WA: WETLAND A
Peak Storage= 1.970 af Inflow= 26.34 cfs 4.555 af
Primary= 33.01 cfs 4.140 af Outflow= 33.01 cfs 4.140 af

Pond WB: WETLAND B
Peak Storage= 2.274 af Inflow= 66.02 cfs 27.831 af
Primary= 33.27 cfs 27.069 af Outflow= 33.27 cfs 27.069 af

Pond WC: WETLAND C
Peak Storage= 62,717 cf Inflow= 59.16 cfs 40.270 af
Primary= 59.12 cfs 40.270 af Outflow= 59.12 cfs 40.270 af

Runoff Area = 235.597 ac Volume = 47.495 af Average Depth = 2.42"

Subcatchment 1S: DIRECT RUNOFF TO POND 1

Runoff = 5.39 cfs @ 12.01 hrs, Volume= 0.281 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (sf)	CN	Description
21,587	100	POND NWL
65,363	39	>75% Grass cover, Good, HSG A
5,700	98	Paved parking & roofs
92,650	57	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	120	0.0600	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Subcatchment 2S: AREA TO POND 1

Runoff = 8.29 cfs @ 12.02 hrs, Volume= 0.452 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (sf)	CN	Description
109,000	46	2 acre lots, 12% imp, HSG A
33,000	98	BITUMINOUS
142,000	58	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	180	0.0947	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Subcatchment 3S: DIRECT RUNOFF TO WETLAND A

Runoff = 24.24 cfs @ 12.04 hrs, Volume= 1.373 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (ac)	CN	Description
2.050	39	>75% Grass cover, Good, HSG A
3.912	85	WETLAND
0.170	98	Paved parking & roofs
6.132	70	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	195	0.0660	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Subcatchment 4S: DIRECT RUNOFF TO WETLAND B

Runoff = 32.56 cfs @ 12.06 hrs, Volume= 1.993 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (ac)	CN	Description
3.960	39	>75% Grass cover, Good, HSG A
5.844	85	WETLAND
0.090	98	Paved parking & roofs
9.894	67	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	180	0.0375	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Subcatchment 5S: DIRECT RUNOFF TO WETLAND C

Runoff = 3.25 cfs @ 12.00 hrs, Volume= 0.170 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (sf)	CN	Description
48,384	39	>75% Grass cover, Good, HSG A
20,800	85	WETLAND
69,184	53	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	82	0.0366	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Subcatchment 6S: DIRECT TO 29

Runoff = 2.04 cfs @ 12.06 hrs, Volume= 0.147 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (ac)	CN	Description
1.460	39	>75% Grass cover, Good, HSG A
0.300	98	Paved parking & roofs
1.760	49	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	220	0.0682	0.3		**Sheet Flow, sheet** Grass: Short n= 0.150 P2= 2.80"

Subcatchment 181: 181ST AVENUE

Runoff = 7.03 cfs @ 11.94 hrs, Volume= 0.369 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (ac)	CN	Description
0.790	98	STREET

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	500	0.0200	2.1		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps

Subcatchment 414: 414S FROM CITY CALCS

Runoff = 19.16 cfs @ 12.41 hrs, Volume= 2.393 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (ac)	CN	Description
2.795	100	POND
7.205	61	OPEN SPACES
10.000	72	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	500	0.0010	0.5		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
25.7	300	0.0200	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
43.3	800	Total			

Subcatchment 416: 416S FROM CITY CALCS

Runoff = 51.10 cfs @ 12.36 hrs, Volume= 5.983 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (ac)	CN	Description
1.390	78	SUB #1 (-3.250 AC)
10.090	74	SUB #2
2.710	78	SUB #3
2.540	81	SUB #4
1.980	82	SUB #5
0.890	76	SUB #6
0.000	98	SUB #7 (-0.790 AC)
0.160	98	SUB #8
3.000	60	OPEN SPACE
22.760	75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.0					**Direct Entry,**

Subcatchment 419: 419S FROM CITY CALCS

Runoff = 111.38 cfs @ 13.00 hrs, Volume= 23.737 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (ac)	CN	Description
10.160	100	POND
6.350	85	WETLAND
110.490	61	OPEN SPACES
127.000	65	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
59.7	1,700	0.0010	0.5		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
25.7	300	0.0200	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
85.4	2,000	Total			

Subcatchment 421: 421S FROM CITY CALCS

Runoff = 16.18 cfs @ 12.34 hrs, Volume= 1.813 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (ac)	CN	Description
1.404	100	POND
7.596	61	OPEN SPACES
9.000	67	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	300	0.0010	0.5		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
25.7	300	0.0200	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
36.2	600	Total			

Subcatchment BY: STREET & BACKYARDS

Runoff = 15.35 cfs @ 12.04 hrs, Volume= 0.907 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (ac)	CN	Description
3.250	77	1/8 acre lots, 65% imp, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
6.3	800	0.0200	2.1		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
12.4	850	Total			

Subcatchment EX65: OFFSITE HWY 65

Runoff = 16.95 cfs @ 11.99 hrs, Volume= 0.854 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (sf)	CN	Description
267,598	39	>75% Grass cover, Good, HSG A
80,320	98	HIGHWAY 65
347,918	53	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	800	0.0200	2.1		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps

Subcatchment EXCC: COUNTRY CREEK 1

Runoff = 45.17 cfs @ 12.31 hrs, Volume= 4.776 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (ac)	CN	Description
13.320	61	1/4 acre lots, 38% imp, HSG A
7.510	85	WETLAND
0.500	100	POND
21.330	70	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.9	300	0.0100	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Subcatchment L1B2: COMMERCIAL AREA (L1B2)

Runoff = 9.94 cfs @ 11.97 hrs, Volume= 0.480 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (sf)	CN	Description
50,000	90	Commercial
10,000	39	>75% Grass cover, Good, HSG A
3,500	100	POND NWL
63,500	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	110	0.1000	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Subcatchment L1B3: COMMERICAL AREA (L1B3)

Runoff = 17.40 cfs @ 11.97 hrs, Volume= 0.847 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (sf)	CN	Description
96,408	90	Commercial
10,000	39	>75% Grass cover, Good, HSG A
106,408	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	120	0.1250	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Subcatchment L7B1: COMMERCIAL AREA (L7B1)

Runoff = 8.71 cfs @ 11.96 hrs, Volume= 0.405 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (sf)	CN	Description
46,500	90	Commercial
10,000	39	>75% Grass cover, Good, HSG A
56,500	81	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	30	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
1.1	100	0.0100	1.5		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
5.2	130	Total			

Subcatchment RA: RUSTIC ACRES

Runoff = 2.63 cfs @ 12.14 hrs, Volume= 0.238 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (ac)	CN	Description
2.500	51	1 acre lots, 20% imp, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.2	250	0.0288	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Subcatchment STR: FRONTAGE ROAD (TO POND 2)

Runoff = 6.04 cfs @ 11.96 hrs, Volume= 0.277 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.85"

Area (sf)	CN	Description
44,500	76	Street and ROW

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	30	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
1.2	150	0.0200	2.1		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
5.3	180	Total			

Pond 1P: PROPOSED POND 1

Inflow = 13.65 cfs @ 12.01 hrs, Volume= 0.733 af
Outflow = 0.83 cfs @ 13.49 hrs, Volume= 0.698 af, Atten= 94%, Lag= 88.8 min
Primary = 0.83 cfs @ 13.49 hrs, Volume= 0.698 af

Routing by Sim-Route method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs

Starting Elev= 903.50' Storage= 93,386 cf
Peak Elev= 904.14' Storage= 107,989 cf (14,603 cf above starting storage)
Flood Elev= 905.00' Storage= 128,713 cf (35,326 cf above starting storage)
Plug-Flow detention time= (not calculated)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
894.00	3,236	0	0
895.00	4,456	3,846	3,846
896.00	5,668	5,062	8,908
897.00	6,737	6,203	15,111
898.00	8,163	7,450	22,561
899.00	9,650	8,907	31,467
900.00	11,145	10,398	41,865
901.00	12,744	11,945	53,809
902.00	14,400	13,572	67,381
902.50	15,529	7,482	74,863
903.00	18,488	8,504	83,368
903.50	21,587	10,019	93,386
904.00	22,886	11,118	104,505
905.00	25,530	24,208	128,713

Primary OutFlow (Dynamic Tailwater)
└─2=Culvert
└─1=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Device 2	903.50'	**0.50' x 1.38' Vert. Orifice/Grate** C= 0.600
2	Primary	902.30'	**15.0" x 45.0' long Culvert** Ke= 0.500
			Outlet Invert= 902.20' S= 0.0022 '/' n= 0.012 Cc= 0.900

Pond 2P: PROPOSED POND 2

Inflow	=	32.12 cfs @	11.97 hrs, Volume=	1.529 af
Outflow	=	8.48 cfs @	12.10 hrs, Volume=	1.526 af, Atten= 74%, Lag= 8.1 min
Primary	=	8.48 cfs @	12.10 hrs, Volume=	1.526 af

Routing by Sim-Route method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs

Starting Elev= 900.75' Storage= 21,725 cf
Peak Elev= 903.06' Storage= 48,397 cf (26,671 cf above starting storage)
Flood Elev= 904.00' Storage= 61,776 cf (40,051 cf above starting storage)
Plug-Flow detention time= 266.5 min calculated for 1.027 af (67% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
895.00	827	0	0
896.00	1,671	1,249	1,249
897.00	2,591	2,131	3,380
898.00	3,608	3,100	6,480
899.00	4,689	4,149	10,628
899.75	5,248	3,726	14,354
900.00	6,409	1,457	15,812
900.75	9,361	5,914	21,725
901.00	9,811	2,397	24,122
902.00	11,674	10,743	34,864
903.00	13,554	12,614	47,478
904.00	15,042	14,298	61,776

Primary OutFlow (Dynamic Tailwater)
└─3=Culvert
├─1=Orifice/Grate
└─2=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Device 3	900.75'	**0.75' x 2.35' Vert. Orifice/Grate** C= 0.600
2	Device 3	903.10'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
3	Primary	900.00'	**18.0" x 38.0' long Culvert** Ke= 0.500
			Outlet Invert= 899.70' S= 0.0079 '/' n= 0.012 Cc= 0.900

Pond 29: Ditch 29

[86] Warning: Oscillations may require smaller dt
[80] Warning: Exceeded Pond P416 by 1.02' @ 9.09 hrs (5.36 cfs)
[80] Warning: Exceeded Pond PBY by 0.01' @ 14.83 hrs (0.41 cfs)
[80] Warning: Exceeded Pond WA by 0.88' @ 12.57 hrs (105.91 cfs)

Inflow	=	46.02 cfs @	14.94 hrs, Volume=	11.684 af
Outflow	=	20.23 cfs @	13.23 hrs, Volume=	11.507 af, Atten= 56%, Lag= 0.0 min
Primary	=	20.23 cfs @	13.23 hrs, Volume=	11.507 af

Routing by Sim-Route method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs

Peak Elev= 902.10' Storage= 17,570 cf
Plug-Flow detention time= 27.6 min calculated for 11.504 af (98% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
896.76	0	0	0
898.00	935	580	580
899.00	2,063	1,499	2,079
900.00	3,246	2,655	4,733
901.00	5,200	4,223	8,956
902.00	9,430	7,315	16,271
903.00	17,559	13,495	29,766
904.00	21,675	19,617	49,383

Primary OutFlow (Dynamic Tailwater)
↑—1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	896.76'	**30.0" x 395.0' long Culvert** Ke= 0.610 Outlet Invert= 895.97' S= 0.0020 '/' n= 0.012 Cc= 0.900

Pond FUT: FUTURE POND (L1B2)

Inflow	=	9.94 cfs @	11.97 hrs, Volume=	0.480 af
Outflow	=	5.57 cfs @	12.06 hrs, Volume=	0.480 af, Atten= 44%, Lag= 5.1 min
Primary	=	5.57 cfs @	12.06 hrs, Volume=	0.480 af

Routing by Sim-Route method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs

Starting Elev= 902.00' Storage= 9,077 cf
Peak Elev= 903.25' Storage= 14,678 cf (5,601 cf above starting storage)
Flood Elev= 904.00' Storage= 18,690 cf (9,613 cf above starting storage)
Plug-Flow detention time= 245.3 min calculated for 0.272 af (57% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
898.00	992	0	0
899.00	1,534	1,263	1,263
900.00	2,188	1,861	3,124
901.00	2,951	2,570	5,694
902.00	3,816	3,384	9,077
903.00	4,781	4,299	13,376
904.00	5,848	5,315	18,690

Primary OutFlow (Dynamic Tailwater)
- 1=Culvert
- 2=Orifice/Grate
- 3=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	899.00'	**15.0" x 20.0' long Culvert** Ke= 0.500 Outlet Invert= 898.50' S= 0.0250 '/' n= 0.012 Cc= 0.900
2	Device 1	902.00'	**1.25' x 1.25' Vert. Orifice/Grate** C= 0.600
3	Device 1	903.25'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond P414: 414P FROM CITY CALCS

[86] Warning: Oscillations may require smaller dt

Inflow	=	19.16 cfs @	12.41 hrs, Volume=	2.393 af
Outflow	=	4.06 cfs @	13.42 hrs, Volume=	2.247 af, Atten= 79%, Lag= 60.7 min
Primary	=	4.06 cfs @	13.42 hrs, Volume=	2.247 af

Routing by Sim-Route method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs

Peak Elev= 902.18' Storage= 1.154 af
Flood Elev= 906.50' Storage= 11.270 af
Plug-Flow detention time= 277.3 min calculated for 2.247 af (94% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
901.00	0.000	0.000	0.000
902.50	1.960	1.470	1.470
904.50	2.520	4.480	5.950
906.50	2.800	5.320	11.270

Primary OutFlow (Dynamic Tailwater)
- 1=Culvert
- 2=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	901.00'	**18.0" x 55.0' long Culvert** Ke= 0.500 Outlet Invert= 900.80' S= 0.0036 '/' n= 0.012 Cc= 0.900
2	Device 1	901.00'	**30.0' long Broad-Crested Rectangular Weir**

Head (feet) 0.50
Coef. (English) 3.00

Pond P416: 416P FROM CITY CALCS

[86] Warning: Oscillations may require smaller dt

Inflow	=	51.10 cfs @	12.36 hrs, Volume=	5.983 af
Outflow	=	17.78 cfs @	12.95 hrs, Volume=	5.663 af, Atten= 65%, Lag= 34.9 min
Primary	=	17.78 cfs @	12.95 hrs, Volume=	5.663 af

Routing by Sim-Route method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs

Starting Elev= 897.87' Storage= 0.061 af
Peak Elev= 902.66' Storage= 2.148 af (2.087 af above starting storage)
Flood Elev= 903.50' Storage= 5.306 af (5.245 af above starting storage)
Plug-Flow detention time= 97.3 min calculated for 5.600 af (94% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
895.70	0.000	0.000	0.000
897.30	0.030	0.024	0.024
899.00	0.100	0.111	0.135
900.50	0.120	0.165	0.300
902.20	0.710	0.706	1.005
902.50	2.830	0.531	1.536
903.50	4.710	3.770	5.306

Primary OutFlow (Dynamic Tailwater)
↑—1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	897.87'	**30.0" x 68.0' long Culvert** Ke= 0.500 Outlet Invert= 897.68' S= 0.0028 '/' n= 0.012 Cc= 0.900

Pond P419: 419P FROM CITY CALCS

[86] Warning: Oscillations may require smaller dt

Inflow	=	116.02 cfs @	13.00 hrs, Volume=	25.507 af
Outflow	=	17.02 cfs @	16.36 hrs, Volume=	20.209 af, Atten= 85%, Lag= 201.8 min
Primary	=	17.02 cfs @	16.36 hrs, Volume=	20.209 af

Routing by Sim-Route method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs

Peak Elev= 902.27' Storage= 14.673 af
Plug-Flow detention time= 494.6 min calculated for 20.204 af (79% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
900.00	6.300	0.000	0.000
900.40	6.400	2.540	2.540
900.80	6.400	2.560	5.100
901.20	6.500	2.580	7.680
901.60	6.500	2.600	10.280
902.00	6.600	2.620	12.900
902.40	6.700	2.660	15.560
902.80	6.700	2.680	18.240
903.20	6.800	2.700	20.940
903.60	6.800	2.720	23.660
904.00	6.900	2.740	26.400

Primary OutFlow (Dynamic Tailwater)
↑—2=Culvert
↑—1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Device 2	900.00'	**30.0' long Broad-Crested Rectangular Weir** Head (feet) 0.50 Coef. (English) 3.00
2	Primary	900.00'	**24.0" x 50.0' long Culvert** Ke= 0.500 Outlet Invert= 899.50' S= 0.0100 '/' n= 0.012 Cc= 0.900

Pond P421: 421P FROM CITY CALCS

Inflow	=	16.18 cfs @	12.34 hrs, Volume=	1.813 af
Outflow	=	4.64 cfs @	13.01 hrs, Volume=	1.770 af, Atten= 71%, Lag= 39.9 min
Primary	=	4.64 cfs @	13.01 hrs, Volume=	1.770 af

Routing by Sim-Route method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs

Peak Elev= 904.36' Storage= 0.716 af
Plug-Flow detention time= 163.0 min calculated for 1.769 af (98% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
902.90	0.000	0.000	0.000
904.90	0.980	0.980	0.980
906.90	1.260	2.240	3.220
908.90	1.400	2.660	5.880

Primary OutFlow (Dynamic Tailwater)
↑—1=Culvert
↑—2=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	902.90'	**15.0" x 55.0' long Culvert** Ke= 0.500 Outlet Invert= 902.66' S= 0.0044 '/' n= 0.012 Cc= 0.900

2 Device 1 902.90' **30.0' long Broad-Crested Rectangular Weir**
Head (feet) 0.50
Coef. (English) 3.00

Pond PBY: BACKYARD POND

[86] Warning: Oscillations may require smaller dt

Inflow	=	15.35 cfs @	12.04 hrs, Volume=	0.907 af
Outflow	=	3.22 cfs @	12.17 hrs, Volume=	0.884 af, Atten= 79%, Lag= 7.7 min
Primary	=	3.22 cfs @	12.17 hrs, Volume=	0.884 af

Routing by Sim-Route method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs

Starting Elev= 899.00' Storage= 0 cf
Peak Elev= 902.12' Storage= 19,108 cf
Flood Elev= 904.50' Storage= 54,750 cf
Plug-Flow detention time= 201.8 min calculated for 0.884 af (98% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
900.85	0	0	0
904.50	30,000	54,750	54,750

Primary OutFlow (Dynamic Tailwater)
↑—1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	900.85'	**18.0" x 78.0' long Culvert** Ke= 0.500 Outlet Invert= 899.34' S= 0.0194 '/' n= 0.012 Cc= 0.900

Pond WA: WETLAND A

[88] Warning: Qout>Qin may require smaller dt
[86] Warning: Oscillations may require smaller dt

Inflow	=	26.34 cfs @	12.04 hrs, Volume=	4.555 af
Outflow	=	33.01 cfs @	14.94 hrs, Volume=	4.140 af, Atten= 0%, Lag= 173.7 min
Primary	=	33.01 cfs @	14.94 hrs, Volume=	4.140 af

Routing by Sim-Route method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs

Peak Elev= 901.71' Storage= 1.970 af
Flood Elev= 904.50' Storage= 7.433 af
Plug-Flow detention time= 210.2 min calculated for 4.139 af (91% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
900.70	0.000	0.000	0.000
903.35	3.912	5.183	5.183

Primary OutFlow (Dynamic Tailwater)
└─1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	900.90'	**30.0' long Broad-Crested Rectangular Weir** Head (feet) 0.50 Coef. (English) 3.00

Pond WB: WETLAND B

[86] Warning: Oscillations may require smaller dt
[80] Warning: Exceeded Pond P419 by 0.84' @ 12.32 hrs (4.63 cfs)

Inflow	=	66.02 cfs @	12.06 hrs, Volume=	27.831 af
Outflow	=	33.27 cfs @	12.58 hrs, Volume=	27.069 af, Atten= 50%, Lag= 31.6 min
Primary	=	33.27 cfs @	12.58 hrs, Volume=	27.069 af

Routing by Sim-Route method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs

Peak Elev= 901.02' Storage= 2.274 af
Flood Elev= 904.50' Storage= 19.095 af
Plug-Flow detention time= 62.3 min calculated for 27.062 af (97% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
895.00	0.000	0.000	0.000
897.00	0.160	0.160	0.160
900.70	0.160	0.592	0.752
905.00	9.494	20.756	21.508

Primary OutFlow (Dynamic Tailwater)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	895.18'	**60.0" x 110.0' long Culvert** Ke= 0.500 Outlet Invert= 895.00' S= 0.0016 '/' n= 0.012 Cc= 0.900

Pond WC: WETLAND C

[80] Warning: Exceeded Pond 29 by 3.94' @ 0.00 hrs (27.06 cfs)
[80] Warning: Exceeded Pond WB by 5.70' @ 9.13 hrs (131.15 cfs)

Inflow	=	59.16 cfs @	12.55 hrs, Volume=	40.270 af
Outflow	=	59.12 cfs @	12.58 hrs, Volume=	40.270 af, Atten= 0%, Lag= 1.9 min
Primary	=	59.12 cfs @	12.58 hrs, Volume=	40.270 af

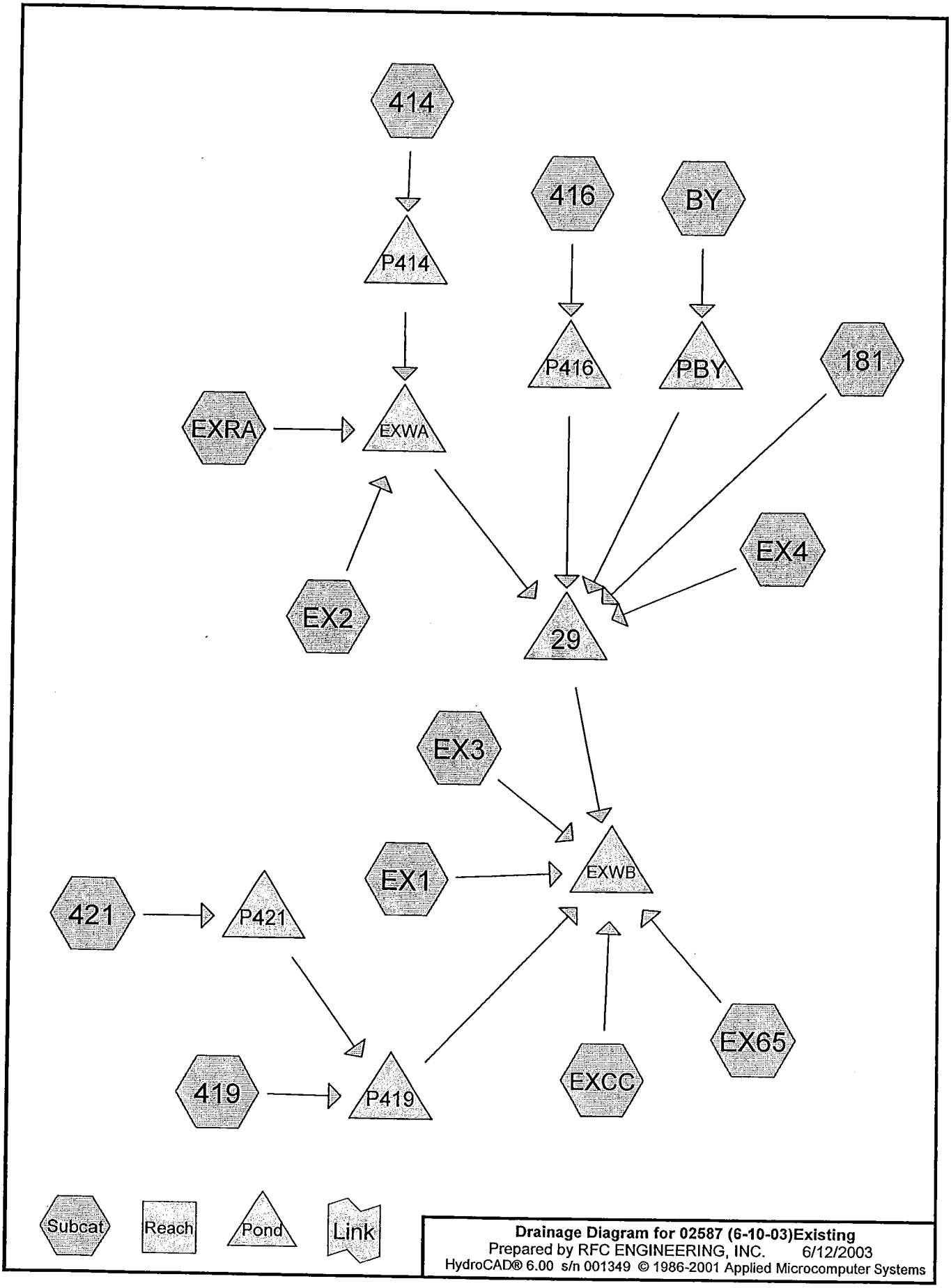
Routing by Sim-Route method, Time Span= 0.00-40.00 hrs, dt= 0.01 hrs

Starting Elev= 900.70' Storage= 58,998 cf
Peak Elev= 900.89' Storage= 62,717 cf (3,719 cf above starting storage)
Flood Elev= 904.50' Storage= 184,907 cf (125,908 cf above starting storage)
Plug-Flow detention time= 51.6 min calculated for 38.906 af (97% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
895.00	501	0	0
896.00	4,553	2,527	2,527
897.00	7,604	6,079	8,606
898.00	10,677	9,141	17,746
899.00	13,815	12,246	29,992
900.00	17,004	15,410	45,402
901.00	21,844	19,424	64,826
902.00	31,413	26,629	91,454
903.00	37,525	34,469	125,923
904.00	41,120	39,323	165,246

Primary OutFlow (Dynamic Tailwater)
↑—2=Special (user-defined)
↑—1=Culvert

#	Routing	Invert	Outlet Devices
1	Device 2	895.00'	**72.0" x 100.0' long Culvert** Ke= 0.500
			Outlet Invert= 895.00' S= 0.0000 '/' n= 0.012 Cc= 0.900
2	Primary	895.00'	**Special (user-defined)**
			Head (feet) 0.00 5.70 5.80 5.90 6.00 6.10 6.20 6.30 6.40 6.50 6.60 6.70 6.80
			Disch. (cfs) 0.00 0.00 42.61 60.66 74.57 86.10 96.27 105.45 113.90 121.77 12



Drainage Diagram for 02587 (6-10-03)Existing
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