ENGINEERING

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Addendum to: STORMWATER DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
LAKESIDE ESTATES - O'FALLON
BAX PROJECT NO. **89-3094C**
February 25, 1999

INTRODUCTION:

This report is in addendum to a previously submitted report dated April 7, 1995 and revised April 17, 1995. In order to provide adequate detention, the structure must be narrowed to 6" and lowered approximately 5". Page four of the previous report indicated that the lake outflow shall be limited to 23 cfs (15 year- 20 minute *undeveloped* flow to the lake). As this analysis shows, the 2, 25, and 100 year-20 minute outflows are below 23 cfs. 2.25 feet of freeboard is provided during the 100-year design storm.

STORM ROUTING CALCULATIONS AND RESULTS:

A computer program was used in routing the 2, 25, and 100 year-20 minute storms through the basin. As found in the routing calculations, the results are as follows:

20 MIN STORM	PERMITTED RELEASE RATE	CALCULATED RELEASE RATE	PEAK ELEVATION
2 YR	-	1.46 cfs	516.48
25 YR	-	7.13 cfs	517.36
100 YR	23 cfs	22.84 cfs	517.75

SUMMARY

Slot (to top of structure)	6" wide x 20" high
Slot Elevation	515.50
Overflow	existing 54" standpipe
Overflow Elevation	existing top 517.18
Top Of Berm	520.00

STATE OF MISSOURI
RICHARD L. FRANCIS
NUMBER E-25651
REGISTERED PROFESSIONAL ENGINEER

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POND-2 Version: 5.20
S/N:

LAKESIDE ESTATES
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
OCTOBER 17, 1996 revised March 2, 1999

CALCULATED 03-02-1999 09:38:59
DISK FILE: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .VOL

Planimeter scale: 1 inch = 50 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
515.50	15.22	0.87	0.00	0.00	0.00
516.00	17.20	0.99	2.79	0.46	0.46
518.00	20.21	1.16	3.22	2.14	2.61
520.00	23.74	1.36	3.78	2.52	5.13

* 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

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* LAKESIDE ESTATES *
* DETENTION ANALYSIS *
* BAX ENGINEERING COMPANY, INCORPORATED *
* 2-22-99 *
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Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\3094-002.HYD
Rating Table file: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .PND

----INITIAL CONDITIONS----
Elevation = 515.50 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
515.50	0.0	0.000	0.0	0.0
515.70	0.1	0.179	260.1	260.2
515.90	0.4	0.367	533.2	533.6
516.10	0.7	0.564	818.7	819.4
516.30	1.1	0.765	1110.1	1111.2
516.50	1.5	0.969	1406.4	1407.9
516.70	2.0	1.176	1707.7	1709.7
516.90	2.5	1.387	2013.9	2016.4
517.10	3.0	1.601	2325.1	2328.1
517.30	5.3	1.819	2641.4	2646.7
517.50	11.6	2.040	2962.7	2974.3
517.70	20.2	2.265	3289.3	3309.5
517.90	30.6	2.494	3620.9	3651.5
518.10	42.4	2.726	3957.8	4000.2
518.30	55.5	2.962	4300.3	4355.8
518.50	69.8	3.202	4648.6	4718.4
518.70	85.3	3.445	5002.6	5087.9
518.90	101.7	3.693	5362.4	5464.1
519.10	116.4	3.945	5728.0	5844.4
519.30	122.6	4.201	6099.6	6222.2
519.50	128.6	4.461	6477.1	6605.7
519.70	134.5	4.725	6860.6	6995.1
519.90	140.1	4.993	7250.2	7390.3
520.00	142.9	5.129	7447.2	7590.1

Time increment (t) = 1.0 min.

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\3094-002.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\30940002.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	0.00	-----	0.0	0.0	0.00	515.50
1.0	17.54	17.5	17.5	17.5	0.01	515.51
2.0	35.07	52.6	70.1	70.1	0.03	515.55
3.0	35.07	70.1	140.1	140.2	0.05	515.61
4.0	35.07	70.1	210.1	210.3	0.08	515.66
5.0	35.07	70.1	280.0	280.2	0.12	515.71
6.0	35.07	70.1	349.7	350.1	0.20	515.77
7.0	35.07	70.1	419.3	419.9	0.28	515.82
8.0	35.07	70.1	488.8	489.5	0.35	515.87
9.0	35.07	70.1	558.0	558.9	0.43	515.92
10.0	35.07	70.1	627.2	628.2	0.50	515.97
11.0	35.07	70.1	696.2	697.3	0.57	516.01
12.0	35.07	70.1	765.0	766.3	0.64	516.06
13.0	35.07	70.1	833.7	835.2	0.72	516.11
14.0	35.07	70.1	902.2	903.9	0.82	516.16
15.0	35.07	70.1	970.6	972.4	0.91	516.20
16.0	35.07	70.1	1038.7	1040.7	1.00	516.25
17.0	35.07	70.1	1106.6	1108.8	1.10	516.30
18.0	35.07	70.1	1174.4	1176.8	1.19	516.34
19.0	35.07	70.1	1242.0	1244.5	1.28	516.39
20.0	35.07	70.1	1309.4	1312.1	1.37	516.44
21.0	17.54	52.6	1359.1	1362.0	1.44	516.47
22.0	0.00	17.5	1373.7	1376.7	1.46	516.48
23.0	0.00	0.0	1370.8	1373.7	1.45	516.48

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\3094-002.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\30940002.HYD

Starting Pond W.S. Elevation = 515.50 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	35.07 cfs
Peak Outflow	=	1.46 cfs
Peak Elevation	=	516.48 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	0.95 ac-ft
Total Storage in Pond	=	0.95 ac-ft

Return Freq: 2 years

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\3094-002.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\30940002.HYD

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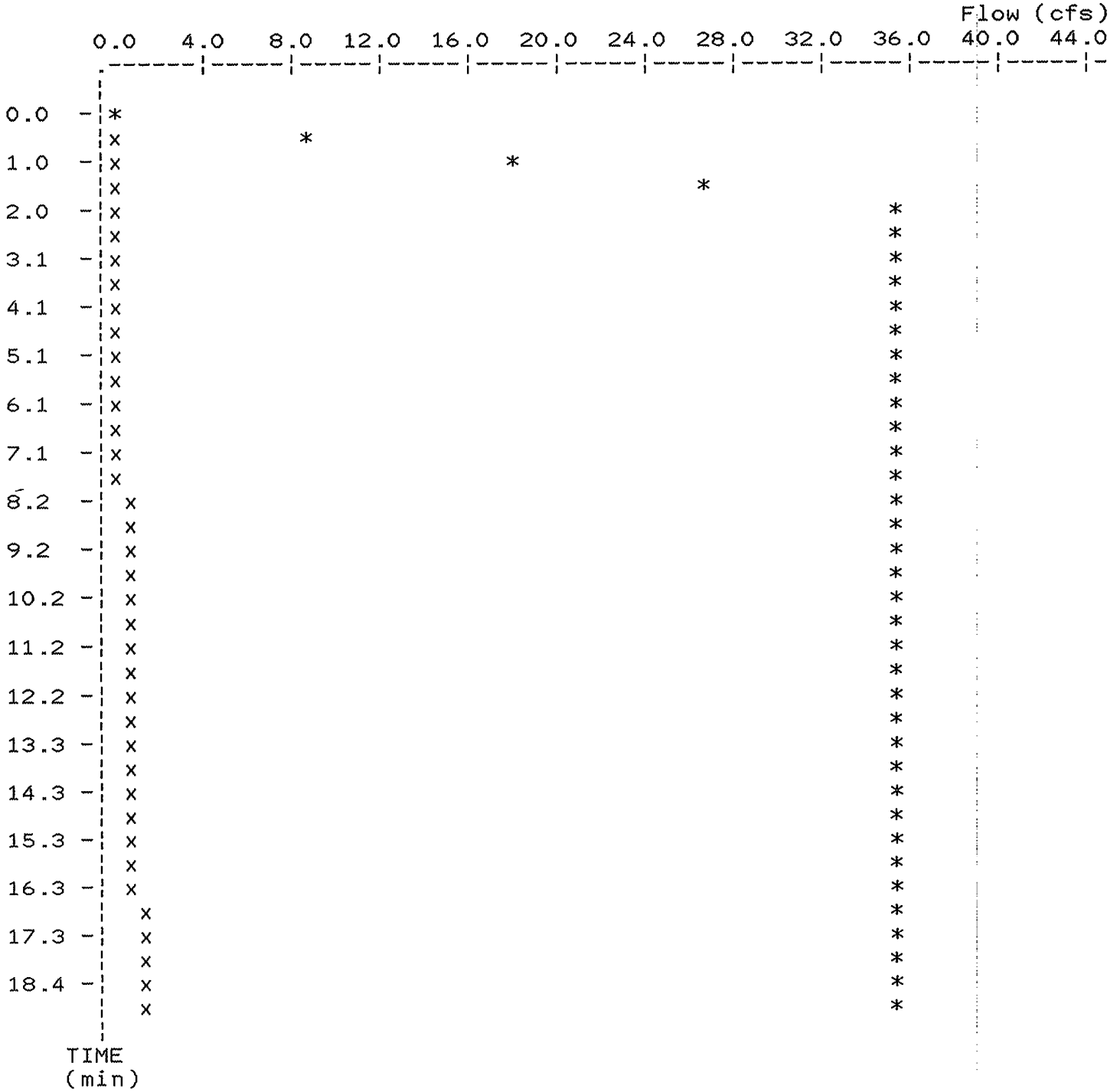
Peak Inflow = 35.07 cfs
Peak Outflow = 1.46 cfs
Peak Elevation = 516.48 ft



x File: C:\WINDOWS\DESKTOP\PONDPA~1\30940002.HYD Qmax = 1.5 cfs
* File: C:\WINDOWS\DESKTOP\PONDPA~1\3094-002.HYD Qmax = 35.1 cfs

LAKESIDE ESTATES
DETENTION ANALYSIS
BAX ENGINEERING COMPANY, INCORPORATED
2-22-99

Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\3094-025.HYD
Rating Table file: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .PND

----INITIAL CONDITIONS----
Elevation = 515.50 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
515.50	0.0	0.000
515.70	0.1	0.179
515.90	0.4	0.367
516.10	0.7	0.564
516.30	1.1	0.765
516.50	1.5	0.969
516.70	2.0	1.176
516.90	2.5	1.387
517.10	3.0	1.601
517.30	5.3	1.819
517.50	11.6	2.040
517.70	20.2	2.265
517.90	30.6	2.494
518.10	42.4	2.726
518.30	55.5	2.962
518.50	69.8	3.202
518.70	85.3	3.445
518.90	101.7	3.693
519.10	116.4	3.945
519.30	122.6	4.201
519.50	128.6	4.461
519.70	134.5	4.725
519.90	140.1	4.993
520.00	142.9	5.129

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
260.1	260.2
533.2	533.6
818.7	819.4
1110.1	1111.2
1406.4	1407.9
1707.7	1709.7
2013.9	2016.4
2325.1	2328.1
2641.4	2646.7
2962.7	2974.3
3289.3	3309.5
3620.9	3651.5
3957.8	4000.2
4300.3	4355.8
4648.6	4718.4
5002.6	5087.9
5362.4	5464.1
5728.0	5844.4
6099.6	6222.2
6477.1	6605.7
6860.6	6995.1
7250.2	7390.3
7447.2	7590.1

Time increment (t) = 1.0 min.

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\3094-025.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\30940025.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	0.00	-----	0.0	0.0	0.00	515.50
1.0	35.27	35.3	35.2	35.3	0.01	515.53
2.0	70.54	105.8	140.9	141.1	0.05	515.61
3.0	70.54	141.1	281.8	282.0	0.12	515.72
4.0	70.54	141.1	422.3	422.9	0.28	515.82
5.0	70.54	141.1	562.5	563.4	0.43	515.92
6.0	70.54	141.1	702.4	703.6	0.58	516.02
7.0	70.54	141.1	842.1	843.5	0.73	516.12
8.0	70.54	141.1	981.3	983.1	0.92	516.21
9.0	70.54	141.1	1120.1	1122.4	1.12	516.31
10.0	70.54	141.1	1258.6	1261.2	1.30	516.40
11.0	70.54	141.1	1396.7	1399.7	1.49	516.49
12.0	70.54	141.1	1534.4	1537.8	1.72	516.59
13.0	70.54	141.1	1671.6	1675.4	1.94	516.68
14.0	70.54	141.1	1808.3	1812.6	2.17	516.77
15.0	70.54	141.1	1944.6	1949.4	2.39	516.86
16.0	70.54	141.1	2080.5	2085.7	2.61	516.94
17.0	70.54	141.1	2215.9	2221.5	2.83	517.03
18.0	70.54	141.1	2350.5	2357.0	3.21	517.12
19.0	70.54	141.1	2483.3	2491.6	4.18	517.20
20.0	70.54	141.1	2614.1	2624.3	5.14	517.29
21.0	35.27	105.8	2706.5	2719.9	6.71	517.34
22.0	0.00	35.3	2727.5	2741.7	7.13	517.36
23.0	0.00	0.0	2713.8	2727.5	6.85	517.35

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\3094-025.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\30940025.HYD

Starting Pond W.S. Elevation = 515.50 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	70.54 cfs
Peak Outflow	=	7.13 cfs
Peak Elevation	=	517.36 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	1.88 ac-ft
Total Storage in Pond	=	1.88 ac-ft

Return Freq: 25 years

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\3094-025.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\30940025.HYD

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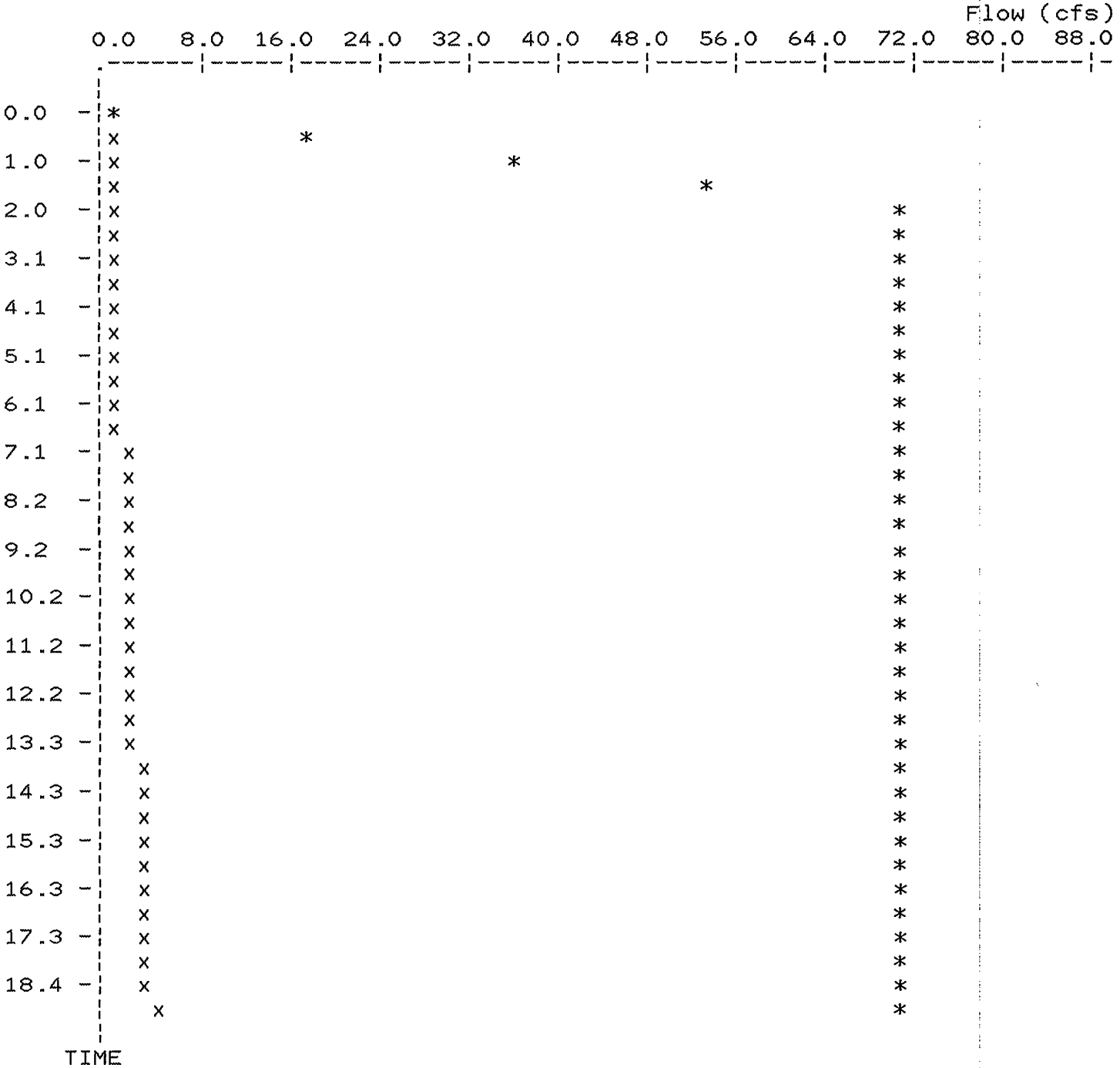
Peak Inflow = 70.54 cfs
Peak Outflow = 7.13 cfs
Peak Elevation = 517.36 ft



x File: C:\WINDOWS\DESKTOP\PONDPA~1\30940025.HYD Qmax = 7.1 cfs
* File: C:\WINDOWS\DESKTOP\PONDPA~1\3094-025.HYD Qmax = 70.5 cfs

LAKESIDE ESTATES
DETENTION ANALYSIS
BAX ENGINEERING COMPANY, INCORPORATED
2-22-99

Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\3094-100.HYD
Rating Table file: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .PND

----INITIAL CONDITIONS----
Elevation = 515.50 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
515.50	0.0	0.000
515.70	0.1	0.179
515.90	0.4	0.367
516.10	0.7	0.564
516.30	1.1	0.765
516.50	1.5	0.969
516.70	2.0	1.176
516.90	2.5	1.387
517.10	3.0	1.601
517.30	5.3	1.819
517.50	11.6	2.040
517.70	20.2	2.265
517.90	30.6	2.494
518.10	42.4	2.726
518.30	55.5	2.962
518.50	69.8	3.202
518.70	85.3	3.445
518.90	101.7	3.693
519.10	116.4	3.945
519.30	122.6	4.201
519.50	128.6	4.461
519.70	134.5	4.725
519.90	140.1	4.993
520.00	142.9	5.129

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
260.1	260.2
533.2	533.6
818.7	819.4
1110.1	1111.2
1406.4	1407.9
1707.7	1709.7
2013.9	2016.4
2325.1	2328.1
2641.4	2646.7
2962.7	2974.3
3289.3	3309.5
3620.9	3651.5
3957.8	4000.2
4300.3	4355.8
4648.6	4718.4
5002.6	5087.9
5362.4	5464.1
5728.0	5844.4
6099.6	6222.2
6477.1	6605.7
6860.6	6995.1
7250.2	7390.3
7447.2	7590.1

Time increment (t) = 1.0 min.

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\3094-100.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\30940100.HYD

INFLOW HYDROGRAPH

ROUTING COMPUTATIONS

TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	0.00	-----	0.0	0.0	0.00	515.50
1.0	45.15	45.2	45.1	45.2	0.02	515.53
2.0	90.29	135.4	180.4	180.6	0.07	515.64
3.0	90.29	180.6	360.6	361.0	0.21	515.77
4.0	90.29	180.6	540.3	541.2	0.41	515.91
5.0	90.29	180.6	719.7	720.9	0.60	516.03
6.0	90.29	180.6	898.7	900.3	0.81	516.16
7.0	90.29	180.6	1077.2	1079.3	1.06	516.28
8.0	90.29	180.6	1255.1	1257.7	1.30	516.40
9.0	90.29	180.6	1432.6	1435.7	1.55	516.52
10.0	90.29	180.6	1609.5	1613.2	1.84	516.64
11.0	90.29	180.6	1785.8	1790.1	2.13	516.75
12.0	90.29	180.6	1961.6	1966.4	2.42	516.87
13.0	90.29	180.6	2136.8	2142.2	2.70	516.98
14.0	90.29	180.6	2311.4	2317.3	2.98	517.09
15.0	90.29	180.6	2483.6	2492.0	4.18	517.20
16.0	90.29	180.6	2652.9	2664.2	5.64	517.31
17.0	90.29	180.6	2815.7	2833.5	8.89	517.41
18.0	90.29	180.6	2971.9	2996.3	12.16	517.51
19.0	90.29	180.6	3120.2	3152.5	16.17	517.61
20.0	90.29	180.6	3260.8	3300.8	19.98	517.69
21.0	45.15	135.4	3350.6	3396.2	22.84	517.75
22.0	0.00	45.2	3350.1	3395.7	22.82	517.75
23.0	0.00	0.0	3307.2	3350.1	21.44	517.72

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\3094-100.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\30940100.HYD

Starting Pond W.S. Elevation = 515.50 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	90.29 cfs
Peak Outflow	=	22.84 cfs
Peak Elevation	=	517.75 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	2.32 ac-ft
Total Storage in Pond	=	2.32 ac-ft

Return Freq: 100 years

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\3094-100.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\30940100.HYD

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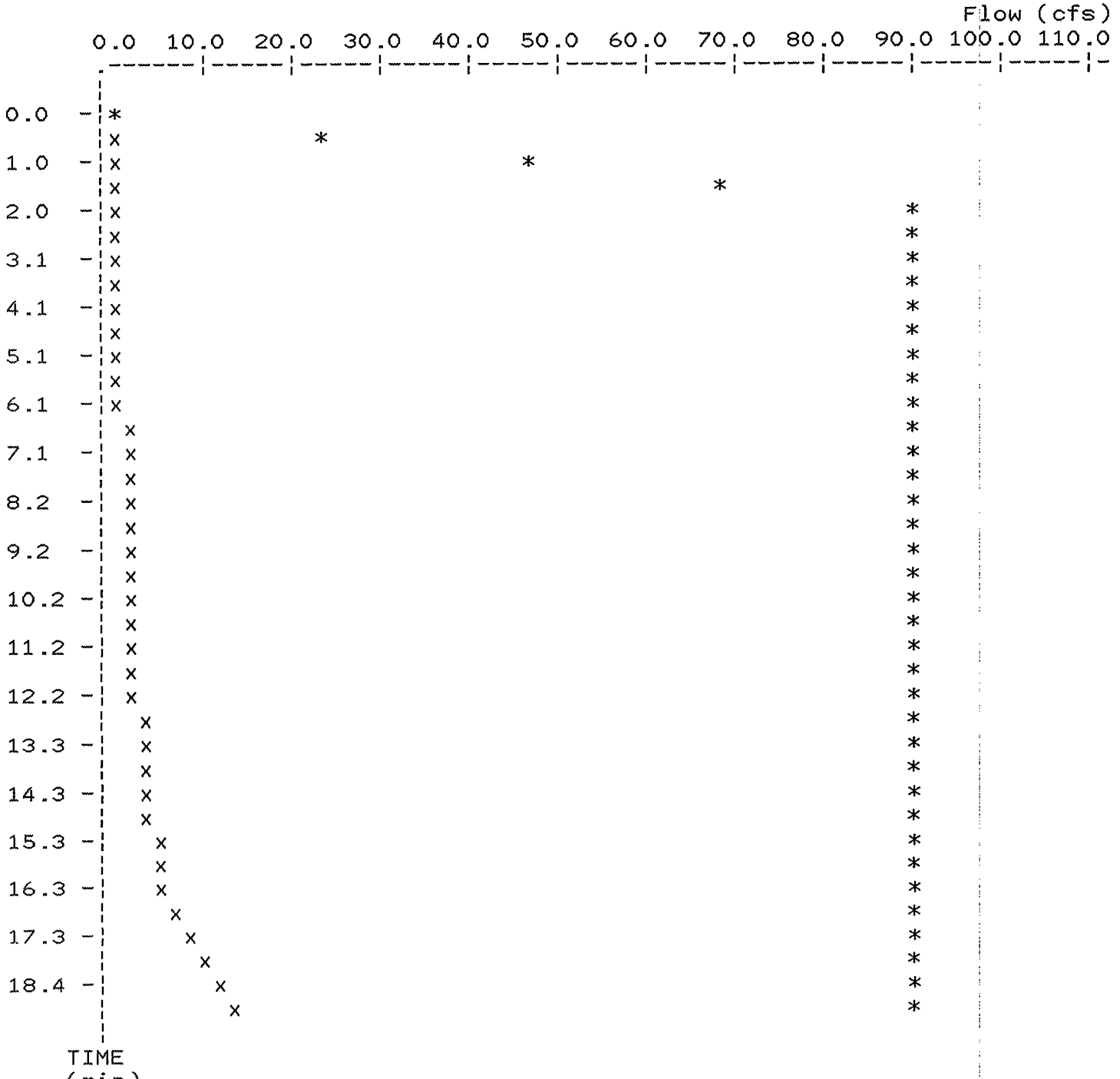
Peak Inflow = 90.29 cfs
Peak Outflow = 22.84 cfs
Peak Elevation = 517.75 ft



x File: C:\WINDOWS\DESKTOP\PONDPA~1\30940100.HYD Qmax = 22.8 cfs
* File: C:\WINDOWS\DESKTOP\PONDPA~1\3094-100.HYD Qmax = 90.3 cfs

Outlet Structure File: 3094 .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

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LAKESIDE ESTATES
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
FEB 22, 1999
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***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
515.50	0.0	1
515.70	0.1	1
515.90	0.4	1
516.10	0.7	1
516.30	1.1	1
516.50	1.5	1
516.70	2.0	1
516.90	2.5	1
517.10	3.0	1
517.30	5.3	3 +1
517.50	11.6	3 +1
517.70	20.2	3 +1
517.90	30.6	3 +1
518.10	42.4	3 +1
518.30	55.5	3 +1
518.50	69.8	3 +1
518.70	85.3	3 +1
518.90	101.7	3 +1
519.10	116.4	2 +1
519.30	122.6	2 +1
519.50	128.6	2 +1
519.70	134.5	2 +1
519.90	140.1	2 +1
520.00	142.9	2 +1

Outlet Structure File: 3094 .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

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LAKESIDE ESTATES
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
FEB 22, 1999
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Outlet Structure File: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .STR
Planimeter Input File: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .VOL
Rating Table Output File: C:\WINDOWS\DESKTOP\PONDPA~1\3094 .PND

Min. Elev.(ft) = 515.5 Max. Elev.(ft) = 520 Incr.(ft) = .2

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

Structure	No.	Q Table		Q Table
WEIR-VR	3		->	3
ORIFICE	2	? 3	->	A
WEIR-VR	1		->	1

Outflow rating table summary was stored in file:
C:\WINDOWS\DESKTOP\PONDPA~1\3094 .PND

Outlet Structure File: 3094 .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
LAKESIDE ESTATES
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
FEB 22, 1999
****

›››››› Structure No. 3 ‹‹‹‹‹‹
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	517.18
E2 elev.(ft)?	520.001
Weir coefficient?	3.00
Weir elev.(ft)?	517.18
Length (ft)?	13.637
Contracted/Suppressed (C/S)?	S

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›››››› Structure No. 2 ‹‹‹‹‹‹
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	517.18
E2 elev.(ft)?	520.001
Orifice coeff.?	.6
Invert elev.(ft)?	517.18
Datum elev.(ft) ?	517.18
Orifice area (sq ft)?	15.904

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

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	515.5
E2 elev.(ft)?	520.001
Weir coefficient?	3.00
Weir elev.(ft)?	515.50
Length (ft)?	.5
Contracted/Suppressed (C/S)?	S

Outlet Structure File: 3094 .STR

POND-2 Version: 5.20 S/N:
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DETENTION ANALYSIS
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FEB 22, 1999
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Outflow Rating Table for Structure #3
WEIR-VR Weir - Vertical Rectangular

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

Elevation (ft)	Q (cfs)	Computation Messages
515.50	0.0	E < Inv.El.= 517.18
515.70	0.0	E < Inv.El.= 517.18
515.90	0.0	E < Inv.El.= 517.18
516.10	0.0	E < Inv.El.= 517.18
516.30	0.0	E < Inv.El.= 517.18
516.50	0.0	E < Inv.El.= 517.18
516.70	0.0	E < Inv.El.= 517.18
516.90	0.0	E < Inv.El.= 517.18
517.10	0.0	E < Inv.El.= 517.18
517.30	1.7	H =.12
517.50	7.4	H =.32
517.70	15.3	H =.52
517.90	25.0	H =.72
518.10	36.1	H =.92
518.30	48.5	H =1.12
518.50	62.0	H =1.32
518.70	76.7	H =1.52
518.90	92.3	H =1.72
519.10	108.8	H =1.92
519.30	126.3	H =2.12
519.50	144.6	H =2.32
519.70	163.7	H =2.52
519.90	183.5	H =2.72
520.00	193.7	H =2.82

C = 3 L (ft) = 13.637
H (ft) = Table elev. - Invert elev. (517.18 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: 3094 .STR

POND-2 Version: 5.20 S/N:
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LAKESIDE ESTATES
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
FEB 22, 1999
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Outflow Rating Table for Structure #2
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
515.50	0.0	E < E1= 517.18
515.70	0.0	E < E1= 517.18
515.90	0.0	E < E1= 517.18
516.10	0.0	E < E1= 517.18
516.30	0.0	E < E1= 517.18
516.50	0.0	E < E1= 517.18
516.70	0.0	E < E1= 517.18
516.90	0.0	E < E1= 517.18
517.10	0.0	E < E1= 517.18
517.30	26.5	H =.12
517.50	43.3	H =.32
517.70	55.2	H =.52
517.90	65.0	H =.72
518.10	73.4	H =.92
518.30	81.0	H =1.12
518.50	88.0	H =1.32
518.70	94.4	H =1.52
518.90	100.4	H =1.72
519.10	106.1	H =1.92
519.30	111.5	H =2.12
519.50	116.6	H =2.32
519.70	121.6	H =2.52
519.90	126.3	H =2.72
520.00	128.6	H =2.82

C = .6 A = 15.904 sq.ft.
H (ft) = Table elev. - Datum elev. (517.18 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: 3094 .STR

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LAKESIDE ESTATES
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
FEB 22, 1999
****

Outflow Rating Table for Structure #1
WEIR-VR Weir - Vertical Rectangular

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

Elevation (ft)	Q (cfs)	Computation Messages
515.50	0.0	H =0.0
515.70	0.1	H =.2
515.90	0.4	H =.4
516.10	0.7	H =.6
516.30	1.1	H =.8
516.50	1.5	H =1.0
516.70	2.0	H =1.2
516.90	2.5	H =1.4
517.10	3.0	H =1.6
517.30	3.6	H =1.8
517.50	4.2	H =2.0
517.70	4.9	H =2.2
517.90	5.6	H =2.4
518.10	6.3	H =2.6
518.30	7.0	H =2.8
518.50	7.8	H =3.0
518.70	8.6	H =3.2
518.90	9.4	H =3.4
519.10	10.2	H =3.6
519.30	11.1	H =3.8
519.50	12.0	H =4.0
519.70	12.9	H =4.2
519.90	13.8	H =4.4
520.00	14.3	H =4.5

C = 3 L (ft) = .5
H (ft) = Table elev. - Invert elev. (515.5 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

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DETENTION ANALYSIS
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FEB 22, 1999
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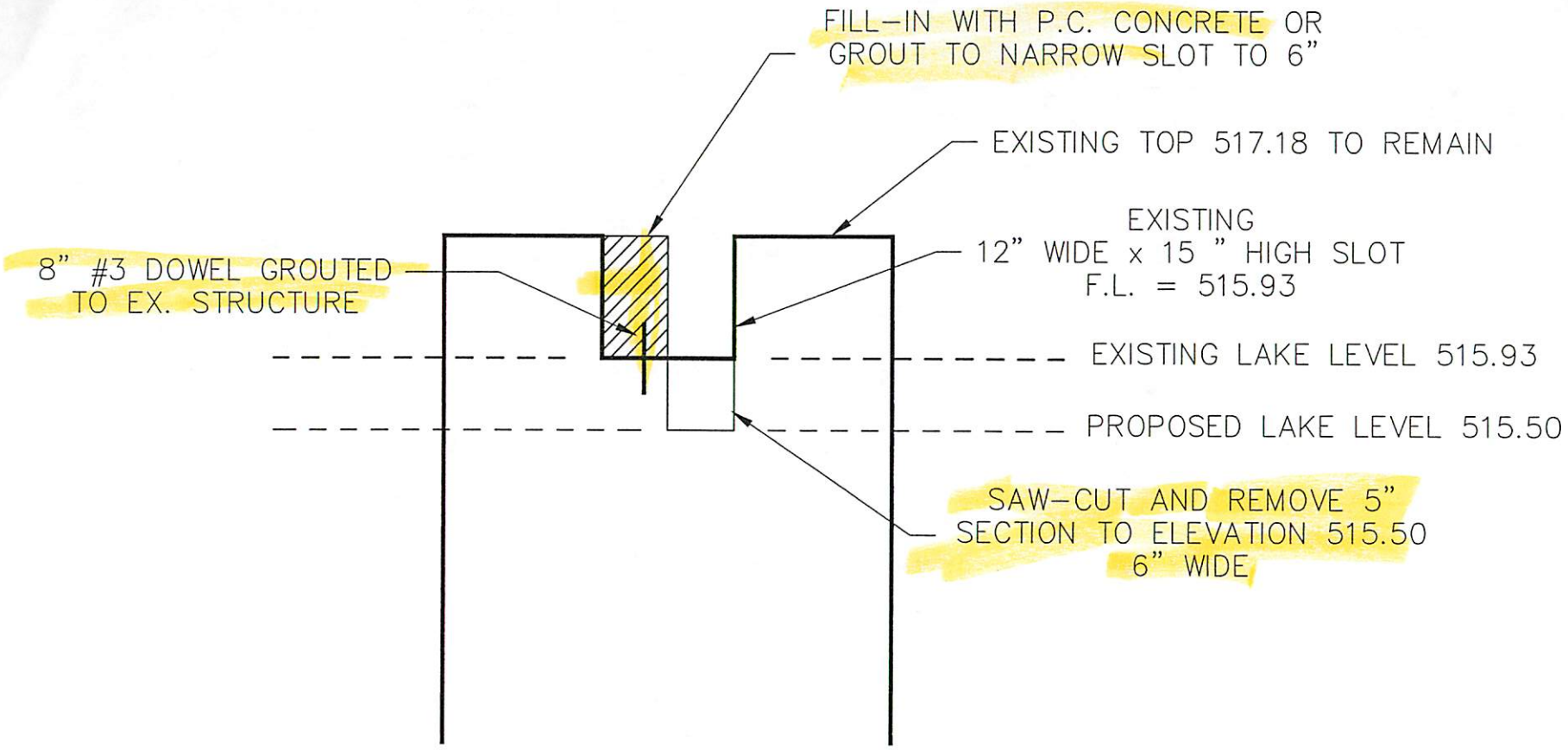
Outflow Rating Table A
Table A = 3 ? 2

Elevation (ft)	Q (cfs)	Contributing Structures
515.50	0.0	-
515.70	0.0	-
515.90	0.0	-
516.10	0.0	-
516.30	0.0	-
516.50	0.0	-
516.70	0.0	-
516.90	0.0	-
517.10	0.0	-
517.30	1.7	3
517.50	7.4	3
517.70	15.3	3
517.90	25.0	3
518.10	36.1	3
518.30	48.5	3
518.50	62.0	3
518.70	76.7	3
518.90	92.3	3
519.10	106.1	2
519.30	111.5	2
519.50	116.6	2
519.70	121.6	2
519.90	126.3	2
520.00	128.6	2



MODIFICATIONS TO EXISTING STRUCTURE

LAKESIDE ESTATES BAX ENGINEERING COMPANY INC. PROJECT NO. 89-3094

3-2-99

PORTION OF ORIGINAL REPORT (4 SHEETS)

ENGINEERING

PLANNING

SURVEYING

STORMWATER DETENTION ANALYSIS
LAKESIDE ESTATES
PREPARED BY: BAX ENGINEERING COMPANY, INC.
APRIL 7, 1995
REVISED APRIL 17, 1995
BAX PROJECT NO. 89-3094C

INTRODUCTION

The purpose of this analysis is to analyze the wet stormwater detention basin/lake which is partially located at the proposed development to be known as Lakeside Estates. The existing lake currently serves for detention purposes for the Coronation Heights subdivision. A detention report prepared by Pickett, Ray & Silver, Inc. for Coronation Heights is attached to this analysis. It shall be proposed that the outfall structure shall be modified so that the detention for Coronation Heights, Twin Oaks Care Facility and Lakeside Estates is in compliance with the City of O'Fallon stormwater detention requirements. (The shape of the basin/lake shall also be modified with the normal pool elevation being raised.) Stormwater detention requirements for the City of O'Fallon are such that the storage volume and outflow rates shall be proportioned to insure that the peak rate of runoff leaving the site under post developed conditions is less than or equal to the peak rate of runoff leaving the site under pre-developed conditions of the design 25 year frequency-20 minute duration storm. Detention shall also be checked for the design 2 year and 100 year-20 minute storms.

GENERAL SITE DATA AND RUNOFF CALCULATIONS

1) Area of tract: 9.033 Acres
   Number of Lots: 5
   Average Area/Lot: 1.81 Acres

2) The pre-developed P.I. factors to be used for the analysis are: (All areas assumed 0% - 5% impervious)

   25 year-20 minute storm: 2.31 c.f.s./Ac

3) The post-developed P.I. factors to be used for the analysis are:

25 year-20 minute storm: 2.58 c.f.s./Ac
(Assumes average Lot = 1 Acre)

4) From the drainage area map of the project, the storm inflows to the basin are found as:

25 Year-20 Minute Storm:

Offsite - Twin Oaks Care:
6.20 Ac @ 4.75 c.f.s./Ac = 29.45 c.f.s.

Offsite - Coronation Heights:
5.10 Ac @ 3.26 c.f.s./Ac = 16.63 c.f.s.

Lakeside Estates & Blattel Tract:
9.48 Ac @ 2.58 c.f.s./Ac = 24.46 c.f.s.

TOTAL $Q_{25/20}$ = 70.54 c.f.s.

100 Year-20 Minute Storm:

TOTAL $Q_{100/20}$ = 1.28 x 70.54 c.f.s.
= 90.29 c.f.s.

2 Year-20 Minute Storm:
(St. Louis Metropolitan Sewer District P.I. Factors Used)

6.20 Ac @ 2.39 c.f.s./Ac = 14.82 c.f.s.
5.10 Ac @ 1.61 c.f.s./Ac = 8.21 c.f.s.
9.48 Ac @ 1.27 c.f.s./Ac = 12.04 c.f.s.

TOTAL $Q_{2/20}$ = 35.07 c.f.s.

5) Of the flows which inflow to the proposed detention basin, the most remote point of origination lies approximately 1,000 feet upstream of the detention basin. It will be assumed that the flow will travel through a storm sewer system with an average velocity of 7 ft/sec. This results in a travel time of 2.38 minutes. For the purpose of this analysis, a time of concentration of 2 minutes will be used.

6) The required attenuation due to the development of the sites is estimated at:

Lakeside Estates:
9.033 Ac x (2.58 c.f.s./Ac - 2.31 c.f.s./Ac) = 2.44 c.f.s.

Coronation Heights:
10.52 Ac x (3.26 c.f.s./Ac - 2.31 c.f.s./Ac) = 9.99 c.f.s.

Twin Oaks Care Facility:
7.07 Ac x (4.75 c.f.s./Ac - 2.31 c.f.s./Ac) = 17.25 c.f.s.

Total Attenuation Required = 29.68 c.f.s.

7) The permitted release rate of the detention basin is found by subtracting the required attenuation from the peak inflow to the basin. The permitted release rate is as follows:

25 Year-20 Minute Storm:
Permitted Release Rate = 70.54 c.f.s.- 29.68 c.f.s. = 40.86 c.f.s.

ROUTING CALCULATIONS AND RESULTS

A computer program "PONDPACK" was utilized in routing the design storms through the basin. As found in the routing calculations, the results of such analysis are as follows:

25 Year-20 Minute Storm:
Peak Inflow = 70.54 c.f.s.
Peak Release Rate = 6.57 c.f.s.
(<permitted rate of 40.86 c.f.s.)
Peak Elevation = 517.33

100 Year-20 Minute Storm:
Peak Inflow = 90.29 c.f.s.
Peak Release Rate = 7.72 c.f.s.
Peak Elevation = 517.79

2 Year-20 Minute Storm:
Peak Inflow = 35.07 c.f.s.
Peak Release Rate = 2.82 c.f.s.
Peak Elevation = 516.46

According to the detention analysis for Coronation Heights, the downstream pipe is undersized and therefore it is desired that the peak discharge of the basin be less that or equal to a 15 year-20 minute design storm. If the area draining to the basin was assumed undeveloped, the 15 year-20 minute discharge is estimated at:

12.30 Ac x 1.87 c.f.s./Ac = 23.00 c.f.s.
(approximate area and flow under undeveloped conditions)

The peak discharge of the basin for the 100 year-20 minutes design storm is 12.15 c.f.s. well below the 15 year-20 minute storm undeveloped flow of 23 c.f.s. found above.

DETENTION BASIN CHARACTERISTICS SUMMARY

Overflow Structure
low flow opening: 1 slot; 12 inches wide x 15 inches high
flowline elevation = 515.50
overflow sill: 54" diameter barrel; sill elev. = 518.50
Top of berm: 520.0