ENGINEERING

PLANNING

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STORMWATER DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
PERUQUE CREEK – PHASE I – CITY OF O'FALLON
BAX PROJECT NO. **00-11282C**
December 24, 2002

INTRODUCTION:

This presently undeveloped site is located in the City of O'Fallon, St. Charles County, Missouri. It is proposed that the 8.37-acre tract be developed into commercial lots. Two storm water detention basin shall be constructed in the northeastern and southeastern area of the site. The storage volume and outflow rates shall be proportioned to insure that the peak rate of runoff leaving the tract under post-developed conditions is less than or equal to the peak rate of runoff under pre-developed conditions for the 2, 15 and 25 year-20 minute design storms.

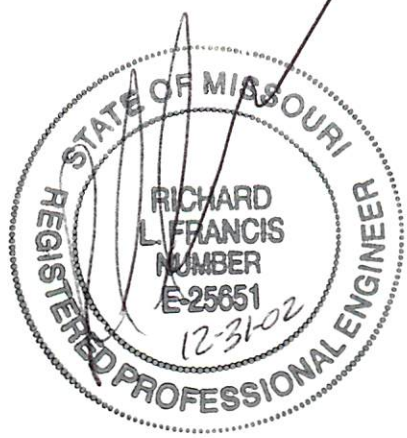
GENERAL SITE DATA AND RUNOFF CALCULATIONS:

The pre-developed P.I. factors to be used for the analysis are:

2 year	0-5%	Impervious	1.15	cfs/ac
15 year	0-5%	Impervious	1.87	cfs/ac
25 year	0-5%	Impervious	2.31	cfs/ac
100 year	0-5%	Impervious	2.95	cfs/ac

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

2 year	100%	Impervious	2.39	cfs/ac
15 year	100%	Impervious	3.85	cfs/ac
25 year	100%	Impervious	4.75	cfs/ac
100 year	100%	Impervious	6.08	cfs/ac



BASIN PEAK INFLOWS:

Inflows to the basin have been estimated from the drainage area map (se construction plans).

UPPER BASIN

15 year-20 minute storm

Land Use	Area	PI Factor	Runoff
Commercial	1.92 ac x	3.85 cfs/ac =	7.39 cfs
Undeveloped	0.75 ac x	1.87 cfs/ac =	1.40 cfs
		TOTAL =	8.79 cfs

2 year-20 minute storm:	5.45 cfs
15 year-20 minute storm:	8.79 cfs
25 year-20 minute storm:	10.85 cfs
100 year-20 minute storm:	13.89 cfs

LOWER BASIN

15 year-20 minute storm

Land Use	Area	PI Factor	Runoff
Commercial	6.07 ac x	3.85 cfs/ac =	23.37 cfs
Undeveloped	1.72 ac x	1.87 cfs/ac =	3.22 cfs
		TOTAL =	26.59 cfs

2 year-20 minute storm:	16.49 cfs
15 year-20 minute storm:	26.59 cfs
25 year-20 minute storm:	32.81 cfs
100 year-20 minute storm:	41.98 cfs

REQUIRED ATTENUATION: (20 minute storms)

The required attenuation for the site was found by subtracting the peak runoff rate from the site under existing conditions from the peak runoff rate from the site under proposed conditions for each design storm:

15 year 20 minute storm:

Existing peak flow rate from site	8.37	acres @ 1.87 cfs/acre =	15.65 cfs
Proposed peak flow rate from site	6.65	acres @ 3.85 cfs/acre =	25.60 cfs
	1.72	acres @ 1.87 cfs/acre =	3.22 cfs
		Total =	28.82 cfs

28.82 cfs – 15.65 cfs = 13.17 cfs

2 year 20-minute storm: 8.25 cfs
15 year 20-minute storm: 13.17 cfs
25 year 20-minute storm: 16.23 cfs

PERMITTED RELEASE RATE:

The permitted release rate of the basin was found by subtracting the required attenuation from the peak inflow to the basin for each design storm:

2 year	21.94 cfs	-	8.25 cfs	=	13.69 cfs
15 year	35.38 cfs	-	13.17 cfs	=	22.21 cfs
25 year	43.66 cfs	-	16.23 cfs	=	27.43 cfs

STORM ROUTING CALCULATIONS AND RESULTS:

A computer program was used in routing the design 2, 15 and 25 year-20 minute storms through the basin. As found in the routing calculations, the results are as follows:

UPPER BASIN

20 MIN STORM	PEAK INFLOW	PERMITTED RELEASE RATE	CALCULATED RELEASE RATE	PEAK ELEVATION
2 YR	5.45 cfs	-------	2.24 cfs	526.85 ft
15 YR	8.79 cfs	-------	2.65 cfs	528.23 ft
25 YR	10.85 cfs	-------	2.83 cfs	528.93 ft

LOWER BASIN

20 MIN STORM	PEAK INFLOW	PERMITTED RELEASE RATE	CALCULATED RELEASE RATE	PEAK ELEVATION
2 YR	16.49 cfs	13.69 cfs	13.69 cfs	510.64 ft
15 YR	26.59 cfs	22.21 cfs	22.20 cfs	512.96 ft
25 YR	32.81 cfs	27.43 cfs	25.80 cfs	512.59 ft

CHECK 100-YEAR OUTFLOW:(low-flow slots blocked)

UPPER BASIN

Standard Area Inlet Top

WEIR FLOW $Q = C \times L \times H^{(3/2)}$

Where 100-YEAR FLOW

Q	=	13.89 cfs
C	=	3.0
L	=	11.67
H	=	0.54 ft
Sill	=	528.96 ft
HW	=	529.50 ft

LOWER BASIN

Standard Area Inlet Top

WEIR FLOW $Q = C \times L \times H^{(3/2)}$

Where 100-YEAR FLOW

Q	=	55.87 cfs
C	=	3.0
L	=	18.75
H	=	1.00 ft
Sill	=	512.60 ft
HW	=	513.60 ft

SUMMARY

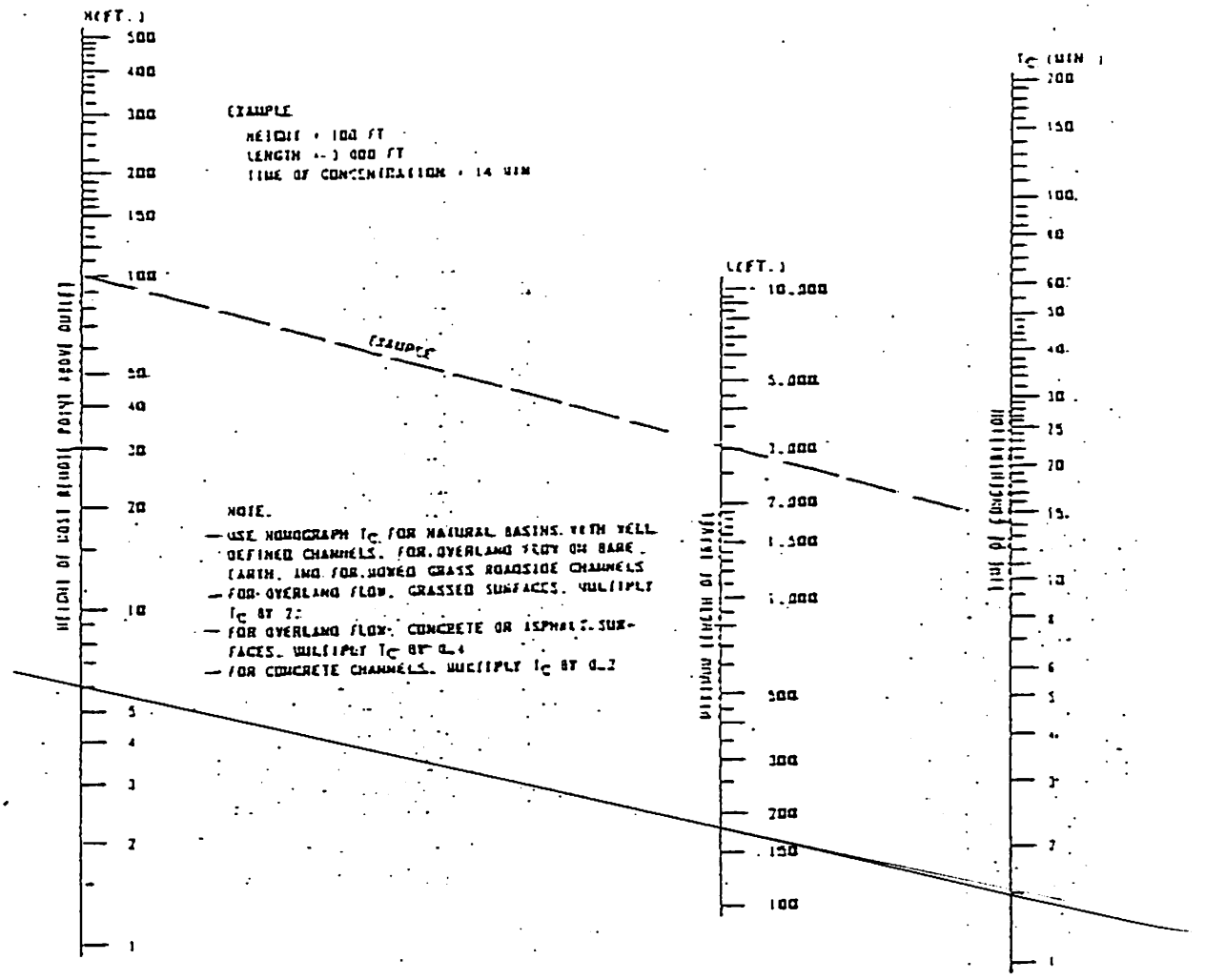
UPPER BASIN

2 year-20min H.W.	526.85 ft
15 year-20min H.W.	528.23 ft
25 year-20min H.W.	528.93 ft
100 year-20min H.W. (low flow blocked)	529.50 ft
Overflow Sill	528.96
Top Of Berm	530.50

LOWER BASIN

2 year-20min H.W.	510.64 ft
15 year-20min H.W.	512.96 ft
25 year-20min H.W.	512.59 ft
100 year-20min H.W. (low flow blocked)	513.60 ft
Overflow Sill	512.60
Top Of Berm	514.60

BAX ENGINEERING CO., INC.
1052 South Cloverleaf Drive
St. Peters, MO 63376-6445
636-928-5552 FAX 928-1718

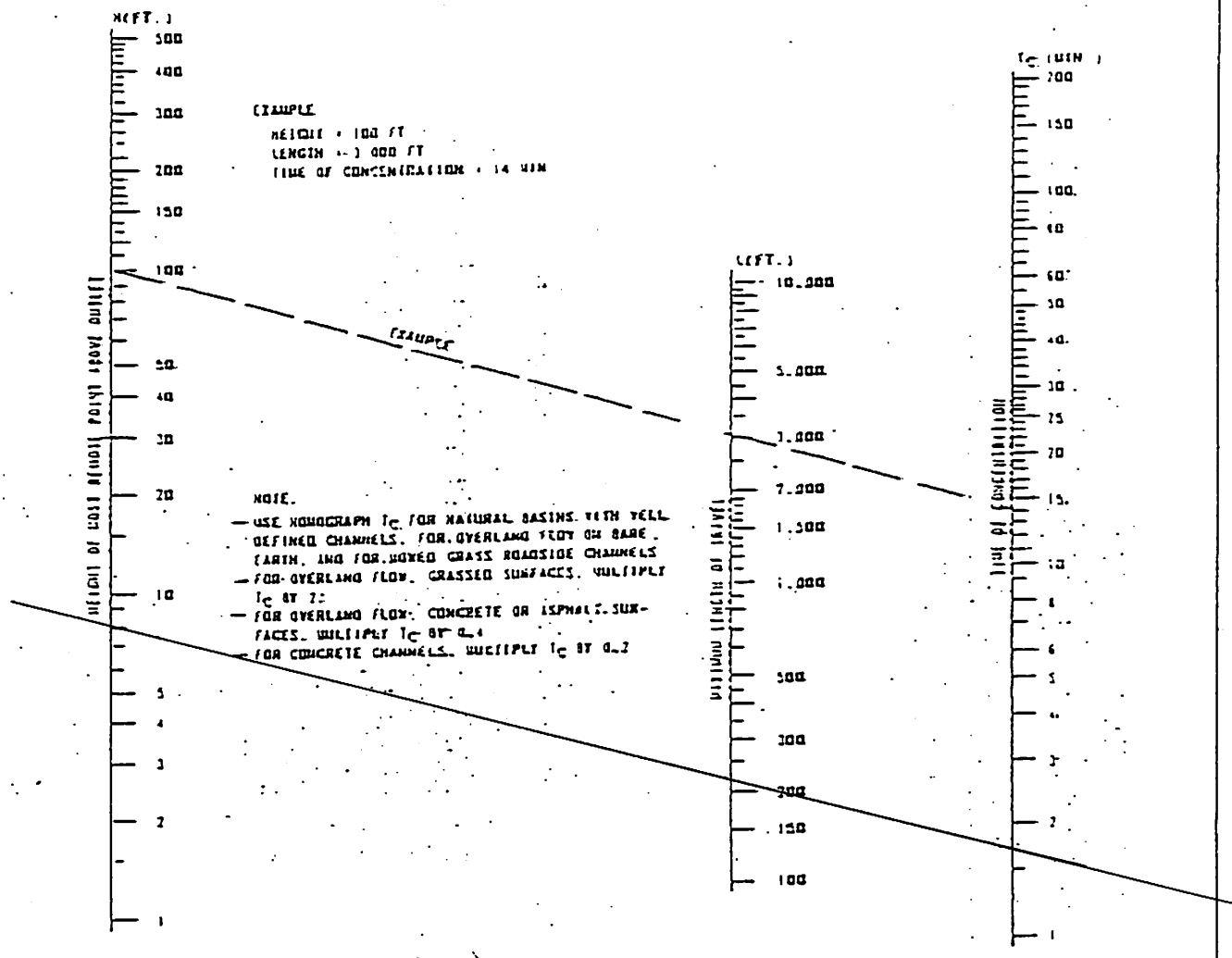


$.4\,(1.5) = .6\,\text{min}$

FIGURE 1

TIME OF CONCENTRATION OF SMALL DRAINAGE BASINS

1052 South Cloverleaf Drive
St. Peters, MO 63376-6445



$$.4(1.70) = 0.68 \text{ min}$$

FIGURE 2

TIME OF CONCENTRATION OF SMALL DRAINAGE BASINS

1052 South Cloverleaf Drive
St. Peters, MO 63376-6445

==========
JOB TITLE
==========

JOB TITLE NOT SPECIFIED
Press Units & Storm button (main menu screen) to enter title.

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POND VOLUME CALCULATIONS

Planimeter scale: 1.00 ft/in

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (cu.ft)	Volume Sum (cu.ft)
507.00	.000	.0000	.0000	0	0
508.00	1882.000	.0432	.0432	627	627
510.00	3875.000	.0890	.1942	5638	6266
512.00	6198.000	.1423	.3437	9982	16248
514.00	8794.000	.2019	.5137	14917	31165

POND VOLUME EQUATIONS

* 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

File.... E:\PONDPACK\11282\11282.PPW

POND VOLUME CALCULATIONS

Planimeter scale: 1.00 ft/in

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (cu.ft)	Volume Sum (cu.ft)
523.00	.000	.0000	.0000	0	0
524.00	783.000	.0180	.0180	261	261
526.00	1665.000	.0382	.0824	2393	2654
528.00	2870.000	.0659	.1543	4481	7135
530.00	4322.000	.0992	.2460	7143	14277

POND VOLUME EQUATIONS

* 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

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 507.00 ft
Increment = .20 ft
Max. Elev.= 514.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Area	4	--->	TW	511.900	514.000
Weir-Rectangular	3	--->	TW	510.650	511.950
Orifice-Area	2	--->	TW	509.000	514.000
Weir-Rectangular	1	--->	TW	507.000	509.000

TW SETUP, DS Channel

OUTLET STRUCTURE INPUT DATA

Structure ID = 4
Structure Type = Orifice-Area

# of Openings	=	1
Invert Elev.	=	510.65 ft
Area	=	1.4060 sq.ft
Top of Orifice	=	511.90 ft
Datum Elev.	=	511.28 ft
Orifice Coeff.	=	.600

Structure ID = 3
Structure Type = Weir-Rectangular

# of Openings	=	1
Crest Elev.	=	510.65 ft
Weir Length	=	1.13 ft
Weir Coeff.	=	3.000000

Weir TW effects (Use adjustment equation)

Structure ID = 2
Structure Type = Orifice-Area

# of Openings	=	1
Invert Elev.	=	507.00 ft
Area	=	1.7500 sq.ft
Top of Orifice	=	509.00 ft
Datum Elev.	=	508.00 ft
Orifice Coeff.	=	.600

OUTLET STRUCTURE INPUT DATA

Structure ID = 1
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 507.00 ft
Weir Length = .88 ft
Weir Coeff. = 3.000000

Weir TW effects (Use adjustment equation)

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 30
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .10 cfs
Max. Q tolerance = .10 cfs

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

WS Elev, Total Q		Notes		
		Converge		
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
507.00	.00	Free Outfall	1	
507.20	.23	Free Outfall	1	
507.40	.66	Free Outfall	1	
507.60	1.22	Free Outfall	1	
507.80	1.88	Free Outfall	1	
508.00	2.63	Free Outfall	1	
508.20	3.45	Free Outfall	1	
508.40	4.35	Free Outfall	1	
508.60	5.31	Free Outfall	1	
508.80	6.34	Free Outfall	1	
509.00	8.42	Free Outfall	2	
509.20	9.23	Free Outfall	2	
509.40	9.97	Free Outfall	2	
509.60	10.65	Free Outfall	2	
509.80	11.30	Free Outfall	2	
510.00	11.91	Free Outfall	2	
510.20	12.49	Free Outfall	2	
510.40	13.05	Free Outfall	2	
510.60	13.58	Free Outfall	2	
510.65	13.71	Free Outfall	3	+2
510.80	14.29	Free Outfall	3	+2
511.00	15.29	Free Outfall	3	+2
511.20	16.44	Free Outfall	3	+2
511.40	17.72	Free Outfall	3	+2
511.60	19.11	Free Outfall	3	+2
511.80	20.58	Free Outfall	3	+2
512.00	22.61	Free Outfall	4	+2
512.20	23.77	Free Outfall	4	+2
512.40	24.85	Free Outfall	4	+2
512.60	25.85	Free Outfall	4	+2
512.80	26.81	Free Outfall	4	+2
513.00	27.72	Free Outfall	4	+2
513.20	28.60	Free Outfall	4	+2
513.40	29.44	Free Outfall	4	+2
513.60	30.25	Free Outfall	4	+2
513.80	31.04	Free Outfall	4	+2
514.00	31.80	Free Outfall	4	+2

File.... E:\PONDPACK\11282\11282.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 523.00 ft
Increment = .10 ft
Max. Elev.= 530.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Area	2	--->	TW	523.750	530.000
Weir-Rectangular	1	--->	TW	523.000	523.750

TW SETUP, DS Channel

OUTLET STRUCTURE INPUT DATA

Structure ID = 2
Structure Type = Orifice-Area

# of Openings = 1
Invert Elev. = 523.00 ft
Area = .2500 sq.ft
Top of Orifice = 523.75 ft
Datum Elev. = 523.38 ft
Orifice Coeff. = .600

Structure ID = 1
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 523.00 ft
Weir Length = .33 ft
Weir Coeff. = 3.000000

Weir TW effects (Use adjustment equation)

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 30
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .10 cfs
Max. Q tolerance = .10 cfs

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

WS Elev, Total Q		Notes		
		Converge		
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
523.00	.00	Free Outfall		1
523.10	.03	Free Outfall		1
523.20	.09	Free Outfall		1
523.30	.16	Free Outfall		1
523.40	.25	Free Outfall		1
523.50	.35	Free Outfall		1
523.60	.46	Free Outfall		1
523.70	.59	Free Outfall		1
523.80	.78	Free Outfall		2
523.90	.87	Free Outfall		2
524.00	.95	Free Outfall		2
524.10	1.02	Free Outfall		2
524.20	1.09	Free Outfall		2
524.30	1.16	Free Outfall		2
524.40	1.22	Free Outfall		2
524.50	1.28	Free Outfall		2
524.60	1.33	Free Outfall		2
524.70	1.39	Free Outfall		2
524.80	1.44	Free Outfall		2
524.90	1.49	Free Outfall		2
525.00	1.53	Free Outfall		2
525.10	1.58	Free Outfall		2
525.20	1.63	Free Outfall		2
525.30	1.67	Free Outfall		2
525.40	1.71	Free Outfall		2
525.50	1.75	Free Outfall		2
525.60	1.79	Free Outfall		2
525.70	1.83	Free Outfall		2
525.80	1.87	Free Outfall		2
525.90	1.91	Free Outfall		2
526.00	1.95	Free Outfall		2
526.10	1.99	Free Outfall		2
526.20	2.02	Free Outfall		2
526.30	2.06	Free Outfall		2
526.40	2.09	Free Outfall		2
526.50	2.13	Free Outfall		2
526.60	2.16	Free Outfall		2
526.70	2.19	Free Outfall		2
526.80	2.23	Free Outfall		2
526.90	2.26	Free Outfall		2

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

WS Elev, Total Q		Notes		
		Converge		
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
527.00	2.29	Free Outfall		2
527.10	2.32	Free Outfall		2
527.20	2.35	Free Outfall		2
527.30	2.38	Free Outfall		2
527.40	2.41	Free Outfall		2
527.50	2.44	Free Outfall		2
527.60	2.47	Free Outfall		2
527.70	2.50	Free Outfall		2
527.80	2.53	Free Outfall		2
527.90	2.56	Free Outfall		2
528.00	2.59	Free Outfall		2
528.10	2.62	Free Outfall		2
528.20	2.64	Free Outfall		2
528.30	2.67	Free Outfall		2
528.40	2.70	Free Outfall		2
528.50	2.72	Free Outfall		2
528.60	2.75	Free Outfall		2
528.70	2.78	Free Outfall		2
528.80	2.80	Free Outfall		2
528.90	2.83	Free Outfall		2
529.00	2.85	Free Outfall		2
529.10	2.88	Free Outfall		2
529.20	2.90	Free Outfall		2
529.30	2.93	Free Outfall		2
529.40	2.95	Free Outfall		2
529.50	2.98	Free Outfall		2
529.60	3.00	Free Outfall		2
529.70	3.03	Free Outfall		2
529.80	3.05	Free Outfall		2
529.90	3.07	Free Outfall		2
530.00	3.10	Free Outfall		2

LEVEL POOL ROUTING DATA

HYG Dir = E:\PONDPACK\11282\
Inflow HYG file = NONE STORED - LOWER BASIN IN 002
Outflow HYG file = NONE STORED - LOWER BASIN OUT 002

Pond Node Data = LOWER BASIN
Pond Volume Data = LOWER BASIN
Pond Outlet Data = LOWER STRUCTURE

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	507.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
507.00	.00	0	.0000	.00	.00	.00
507.20	.23	5	.0017	.00	.23	.40
507.40	.66	40	.0069	.00	.66	2.00
507.60	1.22	136	.0156	.00	1.22	5.74
507.80	1.88	321	.0277	.00	1.88	12.58
508.00	2.63	627	.0432	.00	2.63	23.54
508.20	3.45	1020	.0470	.00	3.45	37.46
508.40	4.35	1447	.0510	.00	4.35	52.60
508.60	5.31	1910	.0552	.00	5.31	68.99
508.80	6.34	2410	.0595	.00	6.34	86.67
509.00	8.42	2948	.0640	.00	8.42	106.70
509.20	9.23	3526	.0687	.00	9.23	126.77
509.40	9.97	4146	.0735	.00	9.97	148.15
509.60	10.65	4808	.0785	.00	10.65	170.91
509.80	11.30	5514	.0836	.00	11.30	195.10
510.00	11.91	6266	.0890	.00	11.91	220.77
510.20	12.49	7061	.0937	.00	12.49	247.87
510.40	13.05	7899	.0986	.00	13.05	276.35
510.60	13.58	8780	.1036	.00	13.58	306.25
510.65	13.71	9007	.1049	.00	13.71	313.95
510.80	14.29	9705	.1088	.00	14.29	337.80
511.00	15.29	10676	.1141	.00	15.29	371.16
511.20	16.44	11693	.1195	.00	16.44	406.22

LEVEL POOL ROUTING DATA

HYG Dir = E:\PONDPACK\11282\
Inflow HYG file = NONE STORED - LOWER BASIN IN 002
Outflow HYG file = NONE STORED - LOWER BASIN OUT 002

Pond Node Data = LOWER BASIN
Pond Volume Data = LOWER BASIN
Pond Outlet Data = LOWER STRUCTURE

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	507.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
511.40	17.72	12758	.1250	.00	17.72	442.99
511.60	19.11	13871	.1306	.00	19.11	481.48
511.80	20.58	15034	.1364	.00	20.58	521.72
512.00	22.61	16248	.1423	.00	22.61	564.21
512.20	23.77	17512	.1478	.00	23.77	607.49
512.40	24.85	18824	.1534	.00	24.85	652.29
512.60	25.85	20184	.1591	.00	25.85	698.66
512.80	26.81	21595	.1649	.00	26.81	746.65
513.00	27.72	23057	.1708	.00	27.72	796.30
513.20	28.60	24572	.1768	.00	28.60	847.64
513.40	29.44	26138	.1829	.00	29.44	900.72
513.60	30.25	27759	.1891	.00	30.25	955.53
513.80	31.04	29434	.1955	.00	31.04	1012.16
514.00	31.80	31165	.2019	.00	31.80	1070.62

SUMMARY FOR HYDROGRAPH ADDITION
at Node: LOWER BASIN IN

HYG Directory: E:\PONDPACK\11282\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
A 20	LOWER		002L YEAR	
PR 10	UPPER BASIN IN		PR 10	002

INFLOWS TO: LOWER BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	002L YEAR		19778	3.00	16.49
	PR 10	002	6537	22.00	2.24

TOTAL FLOW INTO: LOWER BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	LOWER BASIN IN	002	26315	20.00	18.71

TOTAL NODE INFLOW...
HYG file =
HYG ID = LOWER BASIN IN
HYG Tag = 002

Peak Discharge =	18.71 cfs
Time to Peak =	20.00 min
HYG Volume =	26315 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	5.84	11.72	17.55	17.73
5.00	17.87	17.98	18.07	18.15	18.22
10.00	18.29	18.34	18.40	18.45	18.49
15.00	18.53	18.57	18.61	18.64	18.67
20.00	18.71	13.29	7.68	2.23	2.21
25.00	2.19	2.17	2.14	2.12	2.10
30.00	2.08	2.05	2.03	2.00	1.98
35.00	1.95	1.93	1.90	1.87	1.84
40.00	1.82	1.79	1.76	1.72	1.69
45.00	1.66	1.63	1.59	1.56	1.52
50.00	1.48	1.44	1.40	1.36	1.32
55.00	1.27	1.23	1.18	1.13	1.08
60.00	1.03	.98	.92	.86	.77
65.00	.59	.47	.36	.24	.13
70.00	.01	.00			

SUMMARY FOR HYDROGRAPH ADDITION
at Node: LOWER BASIN IN

HYG Directory: E:\PONDPACK\11282\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
A 20	LOWER		015L YEAR	
PR 10	UPPER BASIN IN		PR 10	015

INFLOWS TO: LOWER BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	015L YEAR		31892	3.00	26.59
	PR 10	015	10543	22.00	2.65

TOTAL FLOW INTO: LOWER BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	LOWER BASIN IN	015	42435	20.00	29.21

TOTAL NODE INFLOW...
HYG file =
HYG ID   = LOWER BASIN IN
HYG Tag = 015

Peak Discharge =	29.21 cfs
Time to Peak =	20.00 min
HYG Volume =	42435 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	9.29	18.53	27.84	28.07
5.00	28.23	28.37	28.48	28.57	28.65
10.00	28.72	28.79	28.85	28.91	28.96
15.00	29.01	29.05	29.09	29.13	29.17
20.00	29.21	20.46	11.43	2.65	2.63
25.00	2.62	2.60	2.59	2.57	2.56
30.00	2.54	2.52	2.51	2.49	2.47
35.00	2.46	2.44	2.42	2.41	2.39
40.00	2.37	2.35	2.33	2.31	2.30
45.00	2.28	2.26	2.24	2.21	2.19
50.00	2.17	2.15	2.13	2.11	2.08
55.00	2.06	2.04	2.01	1.99	1.96
60.00	1.93	1.91	1.88	1.85	1.82
65.00	1.79	1.76	1.73	1.70	1.67
70.00	1.64	1.60	1.57	1.53	1.49
75.00	1.45	1.41	1.37	1.33	1.29
80.00	1.24	1.19	1.15	1.10	1.05
85.00	.99	.94	.88	.80	.63
90.00	.50	.39	.27	.16	.03
95.00	.00				

SUMMARY FOR HYDROGRAPH ADDITION
at Node: LOWER BASIN IN

HYG Directory: E:\PONDPACK\11282\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
A 20	LOWER		025L YEAR	
PR 10	UPPER BASIN IN		PR 10	025

INFLOWS TO: LOWER BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	025L YEAR		39352	3.00	32.81
	PR 10	025	13014	22.00	2.83

TOTAL FLOW INTO: LOWER BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	LOWER BASIN IN	025	52366	20.00	35.61

TOTAL NODE INFLOW...
HYG file =
HYG ID   = LOWER BASIN IN
HYG Tag = 025

Peak Discharge =	35.61 cfs
Time to Peak =	20.00 min
HYG Volume =	52366 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	11.41	22.70	34.16	34.40
5.00	34.58	34.72	34.84	34.94	35.02
10.00	35.10	35.17	35.23	35.29	35.34
15.00	35.39	35.44	35.49	35.53	35.57
20.00	35.61	24.81	13.66	2.83	2.82
25.00	2.81	2.79	2.78	2.77	2.75
30.00	2.74	2.73	2.71	2.70	2.69
35.00	2.67	2.66	2.64	2.63	2.61
40.00	2.60	2.58	2.57	2.55	2.54
45.00	2.52	2.50	2.49	2.47	2.45
50.00	2.44	2.42	2.40	2.39	2.37
55.00	2.35	2.33	2.31	2.29	2.27
60.00	2.25	2.23	2.21	2.19	2.17
65.00	2.15	2.12	2.10	2.08	2.05
70.00	2.03	2.01	1.98	1.95	1.93
75.00	1.90	1.87	1.85	1.82	1.79
80.00	1.76	1.73	1.69	1.66	1.63
85.00	1.59	1.56	1.52	1.48	1.45
90.00	1.41	1.36	1.32	1.28	1.23
95.00	1.19	1.14	1.09	1.04	.98
100.00	.92	.86	.79	.60	.48
105.00	.36	.25	.13	.02	.00

LEVEL POOL ROUTING SUMMARY

HYG Dir = E:\PONDPACK\11282\
Inflow HYG file = NONE STORED - LOWER BASIN IN 002
Outflow HYG file = NONE STORED - LOWER BASIN OUT 002

Pond Node Data = LOWER BASIN
Pond Volume Data = LOWER BASIN
Pond Outlet Data = LOWER STRUCTURE

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	507.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	18.71 cfs	at	20.00 min
Peak Outflow	=	13.69 cfs	at	21.00 min
Peak Elevation	=	510.64 ft		
Peak Storage	=	8977 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	26315
- Infiltration	=	0
- HYG Vol OUT	=	26315
- Retained Vol	=	0
Unrouted Vol	= -	cu.ft (.000% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = E:\PONDPACK\11282\
Inflow HYG file = NONE STORED - LOWER BASIN IN 015
Outflow HYG file = NONE STORED - LOWER BASIN OUT 015

Pond Node Data = LOWER BASIN
Pond Volume Data = LOWER BASIN
Pond Outlet Data = LOWER STRUCTURE

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	507.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	29.21 cfs	at	20.00 min
Peak Outflow	=	22.20 cfs	at	21.00 min
Peak Elevation	=	511.96 ft		
Peak Storage	=	16001 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	42435
- Infiltration	=	0
- HYG Vol OUT	=	42435
- Retained Vol	=	0
Unrouted Vol	=	0 cu.ft (.000% of Outflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = E:\PONDPACK\11282\
Inflow HYG file = NONE STORED - LOWER BASIN IN 025
Outflow HYG file = NONE STORED - LOWER BASIN OUT 025

Pond Node Data = LOWER BASIN
Pond Volume Data = LOWER BASIN
Pond Outlet Data = LOWER STRUCTURE

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	507.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	35.61 cfs	at	20.00 min
Peak Outflow	=	25.80 cfs	at	21.00 min
Peak Elevation	=	512.59 ft		
Peak Storage	=	20114 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	52366
- Infiltration	=	0
- HYG Vol OUT	=	52366
- Retained Vol	=	0
Unrouted Vol	= -	cu.ft (.000% of Inflow Volume)

LEVEL POOL ROUTING DATA

HYG Dir = E:\PONDPACK\11282\
Inflow HYG file = NONE STORED - UPPER BASIN IN 002
Outflow HYG file = NONE STORED - UPPER BASIN OUT 002

Pond Node Data = UPPER BASIN
Pond Volume Data = UPPER BASIN
Pond Outlet Data = UPPER STRUCTURE

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 523.00 ft
Starting Volume = 0 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
523.00	.00	0	.0000	.00	.00	.00
523.10	.03	0	.0002	.00	.03	.04
523.20	.09	2	.0007	.00	.09	.16
523.30	.16	7	.0016	.00	.16	.40
523.40	.25	17	.0029	.00	.25	.81
523.50	.35	33	.0045	.00	.35	1.44
523.60	.46	56	.0065	.00	.46	2.34
523.70	.59	90	.0088	.00	.59	3.57
523.80	.78	134	.0115	.00	.78	5.24
523.90	.87	190	.0146	.00	.87	7.21
524.00	.95	261	.0180	.00	.95	9.65
524.10	1.02	341	.0188	.00	1.02	12.39
524.20	1.09	425	.0197	.00	1.09	15.26
524.30	1.16	512	.0205	.00	1.16	18.24
524.40	1.22	604	.0214	.00	1.22	21.34
524.50	1.28	699	.0223	.00	1.28	24.58
524.60	1.33	798	.0233	.00	1.33	27.94
524.70	1.39	902	.0242	.00	1.39	31.44
524.80	1.44	1009	.0252	.00	1.44	35.08
524.90	1.49	1121	.0262	.00	1.49	38.85
525.00	1.53	1237	.0272	.00	1.53	42.77
525.10	1.58	1358	.0282	.00	1.58	46.83
525.20	1.63	1483	.0292	.00	1.63	51.05

LEVEL POOL ROUTING DATA

HYG Dir = E:\PONDPACK\11282\
Inflow HYG file = NONE STORED - UPPER BASIN IN 002
Outflow HYG file = NONE STORED - UPPER BASIN OUT 002

Pond Node Data = UPPER BASIN
Pond Volume Data = UPPER BASIN
Pond Outlet Data = UPPER STRUCTURE

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	523.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
525.30	1.67	1612	.0303	.00	1.67	55.41
525.40	1.71	1746	.0314	.00	1.71	59.93
525.50	1.75	1885	.0325	.00	1.75	64.60
525.60	1.79	2029	.0336	.00	1.79	69.43
525.70	1.83	2178	.0347	.00	1.83	74.43
525.80	1.87	2332	.0359	.00	1.87	79.59
525.90	1.91	2490	.0370	.00	1.91	84.92
526.00	1.95	2654	.0382	.00	1.95	90.42
526.10	1.99	2823	.0394	.00	1.99	96.10
526.20	2.02	2998	.0407	.00	2.02	101.95
526.30	2.06	3177	.0419	.00	2.06	107.97
526.40	2.09	3363	.0432	.00	2.09	114.19
526.50	2.13	3554	.0444	.00	2.13	120.58
526.60	2.16	3750	.0457	.00	2.16	127.16
526.70	2.19	3952	.0471	.00	2.19	133.93
526.80	2.23	4160	.0484	.00	2.23	140.89
526.90	2.26	4374	.0497	.00	2.26	148.05
527.00	2.29	4593	.0511	.00	2.29	155.40
527.10	2.32	4819	.0525	.00	2.32	162.95
527.20	2.35	5051	.0539	.00	2.35	170.71
527.30	2.38	5289	.0554	.00	2.38	178.68
527.40	2.41	5533	.0568	.00	2.41	186.85
527.50	2.44	5784	.0583	.00	2.44	195.23

LEVEL POOL ROUTING DATA

HYG Dir = E:\PONDPACK\11282\
Inflow HYG file = NONE STORED - UPPER BASIN IN 002
Outflow HYG file = NONE STORED - UPPER BASIN OUT 002

Pond Node Data = UPPER BASIN
Pond Volume Data = UPPER BASIN
Pond Outlet Data = UPPER STRUCTURE

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	523.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
527.60	2.47	6041	.0598	.00	2.47	203.83
527.70	2.50	6304	.0613	.00	2.50	212.65
527.80	2.53	6574	.0628	.00	2.53	221.68
527.90	2.56	6851	.0643	.00	2.56	230.94
528.00	2.59	7135	.0659	.00	2.59	240.42
528.10	2.62	7425	.0674	.00	2.62	250.12
528.20	2.64	7722	.0689	.00	2.64	260.04
528.30	2.67	8025	.0705	.00	2.67	270.19
528.40	2.70	8336	.0720	.00	2.70	280.56
528.50	2.72	8653	.0736	.00	2.72	291.15
528.60	2.75	8977	.0752	.00	2.75	301.98
528.70	2.78	9308	.0768	.00	2.78	313.04
528.80	2.80	9646	.0784	.00	2.80	324.33
528.90	2.83	9991	.0800	.00	2.83	335.86
529.00	2.85	10343	.0817	.00	2.85	347.63
529.10	2.88	10703	.0834	.00	2.88	359.63
529.20	2.90	11070	.0851	.00	2.90	371.89
529.30	2.93	11444	.0868	.00	2.93	384.39
529.40	2.95	11826	.0885	.00	2.95	397.14
529.50	2.98	12215	.0902	.00	2.98	410.14
529.60	3.00	12612	.0920	.00	3.00	423.39
529.70	3.03	13017	.0938	.00	3.03	436.91
529.80	3.05	13429	.0956	.00	3.05	450.68

LEVEL POOL ROUTING DATA

HYG Dir = E:\PONDPACK\11282\
Inflow HYG file = NONE STORED - UPPER BASIN IN 002
Outflow HYG file = NONE STORED - UPPER BASIN OUT 002

Pond Node Data = UPPER BASIN
Pond Volume Data = UPPER BASIN
Pond Outlet Data = UPPER STRUCTURE

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	523.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
529.90	3.07	13849	.0974	.00	3.07	464.72
530.00	3.10	14277	.0992	.00	3.10	479.01

SUMMARY FOR HYDROGRAPH ADDITION
at Node: UPPER BASIN IN

HYG Directory: E:\PONDPACK\11282\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
A 10	UPPER		002 YEAR	

INFLOWS TO: UPPER BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	002 YEAR		6537	3.00	5.45

TOTAL FLOW INTO: UPPER BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	UPPER BASIN IN	002	6537	3.00	5.45

TOTAL NODE INFLOW...
HYG file =
HYG ID = UPPER BASIN IN
HYG Tag = 002

Peak Discharge =	5.45 cfs
Time to Peak =	3.00 min
HYG Volume =	6537 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	1.80	3.60	5.45	5.45
5.00	5.45	5.45	5.45	5.45	5.45
10.00	5.45	5.45	5.45	5.45	5.45
15.00	5.45	5.45	5.45	5.45	5.45
20.00	5.45	3.65	1.80	.00	

SUMMARY FOR HYDROGRAPH ADDITION
at Node: UPPER BASIN IN

HYG Directory: E:\PONDPACK\11282\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
A 10	UPPER		015 YEAR	

INFLOWS TO: UPPER BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	015 YEAR		10543	3.00	8.79

TOTAL FLOW INTO: UPPER BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	UPPER BASIN IN	015	10543	3.00	8.79

TOTAL NODE INFLOW...
HYG file =
HYG ID = UPPER BASIN IN
HYG Tag = 015

Peak Discharge =	8.79 cfs
Time to Peak =	3.00 min
HYG Volume =	10543 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	2.90	5.80	8.79	8.79
5.00	8.79	8.79	8.79	8.79	8.79
10.00	8.79	8.79	8.79	8.79	8.79
15.00	8.79	8.79	8.79	8.79	8.79
20.00	8.79	5.89	2.90	.00	

SUMMARY FOR HYDROGRAPH ADDITION
at Node: UPPER BASIN IN

HYG Directory: E:\PONDPACK\11282\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
A 10	UPPER		025 YEAR	

INFLOWS TO: UPPER BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	025 YEAR		13014	3.00	10.85

TOTAL FLOW INTO: UPPER BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	UPPER BASIN IN	025	13014	3.00	10.85

TOTAL NODE INFLOW...
HYG file =
HYG ID   = UPPER BASIN IN
HYG Tag = 025

Peak Discharge =	10.85 cfs
Time to Peak =	3.00 min
HYG Volume =	13014 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	3.58	7.16	10.85	10.85
5.00	10.85	10.85	10.85	10.85	10.85
10.00	10.85	10.85	10.85	10.85	10.85
15.00	10.85	10.85	10.85	10.85	10.85
20.00	10.85	7.27	3.58	.00	

LEVEL POOL ROUTING SUMMARY

HYG Dir = E:\PONDPACK\11282\
Inflow HYG file = NONE STORED - UPPER BASIN IN 002
Outflow HYG file = NONE STORED - UPPER BASIN OUT 002

Pond Node Data = UPPER BASIN
Pond Volume Data = UPPER BASIN
Pond Outlet Data = UPPER STRUCTURE

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	523.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	5.45 cfs	at	3.00 min
Peak Outflow	=	2.24 cfs	at	22.00 min
Peak Elevation	=	526.85 ft		
Peak Storage	=	4259 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	6537
- Infiltration	=	0
- HYG Vol OUT	=	6537
- Retained Vol	=	0
Unrouted Vol	=	0 cu.ft (.000% of Outflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = E:\PONDPACK\11282\
Inflow HYG file = NONE STORED - UPPER BASIN IN 015
Outflow HYG file = NONE STORED - UPPER BASIN OUT 015

Pond Node Data = UPPER BASIN
Pond Volume Data = UPPER BASIN
Pond Outlet Data = UPPER STRUCTURE

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	523.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	8.79 cfs	at	3.00 min
Peak Outflow	=	2.65 cfs	at	22.00 min
Peak Elevation	=	528.23 ft		
Peak Storage	=	7819 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	10543
- Infiltration	=	0
- HYG Vol OUT	=	10543
- Retained Vol	=	0
Unrouted Vol	=	0 cu.ft (.000% of Outflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = E:\PONDPACK\11282\
Inflow HYG file = NONE STORED - UPPER BASIN IN 025
Outflow HYG file = NONE STORED - UPPER BASIN OUT 025

Pond Node Data = UPPER BASIN
Pond Volume Data = UPPER BASIN
Pond Outlet Data = UPPER STRUCTURE

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	523.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	10.85 cfs	at	3.00 min
Peak Outflow	=	2.83 cfs	at	22.00 min
Peak Elevation	=	528.93 ft		
Peak Storage	=	10079 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	13014
- Infiltration	=	0
- HYG Vol OUT	=	13014
- Retained Vol	=	0
Unrouted Vol	=	0 cu.ft (.000% of Outflow Volume)

Index of Starting Page Numbers for ID Names