STORM WATER DETENTION CACULATIONS AND REPORT FOR MALLARD'S LANDING

Prepared for:

DOMINION CONSTRUCTION, INC
1714 Deer Tracks Trail, 2nd Floor
Town & Country, Missouri 63131

Prepared by:

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DOMINION PROPERTIES, INC.
MALLARD'S LANDING

THE CLAYTON ENGINEERING COMPANY
12755 OLIVE BLVD - SUITE 100
ST. LOUIS, MO 63141
(314) 542-0009

<<<<< PIPE HYDRAULICS MODULE >>>>>

Description =
System Number = 1
Return Period (yr) = 15
Rainfall Duration (min) = 20
Runoff Factor Multiplier = 1.00
Starting HGL Elev. (ft) = 535.00
Use St. Louis Co./MSD Losses? = Y

STRUCTURES UP/LOW	FLOWLINES UP/LOW	DIAM	LENGTH	n	AREA/PI	Qadd	Qtot/Qfull	CS/RS	Yn/Yc	PARTIAL V/Y	FULL V/Vhead	LOSSES F/C	LOSSES V/T	COND UP/LOW	HGL UP/LOW	UPPER STRUCT TOP/FREEBD
CB 1-28	556.29	12	63	0.013	0.29	0.94	0.94	2.00	0.29	1.20	1.20	0.47	0.50	ND	557.08	562.00
MH 1-27	555.03				3.30		5.05	0.07	0.41	1.08	0.02	0.00	0.00	FP	556.11	4.92
MH 1-27	555.03	12	115	0.013	0.23	0.78	1.72	5.00	0.31	2.19	2.19	5.33	0.08	OF	556.11	564.00
MH 1-11	549.28				3.30		7.99	0.23	0.56	1.42	0.07	0.00	0.00	FP	550.70	7.89
CB 1-13	555.23	12	135	0.013	0.04	0.13	0.13	3.00	0.10	0.17	0.17	2.98	0.21	ND	555.54	565.50
CB 1-12	551.18				3.30		6.19	0.00	0.15	1.17	0.00	0.00	0.00	FP	552.35	9.96
CB 1-12	551.18	12	95	0.013	0.64	2.11	2.24	2.00	0.47	2.85	2.85	1.48	0.17	OF	552.35	556.50
MH 1-11	549.28				3.30		5.05	0.39	0.64	1.42	0.13	0.00	0.00	FP	550.70	4.15
MH 1-11	549.28	12	38	0.013	0.23	1.72	3.96	3.15	0.57	5.04	5.04	0.73	0.39	OF	550.70	557.00
MH 1-10	548.08				3.30		6.34	1.23	0.84	1.47	0.39	0.00	0.03	FP	549.55	6.30
MH 1-10	548.08	12	88	0.013	0.23	0.76	4.73	3.15	0.64	6.02	6.02	2.50	0.31	OF	549.55	556.50
MH 1-9	545.31				3.30		6.34	1.75	0.90	1.27	0.56	0.00	0.16	FP	546.58	6.95
MH 1-9	545.31	12	32	0.013	0.00	0.00	4.73	3.15	0.64	6.02	6.02	0.70	0.00	OF	546.58	550.00
MH 1-8	544.30				3.30		6.34	1.75	0.90	1.31	0.56	0.00	0.27	FP	545.61	3.42
CB 1-8	544.30	18	132	0.013	0.62	2.05	6.78	1.00	0.88	3.96	3.84	0.80	0.31	ND	545.61	548.80
CB 1-7	542.98				3.30		10.53	0.41	1.01	1.39	0.23	0.00	0.12	OJ	544.37	3.19
CB 1-7	542.98	18	124	0.013	0.12	0.40	7.18	1.00	0.91	4.06	4.06	0.58	0.17	OC	544.37	553.50
CB 1-6	541.74				3.30		10.53	0.46	1.04	1.85	0.26	0.00	0.04	FP	543.59	9.13

STRUCTURES UP/LOW	FLOWLINES UP/LOW	DIAM	LENGTH	n	AREA/PI	Qadd	Qtot/Qfull	CS/RS	Yn/Yc	PARTIAL V/Y	FULL V/Vhead	LOSSES F/C	LOSSES V/T	COND UP/LOW	HGL UP/LOW	UPPER STRUCT TOP/FREEBD
CB 1-6	541.74	18	116	0.013	0.41	1.36	8.54	1.00	1.03	4.83	4.83	1.03	0.20	OF	543.59	548.80
CB 1-5	540.58				3.30		10.53	0.66	1.13	1.63	0.36	0.00	0.15	FP	542.21	5.21
CB 1-5	540.58	18	145	0.013	0.11	0.36	8.90	3.43	0.71	5.04	5.04	3.46	0.06	OF	542.21	549.80
CB 1-4	535.61				3.30		19.51	0.71	1.15	3.01	0.39	0.00	0.07	FP	538.62	7.59
CB 1-4	535.61	18	69	0.013	0.20	0.66	9.56	1.99	0.88	5.41	5.41	0.57	0.12	FP	538.62	543.80
MH 1-3	534.24				3.30		14.86	0.82	1.19	3.61	0.45	0.00	0.09	FP	537.85	5.18
CB 1-18	549.59	12	90	0.013	0.51	1.68	1.68	3.00	0.36	2.14	2.14	2.61	0.09	OF	550.68	557.00
CB 1-17	546.89				3.30		6.19	0.22	0.55	1.09	0.07	0.00	0.00	FP	547.98	6.32
CB 1-17	546.89	12	42	0.013	0.16	0.51	2.20	5.00	0.36	2.80	2.80	1.83	0.09	OF	547.98	551.50
CB 1-16	544.79				3.30		7.99	0.38	0.63	1.27	0.12	0.00	0.00	FP	546.06	3.52
CB 1-16	544.79	12	31	0.013	0.35	1.16	3.36	5.00	0.45	4.28	4.28	1.40	0.27	OF	546.06	551.50
MH 1-15	543.24				3.30		7.99	0.88	0.78	1.15	0.28	0.00	0.00	FP	544.39	5.44
MH 1-15	543.24	12	165	0.013	0.00	0.00	3.36	5.00	0.45	4.28	4.28	5.85	0.00	OF	544.39	549.00
CB 1-14	534.99				3.30		7.99	0.88	0.78	3.40	0.28	0.00	0.15	FP	538.39	4.61
CB 1-26	539.00	12	90	0.013	0.65	2.16	2.16	1.00	0.56	2.75	2.75	0.33	0.16	FP	540.55	543.50
MH 1-19	538.10				3.30		3.57	0.37	0.63	1.97	0.12	0.00	0.00	FP	540.07	2.95
CB 1-25	552.57	12	38	0.013	0.55	1.82	1.82	1.00	0.51	4.56	2.32	0.38	0.43	OC	553.51	561.00
MH 1-24	552.19				3.30		3.57	0.26	0.57	0.51	0.08	0.00	0.00	ND	552.70	7.49
MH 1-24	552.19	12	90	0.013	0.00	0.00	1.82	1.00	0.51	2.32	2.32	0.35	0.00	ND	552.70	562.00
MH 1-23	551.29				3.30		3.57	0.26	0.57	1.06	0.08	0.00	0.00	FP	552.35	9.30
MH 1-23	551.29	12	69	0.013	0.00	0.00	1.82	13.00	0.25	2.32	2.32	8.39	0.00	OF	552.35	556.20
CB 1-22	542.32				3.30		12.88	0.26	0.57	1.58	0.08	0.00	0.06	FP	543.90	3.85
CB 1-22	542.32	15	70	0.013	0.99	3.27	5.10	2.00	0.67	4.16	4.16	1.30	0.32	OF	543.90	553.00
MH 1-21	540.92				3.30		9.16	0.62	0.92	1.35	0.27	0.00	0.01	FP	542.27	9.10
MH 1-21	540.92	15	87	0.013	0.00	0.00	5.10	3.00	0.59	4.16	4.16	1.37	0.00	OF	542.27	555.00
CB 1-20	538.31				3.30		11.22	0.62	0.92	2.49	0.27	0.00	0.10	FP	540.80	12.73
CB 1-20	538.31	15	87	0.013	0.09	0.28	5.38	2.00	0.69	4.38	4.38	0.60	0.06	FP	540.80	554.50
MH 1-19	536.57				3.30		9.16	0.69	0.94	3.50	0.30	0.00	0.07	FP	540.07	13.70

STRUCTURES UP/LOW	FLOWLINES UP/LOW	DIAM	LENGTH	n	AREA/PI	Qadd	Qtot/Qfull	CS/RS	Yn/Yc	PARTIAL V/Y	FULL V/Vhead	LOSSES F/C	LOSSES V/T	COND UP/LOW	HGL UP/LOW	UPPER STRUCT TOP/FREEBD
MH 1-19	536.57	15	79	0.013	0.00	2.16	7.54	2.00	0.86	6.14	6.14	1.07	0.50	FP	540.07	543.00
CB 1-14	534.99				3.30		9.16	1.36	1.09	3.40	0.59	0.00	0.10	FP	538.39	2.93
CB 1-14	534.99	24	111	0.013	1.06	11.04	14.40	1.00	1.16	4.58	4.58	0.45	0.00	FP	538.39	540.00
MH 1-3	533.88				3.30		22.68	0.40	1.37	3.97	0.33	0.00	0.10	FP	537.85	1.61
MH 1-3	534.24	24	144	0.013	0.24	15.20	24.76	1.25	1.60	7.88	7.88	1.72	0.80	FP	537.85	545.20
CB 1-2	532.44				3.30		25.36	1.19	1.76	2.81	0.96	0.00	0.08	FP	535.25	7.35
CB 1-2	532.44	36	24	0.013	0.32	1.06	25.82	1.00	1.29	3.76	3.65	0.04	0.00	OC	535.25	538.00
FES 1-1	532.20				3.30		66.88	0.15	1.64	2.80	0.21	0.00	0.22	OJ	535.00	2.75

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DOMINION PROPERTIES, INC.
MALLARD'S LANDING

THE CLAYTON ENGINEERING COMPANY
12755 OLIVE BLVD — SUITE 100
ST. LOUIS, MO 63141
(314) 542-0009

<<<<< PIPE HYDRAULICS MODULE >>>>>

Description =
System Number = 2
Return Period (yr) = 15
Rainfall Duration (min) = 20
Runoff Factor Multiplier = 1.00
Starting HGL Elev. (ft) = 535.00
Use St. Louis Co./MSD Losses? = Y

STRUCTURES UP/LOW	FLOWLINES UP/LOW	DIAM	LENGTH	n	AREA/PI	Qadd	Qtot/Qfull	CS/RS	Yn/Yc	PARTIAL V/Y	FULL V/Vhead	LOSSES F/C	LOSSES V/T	COND UP/LOW	HGL UP/LOW	UPPER STRUCT TOP/FREEBD
CB 2-8	542.74	12	8	0.013	0.17	0.57	0.57	4.50	0.19	0.73	0.73	0.00	0.02	OC	543.46	548.80
CB 2-7	542.38				3.30		7.58	0.03	0.31	1.05	0.01	0.00	0.00	FP	543.43	5.34
CB 2-7	542.38	12	148	0.013	0.23	0.76	1.33	4.50	0.28	1.69	1.69	5.47	0.05	OF	543.43	548.50
CB 2-4	535.72				3.30		7.58	0.14	0.49	2.19	0.04	0.00	0.00	FP	537.91	5.07
CB 2-9	544.57	12	69	0.013	0.89	2.94	2.94	8.00	0.37	3.74	3.74	3.55	0.29	OF	545.86	551.50
MH 2-5	539.05				3.30		10.10	0.68	0.73	2.97	0.22	0.00	0.00	FP	542.02	5.64
FES 2-6	541.00	18	65	0.013	8.26	14.04	14.04	3.00	0.99	7.95	7.95	1.16	1.31	FP	544.49	541.00
MH 2-5	539.05				1.70		18.24	1.78	1.38	2.97	0.98	0.00	0.00	FP	542.02	-3.49
MH 2-5	539.05	18	111	0.013	0.21	3.64	17.68	3.00	1.19	10.00	10.00	3.13	0.99	FP	542.02	553.00
CB 2-4	535.72				3.30		18.24	2.82	0.00	2.19	1.55	0.00	0.00	FP	537.91	10.98
CB 2-4	535.72	24	105	0.013	0.91	4.34	22.02	3.00	1.07	7.01	7.01	1.85	0.00	OF	537.91	546.00
MH 2-3	532.57				3.30		39.29	0.94	1.68	3.30	0.76	0.00	0.19	FP	535.87	8.09
MH 2-3	532.57	24	50	0.013	0.00	0.00	22.02	1.00	1.59	7.01	7.01	0.47	0.00	FP	535.87	539.70
CB 2-2	532.07				3.30		22.68	0.94	1.68	3.27	0.76	0.00	0.06	FP	535.34	3.83
CB 2-2	532.07	30	30	0.013	0.30	0.99	23.01	1.00	1.34	4.69	4.69	0.09	0.00	FP	535.34	539.00
FES 2-1	531.77				3.30		41.13	0.31	1.63	3.23	0.34	0.00	0.25	FP	535.00	3.66

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DOMINION PROPERTIES, INC.
MALLARD'S LANDING

THE CLAYTON ENGINEERING COMPANY
12755 OLIVE BLVD — SUITE 100
ST. LOUIS, MO 63141
(314) 542-0009

<<<<< PIPE HYDRAULICS MODULE >>>>>

Description =
System Number = 3
Return Period (yr) = 15
Rainfall Duration (min) = 20
Runoff Factor Multiplier = 1.00
Starting HGL Elev. (ft) = 535.00
Use St. Louis Co./MSD Losses? = Y

STRUCTURES UP/LOW	FLOWLINES UP/LOW	DIAM	LENGTH	n	AREA/PI	Qadd	Qtot/Qfull	CS/RS	Yn/Yc	PARTIAL V/Y	FULL V/Vhead	LOSSES F/C	LOSSES V/T	COND UP/LOW	HGL UP/LOW	UPPER STRUCT TOP/FREEBD
CB 3-5	534.58	12	76	0.013	0.06	0.20	0.20	5.00	0.11	0.25	0.25	0.00	0.00	OC	535.29	542.50
CB 3-2	530.78				3.30		7.99	0.00	0.18	4.51	0.00	0.00	0.00	FP	535.29	7.21
CB 3-4	536.78	12	80	0.013	0.44	1.45	1.45	2.00	0.37	1.85	1.85	1.50	0.07	OF	537.85	542.00
MH 3-3	535.18				3.30		5.05	0.17	0.51	1.10	0.05	0.00	0.00	FP	536.28	4.15
MH 3-3	535.18	12	110	0.013	0.20	0.67	2.12	4.00	0.37	2.70	2.70	0.89	0.10	OF	536.28	545.00
CB 3-2	530.78				3.30		7.14	0.35	0.62	4.51	0.11	0.00	0.00	FP	535.29	8.72
CB 3-2	530.78	15	32	0.013	0.52	1.92	4.04	4.00	0.48	3.29	3.29	0.12	0.15	FP	535.29	537.50
FES 3-1	529.50				3.30		12.95	0.39	0.81	5.50	0.17	0.00	0.02	FP	535.00	2.21

LEGEND

UP - At upper end of pipe	Yn - Normal depth (ft)	COND - Flow condition code at each end of pipe:
LOW - At lower end of pipe	Yc - Critical depth (ft)	FP - full pipe flow
DIAM - Pipe diameter (in)	PARTIAL - Conditions at lower end of pipe	OC - open channel flow
LENGTH - Pipe length (ft)	FULL - Conditions assuming full pipe flow	ND - set to normal depth
n - Manning's roughness factor	V - Velocity (fps)	CD - set to critical depth
AREA - Upper drainage area (ac)	Y - Depth (ft)	OJ - open channel flow but hydraulic jump will occur downstream
PI - Runoff factor (cfs/ac)	Vhead - Velocity head (ft)	OF - initially set to open channel depth then set to full pipe flow
Qadd - Added flowrate (cfs)	LOSSES - Major and minor head losses	HGL - Hydraulic grade line elevation (ft)
Qtot - Total flowrate (cfs)	F - Friction in pipe (ft)	TOP - Elevation of top of upper structure (ft)
Qfull - Pipe full capacity (cfs)	C - Curve in pipe (ft)	FREEBD - Difference btwn upper HGL and TOP (ft)
CS - Construction slope of pipe (%)	V - Velocities in upper structure (ft)	
RS - Minimum required slope (%)	T - Turns in upper structure (ft)	

Notes:

1. Friction losses computed with Manning's formula if full pipe flow or back-calculated if open channel flow (simulating flow profile)
2. HGL at upper structure includes structure losses calculated with actual inflowing velocities using iterative procedure
3. Velocity and turn structure loss components only computed for incoming pipes with invert elevations below outlet crown elevation

THE CLAYTON ENGINEERING COMPANY

the clayton engineering company

Project No. **97454** Proj. Name **MALLARD'S LANDING**

Subject **Detention Calculations (2 yr. Frequency)**

By **CEY** Date **3/23/98** Checked _____ Date _____

INFLOW HYDROGRAPH PARAMETERS

Offsite Area	8.26 Ac. @	1.09 c.f.s./Ac.	=	9.00 c.f.s.
Onsite Area	11.76 Ac. @	2.26 c.f.s./Ac.	=	26.58 c.f.s.
		TOTAL PROPOSED INFLOW	=	**35.58 c.f.s.**

UNDETAINED RUNOFF FROM SITE

Developed Onsite Area	1.38 Ac. @	2.26 c.f.s./Ac.	=	3.12 c.f.s.
		TOTAL UNDETAINED RUNOFF FROM SITE	=	**3.12 c.f.s.**

ALLOWABLE OUTFLOW

Offsite Area	8.26 Ac. @	1.09 c.f.s./Ac.	=	9.00 c.f.s.
Onsite Area	11.76 Ac. @	1.09 c.f.s./Ac.	=	12.82 c.f.s.
		ALLOWABLE OUTFLOW	=	**21.82 c.f.s.**
		Less Undetained Runoff	=	**3.12 c.f.s.**
		TOTAL ALLOWABLE OUTFLOW	=	**18.70 c.f.s.**

REQUIRED DETENTION

13.14 Ac. * (2.26 - 1.09) * 30 min. * 60 sec. = **27,673 cu. ft.**

THE CLAYTON ENGINEERING COMPANY

the clayton engineering company

Project No. **97454** Proj. Name **MALLARD'S LANDING**

Subject **Detention Calculations (5 yr. Frequency)**

By **CEY** Date **3/23/98** Checked _____ Date _____

INFLOW HYDROGRAPH PARAMETERS

Offsite Area	8.26 Ac. @	1.33 c.f.s./Ac.	=	10.99 c.f.s.
Onsite Area	11.76 Ac. @	2.77 c.f.s./Ac.	=	32.58 c.f.s.
		TOTAL PROPOSED INFLOW	=	**43.56 c.f.s.**

UNDETAINED RUNOFF FROM SITE

Developed Onsite Area	1.38 Ac. @	2.77 c.f.s./Ac.	=	3.82 c.f.s.
		TOTAL UNDETAINED RUNOFF FROM SITE	=	**3.82 c.f.s.**

ALLOWABLE OUTFLOW

Offsite Area	8.26 Ac. @	1.33 c.f.s./Ac.	=	10.99 c.f.s.
Onsite Area	11.76 Ac. @	1.33 c.f.s./Ac.	=	15.64 c.f.s.
		ALLOWABLE OUTFLOW	=	**26.63 c.f.s.**
		Less Undetained Runoff	=	**3.82 c.f.s.**
		TOTAL ALLOWABLE OUTFLOW	=	**22.81 c.f.s.**

REQUIRED DETENTION

13.14 Ac. * (2.77 - 1.33) * 30 min. * 60 sec. = **34,059 cu. ft.**

THE CLAYTON ENGINEERING COMPANY

the clayton engineering company

Project No. 97454 Proj. Name MALLARD'S LANDING
Subject Detention Calculations (15 yr. Frequency)
By CEY Date 3/23/98 Checked _____ Date _____

INFLOW HYDROGRAPH PARAMETERS

Offsite Area	8.26 Ac. @	1.87 c.f.s./Ac.	=	15.45 c.f.s.
Onsite Area	11.76 Ac. @	3.30 c.f.s./Ac.	=	38.81 c.f.s.
		TOTAL PROPOSED INFLOW	=	**54.25 c.f.s.**

UNDETAINED RUNOFF FROM SITE

Developed Onsite Area	1.38 Ac. @	3.30 c.f.s./Ac.	=	4.55 c.f.s.
		TOTAL UNDETAINED RUNOFF FROM SITE	=	**4.55 c.f.s.**

ALLOWABLE OUTFLOW

Offsite Area	8.26 Ac. @	1.87 c.f.s./Ac.	=	15.45 c.f.s.
Onsite Area	11.76 Ac. @	1.87 c.f.s./Ac.	=	21.99 c.f.s.
		ALLOWABLE OUTFLOW	=	**37.44 c.f.s.**
		Less Undetained Runoff	=	**4.55 c.f.s.**
		TOTAL ALLOWABLE OUTFLOW	=	**32.89 c.f.s.**

REQUIRED DETENTION

13.14 Ac. * (3.30 - 1.87) * 30 min. * 60 sec. = **33,822 cu. ft.**

THE CLAYTON ENGINEERING COMPANY

the clayton engineering company

Project No. **97454** Proj. Name **MALLARD'S LANDING**

Subject **Detention Calculations (25 yr. Frequency)**

By **CEY** Date **3/23/98** Checked _____ Date _____

INFLOW HYDROGRAPH PARAMETERS

Offsite Area	8.26 Ac. @	2.31 c.f.s./Ac.	=	19.08 c.f.s.
Onsite Area	11.76 Ac. @	4.07 c.f.s./Ac.	=	47.86 c.f.s.
		TOTAL PROPOSED INFLOW	=	**66.94 c.f.s.**

UNDETAINED RUNOFF FROM SITE

Developed Onsite Area	1.38 Ac. @	4.07 c.f.s./Ac.	=	5.61 c.f.s.
		TOTAL UNDETAINED RUNOFF FROM SITE	=	**5.61 c.f.s.**

ALLOWABLE OUTFLOW

Offsite Area	8.26 Ac. @	2.31 c.f.s./Ac.	=	19.08 c.f.s.
Onsite Area	11.76 Ac. @	2.31 c.f.s./Ac.	=	27.17 c.f.s.
		ALLOWABLE OUTFLOW	=	**46.25 c.f.s.**
		Less Undetained Runoff	=	**5.61 c.f.s.**
		TOTAL ALLOWABLE OUTFLOW	=	**40.64 c.f.s.**

REQUIRED DETENTION

13.14 Ac. * (4.07 - 2.31) * 30 min. * 60 sec. = **41,628 cu. ft.**

THE CLAYTON ENGINEERING COMPANY

the clayton engineering company

Project No. **97454** Proj. Name **MALLARD'S LANDING**

Subject **Detention Calculations (100 yr. Frequency)**

By **CEY** Date **3/23/98** Checked _____ Date _____

INFLOW HYDROGRAPH PARAMETERS

Offsite Area	8.26 Ac. @	2.95 c.f.s./Ac.	=	24.37 c.f.s.
Onsite Area	11.76 Ac. @	5.21 c.f.s./Ac.	=	61.27 c.f.s.
	TOTAL PROPOSED INFLOW		=	**85.64 c.f.s.**

THE CLAYTON ENGINEERING COMPANY

the clayton engineering company

Project No. **97454** Proj. Name **MALLARD'S LANDING**

Subject **Detention Calculations**

By **CEY** Date 3/25/98 Checked ____ Date

SUMMARY

Storm Frequency (yrs)	Allow. Outflow c.f.s.	Required Volume c.f.	Design Outflow c.f.s.	Volume Provided c.f.
2	18.7	27,673	17.82	28,864
5	22.81	34,059	20.04	36,200
15	32.89	33,822	32.34	44,641
25	40.63	41,628	40.64	53,372
100	XX	XX	85.62	61,378

POND-2 Version: 5.17
S/N:

Mallard's Landing
Detention Calcultions
Basin Parameters

CALCULATED 03-25-1998 09:22:16
DISK FILE: n:\97454\deten\97454VOL.VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
530.00	6,721.00	6,721	0	0	0
531.00	8,016.00	8,016	22,077	7,359	7,359
532.00	9,391.00	9,391	26,083	8,694	16,053
532.50	10,104.00	10,104	29,236	4,873	20,926
533.00	10,834.00	10,834	31,401	5,233	26,160
533.50	11,579.00	11,579	33,613	5,602	31,762
534.00	12,338.00	12,338	35,869	5,978	37,740
534.50	13,112.00	13,112	38,169	6,362	44,102
535.00	13,900.00	13,900	40,512	6,752	50,854
536.00	15,520.00	15,520	44,108	14,703	65,556

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

Outlet Structure File: OUTFLOW .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
MALLARD'S LANDING
Detention Calculations

****

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

Elevation (ft)	Q (cfs)	Contributing Structures
530.00	0.0	1
530.50	1.2	1
531.00	4.1	1
531.50	7.6	1
532.00	12.3	2
532.50	14.8	2
533.00	16.9	2
533.50	18.8	2
534.00	20.5	2 +3
534.50	31.6	2 +4 +5
535.00	40.8	2 +4 +5
535.50	39.6	2 +4
536.00	0.0	

Outlet Structure File: OUTFLOW .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
MALLARD'S LANDING
Detention Calculations
****

Outlet Structure File: n:\97454\deten\OUTFLOW .STR
Planimeter Input File: n:\97454\deten\97454VOL.VOL
Rating Table Output File: n:\97454\deten\POND .PND

Min. Elev.(ft) = 530 Max. Elev.(ft) = 536 Incr.(ft) = .5

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

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
CULVERT-CR	1		->	1
ORIFICE	2		->	2
WEIR-VR	3		->	3
ORIFICE	4		->	4
WEIR-VR	5		->	5

Outflow rating table summary was stored in file:
n:\97454\deten\POND .PND

Outlet Structure File: OUTFLOW .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
MALLARD'S LANDING
Detention Calculations

****

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

CULVERT-CR
Circular Culvert (With Inlet Control)

E1 elev.(ft)?	530
E2 elev.(ft)?	531.75
Diam. (ft)?	1.75 - 21"
Inv. el.(ft)?	530
Slope (ft/ft)?	.05
T1 ratio?	
T2 ratio?	
K Coeff.?	.0098
M Coeff.?	2
c Coeff.?	.0398
Y Coeff.?	.67
Form 1 or 2?	1
Slope factor?	-.5

Outlet Structure File: OUTFLOW .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
MALLARD'S LANDING
Detention Calculations

****

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

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	531.75
E2 elev.(ft)?	536.00
Orifice coeff.?	0.6
Invert elev.(ft)?	530
Datum elev.(ft) ?	530.875
Orifice area (sq ft)?	2.405

Outlet Structure File: OUTFLOW .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
MALLARD'S LANDING
Detention Calculations

****

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

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	533.75
E2 elev.(ft)?	534.25
Weir coefficient?	3.0
Weir elev.(ft)?	534.00
Length (ft)?	1.00
Contracted/Suppressed (C/S)?	S

Outlet Structure File: OUTFLOW .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
MALLARD'S LANDING
Detention Calculations

****

>>>>>> Structure No. 4 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	534.25
E2 elev.(ft)?	536
Orifice coeff.?	3
Invert elev.(ft)?	533.75
Datum elev.(ft) ?	534.00
Orifice area (sq ft)?	0.50

Outlet Structure File: OUTFLOW .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
MALLARD'S LANDING
Detention Calculations

****

>>>>>> Structure No. 5 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	534.25
E2 elev.(ft)?	535.25
Weir coefficient?	3
Weir elev.(ft)?	534.25
Length (ft)?	2.67
Contracted/Suppressed (C/S)?	S

Outlet Structure File: OUTFLOW .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
MALLARD'S LANDING
Detention Calculations

****

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

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

Elevation (ft)	Q (cfs)	Computation Messages		
530.00	0.0	No headwater		
530.50	1.2	Equ.1: HW =.5	dc=.398	Ac=.412
531.00	4.1	Equ.1: HW =1.0	dc=.74	Ac=.968
531.50	7.6	Equ.1: HW =1.5	dc=1.023	Ac=1.46
532.00	0.0	E = or > E2=531.75		
532.50	0.0	E = or > E2=531.75		
533.00	0.0	E = or > E2=531.75		
533.50	0.0	E = or > E2=531.75		
534.00	0.0	E = or > E2=531.75		
534.50	0.0	E = or > E2=531.75		
535.00	0.0	E = or > E2=531.75		
535.50	0.0	E = or > E2=531.75		
536.00	0.0	E = or > E2=531.75		

Used Unsubmerged Equ. Form (1) for elev. less than 531.99 ft
Used Submerged Equation for elevations greater than 532.24 ft
HW=Headwater (ft) dc=Critical depth (ft) Ac=Area (sq.ft) at dc

Transition flows interpolated from the following values:
E1=531.99 ft; Q1=11.14 cfs; Dc=1.24 ft; E2=532.24 ft; Q2=12.73 cfs

Outlet Structure File: OUTFLOW .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
MALLARD'S LANDING
Detention Calculations

****

Outflow Rating Table for Structure #2
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
530.00	0.0	E < E1=531.75
530.50	0.0	E < E1=531.75
531.00	0.0	E < E1=531.75
531.50	0.0	E < E1=531.75
532.00	12.3	H =1.125
532.50	14.8	H =1.625
533.00	16.9	H =2.125
533.50	18.8	H =2.625
534.00	20.5	H =3.125
534.50	22.0	H =3.625
535.00	23.5	H =4.125
535.50	24.9	H =4.625
536.00	0.0	E = or > E2=536.00

C = .6 A = 2.405 sq.ft.
H (ft) = Table elev. - Datum elev. (530.875 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: OUTFLOW .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
MALLARD'S LANDING
Detention Calculations

****

Outflow Rating Table for Structure #3
WEIR-VR Weir - Vertical Rectangular
(Horizontal)

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

Elevation (ft)	Q (cfs)	Computation Messages
530.00	0.0	E < Inv.El.= 534
530.50	0.0	E < Inv.El.= 534
531.00	0.0	E < Inv.El.= 534
531.50	0.0	E < Inv.El.= 534
532.00	0.0	E < Inv.El.= 534
532.50	0.0	E < Inv.El.= 534
533.00	0.0	E < Inv.El.= 534
533.50	0.0	E < Inv.El.= 534
534.00	0.0	H =0.0
534.50	0.0	E = or > E2=534.25
535.00	0.0	E = or > E2=534.25
535.50	0.0	E = or > E2=534.25
536.00	0.0	E = or > E2=534.25

C = 3 L (ft) = 1
H (ft) = Table elev. - Invert elev. (534 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: OUTFLOW .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
MALLARD'S LANDING
Detention Calculations
****

Outflow Rating Table for Structure #4
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
530.00	0.0	E < E1=534.25
530.50	0.0	E < E1=534.25
531.00	0.0	E < E1=534.25
531.50	0.0	E < E1=534.25
532.00	0.0	E < E1=534.25
532.50	0.0	E < E1=534.25
533.00	0.0	E < E1=534.25
533.50	0.0	E < E1=534.25
534.00	0.0	E < E1=534.25
534.50	8.5	H =.5
535.00	12.0	H =1.0
535.50	14.7	H =1.5
536.00	0.0	E = or > E2=536

C = 3 A = .5 sq.ft.
H (ft) = Table elev. - Datum elev. (534 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: OUTFLOW .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
MALLARD'S LANDING
Detention Calculations

****

Outflow Rating Table for Structure #5
WEIR-VR Weir - Vertical Rectangular

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

Elevation (ft)	Q (cfs)	Computation Messages
530.00	0.0	E < Inv.El.= 534.25
530.50	0.0	E < Inv.El.= 534.25
531.00	0.0	E < Inv.El.= 534.25
531.50	0.0	E < Inv.El.= 534.25
532.00	0.0	E < Inv.El.= 534.25
532.50	0.0	E < Inv.El.= 534.25
533.00	0.0	E < Inv.El.= 534.25
533.50	0.0	E < Inv.El.= 534.25
534.00	0.0	E < Inv.El.= 534.25
534.50	1.0	H =.25
535.00	5.2	H =.750
535.50	0.0	E = or > E2=535.25
536.00	0.0	E = or > E2=535.25

C = 3 L (ft) = 2.67
H (ft) = Table elev. - Invert elev. (534.25 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

POND-2 Version: 5.17 S/N:
EXECUTED: 03-24-1998 17:39:41

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*****************************
*                           *
*     MALLARD'S LANDING     *
*  Detention Calculations   *
*       2 Year Storm        *
*                           *
*                           *
*****************************
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Inflow Hydrograph: n:\97454\deten\002-IN .HYD
Rating Table file: n:\97454\deten\POND .PND

----INITIAL CONDITIONS----
Elevation = 530.00 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)
530.00	0.0	0
530.50	1.2	3,517
531.00	4.1	7,359
531.50	7.6	11,534
532.00	12.3	16,054
532.50	14.8	20,926
533.00	16.9	26,160
533.50	18.8	31,762
533.75	19.6	34,703
534.00	20.5	37,740
534.25	27.3	40,872
534.50	31.6	44,101
535.00	40.8	50,854
535.50	50.8	58,002

INTERMEDIATE ROUTING COMPUTATIONS

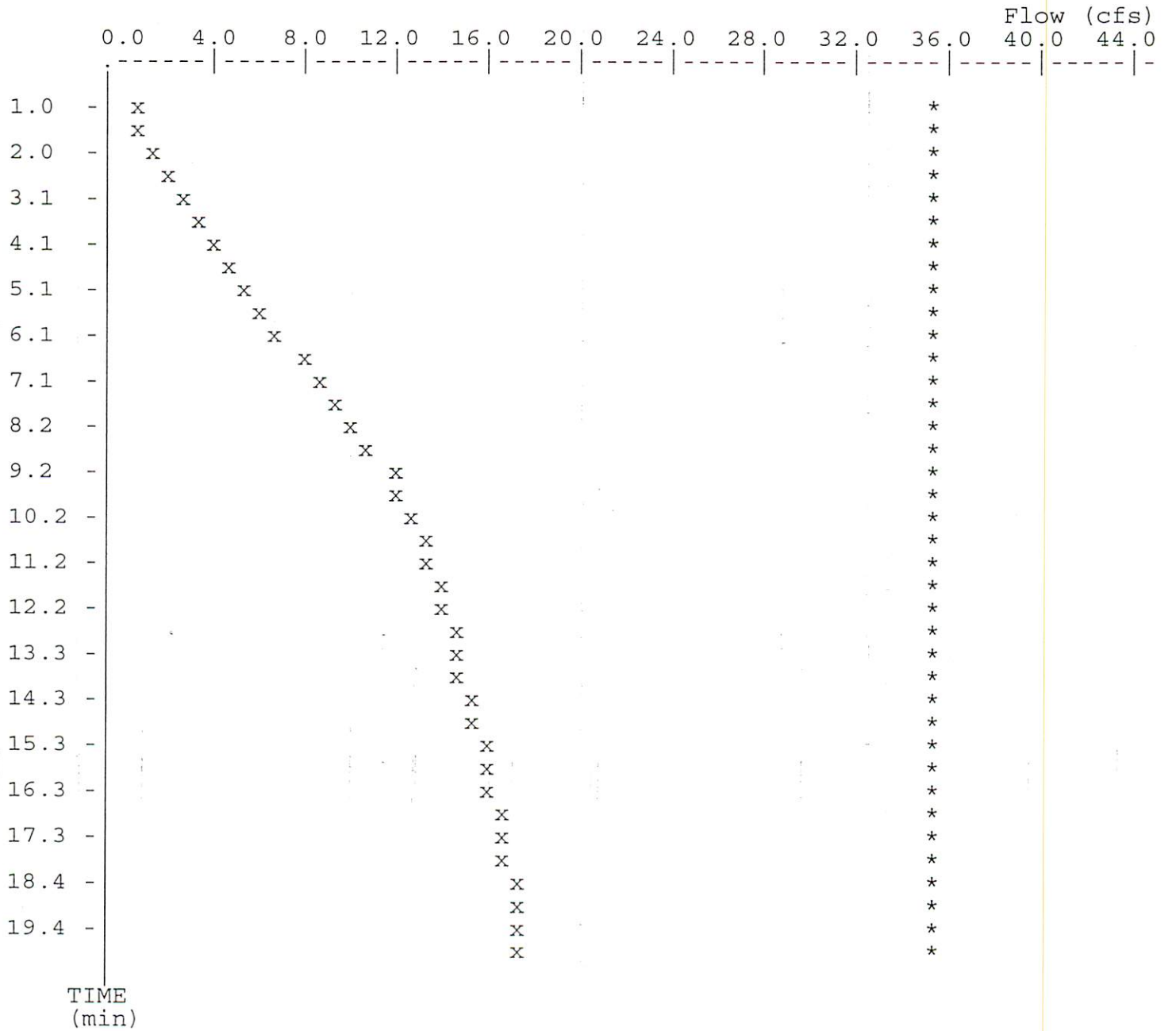
2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
117.2	118.4
245.3	249.4
384.5	392.1
535.1	547.4
697.5	712.3
872.0	888.9
1058.7	1077.5
1156.8	1176.4
1258.0	1278.5
1362.4	1389.7
1470.0	1501.6
1695.1	1735.9
1933.4	1984.2

Time increment (t) = 1.0 min.

Pond File: n:\97454\deten\POND .PND
Inflow Hydrograph: n:\97454\deten\002-IN .HYD
Outflow Hydrograph: n:\97454\deten\OUT .HYD

EXECUTED: 03-24-1998
17:39:41

Peak Inflow = 35.58 cfs
Peak Outflow = 17.82 cfs
Peak Elevation = 533.24 ft



x File: n:\97454\deten\002-IN .HYD Qmax = 17.8 cfs
* File: n:\97454\deten\OUT .HYD Qmax = 35.6 cfs

****
* *
* MALLARD'S LANDING *
* Detention Calculations *
* 5 Year Storm *
* *
* *
****

Inflow Hydrograph: n:\97454\deten\005-IN .HYD
Rating Table file: n:\97454\deten\POND .PND

----INITIAL CONDITIONS----
Elevation = 530.00 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
530.00	0.0	0	0.0	0.0
530.50	1.2	3,517	117.2	118.4
531.00	4.1	7,359	245.3	249.4
531.50	7.6	11,534	384.5	392.1
532.00	12.3	16,054	535.1	547.4
532.50	14.8	20,926	697.5	712.3
533.00	16.9	26,160	872.0	888.9
533.50	18.8	31,762	1058.7	1077.5
533.75	19.6	34,703	1156.8	1176.4
534.00	20.5	37,740	1258.0	1278.5
534.25	27.3	40,872	1362.4	1389.7
534.50	31.6	44,101	1470.0	1501.6
535.00	40.8	50,854	1695.1	1735.9
535.50	50.8	58,002	1933.4	1984.2

Time increment (t) = 1.0 min.

Pond File: n:\97454\deten\POND .PND
Inflow Hydrograph: n:\97454\deten\005-IN .HYD
Outflow Hydrograph: n:\97454\deten\OUT .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	530.00
1.0	43.56	43.6	42.7	43.6	0.44	530.18
2.0	43.56	87.1	126.9	129.8	1.45	530.54
3.0	43.56	87.1	207.4	214.0	3.32	530.86
4.0	43.56	87.1	284.1	294.5	5.21	531.16
5.0	43.56	87.1	357.0	371.2	7.09	531.43
6.0	43.56	87.1	425.8	444.2	9.18	531.67
7.0	43.56	87.1	490.4	512.9	11.26	531.89
8.0	43.56	87.1	552.0	577.5	12.76	532.09
9.0	43.56	87.1	611.8	639.1	13.69	532.28
10.0	43.56	87.1	669.7	698.9	14.60	532.46
11.0	43.56	87.1	726.1	756.8	15.33	532.63
12.0	43.56	87.1	781.3	813.3	16.00	532.79
13.0	43.56	87.1	835.1	868.4	16.66	532.94
14.0	43.56	87.1	887.7	922.2	17.24	533.09
15.0	43.56	87.1	939.3	974.8	17.77	533.23
16.0	43.56	87.1	989.9	1026.4	18.29	533.36
17.0	43.56	87.1	1039.4	1077.0	18.79	533.50
18.0	43.56	87.1	1088.1	1126.5	19.20	533.62
19.0	43.56	87.1	1136.1	1175.2	19.59	533.75
20.0	43.56	87.1	1183.2	1223.2	20.01	533.86
21.0	0.00	43.6	1186.6	1226.7	20.04	533.87
22.0	0.00	0.0	1147.2	1186.6	19.69	533.78
23.0	0.00	0.0	1108.5	1147.2	19.36	533.68
24.0	0.00	0.0	1070.4	1108.5	19.05	533.58
25.0	0.00	0.0	1033.0	1070.4	18.73	533.48
26.0	0.00	0.0	996.3	1033.0	18.35	533.38
27.0	0.00	0.0	960.3	996.3	17.98	533.28
28.0	0.00	0.0	925.1	960.3	17.62	533.19
29.0	0.00	0.0	890.5	925.1	17.26	533.10
30.0	0.00	0.0	856.7	890.5	16.92	533.00
31.0	0.00	0.0	823.7	856.7	16.52	532.91
32.0	0.00	0.0	791.4	823.7	16.12	532.82
33.0	0.00	0.0	759.9	791.4	15.74	532.72
34.0	0.00	0.0	729.2	759.9	15.37	532.63
35.0	0.00	0.0	699.2	729.2	15.00	532.55
36.0	0.00	0.0	670.0	699.2	14.60	532.46
37.0	0.00	0.0	641.7	670.0	14.16	532.37
38.0	0.00	0.0	614.2	641.7	13.73	532.29
39.0	0.00	0.0	587.6	614.2	13.31	532.20
40.0	0.00	0.0	561.8	587.6	12.91	532.12

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

Pond File: n:\97454\deten\POND .PND
Inflow Hydrograph: n:\97454\deten\005-IN .HYD
Outflow Hydrograph: n:\97454\deten\OUT .HYD

Starting Pond W.S. Elevation = 530.00 ft

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

Peak Inflow	=	43.56 cfs
Peak Outflow	=	20.04 cfs
Peak Elevation	=	533.87 ft

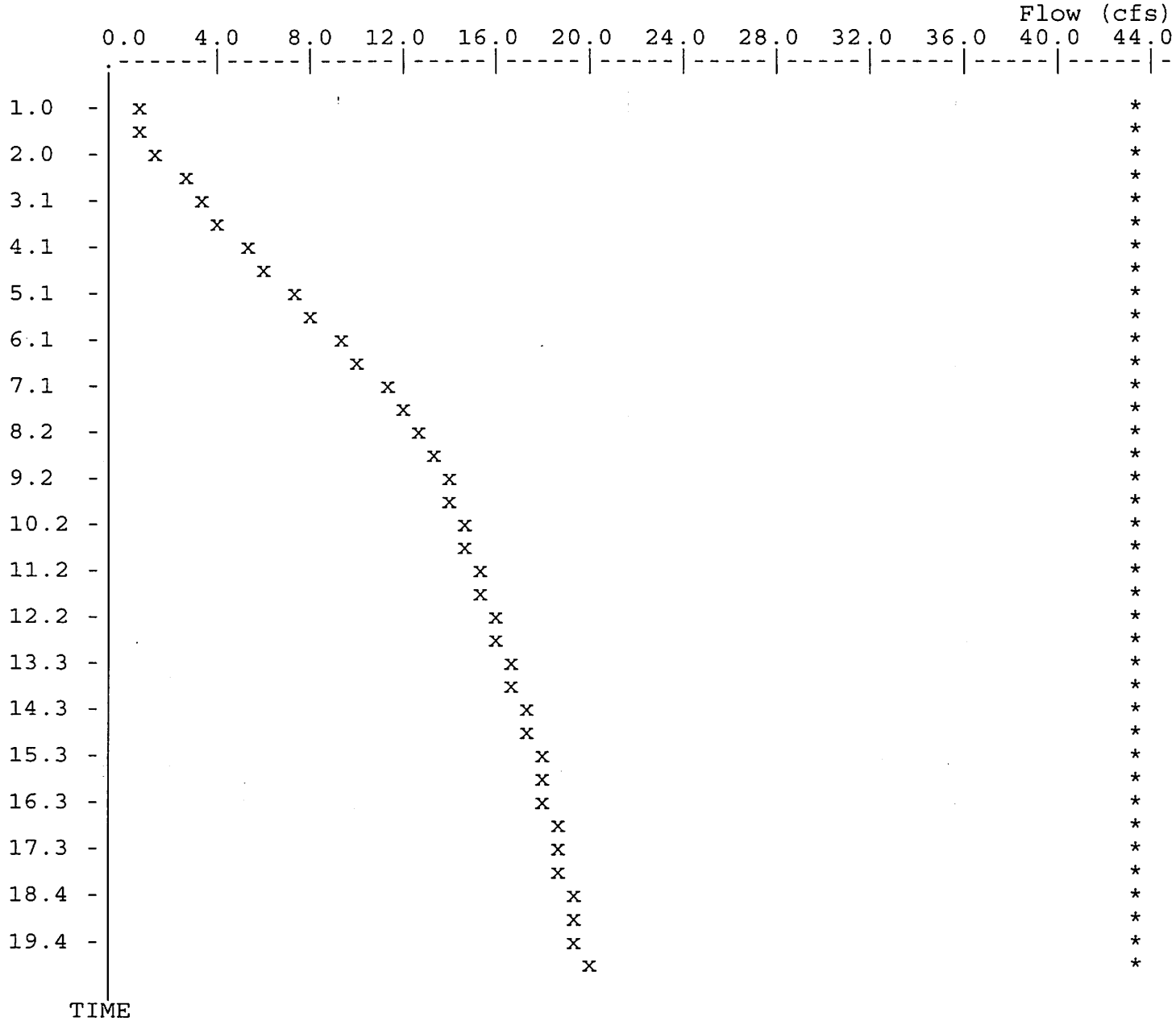
***** Summary of Approximate Peak Storage *****

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	36,200 cu-ft
Total Storage in Pond	=	36,200 cu-ft

Pond File: n:\97454\deten\POND .PND
Inflow Hydrograph: n:\97454\deten\005-IN .HYD
Outflow Hydrograph: n:\97454\deten\OUT .HYD

EXECUTED: 03-24-1998
17:40:31

Peak Inflow = 43.56 cfs
Peak Outflow = 20.04 cfs
Peak Elevation = 533.87 ft



x File: n:\97454\deten\005-IN .HYD Qmax = 20.0 cfs
* File: n:\97454\deten\OUT .HYD Qmax = 43.6 cfs

MALLARD'S LANDING
Detention Calculations
15 Year Storm

Inflow Hydrograph: n:\97454\deten\015-IN .HYD
Rating Table file: n:\97454\deten\POND .PND

----INITIAL CONDITIONS----
Elevation = 530.00 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)
530.00	0.0	0
530.50	1.2	3,517
531.00	4.1	7,359
531.50	7.6	11,534
532.00	12.3	16,054
532.50	14.8	20,926
533.00	16.9	26,160
533.50	18.8	31,762
533.75	19.6	34,703
534.00	20.5	37,740
534.25	27.3	40,872
534.50	31.6	44,101
535.00	40.8	50,854
535.50	50.8	58,002

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
117.2	118.4
245.3	249.4
384.5	392.1
535.1	547.4
697.5	712.3
872.0	888.9
1058.7	1077.5
1156.8	1176.4
1258.0	1278.5
1362.4	1389.7
1470.0	1501.6
1695.1	1735.9
1933.4	1984.2

Time increment (t) = 1.0 min.

Pond File: n:\97454\deten\POND .PND
Inflow Hydrograph: n:\97454\deten\015-IN .HYD
Outflow Hydrograph: n:\97454\deten\OUT .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	530.00
1.0	54.25	54.3	53.2	54.3	0.55	530.23
2.0	54.25	108.5	157.3	161.7	2.16	530.66
3.0	54.25	108.5	256.8	265.8	4.50	531.06
4.0	54.25	108.5	351.4	365.3	6.94	531.41
5.0	54.25	108.5	440.6	459.9	9.65	531.72
6.0	54.25	108.5	524.5	549.1	12.33	532.01
7.0	54.25	108.5	605.8	633.0	13.60	532.26
8.0	54.25	108.5	684.6	714.3	14.82	532.51
9.0	54.25	108.5	761.6	793.1	15.76	532.73
10.0	54.25	108.5	836.8	870.1	16.68	532.95
11.0	54.25	108.5	910.3	945.3	17.47	533.15
12.0	54.25	108.5	982.4	1018.8	18.21	533.34
13.0	54.25	108.5	1053.1	1090.9	18.91	533.53
14.0	54.25	108.5	1122.6	1161.6	19.48	533.71
15.0	54.25	108.5	1191.0	1231.1	20.08	533.88
16.0	54.25	108.5	1255.9	1299.5	21.78	534.05
17.0	54.25	108.5	1312.9	1364.4	25.75	534.19
18.0	54.25	108.5	1364.4	1421.4	28.52	534.32
19.0	54.25	108.5	1411.9	1472.9	30.49	534.44
20.0	54.25	108.5	1455.7	1520.4	32.34	534.54
21.0	0.00	54.3	1446.1	1510.0	31.93	534.52
22.0	0.00	0.0	1387.2	1446.1	29.47	534.38
23.0	0.00	0.0	1332.9	1387.2	27.14	534.24
24.0	0.00	0.0	1285.2	1332.9	23.83	534.12
25.0	0.00	0.0	1243.4	1285.2	20.91	534.02
26.0	0.00	0.0	1203.0	1243.4	20.19	533.91
27.0	0.00	0.0	1163.4	1203.0	19.83	533.82
28.0	0.00	0.0	1124.4	1163.4	19.49	533.72
29.0	0.00	0.0	1086.0	1124.4	19.18	533.62
30.0	0.00	0.0	1048.3	1086.0	18.87	533.52
31.0	0.00	0.0	1011.3	1048.3	18.51	533.42
32.0	0.00	0.0	975.0	1011.3	18.13	533.32
33.0	0.00	0.0	939.5	975.0	17.77	533.23
34.0	0.00	0.0	904.6	939.5	17.41	533.13
35.0	0.00	0.0	870.5	904.6	17.06	533.04
36.0	0.00	0.0	837.2	870.5	16.68	532.95
37.0	0.00	0.0	804.6	837.2	16.28	532.85
38.0	0.00	0.0	772.8	804.6	15.90	532.76
39.0	0.00	0.0	741.8	772.8	15.52	532.67
40.0	0.00	0.0	711.5	741.8	15.15	532.58

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

Pond File: n:\97454\deten\POND .PND
Inflow Hydrograph: n:\97454\deten\015-IN .HYD
Outflow Hydrograph: n:\97454\deten\OUT .HYD

Starting Pond W.S. Elevation = 530.00 ft

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

Peak Inflow	=	54.25 cfs
Peak Outflow	=	32.34 cfs
Peak Elevation	=	534.54 ft

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

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	44,641 cu-ft
Total Storage in Pond	=	44,641 cu-ft

Pond File: n:\97454\deten\POND .PND
Inflow Hydrograph: n:\97454\deten\015-IN .HYD
Outflow Hydrograph: n:\97454\deten\OUT .HYD

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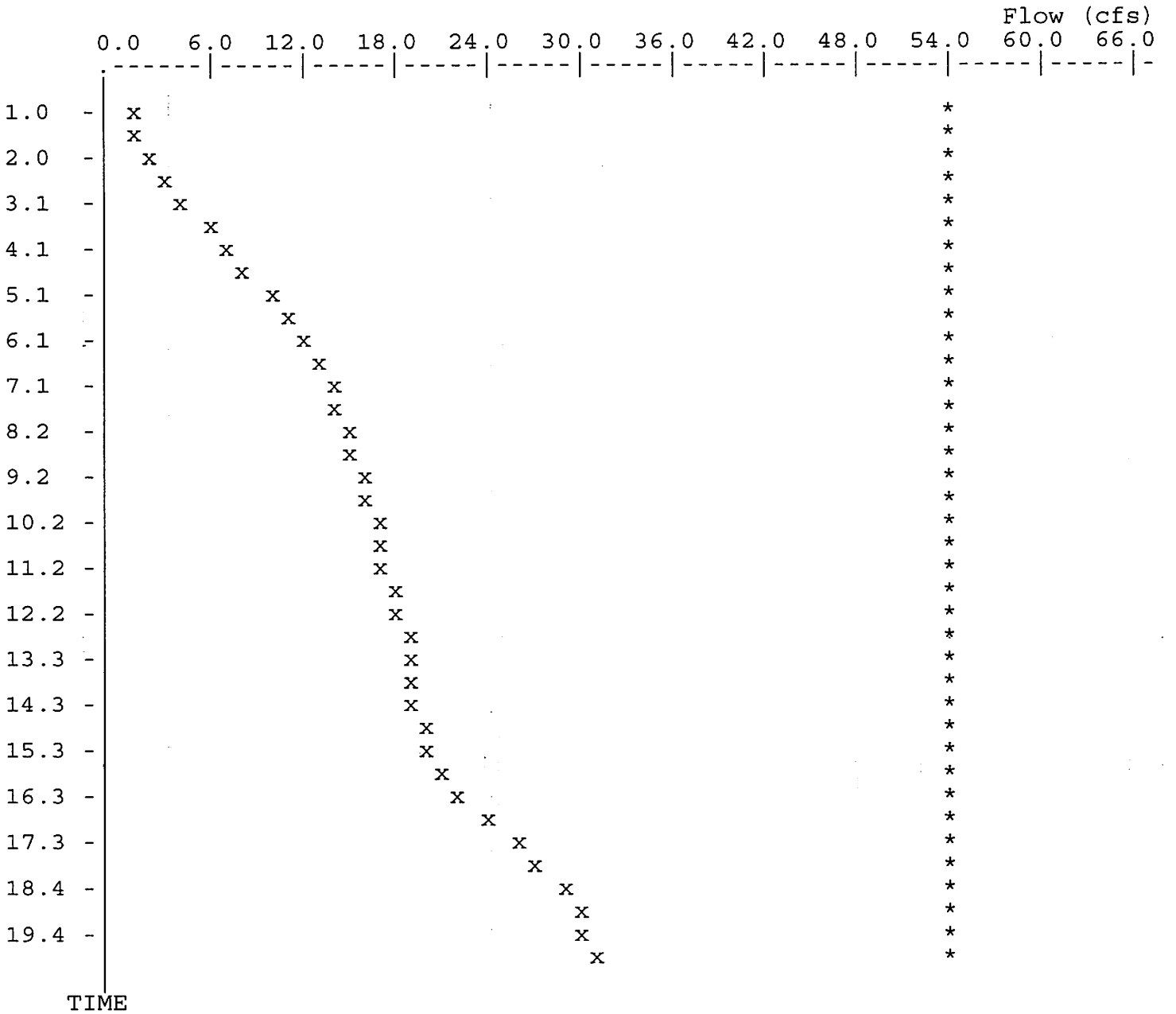
Peak Inflow = 54.25 cfs
Peak Outflow = 32.34 cfs
Peak Elevation = 534.54 ft



x File: n:\97454\deten\015-IN .HYD Qmax = 32.3 cfs
* File: n:\97454\deten\OUT .HYD Qmax = 54.3 cfs

****
* *
* MALLARD'S LANDING *
* Detention Calculations *
* 25 Year Storm *
* *
* *
****

Inflow Hydrograph: n:\97454\deten\025-IN .HYD
Rating Table file: n:\97454\deten\POND .PND

----INITIAL CONDITIONS----
Elevation = 530.00 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
530.00	0.0	0	0.0	0.0
530.50	1.2	3,517	117.2	118.4
531.00	4.1	7,359	245.3	249.4
531.50	7.6	11,534	384.5	392.1
532.00	12.3	16,054	535.1	547.4
532.50	14.8	20,926	697.5	712.3
533.00	16.9	26,160	872.0	888.9
533.50	18.8	31,762	1058.7	1077.5
533.75	19.6	34,703	1156.8	1176.4
534.00	20.5	37,740	1258.0	1278.5
534.25	27.3	40,872	1362.4	1389.7
534.50	31.6	44,101	1470.0	1501.6
535.00	40.8	50,854	1695.1	1735.9
535.50	39.6	58,002	1933.4	1973.0

Time increment (t) = 1.0 min.

POND-2 Version: 5.17 S/N:
EXECUTED: 03-24-1998 17:48:58

Pond File: n:\97454\deten\POND .PND
Inflow Hydrograph: n:\97454\deten\025-IN .HYD
Outflow Hydrograph: n:\97454\deten\OUT .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	530.00
1.0	66.94	66.9	65.6	66.9	0.68	530.28
2.0	66.94	133.9	193.5	199.5	2.99	530.81
3.0	66.94	133.9	315.3	327.4	6.01	531.27
4.0	66.94	133.9	430.6	449.2	9.33	531.68
5.0	66.94	133.9	539.3	564.4	12.56	532.05
6.0	66.94	133.9	644.8	673.2	14.21	532.38
7.0	66.94	133.9	747.5	778.7	15.59	532.69
8.0	66.94	133.9	847.7	881.4	16.81	532.98
9.0	66.94	133.9	946.0	981.6	17.83	533.25
10.0	66.94	133.9	1042.2	1079.8	18.82	533.51
11.0	66.94	133.9	1136.9	1176.1	19.60	533.75
12.0	66.94	133.9	1229.9	1270.8	20.43	533.98
13.0	66.94	133.9	1312.4	1363.8	25.71	534.19
14.0	66.94	133.9	1387.3	1446.2	29.47	534.38
15.0	66.94	133.9	1456.4	1521.2	32.37	534.54
16.0	66.94	133.9	1520.2	1590.3	35.08	534.69
17.0	66.94	133.9	1578.9	1654.0	37.58	534.83
18.0	66.94	133.9	1633.0	1712.7	39.89	534.95
19.0	66.94	133.9	1685.6	1766.8	40.64	535.07
20.0	66.94	133.9	1738.7	1819.4	40.38	535.18
21.0	0.00	66.9	1724.7	1805.6	40.45	535.15
22.0	0.00	0.0	1644.0	1724.7	40.36	534.98
23.0	0.00	0.0	1569.6	1644.0	37.19	534.80
24.0	0.00	0.0	1501.1	1569.6	34.27	534.65
25.0	0.00	0.0	1437.9	1501.1	31.58	534.50
26.0	0.00	0.0	1379.6	1437.9	29.15	534.36
27.0	0.00	0.0	1326.3	1379.6	26.68	534.23
28.0	0.00	0.0	1279.4	1326.3	23.42	534.11
29.0	0.00	0.0	1238.3	1279.4	20.56	534.00
30.0	0.00	0.0	1198.0	1238.3	20.15	533.90
31.0	0.00	0.0	1158.4	1198.0	19.79	533.80
32.0	0.00	0.0	1119.5	1158.4	19.45	533.70
33.0	0.00	0.0	1081.2	1119.5	19.14	533.61
34.0	0.00	0.0	1043.6	1081.2	18.83	533.51
35.0	0.00	0.0	1006.7	1043.6	18.46	533.41
36.0	0.00	0.0	970.5	1006.7	18.09	533.31
37.0	0.00	0.0	935.0	970.5	17.72	533.22
38.0	0.00	0.0	900.3	935.0	17.36	533.12
39.0	0.00	0.0	866.3	900.3	17.02	533.03
40.0	0.00	0.0	833.0	866.3	16.63	532.94

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

Pond File: n:\97454\deten\POND .PND
Inflow Hydrograph: n:\97454\deten\025-IN .HYD
Outflow Hydrograph: n:\97454\deten\OUT .HYD

Starting Pond W.S. Elevation = 530.00 ft

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

Peak Inflow	=	66.94 cfs
Peak Outflow	=	40.64 cfs
Peak Elevation	=	535.18 ft

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

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	53,372 cu-ft
Total Storage in Pond	=	53,372 cu-ft

Pond File: n:\97454\deten\POND .PND
Inflow Hydrograph: n:\97454\deten\025-IN .HYD
Outflow Hydrograph: n:\97454\deten\OUT .HYD

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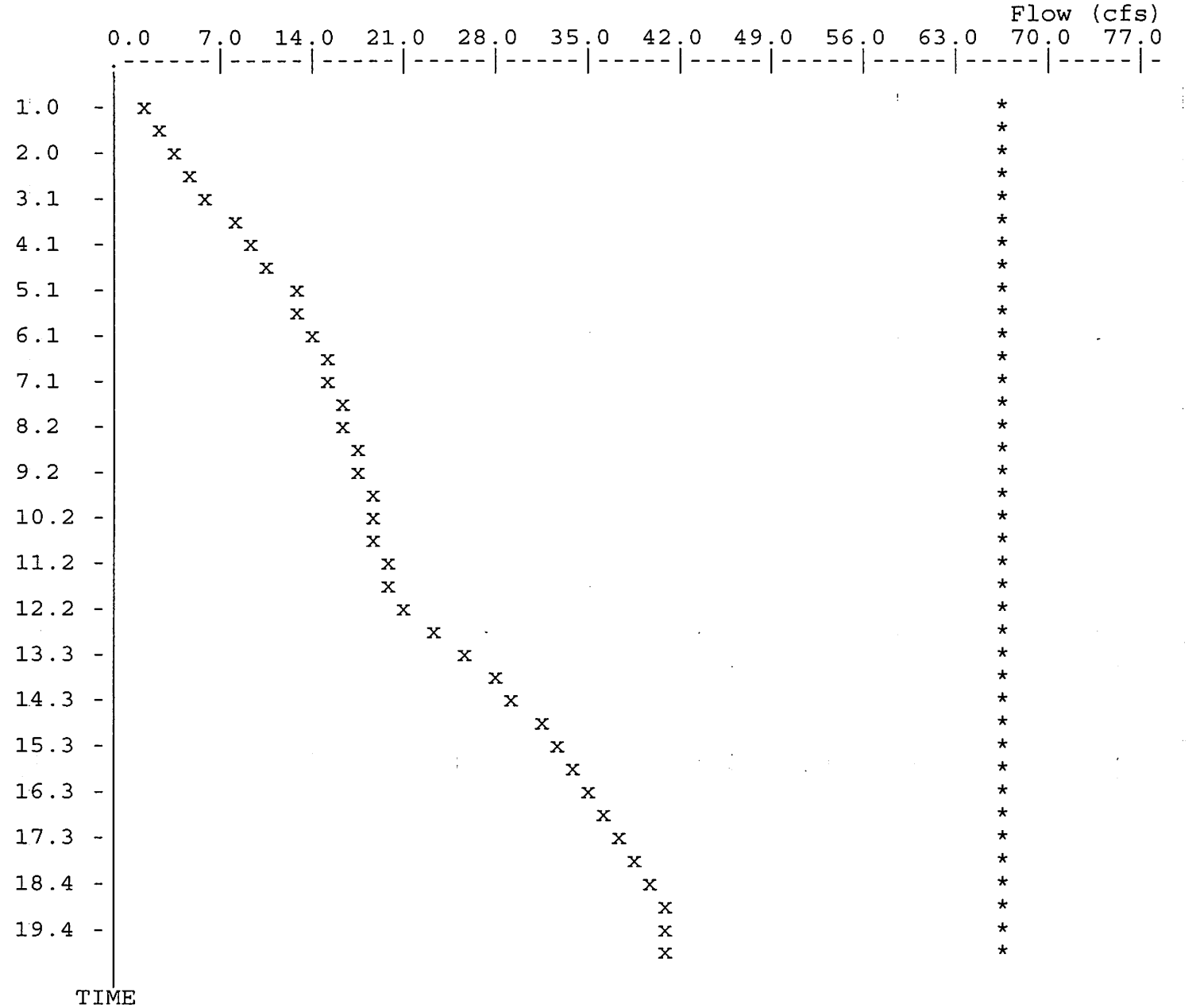
Peak Inflow = 66.94 cfs
Peak Outflow = 40.64 cfs
Peak Elevation = 535.18 ft



x File: n:\97454\deten\025-IN .HYD Qmax = 40.6 cfs
* File: n:\97454\deten\OUT .HYD Qmax = 66.9 cfs

Outlet Structure File: 100YRLFB.STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

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MALLARD'S LANDING
Detention Calculations for the 100 yr Storm Low Flow Blocked

****

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

Elevation (ft)	Q (cfs)	Contributing Structures
533.75	0.0	1
534.25	6.0	2 +3
534.75	13.3	2 +3
535.18	20.3	2 +3 +4
535.25	24.0	2 +3 +4
535.75	88.7	2 +3 +4
536.00	0.0	

Outlet Structure File: 100YRLFB.STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

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MALLARD'S LANDING
Detention Calculations for the 100 yr Storm Low Flow Blocked

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Outlet Structure File: n:\97454\deten\100YRLFB.STR
Planimeter Input File: n:\97454\deten\97454VOL.VOL
Rating Table Output File: n:\97454\deten\POND2 .PND

Min. Elev.(ft) = 533.75 Max. Elev.(ft) = 536 Incr.(ft) = .5

Additional elevations (ft) to be included in table:
* *
535.18

****

SYSTEM CONNECTIVITY

****

Structure	No.	Q Table		Q Table
WEIR-VR	1		->	1
ORIFICE	2		->	2
WEIR-VR	3		->	3
WEIR-VR	4		->	4

Outflow rating table summary was stored in file:
n:\97454\deten\POND2 .PND

Outlet Structure File: 100YRLFB.STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

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MALLARD'S LANDING
Detention Calculations for the 100 yr Storm Low Flow Blocked

****

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

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	533.75
E2 elev.(ft)?	534.25
Weir coefficient?	3
Weir elev.(ft)?	533.75
Length (ft)?	1
Contracted/Suppressed (C/S)?	S

Outlet Structure File: 100YRLFB.STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

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MALLARD'S LANDING
Detention Calculations for the 100 yr Storm Low Flow Blocked

****

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

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	534.25
E2 elev.(ft)?	536
Orifice coeff.?	3
Invert elev.(ft)?	533.75
Datum elev.(ft) ?	534
Orifice area (sq ft)?	.5

Outlet Structure File: 100YRLFB.STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

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MALLARD'S LANDING
Detention Calculations for the 100 yr Storm Low Flow Blocked

****

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

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	534.25
E2 elev.(ft)?	536.00
Weir coefficient?	3
Weir elev.(ft)?	534.25
Length (ft)?	2.67
Contracted/Suppressed (C/S)?	S

Outlet Structure File: 100YRLFB.STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

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MALLARD'S LANDING
Detention Calculations for the 100 yr Storm Low Flow Blocked

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>>>>>> Structure No. 4 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	535.18
E2 elev.(ft)?	536
Weir coefficient?	3
Weir elev.(ft)?	535.18
Length (ft)?	45.00
Contracted/Suppressed (C/S)?	S

Outlet Structure File: 100YRLFB.STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

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MALLARD'S LANDING
Detention Calculations for the 100 yr Storm Low Flow Blocked

****

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

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

Elevation (ft)	Q (cfs)	Computation Messages
533.75	0.0	H =0.0
534.25	0.0	E = or > E2=534.25
534.75	0.0	E = or > E2=534.25
535.18	0.0	E = or > E2=534.25
535.25	0.0	E = or > E2=534.25
535.75	0.0	E = or > E2=534.25
536.00	0.0	E = or > E2=534.25

C = 3 L (ft) = 1
H (ft) = Table elev. - Invert elev. (533.75 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: 100YRLFB.STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

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MALLARD'S LANDING
Detention Calculations for the 100 yr Storm Low Flow Blocked

****

Outflow Rating Table for Structure #2
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
533.75	0.0	E < E1=534.25
534.25	6.0	H =.25
534.75	10.4	H =.750
535.18	13.1	H =1.18
535.25	13.5	H =1.25
535.75	15.9	H =1.75
536.00	0.0	E = or > E2=536

C = 3 A = .5 sq.ft.
H (ft) = Table elev. - Datum elev. (534 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: 100YRLFB.STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

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MALLARD'S LANDING
Detention Calculations for the 100 yr Storm Low Flow Blocked

****

Outflow Rating Table for Structure #3
WEIR-VR Weir - Vertical Rectangular

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

Elevation (ft)	Q (cfs)	Computation Messages
533.75	0.0	E < Inv.El.= 534.25
534.25	0.0	H =0.0
534.75	2.8	H =.5
535.18	7.2	H =.930
535.25	8.0	H =1.0
535.75	14.7	H =1.5
536.00	0.0	E = or > E2=536.00

C = 3 L (ft) = 2.67
H (ft) = Table elev. - Invert elev. (534.25 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: 100YRLFB.STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

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MALLARD'S LANDING
Detention Calculations for the 100 yr Storm Low Flow Blocked

****

Outflow Rating Table for Structure #4
WEIR-VR Weir - Vertical Rectangular

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

Elevation (ft)	Q (cfs)	Computation Messages
533.75	0.0	E < Inv.El.= 535.18
534.25	0.0	E < Inv.El.= 535.18
534.75	0.0	E < Inv.El.= 535.18
535.18	0.0	H =0.0
535.25	2.5	H =.07
535.75	58.1	H =.570
536.00	0.0	E = or > E2=536

C = 3 L (ft) = 45
H (ft) = Table elev. - Invert elev. (535.18 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

MALLARD'S LANDING
Detention Calculations
100 Year Storm With Low Flow Blocked

Inflow Hydrograph: n:\97454\deten\100-IN .HYD
Rating Table file: n:\97454\deten\POND2 .PND

----INITIAL CONDITIONS----
Elevation = 533.75 ft
Outflow = 0.00 cfs
Storage = 34,703 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
533.75	0.0	34,703	1156.8	1156.8
534.25	6.0	40,872	1362.4	1368.4
534.75	13.3	47,428	1580.9	1594.2
535.18	20.3	53,381	1779.4	1799.7
535.25	24.0	54,378	1812.6	1836.6
535.75	88.7	61,728	2057.6	2146.3

Time increment (t) = 1.0 min.

Pond File: n:\97454\deten\POND2 .PND
Inflow Hydrograph: n:\97454\deten\100-IN .HYD
Outflow Hydrograph: n:\97454\deten\OUT .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	-----	1156.8	1156.8	0.00	533.75
1.0	85.64	85.6	1237.6	1242.4	2.43	533.95
2.0	85.64	171.3	1394.2	1408.8	7.31	534.34
3.0	85.64	171.3	1540.8	1565.5	12.37	534.69
4.0	85.64	171.3	1677.4	1712.0	17.31	535.00
5.0	85.64	171.3	1795.6	1848.7	26.53	535.27
6.0	85.64	171.3	1864.5	1966.9	51.23	535.46
7.0	85.64	171.3	1904.5	2035.7	65.61	535.57
8.0	85.64	171.3	1927.9	2075.8	73.98	535.64
9.0	85.64	171.3	1941.4	2099.1	78.85	535.67
10.0	85.64	171.3	1949.4	2112.7	81.69	535.70
11.0	85.64	171.3	1954.0	2120.6	83.34	535.71
12.0	85.64	171.3	1956.6	2125.2	84.30	535.72
13.0	85.64	171.3	1958.2	2127.9	84.86	535.72
14.0	85.64	171.3	1959.1	2129.5	85.19	535.72
15.0	85.64	171.3	1959.6	2130.4	85.38	535.72
16.0	85.64	171.3	1959.9	2130.9	85.49	535.73
17.0	85.64	171.3	1960.1	2131.2	85.55	535.73
18.0	85.64	171.3	1960.2	2131.4	85.59	535.73
19.0	85.64	171.3	1960.3	2131.5	85.61	535.73
20.0	85.64	171.3	1960.3	2131.6	85.62	535.73
21.0	0.00	85.6	1910.5	2046.0	67.74	535.59
22.0	0.00	0.0	1831.6	1910.5	39.44	535.37
23.0	0.00	0.0	1784.6	1831.6	23.50	535.24
24.0	0.00	0.0	1745.0	1784.6	19.79	535.15
25.0	0.00	0.0	1708.2	1745.0	18.44	535.07
26.0	0.00	0.0	1673.8	1708.2	17.18	534.99
27.0	0.00	0.0	1641.8	1673.8	16.01	534.92
28.0	0.00	0.0	1611.9	1641.8	14.92	534.85
29.0	0.00	0.0	1584.1	1611.9	13.90	534.79
30.0	0.00	0.0	1558.2	1584.1	12.97	534.73
31.0	0.00	0.0	1533.9	1558.2	12.13	534.67
32.0	0.00	0.0	1511.2	1533.9	11.35	534.62
33.0	0.00	0.0	1490.0	1511.2	10.62	534.57
34.0	0.00	0.0	1470.1	1490.0	9.93	534.52
35.0	0.00	0.0	1451.5	1470.1	9.29	534.48
36.0	0.00	0.0	1434.2	1451.5	8.69	534.43
37.0	0.00	0.0	1417.9	1434.2	8.13	534.40
38.0	0.00	0.0	1402.7	1417.9	7.60	534.36
39.0	0.00	0.0	1388.5	1402.7	7.11	534.33
40.0	0.00	0.0	1375.2	1388.5	6.65	534.29

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

Pond File: n:\97454\deten\POND2 .PND
Inflow Hydrograph: n:\97454\deten\100-IN .HYD
Outflow Hydrograph: n:\97454\deten\OUT .HYD

Starting Pond W.S. Elevation = 533.75 ft

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

Peak Inflow	=	85.64 cfs
Peak Outflow	=	85.62 cfs
Peak Elevation	=	535.73 ft

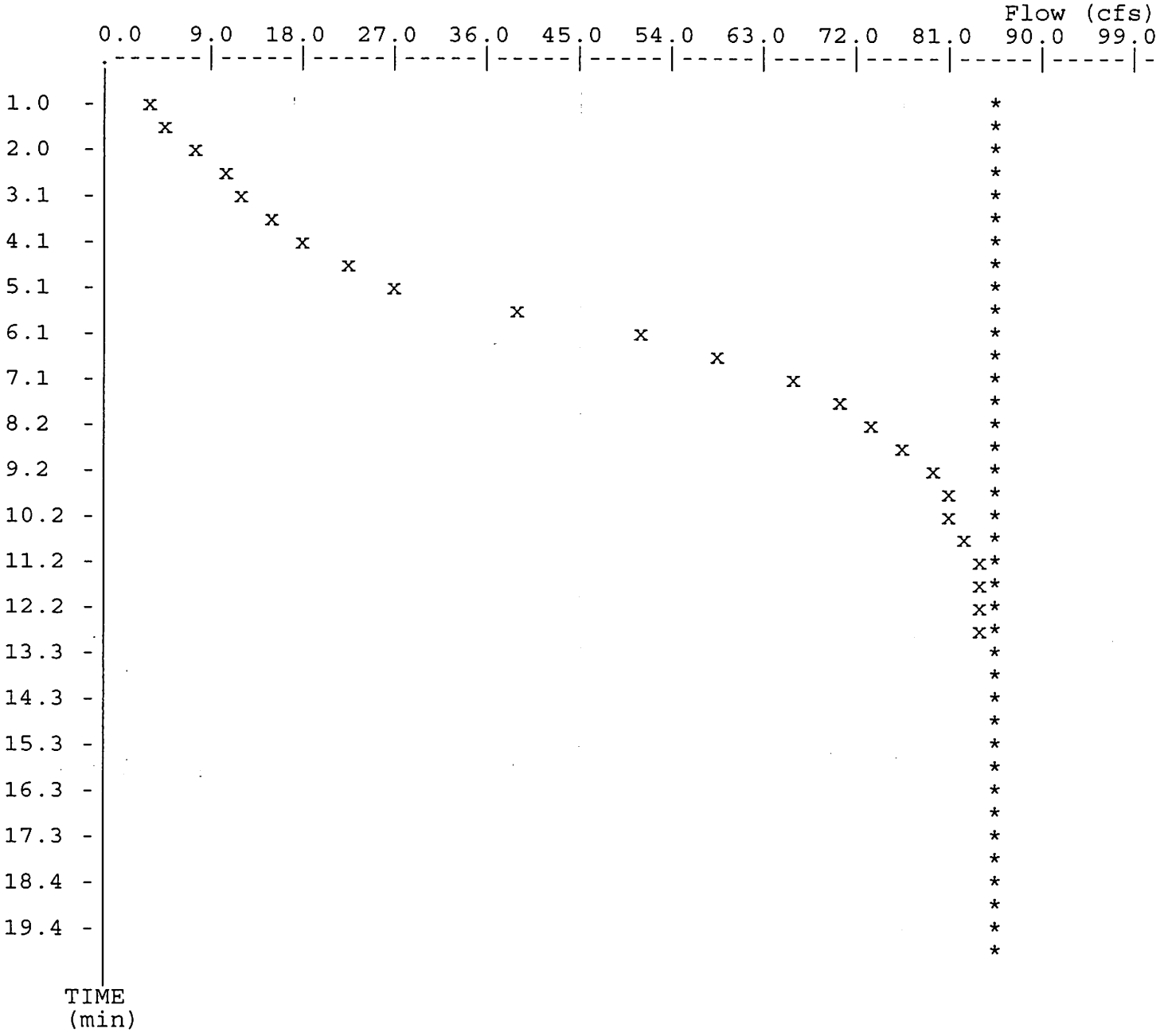
***** Summary of Approximate Peak Storage *****

Initial Storage	=	34,703 cu-ft
Peak Storage From Storm	=	26,675 cu-ft
Total Storage in Pond	=	61,378 cu-ft

Pond File: n:\97454\deten\POND2 .PND
Inflow Hydrograph: n:\97454\deten\100-IN .HYD
Outflow Hydrograph: n:\97454\deten\OUT .HYD

EXECUTED: 03-24-1998
17:29:45

Peak Inflow = 85.64 cfs
Peak Outflow = 85.62 cfs
Peak Elevation = 535.73 ft



x File: n:\97454\deten\100-IN .HYD Qmax = 85.6 cfs
* File: n:\97454\deten\OUT .HYD Qmax = 85.6 cfs

JOB:97454 FB:1221 BY:CEY 05/28/98
ID:004 6:35P

DOMINION PROPERTIES, INC.
MALLARD'S LANDING

THE CLAYTON ENGINEERING COMPANY
12755 OLIVE BLVD — SUITE 100
ST. LOUIS, MO 63141
(314) 542-0009

‹‹‹‹‹ PIPE HYDRAULICS MODULE ›››››

Description = OUTFALL
System Number = 4
Return Period (yr) = 15
Rainfall Duration (min) = 20
Runoff Factor Multiplier = 1.00
Starting HGL Elev. (ft) = 0.00
Use St. Louis Co./MSD Losses? = Y

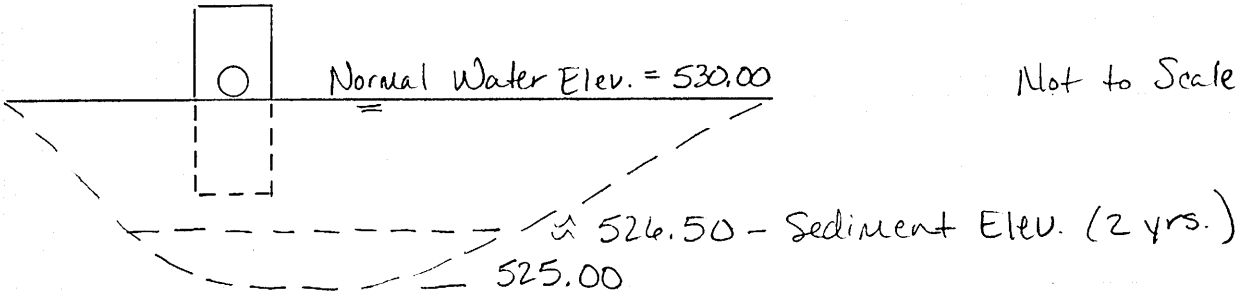
STRUCTURES UP/LOW	FLOWLINES UP/LOW	DIAM	LENGTH	n	AREA/PI	Qadd	Qtot/Qfull	CS/RS	Yn/Yc	PARTIAL V/Y	FULL V/Vhead	LOSSES F/C	LOSSES V/T	COND UP/LOW	HGL UP/LOW	UPPER STRUCT TOP/FREEBD
OS 4-2	527.00	36	46	0.013	32.34	32.34	32.34	1.00	1.47	9.38	4.58	1.99	0.43	OF	530.43	535.67
FES 4-1	526.54				1.00		66.88	0.23	1.85	1.47	0.33	0.00	0.00	ND	528.01	5.24

THE CLAYTON ENGINEERING CO.

Project No. 97454 Project Name Mallard's Landing

Computation for Sediment Storage in Detention Basin

By CEY Date 5/28/98 Checked _____ Date _____ Sheet _____ of _____



Volume of Pond at Normal Depth = 19,950 cu. ft.

Annual Sediment Storage = 125 x 13.1 = 1,640 cu. ft.

For 2 years = 1,640 x 2 = 3280 cu. ft

(See attached Figure 6)

* Since this is a wet basin, the sediment does not effect the storage capacity. The low flow outlet remains constant and therefore the normal water elevation remains constant. This in turn means the detention volume remains constant with or without sediment

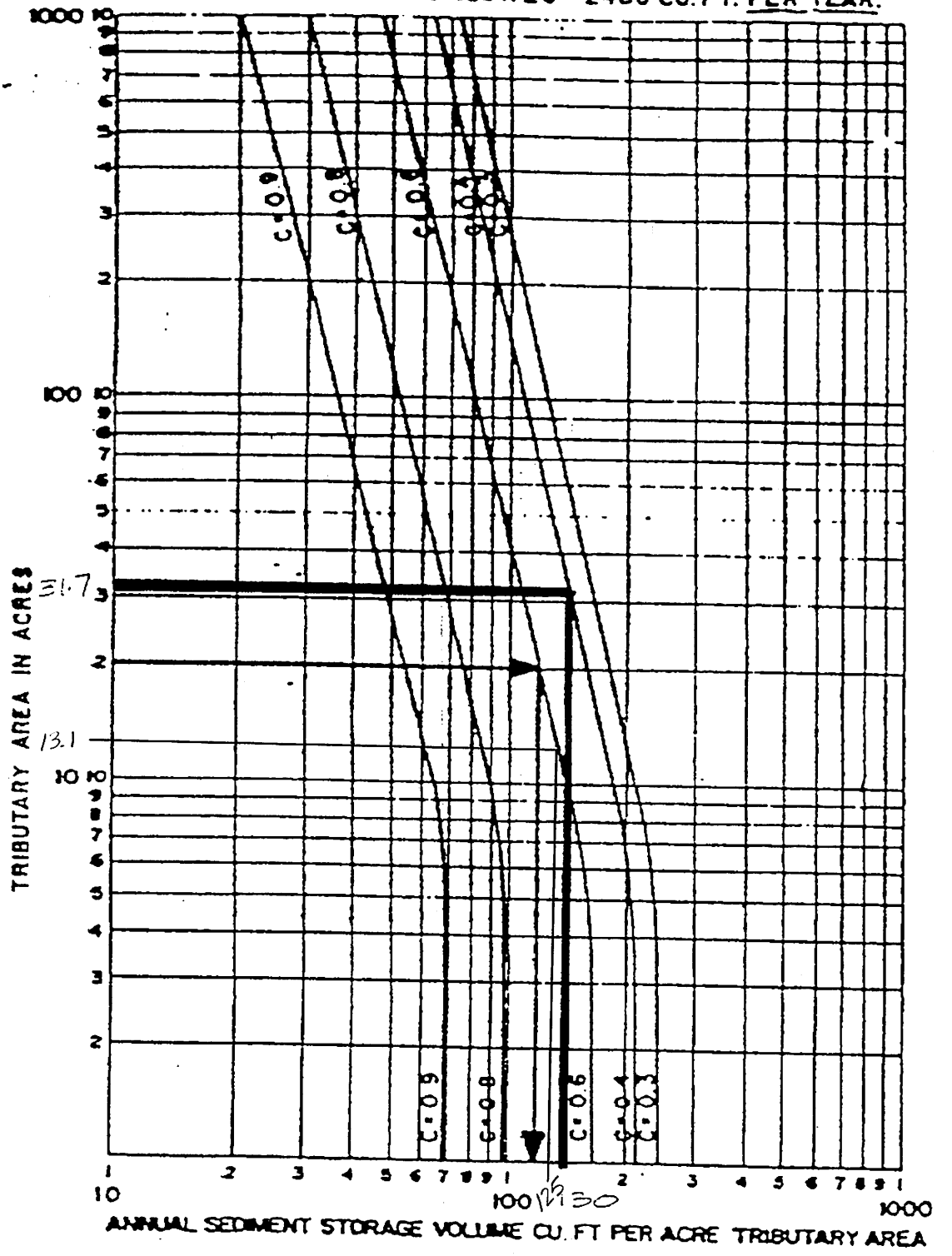
EXAMPLE:

TRIBUTARY AREA = 20 ACRES

RATIONAL METHOD RUNOFF COEFFICIENT "C" = 0.6

SEDIMENT STORAGE = 120 CU. FT. PER ACRE PER YEAR

TOTAL SEDIMENT STORAGE = 120 X 20 = 2400 CU. FT. PER YEAR.



130 x 2 = 260

ANNUAL SEDIMENT STORAGE

125 x 13.1 x 2 = 3275 cu. ft

FIG. 6

POND-2 Version: 5.17
S/N:

Volume of Pond Below the Normal Water Elevation
Mallard's Landing

CALCULATED 05-28-1998 18:40:46
DISK FILE: n:\97454\deten\PONDVOL .VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
525.00	1,659.92	1,660	0	0	0
526.00	2,488.87	2,489	6,181	2,060	2,060
527.00	3,402.32	3,402	8,801	2,934	4,994
528.00	4,409.62	4,410	11,685	3,895	8,889
529.00	5,513.66	5,514	14,854	4,951	13,841
530.00	6,721.40	6,721	18,323	6,108	19,948

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