DRAINAGE DESIGN REPORT

Planet Fitness

O'Fallon, MO

Prepared for:

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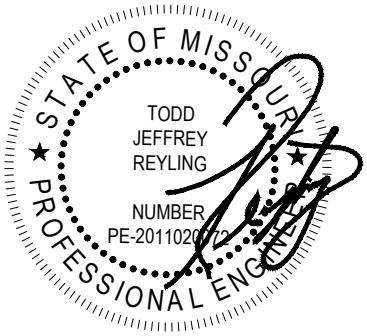

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1 EXECUTIVE SUMMARY

This stormwater detention report has been prepared for the proposed Planet Fitness in O'Fallon, MO. The report will establish the design of the storm sewer detention system for the proposed project.

This report will evaluate the existing (pre-development) and proposed (post-development) conditions.

The storm sewer release rates for the design of the detention facilities were based on the requirements per the Metropolitan St. Louis Sewer District (MSD) Rules and Regulations and the City of O'Fallon "*Development Standards*," Section 405.230. A Differential runoff of **4.17 CFS** was calculated between the pre- and post-development conditions for the 15-year and **5.62 CFS** for for the 100-year.

The differential flows were calculated using values of P.I factors for the existing and proposed conditions per the section 4.030.01 of the MSD's Rules and Regulations.

The results of the calculations are shown in the table below.

PROPOSED LAND USAGE (15-YR)						
LAND DESCRIPTION	RUNOFF COEF.	AREA (AC.)	PERCENT IMP.	CURVE NUMBER	PI	FLOW (CFS)
BUILDING/ROOF	0.95	0.57	100%	98	3.54	**2.02**
ASPHALT	0.90	2.87	100%	98	3.54	**10.16**
LANDSCAPING/GRASS	0.35	0.70	30%	60	2.19	**1.53**
TOTAL AREA		4.14		**92**		**13.71**

EXISTING LAND USAGE						
LAND DESCRIPTION	RUNOFF COEF.	AREA (AC.)	PERCENT IMP.	CURVE NUMBER	PI	FLOW (CFS)
BUILDING/ROOF	0.95	0.14	100%	98	3.54	**0.51**
ASPHALT	0.90	0.21	100%	98	3.54	**0.74**
GRASS	0.35	3.79	30%	69	2.19	**8.29**
TOTAL AREA		4.14				**9.55**

DIFERRENTIAL						
LAND DESCRIPTION	**RUNOFF COEF.**	**AREA (AC.)**	**PERCENT IMP.**	**CURVE NUMBER**	**PI**	**FLOW (CFS)**
						4.17

PROPOSED LAND USAGE (100-YR)						
LAND DESCRIPTION	RUNOFF COEF.	AREA (AC.)	PERCENT IMP.	CURVE NUMBER	PI	FLOW (CFS)
BUILDING/ROOF	0.95	0.57	100%	98	4.77	**2.72**
ASPHALT	0.90	2.87	100%	98	4.77	**13.69**
LANDSCAPING/GRASS	0.35	0.70	30%	60	2.95	**2.07**
TOTAL AREA		4.14		**92**		**18.47**

EXISTING LAND USAGE						
LAND DESCRIPTION	RUNOFF COEF.	AREA (AC.)	PERCENT IMP.	CURVE NUMBER	PI	FLOW (CFS)
BUILDING/ROOF	0.95	0.14	100%	98	4.77	**0.69**
ASPHALT	0.90	0.21	100%	98	4.77	**1.00**
GRASS	0.35	3.79	30%	69	2.95	**11.17**
TOTAL AREA		4.14				**12.86**

DIFERRENTIAL						
LAND DESCRIPTION	**RUNOFF COEF.**	**AREA (AC.)**	**PERCENT IMP.**	**CURVE NUMBER**	**PI**	**FLOW (CFS)**
						5.62

Therefore, a TR55 analysis for the 2-year and 100-year evens was performed to meet release rates. The routing calculations and model printouts are included in this report.

2 PROJECT SITE AND LAND USAGES

Cornerstone Planet Fitness currently owns the property located north of the proposed development. This site will be developed later. It was included in the current development as considered at its fully developed condition with a 90% percent impervious area. The objective of this report is to meet the City of O'Fallon requirements for Stormwater management regarding release rates, detention requirements and pipe network design capacity.

The topography of the site varies from an elevation of 530-feet to 560-feet and the existing ground cover primarily consists of prairie grass.

3 DESIGN METHODOLOGY

The design criteria utilized for this report is in accordance with the City Drainage requirements. The stormwater detention facilities have been designed in accordance with these ordinances to accommodate a ***Zero Increase*** for the 2 year – 24-hour storm event and the 100 year – 24-hour storm event.

Rainfall from the Metropolitan St. Louis Sewer District were used and established as follows:
3.1" for the 2-year, 24-hour storm and 7.2" for the 100-year, 24-hour storm.

3.1 Existing Watershed

The project existing drainage conditions were considered completely bare and undeveloped with a zero percent impervious cover. Based on our analysis of the existing watershed, the following peak flows were generated. A drainage Map, existing Curve Number and a numerical printout of these peak flows can be found in **Appendix 5.1** of this report.

	2-Year Storm (CFS)	100-Year Storm (CFS)
Peak Runoff	11.19	33.29

3.2 Proposed Conditions

The proposed site was split into several sub-catchments to account for the previous developments and the currently proposed extension. Based on our analysis of the proposed drainage areas, the following peak flows were generated in the above-described watersheds. A numerical printout of these peak flows can be found in the **Appendix** of this report.

3.3 Proposed Detention Basin

To provide stormwater detention for the additions to the site, we have designed a detention pond, as per the requirements of the City rules and regulations, in accordance with the differential runoff calculations. The proposed drainage area is routed through the detention basin for the 2-Year, the 100-Year and the 100-Year low flow blocked Storm hydrographs to determine the peak discharge. A stormwater outfall structure including a low flow (2-year) orifice and high flow (100-year) weir was designed to limit the release rates to the predevelopment levels.

The following tables are a summary of the results. A numerical printout of these hydrographs can be found in **Appendix C** of this report.

Drainage Area			
	Peak Discharge (cfs)	**Max. Storage (cu.ft)**	**Max. Elevation (ft)**
2-Year Storm	11.19	7,157	533.49
100-Year Storm	33.29	18,.780	535.98
100-Year Storm (Low Flow Blocked)	38.82	20,629	536.29

4 DRAINAGE COMPARISON

When comparing the peak discharge from to the value to the existing conditions, the peak flow release rates were reduced for the 2-Year and 100-Year Storms Events. This is shown in the following tables.

Drainage Area			
Design Storm Event	**Existing Discharge (cfs)**	**Proposed Discharge (cfs)**	**Net Discharge (cfs)**
2-Year Storm	11.19	9.93	-1.26
100-Year Storm	33.29	33.22	-0.07

5 STORM SEWER

Based on the hydraulic analysis and Storm and Sanitary modeling, the proposed storm sewer pipes and the proposed culverts will provide adequate capacity to convey the contributing flows to the site for the 15-year 20 min design storm events

IDF curves were also available from the City design manual and calculated as follows. The 15-year IDF values were interpolated between the 10 and 25-year storms.

St. Louis District

$i = A/(B+t_r)^m$

Frequency	A	B	m
2-year	18.61	3.09	0.61
5-year	22.86	3.07	0.61
10-year	26.22	3.02	0.61
25-year	30.51	2.91	0.60
50-year	33.43	2.75	0.59
100-year	36.39	2.65	0.59

2Yr			10			15yr			25			100Yr		
a	**b**	**m**	**a**	**b**	**m**	**a**	**b**	**m**	**a**	**b**	**m**	**a**	**b**	**m**
18.61	**3.09**	**0.61**	**26.22**	**3.02**	**0.61**	**27.65**	**2.98**	**0.61**	**30.51**	**2.91**	**0.6**	**36.39**	**2.65**	**0.59**
Tc	**Intensity**		**Tc**	**Intensity**		**Tc**	**Intensity**		**Tc**	**Intensity**		**Tc**	**Intensity**	
5	5.20		5	7.36		5	7.84		5	8.82		5	10.96	
10	3.88		10	5.48		10	5.84		10	6.57		10	8.14	
15	3.18		15	4.49		20	4.13		20	4.66		20	5.77	
30	2.20		30	3.11		30	3.32		30	3.75		30	4.65	
60	1.49		60	2.09		60	2.24		60	2.54		60	3.17	
120	0.99		120	1.39		120	1.49		120	1.70		120	2.13	

STORM SEWER INPUT

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.147 (Build 0)

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Project Description

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File Name ..... O'Fallon Detention - SEWERS June31.21.SPF

Description ..... Planet Fitness-Cornerstone\20-115 PF O'Fallon MO\Design

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Analysis Options

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Flow Units	cfs
Subbasin Hydrograph Method.	Rational
Time of Concentration.....	SCS TR-55
Return Period.....	15 years
Link Routing Method	Hydrodynamic
Storage Node Exfiltration..	Constant flow
Starting Date	JUN-31-2021 00:00:00
Ending Date	JUN-31-2021 00:20:00
Report Time Step	00:00:10

STORM SEWER CATCHMENTS

SN	Element ID	Area	Drainage Node ID	Weighted Runoff Coefficient	Accumulated Precipitation	Total Runoff	Peak Runoff	Rainfall Intensity	Time of Concentration
		(acres)			(inches)	(inches)	(cfs)	(inches/hr)	(days hh:mm:ss)
1	{Catchments}.CATCH-INLET#1	0.18	STRUCTURE #9	0.9000	0.82	0.73	1.09	6.675	0 00:07:18
2	{Catchments}.CATCH-INLET#10	0.53	STRUCTURE #8	0.9000	0.82	0.73	3.21	6.675	0 00:07:18
3	{Catchments}.CATCH-INLET#2	0.11	STRUCTURE #10	0.9000	0.65	0.59	0.81	7.850	0 00:05:00
4	{Catchments}.CATCH-INLET#3	0.11	STRUCTURE #11	0.9000	0.69	0.62	0.72	7.497	0 00:05:34
5	{Catchments}.CATCH-INLET#4	0.26	DS#1	0.9000	0.82	0.73	1.54	6.675	0 00:07:18
6	{Catchments}.CATCH-INLET#5	0.13	STRUCTURE #3	0.9000	0.82	0.73	0.75	6.675	0 00:07:18
7	{Catchments}.CATCH-INLET#6	0.23	DS#5	0.9000	0.82	0.73	1.39	6.675	0 00:07:18
8	{Catchments}.CATCH-INLET#7	0.53	STRUCTURE #5	0.9000	0.82	0.73	3.20	6.675	0 00:07:18
9	{Catchments}.CATCH-INLET#8	0.19	STRUCTURE #6	0.9000	0.82	0.73	1.12	6.675	0 00:07:18
10	{Catchments}.CATCH-INLET#9	0.22	STRUCTURE #7	0.9000	0.82	0.73	1.31	6.675	0 00:07:18
11	{Catchments}.CATCH-OFFSITE	1.03	STRUCTURE #7	0.9000	0.93	0.84	5.53	5.996	0 00:09:24

STORM SEWER PIPES

SN	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Total Drop	Average Slope	Pipe Diameter or Height	Pipe Width	Initial Flow	Lengthening Factor	Peak Flow	Time of Peak Flow Occurrence	Max Flow Velocity	Travel Time	Design Flow Capacity	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged	Max Flow Depth
			(ft)	(ft)	(ft)	(ft)	(%)	(inches)	(inches)	(cfs)		(cfs)	(days hh:mm)	(ft/sec)	(min)	(cfs)			(min)	(ft)
1	DS#3	DS#4	68.00	557.00	555.50	1.50	2.2100	8.000	8.04	0.00	1.00	0.00	0 00:00	0.00		1.94	0.00	0.00	0.00	0.00
2	OUTFALL-STRUC	OUTFALL	5.80	530.00	529.50	0.50	8.6200	24.000	24.00	0.00	4.54	1.77	0 00:17	6.10	0.02	57.57	0.03	0.15	0.00	0.30
3	DS#1	DS#2	17.41	557.42	557.00	0.42	2.4100	8.000	8.04	0.00	1.00	1.53	0 00:07	5.51	0.05	2.03	0.75	0.75	0.00	0.50
4	DS#2	STRUCTURE #12	63.56	557.00	554.00	3.00	4.7200	8.000	8.04	0.00	1.00	1.53	0 00:07	6.41	0.17	2.84	0.54	0.65	0.00	0.43
5	STRUCTURE #12	STRUCTURE #11	100.20	554.00	553.50	0.50	0.5000	18.000	18.00	0.00	1.00	1.51	0 00:08	2.64	0.63	7.42	0.20	0.36	0.00	0.54
6	STRUCTURE #11	STRUCTURE #10	84.00	553.50	553.08	0.42	0.5000	18.000	18.00	0.00	1.00	1.92	0 00:08	2.92	0.48	7.43	0.26	0.40	0.00	0.60
7	STRUCTURE #10	STRUCTURE #9	143.91	553.08	552.36	0.72	0.5000	18.000	18.00	0.00	1.00	2.34	0 00:07	3.54	0.68	7.43	0.32	0.40	0.00	0.60
8	STRUCTURE #9	STRUCTURE #3	141.75	552.36	545.78	6.58	4.6400	18.000	18.00	0.00	1.00	3.41	0 00:07	8.84	0.27	22.63	0.15	0.27	0.00	0.41
9	STRUCTURE #3	STRUCTURE #2	20.90	534.34	533.50	0.84	4.0200	18.000	18.00	0.00	1.00	18.12	0 00:08	11.36	0.03	21.06	0.86	0.85	0.00	1.28
10	STRUCTURE #2	POND	57.65	533.50	530.00	3.50	6.0700	24.000	24.00	0.00	1.00	18.05	0 00:08	10.99	0.09	55.74	0.32	0.76	0.00	1.53
11	STRUCTURE #8	STRUCTURE #4	95.52	546.75	546.27	0.48	0.5000	18.000	18.00	0.00	1.00	3.12	0 00:07	2.55	0.62	7.43	0.42	0.66	0.00	0.99
12	STRUCTURE #4	STRUCTURE #3	98.60	546.27	542.33	3.94	4.0000	18.000	18.00	0.00	1.00	14.09	0 00:08	11.14	0.15	21.01	0.67	0.67	0.00	1.01
13	STRUCTURE #7	STRUCTURE #6	63.89	552.50	552.18	0.32	0.5000	18.000	18.00	0.00	1.00	6.47	0 00:09	3.71	0.29	7.43	0.87	0.96	0.00	1.44
14	STRUCTURE #6	STRUCTURE #5	63.00	552.18	551.87	0.31	0.5000	18.000	18.00	0.00	1.00	7.28	0 00:09	4.71	0.22	7.43	0.98	0.82	0.00	1.23
15	STRUCTURE #5	STRUCTURE #4	89.75	551.86	550.07	1.79	2.0000	18.000	18.00	0.00	1.00	9.78	0 00:08	7.89	0.19	14.84	0.66	0.66	0.00	0.99
16	DS#4	STRUCTURE #5	48.80	555.50	551.86	3.64	7.4600	8.040	8.04	0.00	1.00	0.00	0 00:00	0.00	0.00	3.58	0.00	0.50	0.00	0.33
17	DS#5	STRUCTURE #4	49.80	557.00	553.02	3.98	8.0000	8.040	8.04	0.00	1.00	1.38	0 00:07	9.08	0.09	3.70	0.37	0.45	0.00	0.30

STORM SEWER STRUCTURES

SN	Element ID	Invert Elevation	Ground/Rim (Max) Elevation	Initial Water Elevation	Peak Inflow	Peak Lateral Inflow	Maximum HGL Elevation Attained	Maximum HGL Depth Attained	Time of Maximum HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
		(ft)	(ft)	(ft)	(cfs)	(cfs)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-inches)	(minutes)
1	DS#1	557.42	560.00	557.42	1.54	1.54	558.05	0.63	0 00:07	0 00:00	0.00	0.00
2	DS#2	557.00	560.00	557.00	1.53	0.00	557.37	0.37	0 00:07	0 00:00	0.00	0.00
3	DS#3	557.00	560.00	557.00	0.00	0.00	557.00	0.00	0 00:00	0 00:00	0.00	0.00
4	DS#4	555.50	560.00	555.50	0.00	0.00	555.50	0.00	0 00:00	0 00:00	0.00	0.00
5	DS#5	557.00	560.00	557.00	1.39	1.39	557.32	0.32	0 00:07	0 00:00	0.00	0.00
6	OUTFALL-STRUC	530.00	536.00	530.00	1.77	0.00	530.35	0.35	0 00:17	0 00:00	0.00	0.00
7	STRUCTURE #10	553.08	558.75	553.08	2.38	0.80	553.70	0.62	0 00:06	0 00:00	0.00	0.00
8	STRUCTURE #11	553.50	558.90	553.50	1.93	0.71	554.09	0.59	0 00:08	0 00:00	0.00	0.00
9	STRUCTURE #12	554.00	557.40	554.00	1.53	0.00	554.50	0.50	0 00:07	0 00:00	0.00	0.00
10	STRUCTURE #2	533.50	538.50	533.50	18.12	0.00	534.56	1.06	0 00:08	0 00:00	0.00	0.00
11	STRUCTURE #3	534.34	556.50	534.34	18.12	0.75	537.15	2.81	0 00:08	0 00:00	0.00	0.00
12	STRUCTURE #4	546.27	556.70	546.27	14.13	0.00	547.39	1.12	0 00:08	0 00:00	0.00	0.00
13	STRUCTURE #5	551.86	556.90	551.86	9.78	3.20	552.95	1.09	0 00:08	0 00:00	0.00	0.00
14	STRUCTURE #6	552.18	556.15	552.18	7.27	1.12	553.57	1.39	0 00:09	0 00:00	0.00	0.00
15	STRUCTURE #7	552.50	556.00	552.50	6.48	6.48	554.00	1.50	0 00:09	0 00:00	0.00	0.00
16	STRUCTURE #8	546.75	549.75	546.75	3.21	3.21	547.62	0.87	0 00:07	0 00:00	0.00	0.00
17	STRUCTURE #9	552.36	556.50	552.36	3.42	1.09	552.78	0.42	0 00:07	0 00:00	0.00	0.00

6 CULVERT CALCULATIONS

The existing road culverts and proposed pipes crossing the site was design using the 25-year frequency. It was determined by the modeling calculations that there will be no backwater effects from the proposed culverts, even with the upstream contributing pipes flowing at their maximum capacity.

The headwater was maintained constant with a flow equal to the maximum crossing pipe capacity. The results of the calculations are shown in the table below.

CULVERT MODEL INPUT

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.147 (Build 0)

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Project Description
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File Name ..... O'Fallon Detention - CULVERTS
Description ..... \Planet Fitness-Cornerstone\20-115 PF O'Fallon MO\Design

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Analysis Options
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Flow Units	cfs
Subbasin Hydrograph Method.	Rational
Time of Concentration.....	SCS TR-55
Return Period.....	25 years
Link Routing Method	Hydrodynamic
Storage Node Exfiltration..	Constant flow
Starting Date	JUN-31-2021 00:00:00
Ending Date	JUN-31-2021 00:00:00
Report Time Step	00:00:10

CULVERT CATCHMENTS

SN	Element ID	Area	Drainage Node ID	Weighted Runoff Coefficient	Accumulated Precipitation	Total Runoff	Peak Runoff	Rainfall Intensity	Time of Concentration
		(acres)			(inches)	(inches)	(cfs)	(inches/hr)	(days hh:mm:ss)
1	{Catchments}.CATCH-CULV#1	0.71	EX REA INLET#2	0.9000	0.77	0.69	3.98	6.262	0 00:07:18
2	{Catchments}.CATCH-CULV#2	2.17	EXIST. AREA INLET#1	0.9000	0.77	0.69	12.22	6.262	0 00:07:18

CULVERT PIPES

SN	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Pipe Diameter or Height	Peak Flow	Time of Peak Flow Occurrence	Max Flow Velocity	Travel Time	Design Flow Capacity	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged	Max Flow Depth
			(ft)	(ft)	(ft)	(%)	(inches)	(cfs)	(days hh:mm)	(ft/sec)	(min)	(cfs)			(min)	(ft)
1	PROP. AREA INLET#1	STORM MH #1	458.83	550.38	534.00	3.5700	48.000	139.55	0 00:00	19.08	0.40	271.41	0.51	0.66	0.00	2.63
2	PROP. AREA INLET#2	STM MH #2	100.90	552.33	545.00	7.2600	36.000	109.91	0 00:00	18.55	0.09	179.77	0.61	0.79	0.00	2.36
3	STM MH #2	STM FES#2	338.73	545.00	531.00	4.1300	36.000	105.20	0 00:00	19.66	0.29	135.60	0.78	0.77	0.00	2.28
4	PROP. AREA INLET#1	STORM MH #1	458.83	550.38	534.00	3.5700	48.000	139.55	0 00:00	19.08	0.40	271.41	0.51	0.66	0.00	2.63
5	STORM MH #1	STM FES#1	102.81	534.00	530.00	3.8900	48.000	168.76	0 00:08	16.94	0.10	283.34	0.60	0.74	0.00	2.98
6	CULV. INLET#1	EX REA INLET#2	13.53	559.68	558.14	11.3900	24.000	88.38	0 00:00	28.13	0.01	82.69	1.07	1.00	1440.00	2.00
7	EX REA INLET#2	PROP. AREA INLET#2	147.28	558.14	552.33	3.9400	36.000	99.45	0 00:00	16.02	0.15	143.51	0.69	0.92	0.00	2.73
8	EXIST. AREA INLET#1	PROP. AREA INLET#1	176.64	558.56	550.38	4.6300	36.000	169.23	0 00:08	29.54	0.10	155.49	1.09	1.00	1440.00	3.00

CULVERT STRUCTURES

SN	Element ID	Invert Elevation	Ground/Rim (Max) Elevation	Peak Inflow	Peak Lateral Inflow	Maximum HGL Elevation Attained	Maximum HGL Depth Attained	Time of Maximum HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
		(ft)	(ft)	(cfs)	(cfs)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-inches)	(minutes)
1	CULV. INLET#1	559.68	563.68	82.71	82.71	575.52	15.84	0 00:00	0 00:00	0.11	1440.00
2	EX REA INLET#2	558.14	563.79	88.56	4.77	564.08	5.94	0 00:00	0 00:00	0.01	0.00
3	EXIST. AREA INLET#1	558.56	566.14	170.13	170.13	576.98	18.42	0 00:07	0 00:00	0.49	1440.00
4	PROP. AREA INLET#1	550.38	557.00	169.23	0.00	553.41	3.03	0 00:00	0 00:00	0.00	0.00
5	PROP. AREA INLET#2	552.33	557.25	99.45	0.00	557.25	4.92	0 00:00	0 00:00	0.00	0.00
6	STM MH #2	545.00	560.00	109.91	0.00	547.71	2.71	0 00:00	0 00:00	0.00	0.00
7	STORM MH #1	534.00	548.73	279.09	0.00	537.73	3.73	0 00:08	0 00:00	0.00	0.00

CULVERT OUTFALLS

SN	Element ID	X Coordinate	Y Coordinate	Description	Invert Elevation	Boundary Type	Flap Gate	Fixed Water Elevation	Peak Inflow	Peak Lateral Inflow	Maximum HGL Depth Attained	Maximum HGL Elevation Attained
					(ft)			(ft)	(cfs)	(cfs)	(ft)	(ft)
1	STM FES#1	763578.12	1079204.89		530.00	FREE	NO		168.76	0.00	2.22	532.22
2	STM FES#2	763598.59	1079134.42		531.00	FREE	NO		105.20	0.00	1.99	532.99

7 APPENDICES

7.1 Peak Runoff Calculations: Existing Conditions Drainage

.1 2-Year Design Storm

.2 100-Year Design Storm

7.2 Peak Runoff Calculations: Proposed Conditions Drainage

.1 2-Year Design Storm

.2 100-Year Design Storm

.3 100-Year Design Storm – Low Flow Blocked

7.3 Detention Storage Analysis Detention Pond

.1 2-Year Design Storm

.2 100-Year Design Storm

.3 100-Year Design Storm – Low Flow Blocked

7.4 Storm Sewers

7.5 Culvert Design

APPENDIX 7.1.1

Peak Runoff Calculations

Existing Conditions Drainage Area

2-Year Design Storm

Project Description

File Name	O'Fallon Detention - PRE 2yr.SPF
Description	\Reyling Design and Consulting,LLC
	\Planet Fitness-Cornerstone\20-115
	PF O'Fallon MO\Design

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	SCS TR-55
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	YES

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	2Y-24H	Time Series	SCS-TYPE-II-2Y	Cumulative	inches	Missouri	St. Charles	2	3.50	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	{Catchments}.CATCH-INLET#9	4.14	484.00	70.00	3.50	1.01	4.17	5.84	0 00:07:18
2	Sub-01-2	1.65	484.00	90.00	3.50	2.45	4.04	5.77	0 00:08:02

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-05	Pipe	OUTFALL	Out-01	49.45	529.50	0.00	1070.7800	36.000	0.0150	11.19	58.13	0.19	5.52	0.99	0.33	0.00	Calculated

Subbasin Hydrology

Subbasin : {Catchments}.CATCH-INLET#9

Subbasin Runoff Results

Total Rainfall (in)	3.50
Total Runoff (in)	1.01
Peak Runoff (cfs)	5.84
Weighted Curve Number	70.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : Sub-01-2

Subbasin Runoff Results

Total Rainfall (in)	3.50
Total Runoff (in)	2.45
Peak Runoff (cfs)	5.77
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:08:02

APPENDIX 7.1.2

Peak Runoff Calculations

Existing Conditions Drainage Area

100-Year Design Storm

Project Description

File Name ..... O'Fallon Detention - PRE 100yr.SPF
Description ..... \Reyling Design and Consulting,LLC
\Planet Fitness-Cornerstone\20-115
PF O'Fallon MO\Design

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
Time of Concentration (TOC) Method ..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Enable Overflow Ponding at Nodes ..... YES
Skip Steady State Analysis Time Periods ..... YES

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	2Y-24H	Time Series	SCS-TYPE-II-100Y	Cumulative	inches	Missouri	St. Charles	2	3.50	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	{Catchments}.CATCH-INLET#9	4.14	484.00	70.00	7.00	3.62	14.98	22.22	0 00:07:18
2	Sub-01-2	1.65	484.00	90.00	7.00	5.82	9.61	13.12	0 00:08:02

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-05	Pipe	OUTFALL	Out-01	49.45	529.50	0.00	1070.7800	36.000	0.015	33.29	58.13	0.57	7.19	1.87	0.62	0.00	Calculated

Subbasin Hydrology

Subbasin : {Catchments}.CATCH-INLET#9

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	3.62
Peak Runoff (cfs)	22.22
Weighted Curve Number	70.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : Sub-01-2

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	13.12
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:08:02

APPENDIX 7.2.1

Peak Runoff Calculations

Proposed Conditions Drainage Area

2-Year Design Storm

Project Description

File Name	O'Fallon Detention - POST 2yr.SPF
Description	\Reyling Design and Consulting, LLC\Planet Fitness-Cornerstone\20-115 PF O'Fallon MO\Design

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	SCS TR-55
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	YES

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	100Y-24H	Time Series	SCS-TYPE-II-2Y	Cumulative	inches				0.00	
2	2Y-24H	Time Series	SCS-TYPE-II-2Y	Cumulative	inches				0.00	

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	{Catchments}.CATCH-INLET#1	0.18	484.00	90.00	3.50	2.45	0.44	0.64	0 00:07:18
2	{Catchments}.CATCH-INLET#10	0.53	484.00	90.00	3.50	2.45	1.31	1.89	0 00:07:18
3	{Catchments}.CATCH-INLET#2	0.11	484.00	90.00	3.50	2.44	0.28	0.44	0 00:05:00
4	{Catchments}.CATCH-INLET#3	0.11	484.00	90.00	3.50	2.44	0.26	0.41	0 00:05:34
5	{Catchments}.CATCH-INLET#4	0.26	484.00	90.00	3.50	2.45	0.63	0.91	0 00:07:18
6	{Catchments}.CATCH-INLET#5	0.13	484.00	90.00	3.50	2.44	0.31	0.46	0 00:07:18
7	{Catchments}.CATCH-INLET#6	0.23	484.00	90.00	3.50	2.45	0.57	0.82	0 00:07:18
8	{Catchments}.CATCH-INLET#7	0.53	484.00	90.00	3.50	2.45	1.30	1.89	0 00:07:18
9	{Catchments}.CATCH-INLET#8	0.19	484.00	90.00	3.50	2.45	0.46	0.66	0 00:07:18
10	{Catchments}.CATCH-INLET#9	0.22	484.00	90.00	3.50	2.45	0.53	0.78	0 00:07:18
11	{Catchments}.CATCH-OFFSITE	1.03	484.00	90.00	3.50	2.45	2.51	3.45	0 00:09:24
12	Sub-01	1.65	484.00	90.00	3.50	2.45	4.04	5.77	0 00:08:02

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	INLET#7	Pipe	DS#3	DS#4	68.00	557.00	555.50	2.2100	8.000	0.0120	0.00	1.94	0.00	0.00	0.18	0.27	0.00	Calculated
2	Link-01	Pipe	Out-1Pipe - (34)	POND	20.00	530.50	530.00	2.5000	24.000	0.0150	12.16	31.00	0.39	3.85	2.00	1.00	23.00	SURCHARGED
3	Link-02	Pipe	OUTFALL-STRUCT	OUTFALL-STRUC	20.00	530.00	529.00	5.0000	36.000	0.0150	9.93	129.26	0.08	8.33	0.68	0.23	0.00	Calculated
4	Pipe - (27)	Pipe	DS#1	DS#2	17.41	557.42	557.00	2.4100	8.000	0.0120	0.00	2.03	0.00	0.00	0.00	0.00	0.00	Calculated
5	Pipe - (28)	Pipe	DS#2	STRUCTURE #12	63.56	557.00	554.00	4.7200	8.000	0.0120	0.00	2.84	0.00	0.00	0.18	0.27	0.00	Calculated
6	Pipe - (29)	Pipe	STRUCTURE #12	STRUCTURE #11	100.20	554.00	553.50	0.5000	18.000	0.0130	0.91	7.42	0.12	2.29	0.42	0.28	0.00	Calculated
7	Pipe - (30)	Pipe	STRUCTURE #11	STRUCTURE #10	84.00	553.50	553.08	0.5000	18.000	0.0130	1.30	7.43	0.18	2.57	0.49	0.33	0.00	Calculated
8	Pipe - (31)	Pipe	STRUCTURE #10	STRUCTURE #9	143.91	553.08	552.36	0.5000	18.000	0.0130	1.71	7.43	0.23	3.26	0.51	0.34	0.00	Calculated
9	Pipe - (32)	Pipe	STRUCTURE #9	STRUCTURE #3	141.75	552.36	545.78	4.6400	18.000	0.0130	2.34	22.63	0.10	7.99	0.33	0.22	0.00	Calculated
10	Pipe - (33)	Pipe	STRUCTURE #3	STRUCTURE #2	20.90	534.34	533.50	4.0200	18.000	0.0130	12.16	21.06	0.58	9.24	1.08	0.72	0.00	Calculated
11	Pipe - (34)	Pipe	STRUCTURE #2	Out-1Pipe - (34)	57.65	533.50	530.50	5.2000	24.000	0.0130	12.12	51.61	0.23	5.52	1.41	0.71	0.00	Calculated
12	Pipe - (35)	Pipe	STRUCTURE #8	STRUCTURE #4	95.52	546.75	546.27	0.5000	18.000	0.0130	1.88	7.43	0.25	2.35	0.70	0.47	0.00	Calculated
13	Pipe - (36)	Pipe	STRUCTURE #4	STRUCTURE #3	98.60	546.27	542.33	4.0000	18.000	0.0130	9.38	21.01	0.45	10.38	0.76	0.51	0.00	Calculated
14	Pipe - (43)	Pipe	STRUCTURE #7	STRUCTURE #6	63.89	552.50	552.18	0.5000	18.000	0.0130	3.45	7.43	0.46	3.01	0.93	0.62	0.00	Calculated
15	Pipe - (44)	Pipe	STRUCTURE #6	STRUCTURE #5	63.00	552.18	551.87	0.5000	18.000	0.0130	4.20	7.43	0.57	3.88	0.89	0.59	0.00	Calculated
16	Pipe - (45)	Pipe	STRUCTURE #5	STRUCTURE #4	89.75	551.86	550.07	2.0000	18.000	0.0130	6.70	14.86	0.45	7.35	0.77	0.51	0.00	Calculated
17	Pipe - (47)	Pipe	DS#4	STRUCTURE #5	48.80	555.50	551.86	7.4600	8.000	0.0120	1.89	3.58	0.53	6.52	0.52	0.77	0.00	Calculated
18	Pipe - (48)	Pipe	DS#5	STRUCTURE #4	49.80	557.00	553.02	8.0000	8.000	0.0120	0.82	3.70	0.22	8.03	0.22	0.33	0.00	Calculated
19	Pipe - (49)	Pipe	STRUCTURE #20	STRUCTURE #19	100.90	552.33	545.00	7.2600	36.000	0.0130	5.76	179.77	0.03	10.57	0.39	0.13	0.00	Calculated
20	Pipe - (50)	Pipe	STRUCTURE #19	POND	268.51	545.00	530.00	5.5900	36.000	0.0130	5.75	157.65	0.04	1.86	1.69	0.56	0.00	Calculated
21	Pipe - (53)	Pipe	CULV. INLET#1	EX REA INLET#2	13.53	559.68	558.14	11.3900	24.000	0.0120	5.76	82.69	0.07	9.63	0.49	0.25	0.00	Calculated
22	Pipe - (54)	Pipe	EX REA INLET#2	STRUCTURE #20	147.28	558.14	552.33	3.9400	36.000	0.0120	5.76	143.51	0.04	9.63	0.42	0.14	0.00	Calculated
23	OUTF-ORIFICE	Orifice	POND	OUTFALL-STRUCT		530.00	530.00		15.000		9.93							
24	OUTFALL-WEIR	Weir	POND	OUTFALL-STRUCT		530.00	530.00				0.00							

Subbasin Hydrology

Subbasin : {Catchments}.CATCH-INLET#1

Subbasin Runoff Results

Total Rainfall (in)	3.50
Total Runoff (in)	2.45
Peak Runoff (cfs)	0.64
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#10

Subbasin Runoff Results

Total Rainfall (in)	3.50
Total Runoff (in)	2.45
Peak Runoff (cfs)	1.89
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#2

Subbasin Runoff Results

Total Rainfall (in)	3.50
Total Runoff (in)	2.44
Peak Runoff (cfs)	0.44
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:04:53

Subbasin : {Catchments}.CATCH-INLET#3

Subbasin Runoff Results

Total Rainfall (in)	3.50
Total Runoff (in)	2.44
Peak Runoff (cfs)	0.41
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:05:34

Subbasin : {Catchments}.CATCH-INLET#4

Subbasin Runoff Results

Total Rainfall (in)	3.50
Total Runoff (in)	2.45
Peak Runoff (cfs)	0.91
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#5

Subbasin Runoff Results

Total Rainfall (in)	3.50
Total Runoff (in)	2.44
Peak Runoff (cfs)	0.46
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#6

Subbasin Runoff Results

Total Rainfall (in)	3.50
Total Runoff (in)	2.45
Peak Runoff (cfs)	0.82
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#7

Subbasin Runoff Results

Total Rainfall (in)	3.50
Total Runoff (in)	2.45
Peak Runoff (cfs)	1.89
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#8

Subbasin Runoff Results

Total Rainfall (in)	3.50
Total Runoff (in)	2.45
Peak Runoff (cfs)	0.66
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#9

Subbasin Runoff Results

Total Rainfall (in)	3.50
Total Runoff (in)	2.45
Peak Runoff (cfs)	0.78
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-OFFSITE

Subbasin Runoff Results

Total Rainfall (in)	3.50
Total Runoff (in)	2.45
Peak Runoff (cfs)	3.45
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:09:24

Subbasin : Sub-01

Subbasin Runoff Results

Total Rainfall (in)	3.50
Total Runoff (in)	2.45
Peak Runoff (cfs)	5.77
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:08:02

APPENDIX 7.2.2

Peak Runoff Calculations

Proposed Conditions Drainage Area

100-Year Design Storm

Project Description

File Name ..... O'Fallon Detention - POST 100yr.SPF
Description ..... \Reyling Design and Consulting, LLC\Planet Fitness-Cornerstone\20-115 PF O'Fallon MO\Design

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
Time of Concentration (TOC) Method ..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Enable Overflow Ponding at Nodes ..... YES
Skip Steady State Analysis Time Periods ..... YES

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	100Y-24H	Time Series	SCS-TYPE-II-100Y	Cumulative	inches	Missouri	St. Charles	100	7.00	SCS Type II 24-hr
2	2Y-24H	Time Series	SCS-TYPE-II-100Y	Cumulative	inches	Missouri	St. Charles	100	7.00	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	{Catchments}.CATCH-INLET#1	0.18	484.00	90.00	7.00	5.82	1.05	1.45	0 00:07:18
2	{Catchments}.CATCH-INLET#10	0.53	484.00	90.00	7.00	5.82	3.11	4.31	0 00:07:18
3	{Catchments}.CATCH-INLET#2	0.11	484.00	90.00	7.00	5.82	0.66	1.00	0 00:05:00
4	{Catchments}.CATCH-INLET#3	0.11	484.00	90.00	7.00	5.82	0.62	0.93	0 00:05:34
5	{Catchments}.CATCH-INLET#4	0.26	484.00	90.00	7.00	5.82	1.50	2.08	0 00:07:18
6	{Catchments}.CATCH-INLET#5	0.13	484.00	90.00	7.00	5.82	0.73	1.04	0 00:07:18
7	{Catchments}.CATCH-INLET#6	0.23	484.00	90.00	7.00	5.82	1.34	1.87	0 00:07:18
8	{Catchments}.CATCH-INLET#7	0.53	484.00	90.00	7.00	5.82	3.10	4.31	0 00:07:18
9	{Catchments}.CATCH-INLET#8	0.19	484.00	90.00	7.00	5.82	1.09	1.51	0 00:07:18
10	{Catchments}.CATCH-INLET#9	0.22	484.00	90.00	7.00	5.82	1.27	1.77	0 00:07:18
11	{Catchments}.CATCH-OFFSITE	1.03	484.00	90.00	7.00	5.82	5.97	7.86	0 00:09:24
12	Sub-01	1.65	484.00	90.00	7.00	5.82	9.61	13.12	0 00:08:02

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	INLET#7	Pipe	DS#3	DS#4	68.00	557.00	555.50	2.2100	8.000	0.0120	0.37	1.94	0.19	1.52	0.67	1.00	9.00	SURCHARGED
2	Link-01	Pipe	Out-1Pipe - (34)	POND	20.00	530.50	530.00	2.5000	24.000	0.0150	26.66	31.00	0.86	8.49	2.00	1.00	59.00	SURCHARGED
3	Link-02	Pipe	OUTFALL-STRUCT	OUTFALL-STRUC	20.00	530.00	529.00	5.0000	36.000	0.0150	33.22	129.26	0.26	10.53	1.37	0.46	0.00	Calculated
4	Pipe - (27)	Pipe	DS#1	DS#2	17.41	557.42	557.00	2.4100	8.000	0.0120	0.00	2.03	0.00	0.00	0.00	0.00	0.00	Calculated
5	Pipe - (28)	Pipe	DS#2	STRUCTURE #12	63.56	557.00	554.00	4.7200	8.000	0.0120	0.00	2.84	0.00	0.00	0.30	0.46	0.00	Calculated
6	Pipe - (29)	Pipe	STRUCTURE #12	STRUCTURE #11	100.20	554.00	553.50	0.5000	18.000	0.0130	2.07	7.42	0.28	2.59	0.69	0.46	0.00	Calculated
7	Pipe - (30)	Pipe	STRUCTURE #11	STRUCTURE #10	84.00	553.50	553.08	0.5000	18.000	0.0130	2.97	7.43	0.40	3.01	0.82	0.54	0.00	Calculated
8	Pipe - (31)	Pipe	STRUCTURE #10	STRUCTURE #9	143.91	553.08	552.36	0.5000	18.000	0.0130	3.90	7.43	0.52	4.05	0.80	0.54	0.00	Calculated
9	Pipe - (32)	Pipe	STRUCTURE #9	STRUCTURE #3	141.75	552.36	545.78	4.6400	18.000	0.0130	5.34	22.63	0.24	9.92	0.52	0.34	0.00	Calculated
10	Pipe - (33)	Pipe	STRUCTURE #3	STRUCTURE #2	20.90	534.34	533.50	4.0200	18.000	0.0130	27.10	21.06	1.29	15.33	1.50	1.00	20.00	SURCHARGED
11	Pipe - (34)	Pipe	STRUCTURE #2	Out-1Pipe - (34)	57.65	533.50	530.50	5.2000	24.000	0.0130	26.85	51.61	0.52	8.55	2.00	1.00	21.00	SURCHARGED
12	Pipe - (35)	Pipe	STRUCTURE #8	STRUCTURE #4	95.52	546.75	546.27	0.5000	18.000	0.0130	4.29	7.43	0.58	2.43	1.50	1.00	9.00	SURCHARGED
13	Pipe - (36)	Pipe	STRUCTURE #4	STRUCTURE #3	98.60	546.27	542.33	4.0000	18.000	0.0130	21.04	21.01	1.00	12.32	1.50	1.00	3.00	SURCHARGED
14	Pipe - (43)	Pipe	STRUCTURE #7	STRUCTURE #6	63.89	552.50	552.18	0.5000	18.000	0.0130	7.86	7.43	1.06	4.45	1.50	1.00	11.00	SURCHARGED
15	Pipe - (44)	Pipe	STRUCTURE #6	STRUCTURE #5	63.00	552.18	551.87	0.5000	18.000	0.0130	9.56	7.43	1.29	5.41	1.50	1.00	9.00	SURCHARGED
16	Pipe - (45)	Pipe	STRUCTURE #5	STRUCTURE #4	89.75	551.86	550.07	2.0000	18.000	0.0130	15.10	14.86	1.02	8.80	1.45	0.97	0.00	> CAPACITY
17	Pipe - (47)	Pipe	DS#4	STRUCTURE #5	48.80	555.50	551.86	7.4600	8.000	0.0120	4.12	3.58	1.15	11.80	0.67	1.00	12.00	SURCHARGED
18	Pipe - (48)	Pipe	DS#5	STRUCTURE #4	49.80	557.00	553.02	8.0000	8.000	0.0120	1.86	3.70	0.50	9.66	0.36	0.54	0.00	Calculated
19	Pipe - (49)	Pipe	STRUCTURE #20	STRUCTURE #19	100.90	552.33	545.00	7.2600	36.000	0.0130	13.12	179.77	0.07	13.06	0.60	0.20	0.00	Calculated
20	Pipe - (50)	Pipe	STRUCTURE #19	POND	268.51	545.00	530.00	5.5900	36.000	0.0130	13.11	157.65	0.08	2.97	1.79	0.60	0.00	Calculated
21	Pipe - (53)	Pipe	CULV. INLET#1	EX REA INLET#2	13.53	559.68	558.14	11.3900	24.000	0.0120	13.12	82.69	0.16	10.85	0.82	0.41	0.00	Calculated
22	Pipe - (54)	Pipe	EX REA INLET#2	STRUCTURE #20	147.28	558.14	552.33	3.9400	36.000	0.0120	13.12	143.51	0.09	11.60	0.65	0.22	0.00	Calculated
23	OUTF-ORIFICE	Orifice	POND	OUTFALL-STRUCT		530.00	530.00		15.000		12.79							
24	OUTFALL-WEIR	Weir	POND	OUTFALL-STRUCT		530.00	530.00				20.73							

Subbasin Hydrology

Subbasin : {Catchments}.CATCH-INLET#1

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	1.45
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#10

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	4.31
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#2

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	1.00
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:04:53

Subbasin : {Catchments}.CATCH-INLET#3

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	0.93
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:05:34

Subbasin : {Catchments}.CATCH-INLET#4

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	2.08
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#5

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	1.04
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#6

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	1.87
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#7

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	4.31
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#8

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	1.51
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#9

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	1.77
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-OFFSITE

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	7.86
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:09:24

Subbasin : Sub-01

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	13.12
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:08:02

APPENDIX 7.2.3

Peak Runoff Calculations

Proposed Conditions Drainage Area

100-Year Design Storm – Low Flow Blocked

Project Description

File Name ..... O'Fallon Detention - POST 100yr LFB.SPF
Description ..... \Reyling Design and Consulting, LLC\Planet Fitness-Cornerstone\20-115 PF O'Fallon MO\Design

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
Time of Concentration (TOC) Method ..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Enable Overflow Ponding at Nodes ..... YES
Skip Steady State Analysis Time Periods ..... YES

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	100Y-24H	Time Series	SCS-TYPE-II-100Y	Cumulative	inches	Missouri	St. Charles	100	7.00	SCS Type II 24-hr
2	2Y-24H	Time Series	SCS-TYPE-II-100Y	Cumulative	inches	Missouri	St. Charles	100	7.00	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	{Catchments}.CATCH-INLET#1	0.18	484.00	90.00	7.00	5.82	1.05	1.45	0 00:07:18
2	{Catchments}.CATCH-INLET#10	0.53	484.00	90.00	7.00	5.82	3.11	4.31	0 00:07:18
3	{Catchments}.CATCH-INLET#2	0.11	484.00	90.00	7.00	5.82	0.66	1.00	0 00:05:00
4	{Catchments}.CATCH-INLET#3	0.11	484.00	90.00	7.00	5.82	0.62	0.93	0 00:05:34
5	{Catchments}.CATCH-INLET#4	0.26	484.00	90.00	7.00	5.82	1.50	2.08	0 00:07:18
6	{Catchments}.CATCH-INLET#5	0.13	484.00	90.00	7.00	5.82	0.73	1.04	0 00:07:18
7	{Catchments}.CATCH-INLET#6	0.23	484.00	90.00	7.00	5.82	1.34	1.87	0 00:07:18
8	{Catchments}.CATCH-INLET#7	0.53	484.00	90.00	7.00	5.82	3.10	4.31	0 00:07:18
9	{Catchments}.CATCH-INLET#8	0.19	484.00	90.00	7.00	5.82	1.09	1.51	0 00:07:18
10	{Catchments}.CATCH-INLET#9	0.22	484.00	90.00	7.00	5.82	1.27	1.77	0 00:07:18
11	{Catchments}.CATCH-OFFSITE	1.03	484.00	90.00	7.00	5.82	5.97	7.86	0 00:09:24
12	Sub-01	1.65	484.00	90.00	7.00	5.82	9.61	13.12	0 00:08:02

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	INLET#7	Pipe	DS#3	DS#4	68.00	557.00	555.50	2.2100	8.000	0.0120	0.37	1.94	0.19	1.53	0.67	1.00	9.00	SURCHARGED
2	Link-01	Pipe	Out-1Pipe - (34)	POND	20.00	530.50	530.00	2.5000	24.000	0.0150	26.77	31.00	0.86	8.52	2.00	1.00	922.00	SURCHARGED
3	Link-02	Pipe	OUTFALL-STRUCT	OUTFALL-STRUC	20.00	530.00	529.00	5.0000	36.000	0.0150	38.82	129.26	0.30	10.86	1.51	0.50	0.00	Calculated
4	Pipe - (27)	Pipe	DS#1	DS#2	17.41	557.42	557.00	2.4100	8.000	0.0120	0.00	2.03	0.00	0.00	0.00	0.00	0.00	Calculated
5	Pipe - (28)	Pipe	DS#2	STRUCTURE #12	63.56	557.00	554.00	4.7200	8.000	0.0120	0.00	2.84	0.00	0.00	0.30	0.46	0.00	Calculated
6	Pipe - (29)	Pipe	STRUCTURE #12	STRUCTURE #11	100.20	554.00	553.50	0.5000	18.000	0.0130	2.07	7.42	0.28	2.59	0.69	0.46	0.00	Calculated
7	Pipe - (30)	Pipe	STRUCTURE #11	STRUCTURE #10	84.00	553.50	553.08	0.5000	18.000	0.0130	2.97	7.43	0.40	3.01	0.82	0.54	0.00	Calculated
8	Pipe - (31)	Pipe	STRUCTURE #10	STRUCTURE #9	143.91	553.08	552.36	0.5000	18.000	0.0130	3.90	7.43	0.52	4.05	0.80	0.54	0.00	Calculated
9	Pipe - (32)	Pipe	STRUCTURE #9	STRUCTURE #3	141.75	552.36	545.78	4.6400	18.000	0.0130	5.34	22.63	0.24	9.92	0.52	0.34	0.00	Calculated
10	Pipe - (33)	Pipe	STRUCTURE #3	STRUCTURE #2	20.90	534.34	533.50	4.0200	18.000	0.0130	26.79	21.06	1.27	15.16	1.50	1.00	40.00	SURCHARGED
11	Pipe - (34)	Pipe	STRUCTURE #2	Out-1Pipe - (34)	57.65	533.50	530.50	5.2000	24.000	0.0130	26.78	51.61	0.52	8.52	2.00	1.00	105.00	SURCHARGED
12	Pipe - (35)	Pipe	STRUCTURE #8	STRUCTURE #4	95.52	546.75	546.27	0.5000	18.000	0.0130	4.30	7.43	0.58	2.43	1.50	1.00	9.00	SURCHARGED
13	Pipe - (36)	Pipe	STRUCTURE #4	STRUCTURE #3	98.60	546.27	542.33	4.0000	18.000	0.0130	20.70	21.01	0.99	11.71	1.50	1.00	6.00	SURCHARGED
14	Pipe - (43)	Pipe	STRUCTURE #7	STRUCTURE #6	63.89	552.50	552.18	0.5000	18.000	0.0130	7.86	7.43	1.06	4.45	1.50	1.00	11.00	SURCHARGED
15	Pipe - (44)	Pipe	STRUCTURE #6	STRUCTURE #5	63.00	552.18	551.87	0.5000	18.000	0.0130	9.56	7.43	1.29	5.41	1.50	1.00	9.00	SURCHARGED
16	Pipe - (45)	Pipe	STRUCTURE #5	STRUCTURE #4	89.75	551.86	550.07	2.0000	18.000	0.0130	15.10	14.86	1.02	8.80	1.45	0.97	0.00	> CAPACITY
17	Pipe - (47)	Pipe	DS#4	STRUCTURE #5	48.80	555.50	551.86	7.4600	8.000	0.0120	4.12	3.58	1.15	11.80	0.67	1.00	13.00	SURCHARGED
18	Pipe - (48)	Pipe	DS#5	STRUCTURE #4	49.80	557.00	553.02	8.0000	8.000	0.0120	1.86	3.70	0.50	9.66	0.36	0.54	0.00	Calculated
19	Pipe - (49)	Pipe	STRUCTURE #20	STRUCTURE #19	100.90	552.33	545.00	7.2600	36.000	0.0130	13.12	179.77	0.07	13.06	0.60	0.20	0.00	Calculated
20	Pipe - (50)	Pipe	STRUCTURE #19	POND	268.51	545.00	530.00	5.5900	36.000	0.0130	13.11	157.65	0.08	2.97	1.79	0.60	0.00	Calculated
21	Pipe - (53)	Pipe	CULV. INLET#1	EX REA INLET#2	13.53	559.68	558.14	11.3900	24.000	0.0120	13.12	82.69	0.16	10.85	0.82	0.41	0.00	Calculated
22	Pipe - (54)	Pipe	EX REA INLET#2	STRUCTURE #20	147.28	558.14	552.33	3.9400	36.000	0.0120	13.12	143.51	0.09	11.60	0.65	0.22	0.00	Calculated
23	OUTF-ORIFICE	Orifice	POND	OUTFALL-STRUCT		530.00	530.00		0.001		0.00							
24	OUTFALL-WEIR	Weir	POND	OUTFALL-STRUCT		530.00	530.00				38.82							

Subbasin Hydrology

Subbasin : {Catchments}.CATCH-INLET#1

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	1.45
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#10

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	4.31
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#2

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	1.00
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:04:53

Subbasin : {Catchments}.CATCH-INLET#3

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	0.93
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:05:34

Subbasin : {Catchments}.CATCH-INLET#4

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	2.08
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#5

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	1.04
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#6

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	1.87
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#7

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	4.31
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#8

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	1.51
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#9

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	1.77
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-OFFSITE

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	7.86
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:09:24

Subbasin : Sub-01

Subbasin Runoff Results

Total Rainfall (in)	7.00
Total Runoff (in)	5.82
Peak Runoff (cfs)	13.12
Weighted Curve Number	90.00
Time of Concentration (days hh:mm:ss)	0 00:08:02

APPENDIX 7.3.1

Detention Storage Analysis

Proposed Pond

2-Year Design Storm

Storage Nodes

Storage Node : POND

Input Data

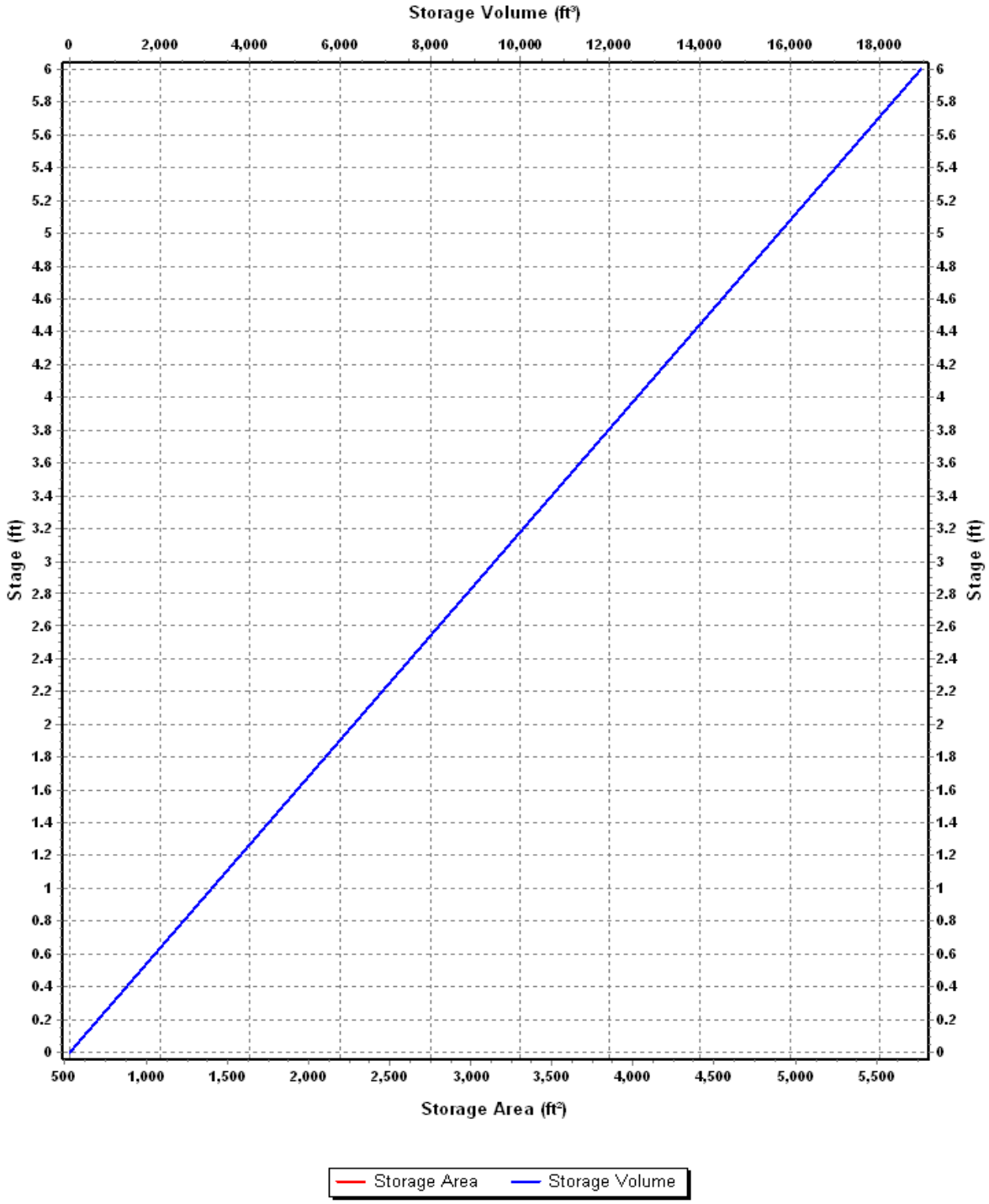
Invert Elevation (ft)	530.00
Max (Rim) Elevation (ft)	540.00
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	530.00
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	5771.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : POND

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	530	0.000
6	5771	18903.00

Storage Area Volume Curves



Storage Node : POND (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	OUTFALL-WEIR	Trapezoidal	No	535.35	5.35	12.00	1.00	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	OUTF-ORIFICE	Side	CIRCULAR	No	15.00			530.00	0.61

Output Summary Results

Peak Inflow (cfs)	17.85
Peak Lateral Inflow (cfs)	0.00
Peak Outflow (cfs)	9.93
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	533.49
Max HGL Depth Attained (ft)	3.49
Average HGL Elevation Attained (ft)	530.25
Average HGL Depth Attained (ft)	0.25
Time of Max HGL Occurrence (days hh:mm)	0 12:07
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

APPENDIX 7.3.2

Detention Storage Analysis

Proposed Pond

100-Year Design Storm

Storage Nodes

Storage Node : POND

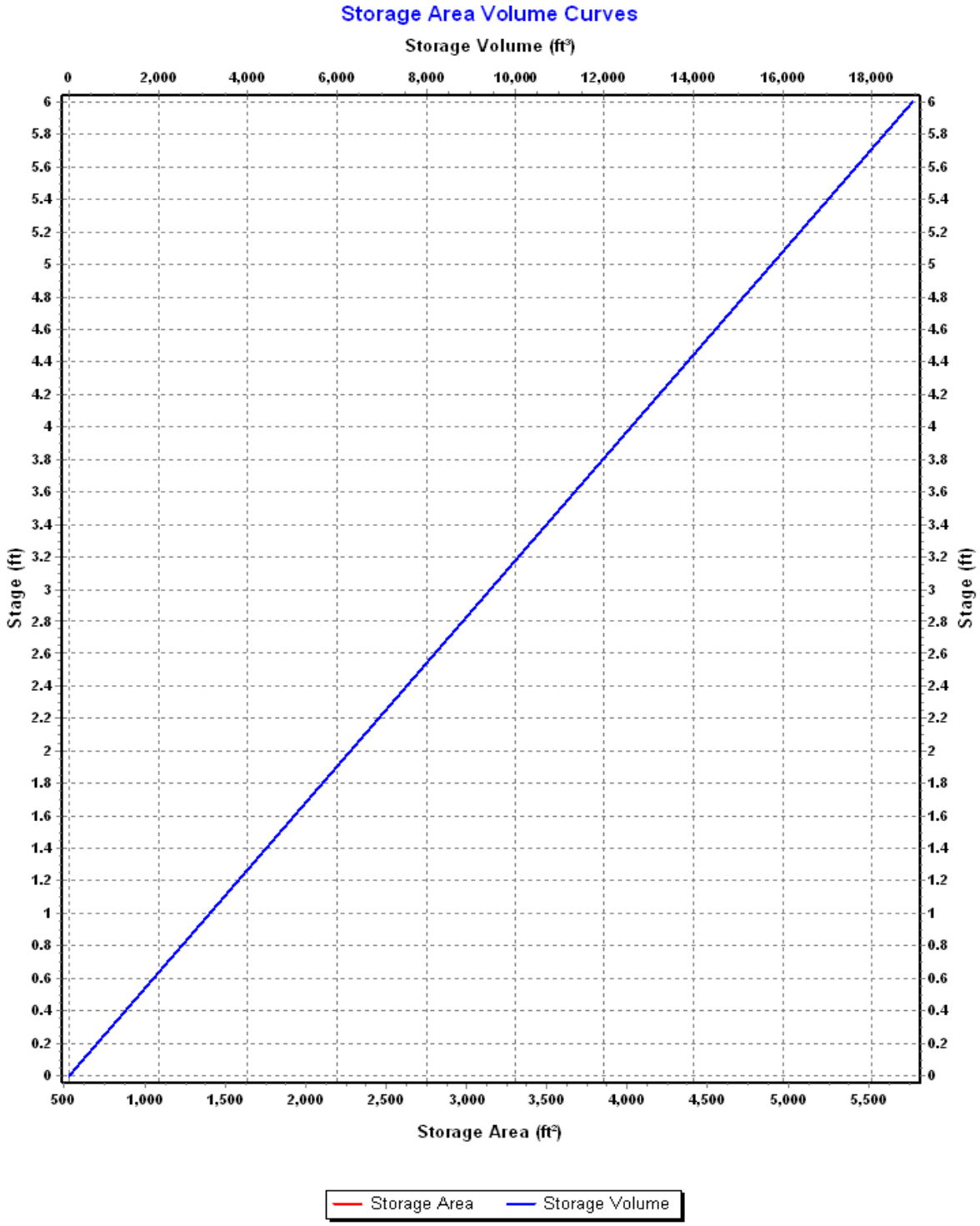
Input Data

Invert Elevation (ft)	530.00
Max (Rim) Elevation (ft)	540.00
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	530.00
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	5771.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : POND

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	530	0.000
6	5771	18903.00


Storage Area Volume Curves
Storage Volume (ft³)
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
Stage (ft)
Stage (ft)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
5
5.2
5.4
5.6
5.8
6
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : POND (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	OUTFALL-WEIR	Trapezoidal	No	535.35	5.35	12.00	3.00	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	OUTF-ORIFICE	Side	CIRCULAR	No	15.00			530.00	0.61

Output Summary Results

Peak Inflow (cfs)	39.70
Peak Lateral Inflow (cfs)	6.48
Peak Outflow (cfs)	33.22
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	535.98
Max HGL Depth Attained (ft)	5.98
Average HGL Elevation Attained (ft)	530.51
Average HGL Depth Attained (ft)	0.51
Time of Max HGL Occurrence (days hh:mm)	0 12:04
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

APPENDIX 7.3.3

Detention Storage Analysis

Proposed Pond

100-Year Design Storm – Low Flow Blocked

Storage Nodes

Storage Node : POND

Input Data

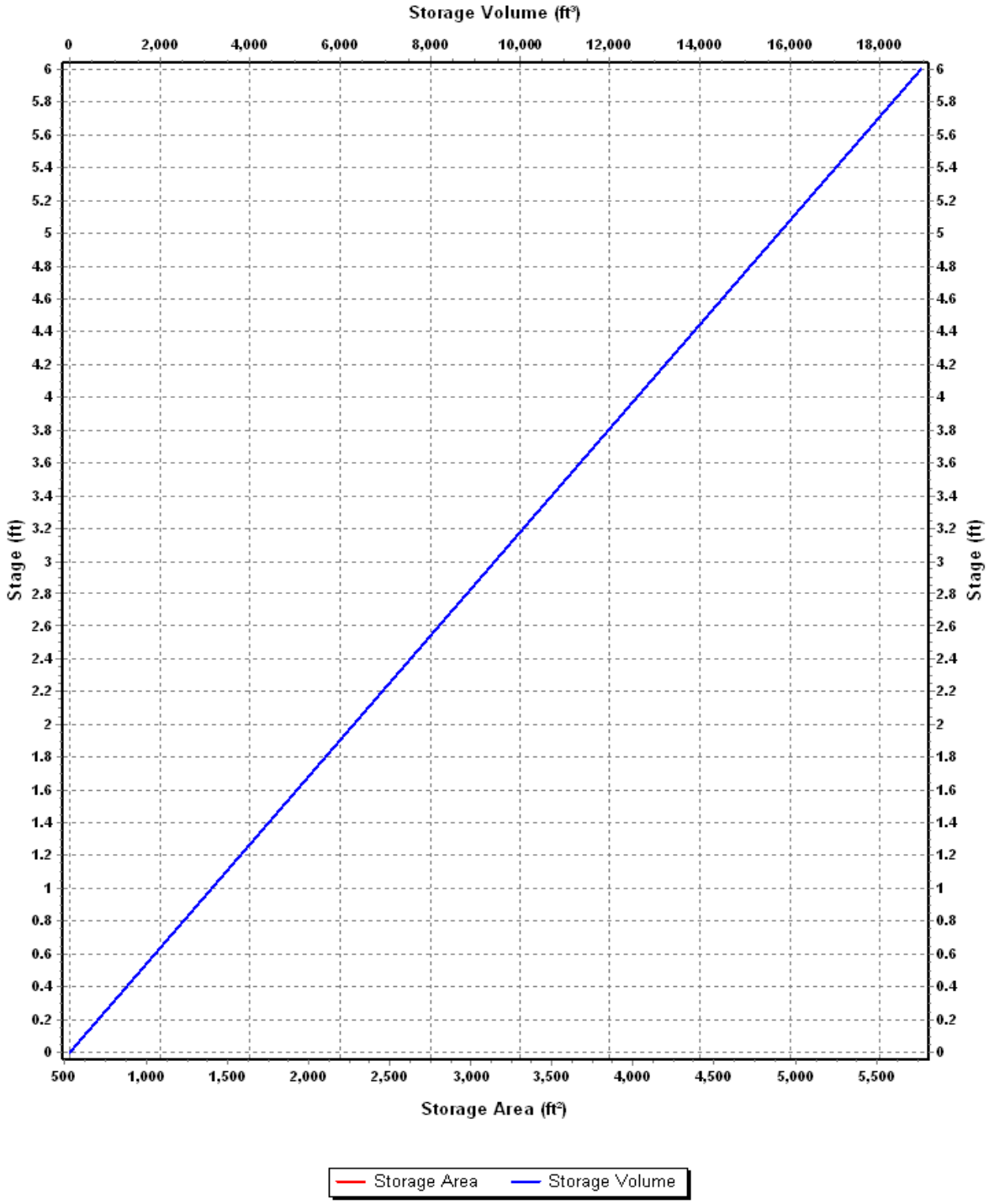
Invert Elevation (ft)	530.00
Max (Rim) Elevation (ft)	540.00
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	530.00
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	5771.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : POND

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	530	0.000
6	5771	18903.00

Storage Area Volume Curves



Storage Node : POND (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	OUTFALL-WEIR	Trapezoidal	No	535.35	5.35	12.00	1.00	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	OUTF-ORIFICE	Side	CIRCULAR	No	0.00			530.00	0.61

Output Summary Results

Peak Inflow (cfs)	39.61
Peak Lateral Inflow (cfs)	0.00
Peak Outflow (cfs)	38.82
Peak Exfiltration Flow Rate (cfm)	0.000
Max HGL Elevation Attained (ft)	536.29
Max HGL Depth Attained (ft)	0.29
Average HGL Elevation Attained (ft)	533.53
Average HGL Depth Attained (ft)	3.53
Time of Max HGL Occurrence (days hh:mm)	0 12:01
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

APPENDIX 7.4

Storm Sewer

15-Year Design Storm

Project Description

File Name	O'Fallon Detention - SEWERS - 15yr.SPF
Description	\Reyling Design and Consulting, LLC\Planet Fitness-Cornerstone\20-115 PF O'Fallon MO\Design

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	YES

Rainfall Details

Return Period	15 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	{Catchments}.CATCH-INLET#1	0.18	0.9000	0.82	0.73	0.13	1.09	0 00:07:18
2	{Catchments}.CATCH-INLET#10	0.53	0.9000	0.82	0.73	0.39	3.21	0 00:07:18
3	{Catchments}.CATCH-INLET#2	0.11	0.9000	0.65	0.59	0.07	0.81	0 00:05:00
4	{Catchments}.CATCH-INLET#3	0.11	0.9000	0.69	0.62	0.07	0.72	0 00:05:34
5	{Catchments}.CATCH-INLET#4	0.26	0.9000	0.82	0.73	0.19	1.54	0 00:07:18
6	{Catchments}.CATCH-INLET#5	0.13	0.9000	0.82	0.73	0.09	0.75	0 00:07:18
7	{Catchments}.CATCH-INLET#6	0.23	0.9000	0.82	0.73	0.17	1.39	0 00:07:18
8	{Catchments}.CATCH-INLET#7	0.53	0.9000	0.82	0.73	0.39	3.20	0 00:07:18
9	{Catchments}.CATCH-INLET#8	0.19	0.9000	0.82	0.73	0.14	1.12	0 00:07:18
10	{Catchments}.CATCH-INLET#9	0.22	0.9000	0.82	0.73	0.16	1.31	0 00:07:18
11	{Catchments}.CATCH-OFFSITE	1.03	0.9000	0.93	0.84	0.86	5.53	0 00:09:24

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	INLET#7	Pipe	DS#3	DS#4	68.00	557.00	555.50	2.2100	8.000	0.0120	0.00	1.94	0.00	0.00	0.00	0.00	0.00	Calculated
2	Link-01	Pipe	OUTFALL-STRUC	OUTFALL	5.80	530.00	529.50	8.6200	24.000	0.0150	1.77	57.57	0.03	6.10	0.30	0.15	0.00	Calculated
3	Pipe - (27)	Pipe	DS#1	DS#2	17.41	557.42	557.00	2.4100	8.000	0.0120	1.53	2.03	0.75	5.51	0.50	0.75	0.00	Calculated
4	Pipe - (28)	Pipe	DS#2	STRUCTURE #12	63.56	557.00	554.00	4.7200	8.000	0.0120	1.53	2.84	0.54	6.41	0.43	0.65	0.00	Calculated
5	Pipe - (29)	Pipe	STRUCTURE #12	STRUCTURE #11	100.20	554.00	553.50	0.5000	18.000	0.0130	1.51	7.42	0.20	2.64	0.54	0.36	0.00	Calculated
6	Pipe - (30)	Pipe	STRUCTURE #11	STRUCTURE #10	84.00	553.50	553.08	0.5000	18.000	0.0130	1.92	7.43	0.26	2.92	0.60	0.40	0.00	Calculated
7	Pipe - (31)	Pipe	STRUCTURE #10	STRUCTURE #9	143.91	553.08	552.36	0.5000	18.000	0.0130	2.34	7.43	0.32	3.54	0.60	0.40	0.00	Calculated
8	Pipe - (32)	Pipe	STRUCTURE #9	STRUCTURE #3	141.75	552.36	545.78	4.6400	18.000	0.0130	3.41	22.63	0.15	8.84	0.41	0.27	0.00	Calculated
9	Pipe - (33)	Pipe	STRUCTURE #3	STRUCTURE #2	20.90	534.34	533.50	4.0200	18.000	0.0130	18.12	21.06	0.86	11.36	1.28	0.85	0.00	Calculated
10	Pipe - (34)	Pipe	STRUCTURE #2	POND	57.65	533.50	530.00	6.0700	24.000	0.0130	18.05	55.74	0.32	10.99	1.53	0.76	0.00	Calculated
11	Pipe - (35)	Pipe	STRUCTURE #8	STRUCTURE #4	95.52	546.75	546.27	0.5000	18.000	0.0130	3.12	7.43	0.42	2.55	0.99	0.66	0.00	Calculated
12	Pipe - (36)	Pipe	STRUCTURE #4	STRUCTURE #3	98.60	546.27	542.33	4.0000	18.000	0.0130	14.09	21.01	0.67	11.14	1.01	0.67	0.00	Calculated
13	Pipe - (43)	Pipe	STRUCTURE #7	STRUCTURE #6	63.89	552.50	552.18	0.5000	18.000	0.0130	6.47	7.43	0.87	3.71	1.44	0.96	0.00	Calculated
14	Pipe - (44)	Pipe	STRUCTURE #6	STRUCTURE #5	63.00	552.18	551.87	0.5000	18.000	0.0130	7.28	7.43	0.98	4.71	1.23	0.82	0.00	Calculated
15	Pipe - (45)	Pipe	STRUCTURE #5	STRUCTURE #4	89.75	551.86	550.07	2.0000	18.000	0.0130	9.78	14.86	0.66	7.89	0.99	0.66	0.00	Calculated
16	Pipe - (47)	Pipe	DS#4	STRUCTURE #5	48.80	555.50	551.86	7.4600	8.000	0.0120	0.00	3.58	0.00	0.00	0.33	0.50	0.00	Calculated
17	Pipe - (48)	Pipe	DS#5	STRUCTURE #4	49.80	557.00	553.02	8.0000	8.000	0.0120	1.38	3.70	0.37	9.08	0.30	0.45	0.00	Calculated
18	OR01	Orifice	POND	OUTFALL-STRUC		530.00	530.00		6.000		1.77							
19	W01	Weir	POND	OUTFALL-STRUC		530.00	530.00				0.00							

Subbasin Hydrology

Subbasin : {Catchments}.CATCH-INLET#1

Subbasin Runoff Results

Total Rainfall (in)	0.82
Total Runoff (in)	0.73
Peak Runoff (cfs)	1.09
Rainfall Intensity	6.675
Weighted Runoff Coefficient	0.9000
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#10

Subbasin Runoff Results

Total Rainfall (in)	0.82
Total Runoff (in)	0.73
Peak Runoff (cfs)	3.21
Rainfall Intensity	6.675
Weighted Runoff Coefficient	0.9000
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#2

Subbasin Runoff Results

Total Rainfall (in)	0.65
Total Runoff (in)	0.59
Peak Runoff (cfs)	0.81
Rainfall Intensity	7.850
Weighted Runoff Coefficient	0.9000
Time of Concentration (days hh:mm:ss)	0 00:04:53

Subbasin : {Catchments}.CATCH-INLET#3

Subbasin Runoff Results

Total Rainfall (in)	0.69
Total Runoff (in)	0.62
Peak Runoff (cfs)	0.72
Rainfall Intensity	7.497
Weighted Runoff Coefficient	0.9000
Time of Concentration (days hh:mm:ss)	0 00:05:34

Subbasin : {Catchments}.CATCH-INLET#4

Subbasin Runoff Results

Total Rainfall (in)	0.82
Total Runoff (in)	0.73
Peak Runoff (cfs)	1.54
Rainfall Intensity	6.675
Weighted Runoff Coefficient	0.9000
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#5

Subbasin Runoff Results

Total Rainfall (in)	0.82
Total Runoff (in)	0.73
Peak Runoff (cfs)	0.75
Rainfall Intensity	6.675
Weighted Runoff Coefficient	0.9000
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#6

Subbasin Runoff Results

Total Rainfall (in)	0.82
Total Runoff (in)	0.73
Peak Runoff (cfs)	1.39
Rainfall Intensity	6.675
Weighted Runoff Coefficient	0.9000
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#7

Subbasin Runoff Results

Total Rainfall (in)	0.82
Total Runoff (in)	0.73
Peak Runoff (cfs)	3.20
Rainfall Intensity	6.675
Weighted Runoff Coefficient	0.9000
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#8

Subbasin Runoff Results

Total Rainfall (in)	0.82
Total Runoff (in)	0.73
Peak Runoff (cfs)	1.12
Rainfall Intensity	6.675
Weighted Runoff Coefficient	0.9000
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-INLET#9

Subbasin Runoff Results

Total Rainfall (in)	0.82
Total Runoff (in)	0.73
Peak Runoff (cfs)	1.31
Rainfall Intensity	6.675
Weighted Runoff Coefficient	0.9000
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-OFFSITE

Subbasin Runoff Results

Total Rainfall (in)	0.93
Total Runoff (in)	0.84
Peak Runoff (cfs)	5.53
Rainfall Intensity	5.996
Weighted Runoff Coefficient	0.9000
Time of Concentration (days hh:mm:ss)	0 00:09:24

APPENDIX 7.5

Storm Culverts

25-Year Design Storm

Project Description

File Name	O'Fallon Detention - CULVERTS.SPF
Description	\Reyling Design and Consulting, LLC\Planet Fitness-Cornerstone\20-115 PF O'Fallon MO\Design

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	YES

Rainfall Details

Return Period	25 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	{Catchments}.CATCH-CULV#1	0.71	0.9000	0.92	0.83	0.58	4.77	0 00:07:18
2	{Catchments}.CATCH-CULV#2	2.17	0.9000	0.92	0.83	1.79	14.65	0 00:07:18

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-05	Pipe	PROP. AREA INLET#1	STORM MH #1	458.83	550.38	534.00	3.5700	48.000	0.0130	139.55	271.41	0.51	19.08	2.63	0.66	0.00	Calculated
2	Pipe - (49)	Pipe	PROP. AREA INLET#2	STM MH #2	100.90	552.33	545.00	7.2600	36.000	0.0130	109.91	179.77	0.61	18.55	2.36	0.79	0.00	Calculated
3	Pipe - (50)	Pipe	STM MH #2	STM FES#2	338.73	545.00	531.00	4.1300	36.000	0.0130	105.20	135.60	0.78	19.66	2.28	0.77	0.00	Calculated
4	Pipe - (51)	Pipe	PROP. AREA INLET#1	STORM MH #1	458.83	550.38	534.00	3.5700	48.000	0.0130	139.55	271.41	0.51	19.08	2.63	0.66	0.00	Calculated
5	Pipe - (52)	Pipe	STORM MH #1	STM FES#1	102.81	534.00	530.00	3.8900	48.000	0.0130	168.76	283.34	0.60	16.94	2.98	0.74	0.00	Calculated
6	Pipe - (53)	Pipe	CULV. INLET#1	EX REA INLET#2	13.53	559.68	558.14	11.3900	24.000	0.0120	88.38	82.69	1.07	28.13	2.00	1.00	1440.00	SURCHARGED
7	Pipe - (54)	Pipe	EX REA INLET#2	PROP. AREA INLET#2	147.28	558.14	552.33	3.9400	36.000	0.0120	99.45	143.51	0.69	16.02	2.73	0.92	0.00	Calculated
8	Pipe - (55)	Pipe	EXIST. AREA INLET#1	PROP. AREA INLET#1	176.64	558.56	550.38	4.6300	36.000	0.0120	169.23	155.49	1.09	29.54	3.00	1.00	1400.00	SURCHARGED

Subbasin Hydrology

Subbasin : {Catchments}.CATCH-CULV#1

Subbasin Runoff Results

Total Rainfall (in)	0.92
Total Runoff (in)	0.83
Peak Runoff (cfs)	4.77
Rainfall Intensity	7.506
Weighted Runoff Coefficient	0.9000
Time of Concentration (days hh:mm:ss)	0 00:07:19

Subbasin : {Catchments}.CATCH-CULV#2

Subbasin Runoff Results

Total Rainfall (in)	0.92
Total Runoff (in)	0.83
Peak Runoff (cfs)	14.65
Rainfall Intensity	7.506
Weighted Runoff Coefficient	0.9000
Time of Concentration (days hh:mm:ss)	0 00:07:19