RANGE USA IMPROVEMENTS

AT 15 CASTLE LANE
O'FALLON, MISSOURI 63366

STORMWATER MANAGEMENT FACILITIES REPORT: CALCULATIONS

Prepared For:

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Prepared By:

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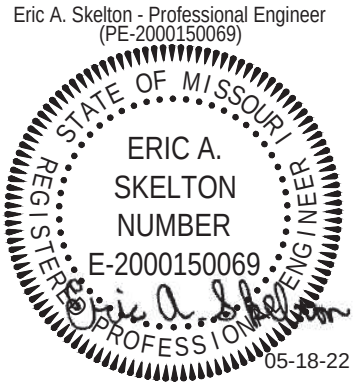
CEC Project No. 21100

May 2022



* These drawings are provided in this Report for informational purposes only. Refer to Site Construction Plans for full sized, scale drawings of the C# sheets.

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DESCRIPTION AND PROCEDURE

Introduction

Range USA is building a new commercial indoor gun range. The overall development is approximately **2.92 acres** in the City of O'Fallon, with an address of 15 Castle Lane. The area to be disturbed for the project covers approximately **2.29 acres**. **Primax Properties, LLC.** has contracted **The Clayton Engineering Company, Inc.** to do the civil site design for the new commercial improvements. This development will provide detention and water quality for both the 2.32 Acre Lot 2A, and the 0.60 acre Lot 2B (Lot 2B is to be developed in the future, by others.).

Existing Conditions

The existing site for the new improvements is one vacant lot. (The lot will be split into 2 lots under proposed conditions). The site is bordered on the east commercial properties, the north by Veteran's memorial Parkway, the west by roundtable Drive,and the south by apartments.

The property has relatively mild slopes. The site does not currently include any water quality BMP features.

The main discharge point for the property is to the north, to the Veteran's Memorial Parkway right-of-way ditch. (A portion of the site also drains to the south.)

The NRCS Web Soil Survey and the Soil Survey of St. Charles County from the USDA Soil Conservation Service indicated 60124 Urban Land-Harvestor complex, with a hydrologic soil group C. This information is used in the stormwater Best Management Practices (BMPs) design for this project.

PROPOSED CONDITIONS – ABOVE GROUND STORMWATER DETENTION

The 15-year, 20-minute storm event differential runoff calculation for this Range USA project site results in an increase **(+2.86 cfs current, +3.45 cfs with future developed Lot B)** in flow discharged for this development for the overall site when compared to the previously developed conditions (Refer to the Proposed Drainage Area Map for calculation details). For the overall site (including other subdivision lots), as determined from current MSD Rules and Regulations, Flood Detention Volume (Qp) and Channel Protection detention (CPv) are required for this project. The Flood Detention volume will be provided by an above ground detention baisn in the southeast corner of the property.

Proposed storm sewers downstream of the new detention facility are designed to carry the 100-year design flows of its tributary area. This system outlets into a swale along the south property line, in the southwest corner of the property. Should the new detention system, and/or the upstream inlets become clogged or the area experiences a storm event greater than the 100-year design storm, drainage would overland flow and get to the Veteran's Memorial Parkway ditch, as it does today. See the following Maintenance and Operation Plan section and the attached plan exhibits for details.

Calculations for the existing conditions, as described above, are located in the remainder of this report. A PondPack Version 8i model was created considering the entire subarea that currently drains through the existing site. These results, along with the low flow standpipe, overflow spillway, and secondary (emergency) spillway structure configurations, are located in the calculations and exhibits that follow this section. See the civil Site Construction Plans by The Clayton Engineering Company, Inc. for details of the drainage area maps, the detention system, the metering structures, and more.

PROPOSED CONDITIONS – STORMWATER QUALITY

The water quality BMP strategy chosen for this project includes a hydrodynamic separator (HDS) unit. This BMP will treat the onsite stormwater runoff able to be captured and then be piped to the existing public storm sewer system along Keaton Crossing Boulevard. Typically, common engineering practice recommends that runoff generated by the proposed site "should be treated by BMPs that mimic pre-existing site hydrology or manage site stormwater to the maximum extent practicable (MEP)". However, due to the site constraints and a lack of usable green space, this project will utilize a proprietary device for the water quality BMP treatment practice. The area to be disturbed for the project covers approximately **2.29 acres** of the property (Refer to the Site Construction Plans for BMP locations and details).

The stormwater management will incorporate a new hydrodynamic separator (HDS) unit, accounting for over **74%** of the disturbed area, and **83%** of the impervious area within the disturbed area. The treatment area being captured with this project includes the new building and the majority of the onsite pavements.

Therefore, for this project, a HydroDynamic Separator (HDS) Unit will be placed "offline" by means of a flow splitter structure diverting any storm event generating more than the 1.14-inch WQ design event around the HDS Unit via an overflow bypass pipe connected to the downstream storm sewer system. The hydrodynamic separator (HDS) unit chosen for this project is a **Downstream Defender unit (6-ft Diameter) produced by Hydro International**. The HDS unit is sized "to capture all floatable trash and free oil, and remove 80% of total suspended solids for OK-110 particle size distribution at the site water quality flow rate (WQf)". This treated stormwater is discharged by gravity from the HDS unit, and into the existing public storm sewer system near the northwestern property line.

The requirements for Water Quality Volume were calculated in accordance with the "2000 Maryland Stormwater Design Manual Volume II". The volume calculated has been provided by the Water Quality measures provided onsite. The flow splitter calculations were developed by the "Flow Restriction Method" defined in "Flow Splitting Design Criteria" by the Montgomery County Maryland Department of Permitting Services Water Resources Section. Refer to **Appendix A - Hydrology - Water Quality Volume & Flow Splitter Calculations** for these calculations.

The proposed onsite storm sewer conveyance system is designed and sized to handle the 15-yr, 20-min. storm event with a ground saturation factor of 1.1. Should the HDS unit and/or the upstream inlets become clogged or the area experiences a storm event greater than the design storms, the emergency overland flow paths for all of these areas still allows the runoff to flow overland and into the existing storm sewer systems around the property perimeter to the north, as it currently does today. Although, this is not likely, as there are multiple existing storm sewer inlets along this path that would capture this flow prior to impacting adjacent properties. To best prevent the failure of these stormwater management facilities, the Stormwater Management Facilities: Operation & Maintenance manual (separate document created by The Clayton Engineering Co., Inc.) describes methods the Owner shall continually practice to keep these facilities functioning properly.

Calculations for the existing and proposed conditions, as described above, are located in the remainder of this report. These results are located in the calculations and exhibits that follow this section. Refer to the civil Site Construction Plans created by The Clayton Engineering Company, Inc. for full sized, scaled drawings of the drainage area maps, the storm sewer system including the water quality BMP features, and more.

BMP MAINTENANCE AND OPERATION PLAN

Above Ground Detention System and HydroDynamic Separator BMP

As part of the site improvements for this project, a n above ground detention system will be installed. This BMP will serve as Flood Protection for the site.

Also as part of the site improvements for this project, a HydroDynamic Separator Unit will be installed. This BMP will serve as Water Quality treatment for the site.

The BMPs are to be private and maintained by the Property Owner, in accordance with City of O'Fallon criteria in keeping with Federal Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Phase II mandated requirements. This Plan shall be followed by the Owner as a means of maintaining the system in proper functioning order. The Property Owner appointed Maintenance Staff shall be responsible for cleaning and maintaining the stormwater management facility BMP.

Refer to the separate document, "Stormwater Management Facilities: Operation & Maintenance" manual by The Clayton Engineering Company for BMP facility inspections and care.

Custom Soil Resource Report
Soil Map

Map Scale: 1:919 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 40 80 160 240

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: St. Charles County, Missouri
Survey Area Data: Version 22, Sep 7, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 17, 2018—Oct 24, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
60124	Harvester-Urban land complex, 2 to 9 percent slopes	3.2	100.0%
Totals for Area of Interest		**3.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

St. Charles County, Missouri

60124—Harvester-Urban land complex, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: 6604
Elevation: 440 to 690 feet
Mean annual precipitation: 37 to 47 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 184 to 228 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Harvester and similar soils: 60 percent
Urban land: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Harvester

Setting

Landform: Hillslopes, ridges
Landform position (two-dimensional): Footslope, backslope, summit
Landform position (three-dimensional): Base slope, side slope, interfluve
Down-slope shape: Linear
Across-slope shape: Linear, convex
Parent material: Loess

Typical profile

C1 - 0 to 5 inches: silt loam
C2 - 5 to 80 inches: silty clay loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 0.57 in/hr)
Depth to water table: About 30 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F115BY061MO - Anthropic Deep Loess Upland
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Description of Urban Land

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8
Hydric soil rating: No

RANGE USA - O'FALLON

FLOOD PROTECTION - DETENTION SUMMARY

ABOVE GROUND DETENTION BASIN

Detention System Description

Detention (Detention vol. starts at 620.23):

Return Period (Yr)	Basin Peak Inflow (cfs)	Basin Peak Discharge (cfs)	Basin Max. Water Surface Elev. (ngvd)	Basin Peak Storage (cf)	Site Pre-Dev. Release Rates (cfs)	Site Post-Dev. Release Rates (cfs)
Free Outfall - Detention Basin #1 (DB#1)						
2	6.18	1.96	621.93	5,146	3.23	3.19
15	11.73	5.73	623.18	9,398	8.68	8.58
100	16.18	8.76	623.43	13,057	13.63	13.07
Blocked*	8.93	3.85	623.18	6,177	-	8.99

*Low-flow orifice blocked & water ponded to the invert of the 1' Wide Overflow Weir, then 100

Summary of Above Ground Detention System

Detention Basin Top Elevation = 624.50
Detention Basin Bottom Elevation = 620.23*
*Surface of Nested Bioretention

Notes:

1.) Flood Volume: for No Flow Increase from Un-Developed Flows
for 2-Yr, 24-Hr. Storm; 15-yr 24-Hr. Storm; and 100-Yr, 24 Hr. Storm (per City of O'Fallon);
2.) Flood Volume provided for Discharge Point #1
3.) Minimum 1 foot Freeboard in Detention Basin above Low Flow Blocked Condition;

Summary of Reinforced Concrete Outlet Structure (Metering)

Size	Type	Flowline
Nested Bioretention #1 (DB#1)		
Var .Width	Emergency Overflow Weir (1'W. & 3'W.)	542.00
8" Ø	Circular Orifice (Low-Flow)	540.23

RANGE USA - O'FALLON

FLOOD PROTECTION - DETENTION SUMMARY

ABOVE GROUND DETENTION BASIN

Low Flow Blocked Calculations:

Incoming 100-Year-20 minute Q= 8.93 CFS
Starting water elevaiton = 622.00 (Overflow Sill)

Q @ elev. 623.18:
Q=3*L*H^(1.5)= 3 * 1.0 * 1.18^(1.5) = 3.85 CFS Flow

Storage at 623.18:
622=4,600 SF
623=5,566 SF 622-623 Avg=5,083 SF x1 /(20min*60s)= 4.24 CFS storage
623.18=5,999SF 623-623.18 Avg=5,783 SF *0.18/1,200 = 0.90 CFS storage

Total 100 year-20 minute storm capacity passed and stored at elevaiton 623.18 =
3.85+4.24+0.90 = 8.99 CFS
100yr-20 minute storm = 8.93 CFS

**The High Water Level reached for the 100 year 20-minute storm,
with the Low Flow Blocked, is elev. 623.18**

Appendix A

PONDPACK VERSION 7.5 HYDROLOGY CALCULATIONS

2-, 25-, & 100-YEAR STORM CALCULATIONS

(100-YEAR FREE OUTFALL & LOW-FLOW BLOCKED)

Range USA - O'Fallon

Project Summary	
Title	Range USA - O'Fallon, MO
Engineer	Eric Skelton
Company	The Clayton Engineering Company
Date	3/15/2022

Notes	Range USA 15 Castle Lane O'Fallon, MO 63366 Detention Design Storms (per City) 2-yr., 24-hr. Storm 15-yr., 24-hr. Storm 100-yr., 24-hour Storm 100-yr., 20 Minute Storm - Low Flow Blocked Check Proposed Q's vs. Existing Q's & LFB

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Range USA - O'Fallon

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
Prop. #1 Inflow	Post-Development 2	2	17,041.000	12.000	6.18
Prop. #1 Inflow	Post Development 15	15	33,399.000	11.950	11.73
Prop. #1 Inflow	Post-Development 100	100	46,937.000	11.950	16.18
Prop. Bypass	Post-Development 2	2	3,930.000	12.050	1.34
Prop. Bypass	Post Development 15	15	9,699.000	12.050	3.31
Prop. Bypass	Post-Development 100	100	14,852.000	12.000	5.02
Existing SCS	Pre-Development 2	2	9,448.000	12.050	3.23
Existing SCS	Pre-Development 15	15	24,980.000	12.000	8.68
Existing SCS	Pre-Development 100	100	39,226.000	12.000	13.63

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
O-1	Pre-Development 2	2	9,448.000	12.050	3.23
O-1	Post-Development 2	2	20,911.000	12.050	3.19
O-1	Pre-Development 15	15	24,980.000	12.000	8.68
O-1	Post Development 15	15	42,991.000	12.100	8.58
O-1	Post-Development 100	100	61,643.000	12.100	13.07
O-1	Pre-Development 100	100	39,226.000	12.000	13.63

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
DB #1 (IN)	Post-Development 2	2	17,041.000	12.000	6.18	(N/A)	(N/A)
DB #1 (OUT)	Post-Development 2	2	16,981.000	12.200	1.96	621.93	5,146.000
DB #1 (IN)	Post Development 15	15	33,399.000	11.950	11.73	(N/A)	(N/A)
DB #1 (OUT)	Post Development 15	15	33,292.000	12.150	5.73	623.18	9,398.000

Range USA - O'Fallon

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft^3)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft^3)
DB #1 (IN)	Post-Development 100	100	46,937.000	11.950	16.18	(N/A)	(N/A)
DB #1 (OUT)	Post-Development 100	100	46,791.000	12.100	8.76	623.43	13,057.000

Range USA - O'Fallon

Subsection: Time-Depth Curve
Label: MSD2006
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Time-Depth Curve: 002	
Label	002
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.00	0.01	0.01	0.01
0.500	0.02	0.02	0.02	0.03	0.03
1.000	0.03	0.04	0.04	0.04	0.05
1.500	0.05	0.05	0.06	0.06	0.06
2.000	0.07	0.07	0.08	0.08	0.08
2.500	0.09	0.09	0.10	0.10	0.10
3.000	0.11	0.11	0.12	0.12	0.12
3.500	0.13	0.13	0.14	0.14	0.14
4.000	0.15	0.15	0.16	0.16	0.17
4.500	0.17	0.18	0.18	0.19	0.19
5.000	0.20	0.20	0.21	0.21	0.22
5.500	0.22	0.23	0.23	0.24	0.24
6.000	0.25	0.25	0.26	0.27	0.27
6.500	0.28	0.28	0.29	0.29	0.30
7.000	0.31	0.31	0.32	0.33	0.33
7.500	0.34	0.35	0.35	0.36	0.37
8.000	0.37	0.38	0.39	0.39	0.40
8.500	0.41	0.42	0.43	0.44	0.45
9.000	0.46	0.47	0.48	0.49	0.50
9.500	0.51	0.52	0.53	0.54	0.55
10.000	0.56	0.57	0.59	0.60	0.62
10.500	0.63	0.65	0.67	0.69	0.71
11.000	0.73	0.75	0.78	0.81	0.84
11.500	0.88	0.95	1.10	1.34	1.76
12.000	2.06	2.11	2.17	2.21	2.25
12.500	2.28	2.30	2.33	2.35	2.37
13.000	2.39	2.41	2.43	2.45	2.46
13.500	2.48	2.49	2.50	2.52	2.53
14.000	2.54	2.55	2.56	2.58	2.59
14.500	2.60	2.61	2.62	2.63	2.64
15.000	2.65	2.66	2.66	2.67	2.68
15.500	2.69	2.70	2.71	2.71	2.72
16.000	2.73	2.74	2.74	2.75	2.76
16.500	2.76	2.77	2.78	2.78	2.79

Range USA - O'Fallon

Subsection: Time-Depth Curve
Label: MSD2006
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	2.80	2.80	2.81	2.81	2.82
17.500	2.83	2.83	2.84	2.84	2.85
18.000	2.86	2.86	2.87	2.87	2.88
18.500	2.88	2.89	2.89	2.90	2.90
19.000	2.91	2.91	2.92	2.92	2.93
19.500	2.93	2.93	2.94	2.94	2.95
20.000	2.95	2.96	2.96	2.96	2.97
20.500	2.97	2.98	2.98	2.98	2.99
21.000	2.99	2.99	3.00	3.00	3.01
21.500	3.01	3.01	3.02	3.02	3.02
22.000	3.03	3.03	3.04	3.04	3.04
22.500	3.05	3.05	3.05	3.06	3.06
23.000	3.07	3.07	3.07	3.08	3.08
23.500	3.08	3.09	3.09	3.09	3.10
24.000	3.10	(N/A)	(N/A)	(N/A)	(N/A)

Range USA - O'Fallon

Subsection: Time-Depth Curve
Label: MSD2006
Scenario: Pre-Development 2

Return Event: 2 years
Storm Event: 002

Time-Depth Curve: 002	
Label	002
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.00	0.01	0.01	0.01
0.500	0.02	0.02	0.02	0.03	0.03
1.000	0.03	0.04	0.04	0.04	0.05
1.500	0.05	0.05	0.06	0.06	0.06
2.000	0.07	0.07	0.08	0.08	0.08
2.500	0.09	0.09	0.10	0.10	0.10
3.000	0.11	0.11	0.12	0.12	0.12
3.500	0.13	0.13	0.14	0.14	0.14
4.000	0.15	0.15	0.16	0.16	0.17
4.500	0.17	0.18	0.18	0.19	0.19
5.000	0.20	0.20	0.21	0.21	0.22
5.500	0.22	0.23	0.23	0.24	0.24
6.000	0.25	0.25	0.26	0.27	0.27
6.500	0.28	0.28	0.29	0.29	0.30
7.000	0.31	0.31	0.32	0.33	0.33
7.500	0.34	0.35	0.35	0.36	0.37
8.000	0.37	0.38	0.39	0.39	0.40
8.500	0.41	0.42	0.43	0.44	0.45
9.000	0.46	0.47	0.48	0.49	0.50
9.500	0.51	0.52	0.53	0.54	0.55
10.000	0.56	0.57	0.59	0.60	0.62
10.500	0.63	0.65	0.67	0.69	0.71
11.000	0.73	0.75	0.78	0.81	0.84
11.500	0.88	0.95	1.10	1.34	1.76
12.000	2.06	2.11	2.17	2.21	2.25
12.500	2.28	2.30	2.33	2.35	2.37
13.000	2.39	2.41	2.43	2.45	2.46
13.500	2.48	2.49	2.50	2.52	2.53
14.000	2.54	2.55	2.56	2.58	2.59
14.500	2.60	2.61	2.62	2.63	2.64
15.000	2.65	2.66	2.66	2.67	2.68
15.500	2.69	2.70	2.71	2.71	2.72
16.000	2.73	2.74	2.74	2.75	2.76
16.500	2.76	2.77	2.78	2.78	2.79

Range USA - O'Fallon

Subsection: Time-Depth Curve
Label: MSD2006
Scenario: Pre-Development 2

Return Event: 2 years
Storm Event: 002

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	2.80	2.80	2.81	2.81	2.82
17.500	2.83	2.83	2.84	2.84	2.85
18.000	2.86	2.86	2.87	2.87	2.88
18.500	2.88	2.89	2.89	2.90	2.90
19.000	2.91	2.91	2.92	2.92	2.93
19.500	2.93	2.93	2.94	2.94	2.95
20.000	2.95	2.96	2.96	2.96	2.97
20.500	2.97	2.98	2.98	2.98	2.99
21.000	2.99	2.99	3.00	3.00	3.01
21.500	3.01	3.01	3.02	3.02	3.02
22.000	3.03	3.03	3.04	3.04	3.04
22.500	3.05	3.05	3.05	3.06	3.06
23.000	3.07	3.07	3.07	3.08	3.08
23.500	3.08	3.09	3.09	3.09	3.10
24.000	3.10	(N/A)	(N/A)	(N/A)	(N/A)

Range USA - O'Fallon

Subsection: Time-Depth Curve
Label: MSD2006
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Time-Depth Curve: 015	
Label	015
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	15 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.01	0.01	0.02	0.02
0.500	0.03	0.03	0.04	0.04	0.05
1.000	0.06	0.06	0.07	0.07	0.08
1.500	0.09	0.09	0.10	0.11	0.11
2.000	0.12	0.12	0.13	0.14	0.14
2.500	0.15	0.16	0.16	0.17	0.18
3.000	0.18	0.19	0.20	0.21	0.21
3.500	0.22	0.23	0.24	0.24	0.25
4.000	0.26	0.26	0.27	0.28	0.29
4.500	0.30	0.30	0.31	0.32	0.33
5.000	0.34	0.35	0.36	0.36	0.37
5.500	0.38	0.39	0.40	0.41	0.42
6.000	0.43	0.44	0.45	0.46	0.47
6.500	0.48	0.49	0.50	0.51	0.52
7.000	0.53	0.54	0.55	0.56	0.57
7.500	0.59	0.60	0.61	0.62	0.63
8.000	0.64	0.66	0.67	0.68	0.69
8.500	0.71	0.72	0.74	0.75	0.77
9.000	0.79	0.81	0.82	0.84	0.86
9.500	0.87	0.89	0.91	0.93	0.95
10.000	0.97	0.99	1.02	1.04	1.07
10.500	1.09	1.12	1.15	1.19	1.22
11.000	1.26	1.30	1.35	1.40	1.46
11.500	1.52	1.64	1.90	2.31	3.04
12.000	3.55	3.66	3.74	3.82	3.89
12.500	3.94	3.98	4.03	4.07	4.10
13.000	4.14	4.17	4.20	4.23	4.26
13.500	4.28	4.31	4.33	4.35	4.37
14.000	4.40	4.41	4.43	4.45	4.47
14.500	4.49	4.51	4.52	4.54	4.56
15.000	4.57	4.59	4.61	4.62	4.64
15.500	4.65	4.66	4.68	4.69	4.70
16.000	4.72	4.73	4.74	4.75	4.77
16.500	4.78	4.79	4.80	4.81	4.82

Range USA - O'Fallon

Subsection: Time-Depth Curve
Label: MSD2006
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	4.83	4.84	4.86	4.87	4.88
17.500	4.89	4.90	4.91	4.92	4.93
18.000	4.94	4.95	4.96	4.96	4.97
18.500	4.98	4.99	5.00	5.01	5.02
19.000	5.03	5.03	5.04	5.05	5.06
19.500	5.07	5.07	5.08	5.09	5.10
20.000	5.10	5.11	5.12	5.12	5.13
20.500	5.14	5.14	5.15	5.16	5.16
21.000	5.17	5.18	5.18	5.19	5.20
21.500	5.20	5.21	5.22	5.22	5.23
22.000	5.24	5.24	5.25	5.26	5.26
22.500	5.27	5.27	5.28	5.29	5.29
23.000	5.30	5.31	5.31	5.32	5.32
23.500	5.33	5.34	5.34	5.35	5.35
24.000	5.36	(N/A)	(N/A)	(N/A)	(N/A)

Range USA - O'Fallon

Subsection: Time-Depth Curve
Label: MSD2006
Scenario: Pre-Development 15

Return Event: 15 years
Storm Event: 015

Time-Depth Curve: 015	
Label	015
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	15 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.01	0.01	0.02	0.02
0.500	0.03	0.03	0.04	0.04	0.05
1.000	0.06	0.06	0.07	0.07	0.08
1.500	0.09	0.09	0.10	0.11	0.11
2.000	0.12	0.12	0.13	0.14	0.14
2.500	0.15	0.16	0.16	0.17	0.18
3.000	0.18	0.19	0.20	0.21	0.21
3.500	0.22	0.23	0.24	0.24	0.25
4.000	0.26	0.26	0.27	0.28	0.29
4.500	0.30	0.30	0.31	0.32	0.33
5.000	0.34	0.35	0.36	0.36	0.37
5.500	0.38	0.39	0.40	0.41	0.42
6.000	0.43	0.44	0.45	0.46	0.47
6.500	0.48	0.49	0.50	0.51	0.52
7.000	0.53	0.54	0.55	0.56	0.57
7.500	0.59	0.60	0.61	0.62	0.63
8.000	0.64	0.66	0.67	0.68	0.69
8.500	0.71	0.72	0.74	0.75	0.77
9.000	0.79	0.81	0.82	0.84	0.86
9.500	0.87	0.89	0.91	0.93	0.95
10.000	0.97	0.99	1.02	1.04	1.07
10.500	1.09	1.12	1.15	1.19	1.22
11.000	1.26	1.30	1.35	1.40	1.46
11.500	1.52	1.64	1.90	2.31	3.04
12.000	3.55	3.66	3.74	3.82	3.89
12.500	3.94	3.98	4.03	4.07	4.10
13.000	4.14	4.17	4.20	4.23	4.26
13.500	4.28	4.31	4.33	4.35	4.37
14.000	4.40	4.41	4.43	4.45	4.47
14.500	4.49	4.51	4.52	4.54	4.56
15.000	4.57	4.59	4.61	4.62	4.64
15.500	4.65	4.66	4.68	4.69	4.70
16.000	4.72	4.73	4.74	4.75	4.77
16.500	4.78	4.79	4.80	4.81	4.82

Range USA - O'Fallon

Subsection: Time-Depth Curve
Label: MSD2006
Scenario: Pre-Development 15

Return Event: 15 years
Storm Event: 015

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	4.83	4.84	4.86	4.87	4.88
17.500	4.89	4.90	4.91	4.92	4.93
18.000	4.94	4.95	4.96	4.96	4.97
18.500	4.98	4.99	5.00	5.01	5.02
19.000	5.03	5.03	5.04	5.05	5.06
19.500	5.07	5.07	5.08	5.09	5.10
20.000	5.10	5.11	5.12	5.12	5.13
20.500	5.14	5.14	5.15	5.16	5.16
21.000	5.17	5.18	5.18	5.19	5.20
21.500	5.20	5.21	5.22	5.22	5.23
22.000	5.24	5.24	5.25	5.26	5.26
22.500	5.27	5.27	5.28	5.29	5.29
23.000	5.30	5.31	5.31	5.32	5.32
23.500	5.33	5.34	5.34	5.35	5.35
24.000	5.36	(N/A)	(N/A)	(N/A)	(N/A)

Range USA - O'Fallon

Subsection: Time-Depth Curve
Label: MSD2006
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

Time-Depth Curve: 100	
Label	100
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.01	0.01	0.02	0.03
0.500	0.04	0.04	0.05	0.06	0.07
1.000	0.08	0.08	0.09	0.10	0.11
1.500	0.12	0.12	0.13	0.14	0.15
2.000	0.16	0.17	0.18	0.18	0.19
2.500	0.20	0.21	0.22	0.23	0.24
3.000	0.25	0.26	0.27	0.28	0.29
3.500	0.30	0.31	0.32	0.33	0.34
4.000	0.35	0.36	0.37	0.38	0.39
4.500	0.40	0.41	0.42	0.43	0.44
5.000	0.45	0.47	0.48	0.49	0.50
5.500	0.51	0.53	0.54	0.55	0.56
6.000	0.58	0.59	0.60	0.62	0.63
6.500	0.64	0.66	0.67	0.68	0.70
7.000	0.71	0.73	0.74	0.76	0.77
7.500	0.79	0.80	0.82	0.83	0.85
8.000	0.86	0.88	0.90	0.91	0.93
8.500	0.95	0.97	0.99	1.01	1.04
9.000	1.06	1.08	1.10	1.13	1.15
9.500	1.17	1.20	1.22	1.25	1.27
10.000	1.30	1.33	1.36	1.40	1.43
10.500	1.47	1.51	1.55	1.59	1.64
11.000	1.69	1.75	1.81	1.88	1.95
11.500	2.04	2.21	2.55	3.10	4.09
12.000	4.77	4.91	5.03	5.13	5.22
12.500	5.29	5.35	5.41	5.46	5.51
13.000	5.56	5.60	5.64	5.68	5.72
13.500	5.75	5.79	5.82	5.85	5.88
14.000	5.90	5.93	5.96	5.98	6.01
14.500	6.03	6.05	6.08	6.10	6.12
15.000	6.15	6.17	6.19	6.21	6.23
15.500	6.25	6.27	6.28	6.30	6.32
16.000	6.34	6.35	6.37	6.38	6.40
16.500	6.42	6.43	6.45	6.46	6.48

Range USA - O'Fallon

Subsection: Time-Depth Curve
Label: MSD2006
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	6.49	6.51	6.52	6.54	6.55
17.500	6.56	6.58	6.59	6.60	6.62
18.000	6.63	6.64	6.66	6.67	6.68
18.500	6.69	6.71	6.72	6.73	6.74
19.000	6.75	6.76	6.77	6.78	6.80
19.500	6.81	6.82	6.83	6.84	6.84
20.000	6.85	6.86	6.87	6.88	6.89
20.500	6.90	6.91	6.92	6.93	6.94
21.000	6.95	6.96	6.96	6.97	6.98
21.500	6.99	7.00	7.01	7.02	7.03
22.000	7.03	7.04	7.05	7.06	7.07
22.500	7.08	7.09	7.09	7.10	7.11
23.000	7.12	7.13	7.14	7.14	7.15
23.500	7.16	7.17	7.18	7.18	7.19
24.000	7.20	(N/A)	(N/A)	(N/A)	(N/A)

Range USA - O'Fallon

Subsection: Time-Depth Curve
Label: MSD2006
Scenario: Pre-Development 100

Return Event: 100 years
Storm Event: 100

Time-Depth Curve: 100	
Label	100
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.00	0.01	0.01	0.02	0.03
0.500	0.04	0.04	0.05	0.06	0.07
1.000	0.08	0.08	0.09	0.10	0.11
1.500	0.12	0.12	0.13	0.14	0.15
2.000	0.16	0.17	0.18	0.18	0.19
2.500	0.20	0.21	0.22	0.23	0.24
3.000	0.25	0.26	0.27	0.28	0.29
3.500	0.30	0.31	0.32	0.33	0.34
4.000	0.35	0.36	0.37	0.38	0.39
4.500	0.40	0.41	0.42	0.43	0.44
5.000	0.45	0.47	0.48	0.49	0.50
5.500	0.51	0.53	0.54	0.55	0.56
6.000	0.58	0.59	0.60	0.62	0.63
6.500	0.64	0.66	0.67	0.68	0.70
7.000	0.71	0.73	0.74	0.76	0.77
7.500	0.79	0.80	0.82	0.83	0.85
8.000	0.86	0.88	0.90	0.91	0.93
8.500	0.95	0.97	0.99	1.01	1.04
9.000	1.06	1.08	1.10	1.13	1.15
9.500	1.17	1.20	1.22	1.25	1.27
10.000	1.30	1.33	1.36	1.40	1.43
10.500	1.47	1.51	1.55	1.59	1.64
11.000	1.69	1.75	1.81	1.88	1.95
11.500	2.04	2.21	2.55	3.10	4.09
12.000	4.77	4.91	5.03	5.13	5.22
12.500	5.29	5.35	5.41	5.46	5.51
13.000	5.56	5.60	5.64	5.68	5.72
13.500	5.75	5.79	5.82	5.85	5.88
14.000	5.90	5.93	5.96	5.98	6.01
14.500	6.03	6.05	6.08	6.10	6.12
15.000	6.15	6.17	6.19	6.21	6.23
15.500	6.25	6.27	6.28	6.30	6.32
16.000	6.34	6.35	6.37	6.38	6.40
16.500	6.42	6.43	6.45	6.46	6.48

Range USA - O'Fallon

Subsection: Time-Depth Curve
Label: MSD2006
Scenario: Pre-Development 100

Return Event: 100 years
Storm Event: 100

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	6.49	6.51	6.52	6.54	6.55
17.500	6.56	6.58	6.59	6.60	6.62
18.000	6.63	6.64	6.66	6.67	6.68
18.500	6.69	6.71	6.72	6.73	6.74
19.000	6.75	6.76	6.77	6.78	6.80
19.500	6.81	6.82	6.83	6.84	6.84
20.000	6.85	6.86	6.87	6.88	6.89
20.500	6.90	6.91	6.92	6.93	6.94
21.000	6.95	6.96	6.96	6.97	6.98
21.500	6.99	7.00	7.01	7.02	7.03
22.000	7.03	7.04	7.05	7.06	7.07
22.500	7.08	7.09	7.09	7.10	7.11
23.000	7.12	7.13	7.14	7.14	7.15
23.500	7.16	7.17	7.18	7.18	7.19
24.000	7.20	(N/A)	(N/A)	(N/A)	(N/A)

Range USA - O'Fallon

Subsection: Time of Concentration Calculations
Label: Existing SCS
Scenario: Pre-Development 2

Return Event: 2 years
Storm Event: 002

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.240
Slope	0.040 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	0.16 ft/s
Segment Time of Concentration	0.170 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	206.00 ft
Is Paved?	False
Slope	0.033 ft/ft
Average Velocity	2.93 ft/s
Segment Time of Concentration	0.020 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	315.00 ft
Is Paved?	True
Slope	0.031 ft/ft
Average Velocity	3.58 ft/s
Segment Time of Concentration	0.024 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.214 hours

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Range USA - O'Fallon

Subsection: Time of Concentration Calculations
Label: Existing SCS
Scenario: Pre-Development 15

Return Event: 15 years
Storm Event: 015

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.240
Slope	0.040 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	0.16 ft/s
Segment Time of Concentration	0.170 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	206.00 ft
Is Paved?	False
Slope	0.033 ft/ft
Average Velocity	2.93 ft/s
Segment Time of Concentration	0.020 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	315.00 ft
Is Paved?	True
Slope	0.031 ft/ft
Average Velocity	3.58 ft/s
Segment Time of Concentration	0.024 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.214 hours

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Range USA - O'Fallon

Subsection: Time of Concentration Calculations
Label: Existing SCS
Scenario: Pre-Development 100

Return Event: 100 years
Storm Event: 100

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.240
Slope	0.040 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	0.16 ft/s
Segment Time of Concentration	0.170 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	206.00 ft
Is Paved?	False
Slope	0.033 ft/ft
Average Velocity	2.93 ft/s
Segment Time of Concentration	0.020 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	315.00 ft
Is Paved?	True
Slope	0.031 ft/ft
Average Velocity	3.58 ft/s
Segment Time of Concentration	0.024 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.214 hours

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Range USA - O'Fallon

Subsection: Time of Concentration Calculations
Label: Prop. #1 Inflow
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	57.00 ft
Manning's n	0.240
Slope	0.024 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	0.12 ft/s
Segment Time of Concentration	0.133 hours

Segment #2: TR-55 Sheet Flow	
Hydraulic Length	43.00 ft
Manning's n	0.013
Slope	0.022 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	1.12 ft/s
Segment Time of Concentration	0.011 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	115.00 ft
Is Paved?	True
Slope	0.017 ft/ft
Average Velocity	2.65 ft/s
Segment Time of Concentration	0.012 hours

Segment #4: TR-55 Shallow Concentrated Flow	
Hydraulic Length	26.00 ft
Is Paved?	True
Slope	0.008 ft/ft
Average Velocity	1.82 ft/s
Segment Time of Concentration	0.004 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.160 hours

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Range USA - O'Fallon

Subsection: Time of Concentration Calculations
Label: Prop. #1 Inflow
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	57.00 ft
Manning's n	0.240
Slope	0.024 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	0.12 ft/s
Segment Time of Concentration	0.133 hours

Segment #2: TR-55 Sheet Flow	
Hydraulic Length	43.00 ft
Manning's n	0.013
Slope	0.022 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	1.12 ft/s
Segment Time of Concentration	0.011 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	115.00 ft
Is Paved?	True
Slope	0.017 ft/ft
Average Velocity	2.65 ft/s
Segment Time of Concentration	0.012 hours

Segment #4: TR-55 Shallow Concentrated Flow	
Hydraulic Length	26.00 ft
Is Paved?	True
Slope	0.008 ft/ft
Average Velocity	1.82 ft/s
Segment Time of Concentration	0.004 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.160 hours

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Range USA - O'Fallon

Subsection: Time of Concentration Calculations
Label: Prop. #1 Inflow
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	57.00 ft
Manning's n	0.240
Slope	0.024 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	0.12 ft/s
Segment Time of Concentration	0.133 hours

Segment #2: TR-55 Sheet Flow	
Hydraulic Length	43.00 ft
Manning's n	0.013
Slope	0.022 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	1.12 ft/s
Segment Time of Concentration	0.011 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	115.00 ft
Is Paved?	True
Slope	0.017 ft/ft
Average Velocity	2.65 ft/s
Segment Time of Concentration	0.012 hours

Segment #4: TR-55 Shallow Concentrated Flow	
Hydraulic Length	26.00 ft
Is Paved?	True
Slope	0.008 ft/ft
Average Velocity	1.82 ft/s
Segment Time of Concentration	0.004 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.160 hours

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Range USA - O'Fallon

Subsection: Time of Concentration Calculations
Label: Prop. Bypass
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	84.00 ft
Manning's n	0.240
Slope	0.016 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	0.11 ft/s
Segment Time of Concentration	0.213 hours

Segment #2: TR-55 Sheet Flow	
Hydraulic Length	16.00 ft
Manning's n	0.013
Slope	0.011 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	0.70 ft/s
Segment Time of Concentration	0.006 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	116.00 ft
Is Paved?	True
Slope	1.500 ft/ft
Average Velocity	24.90 ft/s
Segment Time of Concentration	0.001 hours

Segment #4: TR-55 Shallow Concentrated Flow	
Hydraulic Length	214.00 ft
Is Paved?	False
Slope	1.600 ft/ft
Average Velocity	20.41 ft/s
Segment Time of Concentration	0.003 hours

Segment #5: TR-55 Shallow Concentrated Flow	
Hydraulic Length	113.00 ft
Is Paved?	True
Slope	1.400 ft/ft
Average Velocity	24.05 ft/s
Segment Time of Concentration	0.001 hours

Range USA - O'Fallon

Subsection: Time of Concentration Calculations
Label: Prop. Bypass
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.225 hours

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Range USA - O'Fallon

Subsection: Time of Concentration Calculations
Label: Prop. Bypass
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	84.00 ft
Manning's n	0.240
Slope	0.016 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	0.11 ft/s
Segment Time of Concentration	0.213 hours

Segment #2: TR-55 Sheet Flow	
Hydraulic Length	16.00 ft
Manning's n	0.013
Slope	0.011 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	0.70 ft/s
Segment Time of Concentration	0.006 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	116.00 ft
Is Paved?	True
Slope	1.500 ft/ft
Average Velocity	24.90 ft/s
Segment Time of Concentration	0.001 hours

Segment #4: TR-55 Shallow Concentrated Flow	
Hydraulic Length	214.00 ft
Is Paved?	False
Slope	1.600 ft/ft
Average Velocity	20.41 ft/s
Segment Time of Concentration	0.003 hours

Segment #5: TR-55 Shallow Concentrated Flow	
Hydraulic Length	113.00 ft
Is Paved?	True
Slope	1.400 ft/ft
Average Velocity	24.05 ft/s
Segment Time of Concentration	0.001 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.225 hours

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	84.00 ft
Manning's n	0.240
Slope	0.016 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	0.11 ft/s
Segment Time of Concentration	0.213 hours

Segment #2: TR-55 Sheet Flow	
Hydraulic Length	16.00 ft
Manning's n	0.013
Slope	0.011 ft/ft
2 Year 24 Hour Depth	3.60 in
Average Velocity	0.70 ft/s
Segment Time of Concentration	0.006 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	116.00 ft
Is Paved?	True
Slope	1.500 ft/ft
Average Velocity	24.90 ft/s
Segment Time of Concentration	0.001 hours

Segment #4: TR-55 Shallow Concentrated Flow	
Hydraulic Length	214.00 ft
Is Paved?	False
Slope	1.600 ft/ft
Average Velocity	20.41 ft/s
Segment Time of Concentration	0.003 hours

Segment #5: TR-55 Shallow Concentrated Flow	
Hydraulic Length	113.00 ft
Is Paved?	True
Slope	1.400 ft/ft
Average Velocity	24.05 ft/s
Segment Time of Concentration	0.001 hours

Range USA - O'Fallon

Subsection: Time of Concentration Calculations
Label: Prop. Bypass
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.225 hours

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Range USA - O'Fallon

Subsection: Unit Hydrograph Equations

Unit Hydrograph Method (Computational Notes)

Definition of Terms

At	Total area (acres): At = Ai+Ap
Ai	Impervious area (acres)
Ap	Pervious area (acres)
CNi	Runoff curve number for impervious area
CNp	Runoff curve number for pervious area
fLoss	f loss constant infiltration (depth/time)
gKs	Saturated Hydraulic Conductivity (depth/time)
Md	Volumetric Moisture Deficit
Psi	Capillary Suction (length)
hK	Horton Infiltration Decay Rate (time^-1)
fo	Initial Infiltration Rate (depth/time)
fc	Ultimate(capacity)Infiltration Rate (depth/time)
Ia	Initial Abstraction (length)
dt	Computational increment (duration of unit excess rainfall) Default dt is smallest value of 0.1333Tc, rtm, and th (Smallest dt is then adjusted to match up with Tp)
UDdt	User specified override computational main time increment (only used if UDdt is => .1333Tc)
D(t)	Point on distribution curve (fraction of P) for time step t
K	2 / (1 + (Tr/Tp)): default K = 0.75: (for Tr/Tp = 1.67)
Ks	Hydrograph shape factor = Unit Conversions * K: = ((1hr/3600sec) * (1ft/12in) * ((5280ft)**2/sq.mi)) * K Default Ks = 645.333 * 0.75 = 484
Lag	Lag time from center of excess runoff (dt) to Tp: Lag = 0.6Tc
P	Total precipitation depth, inches
Pa(t)	Accumulated rainfall at time step t
Pi(t)	Incremental rainfall at time step t
qp	Peak discharge (cfs) for 1in. runoff, for 1hr, for 1 sq.mi. = (Ks * A * Q) / Tp (where Q = 1in. runoff, A=sq.mi.)
Qu(t)	Unit hydrograph ordinate (cfs) at time step t
Q(t)	Final hydrograph ordinate (cfs) at time step t
Rai(t)	Accumulated runoff (inches) at time step t for impervious area
Rap(t)	Accumulated runoff (inches) at time step t for pervious area
Rii(t)	Incremental runoff (inches) at time step t for impervious area
Rip(t)	Incremental runoff (inches) at time step t for pervious area
R(t)	Incremental weighted total runoff (inches)
Rtm	Time increment for rainfall table
Si	S for impervious area: Si = (1000/CNi) - 10
Sp	S for pervious area: Sp = (1000/CNp) - 10
t	Time step (row) number
Tc	Time of concentration
Tb	Time (hrs) of entire unit hydrograph: Tb = Tp + Tr
Tp	Time (hrs) to peak of a unit hydrograph: Tp = (dt/2) + Lag
Tr	Time (hrs) of receding limb of unit hydrograph: Tr = ratio of Tp

Unit Hydrograph Method
Computational Notes
Precipitation

Column (1)	Time for time step t
Column (2)	D(t) = Point on distribution curve for time step t
Column (3)	Pi(t) = Pa(t) - Pa(t-1): Col.(4) - Preceding Col.(4)
Column (4)	Pa(t) = D(t) x P: Col.(2) x P

Pervious Area Runoff (using SCS Runoff CN Method)

Column (5)	Rap(t) = Accumulated pervious runoff for time step t
	If (Pa(t) is <= 0.2Sp) then use: Rap(t) = 0.0
	If (Pa(t) is > 0.2Sp) then use:
	
	Rap(t) = (Col.(4)-0.2Sp)**2 / (Col.(4)+0.8Sp)

Column (6)	Rip(t) = Incremental pervious runoff for time step t Rip(t) = Rap(t) - Rap(t-1) Rip(t) = Col.(5) for current row - Col.(5) for preceding row.

Impervious Area Runoff

Column (7 & 8)...	Did not specify to use impervious areas.

Incremental Weighted Runoff

Column (9)	R(t) = (Ap/At) x Rip(t) + (Ai/At) x Rii(t) R(t) = (Ap/At) x Col.(6) + (Ai/At) x Col.(8)

SCS Unit Hydrograph Method

Column (10)	Q(t) is computed with the SCS unit hydrograph method using R(t) and Qu(t).

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Existing SCS
Scenario: Pre-Development 2

Return Event: 2 years
Storm Event: 002

Storm Event	002
Return Event	2 years
Duration	24.000 hours
Depth	3.10 in
Time of Concentration (Composite)	0.214 hours
Area (User Defined)	2.470 acres

Computational Time Increment	0.029 hours
Time to Peak (Computed)	12.036 hours
Flow (Peak, Computed)	3.27 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	3.23 ft³/s

Drainage Area	
SCS CN (Composite)	75.555
Area (User Defined)	2.470 acres
Maximum Retention (Pervious)	3.24 in
Maximum Retention (Pervious, 20 percent)	0.65 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.06 in
Runoff Volume (Pervious)	9,483.925 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	9,448.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.214 hours
Computational Time Increment	0.029 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Existing SCS
Scenario: Pre-Development 2

Return Event: 2 years
Storm Event: 002

SCS Unit Hydrograph Parameters	
Unit peak, qp	13.08 ft³/s
Unit peak time, Tp	0.143 hours
Unit receding limb, Tr	0.570 hours
Total unit time, Tb	0.713 hours

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Existing SCS
Scenario: Pre-Development 15

Return Event: 15 years
Storm Event: 015

Storm Event	015
Return Event	15 years
Duration	24.000 hours
Depth	5.36 in
Time of Concentration (Composite)	0.214 hours
Area (User Defined)	2.470 acres

Computational Time Increment	0.029 hours
Time to Peak (Computed)	12.036 hours
Flow (Peak, Computed)	8.82 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	8.68 ft³/s

Drainage Area	
SCS CN (Composite)	75.555
Area (User Defined)	2.470 acres
Maximum Retention (Pervious)	3.24 in
Maximum Retention (Pervious, 20 percent)	0.65 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.79 in
Runoff Volume (Pervious)	25,055.962 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	24,980.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.214 hours
Computational Time Increment	0.029 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Existing SCS
Scenario: Pre-Development 15

Return Event: 15 years
Storm Event: 015

SCS Unit Hydrograph Parameters	
Unit peak, qp	13.08 ft³/s
Unit peak time, Tp	0.143 hours
Unit receding limb, Tr	0.570 hours
Total unit time, Tb	0.713 hours

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Existing SCS
Scenario: Pre-Development 100

Return Event: 100 years
Storm Event: 100

Storm Event	100
Return Event	100 years
Duration	24.000 hours
Depth	7.20 in
Time of Concentration (Composite)	0.214 hours
Area (User Defined)	2.470 acres

Computational Time Increment	0.029 hours
Time to Peak (Computed)	12.007 hours
Flow (Peak, Computed)	13.77 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	13.63 ft³/s

Drainage Area	
SCS CN (Composite)	75.555
Area (User Defined)	2.470 acres
Maximum Retention (Pervious)	3.24 in
Maximum Retention (Pervious, 20 percent)	0.65 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.39 in
Runoff Volume (Pervious)	39,334.017 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	39,226.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.214 hours
Computational Time Increment	0.029 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Existing SCS
Scenario: Pre-Development 100

Return Event: 100 years
Storm Event: 100

SCS Unit Hydrograph Parameters	
Unit peak, qp	13.08 ft³/s
Unit peak time, Tp	0.143 hours
Unit receding limb, Tr	0.570 hours
Total unit time, Tb	0.713 hours

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Prop. #1 Inflow
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Storm Event	002
Return Event	2 years
Duration	24.000 hours
Depth	3.10 in
Time of Concentration (Composite)	0.160 hours
Area (User Defined)	2.060 acres

Computational Time Increment	0.021 hours
Time to Peak (Computed)	11.963 hours
Flow (Peak, Computed)	6.29 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	6.18 ft³/s

Drainage Area	
SCS CN (Composite)	92.291
Area (User Defined)	2.060 acres
Maximum Retention (Pervious)	0.84 in
Maximum Retention (Pervious, 20 percent)	0.17 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.28 in
Runoff Volume (Pervious)	17,070.760 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	17,041.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.160 hours
Computational Time Increment	0.021 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Prop. #1 Inflow
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

SCS Unit Hydrograph Parameters	
Unit peak, qp	14.62 ft³/s
Unit peak time, Tp	0.106 hours
Unit receding limb, Tr	0.426 hours
Total unit time, Tb	0.532 hours

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Prop. #1 Inflow
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Storm Event	015
Return Event	15 years
Duration	24.000 hours
Depth	5.36 in
Time of Concentration (Composite)	0.160 hours
Area (User Defined)	2.060 acres

Computational Time Increment	0.021 hours
Time to Peak (Computed)	11.963 hours
Flow (Peak, Computed)	11.91 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	11.73 ft³/s

Drainage Area	
SCS CN (Composite)	92.291
Area (User Defined)	2.060 acres
Maximum Retention (Pervious)	0.84 in
Maximum Retention (Pervious, 20 percent)	0.17 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.47 in
Runoff Volume (Pervious)	33,451.722 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	33,399.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.160 hours
Computational Time Increment	0.021 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Prop. #1 Inflow
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

SCS Unit Hydrograph Parameters	
Unit peak, qp	14.62 ft³/s
Unit peak time, Tp	0.106 hours
Unit receding limb, Tr	0.426 hours
Total unit time, Tb	0.532 hours

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Prop. #1 Inflow
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

Storm Event	100
Return Event	100 years
Duration	24.000 hours
Depth	7.20 in
Time of Concentration (Composite)	0.160 hours
Area (User Defined)	2.060 acres

Computational Time Increment	0.021 hours
Time to Peak (Computed)	11.963 hours
Flow (Peak, Computed)	16.42 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	16.18 ft³/s

Drainage Area	
SCS CN (Composite)	92.291
Area (User Defined)	2.060 acres
Maximum Retention (Pervious)	0.84 in
Maximum Retention (Pervious, 20 percent)	0.17 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.29 in
Runoff Volume (Pervious)	47,008.628 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	46,937.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.160 hours
Computational Time Increment	0.021 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Prop. #1 Inflow
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

SCS Unit Hydrograph Parameters	
Unit peak, qp	14.62 ft³/s
Unit peak time, Tp	0.106 hours
Unit receding limb, Tr	0.426 hours
Total unit time, Tb	0.532 hours

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Prop. Bypass
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Storm Event	002
Return Event	2 years
Duration	24.000 hours
Depth	3.10 in
Time of Concentration (Composite)	0.225 hours
Area (User Defined)	0.860 acres

Computational Time Increment	0.030 hours
Time to Peak (Computed)	12.038 hours
Flow (Peak, Computed)	1.36 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	1.34 ft³/s

Drainage Area	
SCS CN (Composite)	79.023
Area (User Defined)	0.860 acres
Maximum Retention (Pervious)	2.65 in
Maximum Retention (Pervious, 20 percent)	0.53 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.26 in
Runoff Volume (Pervious)	3,944.613 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,930.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.225 hours
Computational Time Increment	0.030 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Prop. Bypass
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

SCS Unit Hydrograph Parameters	
Unit peak, qp	4.33 ft³/s
Unit peak time, Tp	0.150 hours
Unit receding limb, Tr	0.600 hours
Total unit time, Tb	0.750 hours

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Prop. Bypass
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Storm Event	015
Return Event	15 years
Duration	24.000 hours
Depth	5.36 in
Time of Concentration (Composite)	0.225 hours
Area (User Defined)	0.860 acres

Computational Time Increment	0.030 hours
Time to Peak (Computed)	12.038 hours
Flow (Peak, Computed)	3.36 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	3.31 ft³/s

Drainage Area	
SCS CN (Composite)	79.023
Area (User Defined)	0.860 acres
Maximum Retention (Pervious)	2.65 in
Maximum Retention (Pervious, 20 percent)	0.53 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.12 in
Runoff Volume (Pervious)	9,728.217 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	9,699.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.225 hours
Computational Time Increment	0.030 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Prop. Bypass
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

SCS Unit Hydrograph Parameters	
Unit peak, qp	4.33 ft³/s
Unit peak time, Tp	0.150 hours
Unit receding limb, Tr	0.600 hours
Total unit time, Tb	0.750 hours

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Prop. Bypass
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

Storm Event	100
Return Event	100 years
Duration	24.000 hours
Depth	7.20 in
Time of Concentration (Composite)	0.225 hours
Area (User Defined)	0.860 acres

Computational Time Increment	0.030 hours
Time to Peak (Computed)	12.038 hours
Flow (Peak, Computed)	5.08 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	5.02 ft³/s

Drainage Area	
SCS CN (Composite)	79.023
Area (User Defined)	0.860 acres
Maximum Retention (Pervious)	2.65 in
Maximum Retention (Pervious, 20 percent)	0.53 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.77 in
Runoff Volume (Pervious)	14,892.300 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	14,852.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.225 hours
Computational Time Increment	0.030 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Range USA - O'Fallon

Subsection: Unit Hydrograph Summary
Label: Prop. Bypass
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

SCS Unit Hydrograph Parameters	
Unit peak, qp	4.33 ft³/s
Unit peak time, Tp	0.150 hours
Unit receding limb, Tr	0.600 hours
Total unit time, Tb	0.750 hours

Range USA - O'Fallon

Subsection: Time vs. Elevation
Label: DB #1 (OUT)
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	620.23	620.23	620.23	620.23	620.23
0.250	620.23	620.23	620.23	620.23	620.23
0.500	620.23	620.23	620.23	620.23	620.23
0.750	620.23	620.23	620.23	620.23	620.23
1.000	620.23	620.23	620.23	620.23	620.23
1.250	620.23	620.23	620.23	620.23	620.23
1.500	620.23	620.23	620.23	620.23	620.23
1.750	620.23	620.23	620.23	620.23	620.23
2.000	620.23	620.23	620.23	620.23	620.23
2.250	620.23	620.23	620.23	620.23	620.23
2.500	620.23	620.23	620.23	620.23	620.23
2.750	620.23	620.23	620.23	620.23	620.23
3.000	620.23	620.23	620.23	620.23	620.23
3.250	620.23	620.23	620.23	620.23	620.23
3.500	620.23	620.23	620.23	620.23	620.23
3.750	620.23	620.23	620.23	620.23	620.23
4.000	620.23	620.23	620.23	620.23	620.23
4.250	620.23	620.23	620.23	620.23	620.23
4.500	620.23	620.23	620.23	620.23	620.23
4.750	620.23	620.23	620.23	620.23	620.23
5.000	620.23	620.23	620.23	620.23	620.23
5.250	620.23	620.24	620.24	620.24	620.24
5.500	620.24	620.24	620.24	620.24	620.24
5.750	620.24	620.24	620.24	620.24	620.24
6.000	620.24	620.24	620.24	620.24	620.24
6.250	620.25	620.25	620.25	620.25	620.25
6.500	620.25	620.25	620.25	620.25	620.25
6.750	620.25	620.25	620.25	620.25	620.25
7.000	620.25	620.26	620.26	620.26	620.26
7.250	620.26	620.26	620.26	620.26	620.26
7.500	620.26	620.26	620.26	620.26	620.26
7.750	620.26	620.27	620.27	620.27	620.27
8.000	620.27	620.27	620.27	620.27	620.27
8.250	620.27	620.27	620.27	620.28	620.28
8.500	620.28	620.28	620.28	620.28	620.28
8.750	620.29	620.29	620.29	620.29	620.29
9.000	620.30	620.30	620.30	620.30	620.30
9.250	620.30	620.31	620.31	620.31	620.31
9.500	620.31	620.31	620.31	620.31	620.32
9.750	620.32	620.32	620.32	620.32	620.33

Range USA - O'Fallon

Subsection: Time vs. Elevation
Label: DB #1 (OUT)
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.000	620.33	620.33	620.33	620.34	620.34
10.250	620.34	620.35	620.35	620.36	620.36
10.500	620.36	620.37	620.37	620.38	620.39
10.750	620.39	620.40	620.40	620.41	620.42
11.000	620.43	620.43	620.44	620.45	620.46
11.250	620.48	620.49	620.50	620.52	620.54
11.500	620.56	620.58	620.62	620.69	620.76
11.750	620.82	620.91	621.03	621.21	621.39
12.000	621.59	621.77	621.88	621.93	621.93
12.250	621.91	621.88	621.85	621.81	621.77
12.500	621.72	621.67	621.62	621.57	621.52
12.750	621.47	621.43	621.38	621.33	621.29
13.000	621.25	621.20	621.15	621.10	621.06
13.250	621.02	620.99	620.95	620.92	620.89
13.500	620.86	620.84	620.82	620.79	620.77
13.750	620.75	620.74	620.69	620.65	620.61
14.000	620.58	620.55	620.53	620.51	620.49
14.250	620.48	620.47	620.46	620.45	620.44
14.500	620.44	620.43	620.43	620.42	620.42
14.750	620.42	620.41	620.41	620.41	620.41
15.000	620.40	620.40	620.40	620.40	620.39
15.250	620.39	620.39	620.39	620.39	620.38
15.500	620.38	620.38	620.38	620.38	620.38
15.750	620.37	620.37	620.37	620.37	620.37
16.000	620.36	620.36	620.36	620.36	620.36
16.250	620.36	620.35	620.35	620.35	620.35
16.500	620.35	620.35	620.35	620.35	620.35
16.750	620.35	620.35	620.34	620.34	620.34
17.000	620.34	620.34	620.34	620.34	620.34
17.250	620.34	620.34	620.34	620.34	620.34
17.500	620.34	620.34	620.34	620.33	620.33
17.750	620.33	620.33	620.33	620.33	620.33
18.000	620.33	620.33	620.33	620.33	620.33
18.250	620.33	620.33	620.33	620.32	620.32
18.500	620.32	620.32	620.32	620.32	620.32
18.750	620.32	620.32	620.32	620.32	620.32
19.000	620.32	620.32	620.32	620.31	620.31
19.250	620.31	620.31	620.31	620.31	620.31
19.500	620.31	620.31	620.31	620.31	620.31
19.750	620.31	620.31	620.31	620.30	620.30
20.000	620.30	620.30	620.30	620.30	620.30

Range USA - O'Fallon

Subsection: Time vs. Elevation
Label: DB #1 (OUT)
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.250	620.30	620.30	620.30	620.30	620.30
20.500	620.30	620.30	620.30	620.30	620.30
20.750	620.30	620.30	620.30	620.30	620.30
21.000	620.30	620.30	620.30	620.30	620.30
21.250	620.30	620.30	620.30	620.30	620.30
21.500	620.30	620.30	620.30	620.30	620.30
21.750	620.30	620.30	620.29	620.29	620.29
22.000	620.29	620.29	620.29	620.29	620.29
22.250	620.29	620.29	620.29	620.29	620.29
22.500	620.29	620.29	620.29	620.29	620.29
22.750	620.29	620.29	620.29	620.29	620.29
23.000	620.29	620.29	620.29	620.29	620.29
23.250	620.29	620.29	620.29	620.29	620.29
23.500	620.29	620.29	620.29	620.29	620.29
23.750	620.29	620.29	620.29	620.29	620.29
24.000	620.29	(N/A)	(N/A)	(N/A)	(N/A)

Range USA - O'Fallon

Subsection: Time vs. Elevation
Label: DB #1 (OUT)
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	620.23	620.23	620.23	620.23	620.23
0.250	620.23	620.23	620.23	620.23	620.23
0.500	620.23	620.23	620.23	620.23	620.23
0.750	620.23	620.23	620.23	620.23	620.23
1.000	620.23	620.23	620.23	620.23	620.23
1.250	620.23	620.23	620.23	620.23	620.23
1.500	620.23	620.23	620.23	620.23	620.23
1.750	620.23	620.23	620.23	620.23	620.23
2.000	620.23	620.23	620.23	620.23	620.23
2.250	620.23	620.23	620.23	620.23	620.23
2.500	620.23	620.23	620.23	620.23	620.23
2.750	620.23	620.23	620.23	620.23	620.23
3.000	620.23	620.23	620.23	620.23	620.23
3.250	620.23	620.23	620.24	620.24	620.24
3.500	620.24	620.24	620.24	620.24	620.24
3.750	620.24	620.24	620.25	620.25	620.25
4.000	620.25	620.25	620.25	620.25	620.25
4.250	620.25	620.26	620.26	620.26	620.26
4.500	620.26	620.26	620.26	620.26	620.26
4.750	620.27	620.27	620.27	620.27	620.27
5.000	620.27	620.27	620.27	620.28	620.28
5.250	620.28	620.28	620.28	620.28	620.28
5.500	620.28	620.29	620.29	620.29	620.29
5.750	620.29	620.29	620.29	620.29	620.30
6.000	620.30	620.30	620.30	620.30	620.30
6.250	620.30	620.30	620.31	620.31	620.31
6.500	620.31	620.31	620.31	620.31	620.32
6.750	620.32	620.32	620.32	620.32	620.32
7.000	620.32	620.33	620.33	620.33	620.33
7.250	620.33	620.33	620.33	620.34	620.34
7.500	620.34	620.34	620.34	620.34	620.34
7.750	620.35	620.35	620.35	620.35	620.35
8.000	620.35	620.35	620.36	620.36	620.36
8.250	620.36	620.36	620.37	620.37	620.37
8.500	620.38	620.38	620.38	620.39	620.39
8.750	620.39	620.40	620.40	620.41	620.41
9.000	620.42	620.42	620.42	620.43	620.43
9.250	620.44	620.44	620.44	620.44	620.45
9.500	620.45	620.45	620.45	620.45	620.46
9.750	620.46	620.46	620.47	620.47	620.48

Range USA - O'Fallon

Subsection: Time vs. Elevation
Label: DB #1 (OUT)
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.000	620.48	620.49	620.50	620.50	620.51
10.250	620.52	620.53	620.53	620.54	620.55
10.500	620.56	620.57	620.58	620.59	620.61
10.750	620.62	620.63	620.65	620.66	620.68
11.000	620.69	620.71	620.73	620.74	620.75
11.250	620.76	620.77	620.79	620.80	620.82
11.500	620.84	620.87	620.91	620.97	621.08
11.750	621.25	621.44	621.71	622.05	622.44
12.000	622.79	623.04	623.17	623.18	623.11
12.250	623.01	622.91	622.81	622.71	622.62
12.500	622.53	622.45	622.38	622.31	622.25
12.750	622.19	622.13	622.07	622.02	621.97
13.000	621.92	621.87	621.82	621.77	621.72
13.250	621.67	621.62	621.57	621.52	621.48
13.500	621.43	621.39	621.34	621.30	621.26
13.750	621.22	621.17	621.13	621.09	621.05
14.000	621.02	620.98	620.95	620.92	620.90
14.250	620.87	620.85	620.83	620.81	620.79
14.500	620.78	620.76	620.75	620.73	620.71
14.750	620.68	620.66	620.64	620.62	620.60
15.000	620.59	620.58	620.57	620.56	620.56
15.250	620.55	620.54	620.54	620.53	620.53
15.500	620.52	620.52	620.51	620.51	620.51
15.750	620.50	620.50	620.50	620.49	620.49
16.000	620.48	620.48	620.48	620.47	620.47
16.250	620.47	620.47	620.46	620.46	620.46
16.500	620.46	620.46	620.45	620.45	620.45
16.750	620.45	620.45	620.45	620.45	620.44
17.000	620.44	620.44	620.44	620.44	620.44
17.250	620.44	620.44	620.43	620.43	620.43
17.500	620.43	620.43	620.43	620.43	620.43
17.750	620.42	620.42	620.42	620.42	620.42
18.000	620.42	620.42	620.42	620.41	620.41
18.250	620.41	620.41	620.41	620.41	620.41
18.500	620.41	620.40	620.40	620.40	620.40
18.750	620.40	620.40	620.40	620.40	620.39
19.000	620.39	620.39	620.39	620.39	620.39
19.250	620.39	620.39	620.38	620.38	620.38
19.500	620.38	620.38	620.38	620.38	620.38
19.750	620.37	620.37	620.37	620.37	620.37
20.000	620.37	620.37	620.37	620.36	620.36

Range USA - O'Fallon

Subsection: Time vs. Elevation
Label: DB #1 (OUT)
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.250	620.36	620.36	620.36	620.36	620.36
20.500	620.36	620.36	620.36	620.36	620.36
20.750	620.36	620.36	620.36	620.36	620.36
21.000	620.36	620.36	620.36	620.36	620.36
21.250	620.35	620.35	620.35	620.35	620.35
21.500	620.35	620.35	620.35	620.35	620.35
21.750	620.35	620.35	620.35	620.35	620.35
22.000	620.35	620.35	620.35	620.35	620.35
22.250	620.35	620.35	620.35	620.35	620.35
22.500	620.35	620.35	620.35	620.35	620.35
22.750	620.35	620.35	620.35	620.35	620.35
23.000	620.35	620.35	620.35	620.35	620.35
23.250	620.35	620.34	620.34	620.34	620.34
23.500	620.34	620.34	620.34	620.34	620.34
23.750	620.34	620.34	620.34	620.34	620.34
24.000	620.34	(N/A)	(N/A)	(N/A)	(N/A)

Range USA - O'Fallon

Subsection: Time vs. Elevation
Label: DB #1 (OUT)
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	620.23	620.23	620.23	620.23	620.23
0.250	620.23	620.23	620.23	620.23	620.23
0.500	620.23	620.23	620.23	620.23	620.23
0.750	620.23	620.23	620.23	620.23	620.23
1.000	620.23	620.23	620.23	620.23	620.23
1.250	620.23	620.23	620.23	620.23	620.23
1.500	620.23	620.23	620.23	620.23	620.23
1.750	620.23	620.23	620.23	620.23	620.23
2.000	620.23	620.23	620.23	620.23	620.23
2.250	620.23	620.23	620.23	620.23	620.23
2.500	620.23	620.23	620.24	620.24	620.24
2.750	620.24	620.24	620.24	620.24	620.25
3.000	620.25	620.25	620.25	620.25	620.25
3.250	620.25	620.26	620.26	620.26	620.26
3.500	620.26	620.26	620.27	620.27	620.27
3.750	620.27	620.27	620.27	620.27	620.28
4.000	620.28	620.28	620.28	620.28	620.28
4.250	620.28	620.29	620.29	620.29	620.29
4.500	620.29	620.29	620.30	620.30	620.30
4.750	620.30	620.30	620.30	620.31	620.31
5.000	620.31	620.31	620.31	620.31	620.32
5.250	620.32	620.32	620.32	620.32	620.33
5.500	620.33	620.33	620.33	620.33	620.33
5.750	620.34	620.34	620.34	620.34	620.34
6.000	620.34	620.35	620.35	620.35	620.35
6.250	620.35	620.36	620.36	620.36	620.36
6.500	620.36	620.36	620.37	620.37	620.37
6.750	620.37	620.37	620.38	620.38	620.38
7.000	620.38	620.38	620.38	620.39	620.39
7.250	620.39	620.39	620.39	620.40	620.40
7.500	620.40	620.40	620.40	620.40	620.41
7.750	620.41	620.41	620.41	620.41	620.42
8.000	620.42	620.42	620.42	620.42	620.43
8.250	620.43	620.43	620.44	620.44	620.44
8.500	620.45	620.45	620.46	620.46	620.47
8.750	620.48	620.48	620.49	620.49	620.50
9.000	620.50	620.51	620.52	620.52	620.53
9.250	620.53	620.53	620.54	620.54	620.54
9.500	620.55	620.55	620.55	620.55	620.56
9.750	620.56	620.57	620.57	620.58	620.59

Range USA - O'Fallon

Subsection: Time vs. Elevation
Label: DB #1 (OUT)
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.000	620.59	620.60	620.61	620.62	620.63
10.250	620.64	620.65	620.66	620.67	620.69
10.500	620.70	620.71	620.73	620.73	620.74
10.750	620.75	620.75	620.76	620.77	620.78
11.000	620.79	620.80	620.81	620.83	620.84
11.250	620.86	620.88	620.90	620.92	620.94
11.500	620.97	621.00	621.05	621.13	621.25
11.750	621.41	621.64	621.93	622.30	622.71
12.000	623.07	623.32	623.43	623.42	623.33
12.250	623.23	623.12	623.01	622.91	622.82
12.500	622.73	622.64	622.56	622.49	622.42
12.750	622.35	622.29	622.24	622.19	622.14
13.000	622.09	622.05	622.01	621.96	621.92
13.250	621.88	621.83	621.79	621.75	621.70
13.500	621.66	621.62	621.57	621.53	621.49
13.750	621.45	621.41	621.37	621.34	621.30
14.000	621.26	621.23	621.19	621.15	621.11
14.250	621.08	621.05	621.02	620.99	620.97
14.500	620.94	620.92	620.90	620.88	620.87
14.750	620.85	620.84	620.82	620.81	620.80
15.000	620.78	620.77	620.76	620.75	620.74
15.250	620.74	620.72	620.70	620.68	620.66
15.500	620.65	620.63	620.62	620.61	620.60
15.750	620.60	620.59	620.58	620.58	620.57
16.000	620.56	620.56	620.55	620.55	620.54
16.250	620.54	620.54	620.53	620.53	620.53
16.500	620.52	620.52	620.52	620.52	620.52
16.750	620.51	620.51	620.51	620.51	620.51
17.000	620.50	620.50	620.50	620.50	620.50
17.250	620.50	620.49	620.49	620.49	620.49
17.500	620.49	620.49	620.49	620.48	620.48
17.750	620.48	620.48	620.48	620.48	620.47
18.000	620.47	620.47	620.47	620.47	620.47
18.250	620.46	620.46	620.46	620.46	620.46
18.500	620.46	620.46	620.45	620.45	620.45
18.750	620.45	620.45	620.45	620.44	620.44
19.000	620.44	620.44	620.44	620.44	620.43
19.250	620.43	620.43	620.43	620.43	620.43
19.500	620.42	620.42	620.42	620.42	620.42
19.750	620.42	620.42	620.41	620.41	620.41
20.000	620.41	620.41	620.41	620.40	620.40

Range USA - O'Fallon

Subsection: Time vs. Elevation
Label: DB #1 (OUT)
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.250	620.40	620.40	620.40	620.40	620.40
20.500	620.40	620.40	620.40	620.40	620.40
20.750	620.39	620.39	620.39	620.39	620.39
21.000	620.39	620.39	620.39	620.39	620.39
21.250	620.39	620.39	620.39	620.39	620.39
21.500	620.39	620.39	620.39	620.39	620.39
21.750	620.39	620.39	620.39	620.39	620.39
22.000	620.39	620.39	620.39	620.39	620.39
22.250	620.38	620.38	620.38	620.38	620.38
22.500	620.38	620.38	620.38	620.38	620.38
22.750	620.38	620.38	620.38	620.38	620.38
23.000	620.38	620.38	620.38	620.38	620.38
23.250	620.38	620.38	620.38	620.38	620.38
23.500	620.38	620.38	620.38	620.38	620.38
23.750	620.38	620.37	620.37	620.37	620.37
24.000	620.37	(N/A)	(N/A)	(N/A)	(N/A)

Range USA - O'Fallon

Subsection: Time vs. Volume
Label: DB #1
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000	0.000
2.250	0.000	0.000	0.000	0.000	0.000
2.500	0.000	0.000	0.000	0.000	0.000
2.750	0.000	0.000	0.000	0.000	0.000
3.000	0.000	0.000	0.000	0.000	0.000
3.250	0.000	0.000	0.000	0.000	0.000
3.500	0.000	0.000	0.000	0.000	0.000
3.750	0.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000	0.000
4.250	0.000	0.000	0.000	0.000	0.000
4.500	0.000	0.000	0.000	0.000	0.000
4.750	0.000	0.000	0.000	0.000	0.000
5.000	0.000	0.000	0.000	0.000	0.000
5.250	0.000	0.000	0.000	0.000	0.000
5.500	0.000	0.000	0.000	0.000	0.000
5.750	0.000	0.000	0.000	0.000	0.000
6.000	0.000	0.000	0.000	0.000	0.000
6.250	0.000	0.000	0.000	0.000	0.000
6.500	0.000	0.000	0.000	0.000	0.000
6.750	0.000	0.000	0.000	0.000	0.000
7.000	0.000	0.000	0.000	0.000	0.000
7.250	0.000	0.000	0.000	0.000	0.000
7.500	0.000	0.000	0.000	0.000	0.000
7.750	0.000	0.000	0.000	0.000	0.000
8.000	0.000	0.000	0.000	0.000	0.000
8.250	0.000	0.000	1.000	1.000	1.000
8.500	1.000	1.000	1.000	1.000	1.000
8.750	1.000	1.000	1.000	1.000	1.000
9.000	2.000	2.000	2.000	2.000	2.000
9.250	2.000	3.000	3.000	3.000	3.000
9.500	3.000	3.000	3.000	3.000	4.000
9.750	4.000	4.000	4.000	5.000	5.000

Range USA - O'Fallon

Subsection: Time vs. Volume
Label: DB #1
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
10.000	6.000	6.000	7.000	7.000	8.000
10.250	9.000	10.000	10.000	12.000	13.000
10.500	14.000	16.000	17.000	19.000	22.000
10.750	24.000	27.000	31.000	34.000	39.000
11.000	44.000	49.000	56.000	64.000	74.000
11.250	86.000	101.000	119.000	140.000	164.000
11.500	190.000	225.000	291.000	426.000	569.000
11.750	722.000	981.000	1,417.000	2,083.000	2,832.000
12.000	3,657.000	4,402.000	4,899.000	5,124.000	5,146.000
12.250	5,062.000	4,925.000	4,762.000	4,584.000	4,397.000
12.500	4,200.000	3,987.000	3,774.000	3,563.000	3,355.000
12.750	3,154.000	2,958.000	2,770.000	2,587.000	2,410.000
13.000	2,240.000	2,053.000	1,865.000	1,692.000	1,533.000
13.250	1,387.000	1,253.000	1,134.000	1,029.000	937.000
13.500	855.000	783.000	718.000	660.000	609.000
13.750	563.000	521.000	432.000	344.000	277.000
14.000	225.000	184.000	152.000	127.000	106.000
14.250	91.000	79.000	69.000	62.000	56.000
14.500	52.000	48.000	44.000	42.000	39.000
14.750	37.000	36.000	34.000	32.000	31.000
15.000	30.000	29.000	28.000	27.000	26.000
15.250	25.000	24.000	23.000	22.000	21.000
15.500	21.000	20.000	19.000	18.000	18.000
15.750	17.000	16.000	16.000	15.000	15.000
16.000	14.000	13.000	13.000	12.000	12.000
16.250	12.000	11.000	11.000	11.000	10.000
16.500	10.000	10.000	10.000	9.000	9.000
16.750	9.000	9.000	9.000	9.000	8.000
17.000	8.000	8.000	8.000	8.000	8.000
17.250	8.000	7.000	7.000	7.000	7.000
17.500	7.000	7.000	7.000	7.000	6.000
17.750	6.000	6.000	6.000	6.000	6.000
18.000	6.000	6.000	6.000	5.000	5.000
18.250	5.000	5.000	5.000	5.000	5.000
18.500	5.000	5.000	4.000	4.000	4.000
18.750	4.000	4.000	4.000	4.000	4.000
19.000	4.000	4.000	4.000	4.000	3.000
19.250	3.000	3.000	3.000	3.000	3.000
19.500	3.000	3.000	3.000	3.000	3.000
19.750	3.000	3.000	3.000	2.000	2.000
20.000	2.000	2.000	2.000	2.000	2.000

Range USA - O'Fallon

Subsection: Time vs. Volume
Label: DB #1
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
20.250	2.000	2.000	2.000	2.000	2.000
20.500	2.000	2.000	2.000	2.000	2.000
20.750	2.000	2.000	2.000	2.000	2.000
21.000	2.000	2.000	2.000	2.000	2.000
21.250	2.000	2.000	2.000	2.000	2.000
21.500	2.000	2.000	2.000	2.000	2.000
21.750	2.000	2.000	2.000	2.000	2.000
22.000	2.000	2.000	2.000	2.000	2.000
22.250	2.000	2.000	1.000	1.000	1.000
22.500	1.000	1.000	1.000	1.000	1.000
22.750	1.000	1.000	1.000	1.000	1.000
23.000	1.000	1.000	1.000	1.000	1.000
23.250	1.000	1.000	1.000	1.000	1.000
23.500	1.000	1.000	1.000	1.000	1.000
23.750	1.000	1.000	1.000	1.000	1.000
24.000	1.000	(N/A)	(N/A)	(N/A)	(N/A)

Range USA - O'Fallon

Subsection: Time vs. Volume
Label: DB #1
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000	0.000
2.250	0.000	0.000	0.000	0.000	0.000
2.500	0.000	0.000	0.000	0.000	0.000
2.750	0.000	0.000	0.000	0.000	0.000
3.000	0.000	0.000	0.000	0.000	0.000
3.250	0.000	0.000	0.000	0.000	0.000
3.500	0.000	0.000	0.000	0.000	0.000
3.750	0.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000	0.000
4.250	0.000	0.000	0.000	0.000	0.000
4.500	0.000	0.000	0.000	0.000	0.000
4.750	0.000	0.000	0.000	0.000	0.000
5.000	0.000	0.000	0.000	1.000	1.000
5.250	1.000	1.000	1.000	1.000	1.000
5.500	1.000	1.000	1.000	1.000	1.000
5.750	1.000	1.000	1.000	2.000	2.000
6.000	2.000	2.000	2.000	2.000	2.000
6.250	2.000	2.000	3.000	3.000	3.000
6.500	3.000	3.000	3.000	3.000	4.000
6.750	4.000	4.000	4.000	4.000	5.000
7.000	5.000	5.000	5.000	5.000	6.000
7.250	6.000	6.000	6.000	7.000	7.000
7.500	7.000	8.000	8.000	8.000	9.000
7.750	9.000	9.000	10.000	10.000	10.000
8.000	11.000	11.000	11.000	12.000	12.000
8.250	13.000	14.000	15.000	16.000	17.000
8.500	18.000	19.000	21.000	22.000	24.000
8.750	26.000	28.000	30.000	32.000	34.000
9.000	37.000	39.000	42.000	45.000	47.000
9.250	50.000	52.000	54.000	56.000	58.000
9.500	59.000	61.000	63.000	65.000	67.000
9.750	70.000	74.000	78.000	83.000	88.000

Range USA - O'Fallon

Subsection: Time vs. Volume
Label: DB #1
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
10.000	94.000	101.000	109.000	117.000	127.000
10.250	137.000	148.000	159.000	172.000	185.000
10.500	199.000	213.000	229.000	246.000	264.000
10.750	284.000	307.000	331.000	357.000	385.000
11.000	414.000	446.000	481.000	496.000	515.000
11.250	537.000	565.000	596.000	633.000	674.000
11.500	721.000	781.000	881.000	1,066.000	1,394.000
11.750	1,894.000	2,516.000	3,426.000	4,661.000	6,158.000
12.000	7,650.000	8,765.000	9,364.000	9,398.000	9,075.000
12.250	8,624.000	8,158.000	7,720.000	7,316.000	6,918.000
12.500	6,554.000	6,221.000	5,919.000	5,646.000	5,401.000
12.750	5,168.000	4,948.000	4,743.000	4,553.000	4,368.000
13.000	4,184.000	4,002.000	3,824.000	3,649.000	3,477.000
13.250	3,296.000	3,123.000	2,955.000	2,793.000	2,637.000
13.500	2,486.000	2,340.000	2,199.000	2,063.000	1,932.000
13.750	1,799.000	1,655.000	1,524.000	1,402.000	1,290.000
14.000	1,186.000	1,091.000	1,005.000	929.000	861.000
14.250	800.000	746.000	697.000	653.000	614.000
14.500	578.000	546.000	517.000	491.000	443.000
14.750	389.000	347.000	313.000	285.000	261.000
15.000	242.000	226.000	212.000	200.000	189.000
15.250	180.000	171.000	163.000	156.000	150.000
15.500	144.000	138.000	132.000	127.000	122.000
15.750	117.000	112.000	108.000	103.000	99.000
16.000	95.000	91.000	87.000	84.000	81.000
16.250	78.000	75.000	73.000	71.000	70.000
16.500	68.000	66.000	65.000	64.000	62.000
16.750	61.000	60.000	59.000	58.000	57.000
17.000	56.000	55.000	54.000	53.000	52.000
17.250	51.000	50.000	49.000	48.000	47.000
17.500	46.000	46.000	45.000	44.000	43.000
17.750	42.000	41.000	41.000	40.000	39.000
18.000	38.000	38.000	37.000	36.000	35.000
18.250	35.000	34.000	33.000	33.000	32.000
18.500	31.000	31.000	30.000	29.000	29.000
18.750	28.000	27.000	27.000	26.000	26.000
19.000	25.000	25.000	24.000	23.000	23.000
19.250	22.000	22.000	21.000	21.000	20.000
19.500	20.000	19.000	19.000	18.000	18.000
19.750	17.000	17.000	17.000	16.000	16.000
20.000	15.000	15.000	15.000	14.000	14.000

Range USA - O'Fallon

Subsection: Time vs. Volume
Label: DB #1
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
20.250	14.000	13.000	13.000	13.000	13.000
20.500	13.000	12.000	12.000	12.000	12.000
20.750	12.000	12.000	12.000	12.000	12.000
21.000	12.000	12.000	11.000	11.000	11.000
21.250	11.000	11.000	11.000	11.000	11.000
21.500	11.000	11.000	11.000	11.000	11.000
21.750	11.000	11.000	10.000	10.000	10.000
22.000	10.000	10.000	10.000	10.000	10.000
22.250	10.000	10.000	10.000	10.000	10.000
22.500	10.000	10.000	10.000	10.000	9.000
22.750	9.000	9.000	9.000	9.000	9.000
23.000	9.000	9.000	9.000	9.000	9.000
23.250	9.000	9.000	9.000	9.000	9.000
23.500	9.000	8.000	8.000	8.000	8.000
23.750	8.000	8.000	8.000	8.000	8.000
24.000	8.000	(N/A)	(N/A)	(N/A)	(N/A)

Range USA - O'Fallon

Subsection: Time vs. Volume
Label: DB #1
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000	0.000
2.250	0.000	0.000	0.000	0.000	0.000
2.500	0.000	0.000	0.000	0.000	0.000
2.750	0.000	0.000	0.000	0.000	0.000
3.000	0.000	0.000	0.000	0.000	0.000
3.250	0.000	0.000	0.000	0.000	0.000
3.500	0.000	0.000	0.000	0.000	0.000
3.750	0.000	0.000	0.000	1.000	1.000
4.000	1.000	1.000	1.000	1.000	1.000
4.250	1.000	1.000	1.000	1.000	1.000
4.500	1.000	2.000	2.000	2.000	2.000
4.750	2.000	2.000	2.000	3.000	3.000
5.000	3.000	3.000	3.000	4.000	4.000
5.250	4.000	4.000	4.000	5.000	5.000
5.500	5.000	6.000	6.000	6.000	7.000
5.750	7.000	7.000	8.000	8.000	8.000
6.000	9.000	9.000	10.000	10.000	11.000
6.250	11.000	11.000	12.000	13.000	13.000
6.500	14.000	14.000	15.000	15.000	16.000
6.750	17.000	17.000	18.000	19.000	19.000
7.000	20.000	21.000	21.000	22.000	23.000
7.250	24.000	25.000	25.000	26.000	27.000
7.500	28.000	29.000	30.000	31.000	32.000
7.750	33.000	34.000	35.000	36.000	37.000
8.000	38.000	39.000	40.000	42.000	43.000
8.250	45.000	48.000	51.000	54.000	57.000
8.500	61.000	65.000	70.000	74.000	80.000
8.750	85.000	91.000	97.000	104.000	111.000
9.000	118.000	126.000	133.000	141.000	147.000
9.250	153.000	159.000	164.000	168.000	172.000
9.500	176.000	179.000	182.000	186.000	191.000
9.750	198.000	205.000	214.000	224.000	235.000

Range USA - O'Fallon

Subsection: Time vs. Volume
Label: DB #1
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
10.000	247.000	261.000	275.000	290.000	307.000
10.250	326.000	346.000	368.000	392.000	417.000
10.500	444.000	472.000	503.000	518.000	531.000
10.750	545.000	562.000	582.000	603.000	626.000
11.000	652.000	680.000	712.000	748.000	789.000
11.250	836.000	891.000	954.000	1,025.000	1,104.000
11.500	1,193.000	1,306.000	1,487.000	1,790.000	2,271.000
11.750	2,909.000	3,857.000	5,153.000	6,875.000	8,957.000
12.000	10,926.000	12,403.000	13,057.000	12,952.000	12,442.000
12.250	11,846.000	11,211.000	10,601.000	10,040.000	9,532.000
12.500	9,074.000	8,616.000	8,194.000	7,807.000	7,456.000
12.750	7,139.000	6,855.000	6,600.000	6,353.000	6,118.000
13.000	5,895.000	5,684.000	5,484.000	5,283.000	5,084.000
13.250	4,888.000	4,696.000	4,507.000	4,322.000	4,133.000
13.500	3,941.000	3,754.000	3,573.000	3,397.000	3,226.000
13.750	3,061.000	2,900.000	2,744.000	2,593.000	2,447.000
14.000	2,304.000	2,164.000	2,002.000	1,853.000	1,715.000
14.250	1,589.000	1,473.000	1,366.000	1,267.000	1,179.000
14.500	1,100.000	1,030.000	967.000	911.000	860.000
14.750	813.000	772.000	733.000	699.000	667.000
15.000	638.000	611.000	586.000	563.000	542.000
15.250	523.000	493.000	443.000	403.000	369.000
15.500	342.000	319.000	299.000	281.000	266.000
15.750	253.000	241.000	230.000	220.000	210.000
16.000	201.000	193.000	185.000	178.000	172.000
16.250	166.000	161.000	157.000	153.000	149.000
16.500	146.000	142.000	139.000	137.000	134.000
16.750	132.000	129.000	127.000	124.000	122.000
17.000	120.000	118.000	116.000	114.000	112.000
17.250	110.000	107.000	106.000	104.000	102.000
17.500	100.000	98.000	96.000	94.000	93.000
17.750	91.000	89.000	87.000	86.000	84.000
18.000	82.000	81.000	79.000	78.000	76.000
18.250	75.000	73.000	72.000	70.000	69.000
18.500	67.000	66.000	64.000	63.000	62.000
18.750	60.000	59.000	58.000	56.000	55.000
19.000	54.000	53.000	52.000	50.000	49.000
19.250	48.000	47.000	46.000	45.000	44.000
19.500	43.000	42.000	41.000	40.000	39.000
19.750	38.000	37.000	36.000	35.000	34.000
20.000	33.000	32.000	31.000	30.000	30.000

Range USA - O'Fallon

Subsection: Time vs. Volume
Label: DB #1
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
20.250	29.000	29.000	28.000	28.000	27.000
20.500	27.000	27.000	27.000	26.000	26.000
20.750	26.000	26.000	25.000	25.000	25.000
21.000	25.000	25.000	25.000	24.000	24.000
21.250	24.000	24.000	24.000	24.000	24.000
21.500	23.000	23.000	23.000	23.000	23.000
21.750	23.000	23.000	22.000	22.000	22.000
22.000	22.000	22.000	22.000	22.000	22.000
22.250	21.000	21.000	21.000	21.000	21.000
22.500	21.000	21.000	21.000	20.000	20.000
22.750	20.000	20.000	20.000	20.000	20.000
23.000	19.000	19.000	19.000	19.000	19.000
23.250	19.000	19.000	19.000	19.000	18.000
23.500	18.000	18.000	18.000	18.000	18.000
23.750	18.000	18.000	17.000	17.000	17.000
24.000	17.000	(N/A)	(N/A)	(N/A)	(N/A)

Range USA - O'Fallon

Subsection: Elevation-Area Volume Curve
Label: DB #1
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ft^3)	Volume (Total) (ft^3)
620.23	0.0	0.000	0.000	0.000	0.000
620.50	0.0	0.029	0.029	114.000	114.000
621.00	0.0	0.085	0.164	1,188.000	1,302.000
622.00	0.0	0.106	0.286	4,152.000	5,453.000
623.00	0.0	0.128	0.350	5,089.000	10,542.000
624.00	0.0	0.151	0.418	6,070.000	16,612.000
624.50	0.0	0.163	0.471	3,419.000	20,031.000
625.00	0.0	0.176	0.508	3,691.000	23,722.000

Range USA - O'Fallon

Subsection: Elevation-Area Volume Curve
Label: DB #1
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ft^3)	Volume (Total) (ft^3)
620.23	0.0	0.000	0.000	0.000	0.000
620.50	0.0	0.029	0.029	114.000	114.000
621.00	0.0	0.068	0.141	1,027.000	1,140.000
622.00	0.0	0.085	0.229	3,325.000	4,466.000
623.00	0.0	0.104	0.283	4,109.000	8,575.000
624.00	0.0	0.123	0.340	4,938.000	13,514.000
624.50	0.0	0.134	0.385	2,798.000	16,311.000
625.00	0.0	0.145	0.418	3,038.000	19,349.000

Range USA - O'Fallon

Subsection: Elevation-Area Volume Curve
Return Event: 100 years
Label: DB #1
Storm Event: 100
Scenario: Post-Development 100

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ft^3)	Volume (Total) (ft^3)
620.23	0.0	0.000	0.000	0.000	0.000
620.50	0.0	0.029	0.029	114.000	114.000
621.00	0.0	0.085	0.164	1,188.000	1,302.000
622.00	0.0	0.106	0.286	4,152.000	5,453.000
623.00	0.0	0.128	0.350	5,089.000	10,542.000
624.00	0.0	0.151	0.418	6,070.000	16,612.000
624.50	0.0	0.163	0.471	3,419.000	20,031.000
625.00	0.0	0.176	0.508	3,691.000	23,722.000

Range USA - O'Fallon

Subsection: Outlet Input Data
Label: 1 Composite Outlet Structure
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Requested Pond Water Surface Elevations	
Minimum (Headwater)	620.23 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	625.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	620.23	625.00
Irregular Weir	Weir - 1	Forward	TW	622.00	625.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	620.23 ft
Orifice Diameter	8.0 in
Orifice Coefficient	0.600

Structure ID: Weir - 1
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
0.00	3.00
0.01	1.20
1.00	1.20
1.01	0.00
2.00	0.00
2.01	1.20
3.00	1.20
3.01	3.00

Lowest Elevation	622.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Downstream Channel
Catalog Conduit	Conduit Catalog - 1
Channel Slope	0.008 ft/ft
Channel Invert Elevation	620.13 ft

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Range USA - O'Fallon

Subsection: Individual Outlet Curves
Label: 1 Composite Outlet Structure
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
620.23	0.00	620.13	0.00
620.73	0.58	620.36	0.00
621.23	1.37	620.48	0.00
621.73	1.81	620.53	0.00
622.00	2.01	620.56	0.00
622.23	2.14	620.60	0.00
622.73	2.36	620.76	0.01
623.23	2.55	620.93	0.01
623.73	2.65	621.23	0.01
624.23	2.69	621.66	0.00
624.73	2.77	622.01	0.00
625.00	2.91	622.01	0.00

Computation Messages

Upstream HW &
DNstream TW < Inv.El
CRIT.DEPTH CONTROL
Vh= .143ft Dcr= .357ft
CRIT.DEPTH Hev= .00ft
H =.67
H =1.17
H =1.44
H =1.63
H =1.97
H =2.30
H =2.50
H =2.57
H =2.72
H =2.99

Range USA - O'Fallon

Subsection: Individual Outlet Curves
Label: 1 Composite Outlet Structure
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Weir - 1 (Irregular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
620.23	0.00	620.13	0.00
620.73	0.00	620.36	0.00
621.23	0.00	620.48	0.00
621.73	0.00	620.53	0.00
622.00	0.00	620.56	0.00
622.23	0.33	620.60	0.00
622.73	1.86	620.76	0.01
623.23	4.11	620.93	0.01
623.73	9.12	621.23	0.01
624.23	16.24	621.66	0.00
624.73	24.86	622.01	0.00
625.00	30.05	622.01	0.00

Computation Messages
E < Y min=622.00
E < Y min=622.00
E < Y min=622.00
E < Y min=622.00
E = Y min=622.00
Max.H=.23; Max.Htw=-1.40;; W(ft)=.99
Max.H=.73; Max.Htw=-1.24;; W(ft)=1.00
Max.H=1.23; Max.Htw=-1.07;; W(ft)=2.99
Max.H=1.73; Max.Htw=-.77;; W(ft)=3.00
Max.H=2.23; Max.Htw=-.34;; W(ft)=3.00
Max.H=2.73; Max.Htw=.01;; W(ft)=3.01
Max.H=3.00; Max.Htw=.01;; W(ft)=3.01

Range USA - O'Fallon

Subsection: Outlet Input Data
Label: 1 Composite Outlet Structure
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Requested Pond Water Surface Elevations	
Minimum (Headwater)	620.23 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	625.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	620.23	625.00
Irregular Weir	Weir - 1	Forward	TW	622.00	625.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	620.23 ft
Orifice Diameter	8.0 in
Orifice Coefficient	0.600

Structure ID: Weir - 1
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
0.00	3.00
0.01	1.20
1.00	1.20
1.01	0.00
2.00	0.00
2.01	1.20
3.00	1.20
3.01	3.00

Lowest Elevation	622.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Downstream Channel
Catalog Conduit	Conduit Catalog - 1
Channel Slope	0.008 ft/ft
Channel Invert Elevation	620.13 ft

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Range USA - O'Fallon

Subsection: Individual Outlet Curves
Label: 1 Composite Outlet Structure
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
Contributing Structures			

Subsection: Individual Outlet Curves
Label: 1 Composite Outlet Structure
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
Contributing Structures			

Range USA - O'Fallon

Subsection: Outlet Input Data
Label: 1 Composite Outlet Structure
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

Requested Pond Water Surface Elevations	
Minimum (Headwater)	620.23 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	625.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	620.23	625.00
Irregular Weir	Weir - 1	Forward	TW	622.00	625.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	620.23 ft
Orifice Diameter	8.0 in
Orifice Coefficient	0.600

Structure ID: Weir - 1
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
0.00	3.00
0.01	1.20
1.00	1.20
1.01	0.00
2.00	0.00
2.01	1.20
3.00	1.20
3.01	3.00

Lowest Elevation	622.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Downstream Channel
Catalog Conduit	Conduit Catalog - 1
Channel Slope	0.008 ft/ft
Channel Invert Elevation	620.13 ft

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Range USA - O'Fallon

Subsection: Individual Outlet Curves
Label: 1 Composite Outlet Structure
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
620.23	0.00	620.13	0.00
620.73	0.58	620.36	0.00
621.23	1.37	620.48	0.00
621.73	1.81	620.53	0.00
622.00	2.01	620.56	0.00
622.23	2.14	620.60	0.00
622.73	2.36	620.76	0.01
623.23	2.55	620.93	0.01
623.73	2.65	621.23	0.01
624.23	2.69	621.66	0.00
624.73	2.77	622.01	0.00
625.00	2.91	622.01	0.00

Computation Messages

Upstream HW &
DNstream TW < Inv.El
CRIT.DEPTH CONTROL
Vh= .143ft Dcr= .357ft
CRIT.DEPTH Hev= .00ft
H =.67
H =1.17
H =1.44
H =1.63
H =1.97
H =2.30
H =2.50
H =2.57
H =2.72
H =2.99

Range USA - O'Fallon

Subsection: Individual Outlet Curves
Label: 1 Composite Outlet Structure
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Weir - 1 (Irregular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
620.23	0.00	620.13	0.00
620.73	0.00	620.36	0.00
621.23	0.00	620.48	0.00
621.73	0.00	620.53	0.00
622.00	0.00	620.56	0.00
622.23	0.33	620.60	0.00
622.73	1.86	620.76	0.01
623.23	4.11	620.93	0.01
623.73	9.12	621.23	0.01
624.23	16.24	621.66	0.00
624.73	24.86	622.01	0.00
625.00	30.05	622.01	0.00

Computation Messages
E < Y min=622.00
E < Y min=622.00
E < Y min=622.00
E < Y min=622.00
E = Y min=622.00
Max.H=.23; Max.Htw=-1.40;; W(ft)=.99
Max.H=.73; Max.Htw=-1.24;; W(ft)=1.00
Max.H=1.23; Max.Htw=-1.07;; W(ft)=2.99
Max.H=1.73; Max.Htw=-.77;; W(ft)=3.00
Max.H=2.23; Max.Htw=-.34;; W(ft)=3.00
Max.H=2.73; Max.Htw=.01;; W(ft)=3.01
Max.H=3.00; Max.Htw=.01;; W(ft)=3.01

Range USA - O'Fallon

Subsection: Elevation-Volume-Flow Table (Pond)
Label: DB #1
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	620.23 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
620.23	0.00	0.000	0.000	0.00	0.00	0.00
620.73	0.58	509.789	0.051	0.00	0.58	6.24
621.23	1.37	2,176.445	0.090	0.00	1.37	25.55
621.73	1.81	4,241.518	0.100	0.00	1.81	48.94
622.00	2.01	5,453.355	0.106	0.00	2.01	62.61
622.23	2.47	6,539.684	0.111	0.00	2.47	75.13
622.73	4.22	9,073.197	0.122	0.00	4.22	105.03
623.23	6.66	11,850.330	0.133	0.00	6.66	138.33
623.73	11.78	14,873.889	0.145	0.00	11.78	177.04
624.23	18.93	18,152.200	0.156	0.00	18.93	220.62
624.73	27.63	21,693.325	0.169	0.00	27.63	268.67
625.00	32.96	23,721.508	0.176	0.00	32.96	296.53

Range USA - O'Fallon

Subsection: Elevation-Volume-Flow Table (Pond)
Label: DB #1
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	620.23 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
620.23	0.00	0.000	0.000	0.00	0.00	0.00
620.73	0.55	481.028	0.045	0.00	0.55	5.89
621.23	1.22	1,840.249	0.072	0.00	1.22	21.67
621.73	1.61	3,494.293	0.080	0.00	1.61	40.43
622.00	1.78	4,465.770	0.085	0.00	1.78	51.40
622.23	2.21	5,338.325	0.089	0.00	2.21	61.52
622.73	3.78	7,383.488	0.099	0.00	3.78	85.82
623.23	5.96	9,638.308	0.108	0.00	5.96	113.05
623.73	10.62	12,098.093	0.118	0.00	10.62	145.04
624.23	17.54	14,770.800	0.128	0.00	17.54	181.66
624.73	25.93	17,678.911	0.139	0.00	25.93	222.36
625.00	31.14	19,348.914	0.145	0.00	31.14	246.13

Range USA - O'Fallon

Subsection: Elevation-Volume-Flow Table (Pond) | Return Event: 100 years
Label: DB #1 | Storm Event: 100
Scenario: Post-Development 100

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	620.23 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
620.23	0.00	0.000	0.000	0.00	0.00	0.00
620.73	0.58	509.789	0.051	0.00	0.58	6.24
621.23	1.37	2,176.445	0.090	0.00	1.37	25.55
621.73	1.81	4,241.518	0.100	0.00	1.81	48.94
622.00	2.01	5,453.355	0.106	0.00	2.01	62.61
622.23	2.47	6,539.684	0.111	0.00	2.47	75.13
622.73	4.22	9,073.197	0.122	0.00	4.22	105.03
623.23	6.66	11,850.330	0.133	0.00	6.66	138.33
623.73	11.78	14,873.889	0.145	0.00	11.78	177.04
624.23	18.93	18,152.200	0.156	0.00	18.93	220.62
624.73	27.63	21,693.325	0.169	0.00	27.63	268.67
625.00	32.96	23,721.508	0.176	0.00	32.96	296.53

Range USA - O'Fallon

Subsection: Level Pool Pond Routing Summary
Label: DB #1 (IN)
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	620.23 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	6.18 ft³/s	Time to Peak (Flow, In)	12.000 hours
Flow (Peak Outlet)	1.96 ft³/s	Time to Peak (Flow, Outlet)	12.200 hours

Elevation (Water Surface, Peak)	621.93 ft
Volume (Peak)	5,145.974 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	17,041.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	16,981.000 ft³
Volume (Retained)	1.000 ft³
Volume (Unrouted)	-60.000 ft³
Error (Mass Balance)	0.4 %

Range USA - O'Fallon

Subsection: Level Pool Pond Routing Summary
Label: DB #1 (IN)
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	620.23 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	11.73 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	5.73 ft³/s	Time to Peak (Flow, Outlet)	12.150 hours

Elevation (Water Surface, Peak)	623.18 ft
Volume (Peak)	9,397.744 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	33,399.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	33,292.000 ft³
Volume (Retained)	4.000 ft³
Volume (Unrouted)	-103.000 ft³
Error (Mass Balance)	0.3 %

Range USA - O'Fallon

Subsection: Level Pool Pond Routing Summary
Label: DB #1 (IN)
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	620.23 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	16.18 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	8.76 ft³/s	Time to Peak (Flow, Outlet)	12.100 hours

Elevation (Water Surface, Peak)	623.43 ft
Volume (Peak)	13,057.322 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	46,937.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	46,791.000 ft³
Volume (Retained)	9.000 ft³
Volume (Unrouted)	-137.000 ft³
Error (Mass Balance)	0.3 %

Range USA - O'Fallon

Subsection: Pond Inflow Summary
Label: DB #1 (IN)
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 002

Summary for Hydrograph Addition at 'DB #1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Prop. #1 Inflow

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Prop. #1 Inflow	17,041.184	12.000	6.18
Flow (In)	DB #1	17,041.184	12.000	6.18

Range USA - O'Fallon

Subsection: Pond Inflow Summary
Label: DB #1 (IN)
Scenario: Post Development 15

Return Event: 15 years
Storm Event: 015

Summary for Hydrograph Addition at 'DB #1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Prop. #1 Inflow

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Prop. #1 Inflow	33,399.105	11.950	11.73
Flow (In)	DB #1	33,399.105	11.950	11.73

Range USA - O'Fallon

Subsection: Pond Inflow Summary
Label: DB #1 (IN)
Scenario: Post-Development 100

Return Event: 100 years
Storm Event: 100

Summary for Hydrograph Addition at 'DB #1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Prop. #1 Inflow

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Prop. #1 Inflow	46,937.440	11.950	16.18
Flow (In)	DB #1	46,937.440	11.950	16.18

Range USA - O'Fallon

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Appendix B

WATER QUALITY VOLUME, FLOW SPLITTER, &

VOLUME REDUCTION CALCULATIONS

(Per “2000 Maryland Stormwater Design Manual Volume II” & the “Flow Restriction Method” defined in “Flow Splitting Design Criteria” by the Montgomery County Maryland Department of Permitting Services Water Resources Section)

the clayton engineering company, inc.

CALCULATION SHEET

Project No.: **21243** Proj. Name **Range USA O'FALLON, MO**

Subject: **Calculation for Flow Splitter & HDS Unit Selection**

By/Date: **EAS / 03-19-2022** Chk/Date: **EAS / 03-19-2022**

Calculatinos for Flow Splitter #1 - Discharge into HydroDynamic Separator #1

Water Quality Area A - to HDS Unit #1

Total Area to Flow Splitter GISI 1-4 = 1.80 acres

P =	1.14	in.	
Total A =	1.80	Ac.	
Imperv A =	1.57	Ac.	
I =	Imperv A/Total A =	87	%
Rv =	0.05+0.009(I) =	0.835	
Qa =	P X Rv =	0.952	
tc =	6	min.	
CN =	98		

Use the TR-55 Graphical Peak Method:

Ia =	0.09	in.
Ia / P =	0.0789	

From Figure D.11.1:

qu =	1010	csm/in
Qa =	0.74	in.

qi = qu*A*Qa, where A is in square miles

qi = 2.10 cfs

Size the WQ outflow pipe from the Flow Splitter to the HydroDynamic Separator

Refer to the Flow Splitter Calculations following this page provided by Hydro International accounting for their specific HDS Unit Headlosses

USE HYDRODYNAMIC SEPARATOR DOWNSTREAM DEFENDER (6 FOOT DIA. MODEL)
(TREATMENT FLOW CAPACITY= _ CFS)

TR-55 Graphical Peak and Storage Detailed Report: TR-55 GP-WQ HDS#1

Element Details			
ID	71	Notes	
Label	TR-55 GP-WQ HDS#1		

>>>>>> DETENTION STORAGE ESTIMATE <<<<<<

Frequency (years)	Rainfall, P, 24-hr (in)	Inflow Runoff, Q (in)	Peak Inflow, qi (ft^3/s)	Peak Outflow, qo (ft^3/s)	qo/qi Ratio	Vs/Vr Ratio	Inflow Volume, Vr (ft^3)
1	1.14	0.74	2.09	2.09	1.000	0.088	4,805.473

Storage Volume, Vs (ft^3)
422.882

>>>>>> GRAPHICAL PEAK DISCHARGE METHOD (INFLOW) <<<<<<	
Drainage Area	1.800 acres
Runoff Curve Number	95.700
Time of Concentration	0.100 hours
Pond and Swamp percent	0.0 %
Pond and Swamp Area	0.000 acres

Frequency (years)	Rainfall, P, 24-hr (in)	Initial Abstraction, Ia (in)	Ia/p Ratio	Runoff, Q (in)	Unit Discharge, * qu (csm/in)	Pond & Swamp Adjustment, Fp (%)	Peak Discharge, qp (ft^3/s)
1	1.14	0.09	0.079	0.74	1,009.997	100.0	2.09

Summary of Computations for qu (Inflow)

Ia/p #1	0.100
C0 #1	2.553
C1 #1	-0.615
C2 #1	-0.164
qu #1 (csm/in)	1,009.997
Ia/p #2	0.100
C0 #2	2.553
C1 #2	-0.615
C2 #2	-0.164
qu #2 (csm/in)	1,009.997
qu (csm/in)	1,009.997

>>>>>> GRAPHICAL PEAK DISCHARGE METHOD (OUTFLOW) <<<<<<	
Drainage Area	1.800 acres

Appendix C

HYDRAULICS –

INLET CAPACITY

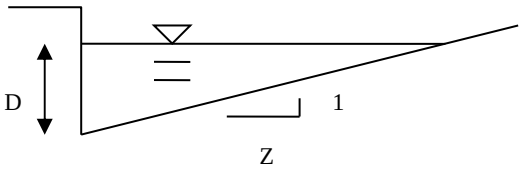
CALCULATIONS

Project No.: 21243	Sheet: 1 of 2
Project Name: Range USA	
Computation for: Double Grate Inlet with Side Intake Capacity Calculations	By: EJS

DOUBLE GRATE INLET WITH SIDE INTAKE (SUMP)

- Refer to Curb Inlet Calculations for Side Intake;
- Cast Iron Grates (NF. R-3297);
- Installation per Manufacturer's Recommendations;
- Grate Open Area, ft^2 = 2.3 per single grate (x 2 for Double Grates);
- Weir Perimeter, lineal ft = 7.5 per single grate or 10.0 per double grate inlet;
- Modified Manning Equation:

$$Q = \frac{0.56}{N} Z D^{\frac{8}{3}} S^{\frac{1}{2}}$$



Where: Q = Channel Flow (cfs)
D = Depth in Feet
Z = Reciprocal of Transverse Slope ($\frac{1}{S^T}$)
S = Longitudinal Slope
N = Roughness Coefficient at Constant 0.016
(value for concrete & asphalt)

DOUBLE GRATE INLET CAPCITY, Q_C

- Q_C = the lowest value between*

$$Q = 0.6A\sqrt{2gh} \quad \text{or} \quad Q = 3.3P(h)^{1.5}$$

(Orifice Flow) (Weir Flow)

Where: A = Grate Open Area
g = 32.2 ft/s^2
h = Head in Feet
P = Weir Perimeter in Feet

- When both rates are approximately the same, physically a vortex appears over the grate. This type of flow, due to its rotation, is not as efficient as either the weir or orifice equations imply. Using 80% of the expected flow in this situation should be a conservative estimate.

$$Q = 0.80 Q_{AVG} \quad \text{(Transitional Flow)}$$

- Assuming the general worst case scenario that water ponds at a sump inlet to approximately 6-inch above the grate, then

h = 0.5 ft $\rightarrow Q_{ORIFICE} = 0.6(2.3x2)\sqrt{2(32.2)(0.5)} = 15.66 cfs$

$\rightarrow Q_{WEIR} = 3.3(10.0)(0.5)^{1.5} = 11.67 cfs$

Q is approximately equal $\therefore$ use 80% of the lowest value

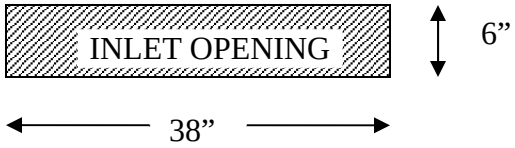
$Q = 0.80(11.67) = 9.33 cfs$ (Transitional Flow) per double grate

+ 5.10 cfs Curb Inlet Capacity for Side Intake (assuming Sump, a=0 from above)

Project No.: 21243	Sheet: 2 of 2
Project Name: Range USA	
Computation for: Curb Inlet Capacity Calculations	By: EJS

CURB INLETS (per 1-side open)

- Typical single curb inlet



INLET CAPACITY, Q_C

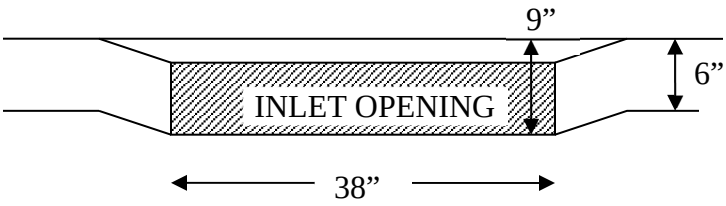
- Inlet Area = 1.5 ft^2; L = Length of crest of weir = 3.17 ft
-

$$Q = 0.6A\sqrt{2gh} \quad \text{or} \quad Q = 3.0L(h)^{1.5}$$

(Orifice Flow) (Weir Flow)

Where: A = Inlet Open Area
g = 32.2 ft/s^2
h = Head in Feet
L = Length of crest of weir

- Use Manning Modified Equation to get the flow depth;



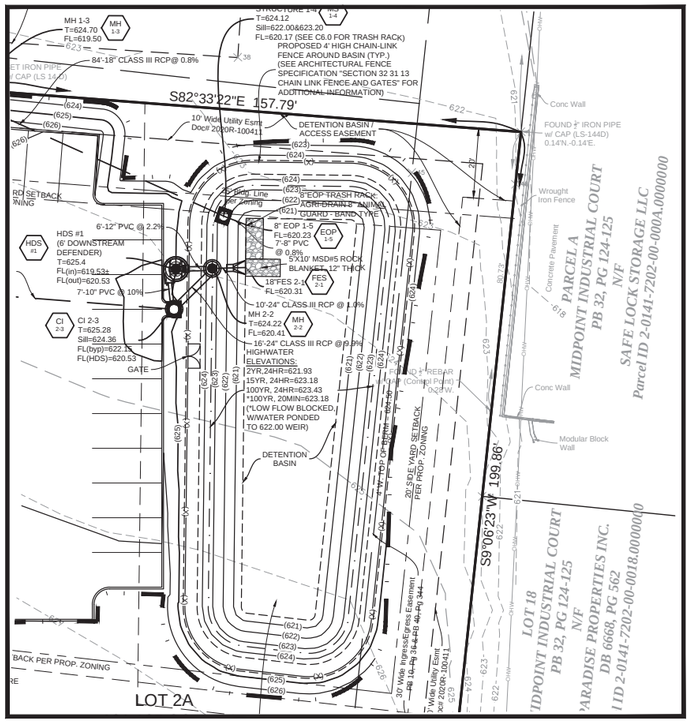
- Assuming the general worst case scenario that water ponds at the inlet to the top of the structure or to the top of the 6-inch vertical curb, then Orifice Flow controls
  - Actual Conditions: h = D + a;
    Where: a = Gutter Depression at Inlet, ft
    D = Flow Depth in Normal Gutter Section, ft
- Assume 3-inch sump, ∴ a = 0.25 ft
  - h = 0.75 ft $\rightarrow Q_{ORIFICE} = 0.6(1.58)\sqrt{2(32.2)(0.75)} = 6.59cfs$

Overall Inlet Capacity, Q = **6.59 cfs (one side open)**
Overall Inlet Capacity, Q = **13.18 cfs (two sides open)**

Appendix D

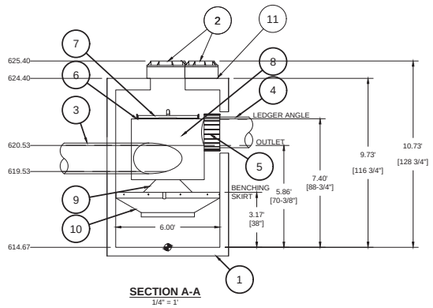
SUPPLEMENTAL CALCULATIONS

& EXHIBITS



HYDRODYNAMIC SEPARATOR #1 – WATER QUALITY AREA

SCALE: 1"=10'



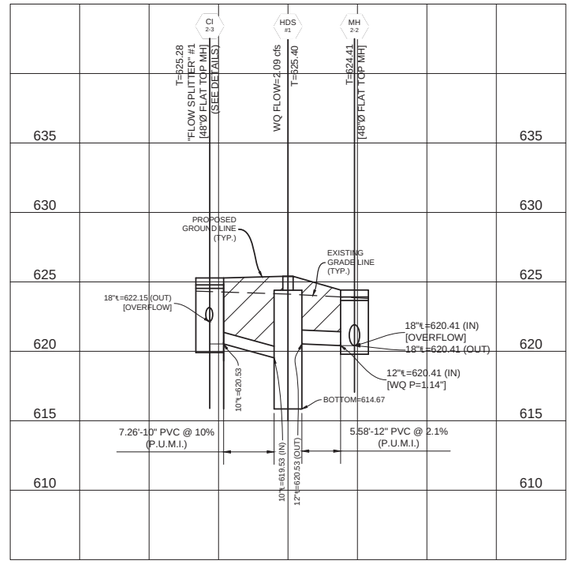
SECTION A-A

1/4" = 1'

PARTS LIST: 6' DOWNSTREAM DEFENDER			
ITEM	SIZE (IN)	MATERIAL	DESCRIPTION
1	72	CONCRETE	I.D. PRECAST MANHOLE
2	18 & 24		FRAME & COVER
3	10	PVC	INLET PIPE (BY OTHERS)
4	12	PVC	OUTLET PIPE (BY OTHERS)
5	18	-	PIPE COUPLING (BY OTHERS)
6	-	-	LEDGER ANGLE
7	-	-	SUPPORT FRAME
8	-	-	DIP PLATE
9	-	-	CENTER SHAFT & CONE
10	-	-	BENCHING SKIRT
11	-	-	MATERIALS & LABOR TO ACHIEVE FINAL GRADE (BY OTHERS)

NOTES:

*ENGINEER / CONTRACTOR TO CONFIRM PIPE MATERIALS.
*ALL CONNECTIONS TO DOWNSTREAM DEFENDER TO BE A-LOK CONNECTIONS.

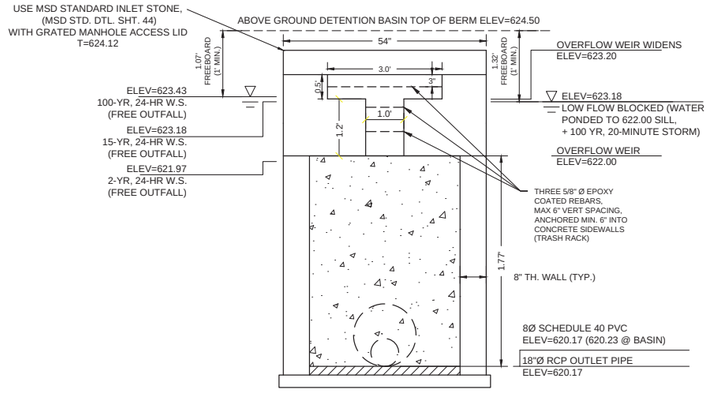


HDS UNIT NOTES:

1. HDS UNIT = HYDRODYNAMIC SEPARATOR UNIT (WATER QUALITY PROPRIETARY DEVICE)
2. THE PIPE SLOPES IN AND OUT OF THE HYDRODYNAMIC SEPARATOR ARE CALCULATED BASED ON THE DISTANCE BETWEEN THE INSIDE OF A 48" (I.D.) STRUCTURE (CI 2-3) AND THE INTAKE CONNECTION POINT OF THE HDS UNIT, AND BETWEEN THE DISCHARGE CONNECTION POINT OF THE HDS UNIT AND INSIDE OF A 48" (I.D.) STRUCTURE (CI 2-2). THE PIPE SLOPES ARE THE CRITICAL FACTOR FOR INSTALLATION, AS THIS GENERATES THE PROPER FLOW RATE TO TREAT THE WATER QUALITY DESIGN STORM. THESE PIPES MUST BE INSTALLED AT THE LISTED SLOPE. SHOULD A DIFFERENT DIAMETER (+ / -) STRUCTURE BE REQUIRED FOR CI 2-3, THEN THE DESIGN WILL BE REVIEWED BY THE PROJECT ENGINEER AFTER THE CONTRACTOR SUPPLIES SHOP DRAWINGS. NO STORM STRUCTURE FABRICATION SHALL OCCUR PRIOR TO SHOP DRAWING APPROVAL.

HDS UNIT #1 PROFILE VIEW

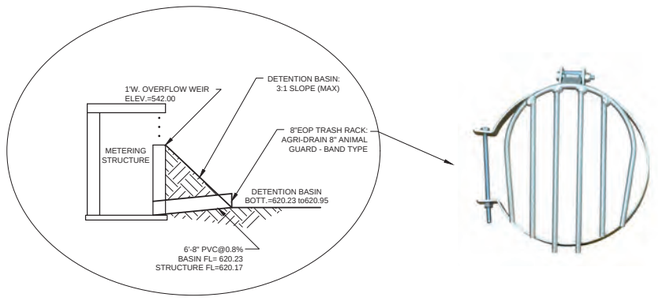
SCALE H: 1"=10'
SCALE V: 1"=5'



USE A MODIFIED MSD AREA INLET PRECAST CONCRETE (MSD STD. DTL. SHT. 34) (OPEN 1 SIDE - EAST SIDE ONLY)

REINFORCED CONCRETE METERING STRUCTURE (MS 1–4)

SCALE: N.T.S.



TYPICAL DETENTION METERING STRUCTURE LOW FLOW PIPE

SCALE: N.T.S.

Call Before you DIG
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1-800-344-7483
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MISSOURI ONE-CALL SYSTEM INC.

Underground facilities, structures & utilities have been plotted from available surveys, records & information, and therefore, do not necessarily reflect the actual existence, nonexistence, size, type, number of, or location of these facilities, structures, & utilities.

The Contractor shall be responsible for verifying the actual location of all underground facilities, structures, & utilities, either shown or not shown on these plans. The underground facilities, structures, & utilities shall be located in the field prior to any grading, excavation or construction of improvements. These provisions shall in no way absolve any party from complying with the Underground Facility Safety and Damage Prevention Act.

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(314) 966-1444 FAX (314) 966-1448
MO Cert of Authority - Prof. Engineering #000967 & Prof. Surveying #000114
IL Dept. Financial & Prof. Reg. Prof. Design & Engineering Corp. #184.000979

REVISIONS

1	04-01-22	EAS	Minor building/parking lot revisions, added HDS info
2	04-25-22	EAS	City of O'Fallon comments
3	05-03-22	EAS	MoDOT comments
4	05-13-22	EAS	BID SET

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PLOTTED:5/13/2022 1:30 PM

P.B. 1447

O'Fallon, MO 63368

Prepared for:
PRIMAX PROPERTIES, LLC
1100 EAST MOREHEAD STREET
CHARLOTTE, NC 28204

STORMWATER MANAGEMENT FACILITIES 1
RANGE USA INDOOR GUN RANGE
2000 Veterans Memorial Parkway

Eric A. Skelton - Professional Engineer (PE-2000150069)

STATE OF MISSOURI
ERIC A. SKELTON
NUMBER E-2000150069
REGISTERED PROFESSIONAL ENGINEER
05-13-22

Designed	EAS
Drawn	EAS
Checked	EAS
Date	March 19, 2022
Project Number	21243
Sheet Number	C6.0 of _____

SCALE IN FEET

SCALE 1"=20'

Note: Caution should be taken in comparing the written scale to the graphic scale.

VETERANS MEMORIAL PARKWAY
(SOUTH OUTER ROAD INTERSTATE HWY. 70)

Edge of Asph
White Stripe
Old Yellow Stripe
Asphalt Pavement

S76°29'17"E 63.33'

S86°57'46"E 301.98'

253' S.C. Flow @ 1.1%

140' S.C. Flow @ 3.7%

EXISTING TIME OF CONCENTRATION

100' Sheet Flow @ 2.4%

S82°33'22"E 157.79'

S6°42'58"W 87.24'

S9°09'23"W 199.86'

N80°28'57"W 525.97'

N/F
AUTO PROPERTIES LLC
DB 4338, PG 833
Parcel ID 2-0141-0055-00-0011.0000000

LOT 2
THE JEWEL
Doc # 2022R-027148
127,180 SQ. FT.
2.92 AC.±
N/F
PRIMAX PROPERTIES, LLC
Parcel ID 2-0141-D020-00-0002.0000000
(Zoned c-2)
"NO BUILDINGS OBSERVED"

LOT 1
THE JEWEL
Doc # 2020R-100411
N/F
JEWEL INVESTORS LLC
Parcel ID 2-0141-D020-00-0001.0000000
(Zoned R-4)

LOT 18
MIDPOINT INDUSTRIAL COURT
PB 32, PG 124-125
N/F
PARADISE PROPERTIES INC.
DB 6668, PG 562
Parcel ID 2-0141-7202-00-0018.0000000

LOT 17
MIDPOINT INDUSTRIAL COURT
PB 32, PG 124-125
N/F
PARADISE PROPERTIES INC.
DB 6668, PG 562
Parcel ID 2-0141-7202-00-0017.0000000

PARCEL A
MIDPOINT INDUSTRIAL COURT
PB 32, PG 124-125
N/F
SAFE LOCK STORAGE LLC
Parcel ID 2-0141-7202-00-0004.0000000

KNIGHT (40' W) LANE
Private Roadway & Utility Easement
PB 10, Pg 36

CASTLE (40' W) LANE
Private Roadway & Utility Easement
PB 10, Pg 36

ROUND TABLE (50' W) DRIVE
Roadway & Easement Agreement
DB 3828, Pg 583

SITE BENCHMARK
"O" in Open on Fire Hydrant
Elev=826.62 (Pt #655)

TEMP. BENCHMARK
Set Iron Pipe
w/ Cap (LS 14-D)
Elev=825.07 (Pt # 712)

FOUND ½" IRON PIPE
w/ CAP (LS 10-D)
0.66'N.-0.84'E.

FOUND ½" REBAR
w/ CAP (Contact Point)
0.29'W.

FOUND ½" REBAR
w/ PUNCH HOLE
9.60'N.-4.36'E.

SET IRON PIPE
w/ CAP (LS 14-D)

SET IRON PIPE
w/ CAP (LS 14-D)

FOUND ½" IRON PIPE
w/ CAP (LS-144D)
0.14'N.-0.14'E.

10' Wide Utility Esmt
Doc# 2020R-100411

10' W. Water Main Esmt
DB 841, Pg 356

5' Wide Water Main Esmt DB 841, Pg 356

10' Wide Buffer Strip
PB 10, Pg 36

35' Bldg. Line
per Zoning

25' Bldg. Line
per Zoning

15' Side Yard Setback
per Zoning

Rear Yard Setback

Sight Easement Area
DB 3852, Pg 1183

Sight Easemer
DB 3852, Pg

Signboard
Easement Area
DB DE3852, Pg 1183

Billboards

30' Wide Ingress/Egress Easement
PB 10, Pg 36 & PB 40, Pg 44

10' Wide Utility Esmt
Doc# 2020R-100411

25' W. Ingress/Egress Esmt
Doc# 2020R-100411

10' W. Esmt for
Existing Water Line
Doc# 2020R-100411

15' Side Yard Setback
per Zoning

Existing 8" steel gas main

Asphalt Pavement w/ Concrete Curb

Concrete Pavement

Plastic Chimney Fence

Wrought Iron Fence

Conc Wall

Modular Block Wall

Sprinkler Control

Water Control

Fiber Optic Vault

Fiber Optic Marker

Gas Valve & Pipeline Marker

Sign w/ Landscaping

Light Standard

Utility Pole

Fire Hydrant

Valve or Meter (Gas or Water)

Cable TV Box

Electric Co. Box

Electric Meter

Telephone Co Box

Traffic Signal

Traffic Signal Box

Deciduous Tree

Evergreen Tree

Bush

Test Hole/ Soil Boring

ADA Parking Space

Parking Space Count

Clean Out

Catch Basin/Curb Inlet/Area Inlet

Double Catch Basin/Curb Inlet

Flared End Section

Grated Inlet

Manhole

Grated Manhole

HDS Unit

Drain

Sign

Light Standard

Utility Pole

Faucet

Fire Hydrant

Valve or Meter (Gas or Water)

Cable TV Box

Electric Co. Box

Electric Meter

Telephone Co Box

Traffic Signal

Traffic Signal Box

Deciduous Tree

Evergreen Tree

Bush

Test Hole/ Soil Boring

ADA Parking Space

Parking Space Count

ABBREVIATIONS	
AI	Area Inlet
Asph	Asphalt
BW	Bottom of Wall
B/B	Back to Back
CB	Catch Basin
Ch∆	Chord Bearing
CI	Curb Inlet
CL or ℄	Centerline
CMP	Corrugated Metal Pipe
Conc	Concrete
CTV	Underground Cable TV
DB	Deed Book
DCB	Double Catch Basin
DCI	Double Curb Inlet
DIP	Ductile Iron Pipe
DS	Downspout
FES	Flared End Section
FF	Finished Floor
FL or ℄	Flow Line
FO	Underground Fiber Optic
GM	Gas Meter
GV	Gas Valve
GI	Grated Inlet
HDPE	High Density Polyethylene Pipe
L	Length of Curve
MH	Manhole
N/F	Now or Formerly
OHE or OHW	Overhead Electric or Wires
OIP	Old Iron Pipe
PG	Page
PB	Plat Book
PL or ℄	Property Line
PVC	Polyvinyl Chloride Pipe
Pvmt	Pavement
R	Radius
RCP	Reinforced Concrete Pipe
R/W	Right of Way
Trans	Transformer
TW	Top of Wall
Typ	Typical
UGE	Underground Electric
UGFO	Underground Fiber Optic
UGT	Underground Telephone
VCP	Vitrified Clay Pipe
WM	Water Meter
WV	Water Valve
32L3017S	Sewer Identification #

ONSITE EXISTING DRAINAGE AREAS (MSD)								
I.D.	Total Area (ac.)	Grass (ac.)	Pavement (ac.)	Roof Piped (ac.)	Roof Surf. Disch (ac.)	15-yr Comp. PI	15-yr Flow, Q (cfs)	to Structure
1	2.13	2.13	0.00	0.00	0.00	1.70	3.62	Runoff to Veteran's Memorial Parkway ditch
1B	0.42	0.42	0.00	0.00	0.00	1.70	0.71	Runoff to Veteran's Memorial Parkway ditch
2	0.12	0.12	0.00	0.00	0.00	1.70	0.20	Runoff to Ex. AI3-1
2B	0.08	0.08	0.00	0.00	0.00	1.70	0.14	Runoff to Ex. AI3-1
3	0.07	0.07	0.00	0.00	0.00	1.70	0.12	Runoff to South (offsite)
3B	0.10	0.10	0.00	0.00	0.00	1.70	0.17	Runoff to South (offsite)
	2.92	2.92	0.00	0.00	0.00		4.96	Area & Flow Totals

OFFSITE EXISTING DRAINAGE AREAS (MSD)								
I.D.	Total Area (ac.)	Grass (ac.)	Pavement (ac.)	Roof Piped (ac.)	Roof Surf. Disch (ac.)	15-yr Comp. PI	15-yr Flow, Q (cfs)	to Structure
4	0.67	0.35	0.32	0.00	0.00	2.58	1.73	Runoff to Veteran's Memorial Parkway ditch
	0.67	0.35	0.32	0.00	0.00		1.73	Area & Flow Totals

DISTURBANCE LIMITS

= DRAINAGE AREA I.D.

MSD DESIGN STORM:
15-yr., 20-min.:
Roof (piped) PI=4.20; Roof (surface discharge) PI-3.54,
Pavement PI=3.54; Grass PI=1.70.

THIS SHEET IS NOT FOR CONSTRUCTION. DRAINAGE EXHIBIT ONLY.

The original signed and sealed of this drawing is on file at the office of The Clayton Engineering Company. Any modifications to this drawing shall release said The Clayton Engineering Company, the Engineer and/or Surveyor whose seal appears hereon from any liability resulting from said unauthorized modifications. The signed and sealed original is the official document and shall take precedence over any digital version.

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MO Cert of Authority - Prof. Engineering #000667 & Prof. Surveying #000114
IL Dept. Financial & Prof. Reg. Prof. Design & Engineering Corp. #184.000879

REVISIONS

1	04-01-22	EAS	Minor building/parking lot revisions, added HDS info
2	04-25-22	EAS	City of O'Fallon comments
3	05-03-22	EAS	MoDOT comments
4	05-13-22	EAS	BID SET

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PLOTTED: 5/18/2022 12:48 PM

P.B. 1447

Prepared for:
PRIMAX PROPERTIES, LLC
1100 EAST MOREHEAD STREET
CHARLOTTE, NC 28204

EXISTING DRAINAGE AREA MAP
RANGE USA INDOOR GUN RANGE
3203 Veterans Memorial Parkway
O'Fallon, MO 63368

Eric A. Skelton - Professional Engineer (PE-2000150069)

STATE OF MISSOURI
ERIC A. SKELTON
NUMBER E-2000150069
REGISTERED PROFESSIONAL ENGINEER
05-18-22

Designed	EAS
Drawn	EAS
Checked	EAS
Date	March 19, 2022
Project Number	21243
Sheet Number	C9.0 of

SCALE 1"=20'

Note: Caution should be taken in comparing the written scale to the graphic scale to ascertain if this plan has been enlarged or reduced.

VETERANS MEMORIAL PARKWAY
(SOUTH OUTER ROAD INTERSTATE HWY. 70)

S76°29'17"E 63.33'

S86°57'46"E 301.98'

S6°42'58"W 87.24'

S82°33'22"E 157.79'

S9°06'22"W 199.86'

N80°28'57"W 525.97'

S9°21'17"E 251.61'

S82°21'43"W 251.92'

LOT 2
THE JEWEL
Doc # 2022R-027148
127,180 SQ. FT.
2.92 AC.±
N/F
PRIMAX PROPERTIES, LLC
Parcel ID 2-0141-D020-00-0002.0000000
(Zoned c-2)

LOT 2B
26,056 SQ. FT.
0.60 Ac.±

LOT 2A
101,125 SQ. FT.
2.32 Ac.±

LOT A
KING ARTHURS COURT RES
PB 40, PG 344
N/F
JOHN PAUL & NANCY QUI
Parcel ID 2-0141-5491-00-000A.0

N/F
AUTO PROPERTIES LLC
DB 4338, PG 833
Parcel ID 2-0141-0055-00-0011.0000000

LOT 1
THE JEWEL
Doc # 2020R-100411
N/F
JEWEL INVESTORS LLC
Parcel ID 2-0141-D020-00-0001.0000000
(Zoned R-4)

PARCEL A
MIDPOINT INDUSTRIAL COURT
PB 32, PG 124-125
N/F
SAFE LOCK STORAGE LLC
Parcel ID 2-0141-7202-00-000A.0000000

LOT 18
MIDPOINT INDUSTRIAL COURT
PB 32, PG 124-125
N/F
PARADISE PROPERTIES INC.
DB 6668, PG 562
Parcel ID 2-0141-7202-00-0018.0000000

LOT 17
MIDPOINT INDUSTRIAL COURT
PB 32, PG 124-125
N/F
PARADISE PROPERTIES INC.
DB 6668, PG 562
Parcel ID 2-0141-7202-00-0017.0000000

DISCHARGE POINT #1
A(total)=2.48 ACRES
Q(total)=6.98 CFS

DISCHARGE POINT #2
A(total)=0.44 ACRES
Q(total)=0.84 CFS

DISTURBANCE LIMITS
PROPOSED SURFACE DRAINAGE FLOW PATH

= DRAINAGE AREA I.D.

DISCHARGE POINT #1 SUMMARY

ORIGINAL EXISTING CONDITIONS
AREA = 2.55 AC
PI = 1.70 CFS/AC
Q = 4.33 CFS

DESIGN CONDITIONS
AREA = 2.48 AC
PI = 2.81 CFS/AC
Q = 6.98 CFS

DISCHARGE POINT #2 SUMMARY

ORIGINAL EXISTING CONDITIONS
AREA = 0.37 AC
PI = 1.70 CFS/AC
Q = 0.63 CFS

DESIGN CONDITIONS
AREA = 0.44 AC
PI = 1.91 CFS/AC
Q = 0.84 CFS

MSD(15-YR., 20-MIN.) STORM WATER ANALYSIS

EXISTING CONDITIONS
TOTAL ANALYSIS AREA = 2.92 AC
GREEN AREA = 2.92 AC
PAVEMENT AREA = 0.00 AC
ROOF AREA = 0.00 AC
COMPOSITE PI = 1.70 CFS/AC
Q = 4.96 CFS

DEVELOPED CONDITIONS
TOTAL ANALYSIS AREA = 2.92 AC
GREEN AREA = 1.49 AC
PAVEMENT AREA = 1.09 AC
ROOF AREA(X4.2 CFS) = 0.34 AC
COMPOSITE PI = 2.68 CFS/AC
Q = 7.82 CFS

STORMWATER MANAGEMENT SUMMARY:

15-yr, 20-min. ONSITE DIFFERENTIAL ΔQ = 2.86 CFS > 1 CFS
~~ FLOOD DETENTION IS REQUIRED ~~

AREA OF DISTURBANCE = 2.29± AC. > 1 AC.
~~ WATER QUALITY IS REQUIRED ~~

NOTES:
1. THIS IS A NEW DEVELOPMENT PROJECT. THE PROPERTY IS UNDER 5 ACRES AND THE DISTURBANCE IS < 5 ACRES

ONSITE PROPOSED DRAINAGE AREAS (MSD)

I.D.	Total Area (ac.)	Grass (ac.)	Pavement (ac.)	Roof Piped (ac.)	Roof Surf. Disch (ac.)	15-yr Comp. PI	15-yr Flow, Q (cfs)	to Structure
1	0.25	0.25	0.00	0.00	0.00	1.70	0.43	Runoff to St. Charles Rock Road
1A	0.05	0.05	0.00	0.00	0.00	1.70	0.09	Runoff to Prop. SIGI 1-2
1B	0.42	0.36	0.06	0.00	0.00	1.96	0.82	Runoff to Prop. CI 1-3
2	0.19	0.14	0.05	0.00	0.00	2.18	0.42	Runoff to Prop.CI 1-4
2B	0.08	0.08	0.00	0.00	0.00	1.70	0.14	Runoff to Prop. Nested Bioretention
3	0.07	0.07	0.00	0.00	0.00	1.70	0.12	Runoff to Prop.CI 1-4
3B	0.10	0.10	0.00	0.00	0.00	1.70	0.17	Runoff to Prop.CI 1-4
5	0.11	0.01	0.10	0.00	0.00	3.37	0.37	Runoff to Prop.CI 1-4
6	0.11	0.00	0.11	0.00	0.00	3.54	0.39	Runoff to Prop.CI 1-4
7	0.20	0.01	0.19	0.00	0.00	3.45	0.69	Runoff to Prop.CI 1-4
8	0.17	0.02	0.15	0.00	0.00	3.32	0.57	Runoff to Prop.CI 1-4
9	0.52	0.13	0.39	0.00	0.00	3.08	1.60	Runoff to Prop.CI 1-4
10	0.34	0.00	0.00	0.34	0.00	4.20	1.43	Runoff to Prop.CI 1-4
11	0.26	0.26	0.00	0.00	0.00	1.70	0.44	Runoff to I-70 ditch
12	0.05	0.01	0.04	0.00	0.00	3.17	0.16	Runoff to I-70 ditch
	2.92	1.49	1.09	0.34	0.00		7.82	Area & Flow Totals

OFFSITE PROPOSED DRAINAGE AREAS (MSD)

I.D.	Total Area (ac.)	Grass (ac.)	Pavement (ac.)	Roof Piped (ac.)	Roof Surf. Disch (ac.)	15-yr Comp. PI	15-yr Flow, Q (cfs)	to Structure
4	0.56	0.21	0.35	0.00	0.00	2.85	1.60	Runoff to Prop. SIGI 1-2
4A	0.11	0.02	0.09	0.00	0.00	3.21	0.35	Runoff to Prop. CI 1-3
	0.67	0.23	0.44	0.00	0.00		1.95	Area & Flow Totals

LAND DISTURBANCE NOTES
1. All storm and sanitary sewer structures and appurtenances are to conform to the Standard Details and Construction Specifications shown in the current Metropolitan St. Louis Sewer District, Standard Construction Specifications for Sewers and Drainage facilities, 2009, except as modified by the City of O'Fallon Ordinances.
2. Limits of Disturbance - The Contractor shall stay within the limits of disturbance as shown on these plans and minimize disturbance within the work area wherever possible.
3. Stormwater Management Note - Land Area Disturbed = 2.29 acres (1.54 acres impervious). Any future land disturbance and/or increase in impervious area on this site may require additional storm water management per CITY Regulations in place at that time (including total land disturbance and/or impervioussness added on this plan).

THIS SHEET IS NOT FOR CONSTRUCTION. DRAINAGE EXHIBIT ONLY.

MSD DESIGN STORM:
15-yr., 20-min.:
Roof (piped) PI=4.20; Roof (surface discharge) PI-3.54,
Pavement PI=3.54; Grass PI=1.70.

The original signed and sealed of this drawing is on file at the office of The Clayton Engineering Company. Any modifications to this drawing shall release said The Clayton Engineering Company, the Engineer and/or Surveyor whose seal appears hereon from any liability resulting from said unauthorized modifications. The signed and sealed original is the official document and shall take precedence over any digital version.

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(314) 997-2626 www.claytoneng.com
MO Cert. of Authority - Prof. Engineering #000967 & Prof. Surveying #000114
IL Dept. Financial & Prof. Reg. Prof. Design & Engineering Corp. #184.000979

REVISIONS			
1	04.01.22	EAS	Minor building/parking lot revisions, added HDS info
2	04.25.22	EAS	City of O'Fallon comments
3	05.03.22	EAS	MoDOT comments
4	05.13.22	EAS	BID SET

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PLOTTED: 5/18/2022 12:48 PM

P.B. 1447

Prepared for:
PRIMAX PROPERTIES, LLC
1100 EAST MOREHEAD STREET
CHARLOTTE, NC 28204

PROPOSED DRAINAGE AREA MAP - CURRENT
RANGE USA INDOOR GUN RANGE
9200 Veterans Memorial Pkwy
O'Fallon, MO 63368

Eric A. Skelton - Professional Engineer
PE-2000150069

STATE OF MISSOURI
ERIC A. SKELTON
NUMBER E-2000150069
REGISTERED PROFESSIONAL ENGINEER
05-18-22

Designed	EAS
Drawn	EAS
Checked	EAS
Date	March 19, 2022
Project Number	21243
Sheet Number	C9.1 of ____

SCALE 1"=20'

Note: Caution should be taken in comparing the written scale to the graphic scale to ascertain if this plan has been enlarged or reduced.

VETERANS MEMORIAL PARKWAY (SOUTH OUTER ROAD INTERSTATE HWY. 70)

DISCHARGE POINT #1
A(total)=2.56 ACRES
Q(total)=7.70 CFS

DISTURBANCE LIMITS
PROPOSED SURFACE DRAINAGE FLOW PATH

= DRAINAGE AREA I.D.

DISCHARGE POINT #1 SUMMARY
ORIGINAL EXISTING CONDITIONS
AREA = 2.55 AC
PI = 1.70 CFS/AC
Q = 4.33 CFS
DESIGN CONDITIONS
AREA = 2.56 AC
PI = 2.81 CFS/AC
Q = 7.70 CFS

DISCHARGE POINT #2 SUMMARY
ORIGINAL EXISTING CONDITIONS
AREA = 0.37 AC
PI = 1.70 CFS/AC
Q = 0.63 CFS
DESIGN CONDITIONS
AREA = 0.36 AC
PI = 1.94 CFS/AC
Q = 0.70 CFS

MSD(15-YR., 20-MIN.) STORM WATER ANALYSIS

EXISTING CONDITIONS
TOTAL ANALYSIS AREA = 2.92 AC
GREEN AREA = 2.92 AC
PAVEMENT AREA = 0.00 AC
ROOF AREA = 0.00 AC
COMPOSITE PI = 1.70 CFS/AC
Q = 4.96 CFS

DEVELOPED CONDITIONS
TOTAL ANALYSIS AREA = 2.92 AC
GREEN AREA = 1.17 AC
PAVEMENT AREA = 1.41 AC
ROOF AREA(X4.2 CFS) = 0.34 AC
COMPOSITE PI = 2.88 CFS/AC
Q = 8.41 CFS

STORMWATER MANAGEMENT SUMMARY:

15-yr, 20-min. ONSITE DIFFERENTIAL ΔQ = 3.45 CFS > 1 CFS
~~ FLOOD DETENTION IS REQUIRED ~~

AREA OF DISTURBANCE = 2.29± AC. > 1 AC.
~~ WATER QUALITY IS REQUIRED ~~

NOTES:
1. THIS IS A NEW DEVELOPMENT PROJECT. THE PROPERTY IS UNDER 5 ACRES AND THE DISTURBANCE IS < 5 ACRES

AREAS 4B & 5 THRU 11 DRAIN TO DETENTION BASIN, TOTAL AREA TO DETENTION= 2.06 ACRES (PERVIOUS=0.40 ACRES, IMPERVIOUS=1.57 ACRES)

ONSITE PROPOSED DRAINAGE AREAS (MSD)

I.D.	Total Area (ac.)	Grass (ac.)	Pavement (ac.)	Roof Piped (ac.)	Roof Surf. Disch (ac.)	15-yr Comp. PI	15-yr Flow, Q (cfs)	to Structure
1	0.25	0.25	0.00	0.00	0.00	1.70	0.43	Runoff to St. Charles Rock Road
1A	0.05	0.05	0.00	0.00	0.00	1.70	0.09	Runoff to Prop. SIGI 1-2
1B	0.15	0.06	0.09	0.00	0.00	2.80	0.42	Runoff to Prop. CI 1-3
2	0.19	0.14	0.05	0.00	0.00	2.18	0.42	Runoff to Prop.CI 1-4
2B	0.07	0.07	0.00	0.00	0.00	1.70	0.12	Runoff to Prop. Nested Bioretention
3	0.07	0.07	0.00	0.00	0.00	1.70	0.12	Runoff to Prop.CI 1-4
3B	0.03	0.03	0.00	0.00	0.00	1.70	0.05	Runoff to Prop.CI 1-4
4B	0.35	0.06	0.29	0.00	0.00	3.22	1.13	Runoff to Prop.CI 1-4
5	0.11	0.01	0.10	0.00	0.00	3.37	0.37	Runoff to Prop.CI 1-4
6	0.11	0.00	0.11	0.00	0.00	3.54	0.39	Runoff to Prop.CI 1-4
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11	0.26	0.26	0.00	0.00	0.00	1.70	0.44	Runoff to I-70 ditch
12	0.05	0.01	0.04	0.00	0.00	3.17	0.16	Runoff to I-70 ditch
	2.92	1.17	1.41	0.34	0.00		8.41	Area & Flow Totals

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4	05.13.22	EAS	BID SET				

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PROPOSED FUTURE DRAINAGE AREA MAP - W/DEVELOPED LOT B
RANGE USA INDOOR GUN RANGE
O'Fallon, MO 63368

Prepared for:
PRIMAX PROPERTIES, LLC
1100 EAST MOREHEAD STREET
CHARLOTTE, NC 28204

2000 Veterans Memorial Parkway

Eric A. Skelton - Professional Engineer (PE-2000150069)
STATE OF MISSOURI — ERIC A. SKELTON — NUMBER E-2000150069 — PROFESSIONAL ENGINEER
05-18-22

Designed	EAS
Drawn	EAS
Checked	EAS
Date	March 19, 2022
Project Number	21243
Sheet Number	C9.2 of ____