Drainage Report

WinCo Foods, LLC

2423 Rulon White Blvd, Ogden, Utah 84404

Prepared For:
WinCo Foods, LLC

Prepared By:
SCJ Alliance
Brandon Johnson, PE
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Centralia, WA 98531
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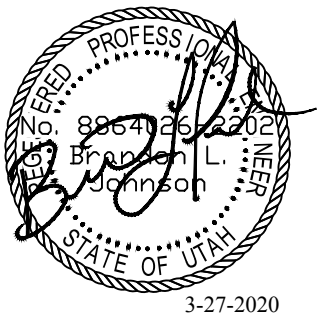
February 2020



3-27-2020

SCJ ALLIANCE
CONSULTING SERVICES

Drainage Report

Project Information

Project:	WinCo Foods, LLC
Prepared for:	WinCo Foods, LLC 650 North Armstrong Place Boise, ID 93704

Reviewing Agency

Jurisdiction:	Weber County 2380 Washington Blvd., Suite 240 Ogden, UT 84401

Project Representative

Prepared by:	SCJ Alliance 212 N Tower Ave Centralia, WA 98531 360.669.0700 scjalliance.com
Contact:	Brandon Johnson, PE
Project Reference:	SCJ #1225.22
	Path: N:\Projects\1225 WinCo Foods LLC\1225.22 WinCo Foods Ogden, UT Cross Dock Expansion\Phase 01 - On-Site Construction Documents\Design\Storm\Drainage Report.docx

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Drainage Report

1 Overview

The following report was prepared for the Ogden WinCo Foods Cross Dock facility. This report was prepared to comply with the minimum technical standards and requirements that are set forth in the Weber County Public Works Standards and Technical Specifications (August 1982).

2 Introduction

The Ogden WinCo Foods Cross Dock facility is located at 2423 Rulon White Boulevard, Ogden, UT 84404, see Figure 1 for a vicinity map. The project site is positioned on a 5.04-acre property that is zoned M-1 Manufacturing.

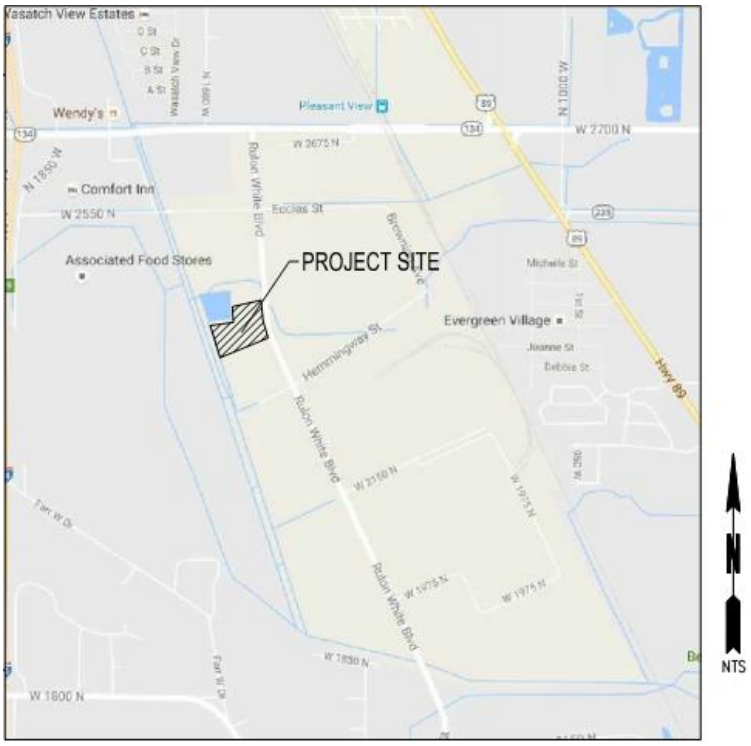

Figure 1: Vicinity Map

3 Existing Conditions

The subject site is 5.04 acres in size. There is an existing building and parking lot on the project site which will remain. The remainder of the site is covered with grass and landscaping. Please see Figure 2 for the project site. The site currently has an on-site stormwater detention facility that releases to the Weber County stormwater facility through an 8-inch pipe that is capped and has a 3-inch circular orifice in the cap. The on-site pond has a riprap-lined spillway which discharges to a ditch that runs to the County stormwater facility.

Figure 2: Project Site

4 Stormwater Basins

Basin A – Proposed Parking Lot and Existing West Parking Lot

The stormwater from the proposed parking lot will sheet flow to a new catch basin, where it is collected and conveyed to the on-site stormwater detention facility. The stormwater from the existing west parking lot will sheet flow directly to the on-site stormwater detention facility and then will be released to the County stormwater facility at a controlled rate.

Basin B – Existing Stabilized Spoil Pile

The existing spoil pile between the existing parking lot and the County stormwater facility will remain undisturbed. The flow path of the on-site generated stormwater runoff from the spoil pile will remain unchanged.

Basin C - Existing South and East Parking Lot

Stormwater from the existing parking lot south and east of the building is currently collected in catch basins and conveyed in pipes to an existing catch basin located in the north-east corner of the parking

lot and then conveyed offsite to a catch basin located in Rulon White Boulevard. The stormwater flow path from basin C will continue to flow to the existing stormwater system in Rulon White Boulevard.

The catch basin located in the north-east corner of the parking lot is currently filled with debris and will be cleaned.

Basin D - Existing driveway and landscaping

Stormwater from Basin D sheet flows to Rulon White Boulevard. This flow path will remain unchanged.

The stormwater basins are depicted in this report in Figure 5.

5 FEMA – Flood Plain Review

According to available FEMA mapping, the site is in an unshaded Zone X, which is an area of minimal flood hazard, above the elevation of the 500-year flood. See Figure 3 for the FEMA Firmette.

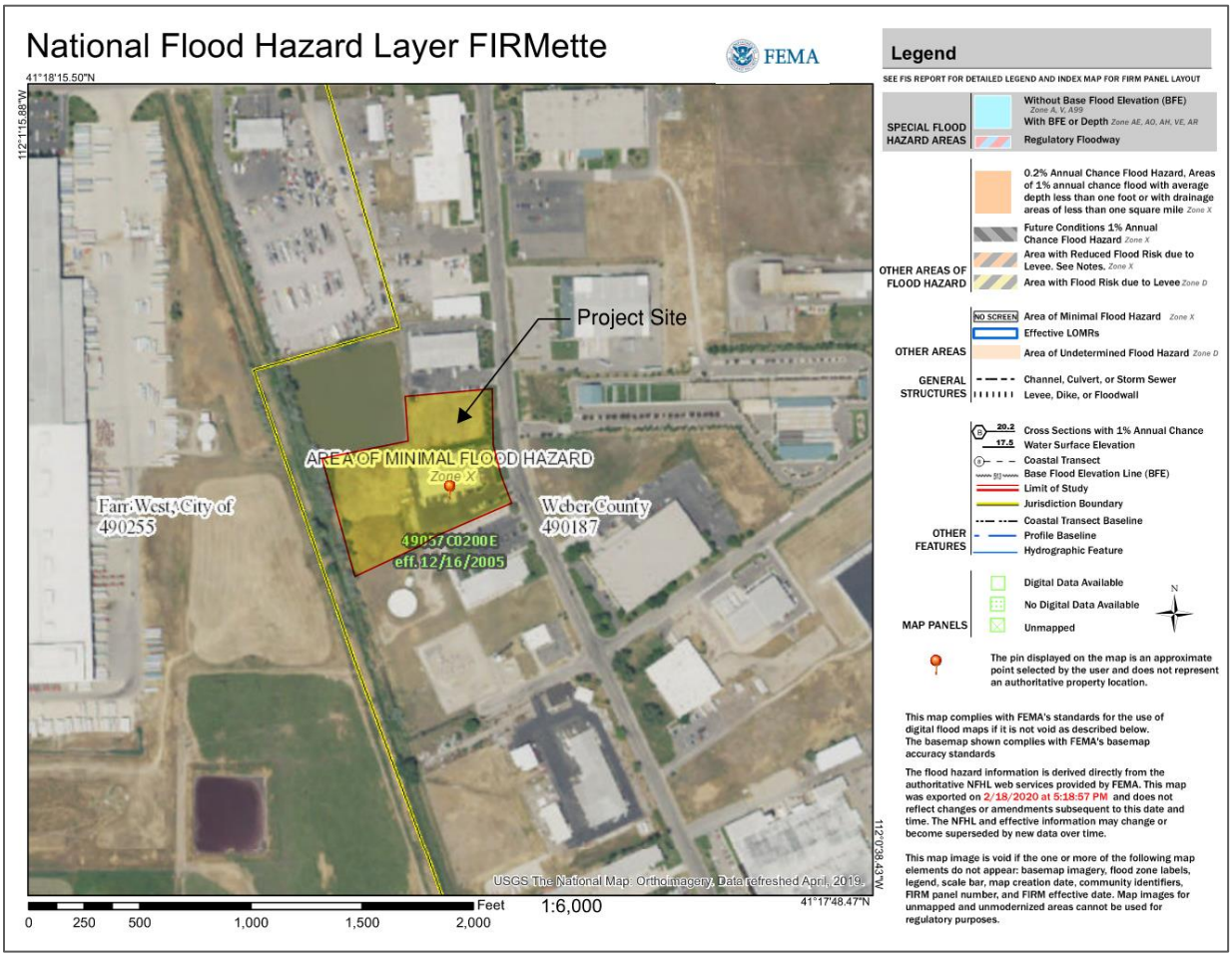

Figure 3: FEMA FIRMette Map

6 Precipitation Rates

The NOAA Point Precipitation Frequency Estimates Table for the project site is shown in below. This data is used to create precipitation Intensity-Duration-Frequency (IDF) curves to model storm events used in sizing the stormwater facilities onsite.

NOAA Atlas 14, Volume 1, Version 5
Location name: Ogden, Utah, US*
Latitude: 41.3011°, Longitude: -112.0168°
Elevation: 4269 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.58 (1.38-1.82)	1.98 (1.75-2.29)	2.71 (2.38-3.13)	3.40 (2.95-3.92)	4.50 (3.82-5.23)	5.52 (4.55-6.50)	6.76 (5.38-8.04)	8.21 (6.29-9.97)	10.6 (7.63-13.2)	12.8 (8.77-16.4)
10-min	1.20 (1.05-1.39)	1.51 (1.34-1.75)	2.06 (1.81-2.38)	2.58 (2.24-2.98)	3.42 (2.90-3.98)	4.20 (3.46-4.94)	5.14 (4.09-6.11)	6.24 (4.78-7.59)	8.04 (5.81-10.1)	9.71 (6.68-12.5)
15-min	0.992 (0.868-1.14)	1.25 (1.10-1.44)	1.70 (1.50-1.97)	2.14 (1.86-2.47)	2.83 (2.40-3.29)	3.47 (2.86-4.09)	4.24 (3.38-5.05)	5.16 (3.95-6.27)	6.64 (4.80-8.32)	8.02 (5.52-10.3)
30-min	0.670 (0.584-0.772)	0.840 (0.744-0.972)	1.15 (1.01-1.33)	1.44 (1.25-1.66)	1.90 (1.62-2.22)	2.34 (1.92-2.75)	2.86 (2.27-3.40)	3.47 (2.66-4.22)	4.47 (3.23-5.61)	5.40 (3.72-6.93)
60-min	0.414 (0.361-0.477)	0.520 (0.460-0.602)	0.710 (0.623-0.820)	0.889 (0.773-1.03)	1.18 (1.00-1.37)	1.45 (1.19-1.70)	1.77 (1.41-2.11)	2.15 (1.65-2.61)	2.77 (2.00-3.47)	3.34 (2.30-4.29)
2-hr	0.263 (0.234-0.300)	0.329 (0.292-0.376)	0.426 (0.376-0.484)	0.518 (0.452-0.590)	0.670 (0.572-0.772)	0.810 (0.676-0.944)	0.977 (0.788-1.16)	1.18 (0.914-1.42)	1.49 (1.09-1.86)	1.79 (1.25-2.29)
3-hr	0.204 (0.183-0.228)	0.251 (0.226-0.283)	0.314 (0.281-0.353)	0.373 (0.332-0.420)	0.467 (0.409-0.532)	0.557 (0.477-0.640)	0.667 (0.556-0.779)	0.797 (0.643-0.951)	1.01 (0.774-1.25)	1.21 (0.886-1.54)
6-hr	0.138 (0.127-0.152)	0.169 (0.154-0.186)	0.204 (0.186-0.225)	0.236 (0.213-0.262)	0.285 (0.254-0.318)	0.326 (0.286-0.366)	0.372 (0.321-0.424)	0.424 (0.358-0.491)	0.531 (0.433-0.634)	0.627 (0.497-0.779)
12-hr	0.088 (0.081-0.096)	0.107 (0.099-0.118)	0.129 (0.119-0.142)	0.149 (0.135-0.163)	0.178 (0.160-0.197)	0.202 (0.179-0.226)	0.228 (0.199-0.258)	0.256 (0.218-0.293)	0.298 (0.247-0.350)	0.333 (0.269-0.399)
24-hr	0.054 (0.049-0.059)	0.066 (0.060-0.072)	0.078 (0.072-0.086)	0.089 (0.082-0.097)	0.103 (0.094-0.113)	0.115 (0.104-0.125)	0.126 (0.114-0.138)	0.137 (0.124-0.150)	0.153 (0.137-0.178)	0.169 (0.146-0.203)
2-day	0.031 (0.029-0.034)	0.038 (0.035-0.042)	0.045 (0.042-0.050)	0.051 (0.047-0.056)	0.059 (0.054-0.064)	0.065 (0.060-0.071)	0.071 (0.065-0.077)	0.077 (0.070-0.084)	0.085 (0.077-0.092)	0.090 (0.081-0.102)
3-day	0.023 (0.021-0.025)	0.028 (0.026-0.030)	0.033 (0.031-0.036)	0.037 (0.034-0.041)	0.043 (0.040-0.047)	0.048 (0.044-0.052)	0.052 (0.048-0.057)	0.057 (0.051-0.062)	0.063 (0.056-0.069)	0.067 (0.060-0.075)
4-day	0.019 (0.017-0.020)	0.023 (0.021-0.025)	0.027 (0.025-0.029)	0.030 (0.028-0.033)	0.035 (0.032-0.038)	0.039 (0.036-0.042)	0.043 (0.039-0.047)	0.047 (0.042-0.051)	0.052 (0.046-0.057)	0.055 (0.049-0.061)
7-day	0.013 (0.012-0.014)	0.015 (0.014-0.017)	0.018 (0.017-0.020)	0.021 (0.019-0.023)	0.024 (0.022-0.026)	0.026 (0.024-0.029)	0.029 (0.026-0.031)	0.031 (0.028-0.034)	0.034 (0.031-0.037)	0.036 (0.033-0.040)
10-day	0.010 (0.009-0.011)	0.012 (0.011-0.013)	0.014 (0.013-0.016)	0.016 (0.015-0.018)	0.019 (0.017-0.020)	0.020 (0.019-0.022)	0.022 (0.020-0.024)	0.024 (0.021-0.026)	0.025 (0.023-0.028)	0.027 (0.024-0.029)
20-day	0.006 (0.006-0.007)	0.008 (0.007-0.009)	0.009 (0.009-0.010)	0.010 (0.010-0.011)	0.012 (0.011-0.013)	0.013 (0.012-0.014)	0.014 (0.013-0.015)	0.015 (0.013-0.016)	0.016 (0.014-0.017)	0.016 (0.015-0.018)
30-day	0.005 (0.005-0.006)	0.006 (0.006-0.007)	0.007 (0.007-0.008)	0.008 (0.008-0.009)	0.009 (0.009-0.010)	0.010 (0.009-0.011)	0.011 (0.010-0.012)	0.011 (0.011-0.012)	0.012 (0.011-0.013)	0.013 (0.012-0.014)
45-day	0.004 (0.004-0.005)	0.005 (0.005-0.006)	0.006 (0.006-0.007)	0.007 (0.006-0.007)	0.008 (0.007-0.008)	0.008 (0.008-0.009)	0.009 (0.008-0.009)	0.009 (0.009-0.010)	0.010 (0.009-0.011)	0.010 (0.009-0.011)
60-day	0.004 (0.004-0.004)	0.005 (0.004-0.005)	0.005 (0.005-0.006)	0.006 (0.006-0.006)	0.007 (0.006-0.007)	0.007 (0.007-0.008)	0.008 (0.007-0.008)	0.008 (0.008-0.009)	0.009 (0.008-0.009)	0.009 (0.008-0.010)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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Figure 4: Point Precipitation Frequency Estimates

7 Stormwater System Design

Basin A is considered to be 100% impervious and is 2.80 acres in size. Please see sheets SD-01 and SD-02 of the construction plans for the complete stormwater system.

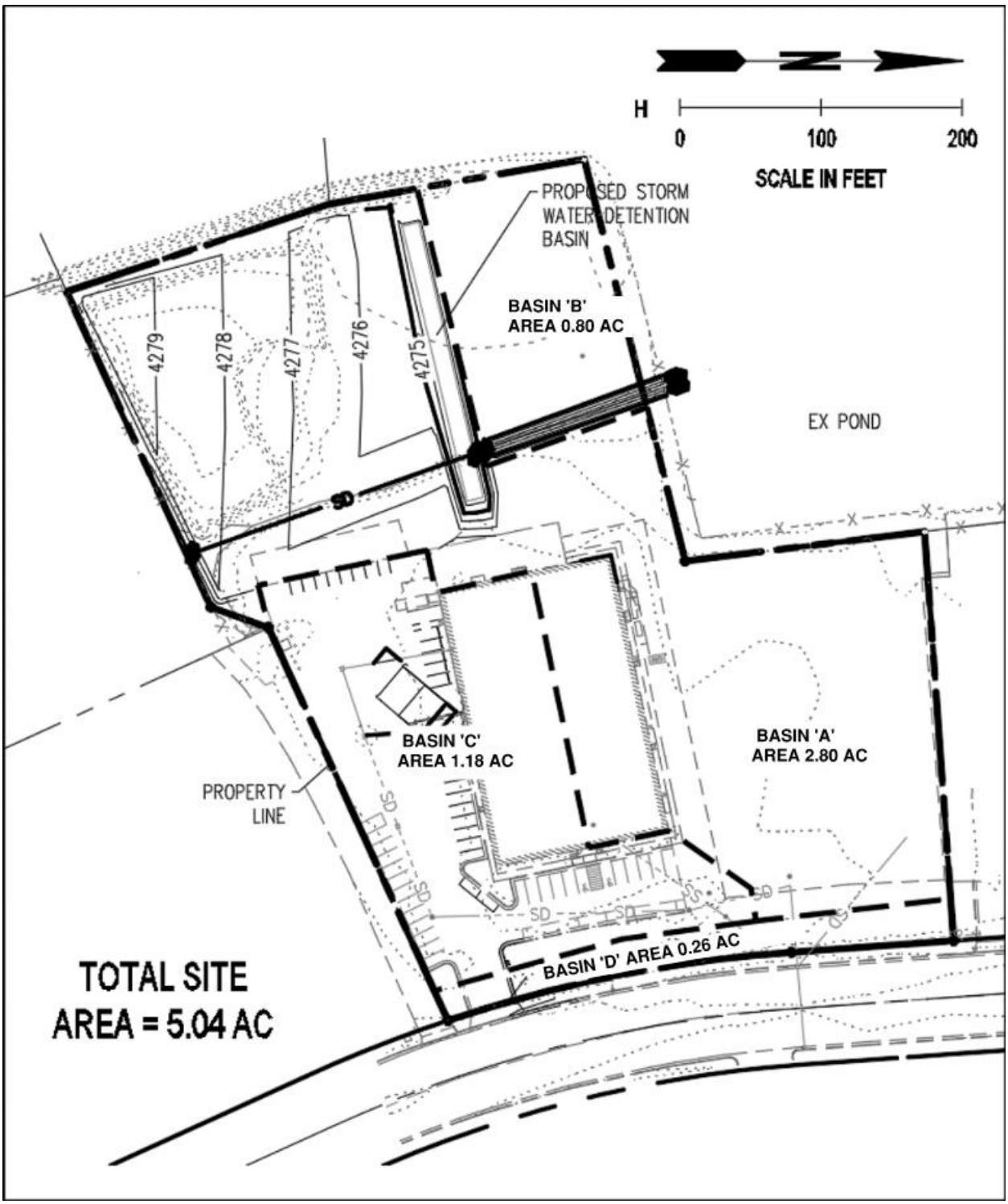


Figure 5: Stormwater Drainage Basins

7.1 Conveyance

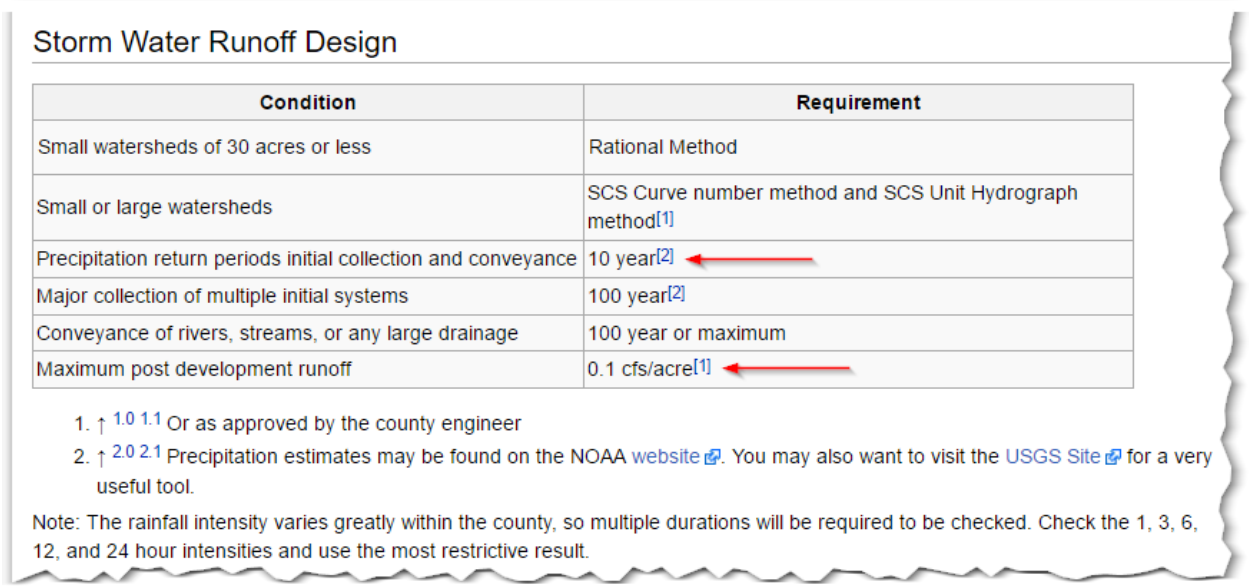
Stormwater runoff from Basin A will either sheet flow directly to the onsite stormwater detention facility or sheet flow across the new parking lot and be collected in a new catch basin and then conveyed to the onsite stormwater detention facility through a 12-inch storm pipe. After being detained in the onsite stormwater facility, stormwater is released into the existing Weber County stormwater facility through an existing 8-inch storm pipe. The 8-inch pipe has an end cap that will be modified to provide a 3.125-inch circular orifice. A riprapped spillway is provided for events with flows greater than the 10-year design storm event.

The existing Weber County Stormwater facility has a control structure in the north-west corner of the facility. The elevation of the stormwater facility during non-storm periods is 4271.53 ft and during storm events is 4274.61 ft.

Stormwater runoff for Basin A was calculated for the 10-year design storm event per Weber County Design Standards, see Figure 6. The 10-year design storm event was analyzed for durations of 1 hour, 3 hours, 6 hours, 12 hours, and 24 hours to determine which storm event should govern the design, the results of this analysis are shown in the table below.

Duration (10-year Event)		Q_{in}	Q_{out}	Orifice	Depth
Hours	**Minutes**	**(cfs)**	**(cfs)**	**(in)**	**(ft)**
1	60	2.26	0.26	3.125	1.11
3	180	0.95	0.27	3.125	1.20
6	360	0.60	0.28	3.125	1.25
12	720	0.38	0.27	3.125	1.16
24	1440	0.23	0.21	3.125	0.79

HydroCAD v.10.00-25 was used to size the stormwater detention facility using the rational method to calculate the runoff from the new impervious areas proposed for the project site. The analysis of various storm durations shows the 10-year design event with a 6-hour duration produces the maximum water depth of 1.25 feet in the onsite detention facility with a release rate of 0.28 cfs through a 3.125-inch circular orifice. This was used as the basis of the design.



Storm Water Runoff Design

Condition	Requirement
Small watersheds of 30 acres or less	Rational Method
Small or large watersheds	SCS Curve number method and SCS Unit Hydrograph method[1]
Precipitation return periods initial collection and conveyance	10 year[2]
Major collection of multiple initial systems	100 year[2]
Conveyance of rivers, streams, or any large drainage	100 year or maximum
Maximum post development runoff	0.1 cfs/acre[1]

1. ↑ 1.0 1.1 Or as approved by the county engineer
2. ↑ 2.0 2.1 Precipitation estimates may be found on the NOAA website. You may also want to visit the USGS Site for a very useful tool.

Note: The rainfall intensity varies greatly within the county, so multiple durations will be required to be checked. Check the 1, 3, 6, 12, and 24 hour intensities and use the most restrictive result.

Figure 6: Excerpt from Weber County Storm Water Runoff Design

The existing on-site detention facility located west of the existing building will be reconstructed with a bottom area of 5187 square feet at an elevation of 4273.5 with side slopes of 3-ft horizontal to 1-ft vertical. The existing 8-inch storm pipe with end cap and 3-inch circular orifice will be modified to have a 3.125-inch circular orifice to meter the release of stormwater runoff from the onsite detention facility at a rate not to exceed 0.1 cfs/acre[1] (2.80 ac x 0.1 cfs/ac = 0.28 cfs) during the design storm event. The existing riprapped spillway will remain, its crest elevation is 4275.72.

The onsite detention facility was analyzed with the Weber County stormwater facility water surface elevation at 4271.53 which is the low-water elevation of the facility prior to a storm event and with the Weber County stormwater facility water surface elevation at 4274.61, the high-water elevation of that facility. With the reconfiguration of the on-site detention facility, when the water surface elevation in the County stormwater facility is 4271.53 the depth of the stormwater in the on-site detention facility is 1.25 feet during the 10-year, 6-hour storm event with a release rate of 0.28 cfs to the Weber County stormwater facility. The design release rate of 0.28 cfs is equal to the maximum allowable release rate of 0.28 cfs and therefore meets the County requirements. With the water surface elevation in the county stormwater facility at 4274.61 the depth of stormwater in the on-site detention facility during the 10-year, 6-hour storm event is 2.05 feet with a release rate of 0.25 cfs to the Weber County stormwater facility. The release rate of 0.25 cfs is less than the maximum allowable release rate of 0.28 cfs and therefor meets the County requirements. In neither case will stormwater flow through the spillway.

During the 100-year, 6-hour storm event, stormwater in the on-site detention facility will pond to a depth of 1.91 feet when the water surface elevation in the County facility is 4271.53 and release at a rate of 0.35 cfs to the County stormwater facility. During the 100-year, 6-hour storm event when the

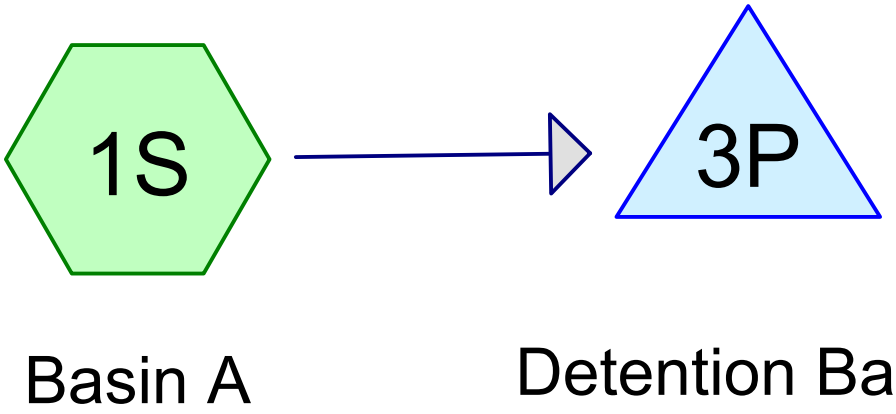
[1] Per Weber County Storm Water Runoff Design Criteria - http://www.webercountyutah.gov/Engineering/design_standards.php

water surface elevation in the County facility is 4274.61 stormwater will be conveyed to the County stormwater facility through the outlet pipe as well as over the riprapped spillway and through an existing ditch. This results in a maximum water surface elevation of 4275.38 feet which is below the top of the proposed on-site detention facility.

Appendix 1

Stormwater Design Calculations

10-Year and 100-year, 6-hour duration storm event calculations with the County stormwater facility surface water elevation at 4271.53.



Subcat Reach Pond Link

Routing Diagram for 1225.22
Prepared by SCJ Alliance, Printed 2/25/2020

Area Listing (all nodes)

Area (acres)	C	Description (subcatchment-numbers)
2.800	0.90	(1S)
2.800	**0.90**	**TOTAL AREA**

The entire area of 2.80 acres that is tributary to the on-site detention facility is assumed to be impervious.

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
2.800	Other	1S
2.800		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	2.800	2.800		1S
0.000	**0.000**	**0.000**	**0.000**	**2.800**	**2.800**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Basin A Runoff Area=2.800 ac 0.00% Impervious Runoff Depth=1.27"
Tc=10.0 min C=0.90 Runoff=0.60 cfs 0.296 af

Peak runoff, 10-yr, 6-hr storm

Pond 3P: Detention Basin Peak Elev=4,274.75' Storage=8,693 cf Inflow=0.60 cfs 0.296 af
Primary=0.28 cfs 0.294 af Secondary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.294 af

Peak discharge to County facility

Total Runoff Area = 2.800 ac Runoff Volume = 0.296 af Average Runoff Depth = 1.27"
100.00% Pervious = 2.800 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Basin A

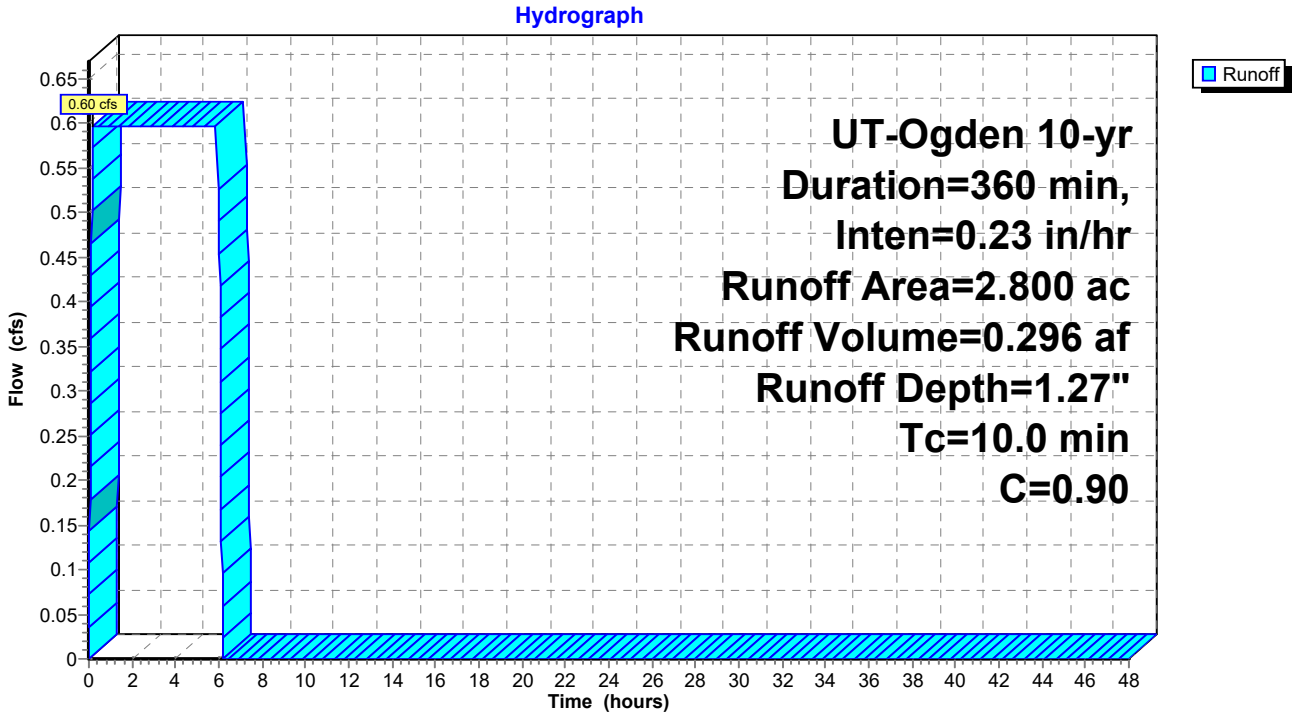
Runoff = 0.60 cfs @ 0.17 hrs, Volume= 0.296 af, Depth= 1.27"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
UT-Ogden 10-yr Duration=360 min, Inten=0.23 in/hr

Area (ac)	C	Description
2.800	0.90	
2.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 1S: Basin A



This is the runoff from the impervious area, 10-yr, 6-hr storm, Rational Method.

Summary for Pond 3P: Detention Basin

Inflow Area = 2.800 ac, 0.00% Impervious, Inflow Depth = 1.27" for 10-yr event
Inflow = 0.60 cfs @ 0.17 hrs, Volume= 0.296 af
Outflow = 0.28 cfs @ 6.09 hrs, Volume= 0.294 af, Atten= 53%, Lag= 355.1 min
Primary = 0.28 cfs @ 6.09 hrs, Volume= 0.294 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 4,274.75' @ 6.09 hrs Surf.Area= 8,631 sf Storage= 8,693 cf

Plug-Flow detention time= 386.2 min calculated for 0.294 af (99% of inflow)
Center-of-Mass det. time= 385.4 min (570.4 - 185.0)

Volume	Invert	Avail.Storage	Storage Description
#1	4,273.50'	27,696 cf	**Detention Basin (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4,273.50	5,187	0	0
4,274.50	8,017	6,602	6,602
4,274.61	8,245	894	7,496
4,275.50	10,667	8,416	15,912
4,275.72	11,153	2,400	18,312
4,276.50	12,907	9,383	27,696

3.125" circular orifice in 8" discharge pipe

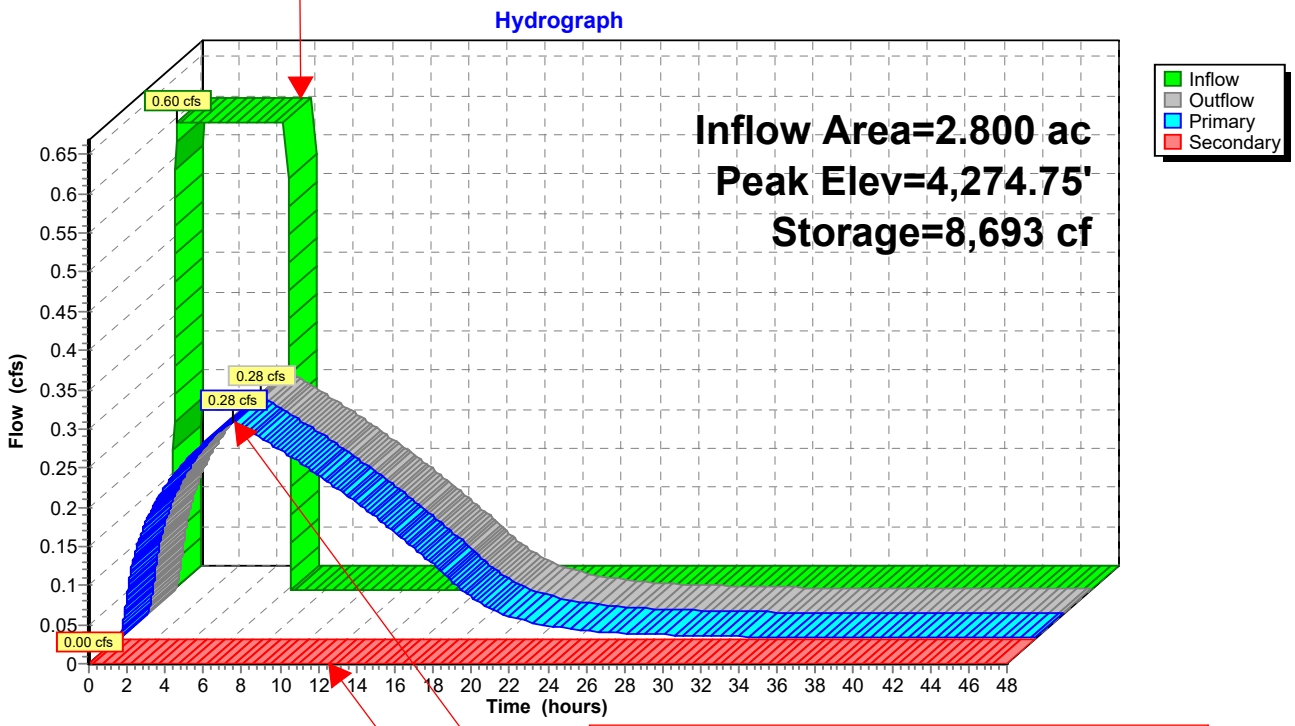
Device	Routing	Invert	Outlet Devices
#1	Primary	4,273.50'	**3.125" Vert. Orifice** C= 0.614
#2	Secondary	4,275.72'	**20.0 deg x 5.0' long x 1.00' rise Overflow** Cv= 2.69 (C= 3.36)

Primary OutFlow Max=0.28 cfs @ 6.09 hrs HW=4,274.75' TW=4,271.53' (Fixed TW Elev= 4,271.53')
└**1=Orifice** (Orifice Controls 0.28 cfs @ 5.22 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=4,273.50' TW=4,271.53' (Fixed TW Elev= 4,271.53')
└**2=Overflow** (Controls 0.00 cfs)

Peak runoff: 0.60 cfs

Pond 3P: Detention Basin



Peak discharge to County facility: 0.28 cfs with County facility water surface at 4271.53, 10-yr, 6-hour storm

Discharge over spillway: 0.65 cfs

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Basin A Runoff Area=2.800 ac 0.00% Impervious Runoff Depth=2.01"
Tc=10.0 min C=0.90 Runoff=0.94 cfs 0.468 af

Peak runoff, 100-yr, 6-hr storm

Pond 3P: Detention Basin Peak Elev=4,275.41' Storage=14,976 cf Inflow=0.94 cfs 0.468 af
Primary=0.35 cfs 0.466 af Secondary=0.00 cfs 0.000 af Outflow=0.35 cfs 0.466 af

Peak discharge to County facility

Total Runoff Area = 2.800 ac Runoff Volume = 0.468 af Average Runoff Depth = 2.01"
100.00% Pervious = 2.800 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Basin A

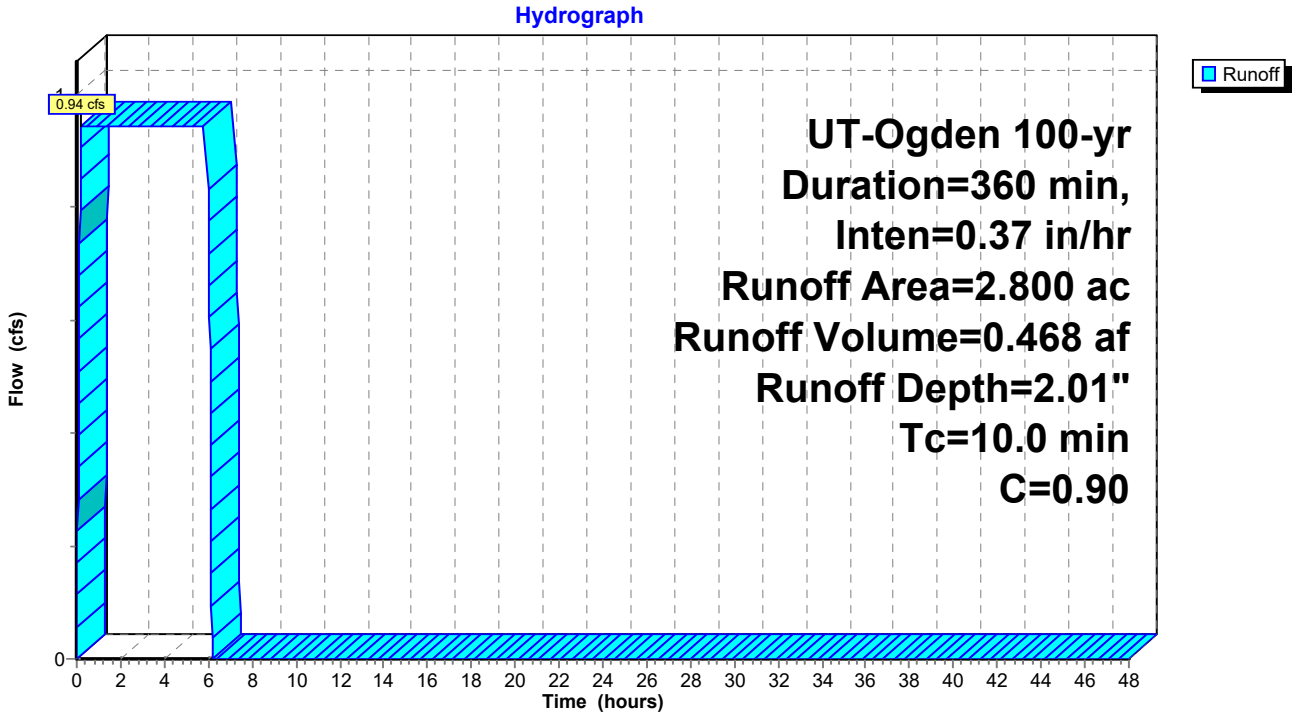
Runoff = 0.94 cfs @ 0.17 hrs, Volume= 0.468 af, Depth= 2.01"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
UT-Ogden 100-yr Duration=360 min, Inten=0.37 in/hr

Area (ac)	C	Description
2.800	0.90	
2.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 1S: Basin A



This is the runoff from the impervious area, 100-yr, 6-hr storm, Rational Method.

Summary for Pond 3P: Detention Basin

Inflow Area = 2.800 ac, 0.00% Impervious, Inflow Depth = 2.01" for 100-yr event
Inflow = 0.94 cfs @ 0.17 hrs, Volume= 0.468 af
Outflow = 0.35 cfs @ 6.10 hrs, Volume= 0.466 af, Atten= 63%, Lag= 356.1 min
Primary = 0.35 cfs @ 6.10 hrs, Volume= 0.466 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 4,275.41' @ 6.10 hrs Surf.Area= 10,425 sf Storage= 14,976 cf

Plug-Flow detention time= 489.0 min calculated for 0.466 af (99% of inflow)
Center-of-Mass det. time= 488.4 min (673.4 - 185.0)

Volume	Invert	Avail.Storage	Storage Description
#1	4,273.50'	27,696 cf	**Detention Basin (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4,273.50	5,187	0	0
4,274.50	8,017	6,602	6,602
4,274.61	8,245	894	7,496
4,275.50	10,667	8,416	15,912
4,275.72	11,153	2,400	18,312
4,276.50	12,907	9,383	27,696

3.125" circular orifice in 8" discharge pipe

Device	Routing	Invert	Outlet Devices
#1	Primary	4,273.50'	**3.125" Vert. Orifice** C= 0.614
#2	Secondary	4,275.72'	**20.0 deg x 5.0' long x 1.00' rise Overflow** Cv= 2.69 (C= 3.36)

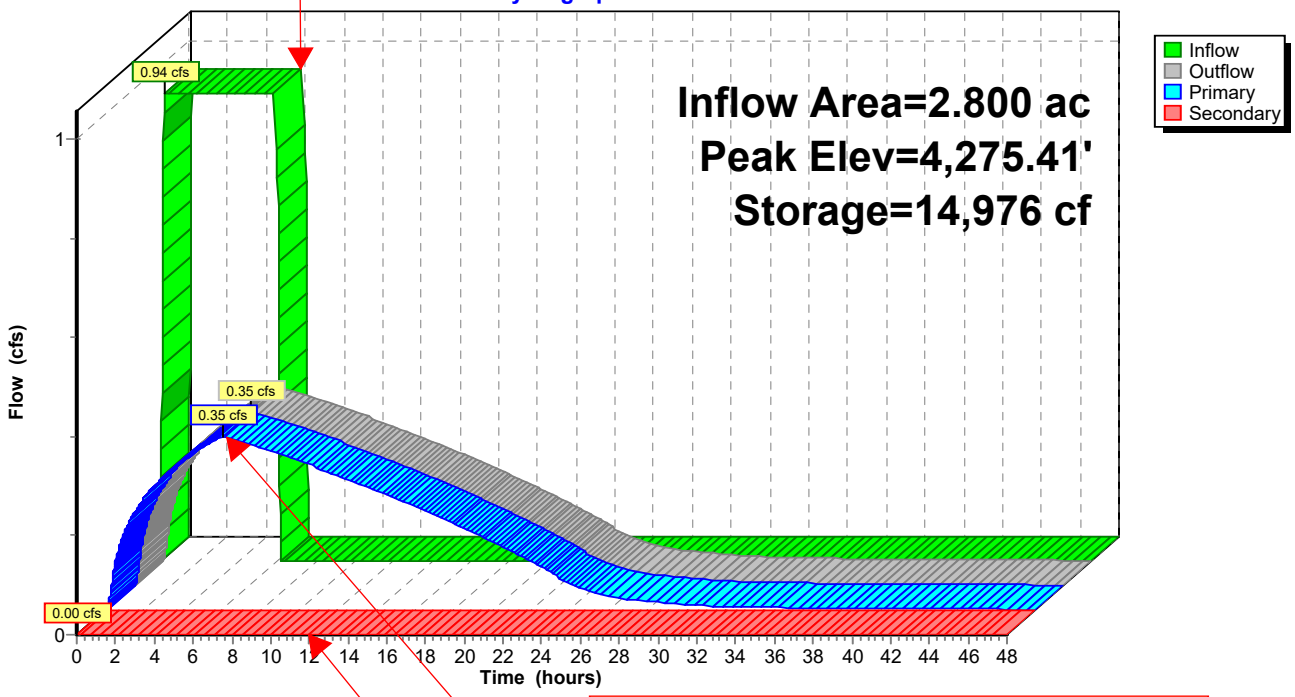
Primary OutFlow Max=0.35 cfs @ 6.10 hrs HW=4,275.41' TW=4,271.53' (Fixed TW Elev= 4,271.53')
└**1=Orifice** (Orifice Controls 0.35 cfs @ 6.58 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=4,273.50' TW=4,271.53' (Fixed TW Elev= 4,271.53')
└**2=Overflow** (Controls 0.00 cfs)

Peak runoff: 0.94 cfs

Pond 3P: Detention Basin

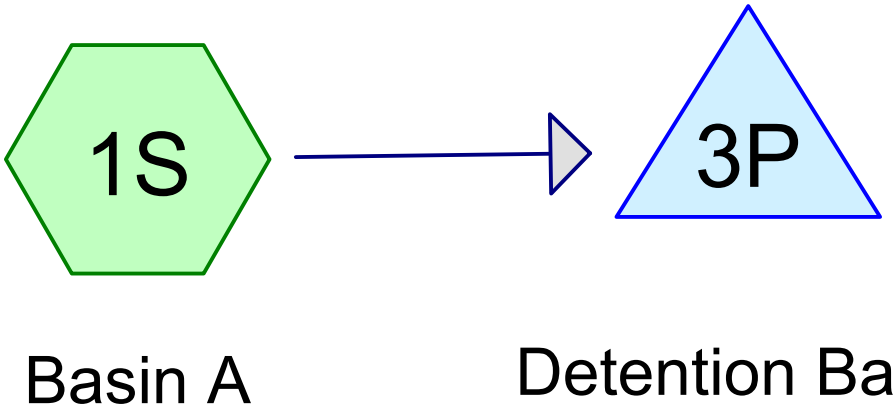
Hydrograph



Peak discharge to County facility: 0.35 cfs with County facility water surface at 4271.53, 100-yr, 6-hour storm

Discharge over spillway: 0 cfs

10-Year and 100-year, 6-hour duration storm event calculations with the County stormwater facility surface water elevation at 4274.61.



Subcat Reach Pond Link

Routing Diagram for 1225.22
Prepared by SCJ Alliance, Printed 2/25/2020

Area Listing (all nodes)

Area (acres)	C	Description (subcatchment-numbers)
2.800	0.90	(1S)
2.800	**0.90**	**TOTAL AREA**

The entire area of 2.80 acres that is tributary to the on-site detention facility is assumed to be impervious.

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
2.800	Other	1S
2.800		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	2.800	2.800		1S
0.000	**0.000**	**0.000**	**0.000**	**2.800**	**2.800**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Basin A Runoff Area=2.800 ac 0.00% Impervious Runoff Depth=1.27"
Tc=10.0 min C=0.90 Runoff=0.60 cfs 0.296 af

Peak runoff, 10-yr, 6-hr storm

Pond 3P: Detention Basin Peak Elev=4,275.55' Storage=16,420 cf Inflow=0.60 cfs 0.296 af
Primary=0.25 cfs 0.295 af Secondary=0.00 cfs 0.000 af Outflow=0.25 cfs 0.295 af

Peak discharge to County facility

Total Runoff Area = 2.800 ac Runoff Volume = 0.296 af Average Runoff Depth = 1.27"
100.00% Pervious = 2.800 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Basin A

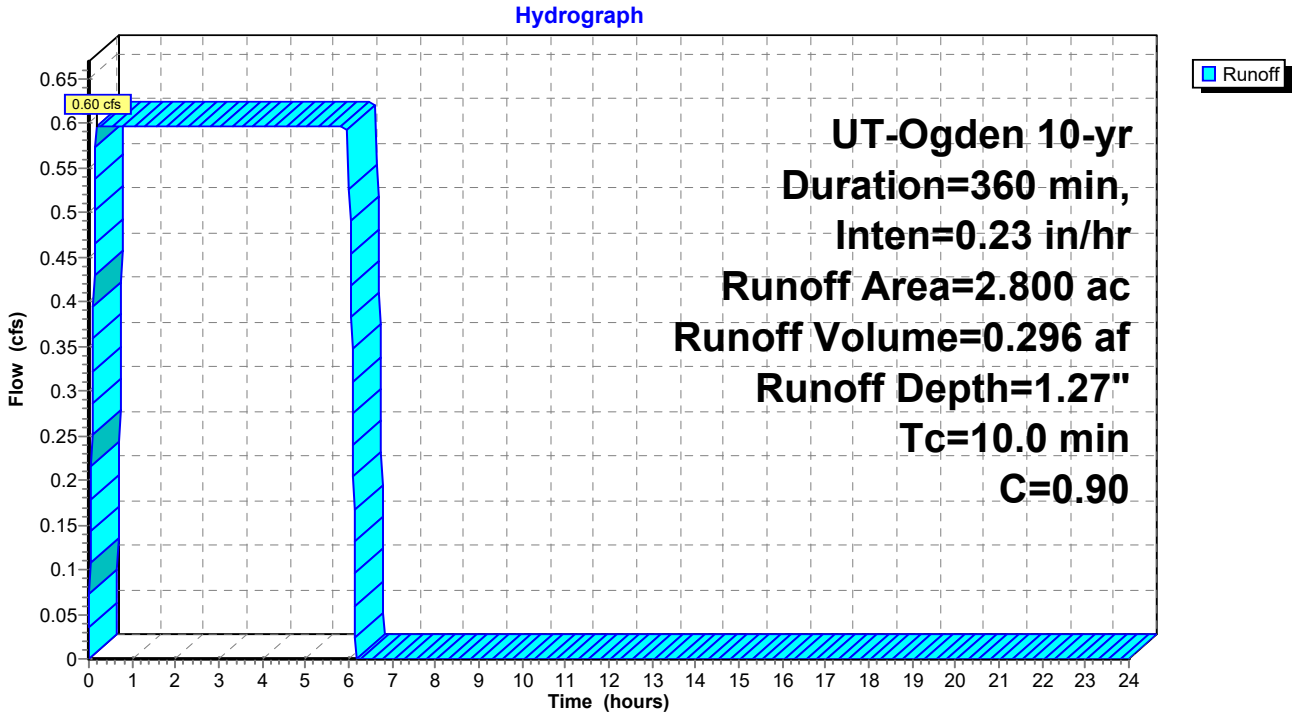
Runoff = 0.60 cfs @ 0.17 hrs, Volume= 0.296 af, Depth= 1.27"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
UT-Ogden 10-yr Duration=360 min, Inten=0.23 in/hr

Area (ac)	C	Description
2.800	0.90	
2.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 1S: Basin A



This is the runoff from the impervious area, 10-yr, 6-hr storm, Rational Method.

Summary for Pond 3P: Detention Basin

Inflow Area = 2.800 ac, 0.00% Impervious, Inflow Depth = 1.27" for 10-yr event
Inflow = 0.60 cfs @ 0.17 hrs, Volume= 0.296 af
Outflow = 0.25 cfs @ 6.10 hrs, Volume= 0.295 af, Atten= 57%, Lag= 355.5 min
Primary = 0.25 cfs @ 6.10 hrs, Volume= 0.295 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 4,274.61' Surf.Area= 8,245 sf Storage= 7,496 cf
Peak Elev= 4,275.55' @ 6.10 hrs Surf.Area= 10,772 sf Storage= 16,420 cf (8,923 cf above start)

Plug-Flow detention time= 832.1 min calculated for 0.123 af (42% of inflow)
Center-of-Mass det. time= 397.2 min (582.2 - 185.0)

Volume	Invert	Avail.Storage	Storage Description
#1	4,273.50'	27,696 cf	**Detention Basin (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4,273.50	5,187	0	0
4,274.50	8,017	6,602	6,602
4,274.61	8,245	894	7,496
4,275.50	10,667	8,416	15,912
4,275.72	11,153	2,400	18,312
4,276.50	12,907	9,383	27,696

3.125" circular orifice in 8" discharge pipe

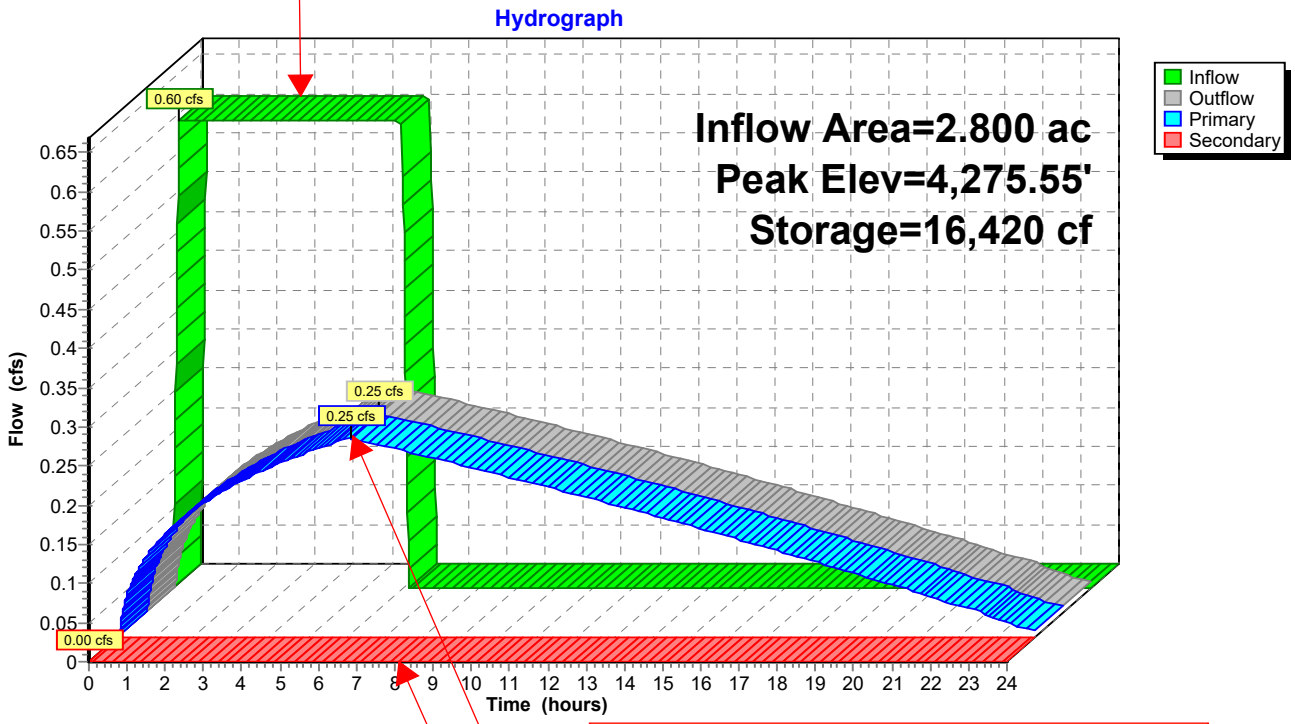
Device	Routing	Invert	Outlet Devices
#1	Primary	4,273.50'	**3.125" Vert. Orifice** C= 0.614
#2	Secondary	4,275.72'	**20.0 deg x 5.0' long x 1.00' rise Overflow** Cv= 2.69 (C= 3.36)

Primary OutFlow Max=0.25 cfs @ 6.10 hrs HW=4,275.55' TW=4,274.61' (Fixed TW Elev= 4,274.61')
└**1=Orifice** (Orifice Controls 0.25 cfs @ 4.77 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=4,274.61' TW=4,274.61' (Fixed TW Elev= 4,274.61')
└**2=Overflow** (Controls 0.00 cfs)

Peak runoff: 0.60 cfs

Pond 3P: Detention Basin



Peak discharge to County facility: 0.25 cfs with County facility water surface at 4274.61, 10-yr, 6-hr storm.

Discharge over spillway: 0 cfs

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Basin A Runoff Area=2.800 ac 0.00% Impervious Runoff Depth=2.01"
Tc=10.0 min C=0.90 Runoff=0.94 cfs 0.468 af

Peak runoff, 100-yr, 6-hr storm

Pond 3P: Detention Basin Peak Elev=4,275.83' Storage=19,589 cf Inflow=0.94 cfs 0.468 af
Primary=0.29 cfs 0.370 af Secondary=0.65 cfs 0.091 af Outflow=0.94 cfs 0.461 af

Peak discharge to County facility

Total Runoff Area = 2.800 ac Runoff Volume = 0.468 af Average Runoff Depth = 2.01"
100.00% Pervious = 2.800 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Basin A

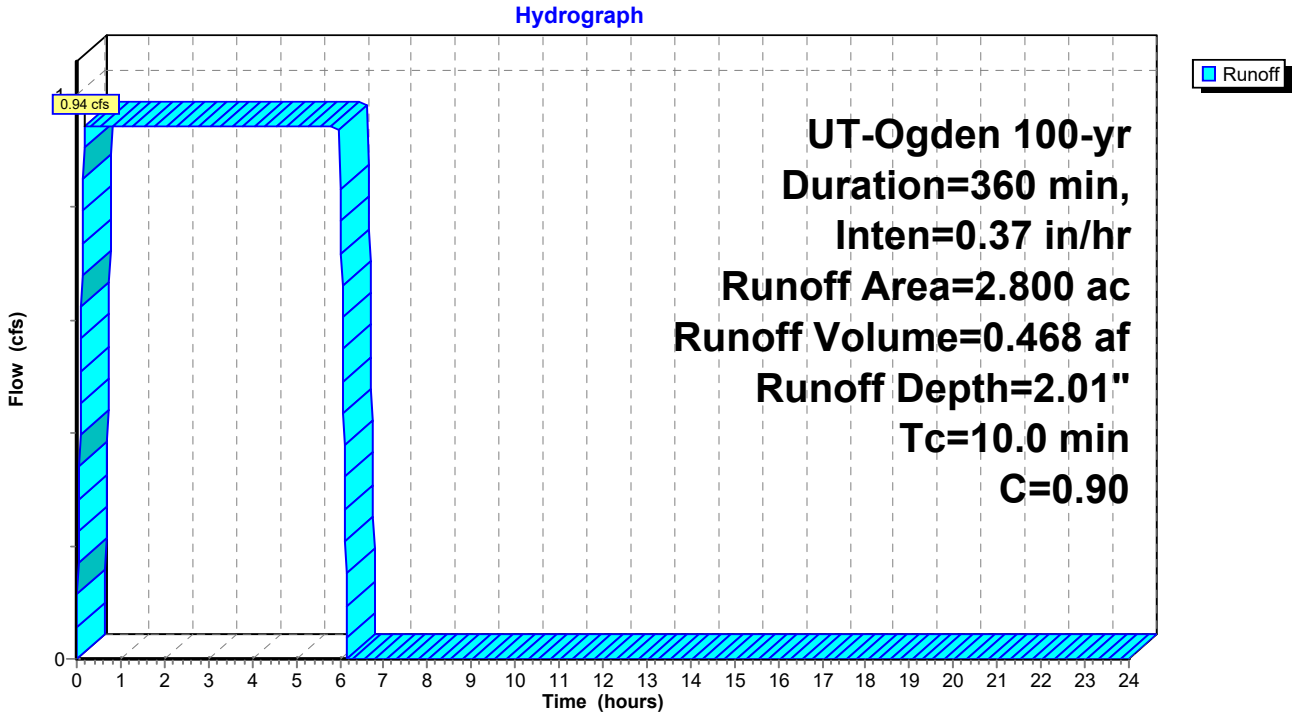
Runoff = 0.94 cfs @ 0.17 hrs, Volume= 0.468 af, Depth= 2.01"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
UT-Ogden 100-yr Duration=360 min, Inten=0.37 in/hr

Area (ac)	C	Description
2.800	0.90	
2.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 1S: Basin A



This is the runoff from the impervious area, 100-yr, 6-hr storm, Rational Method.

Summary for Pond 3P: Detention Basin

Inflow Area = 2.800 ac, 0.00% Impervious, Inflow Depth = 2.01" for 100-yr event
Inflow = 0.94 cfs @ 0.17 hrs, Volume= 0.468 af
Outflow = 0.94 cfs @ 6.00 hrs, Volume= 0.461 af, Atten= 1%, Lag= 349.7 min
Primary = 0.29 cfs @ 6.00 hrs, Volume= 0.370 af
Secondary = 0.65 cfs @ 6.00 hrs, Volume= 0.091 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 4,274.61' Surf.Area= 8,245 sf Storage= 7,496 cf
Peak Elev= 4,275.83' @ 6.00 hrs Surf.Area= 11,408 sf Storage= 19,589 cf (12,093 cf above start)

Plug-Flow detention time= 622.2 min calculated for 0.289 af (62% of inflow)
Center-of-Mass det. time= 369.3 min (554.4 - 185.0)

Volume	Invert	Avail.Storage	Storage Description
#1	4,273.50'	27,696 cf	**Detention Basin (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4,273.50	5,187	0	0
4,274.50	8,017	6,602	6,602
4,274.61	8,245	894	7,496
4,275.50	10,667	8,416	15,912
4,275.72	11,153	2,400	18,312
4,276.50	12,907	9,383	27,696

3.125" circular orifice in 8" discharge pipe

Device	Routing	Invert	Outlet Devices
#1	Primary	4,273.50'	**3.125" Vert. Orifice** C= 0.614
#2	Secondary	4,275.72'	**20.0 deg x 5.0' long x 1.00' rise Overflow** Cv= 2.69 (C= 3.36)

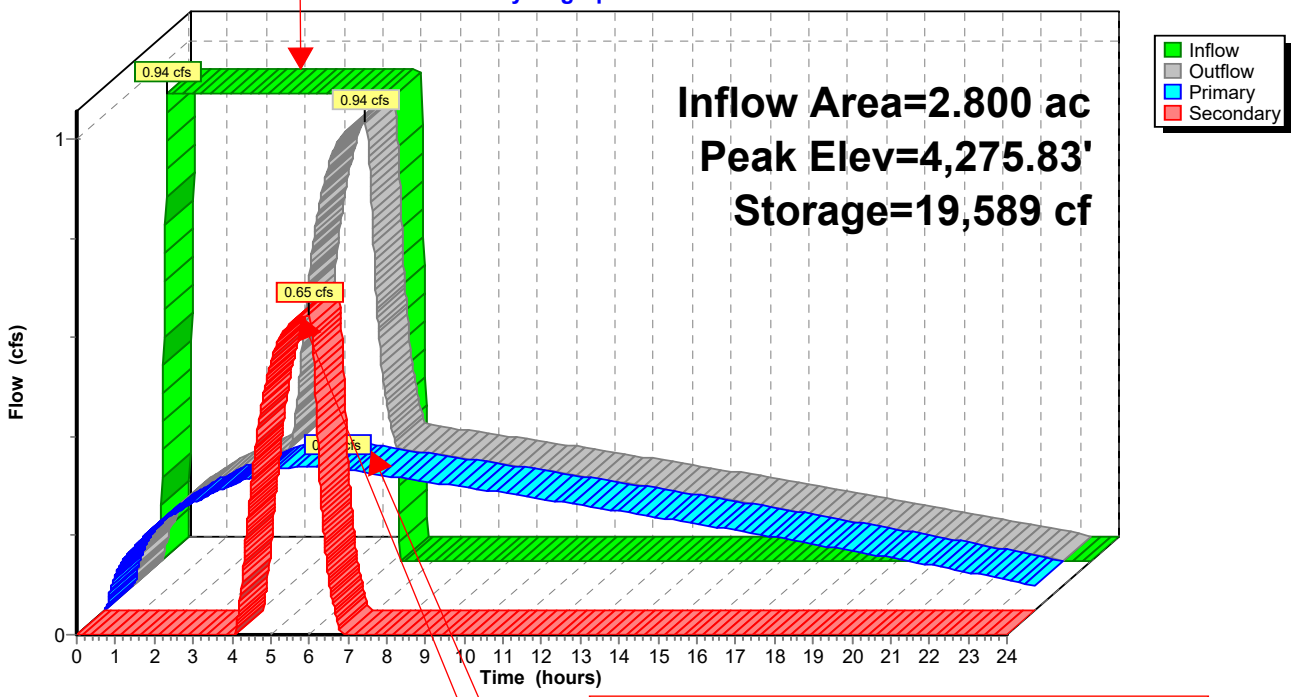
Primary OutFlow Max=0.29 cfs @ 6.00 hrs HW=4,275.83' TW=4,274.61' (Fixed TW Elev= 4,274.61')
└**1=Orifice** (Orifice Controls 0.29 cfs @ 5.45 fps)

Secondary OutFlow Max=0.64 cfs @ 6.00 hrs HW=4,275.83' TW=4,274.61' (Fixed TW Elev= 4,274.61')
└**2=Overflow** (Weir Controls 0.64 cfs @ 1.13 fps)

Peak runoff: 0.94 cfs

Pond 3P: Detention Basin

Hydrograph



Peak discharge to County facility: 0.29 cfs with County facility water surface at 4274.61, 100-yr, 6-hr storm.

Peak discharge over spillway: 0.65 cfs