

# **Final Stormwater Management Plan**

prepared for

**Residences, Reserve and Reunion at  
Blackwell**

**Lee's Summit, MO 64081**

May 11, 2023

prepared by



**14920 W 107<sup>th</sup> ST**

**Lenexa, Kansas**

**(913) 492-5158**

**Schlagel & Associates Project 20-205**

for

**Griffin Riley Property Group**

**21 SE 29<sup>th</sup> Terrace**

**Lee's Summit, Missouri 64082**

## Executive Summary

May 11, 2023

Gene Williams, P.E.  
220 SE Green Street  
Lee's Summit, MO 64063

**RE: Residences at Blackwell  
Blue Parkway & Blackwell Road  
Lee's Summit, MO 64081**

Dear Gene Williams,

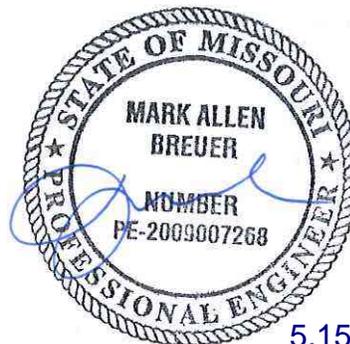
We are submitting the enclosed final stormwater management study in support of the site development plans for the multi-phase development Blackwell. Included are The Residences at Blackwell, a proposed Multi-family development, Reunion at Blackwell proposed townhomes, and Blackwell Reserve proposed single family homes. This report has been prepared to address permitting requirements and provides final design calculations for the required storm water detention and BMP facilities. We have modeled the existing site conditions as they existed at the time this report was prepared.

The proposed site is a 62.40-acre mixed use parcel located in Lee's Summit, MO at the intersection of Blue Parkway and Blackwell Road. The proposed development has been analyzed and designed to meet the APWA Comprehensive Control Strategy, which entails limiting post-development peak discharge rates from the site for the 2-Year, 10-Year, and 100-Year design storm events. One Extended Dry Detention Basin (EDDB) and three Extended Wet Detention Basins (EWDB) have been designed to detain the mentioned events as well as provided 40-hour detention of runoff from the local 90% mean annual event. All elements of the enclosed drainage system will be designed and constructed in accordance with all City of Lee's Summit, Missouri, requirements.

Sincerely,

**Schlagel & Associates, P.A.**

Michael Moore, E.I.T.  
Design Engineer



Mark Breuer, P.E.  
Project Engineer

5.15.23

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## 1.0 GENERAL INFORMATION

Griffin Riley Property Group is proposing to develop the 62.40 acres of land located in Section 11, Township 47 North, Range 31 West, Jackson County, Missouri. The property is located at the intersection of Blue Parkway and Blackwell Road. The proposed development consists of single-family lots, townhomes, apartments, and commercial use along with associated infrastructure.

### 1.1 OBJECTIVE

The intent of this report is to provide information pertaining to the existing and proposed watersheds, identifying and addressing any downstream drainage issues, determine and address any detention requirements, provide 40-hour extended detention of runoff from the local 90% mean annual event, and address permitting requirements. This study provides the final design calculations for the development of the facilities and associated infrastructure.

### 1.2 METHODOLOGY

The following were utilized in the assessment, preparation and analysis of watersheds in this design concept plan: *Section 5600, 2011, Storm Drainage Systems & Facilities* of the Standard Specifications & Design Criteria of the Kansas City Metropolitan Chapter of the American Public Works Association; *City of Lee's Summit, Missouri Design Criteria (2011 Revision), Storm Drainage Systems & Facilities*, prepared by the City of Lee's Summit, Missouri, Public Works Department.

Watersheds for the site were defined according to soil cover and type, tributary area, and runoff times of concentration. Soil cover was determined from inspection of the site and aerial photography. A soil survey for the project area was obtained from the United States Department of Agriculture, Natural Resources Conservation Service (NRCS), website and was utilized in determining soil type. The entire NRCS Soil Resource Report can be found in Appendix B. Watershed size was determined from both aerial topography and topographical survey, and by the proposed grading plan.

Times of concentration were compiled according to *NRCS TR-55 Urban Hydrology for Small Watersheds (1986)* methodology for sheet flow, shallow concentrated flow, and channel flow. For this report, sheet flow travel lengths were modeled at a total distance of 100'. Travel times for channel flows were determined using the length and velocity of the open channel. *HydroCAD-10* was utilized to model the runoff. All storm events were modeled using *SCS 24-hour Type II* distributions and were modeled for 2-Year, 10-Year, and 100-Year storm events.

\* \* \* \* \*

## 2.0 EXISTING CONDITIONS ANALYSIS

The site lies within the East Fork Little Blue River Watershed. The existing site contains 4 watersheds which have release points located in the southwest, northwest, northern boundary, and eastern boundary of the site. Offsite stormwater comes into the site from south and drains to the release point located along the eastern boundary.

### 2.1 TRIBUTARY AREAS

The existing drainage tributary map is provided in Appendix A, Figure A.1. The site release points have been identified as Release Point 1 (RP-1), Release Point 2 (RP-2), Release Point 3 (RP-3), and Release Point 4 (RP-4). The area has been delineated according to the existing topography and an annotation callout of EX DA-1, EX DA-2, EX DA-3, EX DA-4, and EX OFF DA-4, on Figure A.2, have been provided for the watersheds that drain to the release points RP-1 – RP-4 respectively.

### 2.2 CURVE NUMBER AND TIME OF CONCENTRATION

The existing curve numbers and time of concentrations for each area have been established based on the procedures outlined in *NRCS TR-55 Urban Hydrology for Small Watersheds (1986)*. Existing curve numbers were based upon aerial photography, site inspection, and the soil types present on site.

The NRCS Soil Resource Report indicated that a Hydrologic Soil Group (HSG) of C and D were present on site. A current aerial photograph can be found in Appendix A; it depicts the existing cover conditions. Table 2-1 found in section 2.3 Existing Flow Rates summarizes the curve numbers for each of the watershed areas.

Cover types for existing conditions were considered to be “pasture/grassland” in fair condition for the on-site area, and “Woods/grass combo” in fair condition for the off-site area. Procedures outlined in *NRCS TR-55 Urban Hydrology for Small Watersheds* recommends utilizing curve numbers 79 and 84 for HSG C and D for pasture/grassland, and 76 and 82 for the Woods/Grass combination.

Time of concentration flow paths were based upon sheet flow and shallow concentrated flow for the existing conditions. Sheet flow lengths were limited to where a grade break occurred. Flow was then considered shallow concentrated flow until a channel was visible either from the USGS topographic map or the aerial photograph, and then from that point was considered channel flow determined by the length of the channel and the velocity of flow.

### **2.3 EXISTING FLOW RATES**

Existing flow rates were determined for the 2-Year, 10-Year, and 100-Year design storms. Offsite runoff is included in the calculations for Table 2-1 below for existing site conditions. Appropriate runoff coefficient curve numbers were based upon aerial photography, site inspection, and the soil types present on site. Detailed calculations with composite curve numbers and time of concentration can be found in the HydroCAD Model Output in Appendix B.

**Table 2-1 - Existing Flow Rates**

Drainage Sub-Basin	Area (Acres)	CN	Storm Event	Runoff (CFS)
EX DA-1	9.52	79	2-YR	14.34
			10-YR	28.81
			100-YR	48.20
EX DA-2	4.28	80	2-YR	7.26
			10-YR	14.09
			100-YR	23.62
EX DA-3	29.35	80	2-YR	36.97
			10-YR	72.33
			100-YR	121.81
EX DA-4	19.25	82	2-YR	31.44
			10-YR	64.09
			100-YR	110.52
EX OFF DA-4	4.58	92	2-YR	11.43
			10-YR	18.56
			100-YR	27.98

## 2.4 DOWNSTREAM DRAINAGE ISSUES

The existing downstream drainage system has been reviewed with this development plan. FEMA flood maps have been checked and currently no immediate downstream issues appear to be present. A FEMA FIRMette is included in Appendix A. The project lies outside of the identified FEMA floodplain per map numbers 29095C0437G, 29095C0439G, 29095C0441G, and 29095C0445G.

## 2.5 AGENCY REVIEW

Permitting requirements of the following agencies were reviewed as part of the existing conditions analysis.

### **2.5.1 Corps of Engineers Review**

The National Wetlands Inventory (NWI) map was reviewed for the site and there are no identified wetlands located within the project site. The NWI map can be found in Appendix A. A jurisdictional determination is being prepared by others, and any required wetland permitting or mitigation will be completed prior to land disturbance of the wetlands.

### **2.5.2 FEMA Requirements**

No FEMA identified floodplain is located on the proposed property per Flood Insurance Rate Map Panel Nos. 29095C0437G, 29095C0439G, 29095C0441G, and 29095C0445G. There is currently no work proposed in the regulated floodplain. Please see the attached FEMA FIRMette in Appendix A.

### **2.5.3 Missouri Department of Natural Resources**

All land disturbance activities will be permitted in accordance with the City of Lee's Summit, MO specifications as well as the Missouri Department of Water Pollution Control general permit under the National Pollution Discharge Elimination System (NPDES) and an authorized Notice of Intent (NOI) application form. The disturbance of the site is greater than one acre; therefore, NPDES and NOI applications are required with the future permitting of the site in compliance with local, state and federal guidelines.

\* \* \* \* \*

### 3.0 PROPOSED CONDITIONS ANALYSIS

With the proposed development, the site watershed will be divided into four sub-basins for analysis. These sub-basins correspond to: Release Points 1-4. Stormwater runoff will be conveyed through the site via open sheet flow, shallow concentrated flow, enclosed storm sewer, one extended dry detention basin, and three extended wet detention basins. All detention facilities have been designed to detain the 2-Year, 10-Year, and 100-Year storm events.

All components of the overland and enclosed storm sewer systems will meet or exceed the specifications provided in *Section 5600 – Storm Drainage Systems & Facilities* of the *Standard Specifications and Design Criteria* compiled by the Kansas City Metropolitan Chapter of the American Public Works Association.

#### 3.1 TRIBUTARY AREAS

RP-1 sub-catchments, Onsite 2, will be collected by the extended dry detention basin and then released to the proposed curb inlet being constructed with the Blue Parkway improvements, carried across Blue Parkway by two existing 18" pipes located under the roadway. RP-2 sub-catchment existing flows are proposed to be routed to the detention facility located in the northeast corner of the site and released at RP-3. Release Point 2 is located within the proposed plat Blackwell Reserve. The adjacent proposed plat Reunion at Blackwell is being constructed in conjunction with Blackwell Reserve allowing for the opportunity to reduce the number of release points from the master site. This reduces the needs for maintenance, easements and the chances of drainage issues downstream. RP-3 will also be divided into two sub-catchments, Onsite 3 and Onsite 4. Onsite 3 will be collected by a proposed extended wet detention basin. It will then be routed downstream to a second proposed extended wet detention basin that will collect Onsite 4 and then be released via storm sewer to an existing area inlet located directly north of our proposed site. Final design of this basin has been designed to ensure the downstream storm sewer system does not exceed the 100-year storm event. RP-4 sub-catchment, Onsite 5, will be collected by an extended wet detention basin.

The proposed extended wet detention basin will also collect the off-site area, EX OFFSITE 1, from the south. Stormwater runoff will be released into the existing swale and continue to flow to the northeast.

### **3.2 CURVE NUMBER AND TIME OF CONCENTRATION**

Curve numbers for the proposed development were developed in a similar manner as the existing conditions. Hydrologic Soil Group (HSG) of D was utilized for post-development conditions. Cover types for the proposed conditions were considered to be 1/8 acre lots, Multi-Family, Single Family lots, and urban commercial in good condition.

Time of concentration was established in a similar manner as the existing conditions. Shallow concentrated flow lengths were shortened and considered paved. Detailed calculations with composite curve numbers and time of concentration can be found in the HydroCAD Model Output in Appendix B. Appendix A, Figure A.2 depicts the proposed drainage conditions.

### 3.3 PROPOSED FLOW RATES

Proposed flow rates were determined for the 2-Year, 10-Year, and 100-Year design storms for un-detained condition. Detailed calculations can be found in the HydroCAD Model Output Report in Appendix B.

**Table 3-1 – HydroCAD Runoff Conditions**

Drainage Sub-Basin	Drainage Area (Acres)	Storm Event	Peak Discharge (CFS)
*OnSite 2	4.93	2-YR	21.75
		10-YR	34.23
		100-YR	50.65
*OnSite 3	12.00	2-YR	43.73
		10-YR	74.03
		100-YR	114.13
*OnSite 4	23.79	2-YR	76.79
		10-YR	135.68
		100-YR	214.56
OnSite 5	19.08	2-YR	75.92
		10-YR	128.33
		100-YR	197.63
EX OFFSITE 1	6.94	2-YR	27.62
		10-YR	46.68
		100-YR	71.89

### 3.4 DETENTION ANALYSIS

The runoff hydrographs utilized to determine the peak flow volumes for each tributary area were determined using *TR-55* methodology and *HydroCAD-10*. For the 2-Year, 10-Year, and 100-Year storm events, the complete hydrograph routing and model output can be found in the HydroCAD Model Output Report in Appendix B.

The site will need to provide detention that meets the requirement under the Comprehensive Control release rates under Section 5608.4C1a and 5608.4C1b of the APWA. This entails limiting post-development peak discharge rates from the site for the 2-Year, 10-Year, and 100-Year design storm events, as well as providing 40-Hour extended detention of runoff from the local 90% mean annual event. The post-development peak discharge rates from the site shall not exceed the following:

- 50% storm peak rate less than or equal to 0.5 cfs per site acre
- 10% storm peak rate less than or equal to 2.0 cfs per site acre
- 1% storm peak rate less than or equal to 3.0 cfs per site acre

For Release Points 1, 3, and 4, HydroCAD output represents the design release rate. For RP-2, we propose to route all existing flows to the proposed detention facility located in the northeast corner of the site to be detained and released at RP-3.

Table 3-1 – HydroCAD Runoff Conditions are shown in Table 3-3.B - Required & Proposed Runoff Comparison. The proposed post-development design release rates are shown next to the allowable release rates for comparison.

**Table 3-2.B – Allowable Release Rate Calculations**

Release Point	Allowable Release Rate (CFS) Calculations				
	Area (Acres)	Storm Event	Allowable On-Site Release Rate (CFS) (A)	Allowable Off-Site Release Rate (CFS) (B)	Allowable Release Rate (CFS) (A+B)
RP-1	4.93	2-YR	2.47	0.00	2.47
		10-YR	9.86	0.00	9.86
		100-YR	14.79	0.00	14.79
RP-3	35.79	2-YR	17.90	0.00	17.90
		10-YR	71.58	0.00	71.58
		100-YR	107.37	0.00	107.37
RP-4	24.30	2-YR	9.54	27.62	37.16
		10-YR	38.16	46.68	84.84
		100-YR	57.24	71.89	129.13

**Table 3-3.B - Required & Proposed Runoff Comparison**

Site Release Information (cubic feet per second) (w/ EDDB)				
Area	Drainage Area	Storm Event	Allowable Release Rate (CFS)	Design Release Rate (CFS)
RP-1	5.51	2-YR	2.47	2.46
		10-YR	9.86	9.26
		100-YR	14.79	14.32
RP-3	36.31	2-YR	17.90	17.16
		10-YR	71.58	64.84
		100-YR	107.37	82.42
RP-4	24.30	2-YR	37.16	15.29
		10-YR	84.84	31.31
		100-YR	129.13	42.24

Please note: Site release rates are not a direct addition of sub-basin runoff due to differences in the time peak as well as storage effects within the basins.

Proposed stormwater drainage structures will be located throughout the site to capture and convey proposed stormwater runoff to both wet and dry detention basins. The Water Quality volume for all proposed basins will be released over 40 hours. Water quality outlet structures have been provided for each basin and have been designed to meet the allowable release rates provided in Table 3-2 for the 2, 10, and 100 year storm events. The water quality storm event will be controlled by a 15" riser pipe with 1" diameter orifices evenly spaced across the pipe for the extended dry detention basin, and V-notch weirs will be utilized for all proposed extended wet detention basins.

Emergency spillways will be provided for each basin per Section 5600 of the Design and Construction Manual. Each emergency spillway will be set at least 0.5 feet above the 100-year water surface elevation and designed to carry the 100-year storm event

assuming a 100% clogged condition. An additional 1 foot of freeboard will be provided from the water surface elevation in the spillway and the top of dam. For each basin the primary discharge device was removed from the HydroCAD model to simulate a clogged condition. The water surface elevation was set equal to the peak 1% storm water surface elevation, then with no method of primary discharge a second 1% (Back to back) storm was simulated lacking the method of primary discharge and the storage available to the first storm, the emergency spillway was utilized. Table 3-4 summarizes the results of this analysis.

**Table 3-4 – Emergency Spillway Analysis**

	Storm Event	Inflow to Basin (CFS)	Emergency Spillway Elevation (FT)	Emergency Spillway Length (FT)	Clogged Surface Elevation
EWDB-1	1% (100 Year)	269.52	999.70	14.00	1001.54
EWDB-2	1% (100 Year)	114.13	996.50	114.00	996.94
EWDB-3	1% (100 Year)	307.82	991.00	140.00	991.76
EDDB-1	1% (100 Year)	48.94	1010.40	120.00	1010.65

Installing drain works per APWA 5608.4G has been determined to be not applicable in the to the extended wet detention basins on this site. In each case the permanent pool is being detained below both existing and proposed grade. This would require the use of mechanical pumps to completely or substantially drain the basins of the permanent pools of water.

Additionally, erosion control procedures will be designed and implemented at the outlets to reduce impact on the site downstream.

\* \* \* \* \*

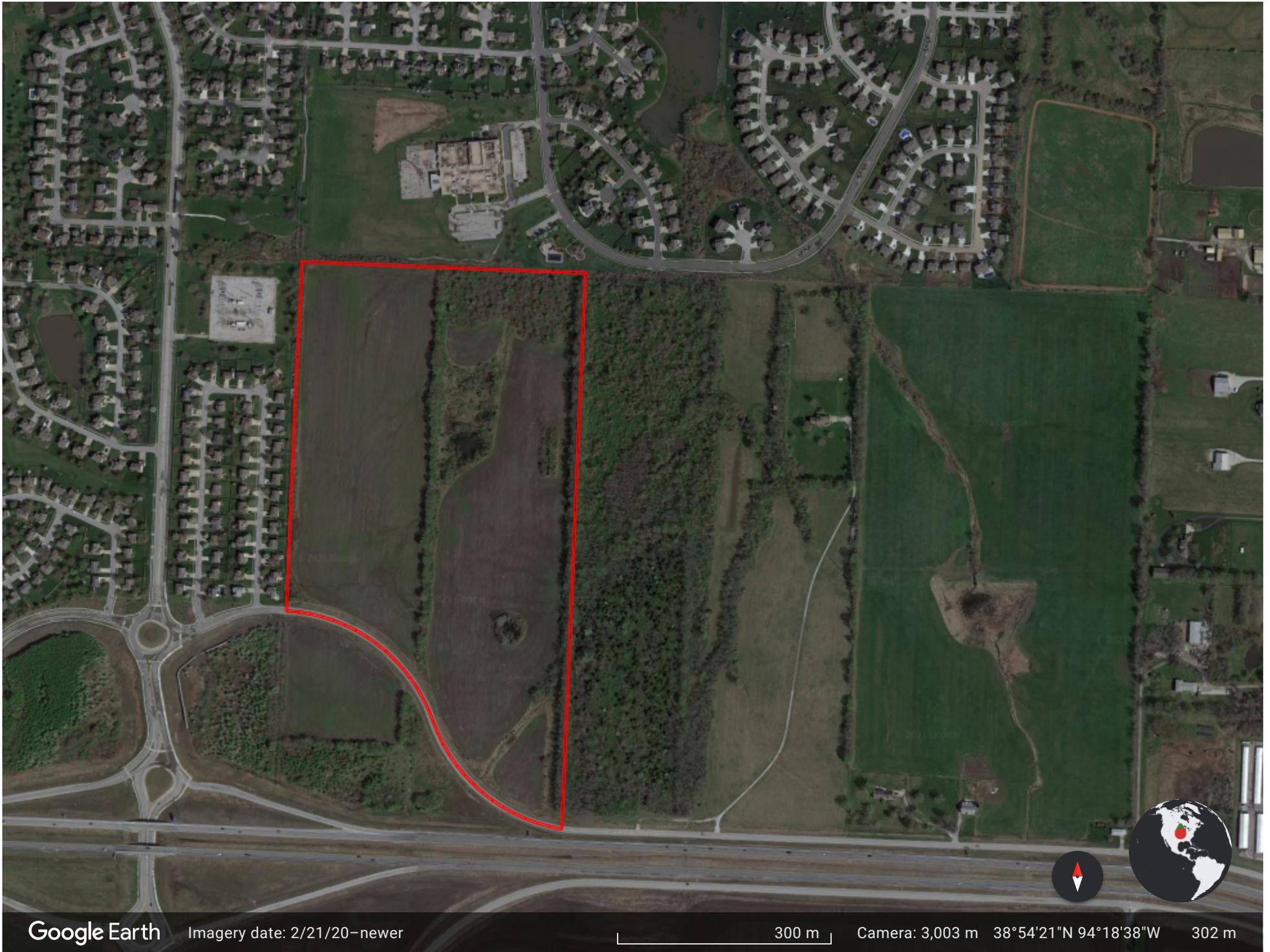
## 4.0 SUMMARY AND RECOMMENDATIONS

The proposed drainage site is a 62.40-acre mixed use parcel of land located in Lee's Summit, MO at the intersection of Blue Parkway and Blackwell Road. The proposed development has been analyzed and designed to meet the APWA Comprehensive Control Strategy, which entails limiting post-development peak discharge rates from the site for the 2-Year, 10-Year, and 100-Year design storm events. One extended dry detention basin and three extended wet detention basins have been designed to detain the mentioned events as well as provided 40-hour detention of runoff from the local 90% mean annual event. All elements of the enclosed drainage system will be designed and constructed in accordance with all City of Lee's Summit, Missouri, requirements.

\* \* \* \*

## **APPENDIX A**

- Existing Site Aerial Photograph
- Existing Drainage Map
- Proposed Drainage Map
- EDDB Water Quality Design
- EWDB Water Quality Design
- FEMA FIRMette
- National Wetlands Inventory



Google Earth

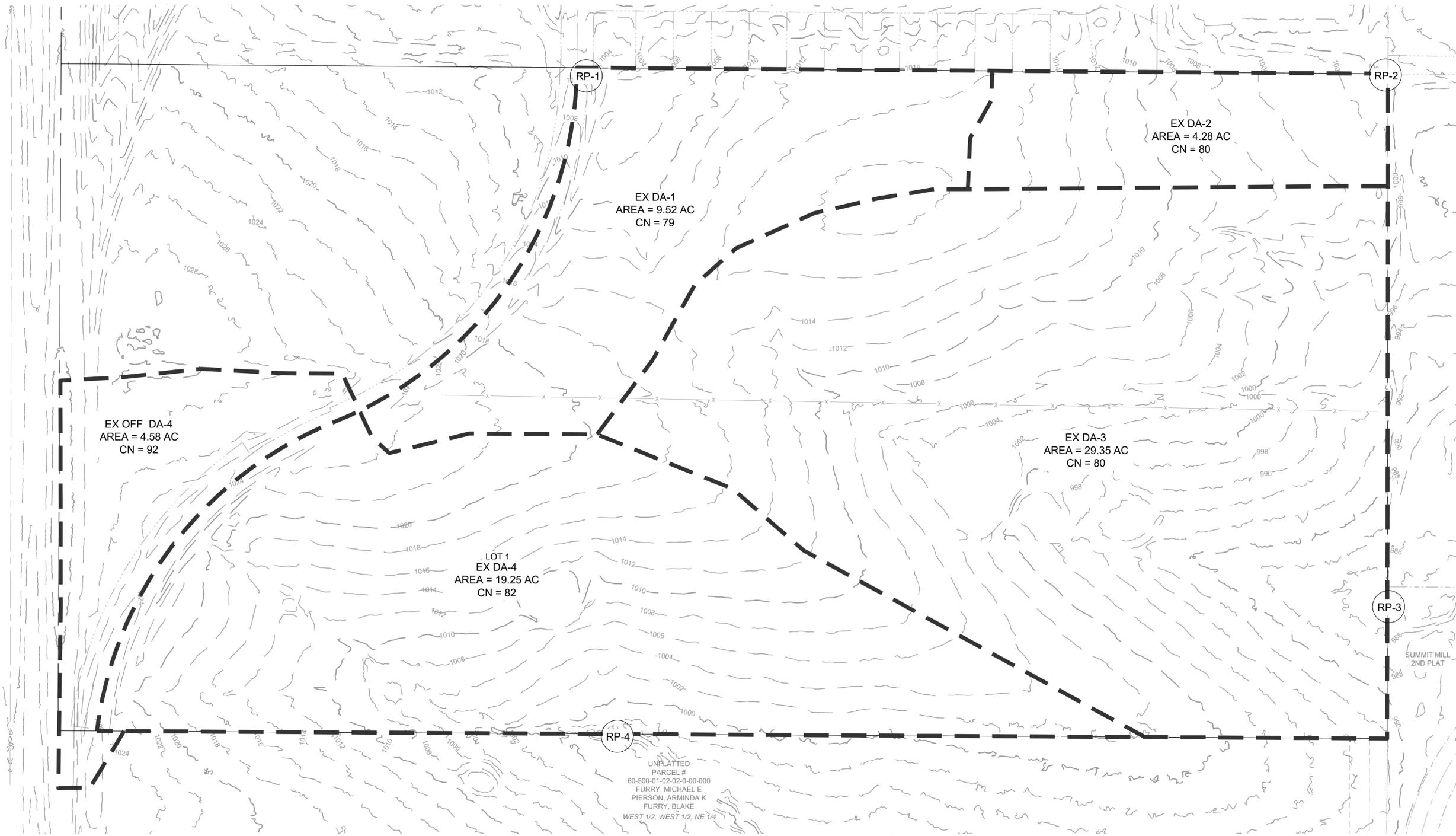
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300 m

Camera: 3,003 m

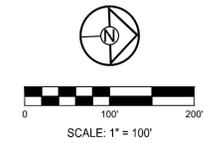
38°54'21"N 94°18'38"W

302 m

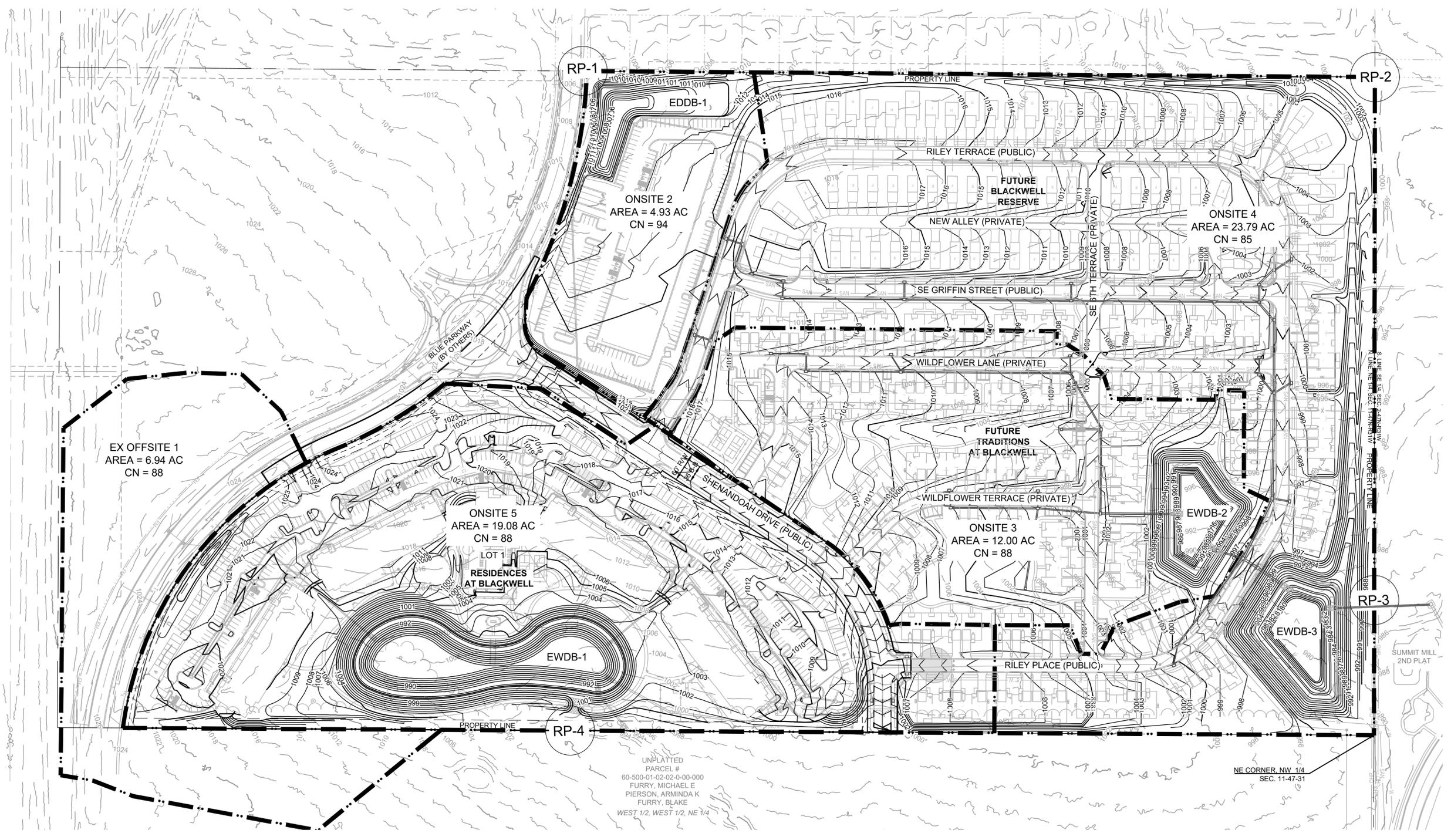


**LEGEND:**

- - - 1000 - - - EXISTING CONTOUR
- 1000 — PROPOSED CONTOUR
- — — PROPOSED WATERSHED



REVISION DATE	DESCRIPTION
3/3/23	DATE PREPARED
22-102	PROJ. NUMBER
MMW	DRAWN BY
MAB	CHECKED BY



EX OFFSITE 1  
AREA = 6.94 AC  
CN = 88

EDDB-1  
ONSITE 2  
AREA = 4.93 AC  
CN = 94

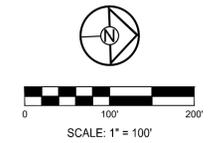
ONSITE 4  
AREA = 23.79 AC  
CN = 85

ONSITE 5  
AREA = 19.08 AC  
CN = 88  
LOT 1  
RESIDENCES  
AT BLACKWELL

ONSITE 3  
AREA = 12.00 AC  
CN = 88

UNPLATTED  
PARCEL #  
60-500-01-02-02-0-00-000  
FURRY, MICHAEL E  
PIERSON, ARMINDA K  
FURRY, BLAKE  
WEST 1/2, WEST 1/2, NE 1/4

- LEGEND:**
- - - 1000 - - - EXISTING CONTOUR
  - 1000 — PROPOSED CONTOUR
  - · · — PROPOSED WATERSHED



BLACKWELL  
HYDRO MAPS  
  
LEES SUMMIT, MO

REVISION DATE	DESCRIPTION

PROPOSED  
DRAINAGE MAP

SHEET  
**A.2**

# Extended Wet Detention Basin - EWDB#1

Project: 22-102 Residences at Blackwell

5/11/2023 15:27

## Water Quality Volume Calculation

$$WQV = P * \text{Weighted RV}$$

WQV - Water Quality Volume (watershed-inches)

P - Rainfall Event (1.37 inches in Kansas City)

RV - Volumetric Runoff Coefficient

$$RV = 0.05 + 0.009(I)$$

I - Percent Site Imperviousness (%)

### I. Determine Weighted RV & Weighted Rational C Coefficient

Cover Type	% Impervious	Area (Ac.)	Total Impervious Area (Ac.)	Rational Runoff Coefficient	RV	C * Area	RV * Area
Multifamily (Apartments)	60	26.02	15.61	0.66	0.59	17.1732	15.3518
			0.00		0.05	0	0
<b>Total</b>		<b>26.02</b>	<b>15.61</b>			<b>17.173</b>	<b>15.3518</b>

$$Rv = \text{Sum}(Rv * A) / \text{Total Area} = 15.35 / 26.02 = 0.590$$

$$C = \text{Sum}(C * A) / \text{Total Area} = 17.17 / 26.02 = 0.660$$

### II. Determine Water Quality Volume

$$WQV = P * Rv = 1.37 * 0.59 = 0.808 \text{ in}$$

### III. Determine Total Water Quality Volume

$$\text{Total Watershed Area (AT)} = 26.02 \text{ acres}$$

$$WQV = 0.808 \text{ in}$$

$$WQV = (26.02 * 0.808) / 12 = 1.75 \text{ ac-ft}$$

## Extended Wet Detention Basin - EWDB#1

Design Worksheet

**Project: 22-102 Residences at Blackwell**  
 FINAL STORMWATER MANAGEMENT PLAN  
 5/11/2023

<b>I. Basin Water Quality Volume</b>		
Tributary Area to EWDB, $A_T$	$A_T =$	26.02 acres
Water Quality Volume, $WQ_V$ - See Attached Calculations	$WQ_V =$	1.753 ac-ft
<b>IIa. Permanent Pool Volume - Method 1</b>		
Average 14 Day Wet Season Rainfall, $R_{14}$	$R_{14} =$	2.2 in
Rational Runoff Coefficient, $C$	$C =$	0.660
Permanent Pool Volume by Method 1, $V_{P1}$ $V_{P1} = (C * A_T * R_{14}) / 12$	$V_{P1} =$	3.148 ac-ft
<b>IIb. Permanent Pool Volume - Method 2</b>		
Ratio of Basin Volume to Runoff Volume, $V_{B/R}$ (From Figure 12; $V_{B/R}$ should be $\geq 4.0$ )	$V_{B/R} =$	4
Mean Storm Depth, $S_d$	$S_d =$	0.6 in
Impervious Tributary Area, $A_i$	$A_i =$	15.61 acres
Permanent Pool Volume by Method 2, $V_{P2}$ $V_{P2} = (V_{B/R} * S_d * A_i) / 12$	$V_{P2} =$	3.122 ac-ft
<b>IIc. Permanent Pool Design Volume</b>		
Design Permanent Pool Volume, $V_P$ (Larger of $V_{P1}$ and $V_{P2}$ plus 20%)	$V_P =$	3.778 ac-ft
Average Permanent Pool Depth, $Z_P$	$Z_P =$	6 ft
Permanent Pool Surface Area, $A_P$	$A_P =$	0.630 ac
<b>IIId. Water Quality Outlet - V-Notch Weir</b>		
Depth of Water Quality Volume Above Permanent Pool, $Z_{WQ}$	$Z_{WQ} =$	1.65 ft
Average Head of Water Quality Pool Volume Over Invert of V-Notch, $H_{WQ}$ $H_{WQ} = 0.50 * Z_{WQ}$	$H_{WQ} =$	0.8 ft
Average Water Quality Pool Outflow Rate, $Q_{WQ}$ $Q_{WQ} = (WQ_V * 43560) / (40 * 3600)$	$Q_{WQ} =$	0.53 cfs
V-Notch Weir Coefficient, $C_v$	$C_v =$	2.62
V-Notch Weir Angle $\Theta = 2 * (180 / \pi) * \arctan(Q_{WQ} / (C_v * H_{WQ}^{5/2}))$ - Not < 20 degrees	$\Theta =$	0.6 deg
V-Notch Weir Top Width, $W_v$ $W_v = 2 * Z_{WQ} * \tan(\Theta / 2)$	$W_v =$	0.02 ft

# Extended Wet Detention Basin - EWDB#2

Project: 22-097 Traditions at Blackwell  
5/11/2023 15:27

## Water Quality Volume Calculation

$$WQV = P * \text{Weighted RV}$$

WQV - Water Quality Volume (watershed-inches)

P - Rainfall Event (1.37 inches in Kansas City)

RV - Volumetric Runoff Coefficient

$$RV = 0.05 + 0.009(I)$$

I - Percent Site Imperviousness (%)

### I. Determine Weighted RV & Weighted Rational C Coefficient

Cover Type	% Impervious	Area (Ac.)	Total Impervious Area (Ac.)	Rational Runoff Coefficient	RV	C * Area	RV * Area
Townhomes	60	12.00	7.20	0.66	0.59	7.92	7.08
			0.00		0.05	0	0
<b>Total</b>		<b>12</b>	<b>7.20</b>			<b>7.920</b>	<b>7.08</b>

$$Rv = \text{Sum}(Rv * A) / \text{Total Area} = 7.08 / 12 = 0.590$$

$$C = \text{Sum}(C * A) / \text{Total Area} = 7.92 / 12 = 0.660$$

### II. Determine Water Quality Volume

$$WQV = P * Rv = 1.37 * 0.59 = 0.808 \text{ in}$$

### III. Determine Total Water Quality Volume

$$\text{Total Watershed Area (AT)} = 12 \text{ acres}$$

$$WQV = 0.808 \text{ in}$$

$$WQV = (12 * 0.808) / 12 = 0.81 \text{ ac-ft}$$

## Extended Wet Detention Basin - EWDB#2

Design Worksheet

### Traditions at Blackwell

PRELIMINARY STORMWATER MANAGEMENT PLAN

5/11/2023

<b>I. Basin Water Quality Volume</b>		
Tributary Area to EWDB, $A_T$	$A_T =$	12.00 acres
Water Quality Volume, $WQ_V$ - See Attached Calculations	$WQ_V =$	0.808 ac-ft
<b>IIa. Permanent Pool Volume - Method 1</b>		
Average 14 Day Wet Season Rainfall, $R_{14}$	$R_{14} =$	2.2 in
Rational Runoff Coefficient, $C$	$C =$	0.660
Permanent Pool Volume by Method 1, $V_{P1}$ $V_{P1} = (C \cdot A_T \cdot R_{14}) / 12$	$V_{P1} =$	1.452 ac-ft
<b>IIb. Permanent Pool Volume - Method 2</b>		
Ratio of Basin Volume to Runoff Volume, $V_{B/R}$ (From Figure 12; $V_{B/R}$ should be $\geq 4.0$ )	$V_{B/R} =$	4
Mean Storm Depth, $S_d$	$S_d =$	0.6 in
Impervious Tributary Area, $A_i$	$A_i =$	7.20 acres
Permanent Pool Volume by Method 2, $V_{P2}$ $V_{P2} = (V_{B/R} \cdot S_d \cdot A_i) / 12$	$V_{P2} =$	1.440 ac-ft
<b>IIc. Permanent Pool Design Volume</b>		
Design Permanent Pool Volume, $V_P$ (Larger of $V_{P1}$ and $V_{P2}$ plus 20%)	$V_P =$	1.742 ac-ft
Average Permanent Pool Depth, $Z_P$	$Z_P =$	6 ft
Permanent Pool Surface Area, $A_P$	$A_P =$	0.290 ac
<b>IIId. Water Quality Outlet - V-Notch Weir</b>		
Depth of Water Quality Volume Above Permanent Pool, $Z_{WQ}$	$Z_{WQ} =$	1.6 ft
Average Head of Water Quality Pool Volume Over Invert of V-Notch, $H_{WQ}$ $H_{WQ} = 0.50 \cdot Z_{WQ}$	$H_{WQ} =$	0.8 ft
Average Water Quality Pool Outflow Rate, $Q_{WQ}$ $Q_{WQ} = (WQ_V \cdot 43560) / (40 \cdot 3600)$	$Q_{WQ} =$	0.24 cfs
V-Notch Weir Coefficient, $C_v$	$C_v =$	2.62
V-Notch Weir Angle $\Theta = 2 \cdot (180/\pi) \cdot \arctan(Q_{WQ} / (C_v \cdot H_{WQ}^{5/2}))$ - Not < 20 degrees	$\Theta =$	20.0 deg
V-Notch Weir Top Width, $W_v$ $W_v = 2 \cdot Z_{WQ} \cdot \tan(\Theta/2)$	$W_v =$	0.56 ft

# Extended Wet Detention Basin - EWDB#3

Project: 22-093 Blackwell Reserve

5/11/2023 15:27

## Water Quality Volume Calculation

$$WQV = P * \text{Weighted RV}$$

WQV - Water Quality Volume (watershed-inches)

P - Rainfall Event (1.37 inches in Kansas City)

RV - Volumetric Runoff Coefficient

$$RV = 0.05 + 0.009(I)$$

I - Percent Site Imperviousness (%)

### I. Determine Weighted RV & Weighted Rational C Coefficient

Cover Type	% Impervious	Area (Ac.)	Total Impervious Area (Ac.)	Rational Runoff Coefficient	RV	C * Area	RV * Area
Single-Family Lots	35	11.25	3.94	0.51	0.365	5.7375	4.10625
Townhomes	60	12.54	7.52	0.66	0.59	8.2764	7.3986
			0.00		0.05	0	0
<b>Total</b>		<b>23.79</b>	<b>11.46</b>			<b>14.014</b>	<b>11.50485</b>

$$Rv = \text{Sum}(Rv * A) / \text{Total Area} = 11.5 / 23.79 = 0.484$$

$$C = \text{Sum}(C * A) / \text{Total Area} = 14.01 / 23.79 = 0.589$$

### II. Determine Water Quality Volume

$$WQV = P * Rv = 1.37 * 0.483601 = 0.663 \text{ in}$$

### III. Determine Total Water Quality Volume

$$\text{Total Watershed Area (AT)} = 23.79 \text{ acres}$$

$$WQV = 0.663 \text{ in}$$

$$WQV = (23.79 * 0.662) / 12 = 1.31 \text{ ac-ft}$$

## Extended Wet Detention Basin - EWDB#3

Design Worksheet

### Blackwell Reserve

PRELIMINARY STORMWATER MANAGEMENT PLAN

5/11/2023

<b>I. Basin Water Quality Volume</b>		
Tributary Area to EWDB, $A_T$	$A_T =$	23.79 acres
Water Quality Volume, $WQ_V$ - See Attached Calculations	$WQ_V =$	1.313 ac-ft
<b>IIa. Permanent Pool Volume - Method 1</b>		
Average 14 Day Wet Season Rainfall, $R_{14}$	$R_{14} =$	2.2 in
Rational Runoff Coefficient, $C$	$C =$	0.589
Permanent Pool Volume by Method 1, $V_{P1}$ $V_{P1} = (C * A_T * R_{14}) / 12$	$V_{P1} =$	2.569 ac-ft
<b>IIb. Permanent Pool Volume - Method 2</b>		
Ratio of Basin Volume to Runoff Volume, $V_{B/R}$ (From Figure 12; $V_{B/R}$ should be $\geq 4.0$ )	$V_{B/R} =$	4
Mean Storm Depth, $S_d$	$S_d =$	0.6 in
Impervious Tributary Area, $A_i$	$A_i =$	11.46 acres
Permanent Pool Volume by Method 2, $V_{P2}$ $V_{P2} = (V_{B/R} * S_d * A_i) / 12$	$V_{P2} =$	2.292 ac-ft
<b>IIc. Permanent Pool Design Volume</b>		
Design Permanent Pool Volume, $V_P$ (Larger of $V_{P1}$ and $V_{P2}$ plus 20%)	$V_P =$	3.083 ac-ft
Average Permanent Pool Depth, $Z_P$	$Z_P =$	7.5 ft
Permanent Pool Surface Area, $A_P$	$A_P =$	0.411 ac
<b>IIId. Water Quality Outlet - V-Notch Weir</b>		
Depth of Water Quality Volume Above Permanent Pool, $Z_{WQ}$	$Z_{WQ} =$	2.0 ft
Average Head of Water Quality Pool Volume Over Invert of V-Notch, $H_{WQ}$ $H_{WQ} = 0.50 * Z_{WQ}$	$H_{WQ} =$	1.0 ft
Average Water Quality Pool Outflow Rate, $Q_{WQ}$ $Q_{WQ} = (WQ_V * 43560) / (40 * 3600)$	$Q_{WQ} =$	0.40 cfs
V-Notch Weir Coefficient, $C_v$	$C_v =$	2.62
V-Notch Weir Angle $\Theta = 2 * (180 / \pi) * \arctan(Q_{WQ} / (C_v * H_{WQ}^{5/2})) - \text{Not} < 20 \text{ degrees}$	$\Theta =$	20.0 deg
V-Notch Weir Top Width, $W_v$ $W_v = 2 * Z_{WQ} * \tan(\Theta / 2)$	$W_v =$	0.71 ft

## Water Quality Volume Calculation - EDDB#1

$$WQV = P * \text{Weighted RV}$$

WQV - Water Quality Volume (watershed-inches)

P - Rainfall Event (1.37 inches in Kansas City)

RV - Volumetric Runoff Coefficient

$$RV = 0.05 + 0.009(I)$$

I - Percent Site Imperviousness (%)

### I. Determine Weighted RV & Weighted Rational C Coefficient

Cover Type	% Impervious	Area (Ac.)	Total Impervious Area (Ac.)	Rational Runoff Coefficient	RV	C * Area	RV * Area
Commercial	85	4.93	4.19	0.81	0.82	3.99	4.02
<b>Total</b>	<b>85</b>	<b>4.93</b>	<b>4.19</b>			<b>3.99</b>	<b>4.02</b>

$$Rv = \text{Sum}(Rv * A) / \text{Total Area} = 4.018 / 4.93 = 0.815$$

$$C = \text{Sum}(C * A) / \text{Total Area} = 3.993 / 4.93 = 0.810$$

### II. Determine Water Quality Volume

$$WQV = P * Rv = 1.37 * 0.815 = 1.117 \text{ in}$$

### III. Determine Total Water Quality Volume

$$\text{Total Watershed Area (AT)} = 4.93 \text{ acres}$$

$$WQV = 1.117 \text{ in}$$

$$WQV = (4.93 * 1.116) / 12 = 0.46 \text{ ac-ft} \quad 19981.67 \text{ c.f.}$$

### IV. Peak rate of runoff for WQv

$$Q = K * C * i * A$$

$$K = 1 \text{ for WQv}$$

$$C = 0.3 + 0.6 I$$

$$I = \text{Percent impervious}$$

$$i = \text{Rainfall Intensity from Table 9 in BMP manual}$$

$$C = 0.3 + 0.6 * I = 0.81$$

$$K = 1.00$$

$$i = 1.90$$

$$Q \text{ (cfs)} = 7.59$$

**Design Procedure Form: Extended Dry Detention Basin (EDDB)  
Main Worksheet**

**Designer:** \_\_\_\_\_ MWM  
**Checked by:** \_\_\_\_\_ MAB  
**Company:** \_\_\_\_\_ SCHLAGEL & ASSOCIATES, P.A.  
**Date:** \_\_\_\_\_ 5/11/2023  
**Project:** \_\_\_\_\_ 22-102  
**Location:** \_\_\_\_\_

EDDB#1

**I. Basin Water Quality Storage Volume:**

Step 1) Tributary Area to EDDB,  $A_T$  (ac.)  $A_T$  (ac.) = 4.93  
 Step 2) Calculate WQv using method in Section 6.1 WQv (ac-ft) = 0.46  
 Step 3) Add 20 percent to account for silt and sand sediment deposition in the basin  $V_{design}$  (ac-ft) = 0.55

**Ila. Water Quality Outlet Type**

Step 1) Set Water Quality Outlet Type Outlet Type = 1.00  
     Type 1 = Single Orifice  
     Type 2 = Perforated riser or plate  
     Type 3 = v-notch weir  
 Step 2) Proceed to step 2b, 2c, or 2d based on water quality outlet type

**Ilb. Water Quality Outlet, Single Orifice**

Step 1) Depth of water quality volume at outlet,  $Z_{WQ}$  (ft.)  $Z_{WQ}$  (ft.) = 2.20  
 Step 2) Average head of Water Quality volume over invert of orifice,  $H_{WQ}$  (ft)  $H_{WQ}$  (ft.) = 1.10  
      $H_{WQ} = 0.5 * Z_{WQ}$   
 Step 3) Average water quality outflow rate,  $Q_{WQ}$  (cfs)  $Q_{WQ}$  (cfs) = 0.17  
      $Q_{WQ} = (WQv * 43,560)/(40 * 3600)$   
 Step 4) Set value of orifice discharge coefficient,  $C_O$   $C_O$  = 0.66  
      $C_O = 0.66$  when thickness of riser/weir plate is = or < orifice diameter  
      $C_O = 0.80$  when thickness of riser/weir plate is > orifice diameter  
 Step 5) Water quality outlet orifice diameter (4.0-in, min.),  $D_O$  (in)  $D_O$  (in) = 2.34  
      $D_O = 12 * 2 * (Q_{WQ}/C_O * \pi * (2 * g * H)^{0.5})^{0.5}$   
 Step 6) To size outlet orifice for EDDB with an irregular stage-volume relationship, use Single Outlet Worksheet

### IIc. Water Quality Outlet, Perforated Riser

Step 1) Depth at outlet above lowest perforation, $Z_{WQ}$ (ft.)	$Z_{WQ}$ (ft.) =	<u>5.00</u>
Step 2) Recommended maximum outlet area per row, $A_o$ (in <sup>2</sup> ) $A_o = (WQv)/(0.013 * Z_{WQ}^2 + 0.22 * Z_{WQ} - 0.10)$	$A_o$ (in <sup>2</sup> ) =	<u>0.35</u>
Step 3) Circular perforation diameter per row assuming a single column, $D_1$ (in)	$D_1$ (in) =	<u>0.66</u>
Step 4) Number of Columns, $n_c$	$n_c$ =	<u>1.00</u>
Step 5) Design circular perforation diameter (should be between 1 and 2 inches), $D_{perf}$ (in)	$D_{perf}$ (in) =	<u>1.00</u>
Step 6) Horizontal perforation column spacing when $n_c > 1$ , center to center, $S_c$ If $D_{perf} \geq 1.0$ in, $S_c = 4$	$S_c$ (in) =	<u>4.00</u>
Step 7) Number of rows (4" vertical spacing between perforations, center to center), $n_r$	$n_r$ =	<u>16.00</u>

### IIb. Water Quality Outlet, V-notch Weir

Step 1) Depth of water quality volume above permanent pool, $Z_{WQ}$ (ft.)	$Z_{WQ}$ (ft.) =	<u>2.50</u>
Step 2) Average head of Water Quality volume over invert of V-notch, $H_{WQ}$ (ft.) $H_{WQ} = 0.5 * Z_{WQ}$	$H_{WQ}$ (ft.) =	<u>1.25</u>
Step 3) Average water quality outflow rate, $Q_{WQ}$ (cfs) $Q_{WQ} = (WQv * 43,560)/(40 * 3600)$	$Q_{WQ}$ (cfs) =	<u>0.17</u>
Step 4) V-notch weir coefficient, $C_v$	$C_v$ =	<u>2.50</u>
Step 5) V-notch weir angle, $\theta$ (deg) $\theta = 2 * \arctan(Q_{WQ} / C_v * H_{WQ}^{5/2})$ V-notch angle should be at least 20 degrees. Set to 20 degrees if calculated angle is smaller.	$\theta$ (deg) =	<u>20.00</u> Use 20
Step 6) Top width of V-notch weir $W_v = 2 * Z_{WQ} * \tan(\theta/2)$	$W_v$ (ft.) =	<u>0.88</u>
Step 7) To calculate v-notch angle for EDDB with and irregular stage-volume relationship, use the V-notch Weir Worksheet		

## Basin Volume - EWDB #1

Project #: Residences at Blackwell

22-102

Time: 5/11/2023 15:57

Work By: MWM

Volume computed using Conic Method For Reservoir Volumes

$$\text{Volume} = (1/3) * (\text{EL2}-\text{EL1}) * (\text{Area1} + \text{Area2} + (\text{Area1} * \text{Area2})^{0.5})$$

Elevation (ft)	Area (ft <sup>2</sup> )	Area (AC)	Δ Volume (ft <sup>3</sup> )	Total Volume (ft <sup>3</sup> )	Total Volume (ac-ft)
986	20535	0.471	0	0	0.000
987	24756	0.568	22610	22610	0.519
988	29078	0.668	26885	49496	1.136
989	33500	0.769	31260	80756	1.854
990	38024	0.873	35735	116490	2.674
991	42647	0.979	40309	156799	3.600
992	47371	1.087	44984	201783	4.632
993	52195	1.198	49759	251542	5.775
993.3	53662	1.232	15876	267418	6.139
994	62399	1.432	40579	307997	7.071
994.3	66238	1.521	19291	327288	7.513
996.8	98192	2.254	204211	531499	12.202
997	69233	1.589	16657	548156	12.584
998	74497	1.710	71842	619997	14.233
999	79862	1.833	77156	697154	16.004
1000	85328	1.959	82572	779725	17.900
1001	90894	2.087	88088	867813	19.922
1002	96560	2.217	93703	961516	22.073
1002.7	1006	0.023	25062	986579	22.649

## Basin Volume - EWDB #2

Project #: Reunion at Blackwell

22-102

Time: 5/11/2023 15:57

Work By: MWM

Volume computed using Conic Method For Reservoir Volumes

$$\text{Volume} = (1/3) * (\text{EL2}-\text{EL1}) * (\text{Area1} + \text{Area2} + (\text{Area1} * \text{Area2})^{0.5})$$

Elevation (ft)	Area (ft <sup>2</sup> )	Area (AC)	Δ Volume (ft <sup>3</sup> )	Total Volume (ft <sup>3</sup> )	Total Volume (ac-ft)
984.0	7552	0.173	0	0	0.000
985.0	9158	0.210	8341	8341	0.191
986.0	10872	0.250	10002	18343	0.421
987.0	12686	0.291	11766	30109	0.691
988.0	14600	0.335	13630	43740	1.004
988.5	15595	0.358	7547	51286	1.177
989.0	18191	0.418	8437	59724	1.371
989.5	20945	0.481	9775	69499	1.595
992.0	20951	0.481	52365	121863	2.798
992.0	21802	0.501	214	122077	2.803
993.0	24155	0.555	22736	144814	3.324
994.0	26610	0.611	25370	170184	3.907
995.0	29165	0.670	27875	198059	4.547
996.0	31820	0.730	30480	228538	5.247
996.5	34150	0.784	16487	245026	5.625
997.0	35304	0.810	17361	262387	6.024
998.0	37500	0.861	36393	298780	6.859

## Basin Volume - EWDB #3

Project #: Reunion at Blackwell

22-102

Time: 5/11/2023 15:57

Work By: MWM

Volume computed using Conic Method For Reservoir Volumes

$$\text{Volume} = (1/3) * (\text{EL2}-\text{EL1}) * (\text{Area1} + \text{Area2} + (\text{Area1} * \text{Area2})^{0.5})$$

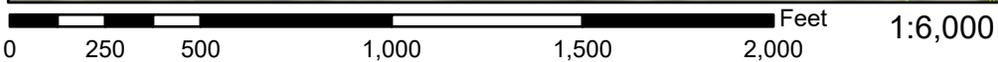
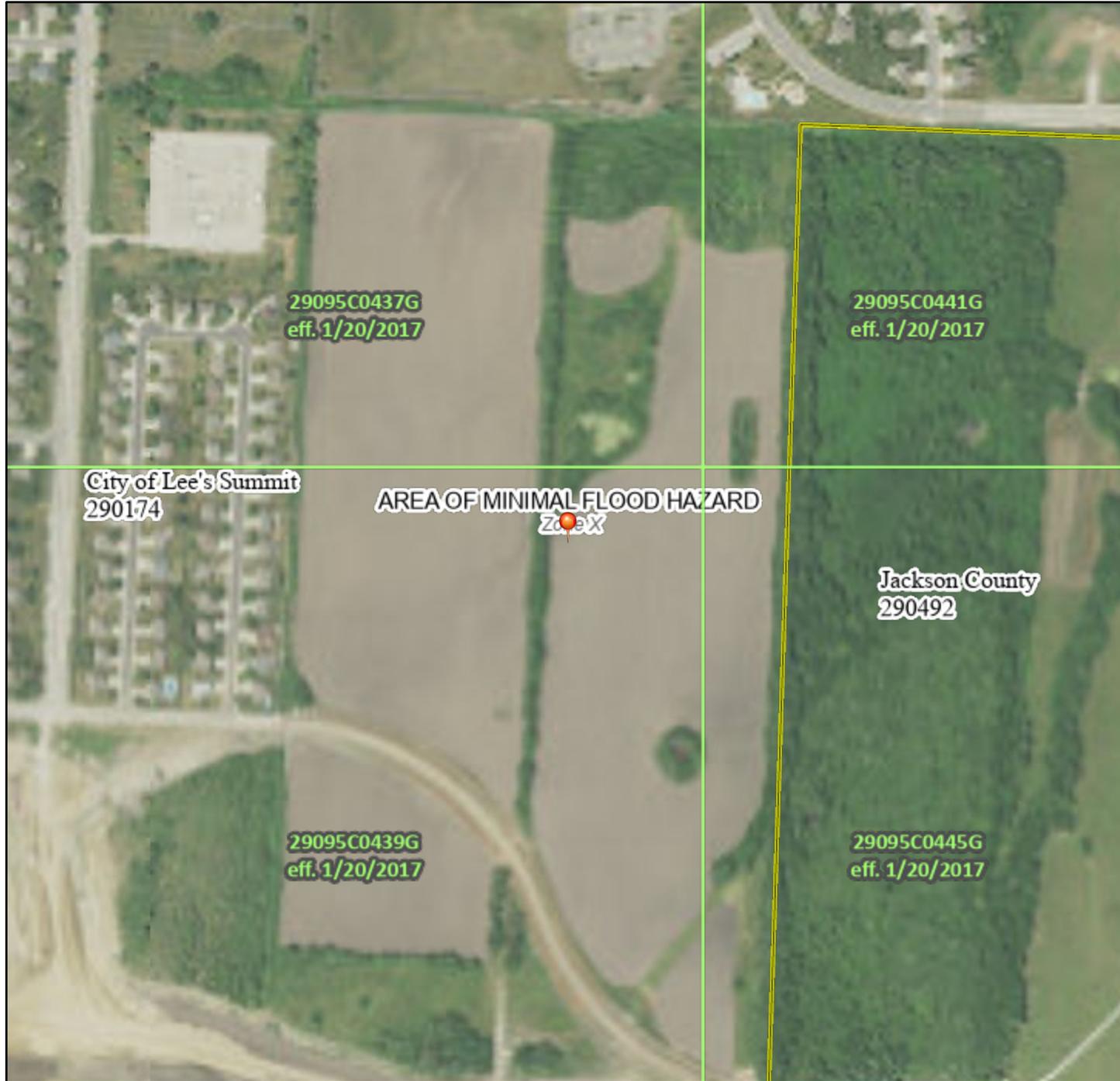
Elevation (ft)	Area (ft <sup>2</sup> )	Area (AC)	Δ Volume (ft <sup>3</sup> )	Total Volume (ft <sup>3</sup> )	Total Volume (ac-ft)
976.0	10215	0.235	0	0	0.000
977.0	12066	0.277	11127	11127	0.255
978.0	14041	0.322	13040	24166	0.555
979.0	16139	0.371	15076	39243	0.901
980.0	18364	0.422	17238	56480	1.297
981.0	20689	0.475	19513	75993	1.745
982.0	23115	0.531	21889	97882	2.247
983.0	29619	0.680	26297	124179	2.851
985.5	29626	0.680	74049	198228	4.551
985.5	30649	0.704	30	198258	4.551
986.0	32044	0.736	15639	213897	4.910
987.0	34910	0.801	33463	247361	5.679
988.0	38421	0.882	36648	284009	6.520
989.0	42954	0.986	40662	324671	7.453
990.0	47178	1.083	45045	369716	8.488
991.0	52031	1.194	49580	419296	9.626
992.0	57384	1.317	54680	473976	10.881
993.0	64631	1.484	60966	534941	12.281
994.0	70388	1.616	67482	602424	13.830

46797.84

# National Flood Hazard Layer FIRMette



94°19'8"W 38°54'35"N



Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

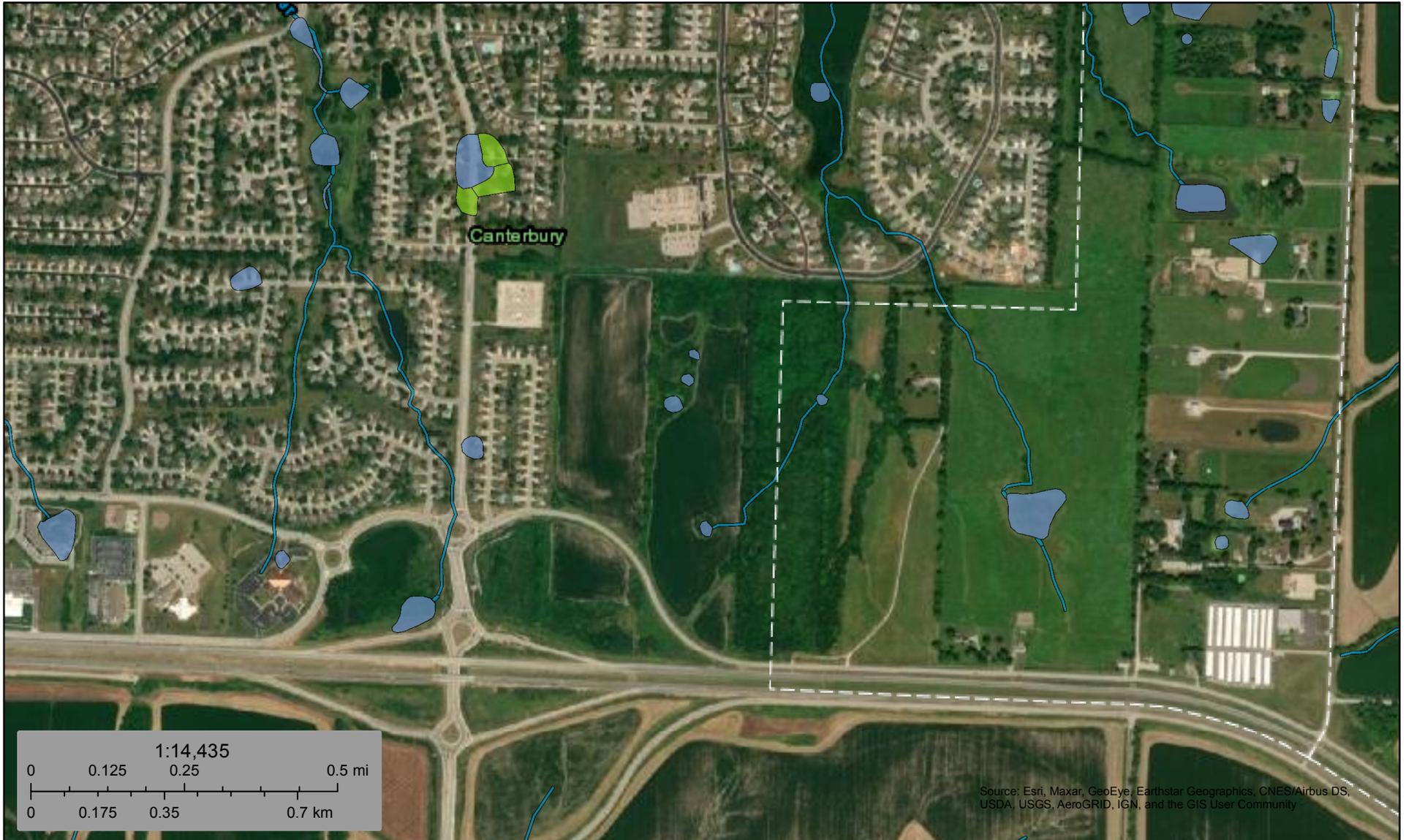
- |                                    |  |  |
|------------------------------------|--|--|
| <b>SPECIAL FLOOD HAZARD AREAS</b>  |  | Without Base Flood Elevation (BFE)<br><i>Zone A, V, A99</i>  |
|                                    |  | With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>   |
|                                    |  | Regulatory Floodway  |
| <b>OTHER AREAS OF FLOOD HAZARD</b> |  | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i> |
|                                    |  | Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>  |
|                                    |  | Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>  |
|                                    |  | Area with Flood Risk due to Levee <i>Zone D</i>  |
| <b>OTHER AREAS</b>                 |  | NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>   |
|                                    |  | Effective LOMRs  |
| <b>GENERAL STRUCTURES</b>          |  | Area of Undetermined Flood Hazard <i>Zone D</i>  |
|                                    |  | Channel, Culvert, or Storm Sewer   |
|                                    |  | Levee, Dike, or Floodwall  |
| <b>OTHER FEATURES</b>              |  | 20.2 Cross Sections with 1% Annual Chance Water Surface Elevation  |
|                                    |  | 17.5   |
|                                    |  | 8 Coastal Transect   |
|                                    |  | 5.12 Base Flood Elevation Line (BFE)   |
|                                    |  | Limit of Study   |
| <b>MAP PANELS</b>                  |  | Jurisdiction Boundary  |
|                                    |  | Coastal Transect Baseline  |
|                                    |  | Profile Baseline   |
|                                    |  | Hydrographic Feature   |
|                                    |  | Digital Data Available   |
|                                    |  | No Digital Data Available  |
|                                    |  | Unmapped   |
|                                    |  | The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.                                     |



This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **7/30/2021 at 10:56 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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July 30, 2021

**Wetlands**

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Lake
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

**APPENDIX B**

-NRCS Soil Resource Report

-HydroCAD Model Output Report

- Wetland Delineation and Jurisdictional Assessment



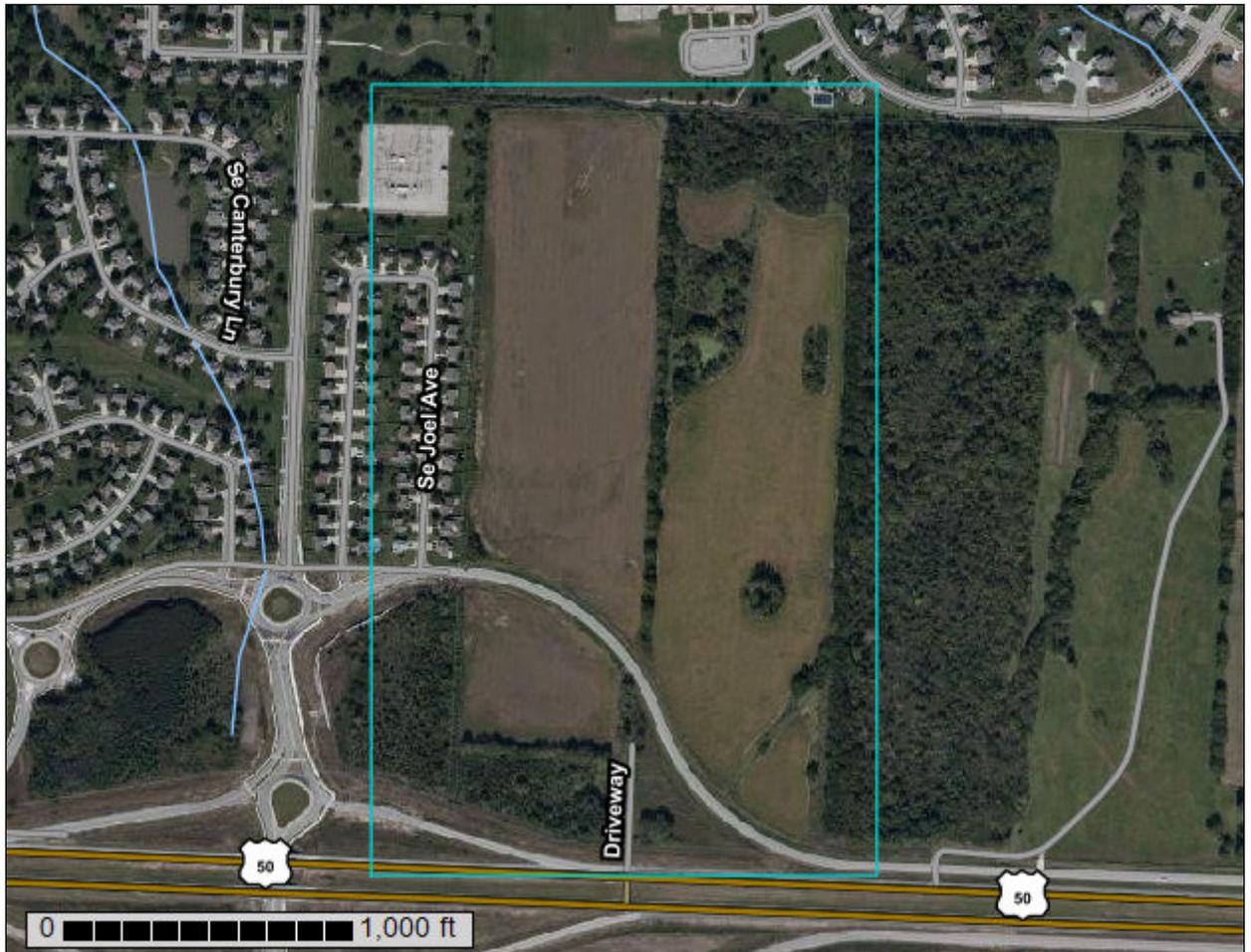
United States  
Department of  
Agriculture

**NRCS**

Natural  
Resources  
Conservation  
Service

A product of the National  
Cooperative Soil Survey,  
a joint effort of the United  
States Department of  
Agriculture and other  
Federal agencies, State  
agencies including the  
Agricultural Experiment  
Stations, and local  
participants

# Custom Soil Resource Report for **Jackson County, Missouri**



# Preface

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Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2\\_053951](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951)).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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# How Soil Surveys Are Made

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Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

## Custom Soil Resource Report

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

## Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

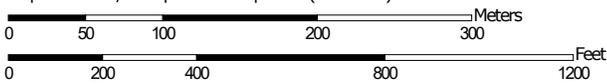
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The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

# Custom Soil Resource Report Soil Map



Map Scale: 1:4,870 if printed on A portrait (8.5" x 11") sheet.



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: Jackson County, Missouri  
 Survey Area Data: Version 22, May 29, 2020

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

Date(s) aerial images were photographed: Sep 6, 2019—Nov 16, 2019

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
10000	Arisburg silt loam, 1 to 5 percent slopes	50.5	46.1%
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	9.1	8.3%
10117	Sampsel silty clay loam, 5 to 9 percent slopes	27.1	24.8%
10128	Sharpsburg-Urban land complex, 2 to 5 percent slopes	5.9	5.4%
10180	Udarents-Urban land-Sampsel complex, 2 to 5 percent slopes	5.8	5.3%
10181	Udarents-Urban land-Sampsel complex, 5 to 9 percent slopes	9.2	8.4%
10183	Udarents-Urban land-Polo complex, 5 to 9 percent slopes	1.9	1.8%
<b>Totals for Area of Interest</b>		<b>109.5</b>	<b>100.0%</b>

## 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

## Custom Soil Resource Report

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.

## Jackson County, Missouri

### 10000—Arisburg silt loam, 1 to 5 percent slopes

#### Map Unit Setting

*National map unit symbol:* 2w22b  
*Elevation:* 610 to 1,130 feet  
*Mean annual precipitation:* 39 to 43 inches  
*Mean annual air temperature:* 50 to 55 degrees F  
*Frost-free period:* 177 to 220 days  
*Farmland classification:* All areas are prime farmland

#### Map Unit Composition

*Arisburg and similar soils:* 87 percent  
*Minor components:* 13 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Arisburg

##### Setting

*Landform:* Interfluves  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Interfluve  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Parent material:* Loess

##### Typical profile

*Ap - 0 to 6 inches:* silt loam  
*A - 6 to 13 inches:* silt loam  
*Bt - 13 to 19 inches:* silty clay loam  
*Btg - 19 to 56 inches:* silty clay loam  
*BCg - 56 to 79 inches:* silty clay loam

##### Properties and qualities

*Slope:* 1 to 5 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Somewhat poorly drained  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.60 in/hr)  
*Depth to water table:* About 18 to 30 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 capacity:* High (about 11.5 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2e  
*Hydrologic Soil Group:* C  
*Ecological site:* R107BY007MO - Loess Upland Prairie *Amorpha canescens*/  
*Andropogon gerardii-Zizia aurea* Leadplant/Big Bluestem-Golden *Zizia*  
*Hydric soil rating:* No

**Minor Components**

**Greenton**

*Percent of map unit:* 5 percent  
*Landform:* Hillslopes  
*Landform position (two-dimensional):* Shoulder  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Ecological site:* R109XY002MO - Loess Upland Prairie  
*Hydric soil rating:* No

**Sharpsburg**

*Percent of map unit:* 5 percent  
*Landform:* Ridges  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Interfluve  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Ecological site:* R109XY002MO - Loess Upland Prairie  
*Hydric soil rating:* No

**Haig**

*Percent of map unit:* 3 percent  
*Landform:* Flats  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Talf  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex  
*Ecological site:* R109XY001MO - Claypan Summit Prairie  
*Hydric soil rating:* Yes

**10082—Arisburg-Urban land complex, 1 to 5 percent slopes**

**Map Unit Setting**

*National map unit symbol:* 2w7ld  
*Elevation:* 750 to 1,130 feet  
*Mean annual precipitation:* 39 to 45 inches  
*Mean annual air temperature:* 50 to 55 degrees F  
*Frost-free period:* 177 to 220 days  
*Farmland classification:* All areas are prime farmland

**Map Unit Composition**

*Arisburg and similar soils:* 61 percent  
*Urban land:* 30 percent  
*Minor components:* 9 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

## Description of Arisburg

### Setting

*Landform:* Interfluves  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Interfluve  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Parent material:* Loess

### Typical profile

*Ap - 0 to 6 inches:* silt loam  
*A - 6 to 13 inches:* silt loam  
*Bt - 13 to 19 inches:* silty clay loam  
*Btg - 19 to 56 inches:* silty clay loam  
*BCg - 56 to 79 inches:* silty clay loam

### Properties and qualities

*Slope:* 1 to 5 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Somewhat poorly drained  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.60 in/hr)  
*Depth to water table:* About 18 to 30 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 capacity:* High (about 11.5 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2e  
*Hydrologic Soil Group:* C  
*Ecological site:* R107BY007MO - Loess Upland Prairie *Amorpha canescens/*  
*Andropogon gerardii-Zizia aurea* Leadplant/Big Bluestem-Golden Zizia  
*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

## Minor Components

### Sampsel

*Percent of map unit:* 3 percent  
*Landform:* Hills  
*Landform position (two-dimensional):* Backslope  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Concave  
*Ecological site:* R109XY010MO - Interbedded Sedimentary Upland Savanna  
*Hydric soil rating:* Yes

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### **Greenton**

*Percent of map unit:* 3 percent  
*Landform:* Hillslopes  
*Landform position (two-dimensional):* Shoulder  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Ecological site:* R109XY002MO - Loess Upland Prairie  
*Hydric soil rating:* No

### **Sharpsburg**

*Percent of map unit:* 3 percent  
*Landform:* Ridges  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Interfluve  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Ecological site:* R109XY002MO - Loess Upland Prairie  
*Hydric soil rating:* No

## **10117—Sampsel silty clay loam, 5 to 9 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* 2qkzz  
*Elevation:* 600 to 900 feet  
*Mean annual precipitation:* 33 to 41 inches  
*Mean annual air temperature:* 50 to 55 degrees F  
*Frost-free period:* 177 to 220 days  
*Farmland classification:* Prime farmland if drained

### **Map Unit Composition**

*Sampsel and similar soils:* 85 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Sampsel**

#### **Setting**

*Landform:* Hillslopes  
*Landform position (two-dimensional):* Shoulder  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Concave  
*Across-slope shape:* Convex, concave  
*Parent material:* Residuum weathered from shale

#### **Typical profile**

*Ap - 0 to 13 inches:* silty clay loam  
*Bt - 13 to 80 inches:* silty clay

**Properties and qualities**

*Slope:* 5 to 9 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Somewhat poorly drained  
*Runoff class:* Very high  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)  
*Depth to water table:* About 0 to 18 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 capacity:* Moderate (about 8.6 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 3e  
*Hydrologic Soil Group:* C/D  
*Ecological site:* R109XY010MO - Interbedded Sedimentary Upland Savanna  
*Other vegetative classification:* Grass/Prairie (Herbaceous Vegetation)  
*Hydric soil rating:* No

**10128—Sharpsburg-Urban land complex, 2 to 5 percent slopes**

**Map Unit Setting**

*National map unit symbol:* 2ql09  
*Elevation:* 1,000 to 1,300 feet  
*Mean annual precipitation:* 33 to 41 inches  
*Mean annual air temperature:* 50 to 55 degrees F  
*Frost-free period:* 177 to 220 days  
*Farmland classification:* All areas are prime farmland

**Map Unit Composition**

*Sharpsburg and similar soils:* 60 percent  
*Urban land:* 35 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Sharpsburg**

**Setting**

*Landform:* Interfluves  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Interfluve  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Parent material:* Loess

**Typical profile**

*A - 0 to 17 inches:* silt loam  
*Bt - 17 to 55 inches:* silty clay loam  
*C - 55 to 60 inches:* silty clay loam

## Custom Soil Resource Report

### Properties and qualities

*Slope:* 2 to 5 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 (0.06 to 0.20 in/hr)  
*Depth to water table:* About 24 to 35 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 capacity:* Very high (about 12.0 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2e  
*Hydrologic Soil Group:* D  
*Ecological site:* R109XY002MO - Loess Upland Prairie  
*Other vegetative classification:* Grass/Prairie (Herbaceous Vegetation)  
*Hydric soil rating:* No

### Description of Urban Land

#### Setting

*Landform:* Interfluves  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Interfluve

#### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 8  
*Hydric soil rating:* No

## 10180—Udarents-Urban land-Sampsel complex, 2 to 5 percent slopes

### Map Unit Setting

*National map unit symbol:* 1n85h  
*Elevation:* 600 to 900 feet  
*Mean annual precipitation:* 33 to 43 inches  
*Mean annual air temperature:* 50 to 57 degrees F  
*Frost-free period:* 175 to 220 days  
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Udarents and similar soils:* 41 percent  
*Urban land:* 39 percent  
*Sampsel and similar soils:* 15 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

## Description of Udarents

### Setting

*Landform position (two-dimensional):* Summit

*Landform position (three-dimensional):* Crest

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Parent material:* Mine spoil or earthy fill

### Typical profile

*C1 - 0 to 5 inches:* silt loam

*C2 - 5 to 80 inches:* silty clay loam

### Properties and qualities

*Slope:* 2 to 5 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Somewhat poorly drained

*Runoff class:* Very 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:* More than 80 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 capacity:* Moderate (about 9.0 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 6e

*Hydrologic Soil Group:* C

*Ecological site:* R107BY002MO - Deep Loess Upland Prairie Amorpha canescens/Schizachyrium scoparium-Sporobolus heterolepis Leadplant/Little Bluestem-Prairie Dropseed

*Other vegetative classification:* Mixed/Transitional (Mixed Native Vegetation)

*Hydric soil rating:* No

## Description of Urban Land

### Setting

*Landform:* Interfluves

*Landform position (two-dimensional):* Summit

*Landform position (three-dimensional):* Interfluve

*Across-slope shape:* Convex

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 8

*Hydric soil rating:* No

## Description of Sampsel

### Setting

*Landform:* Hillslopes

*Landform position (two-dimensional):* Footslope

*Landform position (three-dimensional):* Base slope

*Down-slope shape:* Concave

*Across-slope shape:* Convex

## Custom Soil Resource Report

*Parent material:* Residuum weathered from shale

### Typical profile

*Ap - 0 to 13 inches:* silty clay loam

*Bt - 13 to 80 inches:* silty clay

### Properties and qualities

*Slope:* 2 to 5 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Somewhat poorly drained

*Runoff class:* Very high

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)

*Depth to water table:* About 0 to 18 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 capacity:* Moderate (about 8.6 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 2e

*Hydrologic Soil Group:* C/D

*Ecological site:* R109XY010MO - Interbedded Sedimentary Upland Savanna

*Other vegetative classification:* Grass/Prairie (Herbaceous Vegetation)

*Hydric soil rating:* No

## 10181—Udarents-Urban land-Sampsel complex, 5 to 9 percent slopes

### Map Unit Setting

*National map unit symbol:* 1n85g

*Elevation:* 600 to 900 feet

*Mean annual precipitation:* 33 to 43 inches

*Mean annual air temperature:* 50 to 57 degrees F

*Frost-free period:* 175 to 220 days

*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Udarents and similar soils:* 41 percent

*Urban land:* 39 percent

*Sampsel and similar soils:* 15 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Udarents

#### Setting

*Landform position (two-dimensional):* Shoulder

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Convex

*Across-slope shape:* Convex

## Custom Soil Resource Report

*Parent material:* Mine spoil or earthy fill

### Typical profile

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

### Properties and qualities

*Slope:* 5 to 9 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Somewhat poorly drained  
*Runoff class:* Very 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:* More than 80 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 capacity:* Moderate (about 9.0 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* C  
*Ecological site:* R107BY002MO - Deep Loess Upland Prairie *Amorpha canescens*/Schizachyrium scoparium-Sporobolus heterolepis Leadplant/Little Bluestem-Prairie Dropseed  
*Other vegetative classification:* Mixed/Transitional (Mixed Native Vegetation)  
*Hydric soil rating:* No

### Description of Urban Land

#### Setting

*Landform:* Hillslopes  
*Landform position (two-dimensional):* Shoulder  
*Landform position (three-dimensional):* Side slope  
*Across-slope shape:* Convex

#### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 8  
*Hydric soil rating:* No

### Description of Sampsel

#### Setting

*Landform:* Hillslopes  
*Landform position (two-dimensional):* Footslope  
*Landform position (three-dimensional):* Base slope  
*Down-slope shape:* Concave  
*Across-slope shape:* Convex  
*Parent material:* Residuum weathered from shale

#### Typical profile

*Ap - 0 to 13 inches:* silty clay loam  
*Bt - 13 to 80 inches:* silty clay

#### Properties and qualities

*Slope:* 5 to 9 percent

## Custom Soil Resource Report

*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Somewhat poorly drained  
*Runoff class:* Very high  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)  
*Depth to water table:* About 0 to 18 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 capacity:* Moderate (about 8.6 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 3e  
*Hydrologic Soil Group:* C/D  
*Ecological site:* R109XY010MO - Interbedded Sedimentary Upland Savanna  
*Other vegetative classification:* Grass/Prairie (Herbaceous Vegetation)  
*Hydric soil rating:* No

## 10183—Udarents-Urban land-Polo complex, 5 to 9 percent slopes

### Map Unit Setting

*National map unit symbol:* 1n85d  
*Elevation:* 600 to 1,000 feet  
*Mean annual precipitation:* 33 to 41 inches  
*Mean annual air temperature:* 50 to 57 degrees F  
*Frost-free period:* 175 to 220 days  
*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Udarents and similar soils:* 41 percent  
*Urban land:* 39 percent  
*Polo and similar soils:* 15 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Udarents

#### Setting

*Landform position (two-dimensional):* Shoulder  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Parent material:* Mine spoil or earthy fill

#### Typical profile

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

#### Properties and qualities

*Slope:* 5 to 9 percent

## Custom Soil Resource Report

*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Somewhat poorly drained  
*Runoff class:* Very 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:* More than 80 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 capacity:* Moderate (about 9.0 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* C  
*Ecological site:* R107BY002MO - Deep Loess Upland Prairie *Amorpha canescens*/Schizachyrium scoparium-Sporobolus heterolepis Leadplant/Little Bluestem-Prairie Dropseed  
*Other vegetative classification:* Mixed/Transitional (Mixed Native Vegetation)  
*Hydric soil rating:* No

### Description of Urban Land

#### Setting

*Landform:* Hillslopes  
*Landform position (two-dimensional):* Shoulder  
*Landform position (three-dimensional):* Side slope  
*Across-slope shape:* Convex

#### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 8  
*Hydric soil rating:* No

### Description of Polo

#### Setting

*Landform:* Hillslopes  
*Landform position (two-dimensional):* Shoulder  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave, convex  
*Parent material:* Loess over residuum

#### Typical profile

*A - 0 to 12 inches:* silt loam  
*BA - 12 to 29 inches:* silty clay loam  
*Bt1 - 29 to 35 inches:* silty clay loam  
*2Bt2 - 35 to 80 inches:* silty clay

#### Properties and qualities

*Slope:* 5 to 9 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Well drained  
*Runoff class:* High  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)

## Custom Soil Resource Report

*Depth to water table:* More than 80 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 capacity:* High (about 9.9 inches)

### **Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 3e

*Hydrologic Soil Group:* C

*Ecological site:* R107BY007MO - Loess Upland Prairie *Amorpha canescens/*

*Andropogon gerardii-Zizia aurea* Leadplant/Big Bluestem-Golden *Zizia*

*Other vegetative classification:* Grass/Prairie (Herbaceous Vegetation)

*Hydric soil rating:* No

# Soil Information for All Uses

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## Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

## Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

## Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

## Custom Soil Resource Report

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

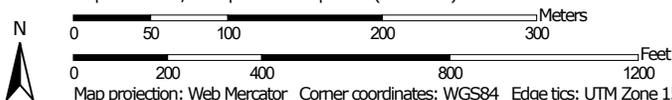
Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report  
Map—Hydrologic Soil Group



Map Scale: 1:4,870 if printed on A portrait (8.5" x 11") sheet.



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 Rating Polygons**

-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

**Soil Rating Lines**

-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

**Soil Rating Points**

-  A
-  A/D
-  B
-  B/D

**Water Features**

-  Streams and Canals

**Transportation**

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

**Background**

-  Aerial Photography

**Soils**

-  C
-  C/D
-  D
-  Not rated or not available

### 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: Jackson County, Missouri  
 Survey Area Data: Version 22, May 29, 2020

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

Date(s) aerial images were photographed: Sep 6, 2019—Nov 16, 2019

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.

**Table—Hydrologic Soil Group**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10000	Arisburg silt loam, 1 to 5 percent slopes	C	50.5	46.1%
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	C	9.1	8.3%
10117	Sampsel silty clay loam, 5 to 9 percent slopes	C/D	27.1	24.8%
10128	Sharpsburg-Urban land complex, 2 to 5 percent slopes	D	5.9	5.4%
10180	Udarents-Urban land-Sampsel complex, 2 to 5 percent slopes	C	5.8	5.3%
10181	Udarents-Urban land-Sampsel complex, 5 to 9 percent slopes	C	9.2	8.4%
10183	Udarents-Urban land-Polo complex, 5 to 9 percent slopes	C	1.9	1.8%
<b>Totals for Area of Interest</b>			<b>109.5</b>	<b>100.0%</b>

**Rating Options—Hydrologic Soil Group**

*Aggregation Method: Dominant Condition*

*Component Percent Cutoff: None Specified*

*Tie-break Rule: Higher*

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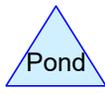
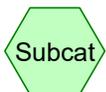
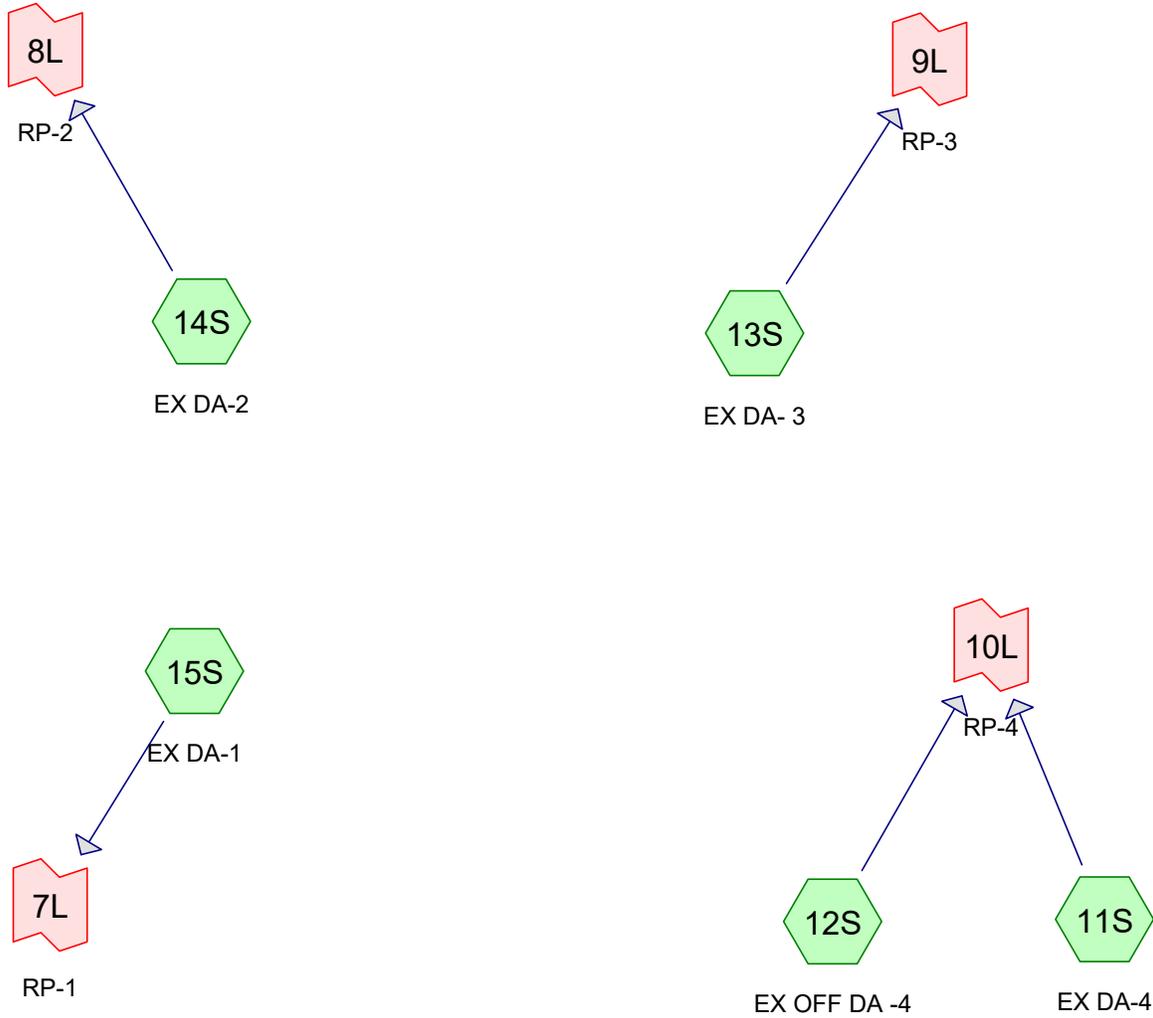
## Custom Soil Resource Report

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Existing Conditions



**22-102-HYDRO-EX**

Prepared by Schlagel

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Type II 24-hr 2-Year Rainfall=3.50"

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**Summary for Subcatchment 11S: EX DA-4**

Runoff = 38.59 cfs @ 12.12 hrs, Volume= 2.622 af, Depth> 1.63"

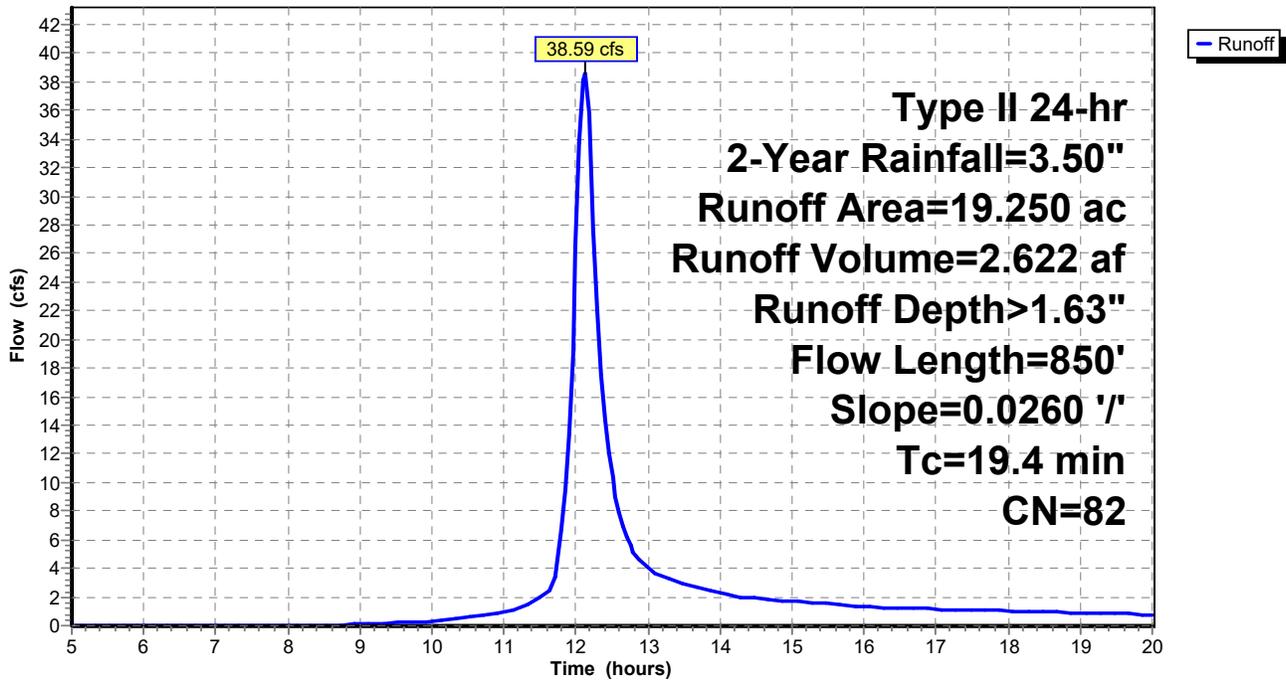
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-Year Rainfall=3.50"

Area (ac)	CN	Description
8.950	79	Pasture/grassland/range, Fair, HSG C
10.300	84	Pasture/grassland/range, Fair, HSG D
19.250	82	Weighted Average
19.250		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.0260	0.20		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.60"
11.1	750	0.0260	1.13		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
19.4	850	Total			

**Subcatchment 11S: EX DA-4**

Hydrograph



**22-102-HYDRO-EX**

Prepared by Schlagel

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Type II 24-hr 2-Year Rainfall=3.50"

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Page 3

**Summary for Subcatchment 12S: EX OFF DA -4**

Runoff = 11.43 cfs @ 12.18 hrs, Volume= 0.939 af, Depth> 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-Year Rainfall=3.50"

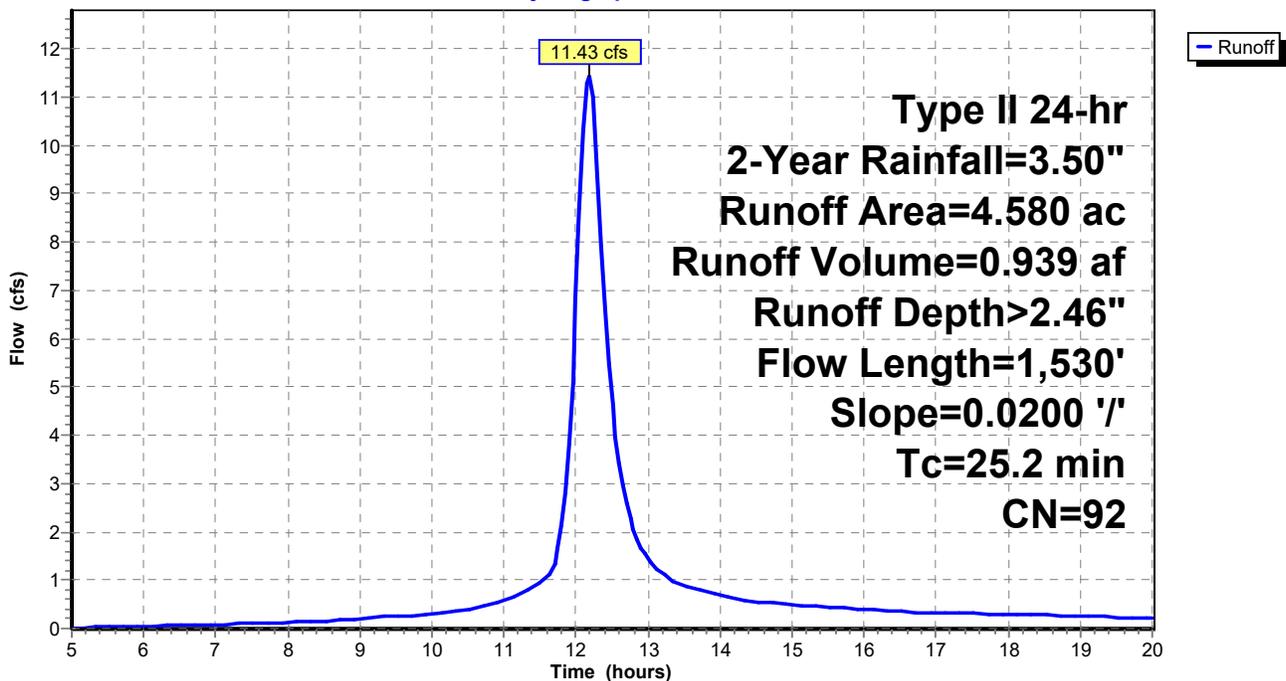
Area (ac)	CN	Description
4.580	92	Paved roads w/open ditches, 50% imp, HSG C
2.290		50.00% Pervious Area
2.290		50.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
24.1	1,430	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
25.2	1,530	Total			

**Subcatchment 12S: EX OFF DA -4**

Hydrograph



**22-102-HYDRO-EX**

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Type II 24-hr 2-Year Rainfall=3.50"

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**Summary for Subcatchment 13S: EX DA- 3**

Runoff = 36.97 cfs @ 12.31 hrs, Volume= 3.631 af, Depth> 1.48"

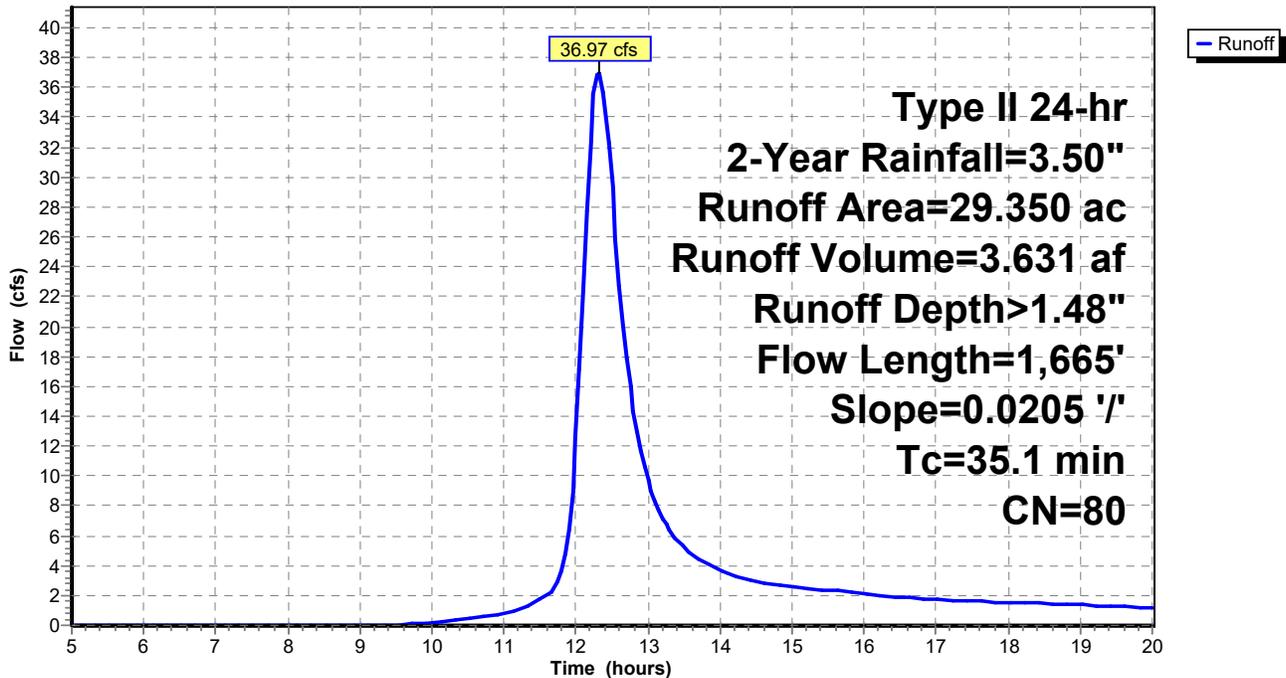
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 2-Year Rainfall=3.50"

Area (ac)	CN	Description
2.920	76	Woods/grass comb., Fair, HSG C
14.020	79	Pasture/grassland/range, Fair, HSG C
7.890	82	Woods/grass comb., Fair, HSG D
4.520	84	Pasture/grassland/range, Fair, HSG D
29.350	80	Weighted Average
29.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0205	0.18		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.60"
26.0	1,565	0.0205	1.00		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
35.1	1,665	Total			

**Subcatchment 13S: EX DA- 3**

Hydrograph



**22-102-HYDRO-EX**

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Type II 24-hr 2-Year Rainfall=3.50"

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Page 5

**Summary for Subcatchment 14S: EX DA-2**

Runoff = 7.26 cfs @ 12.16 hrs, Volume= 0.532 af, Depth> 1.49"

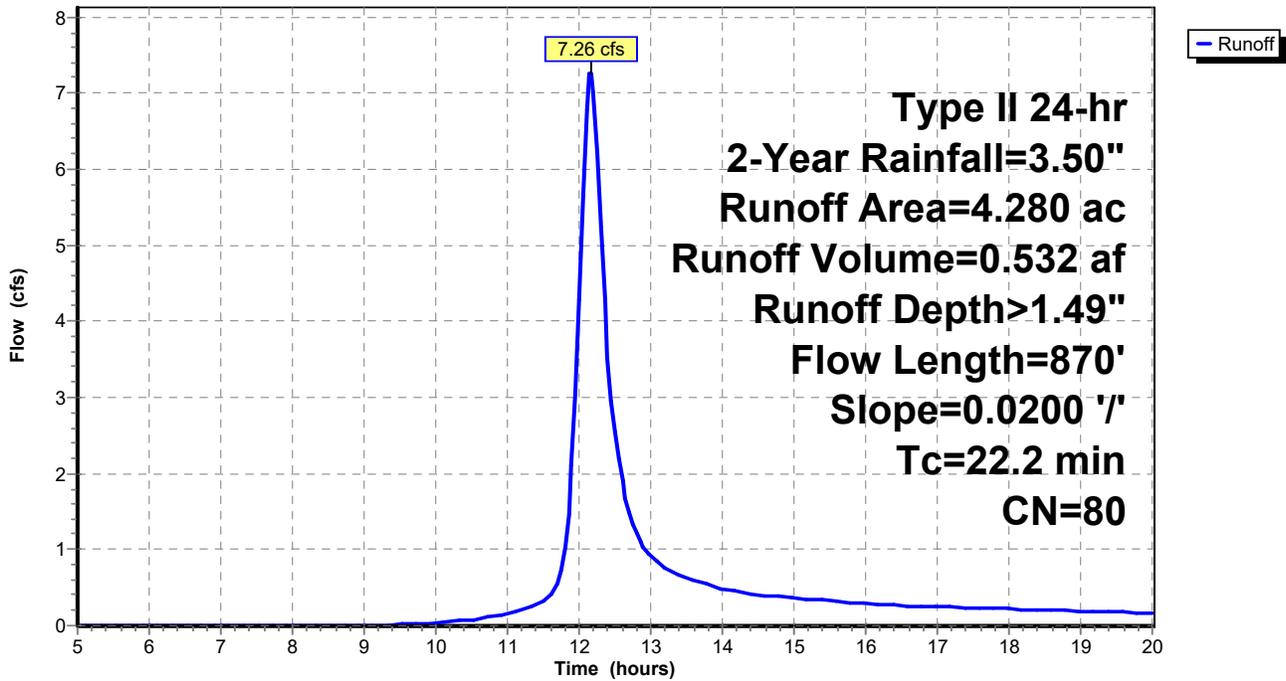
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-Year Rainfall=3.50"

Area (ac)	CN	Description
3.220	79	Pasture/grassland/range, Fair, HSG C
1.060	84	Pasture/grassland/range, Fair, HSG D
4.280	80	Weighted Average
4.280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	100	0.0200	0.18		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.60"
13.0	770	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.2	870	Total			

**Subcatchment 14S: EX DA-2**

Hydrograph



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Type II 24-hr 2-Year Rainfall=3.50"

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**Summary for Subcatchment 15S: EX DA-1**

Runoff = 14.34 cfs @ 12.19 hrs, Volume= 1.129 af, Depth> 1.42"

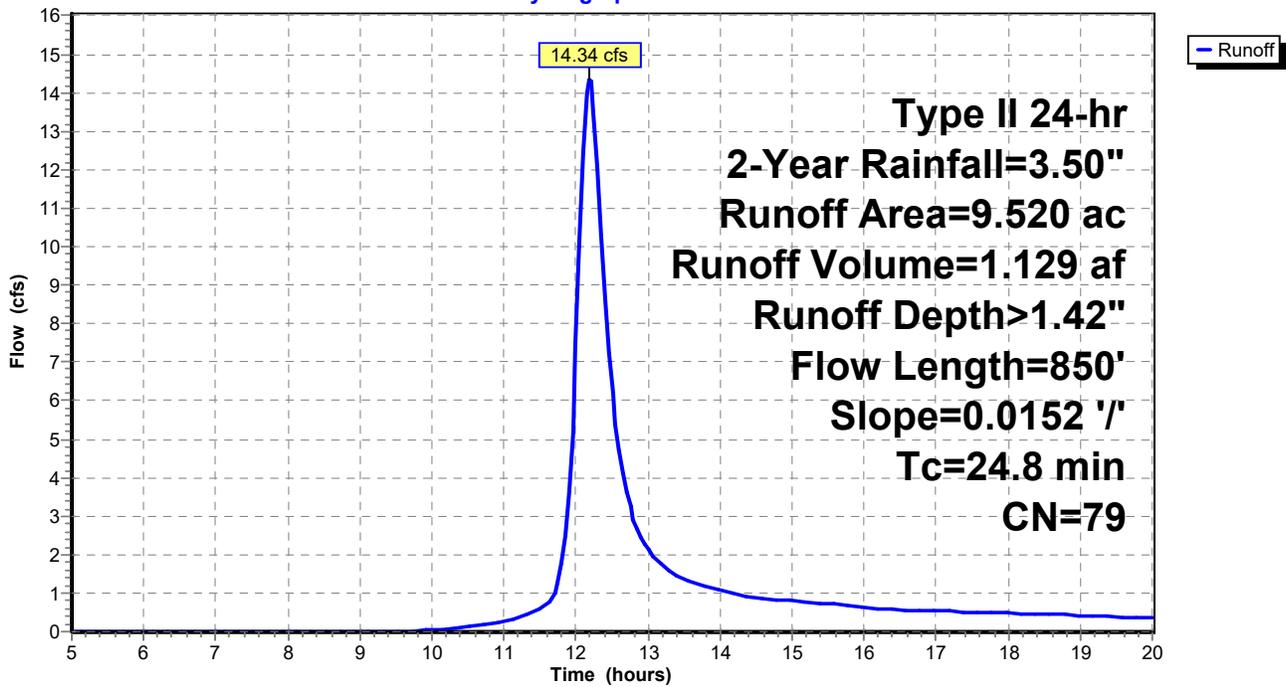
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-Year Rainfall=3.50"

Area (ac)	CN	Description
0.590	76	Woods/grass comb., Fair, HSG C
8.930	79	Pasture/grassland/range, Fair, HSG C
9.520	79	Weighted Average
9.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0152	0.16		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.60"
14.5	750	0.0152	0.86		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
24.8	850	Total			

**Subcatchment 15S: EX DA-1**

Hydrograph



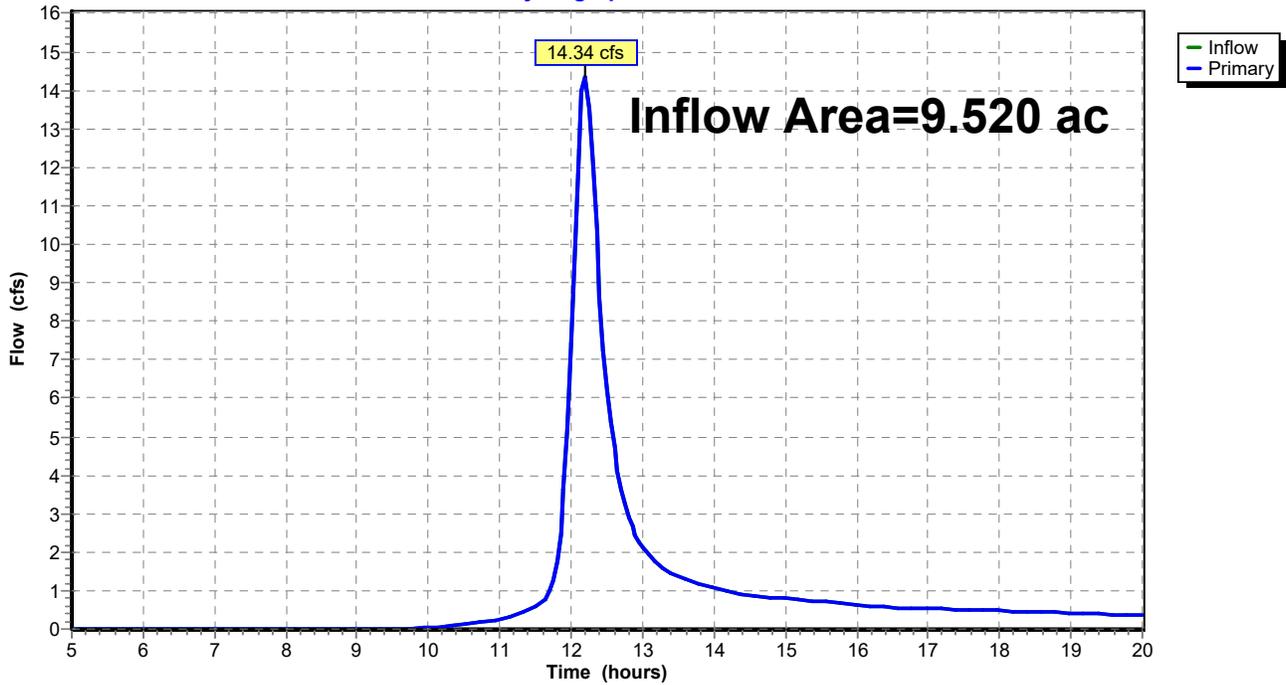
### Summary for Link 7L: RP-1

Inflow Area = 9.520 ac, 0.00% Impervious, Inflow Depth > 1.42" for 2-Year event  
Inflow = 14.34 cfs @ 12.19 hrs, Volume= 1.129 af  
Primary = 14.34 cfs @ 12.19 hrs, Volume= 1.129 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Link 7L: RP-1

Hydrograph



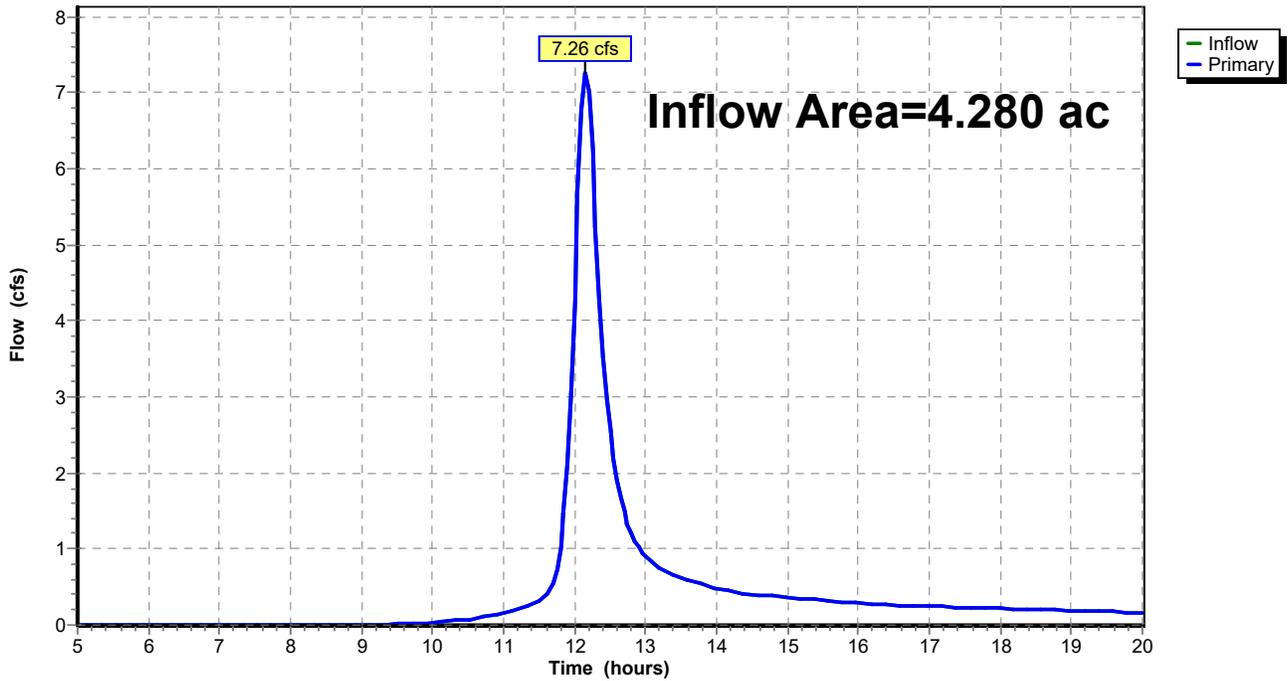
### Summary for Link 8L: RP-2

Inflow Area = 4.280 ac, 0.00% Impervious, Inflow Depth > 1.49" for 2-Year event  
Inflow = 7.26 cfs @ 12.16 hrs, Volume= 0.532 af  
Primary = 7.26 cfs @ 12.16 hrs, Volume= 0.532 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Link 8L: RP-2

Hydrograph



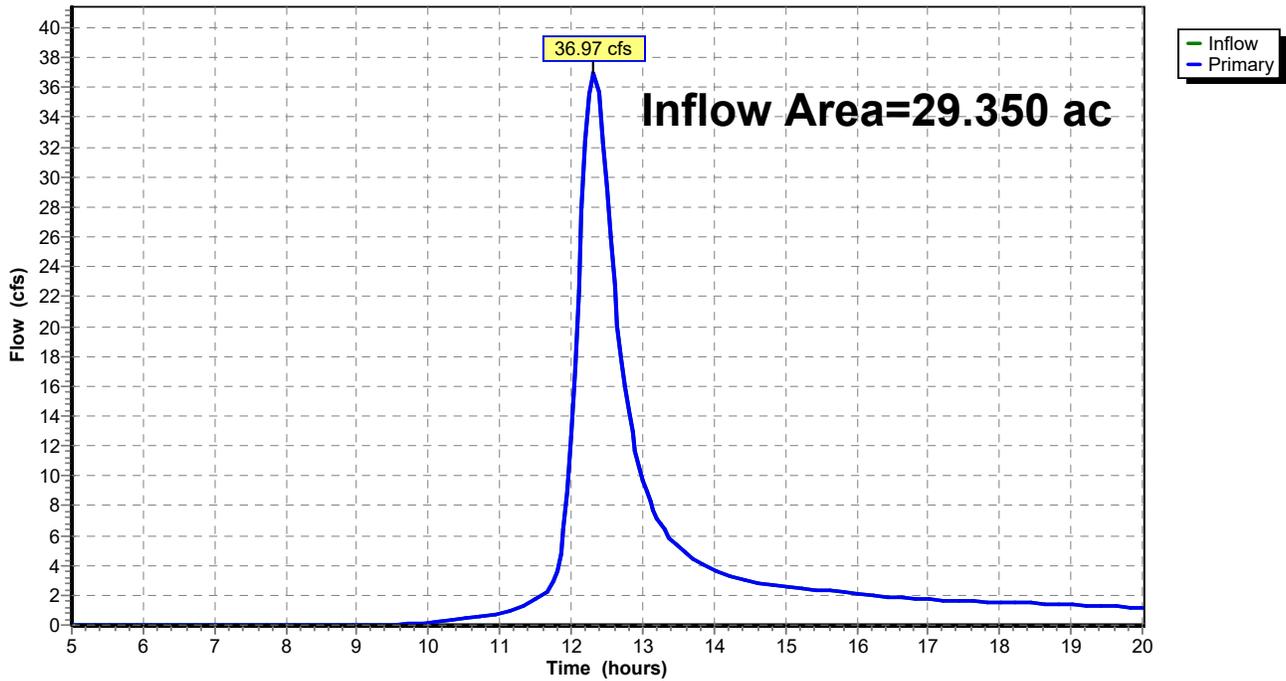
### Summary for Link 9L: RP-3

Inflow Area = 29.350 ac, 0.00% Impervious, Inflow Depth > 1.48" for 2-Year event  
Inflow = 36.97 cfs @ 12.31 hrs, Volume= 3.631 af  
Primary = 36.97 cfs @ 12.31 hrs, Volume= 3.631 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Link 9L: RP-3

Hydrograph



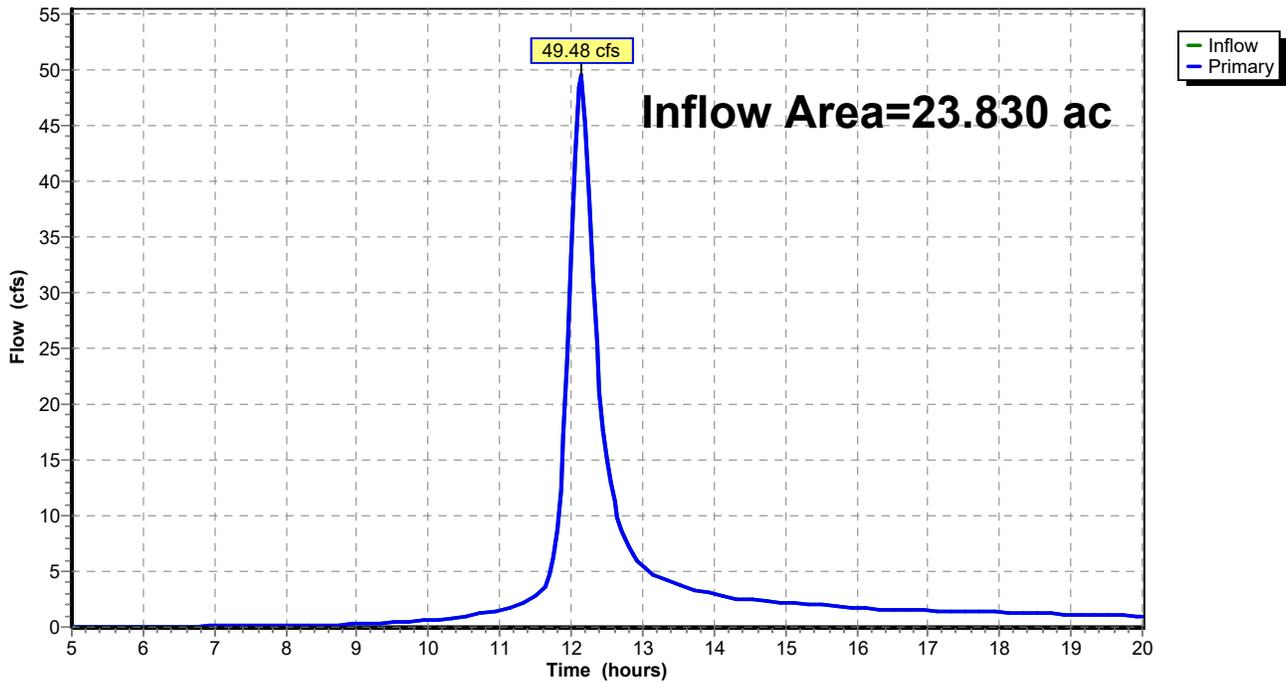
### Summary for Link 10L: RP-4

Inflow Area = 23.830 ac, 9.61% Impervious, Inflow Depth > 1.79" for 2-Year event  
Inflow = 49.48 cfs @ 12.13 hrs, Volume= 3.560 af  
Primary = 49.48 cfs @ 12.13 hrs, Volume= 3.560 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Link 10L: RP-4

Hydrograph



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Type II 24-hr 10-Year Rainfall=5.30"

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**Summary for Subcatchment 11S: EX DA-4**

Runoff = 72.33 cfs @ 12.12 hrs, Volume= 4.977 af, Depth> 3.10"

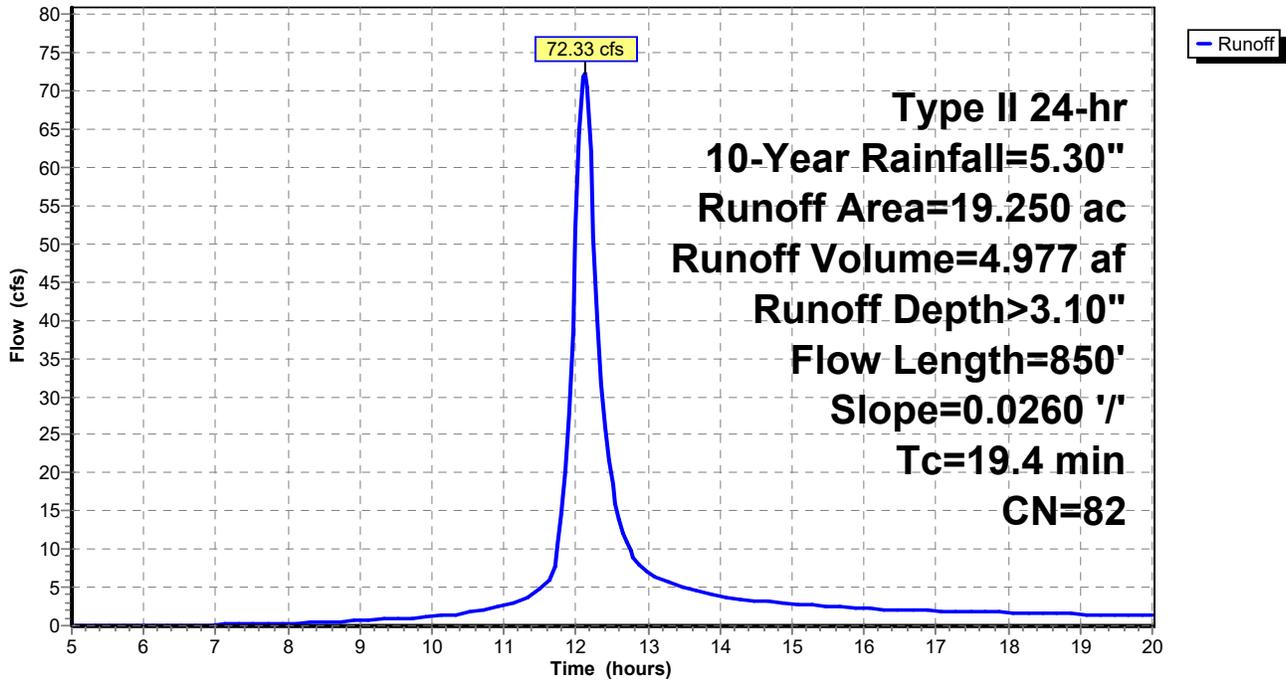
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-Year Rainfall=5.30"

Area (ac)	CN	Description
8.950	79	Pasture/grassland/range, Fair, HSG C
10.300	84	Pasture/grassland/range, Fair, HSG D
19.250	82	Weighted Average
19.250		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.0260	0.20		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.60"
11.1	750	0.0260	1.13		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
19.4	850	Total			

**Subcatchment 11S: EX DA-4**

Hydrograph



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Type II 24-hr 10-Year Rainfall=5.30"

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**Summary for Subcatchment 12S: EX OFF DA -4**

Runoff = 18.56 cfs @ 12.18 hrs, Volume= 1.562 af, Depth> 4.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-Year Rainfall=5.30"

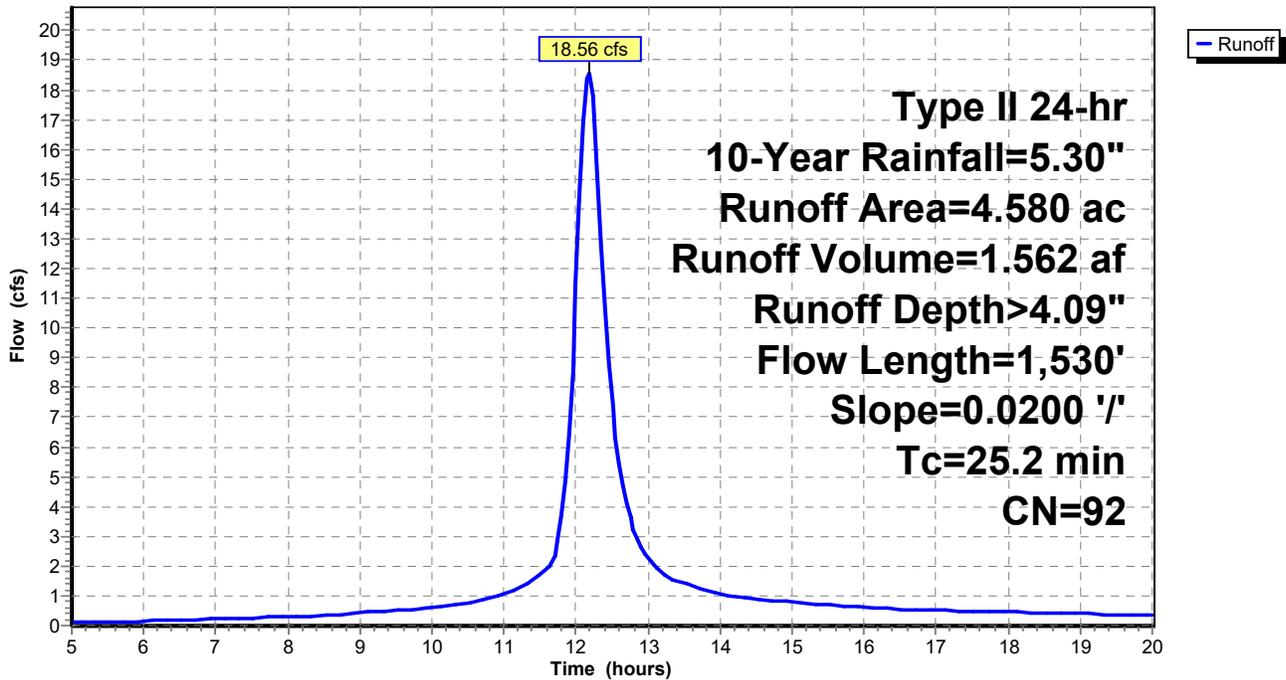
Area (ac)	CN	Description
4.580	92	Paved roads w/open ditches, 50% imp, HSG C
2.290		50.00% Pervious Area
2.290		50.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
24.1	1,430	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
25.2	1,530	Total			

**Subcatchment 12S: EX OFF DA -4**

Hydrograph



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Type II 24-hr 10-Year Rainfall=5.30"

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**Summary for Subcatchment 13S: EX DA- 3**

Runoff = 72.33 cfs @ 12.31 hrs, Volume= 7.092 af, Depth> 2.90"

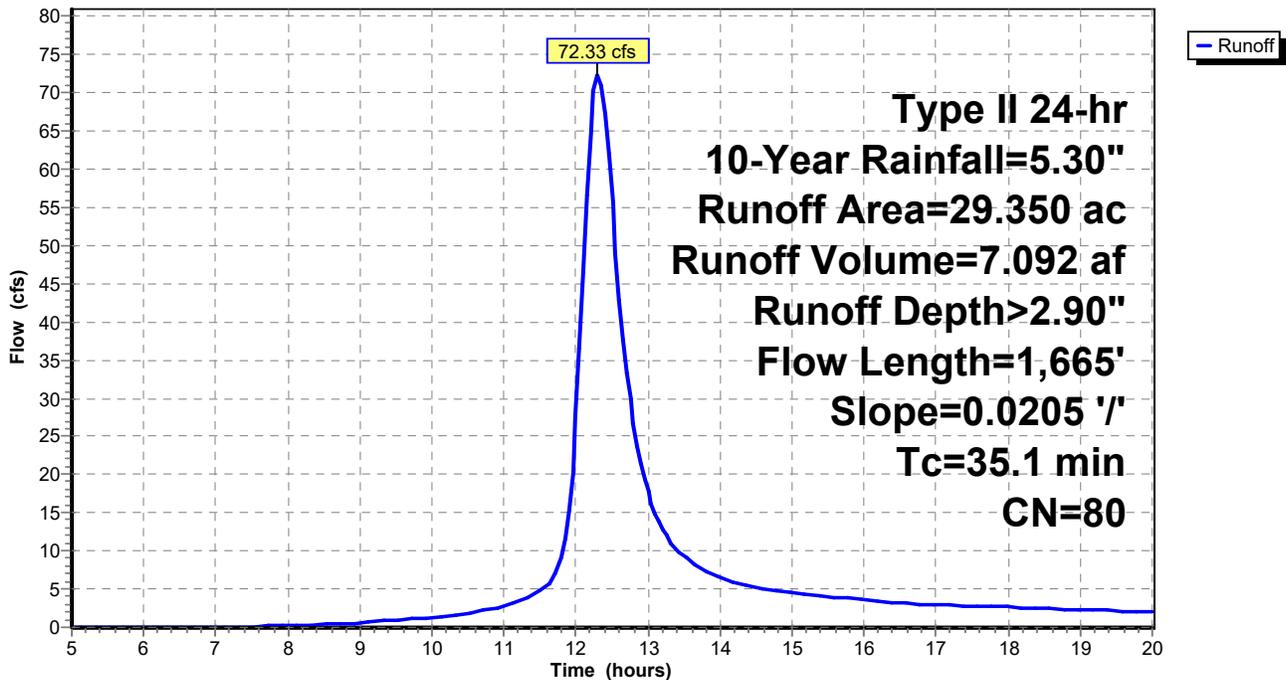
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 10-Year Rainfall=5.30"

Area (ac)	CN	Description
2.920	76	Woods/grass comb., Fair, HSG C
14.020	79	Pasture/grassland/range, Fair, HSG C
7.890	82	Woods/grass comb., Fair, HSG D
4.520	84	Pasture/grassland/range, Fair, HSG D
29.350	80	Weighted Average
29.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0205	0.18		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.60"
26.0	1,565	0.0205	1.00		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
35.1	1,665	Total			

**Subcatchment 13S: EX DA- 3**

Hydrograph



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Type II 24-hr 10-Year Rainfall=5.30"

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**Summary for Subcatchment 14S: EX DA-2**

Runoff = 14.09 cfs @ 12.15 hrs, Volume= 1.039 af, Depth> 2.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-Year Rainfall=5.30"

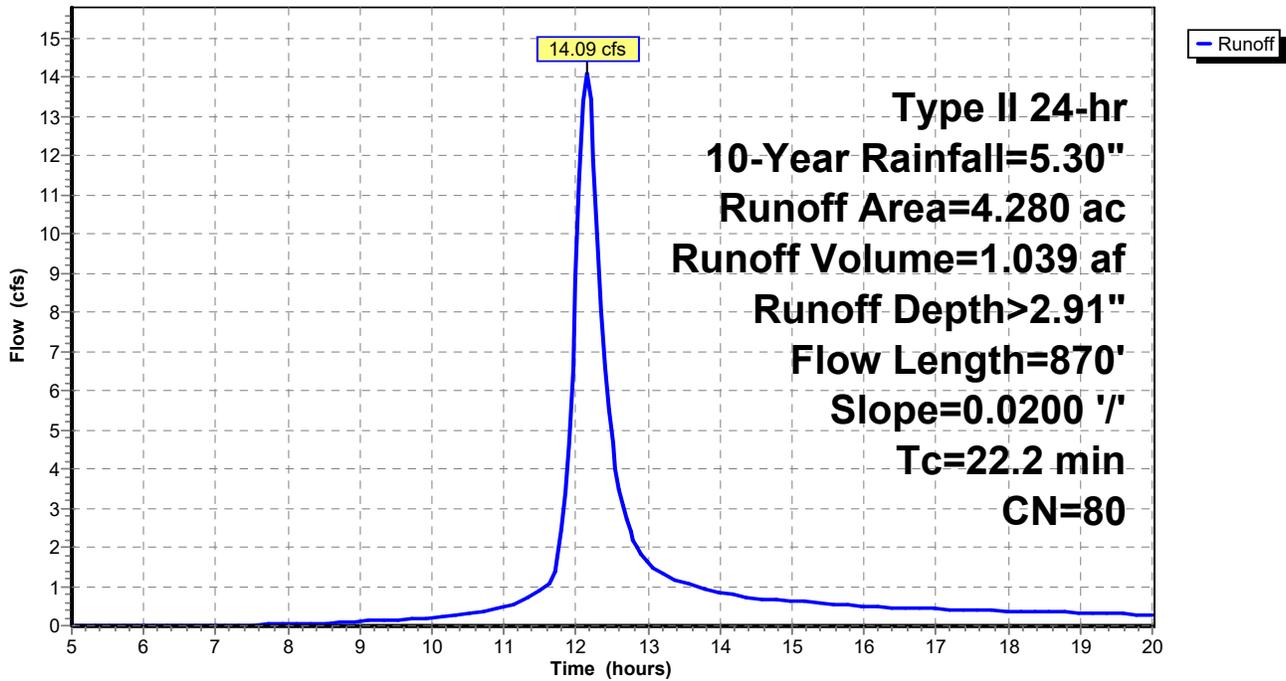
Area (ac)	CN	Description
3.220	79	Pasture/grassland/range, Fair, HSG C
1.060	84	Pasture/grassland/range, Fair, HSG D
4.280	80	Weighted Average
4.280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	100	0.0200	0.18		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.60"
13.0	770	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.2	870	Total			

**Subcatchment 14S: EX DA-2**

Hydrograph



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Type II 24-hr 10-Year Rainfall=5.30"

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**Summary for Subcatchment 15S: EX DA-1**

Runoff = 28.41 cfs @ 12.18 hrs, Volume= 2.236 af, Depth> 2.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-Year Rainfall=5.30"

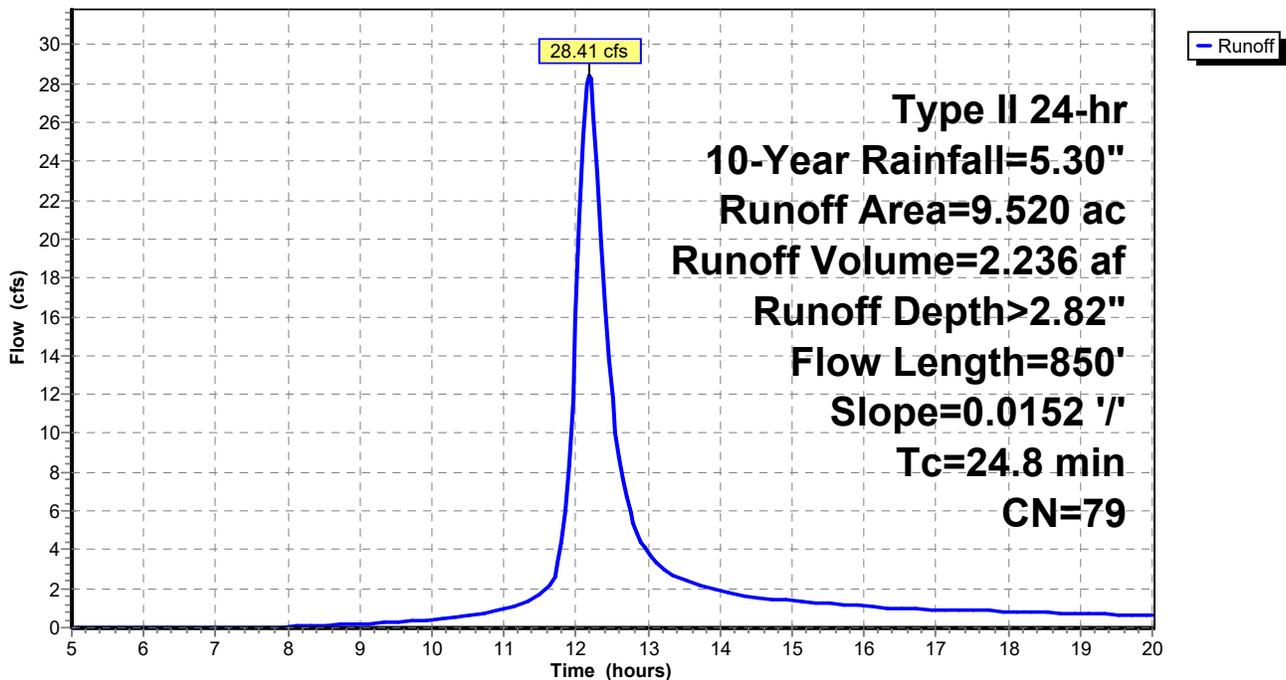
Area (ac)	CN	Description
0.590	76	Woods/grass comb., Fair, HSG C
8.930	79	Pasture/grassland/range, Fair, HSG C
9.520	79	Weighted Average
9.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0152	0.16		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.60"
14.5	750	0.0152	0.86		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
24.8	850	Total			

**Subcatchment 15S: EX DA-1**

Hydrograph



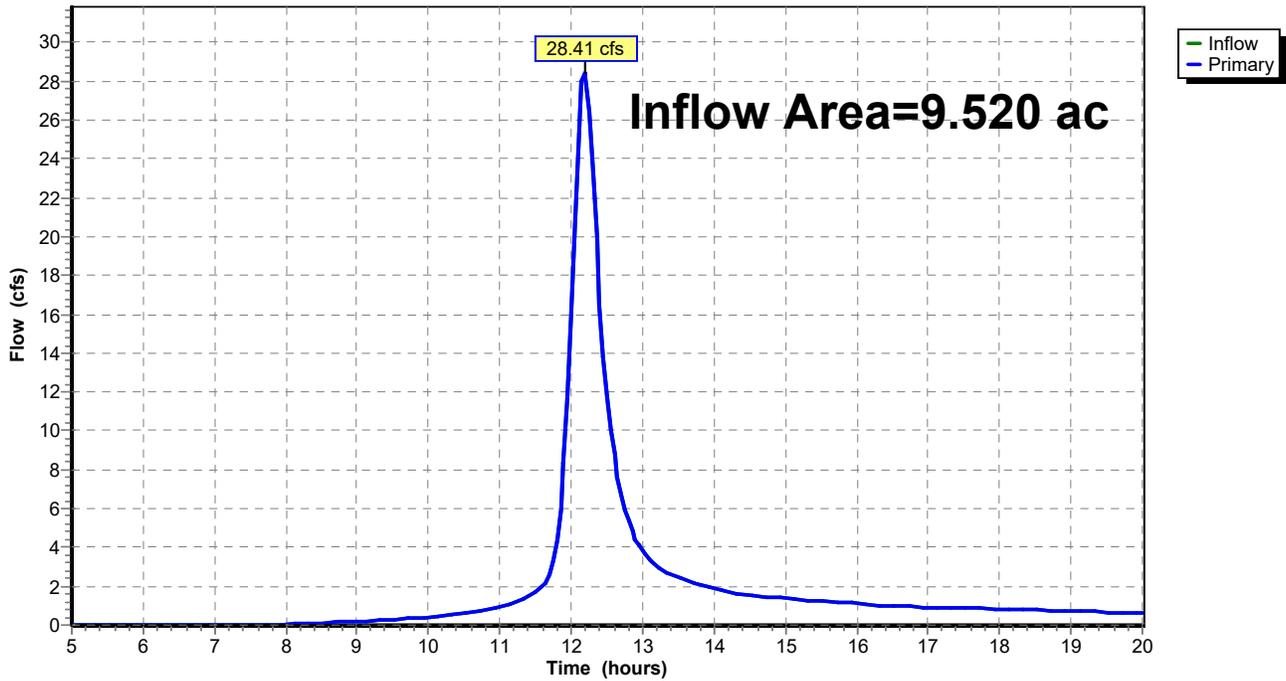
### Summary for Link 7L: RP-1

Inflow Area = 9.520 ac, 0.00% Impervious, Inflow Depth > 2.82" for 10-Year event  
Inflow = 28.41 cfs @ 12.18 hrs, Volume= 2.236 af  
Primary = 28.41 cfs @ 12.18 hrs, Volume= 2.236 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Link 7L: RP-1

Hydrograph



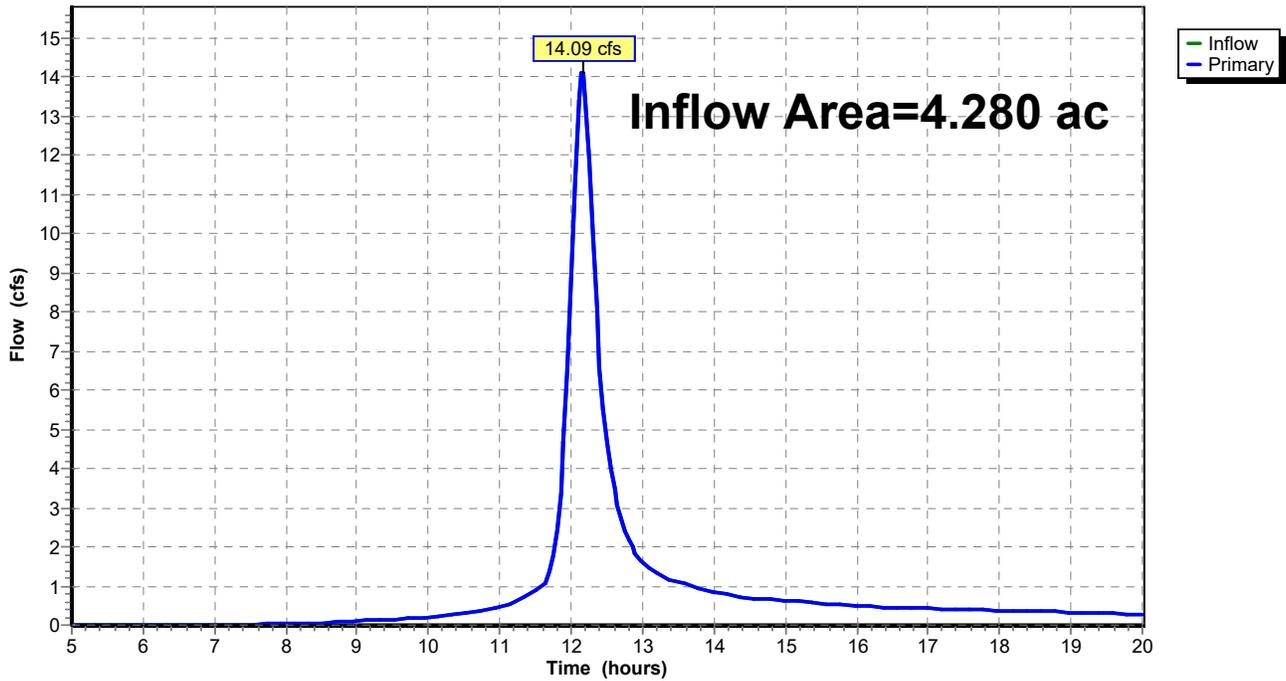
### Summary for Link 8L: RP-2

Inflow Area = 4.280 ac, 0.00% Impervious, Inflow Depth > 2.91" for 10-Year event  
Inflow = 14.09 cfs @ 12.15 hrs, Volume= 1.039 af  
Primary = 14.09 cfs @ 12.15 hrs, Volume= 1.039 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Link 8L: RP-2

Hydrograph



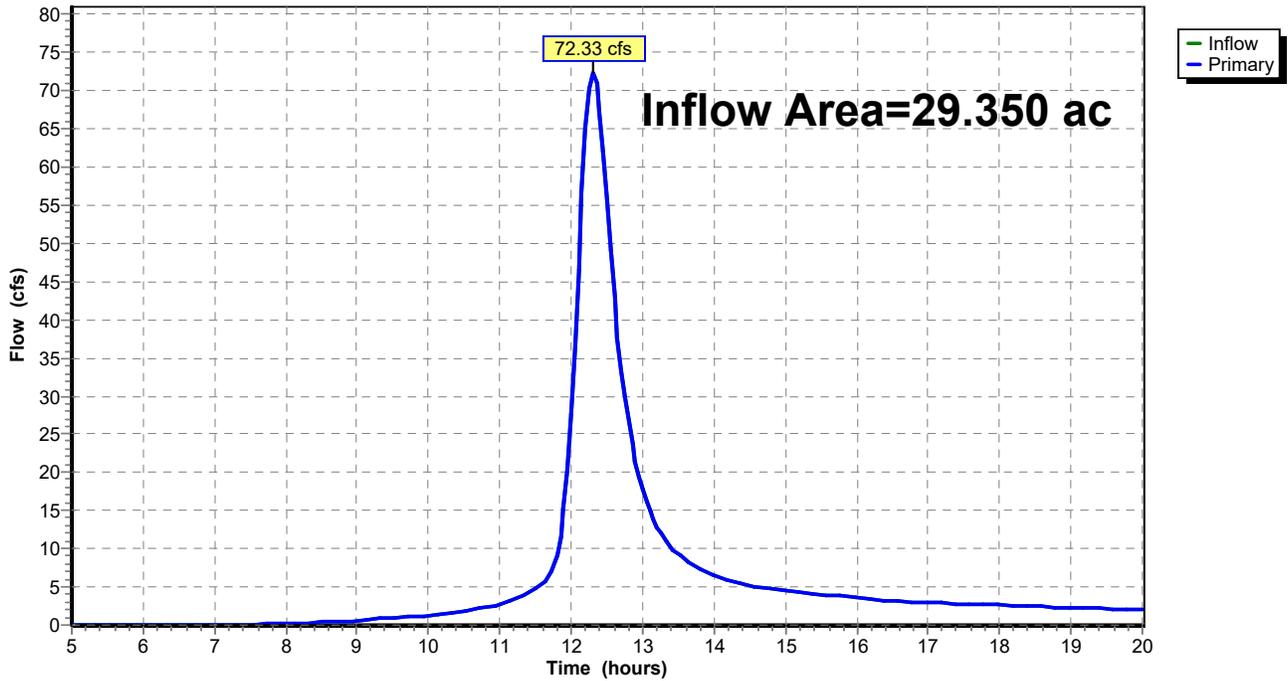
### Summary for Link 9L: RP-3

Inflow Area = 29.350 ac, 0.00% Impervious, Inflow Depth > 2.90" for 10-Year event  
Inflow = 72.33 cfs @ 12.31 hrs, Volume= 7.092 af  
Primary = 72.33 cfs @ 12.31 hrs, Volume= 7.092 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Link 9L: RP-3

Hydrograph



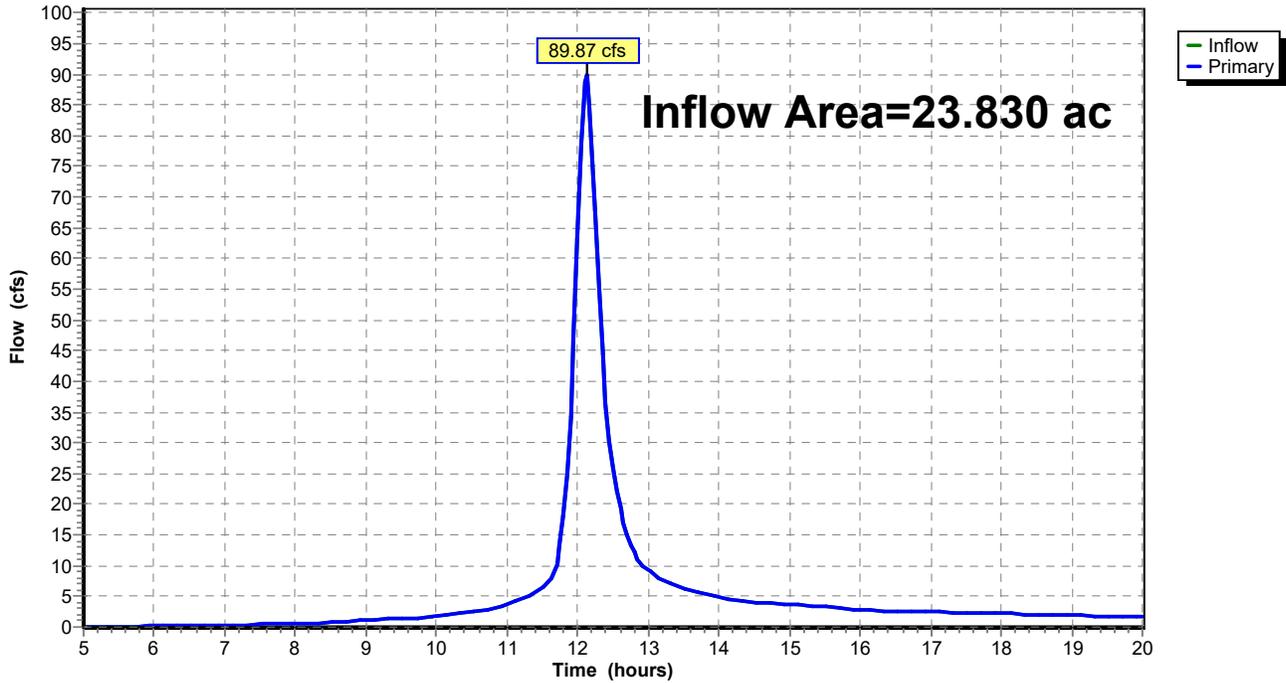
Summary for Link 10L: RP-4

Inflow Area = 23.830 ac, 9.61% Impervious, Inflow Depth > 3.29" for 10-Year event  
Inflow = 89.87 cfs @ 12.13 hrs, Volume= 6.539 af  
Primary = 89.87 cfs @ 12.13 hrs, Volume= 6.539 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 10L: RP-4

Hydrograph



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Type II 24-hr 100-Year Rainfall=7.70"

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**Summary for Subcatchment 11S: EX DA-4**

Runoff = 118.61 cfs @ 12.11 hrs, Volume= 8.341 af, Depth> 5.20"

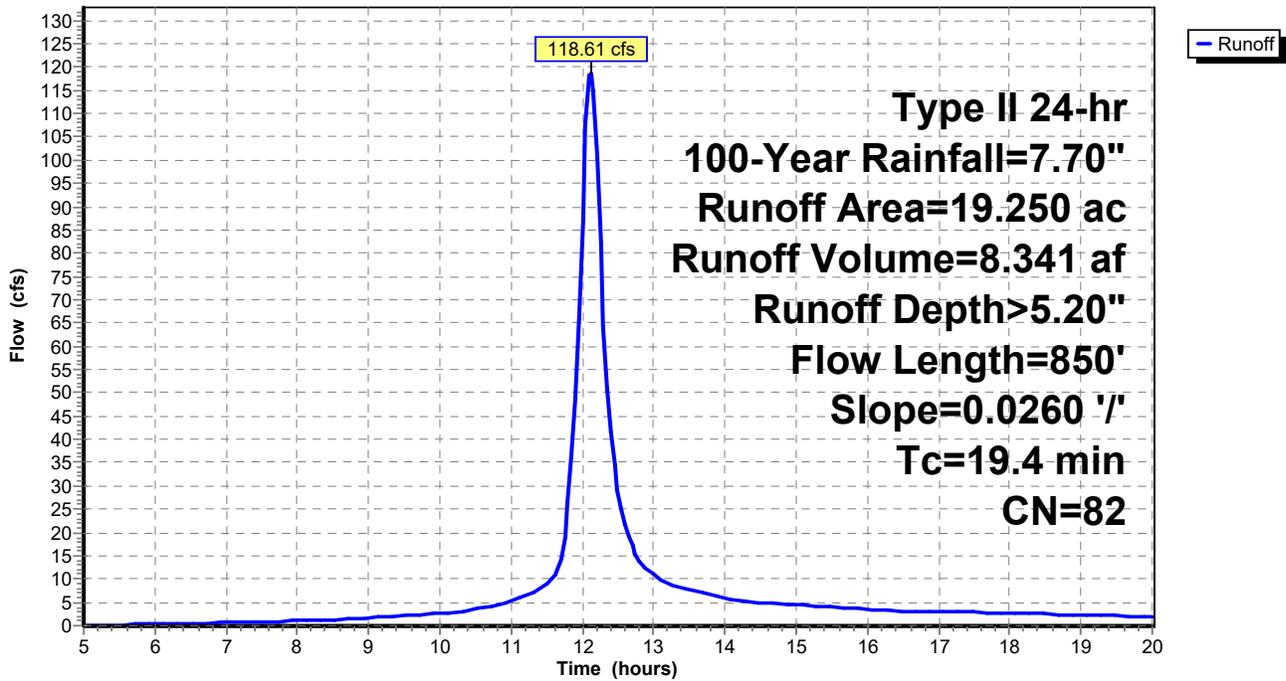
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 100-Year Rainfall=7.70"

Area (ac)	CN	Description
8.950	79	Pasture/grassland/range, Fair, HSG C
10.300	84	Pasture/grassland/range, Fair, HSG D
19.250	82	Weighted Average
19.250		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.0260	0.20		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.60"
11.1	750	0.0260	1.13		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
19.4	850	Total			

**Subcatchment 11S: EX DA-4**

Hydrograph



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Type II 24-hr 100-Year Rainfall=7.70"

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**Summary for Subcatchment 12S: EX OFF DA -4**

Runoff = 27.98 cfs @ 12.17 hrs, Volume= 2.398 af, Depth> 6.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-Year Rainfall=7.70"

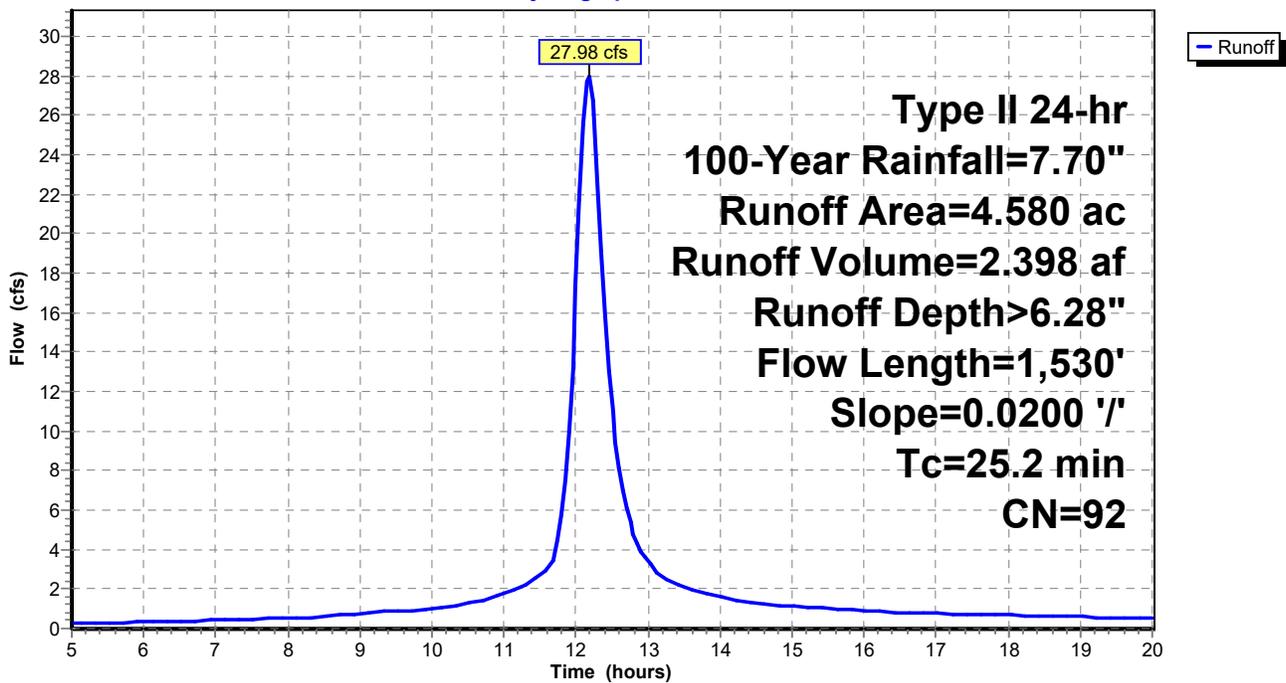
Area (ac)	CN	Description
4.580	92	Paved roads w/open ditches, 50% imp, HSG C
2.290		50.00% Pervious Area
2.290		50.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
24.1	1,430	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
25.2	1,530	Total			

**Subcatchment 12S: EX OFF DA -4**

Hydrograph



**Summary for Subcatchment 13S: EX DA- 3**

Runoff = 121.81 cfs @ 12.30 hrs, Volume= 12.105 af, Depth> 4.95"

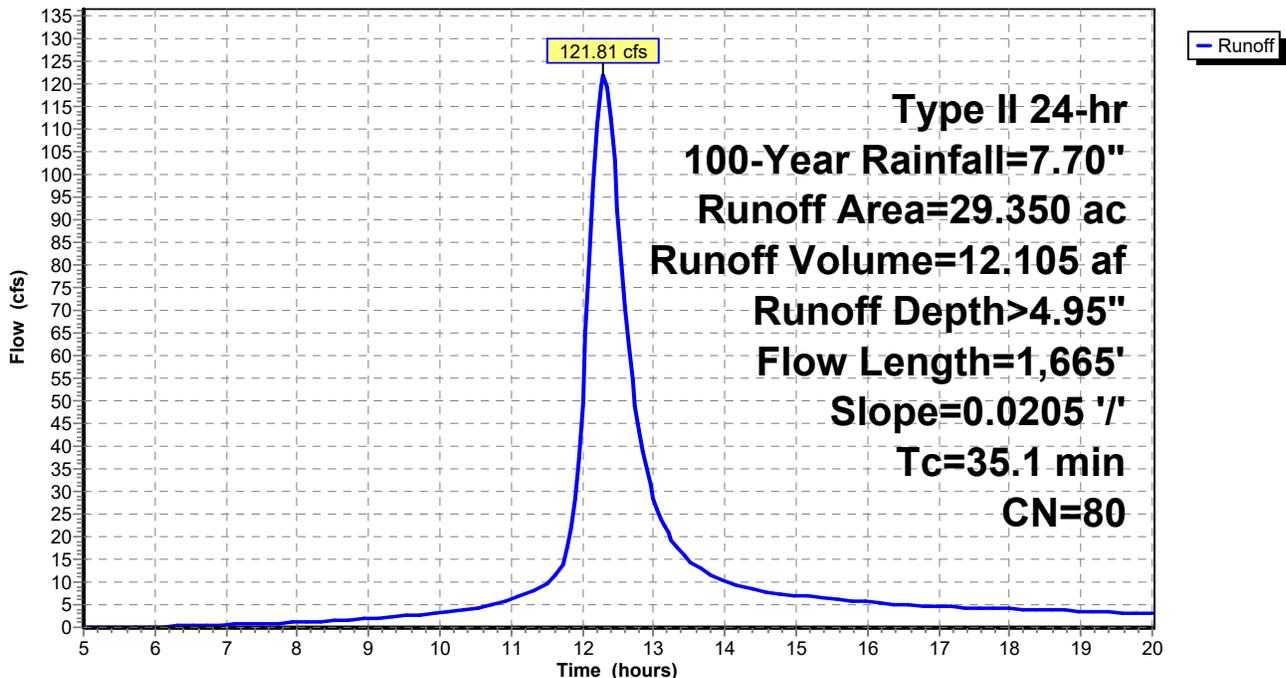
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 100-Year Rainfall=7.70"

Area (ac)	CN	Description
2.920	76	Woods/grass comb., Fair, HSG C
14.020	79	Pasture/grassland/range, Fair, HSG C
7.890	82	Woods/grass comb., Fair, HSG D
4.520	84	Pasture/grassland/range, Fair, HSG D
29.350	80	Weighted Average
29.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0205	0.18		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.60"
26.0	1,565	0.0205	1.00		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
35.1	1,665	Total			

**Subcatchment 13S: EX DA- 3**

Hydrograph



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Type II 24-hr 100-Year Rainfall=7.70"

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**Summary for Subcatchment 14S: EX DA-2**

Runoff = 23.62 cfs @ 12.15 hrs, Volume= 1.772 af, Depth> 4.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-Year Rainfall=7.70"

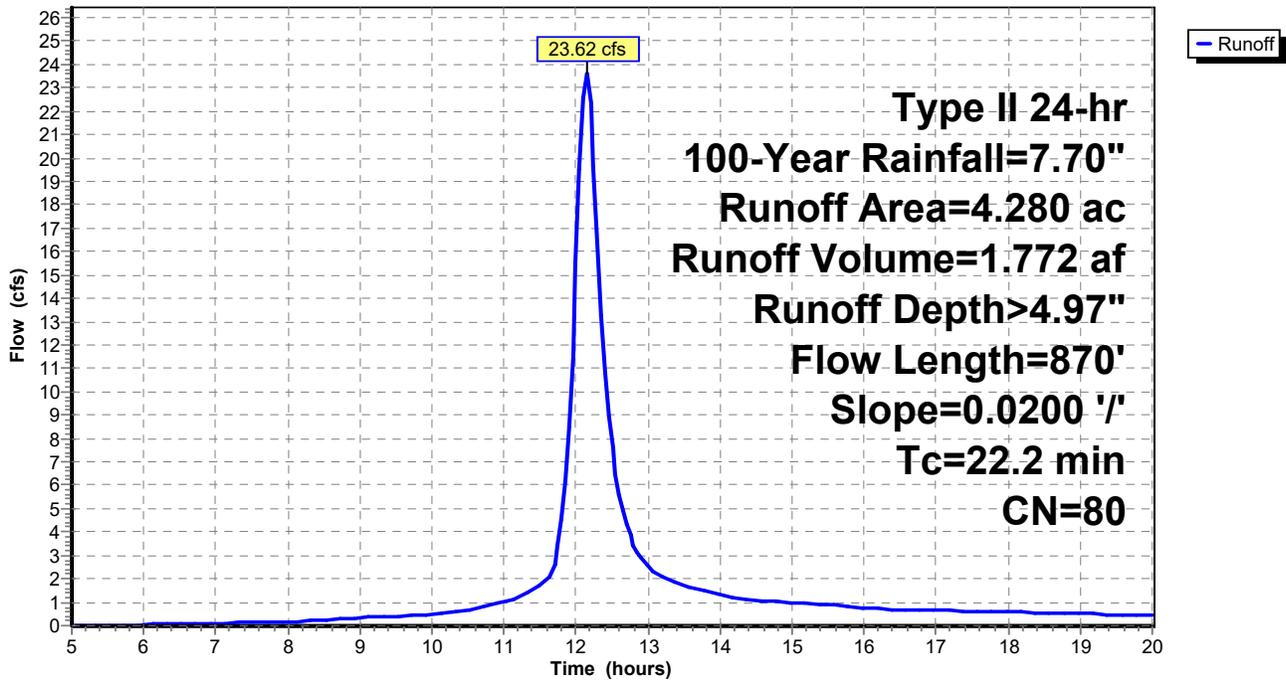
Area (ac)	CN	Description
3.220	79	Pasture/grassland/range, Fair, HSG C
1.060	84	Pasture/grassland/range, Fair, HSG D
4.280	80	Weighted Average
4.280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	100	0.0200	0.18		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.60"
13.0	770	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
22.2	870	Total			

**Subcatchment 14S: EX DA-2**

Hydrograph



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Type II 24-hr 100-Year Rainfall=7.70"

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**Summary for Subcatchment 15S: EX DA-1**

Runoff = 48.20 cfs @ 12.18 hrs, Volume= 3.850 af, Depth> 4.85"

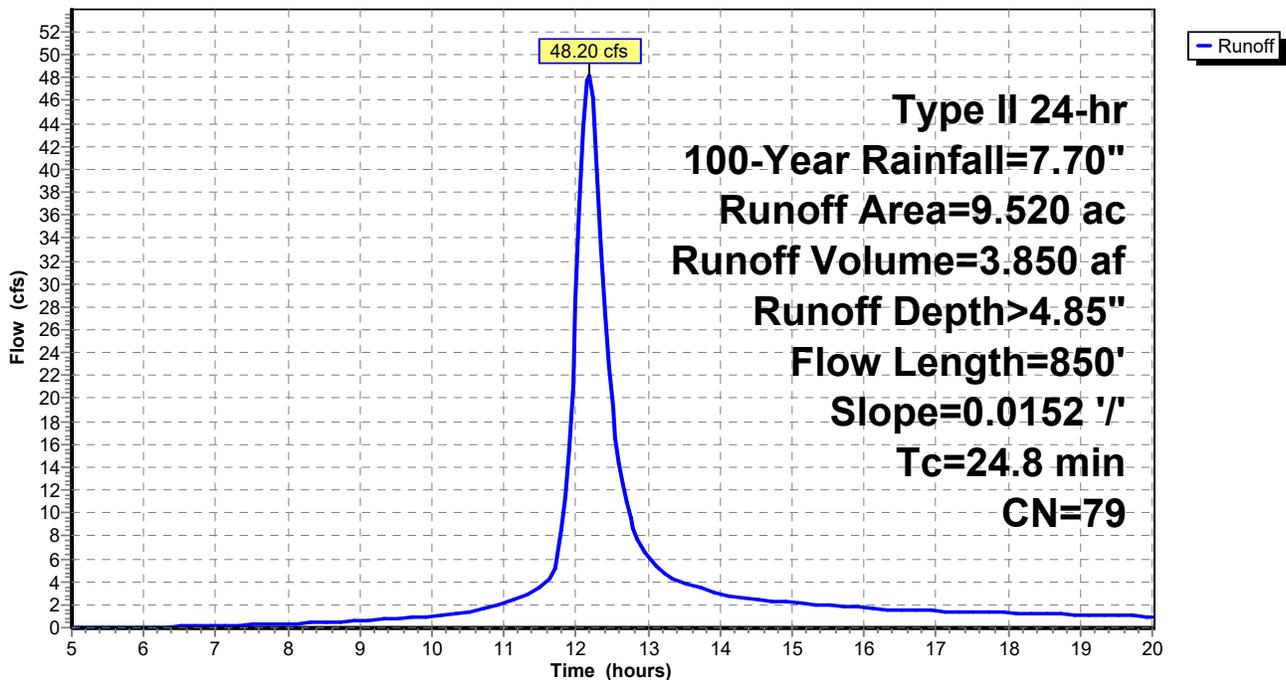
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-Year Rainfall=7.70"

Area (ac)	CN	Description
0.590	76	Woods/grass comb., Fair, HSG C
8.930	79	Pasture/grassland/range, Fair, HSG C
9.520	79	Weighted Average
9.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0152	0.16		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.60"
14.5	750	0.0152	0.86		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
24.8	850	Total			

**Subcatchment 15S: EX DA-1**

Hydrograph



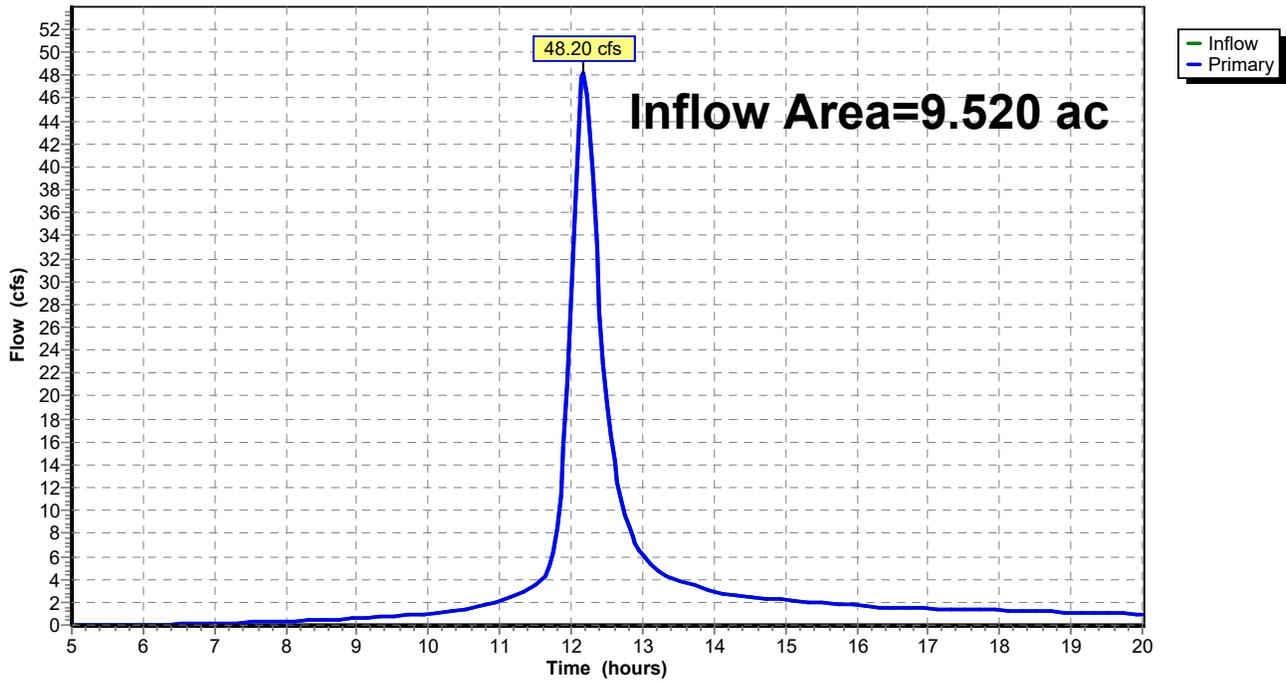
### Summary for Link 7L: RP-1

Inflow Area = 9.520 ac, 0.00% Impervious, Inflow Depth > 4.85" for 100-Year event  
Inflow = 48.20 cfs @ 12.18 hrs, Volume= 3.850 af  
Primary = 48.20 cfs @ 12.18 hrs, Volume= 3.850 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Link 7L: RP-1

Hydrograph



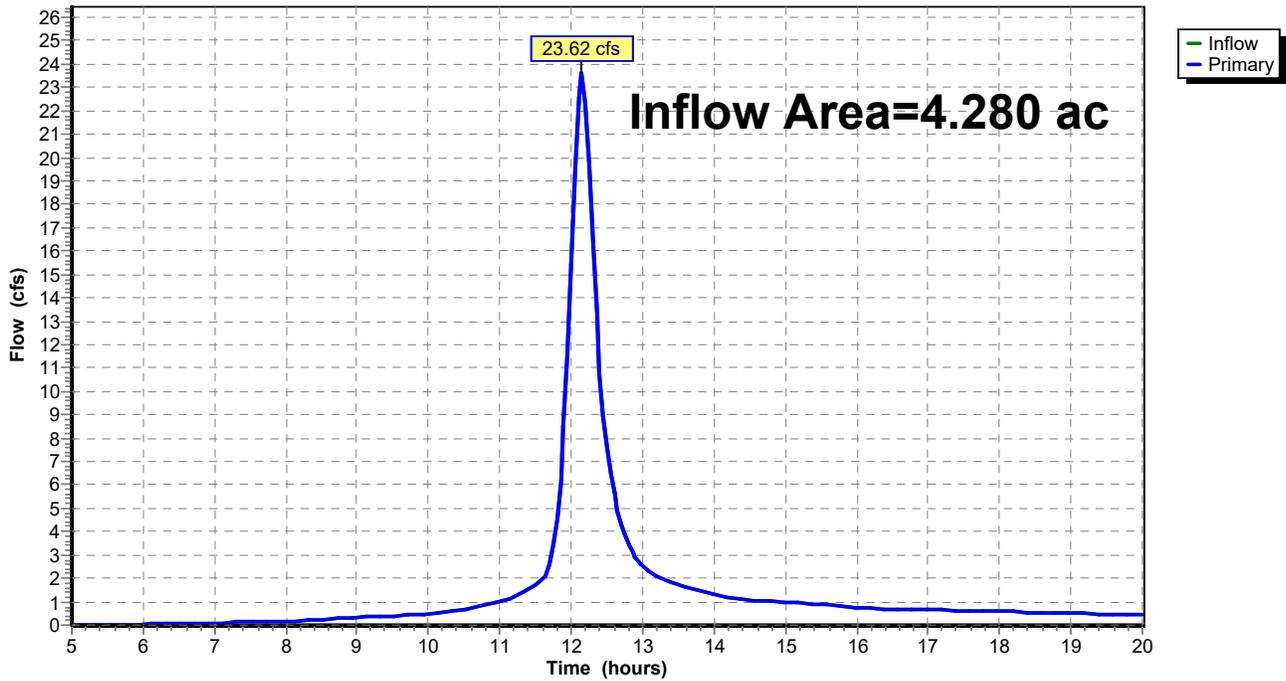
### Summary for Link 8L: RP-2

Inflow Area = 4.280 ac, 0.00% Impervious, Inflow Depth > 4.97" for 100-Year event  
Inflow = 23.62 cfs @ 12.15 hrs, Volume= 1.772 af  
Primary = 23.62 cfs @ 12.15 hrs, Volume= 1.772 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Link 8L: RP-2

Hydrograph



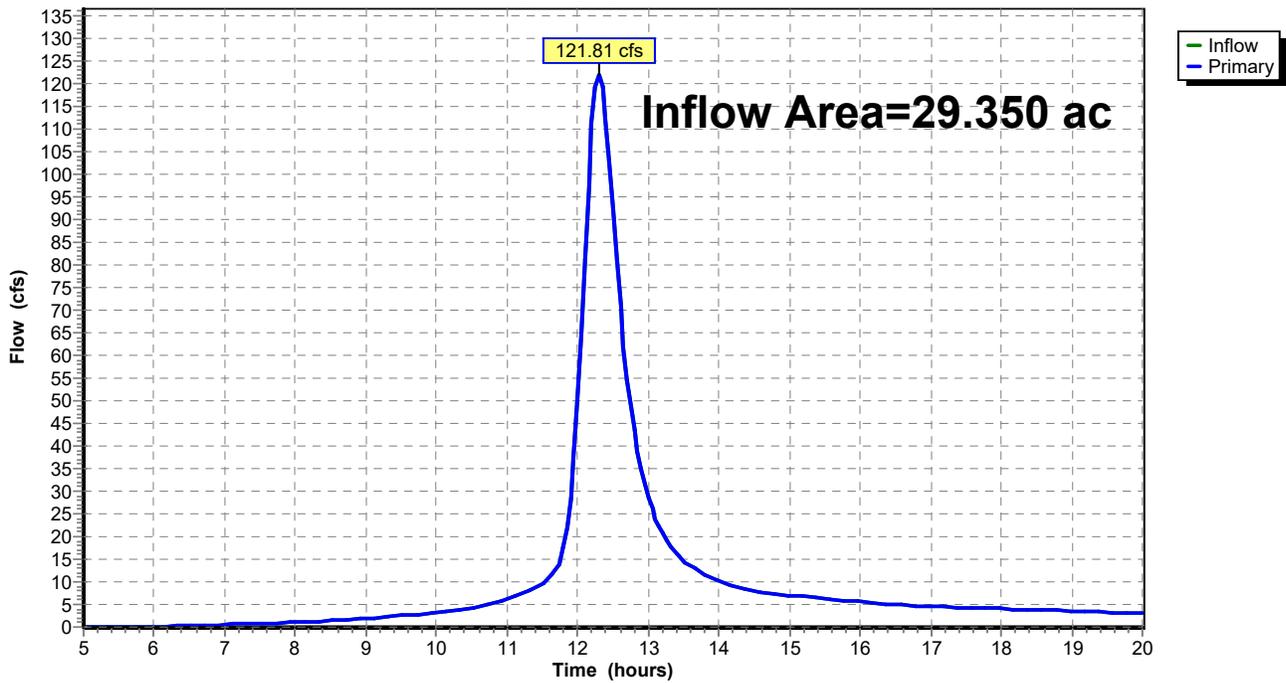
### Summary for Link 9L: RP-3

Inflow Area = 29.350 ac, 0.00% Impervious, Inflow Depth > 4.95" for 100-Year event  
Inflow = 121.81 cfs @ 12.30 hrs, Volume= 12.105 af  
Primary = 121.81 cfs @ 12.30 hrs, Volume= 12.105 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Link 9L: RP-3

Hydrograph



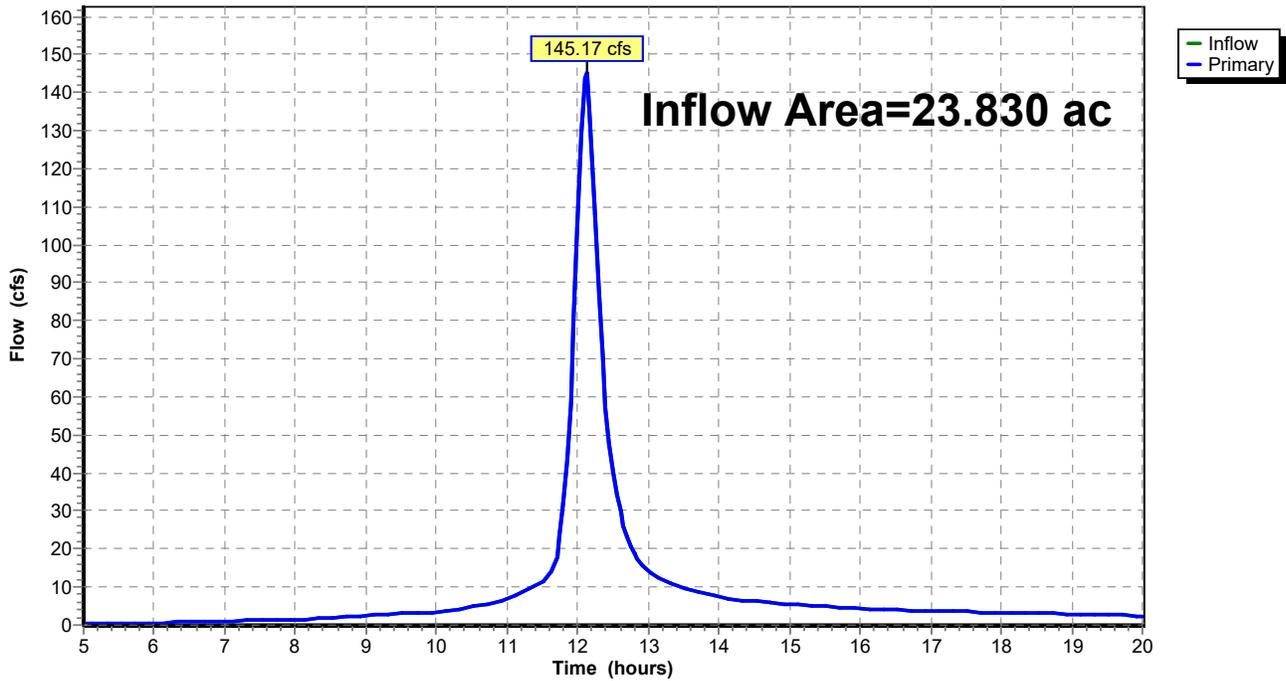
### Summary for Link 10L: RP-4

Inflow Area = 23.830 ac, 9.61% Impervious, Inflow Depth > 5.41" for 100-Year event  
Inflow = 145.17 cfs @ 12.12 hrs, Volume= 10.739 af  
Primary = 145.17 cfs @ 12.12 hrs, Volume= 10.739 af, Atten= 0%, Lag= 0.0 min

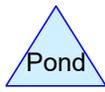
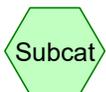
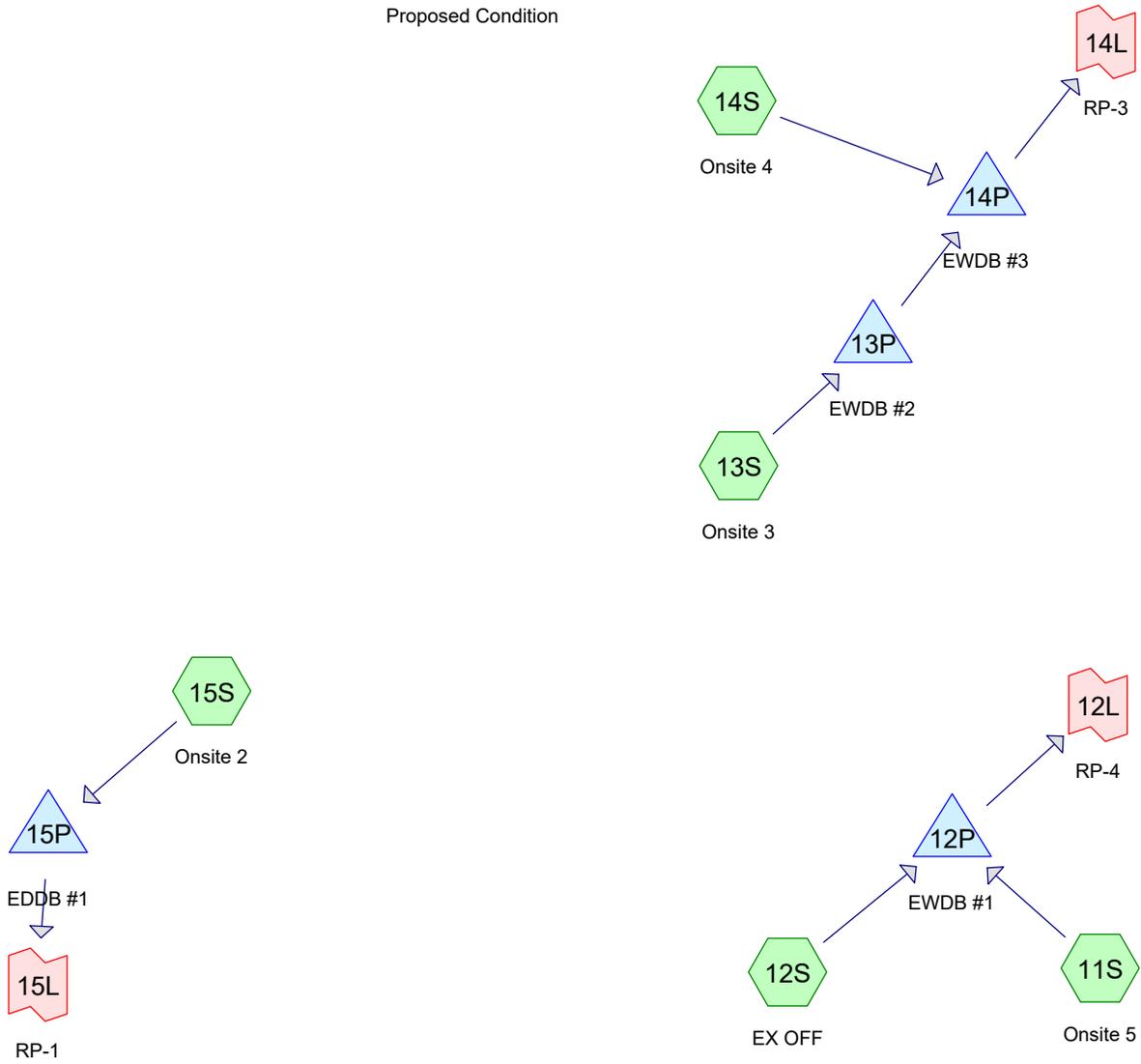
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Link 10L: RP-4

Hydrograph



Proposed Condition



**Summary for Subcatchment 11S: Onsite 5**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 75.92 cfs @ 11.95 hrs, Volume= 3.604 af, Depth> 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 2-Year Rainfall=3.50"

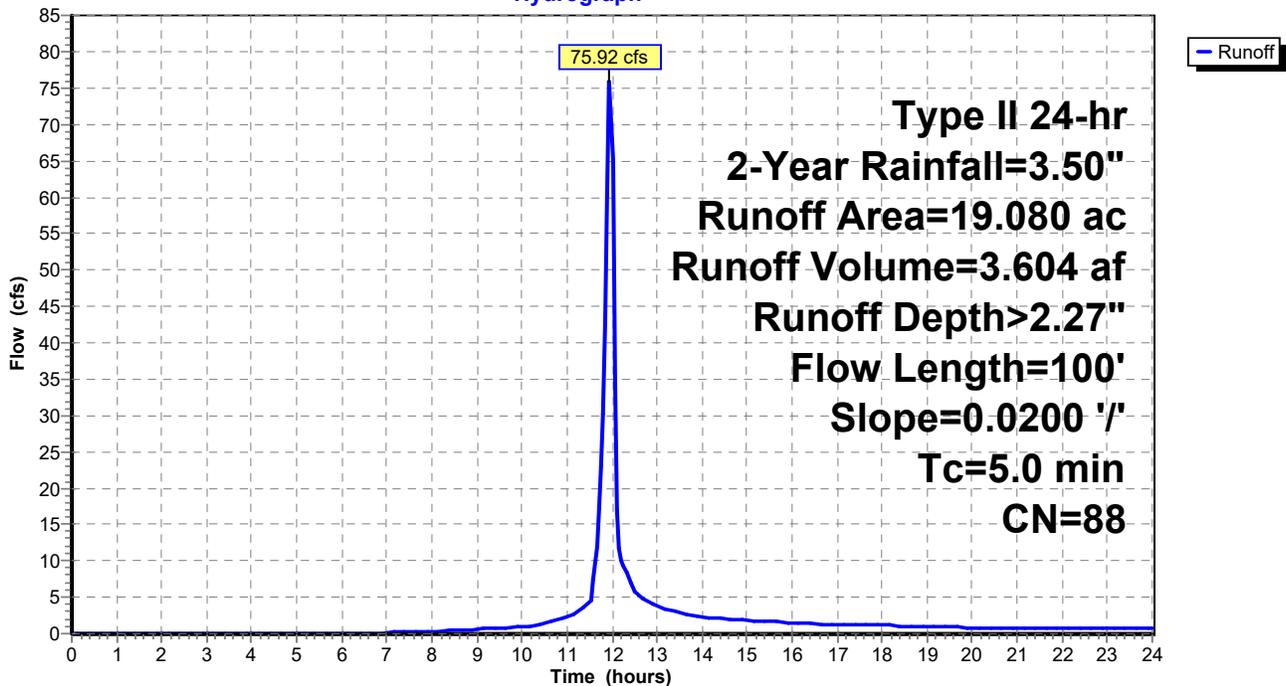
Area (ac)	CN	Description
* 19.080	88	Apartments, 65% imp, HSG C
6.678		35.00% Pervious Area
12.402		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.60"
3.9					Direct Entry, Pipe flow
5.0	100	Total			

**Subcatchment 11S: Onsite 5**

Hydrograph



**Summary for Subcatchment 12S: EX OFF**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 27.62 cfs @ 11.95 hrs, Volume= 1.311 af, Depth> 2.27"

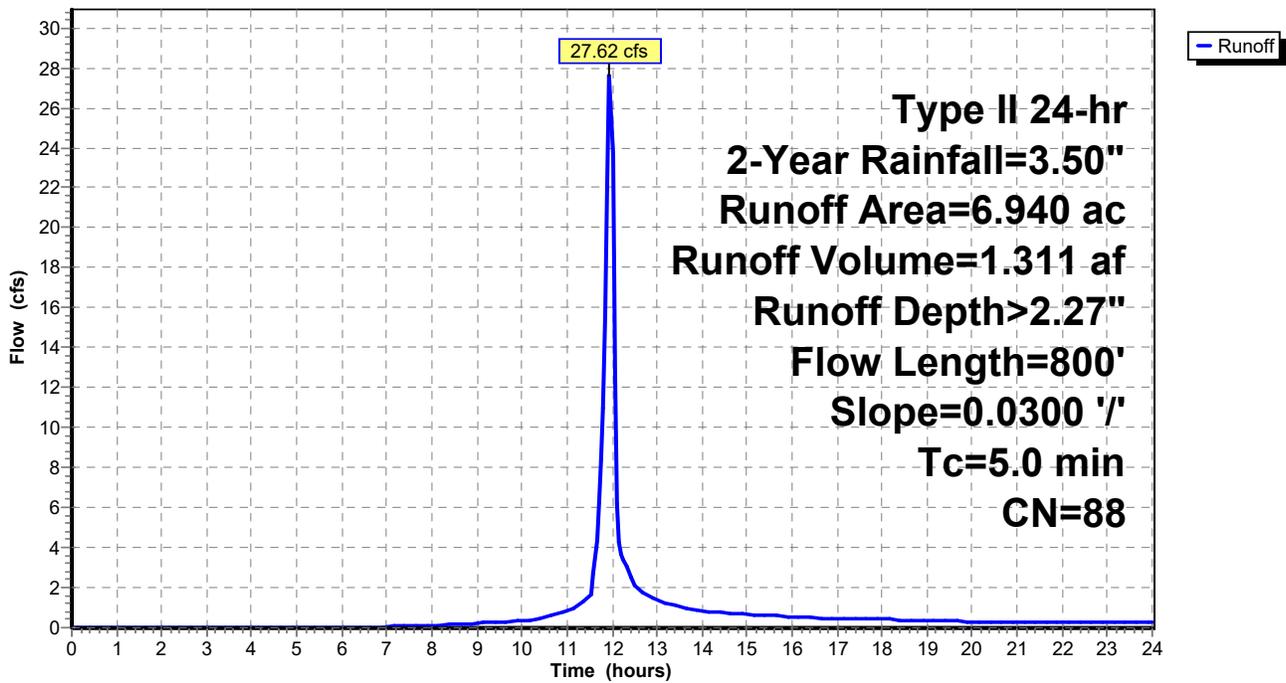
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 2-Year Rainfall=3.50"

Area (ac)	CN	Description
* 6.940	88	Future Multi-Family, 65% imp, HSG C
2.429		35.00% Pervious Area
4.511		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0300	1.72		<b>Sheet Flow, Sheet flow</b> Smooth surfaces n= 0.011 P2= 3.60"
4.0	700		2.92		<b>Direct Entry, Pipe flow</b>
5.0	800	Total			

**Subcatchment 12S: EX OFF**

Hydrograph



**Summary for Subcatchment 13S: Onsite 3**

Runoff = 43.73 cfs @ 11.99 hrs, Volume= 2.265 af, Depth> 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-Year Rainfall=3.50"

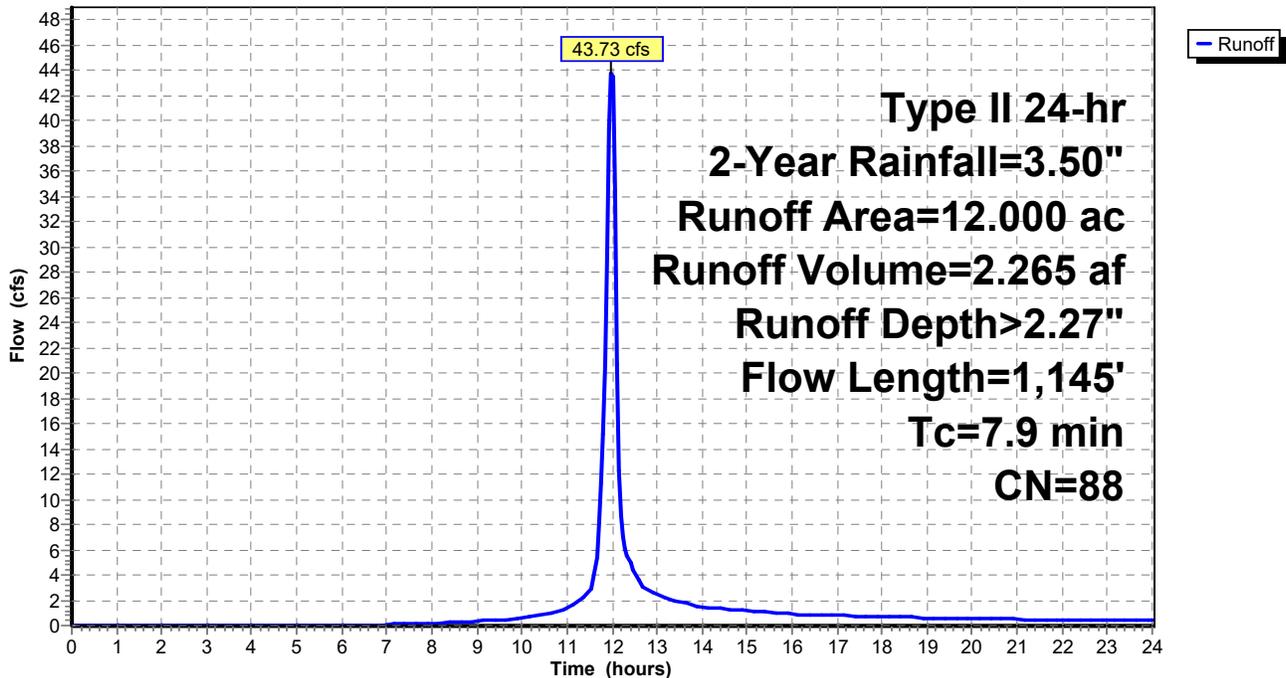
Area (ac)	CN	Description
* 12.000	88	1/8 acre lots, 65% imp, HSG D
4.200		35.00% Pervious Area
7.800		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
6.8	1,045	0.0250	2.55		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
7.9	1,145	Total			

**Subcatchment 13S: Onsite 3**

Hydrograph



**Summary for Subcatchment 14S: Onsite 4**

Runoff = 76.79 cfs @ 12.00 hrs, Volume= 3.990 af, Depth> 2.01"

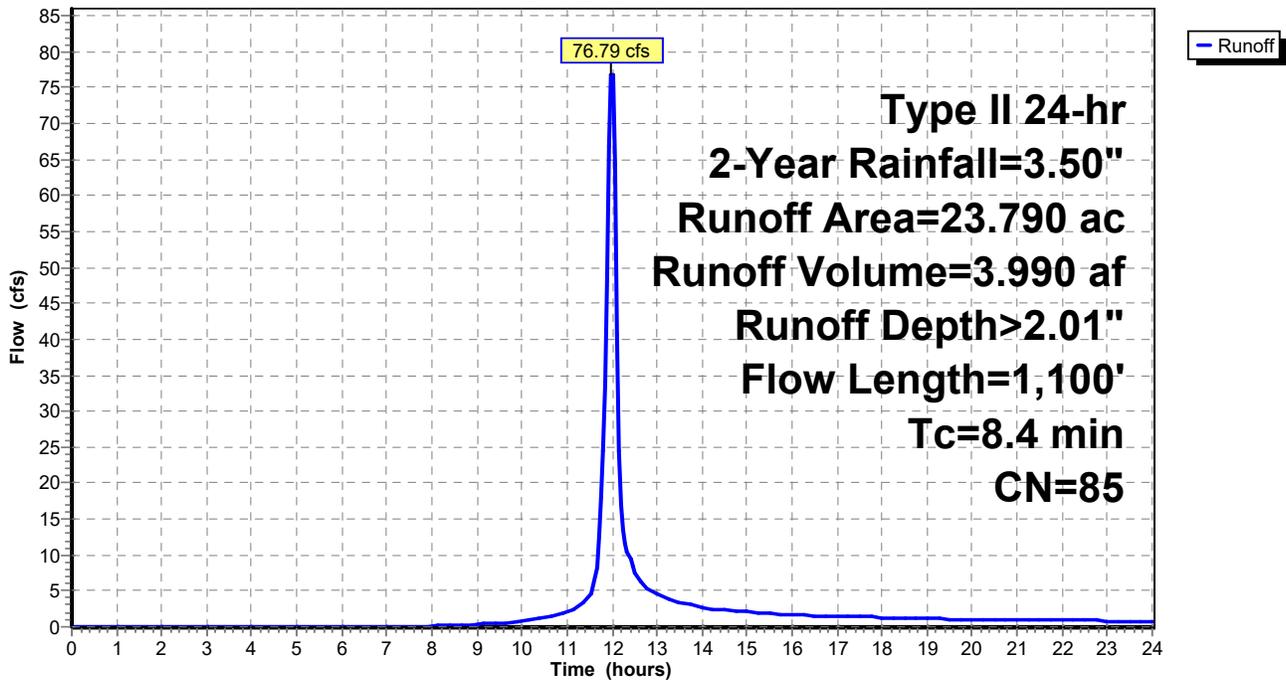
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-Year Rainfall=3.50"

Area (ac)	CN	Description
* 11.250	82	SINGLE FAMILY LOTS
* 12.540	88	1/8 acre lots, 65% imp, HSG D
23.790	85	Weighted Average
15.639		65.74% Pervious Area
8.151		34.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0205	1.47		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
7.3	1,000	0.0200	2.28		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
8.4	1,100	Total			

**Subcatchment 14S: Onsite 4**

Hydrograph



### Summary for Subcatchment 15S: Onsite 2

Runoff = 21.75 cfs @ 11.98 hrs, Volume= 1.164 af, Depth> 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 2-Year Rainfall=3.50"

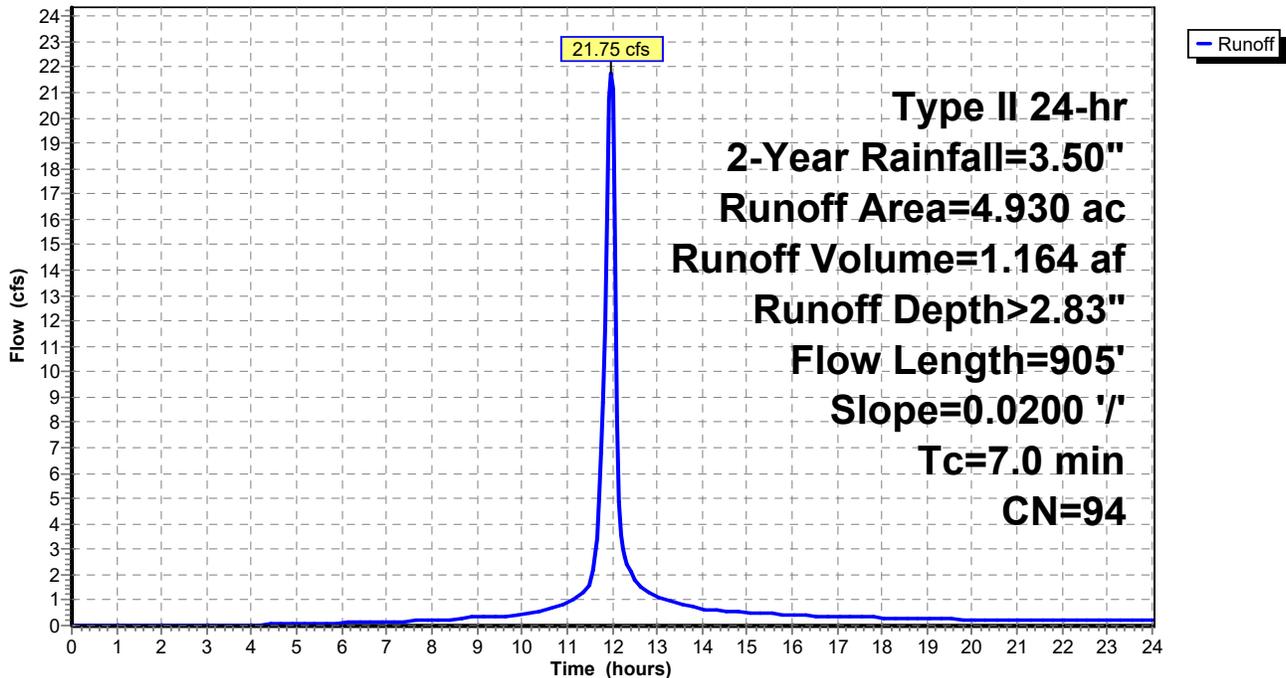
Area (ac)	CN	Description
* 4.930	94	Urban commercial, 85% imp, HSG D
0.739		15.00% Pervious Area
4.190		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
5.9	805	0.0200	2.28		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
7.0	905	Total			

### Subcatchment 15S: Onsite 2

Hydrograph



**Summary for Pond 12P: EWDB #1**

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 2.27" for 2-Year event  
 Inflow = 103.54 cfs @ 11.95 hrs, Volume= 4.915 af  
 Outflow = 15.29 cfs @ 12.17 hrs, Volume= 3.645 af, Atten= 85%, Lag= 13.0 min  
 Primary = 15.29 cfs @ 12.17 hrs, Volume= 3.645 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 996.44' @ 12.17 hrs Surf.Area= 67,839 sf Storage= 109,731 cf

Plug-Flow detention time= 195.3 min calculated for 3.637 af (74% of inflow)  
 Center-of-Mass det. time= 103.8 min ( 910.7 - 806.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	994.80'	561,663 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
994.80	66,251	0	0
996.80	68,192	134,443	134,443
997.00	69,233	13,743	148,186
998.00	74,497	71,865	220,051
999.00	79,862	77,180	297,230
1,000.00	85,328	82,595	379,825
1,001.00	90,894	88,111	467,936
1,002.00	96,560	93,727	561,663

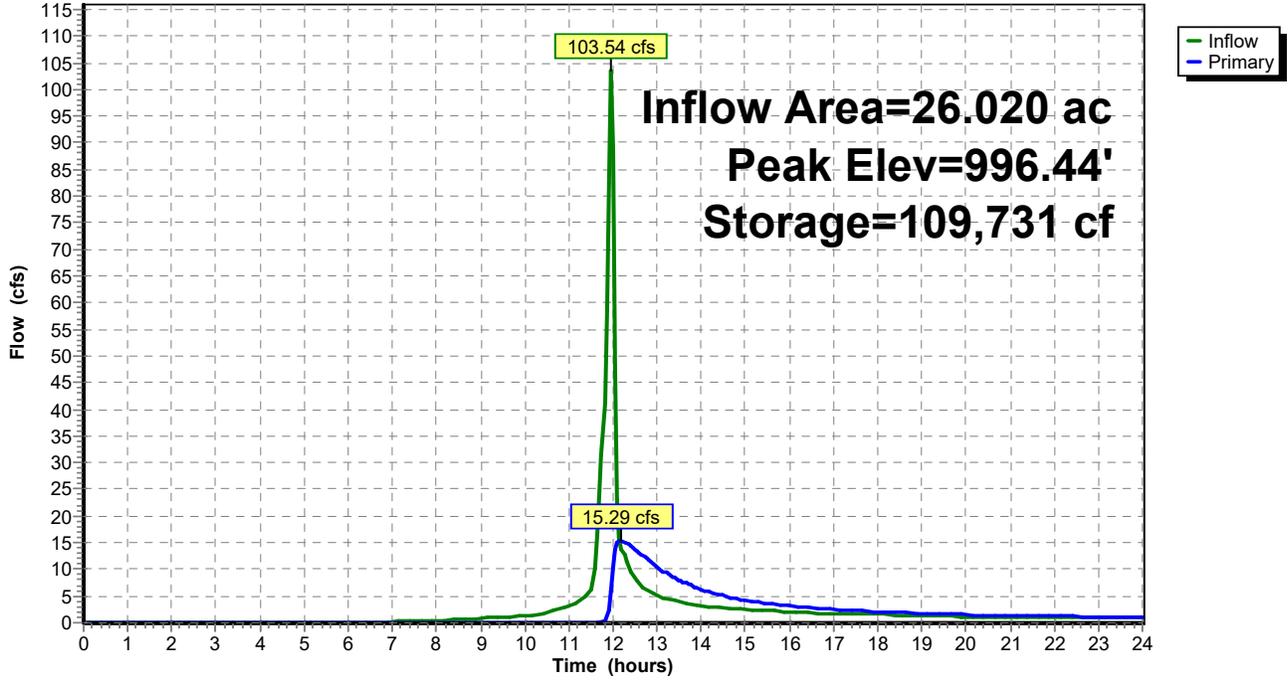
Device	Routing	Invert	Outlet Devices
#1	Primary	994.50'	<b>30.0" Round Culvert</b> L= 80.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 994.50' / 993.90' S= 0.0075 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	994.80'	<b>20.0 deg x 0.70' rise Sharp-Crested Vee/Trap Weir</b> Cv= 2.69 (C= 3.36)
#3	Device 1	995.50'	<b>5.0' long x 3.00' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 3.0' Crest Height
#4	Device 1	998.50'	<b>60.0" x 60.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=15.24 cfs @ 12.17 hrs HW=996.44' (Free Discharge)

- 1=Culvert (Passes 15.24 cfs of 17.20 cfs potential flow)
- 2=Sharp-Crested Vee/Trap Weir (Orifice Controls 0.47 cfs @ 5.44 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 14.77 cfs @ 3.28 fps)
- 4=Orifice/Grate ( Controls 0.00 cfs)

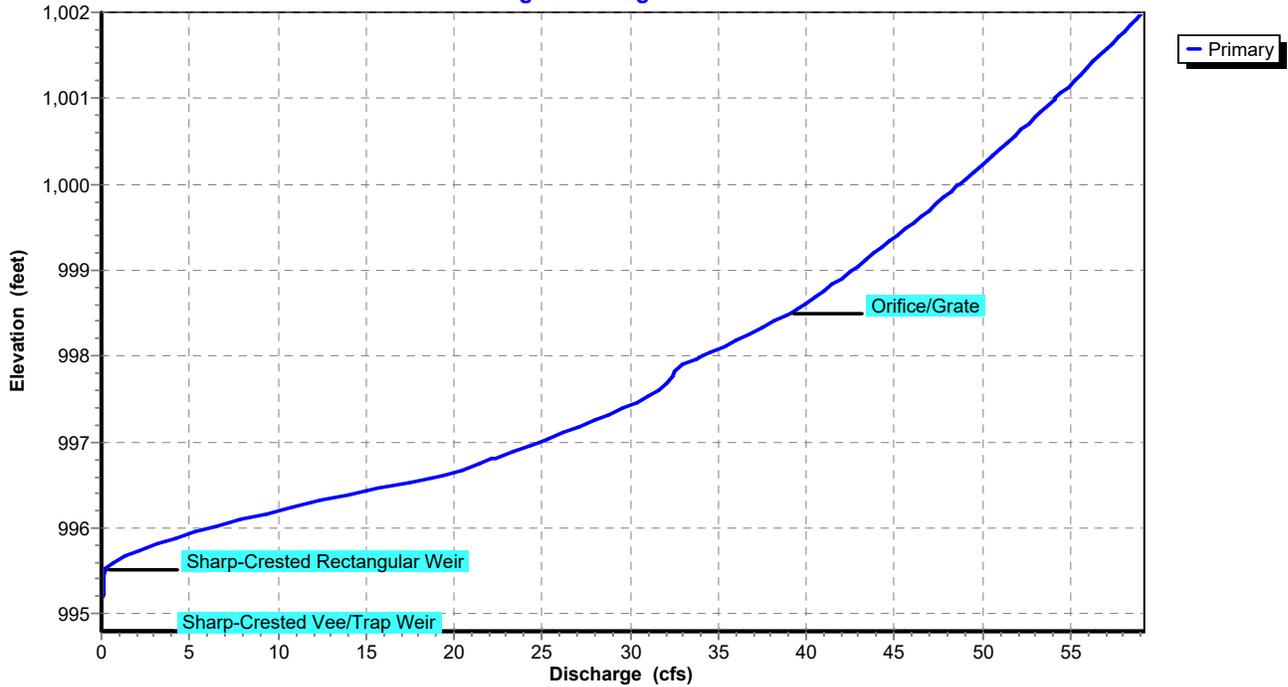
### Pond 12P: EWDB #1

Hydrograph



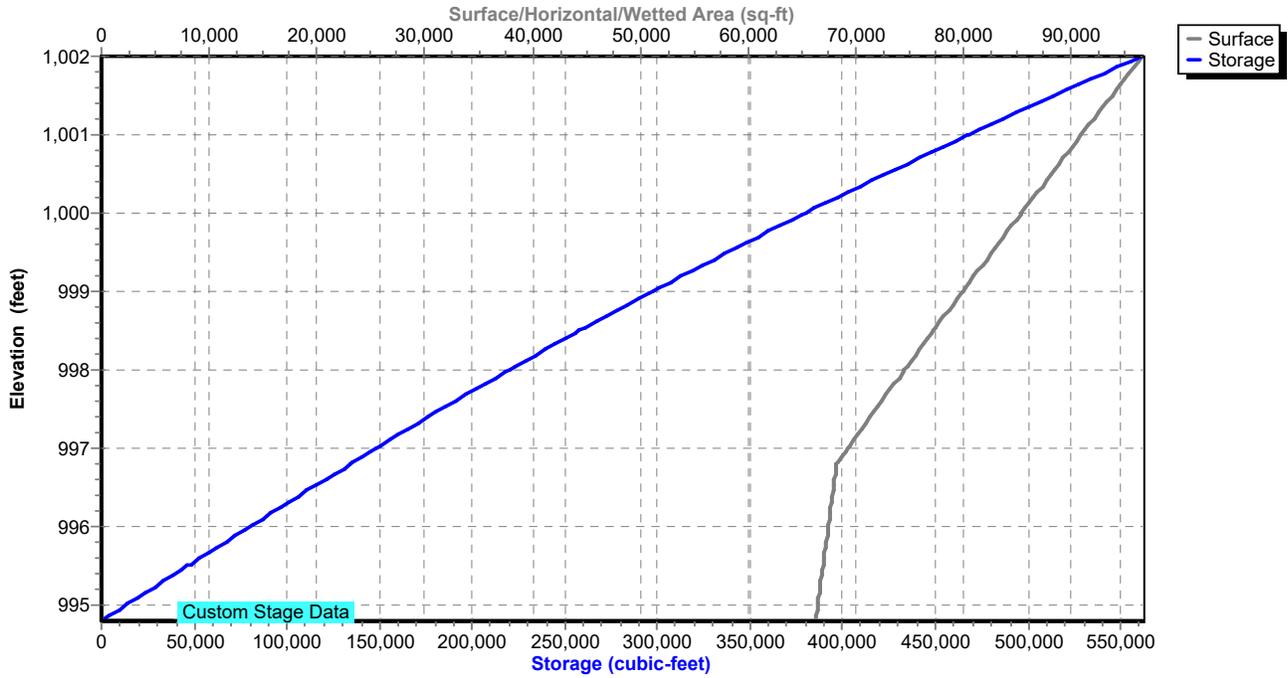
### Pond 12P: EWDB #1

Stage-Discharge



### Pond 12P: EWDB #1

#### Stage-Area-Storage



**Summary for Pond 13P: EWDB #2**

Inflow Area = 12.000 ac, 65.00% Impervious, Inflow Depth > 2.27" for 2-Year event  
 Inflow = 43.73 cfs @ 11.99 hrs, Volume= 2.265 af  
 Outflow = 4.65 cfs @ 12.44 hrs, Volume= 1.731 af, Atten= 89%, Lag= 27.0 min  
 Primary = 4.65 cfs @ 12.44 hrs, Volume= 1.731 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 992.49' @ 12.44 hrs Surf.Area= 22,948 sf Storage= 52,907 cf

Plug-Flow detention time= 229.4 min calculated for 1.731 af (76% of inflow)  
 Center-of-Mass det. time= 141.1 min ( 950.3 - 809.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	990.00'	148,828 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
990.00	20,951	0	0
992.00	20,952	41,903	41,903
992.01	21,802	214	42,117
993.00	24,155	22,749	64,865
996.00	31,820	83,963	148,828

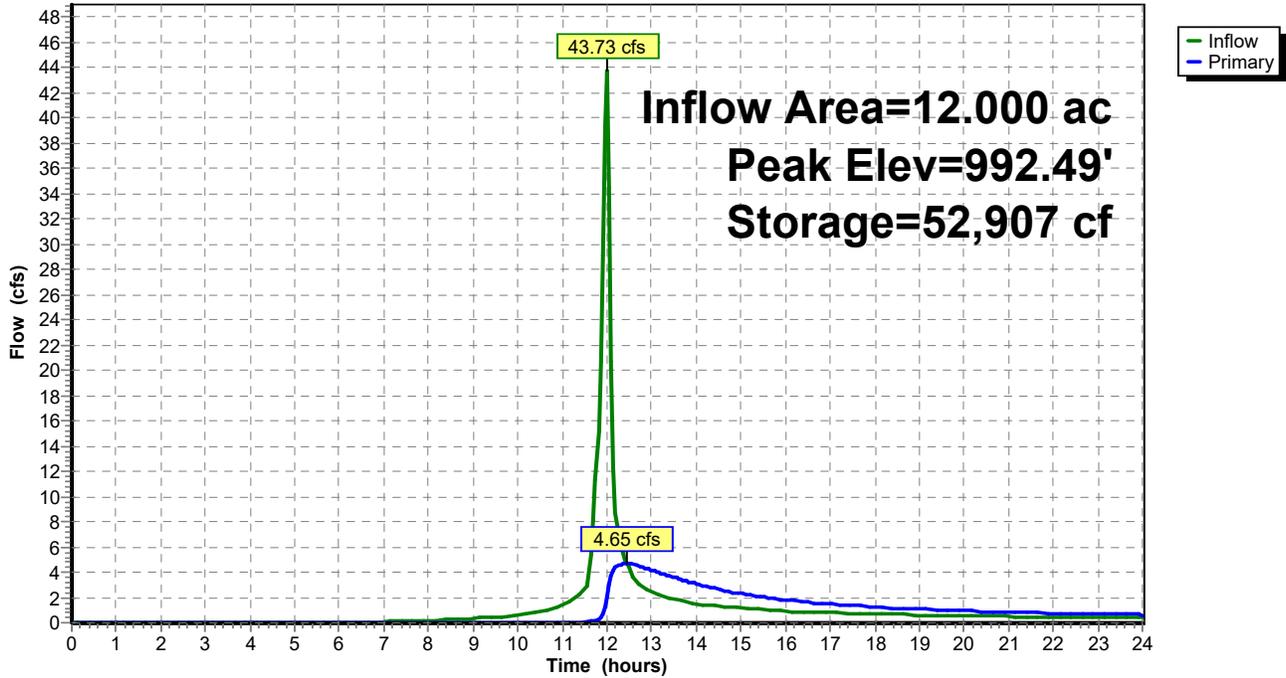
Device	Routing	Invert	Outlet Devices
#1	Primary	989.80'	<b>24.0" Round Culvert</b> L= 144.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 989.80' / 984.00' S= 0.0403 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	990.00'	<b>20.0 deg x 3.70' rise Sharp-Crested Vee/Trap Weir</b> Cv= 2.69 (C= 3.36)
#3	Device 1	993.70'	<b>60.0" x 60.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=4.65 cfs @ 12.44 hrs HW=992.49' (Free Discharge)

- ↑ **1=Culvert** (Passes 4.65 cfs of 19.68 cfs potential flow)
- ↑ **2=Sharp-Crested Vee/Trap Weir** (Weir Controls 4.65 cfs @ 4.25 fps)
- ↑ **3=Orifice/Grate** ( Controls 0.00 cfs)

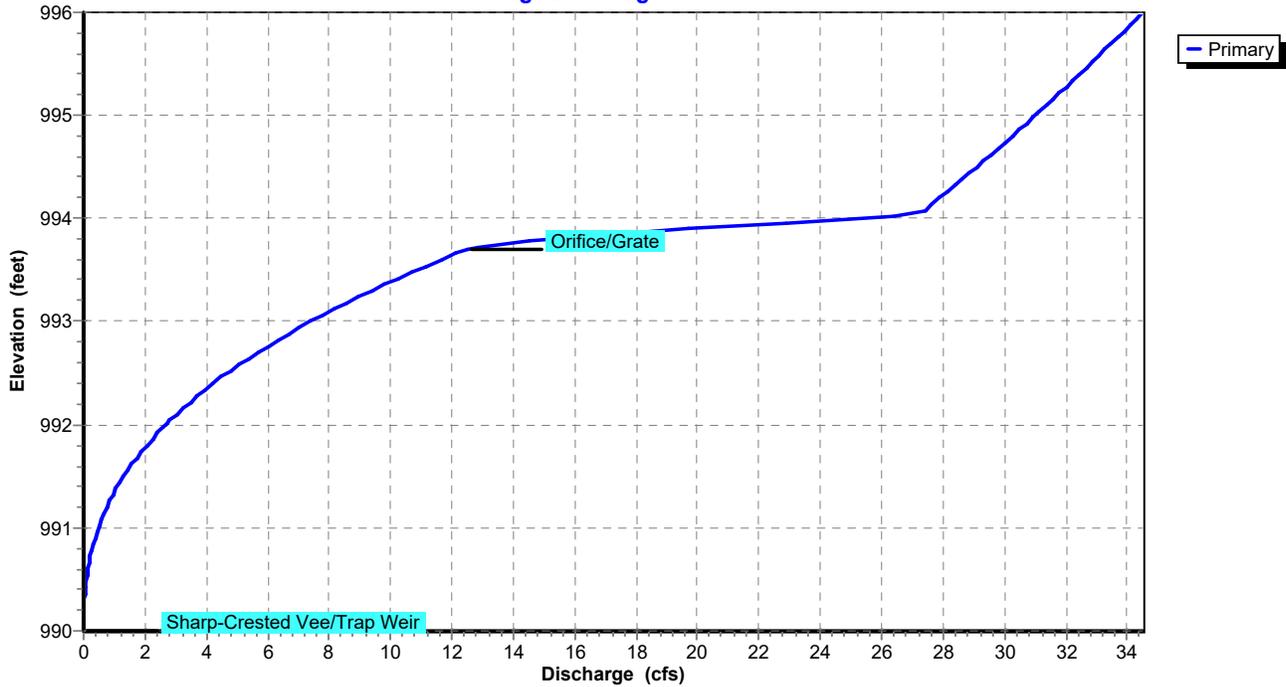
### Pond 13P: EWDB #2

Hydrograph



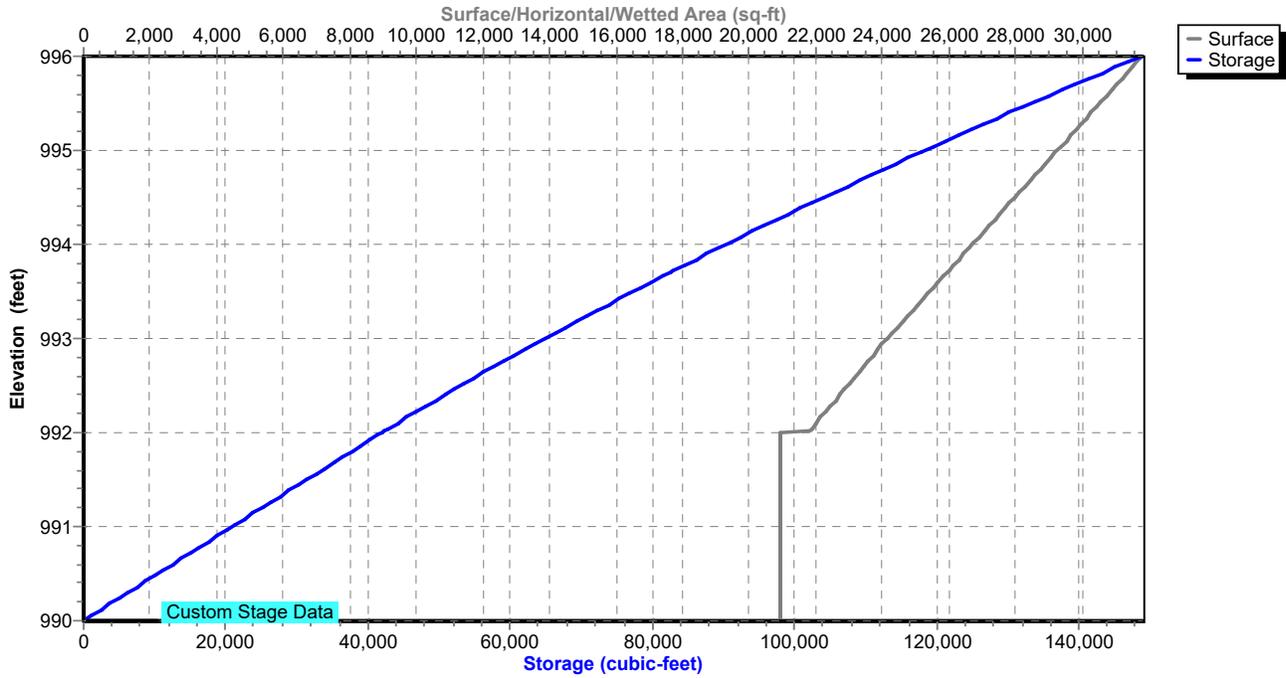
### Pond 13P: EWDB #2

Stage-Discharge



### Pond 13P: EWDB #2

#### Stage-Area-Storage



**Summary for Pond 14P: EWDB #3**

[79] Warning: Submerged Pond 13P Primary device # 1 OUTLET by 2.35'

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 1.92" for 2-Year event  
 Inflow = 78.77 cfs @ 12.00 hrs, Volume= 5.721 af  
 Outflow = 17.16 cfs @ 12.27 hrs, Volume= 4.564 af, Atten= 78%, Lag= 16.5 min  
 Primary = 17.16 cfs @ 12.27 hrs, Volume= 4.564 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 986.35' @ 12.27 hrs Surf.Area= 33,159 sf Storage= 86,307 cf

Plug-Flow detention time= 171.9 min calculated for 4.564 af (80% of inflow)  
 Center-of-Mass det. time= 85.7 min ( 945.2 - 859.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	983.50'	463,800 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
983.50	29,620	0	0
985.50	29,626	59,246	59,246
985.51	30,649	301	59,547
986.00	32,044	15,360	74,907
988.00	38,421	70,465	145,372
990.00	47,178	85,599	230,971
991.00	52,031	49,605	280,576
992.00	57,384	54,708	335,283
993.00	64,631	61,008	396,291
994.00	70,388	67,510	463,800

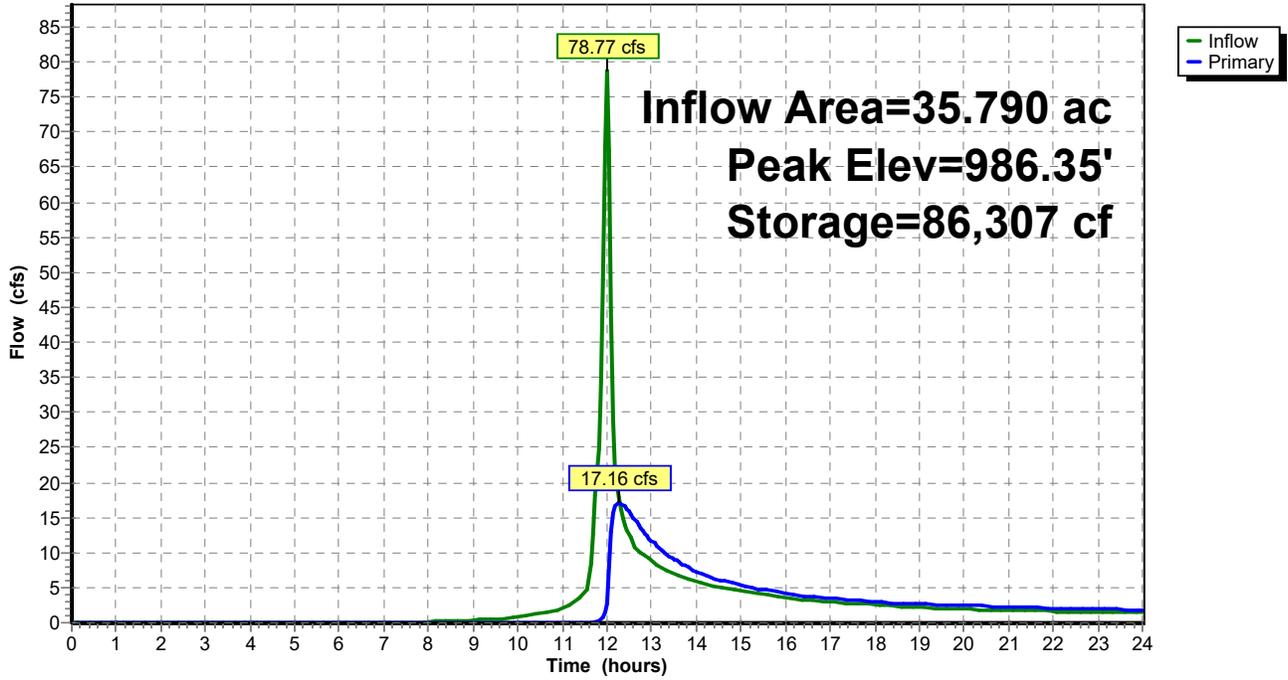
Device	Routing	Invert	Outlet Devices
#1	Primary	979.00'	<b>36.0" Round Culvert</b> L= 191.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 979.00' / 976.78' S= 0.0116 '/ Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Device 1	983.50'	<b>20.0 deg x 2.00' rise Sharp-Crested Vee/Trap Weir</b> Cv= 2.69 (C= 3.36)
#3	Device 1	985.50'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 985.50 988.00 Width (feet) 5.00 5.00
#4	Device 1	988.00'	<b>60.0" x 60.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=17.11 cfs @ 12.27 hrs HW=986.35' (Free Discharge)

- 1=Culvert (Passes 17.11 cfs of 64.98 cfs potential flow)
- 2=Sharp-Crested Vee/Trap Weir (Orifice Controls 4.33 cfs @ 6.13 fps)
- 3=Custom Weir/Orifice (Weir Controls 12.78 cfs @ 3.02 fps)
- 4=Orifice/Grate ( Controls 0.00 cfs)

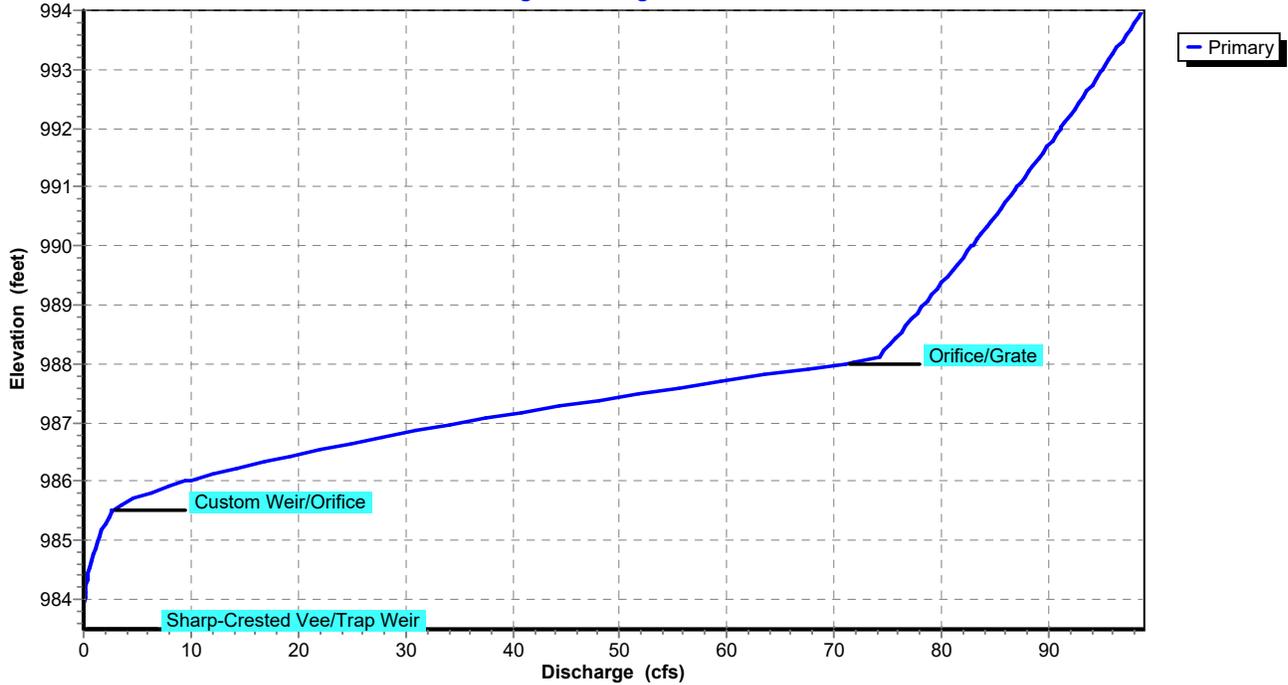
### Pond 14P: EWDB #3

Hydrograph



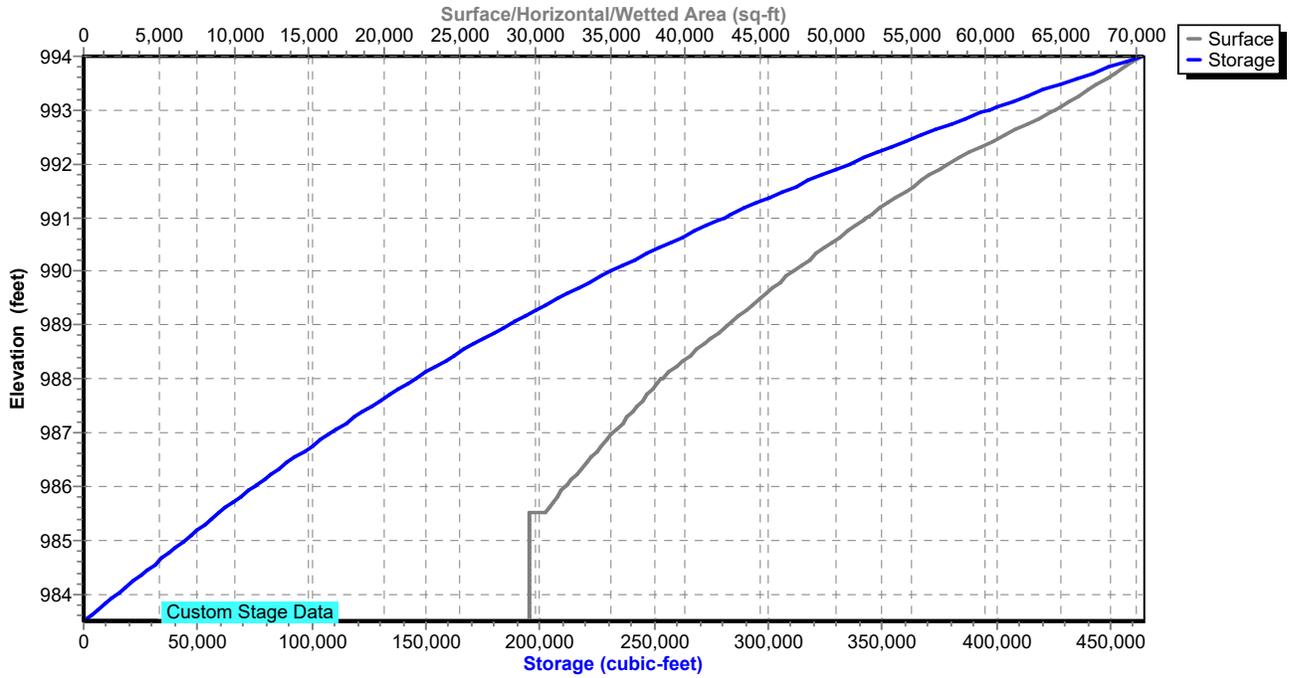
### Pond 14P: EWDB #3

Stage-Discharge



### Pond 14P: EWDB #3

#### Stage-Area-Storage



**22-102-HYDRO-PRO**

Prepared by Schlagel

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Type II 24-hr 2-Year Rainfall=3.50"

Printed 5/11/2023

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**Summary for Pond 15P: Eddb #1**

Inflow Area = 4.930 ac, 85.00% Impervious, Inflow Depth > 2.83" for 2-Year event  
 Inflow = 21.75 cfs @ 11.98 hrs, Volume= 1.164 af  
 Outflow = 2.46 cfs @ 12.35 hrs, Volume= 1.162 af, Atten= 89%, Lag= 22.0 min  
 Primary = 2.46 cfs @ 12.35 hrs, Volume= 1.162 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 1,007.88' @ 12.35 hrs Surf.Area= 13,705 sf Storage= 21,554 cf

Plug-Flow detention time= 85.7 min calculated for 1.159 af (100% of inflow)  
 Center-of-Mass det. time= 84.5 min ( 865.6 - 781.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	1,005.00'	89,114 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,005.00	2,349	0	0
1,006.00	5,514	3,932	3,932
1,007.00	9,388	7,451	11,383
1,008.00	14,288	11,838	23,221
1,009.00	19,717	17,003	40,223
1,010.00	24,607	22,162	62,385
1,011.00	28,850	26,729	89,114

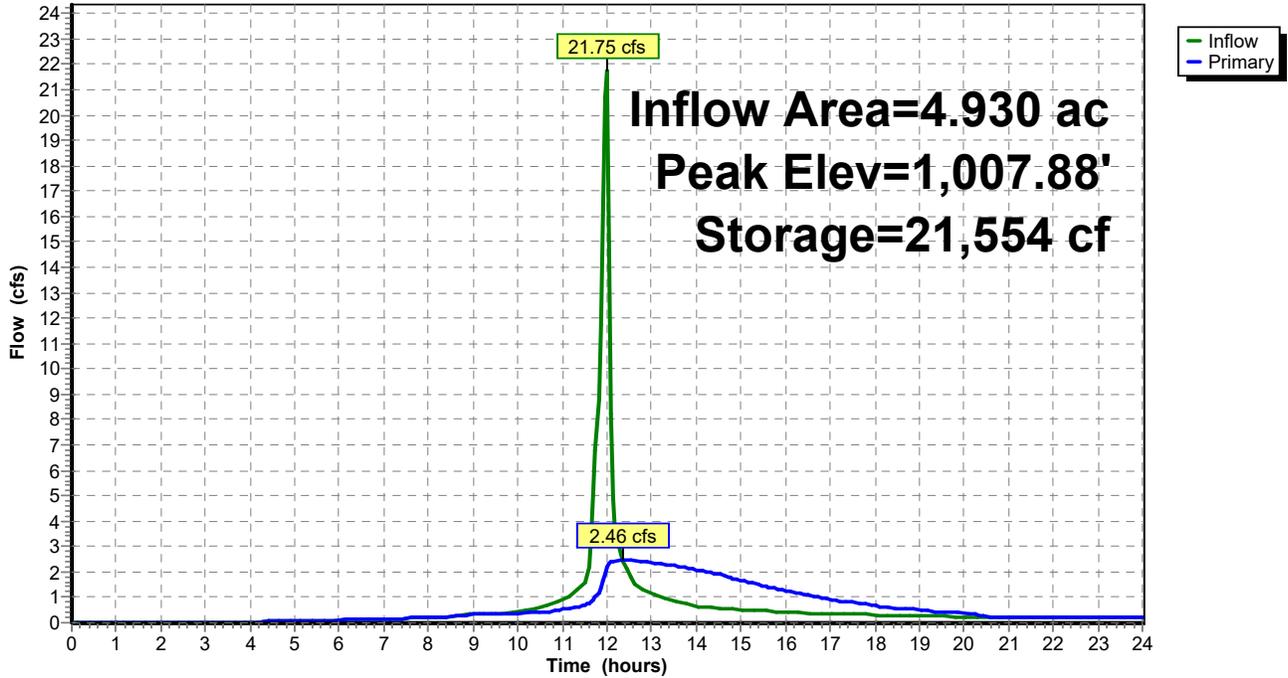
Device	Routing	Invert	Outlet Devices
#1	Primary	1,004.00'	<b>18.0" Round Culvert</b> L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 1,004.00' / 1,003.25' S= 0.0150 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#2	Device 1	1,004.40'	<b>8.0" Round 8" PVC</b> L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,004.40' / 1,004.20' S= 0.0067 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#3	Device 2	1,004.20'	<b>1.0" Vert. 15" RISER X 7.00 columns</b> X 9 rows with 4.0" cc spacing C= 0.600
#4	Device 1	1,007.90'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 1,007.90 1,008.40 Width (feet) 4.00 4.00
#5	Device 1	1,009.35'	<b>48.0" x 48.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=2.46 cfs @ 12.35 hrs HW=1,007.88' (Free Discharge)

- 1=Culvert (Passes 2.46 cfs of 15.06 cfs potential flow)
- 2=8" PVC (Passes 2.46 cfs of 2.98 cfs potential flow)
- 3=15" RISER (Orifice Controls 2.46 cfs @ 7.15 fps)
- 4=Custom Weir/Orifice ( Controls 0.00 cfs)
- 5=Orifice/Grate ( Controls 0.00 cfs)

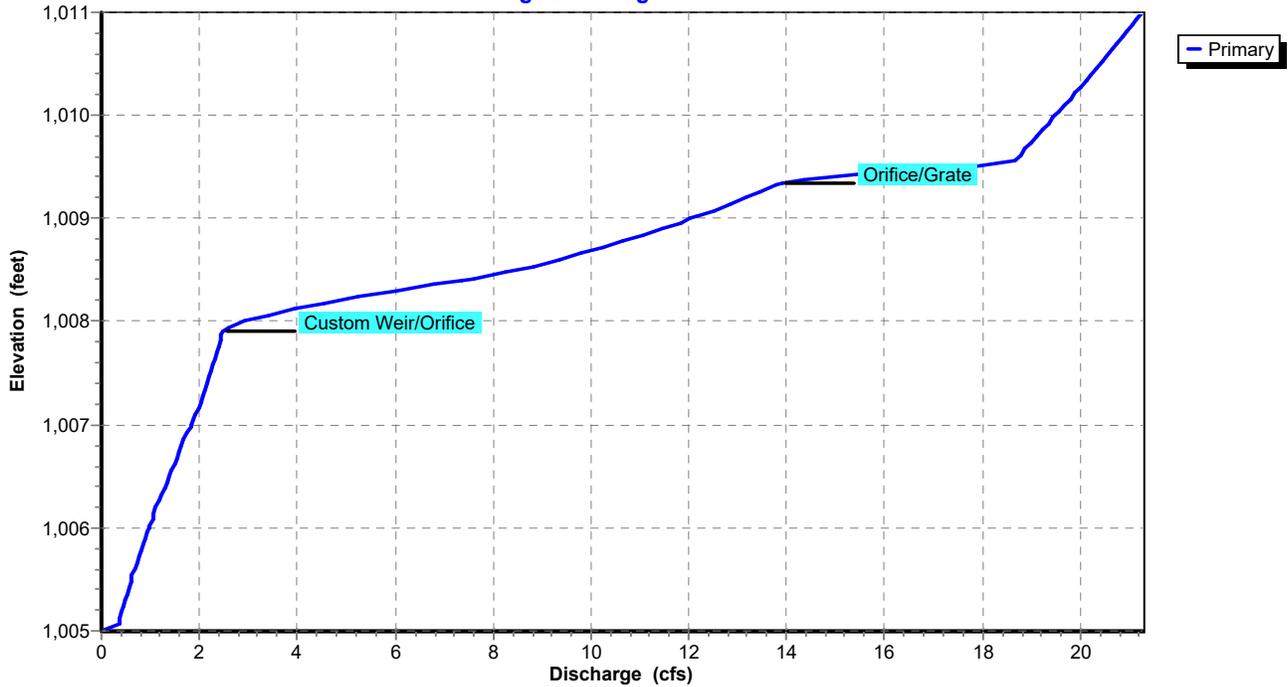
Pond 15P: EDDB #1

Hydrograph



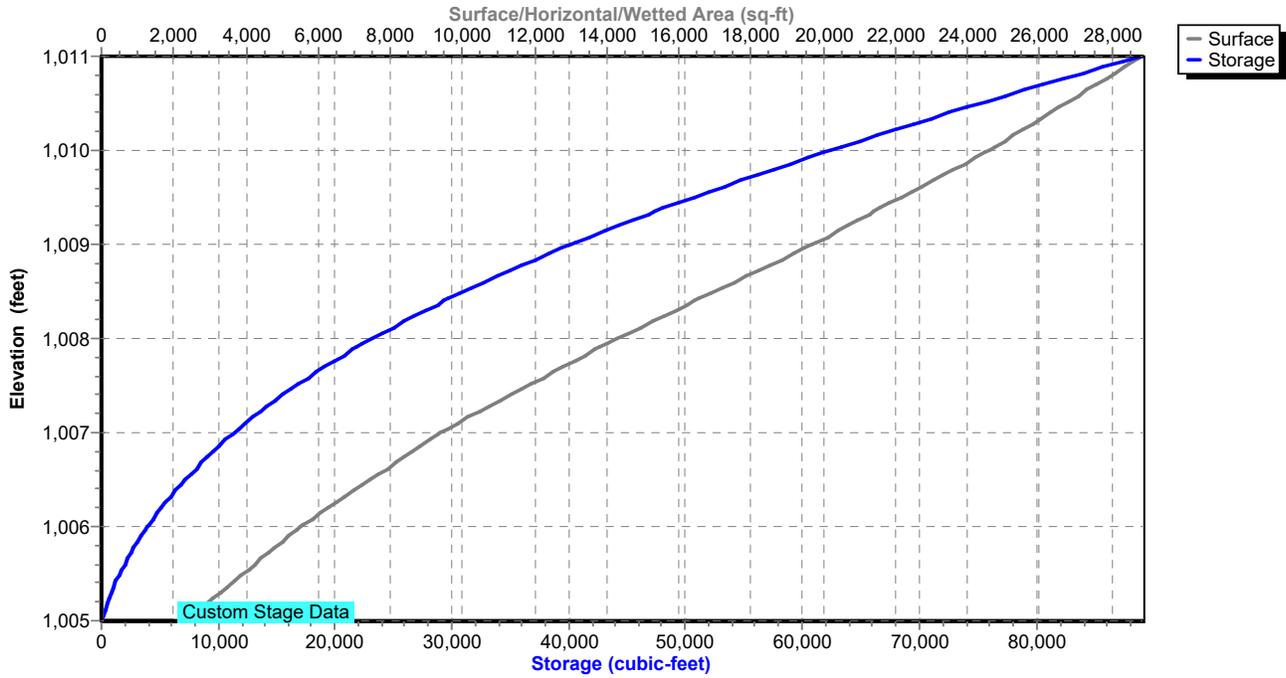
Pond 15P: EDDB #1

Stage-Discharge



### Pond 15P: EDDB #1

#### Stage-Area-Storage



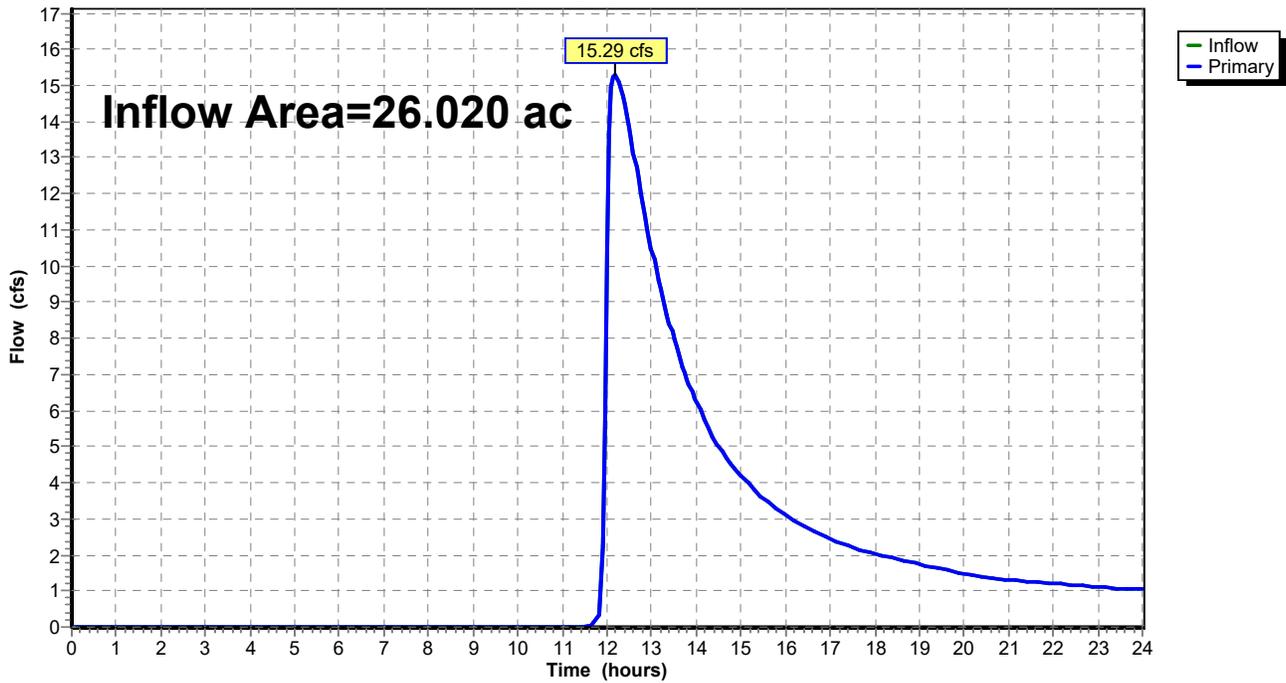
### Summary for Link 12L: RP-4

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 1.68" for 2-Year event  
Inflow = 15.29 cfs @ 12.17 hrs, Volume= 3.645 af  
Primary = 15.29 cfs @ 12.17 hrs, Volume= 3.645 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link 12L: RP-4

Hydrograph



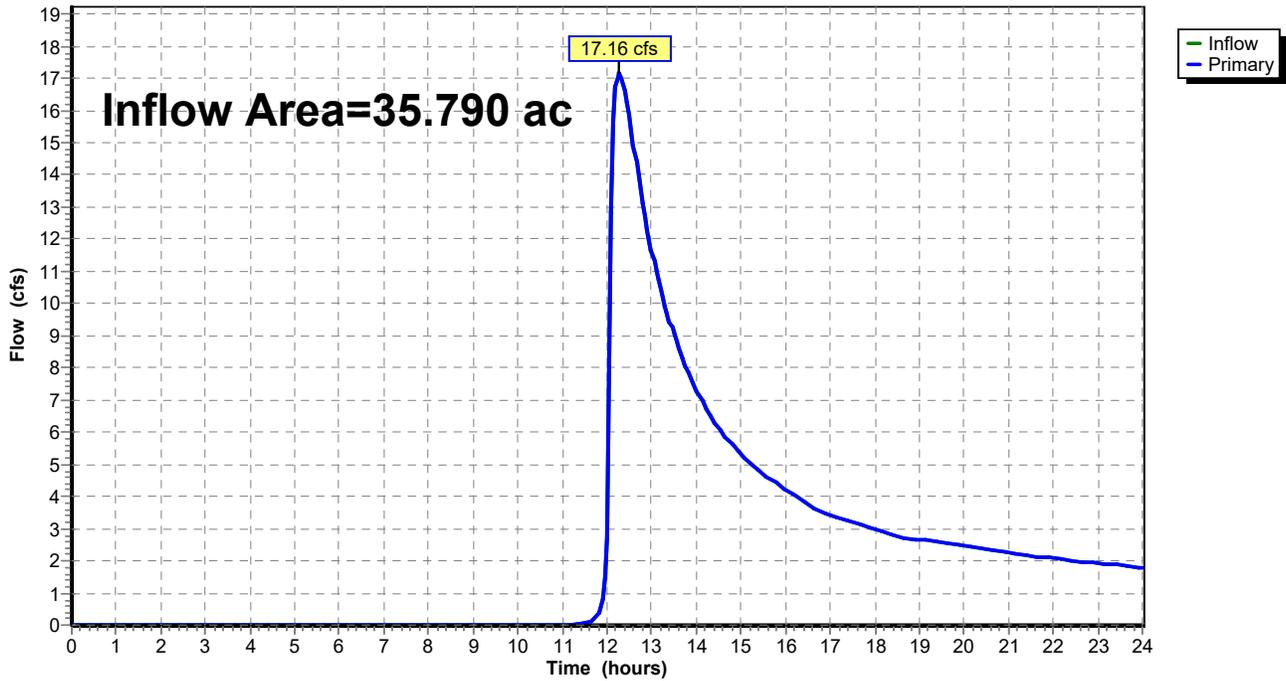
### Summary for Link 14L: RP-3

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 1.53" for 2-Year event  
Inflow = 17.16 cfs @ 12.27 hrs, Volume= 4.564 af  
Primary = 17.16 cfs @ 12.27 hrs, Volume= 4.564 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link 14L: RP-3

Hydrograph



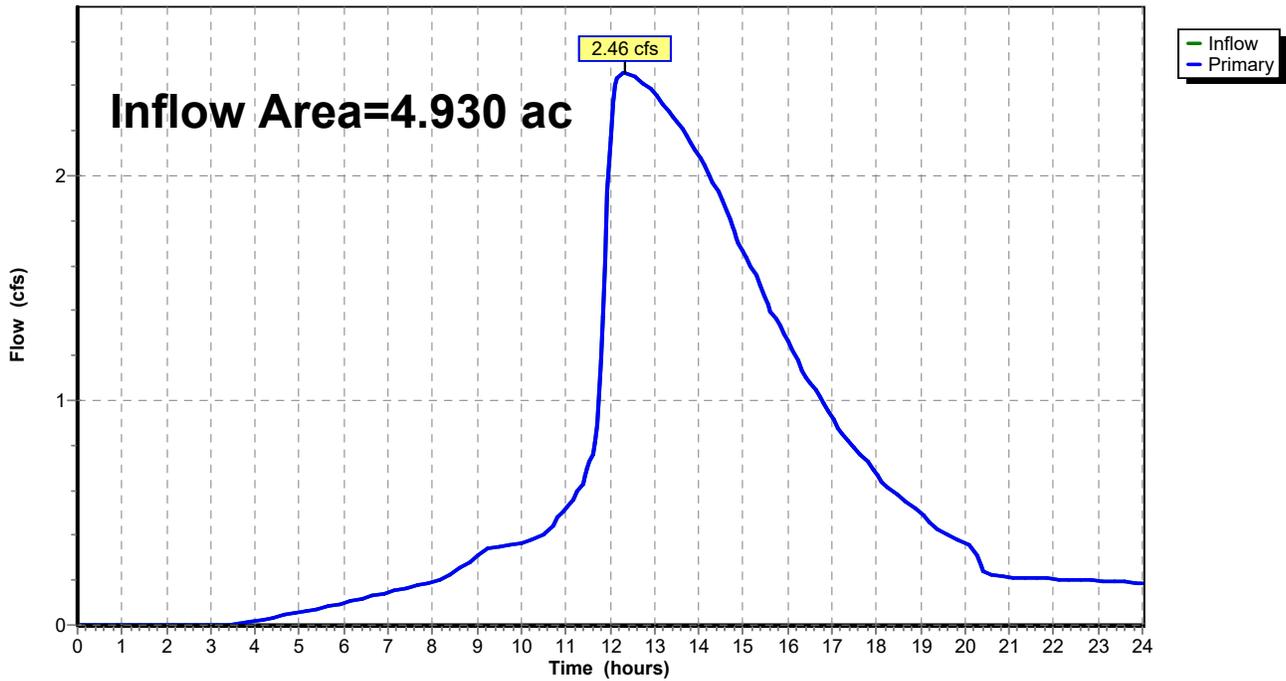
### Summary for Link 15L: RP-1

Inflow Area = 4.930 ac, 85.00% Impervious, Inflow Depth > 2.83" for 2-Year event  
Inflow = 2.46 cfs @ 12.35 hrs, Volume= 1.162 af  
Primary = 2.46 cfs @ 12.35 hrs, Volume= 1.162 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link 15L: RP-1

Hydrograph



**Summary for Subcatchment 11S: Onsite 5**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 128.33 cfs @ 11.95 hrs, Volume= 6.283 af, Depth> 3.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 10-Year Rainfall=5.30"

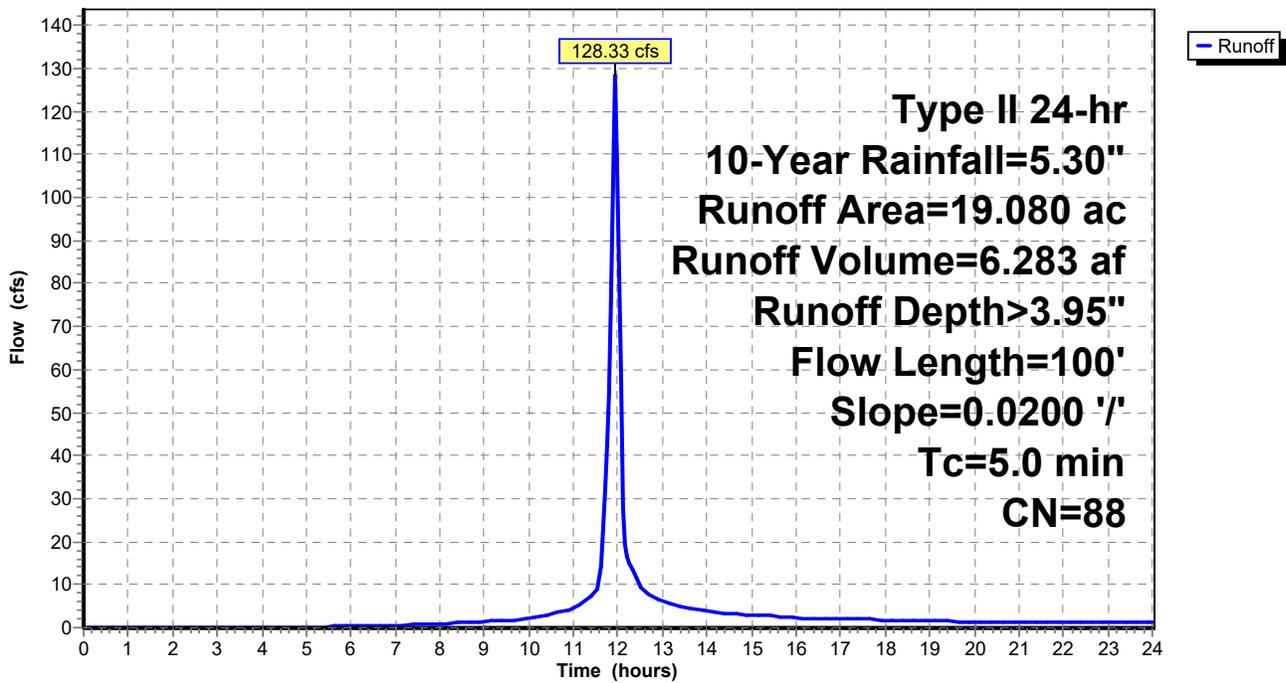
Area (ac)	CN	Description
* 19.080	88	Apartments, 65% imp, HSG C
6.678		35.00% Pervious Area
12.402		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
3.9					<b>Direct Entry, Pipe flow</b>
5.0	100	Total			

**Subcatchment 11S: Onsite 5**

Hydrograph



**Summary for Subcatchment 12S: EX OFF**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 46.68 cfs @ 11.95 hrs, Volume= 2.285 af, Depth> 3.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 10-Year Rainfall=5.30"

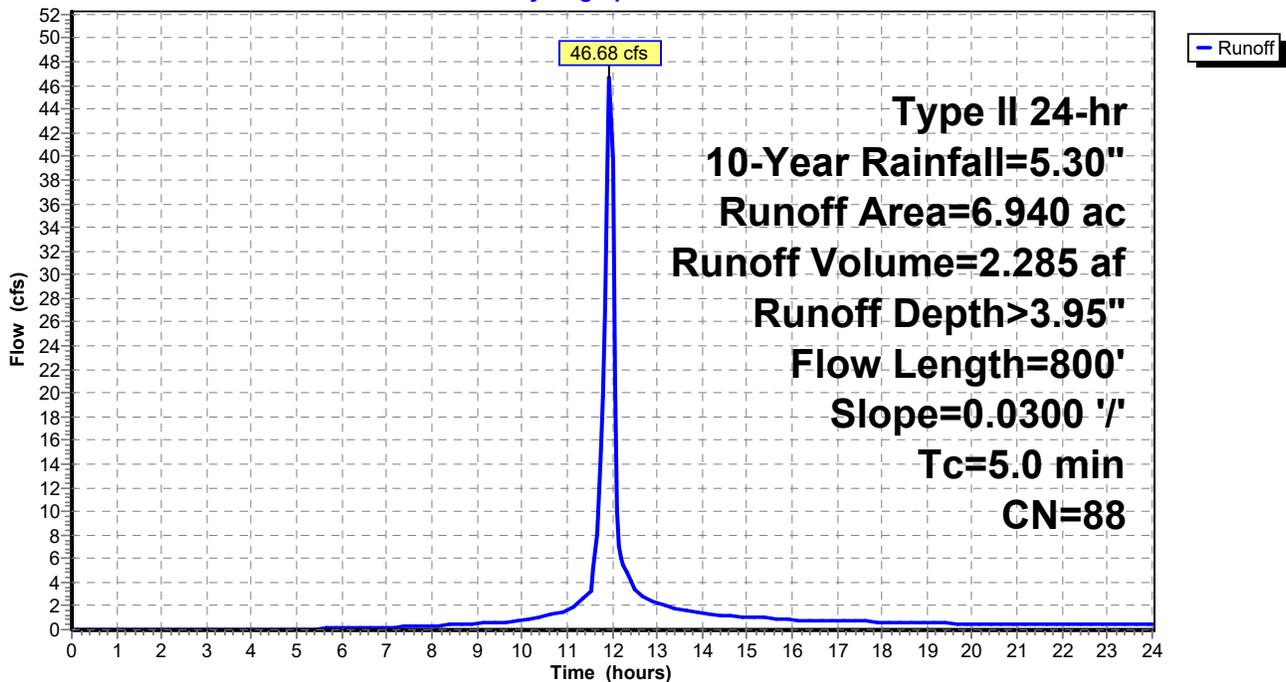
Area (ac)	CN	Description
* 6.940	88	Future Multi-Family, 65% imp, HSG C
2.429		35.00% Pervious Area
4.511		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0300	1.72		<b>Sheet Flow, Sheet flow</b> Smooth surfaces n= 0.011 P2= 3.60"
4.0	700		2.92		<b>Direct Entry, Pipe flow</b>
5.0	800	Total			

**Subcatchment 12S: EX OFF**

Hydrograph



**Summary for Subcatchment 13S: Onsite 3**

Runoff = 74.03 cfs @ 11.99 hrs, Volume= 3.949 af, Depth> 3.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 10-Year Rainfall=5.30"

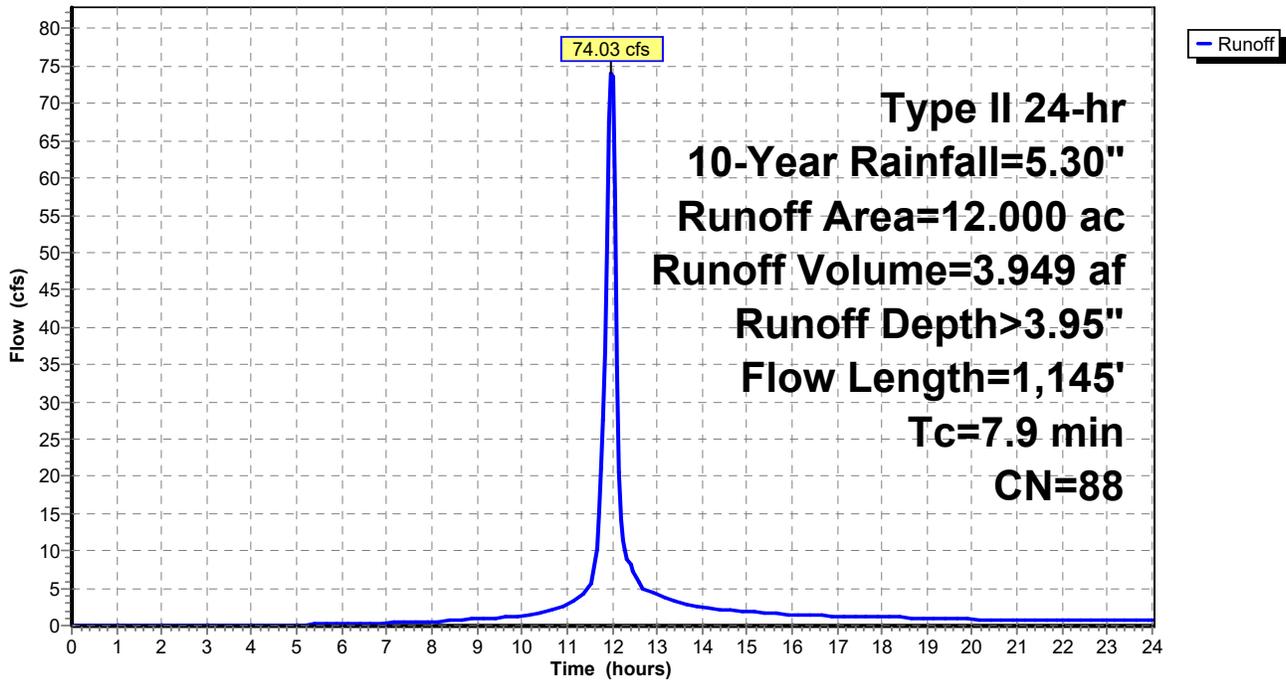
Area (ac)	CN	Description
* 12.000	88	1/8 acre lots, 65% imp, HSG D
4.200		35.00% Pervious Area
7.800		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
6.8	1,045	0.0250	2.55		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
7.9	1,145	Total			

**Subcatchment 13S: Onsite 3**

Hydrograph



**Summary for Subcatchment 14S: Onsite 4**

Runoff = 135.68 cfs @ 11.99 hrs, Volume= 7.218 af, Depth> 3.64"

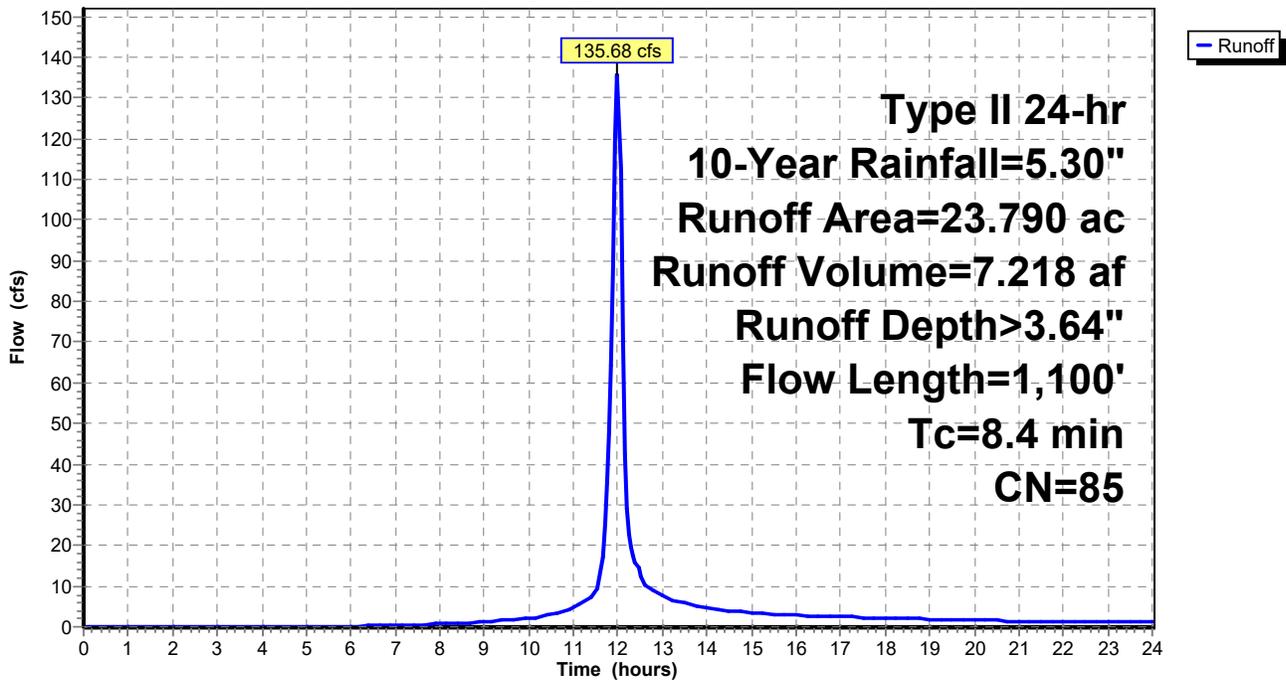
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 10-Year Rainfall=5.30"

Area (ac)	CN	Description
* 11.250	82	SINGLE FAMILY LOTS
* 12.540	88	1/8 acre lots, 65% imp, HSG D
23.790	85	Weighted Average
15.639		65.74% Pervious Area
8.151		34.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0205	1.47		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
7.3	1,000	0.0200	2.28		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
8.4	1,100	Total			

**Subcatchment 14S: Onsite 4**

Hydrograph



**Summary for Subcatchment 15S: Onsite 2**

Runoff = 34.23 cfs @ 11.98 hrs, Volume= 1.890 af, Depth> 4.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 10-Year Rainfall=5.30"

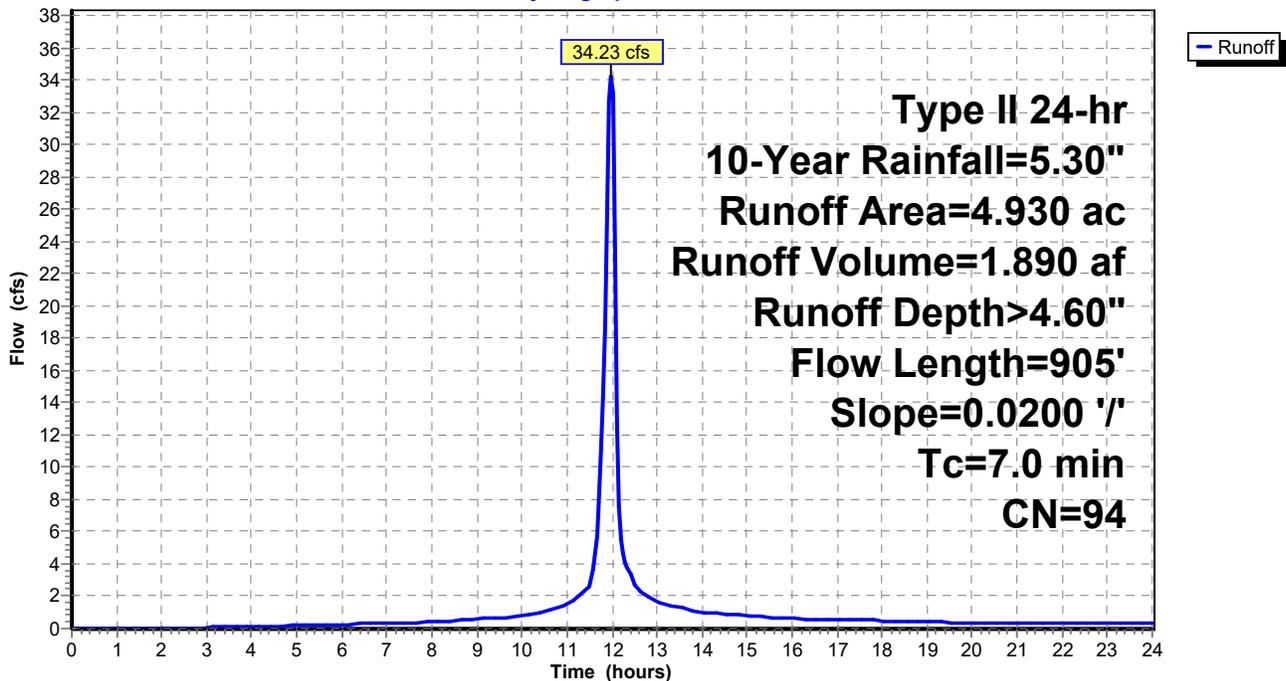
Area (ac)	CN	Description
* 4.930	94	Urban commercial, 85% imp, HSG D
0.739		15.00% Pervious Area
4.190		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
5.9	805	0.0200	2.28		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
7.0	905	Total			

**Subcatchment 15S: Onsite 2**

Hydrograph



**Summary for Pond 12P: EWDB #1**

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 3.95" for 10-Year event  
 Inflow = 175.01 cfs @ 11.95 hrs, Volume= 8.569 af  
 Outflow = 31.31 cfs @ 12.13 hrs, Volume= 7.212 af, Atten= 82%, Lag= 10.8 min  
 Primary = 31.31 cfs @ 12.13 hrs, Volume= 7.212 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 997.57' @ 12.13 hrs Surf.Area= 72,237 sf Storage= 188,545 cf

Plug-Flow detention time= 157.2 min calculated for 7.197 af (84% of inflow)  
 Center-of-Mass det. time= 88.2 min ( 879.5 - 791.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	994.80'	561,663 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
994.80	66,251	0	0
996.80	68,192	134,443	134,443
997.00	69,233	13,743	148,186
998.00	74,497	71,865	220,051
999.00	79,862	77,180	297,230
1,000.00	85,328	82,595	379,825
1,001.00	90,894	88,111	467,936
1,002.00	96,560	93,727	561,663

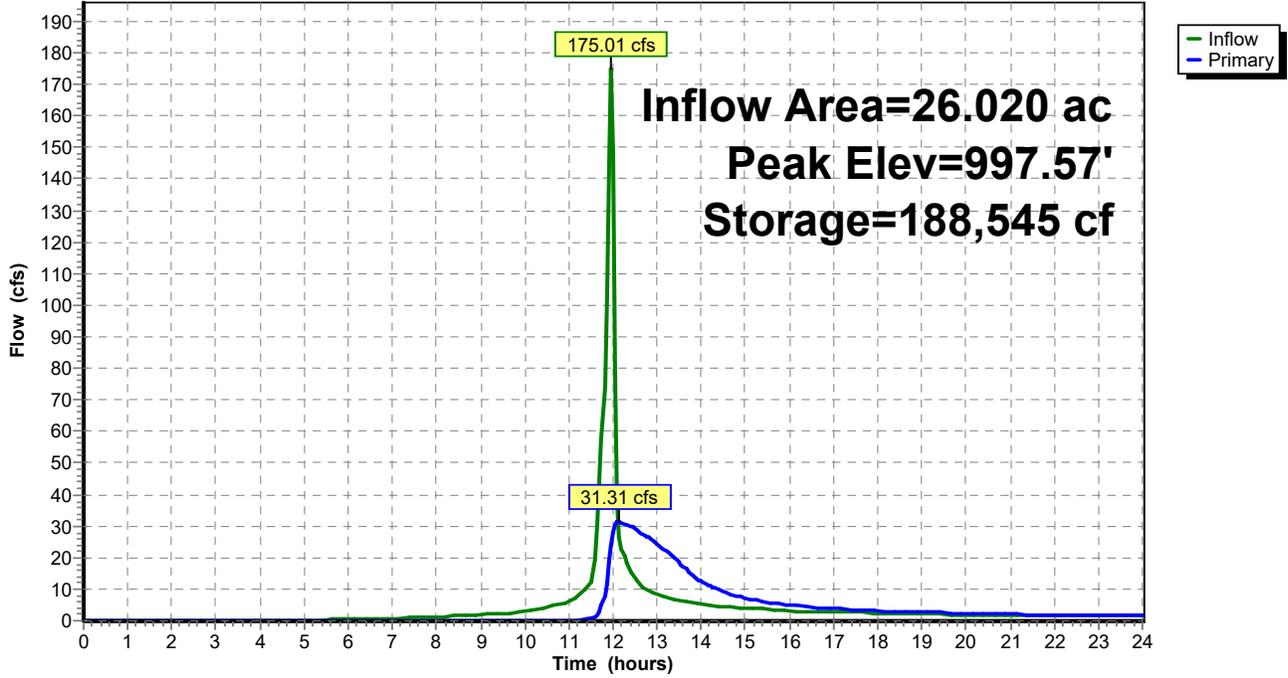
Device	Routing	Invert	Outlet Devices
#1	Primary	994.50'	<b>30.0" Round Culvert</b> L= 80.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 994.50' / 993.90' S= 0.0075 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	994.80'	<b>20.0 deg x 0.70' rise Sharp-Crested Vee/Trap Weir</b> Cv= 2.69 (C= 3.36)
#3	Device 1	995.50'	<b>5.0' long x 3.00' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 3.0' Crest Height
#4	Device 1	998.50'	<b>60.0" x 60.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=31.30 cfs @ 12.13 hrs HW=997.57' (Free Discharge)

- 1=Culvert (Barrel Controls 31.30 cfs @ 6.62 fps)
- 2=Sharp-Crested Vee/Trap Weir (Passes < 0.66 cfs potential flow)
- 3=Sharp-Crested Rectangular Weir (Passes < 48.37 cfs potential flow)
- 4=Orifice/Grate ( Controls 0.00 cfs)

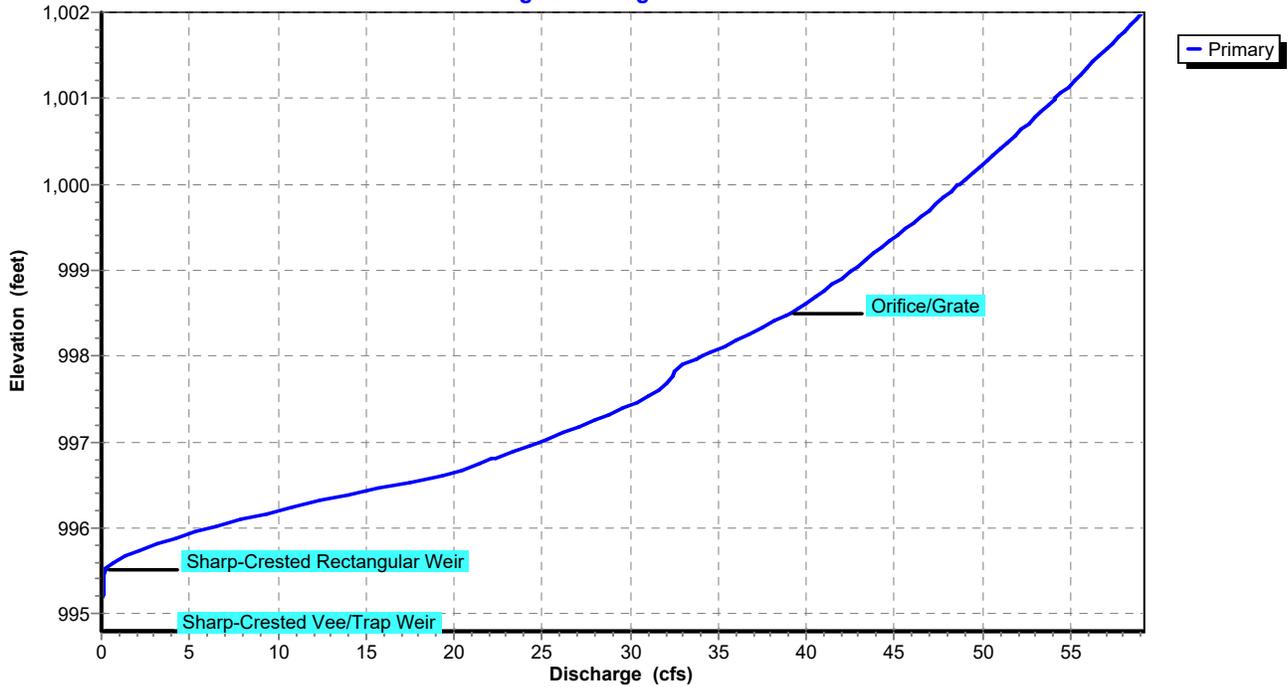
### Pond 12P: EWDB #1

Hydrograph



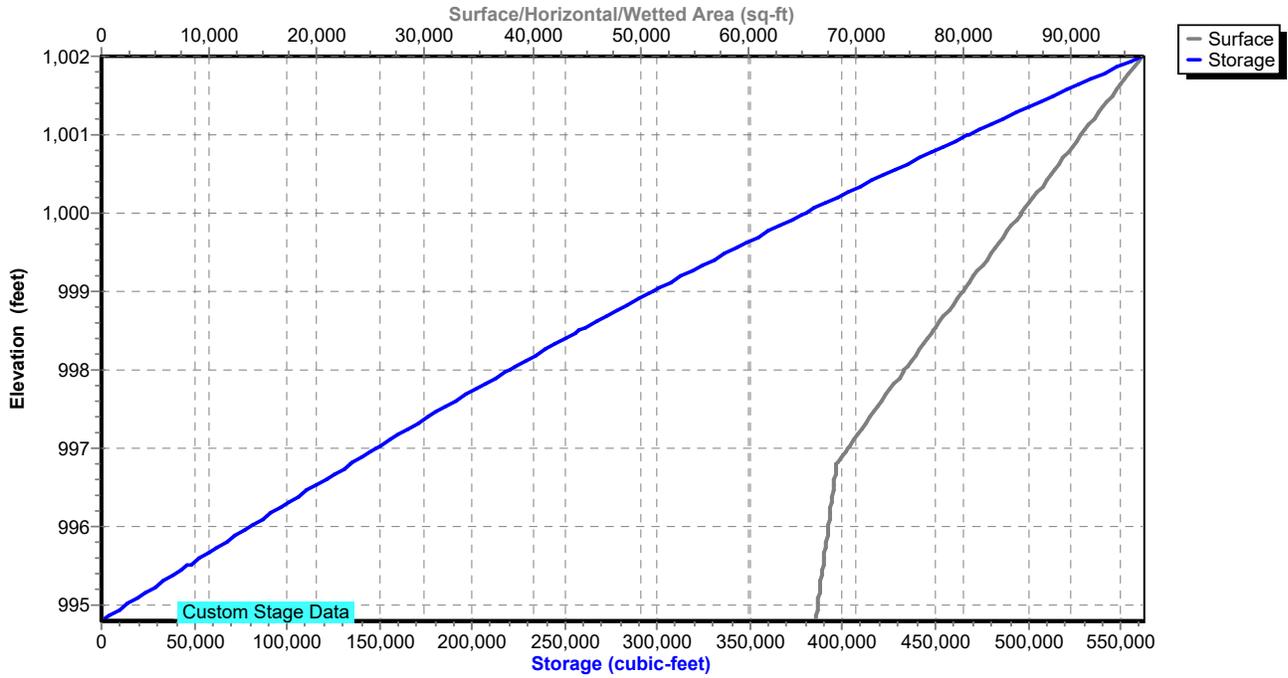
### Pond 12P: EWDB #1

Stage-Discharge



### Pond 12P: EWDB #1

#### Stage-Area-Storage



**Summary for Pond 13P: EWDB #2**

Inflow Area = 12.000 ac, 65.00% Impervious, Inflow Depth > 3.95" for 10-Year event  
 Inflow = 74.03 cfs @ 11.99 hrs, Volume= 3.949 af  
 Outflow = 18.05 cfs @ 12.17 hrs, Volume= 3.333 af, Atten= 76%, Lag= 11.1 min  
 Primary = 18.05 cfs @ 12.17 hrs, Volume= 3.333 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 993.87' @ 12.17 hrs Surf.Area= 26,368 sf Storage= 86,743 cf

Plug-Flow detention time= 177.6 min calculated for 3.326 af (84% of inflow)  
 Center-of-Mass det. time= 109.3 min ( 902.8 - 793.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	990.00'	148,828 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
990.00	20,951	0	0
992.00	20,952	41,903	41,903
992.01	21,802	214	42,117
993.00	24,155	22,749	64,865
996.00	31,820	83,963	148,828

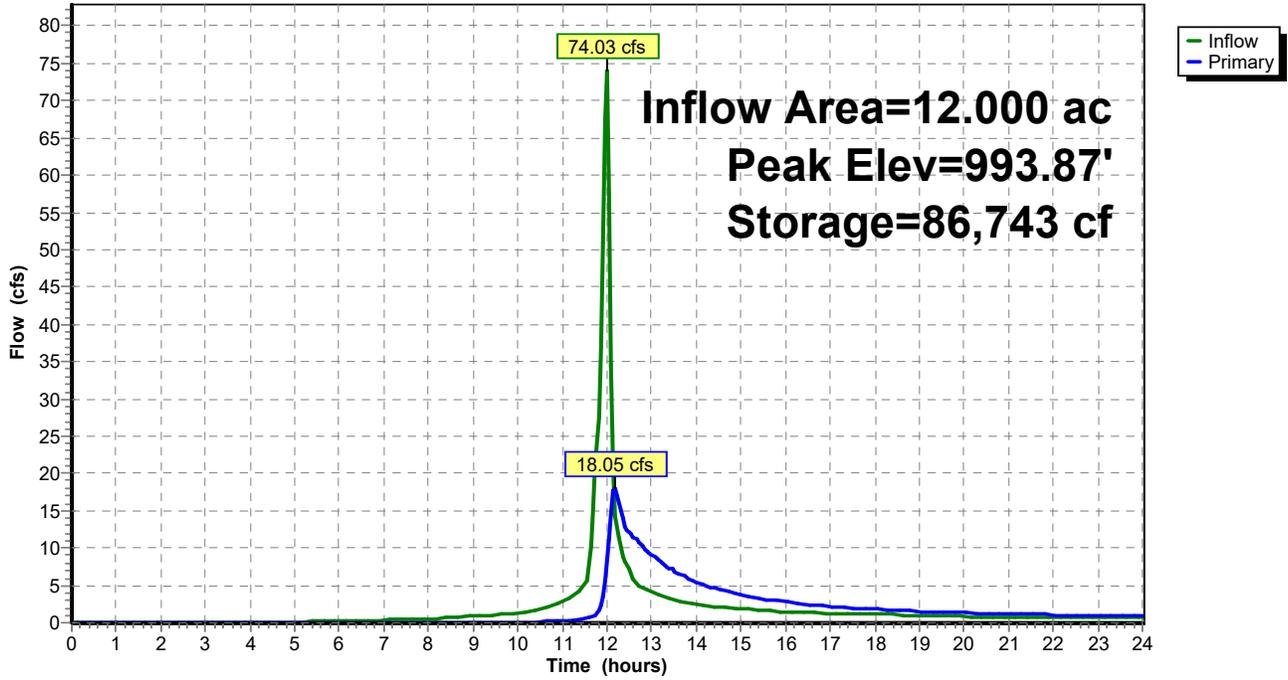
Device	Routing	Invert	Outlet Devices
#1	Primary	989.80'	<b>24.0" Round Culvert</b> L= 144.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 989.80' / 984.00' S= 0.0403 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	990.00'	<b>20.0 deg x 3.70' rise Sharp-Crested Vee/Trap Weir</b> Cv= 2.69 (C= 3.36)
#3	Device 1	993.70'	<b>60.0" x 60.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=17.61 cfs @ 12.17 hrs HW=993.86' (Free Discharge)

- 1=Culvert (Passes 17.61 cfs of 26.44 cfs potential flow)
- 2=Sharp-Crested Vee/Trap Weir (Orifice Controls 13.57 cfs @ 5.62 fps)
- 3=Orifice/Grate (Weir Controls 4.03 cfs @ 1.29 fps)

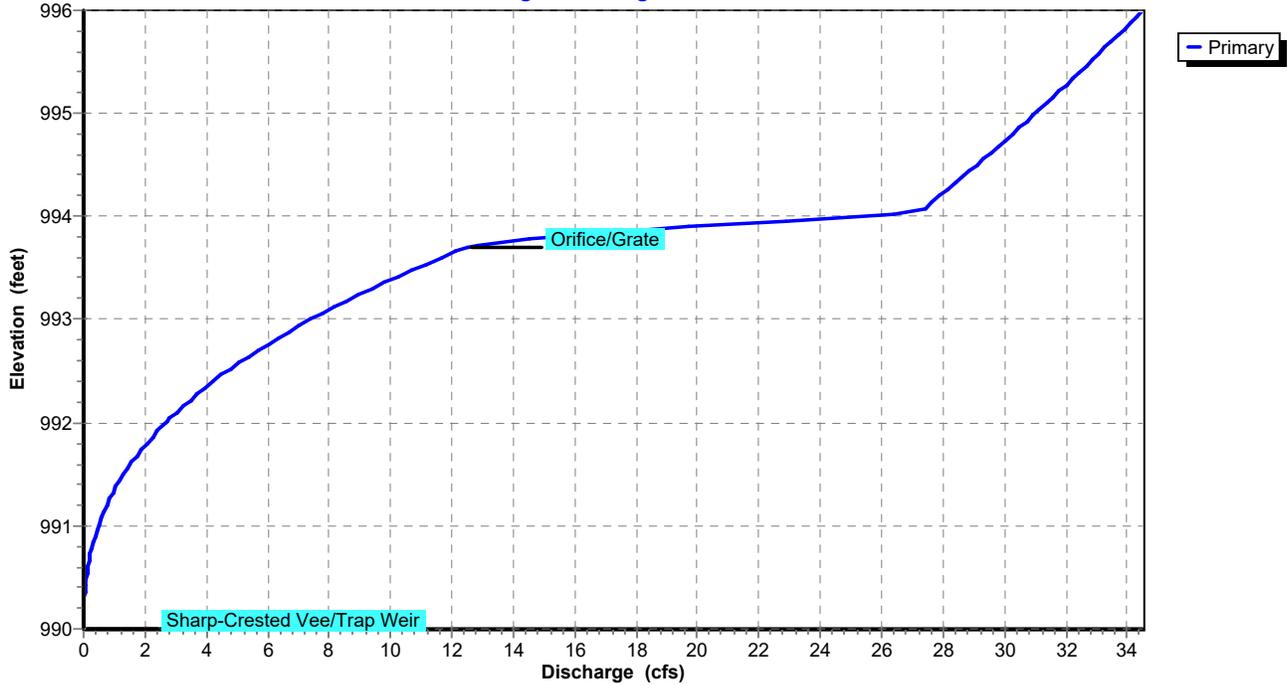
### Pond 13P: EWDB #2

Hydrograph



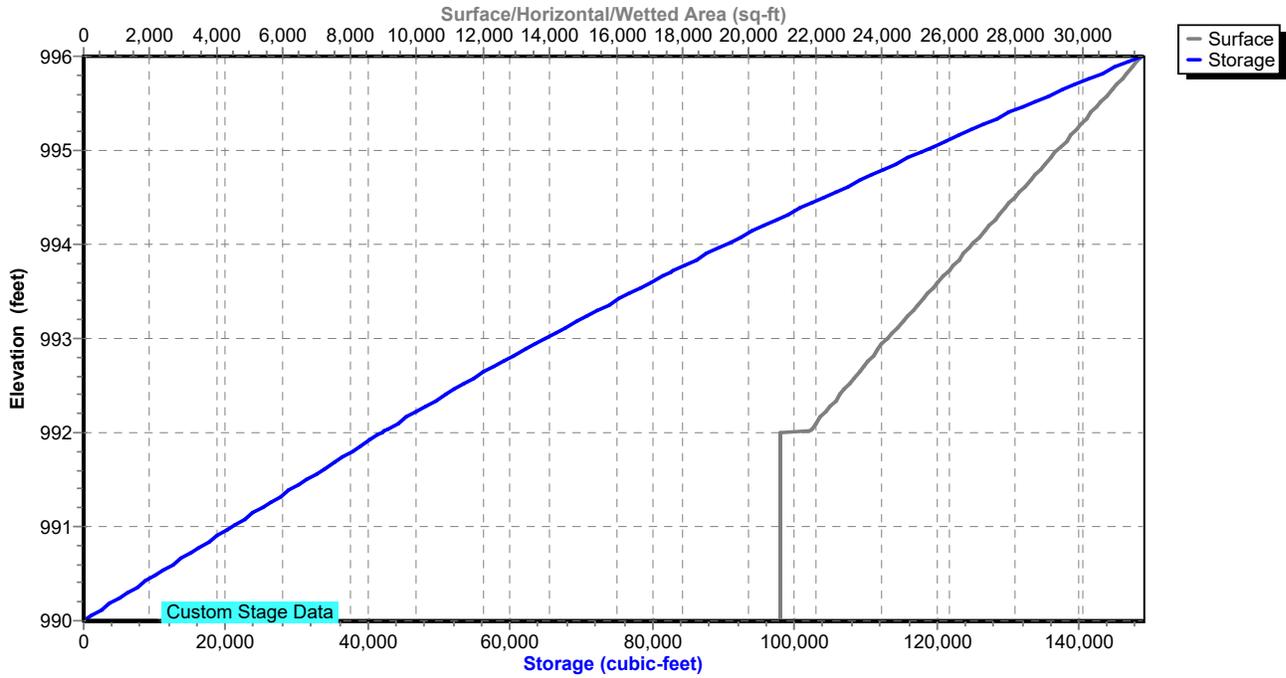
### Pond 13P: EWDB #2

Stage-Discharge



### Pond 13P: EWDB #2

#### Stage-Area-Storage



**Summary for Pond 14P: EWDB #3**

[79] Warning: Submerged Pond 13P Primary device # 1 OUTLET by 3.84'

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 3.54" for 10-Year event  
 Inflow = 143.82 cfs @ 12.00 hrs, Volume= 10.550 af  
 Outflow = 64.84 cfs @ 12.15 hrs, Volume= 9.232 af, Atten= 55%, Lag= 8.9 min  
 Primary = 64.84 cfs @ 12.15 hrs, Volume= 9.232 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 987.84' @ 12.15 hrs Surf.Area= 37,916 sf Storage= 139,328 cf

Plug-Flow detention time= 110.4 min calculated for 9.213 af (87% of inflow)  
 Center-of-Mass det. time= 51.7 min ( 886.5 - 834.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	983.50'	463,800 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
983.50	29,620	0	0
985.50	29,626	59,246	59,246
985.51	30,649	301	59,547
986.00	32,044	15,360	74,907
988.00	38,421	70,465	145,372
990.00	47,178	85,599	230,971
991.00	52,031	49,605	280,576
992.00	57,384	54,708	335,283
993.00	64,631	61,008	396,291
994.00	70,388	67,510	463,800

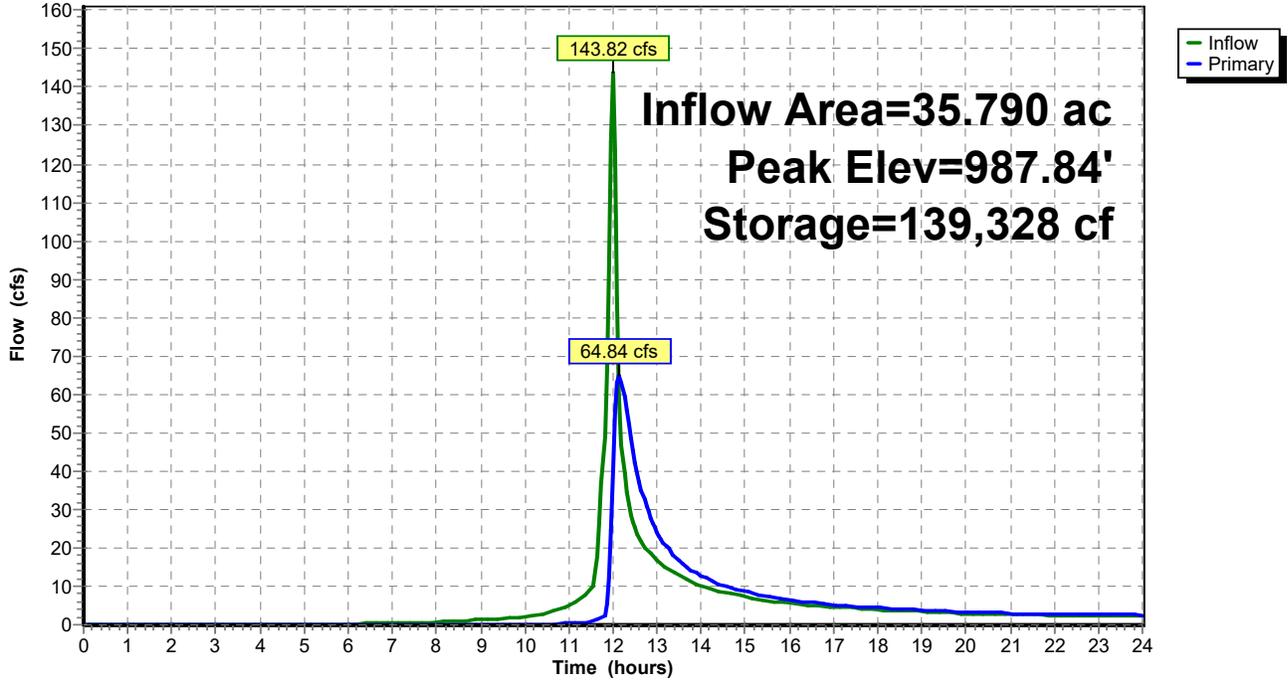
Device	Routing	Invert	Outlet Devices
#1	Primary	979.00'	<b>36.0" Round Culvert</b> L= 191.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 979.00' / 976.78' S= 0.0116 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Device 1	983.50'	<b>20.0 deg x 2.00' rise Sharp-Crested Vee/Trap Weir</b> Cv= 2.69 (C= 3.36)
#3	Device 1	985.50'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 985.50 988.00 Width (feet) 5.00 5.00
#4	Device 1	988.00'	<b>60.0" x 60.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=64.74 cfs @ 12.15 hrs HW=987.84' (Free Discharge)

- 1=Culvert (Passes 64.74 cfs of 72.79 cfs potential flow)
- 2=Sharp-Crested Vee/Trap Weir (Orifice Controls 6.15 cfs @ 8.72 fps)
- 3=Custom Weir/Orifice (Weir Controls 58.59 cfs @ 5.01 fps)
- 4=Orifice/Grate ( Controls 0.00 cfs)

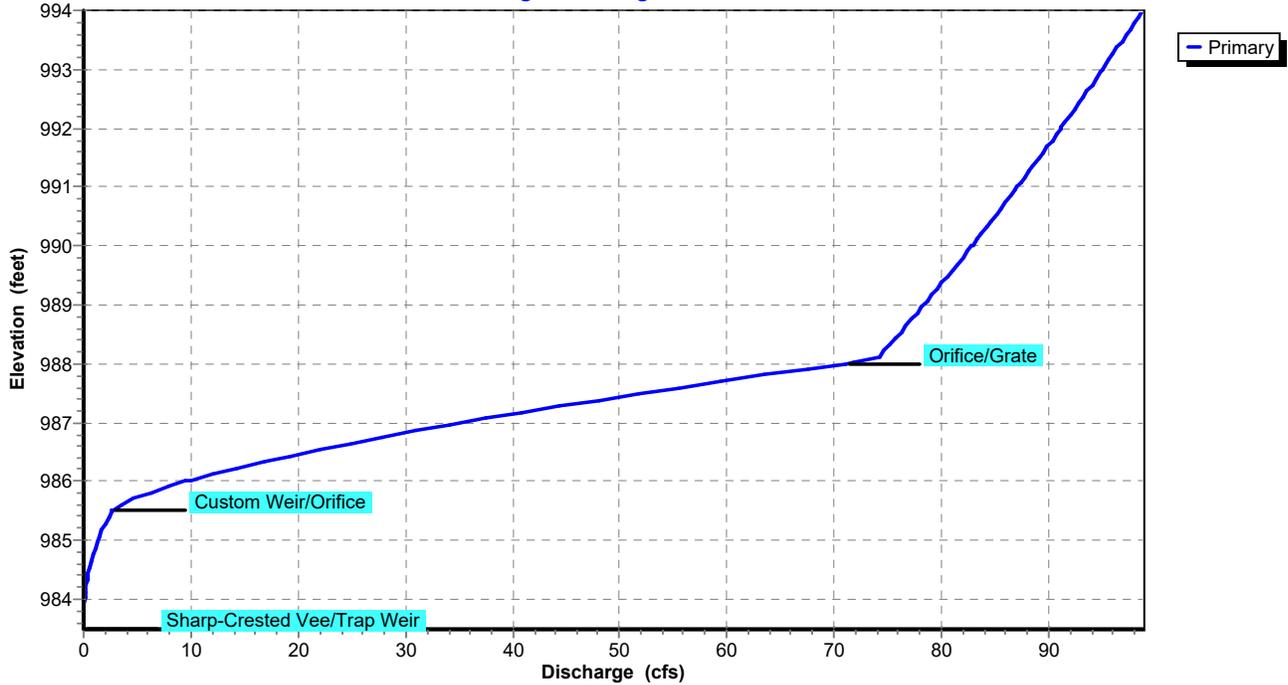
Pond 14P: EWDB #3

Hydrograph



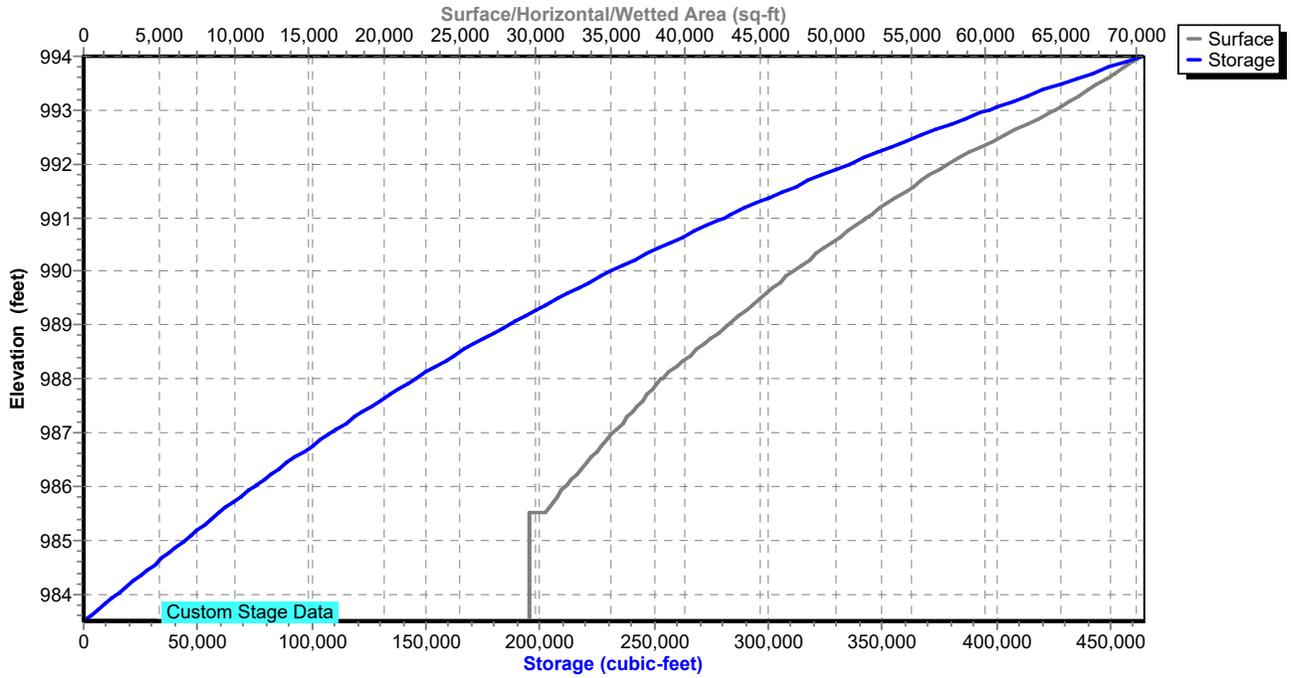
Pond 14P: EWDB #3

Stage-Discharge



### Pond 14P: EWDB #3

#### Stage-Area-Storage



**Summary for Pond 15P: EDDB #1**

[95] Warning: Outlet Device #4 rise exceeded

Inflow Area = 4.930 ac, 85.00% Impervious, Inflow Depth > 4.60" for 10-Year event  
 Inflow = 34.23 cfs @ 11.98 hrs, Volume= 1.890 af  
 Outflow = 9.26 cfs @ 12.14 hrs, Volume= 1.887 af, Atten= 73%, Lag= 9.7 min  
 Primary = 9.26 cfs @ 12.14 hrs, Volume= 1.887 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 1,008.59' @ 12.14 hrs Surf.Area= 17,496 sf Storage= 32,611 cf

Plug-Flow detention time= 81.2 min calculated for 1.887 af (100% of inflow)  
 Center-of-Mass det. time= 80.3 min ( 848.8 - 768.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	1,005.00'	89,114 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,005.00	2,349	0	0
1,006.00	5,514	3,932	3,932
1,007.00	9,388	7,451	11,383
1,008.00	14,288	11,838	23,221
1,009.00	19,717	17,003	40,223
1,010.00	24,607	22,162	62,385
1,011.00	28,850	26,729	89,114

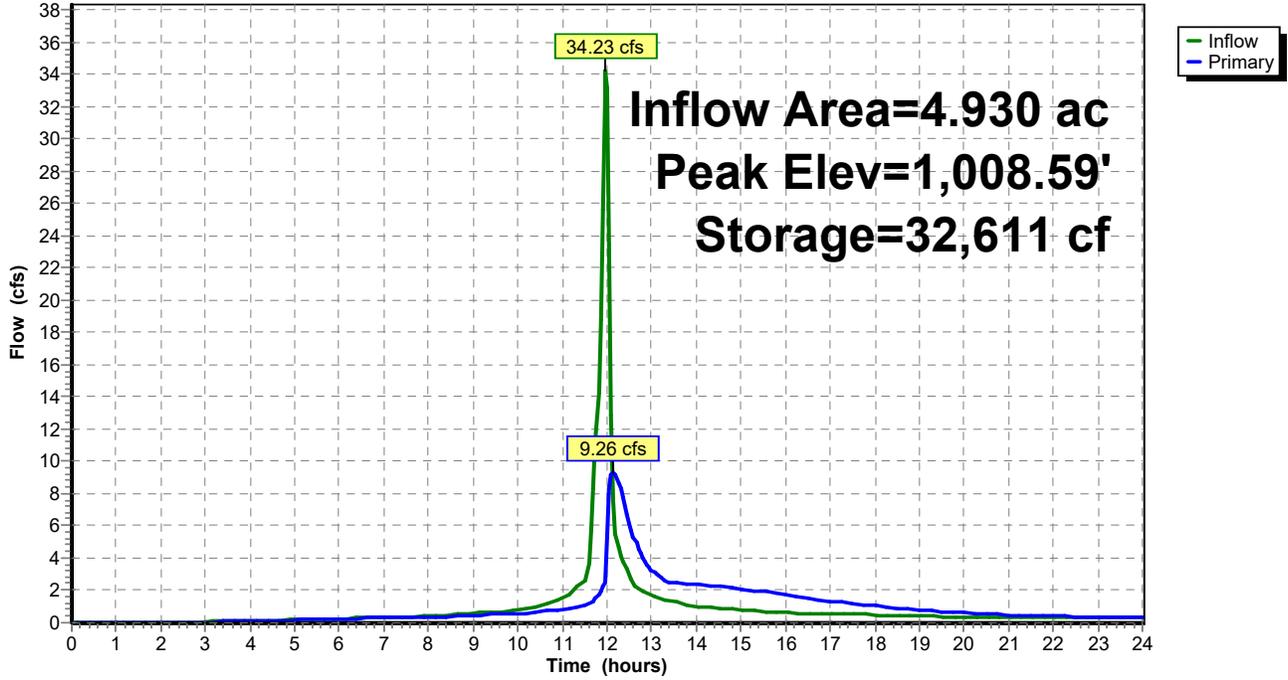
Device	Routing	Invert	Outlet Devices
#1	Primary	1,004.00'	<b>18.0" Round Culvert</b> L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 1,004.00' / 1,003.25' S= 0.0150 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#2	Device 1	1,004.40'	<b>8.0" Round 8" PVC</b> L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,004.40' / 1,004.20' S= 0.0067 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#3	Device 2	1,004.20'	<b>1.0" Vert. 15" RISER X 7.00 columns</b> X 9 rows with 4.0" cc spacing C= 0.600
#4	Device 1	1,007.90'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 1,007.90 1,008.40 Width (feet) 4.00 4.00
#5	Device 1	1,009.35'	<b>48.0" x 48.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=9.24 cfs @ 12.14 hrs HW=1,008.59' (Free Discharge)

- 1=Culvert (Passes 9.24 cfs of 16.67 cfs potential flow)
- 2=8" PVC (Passes 2.83 cfs of 3.30 cfs potential flow)
- 3=15" RISER (Orifice Controls 2.83 cfs @ 8.25 fps)
- 4=Custom Weir/Orifice (Orifice Controls 6.41 cfs @ 3.20 fps)
- 5=Orifice/Grate ( Controls 0.00 cfs)

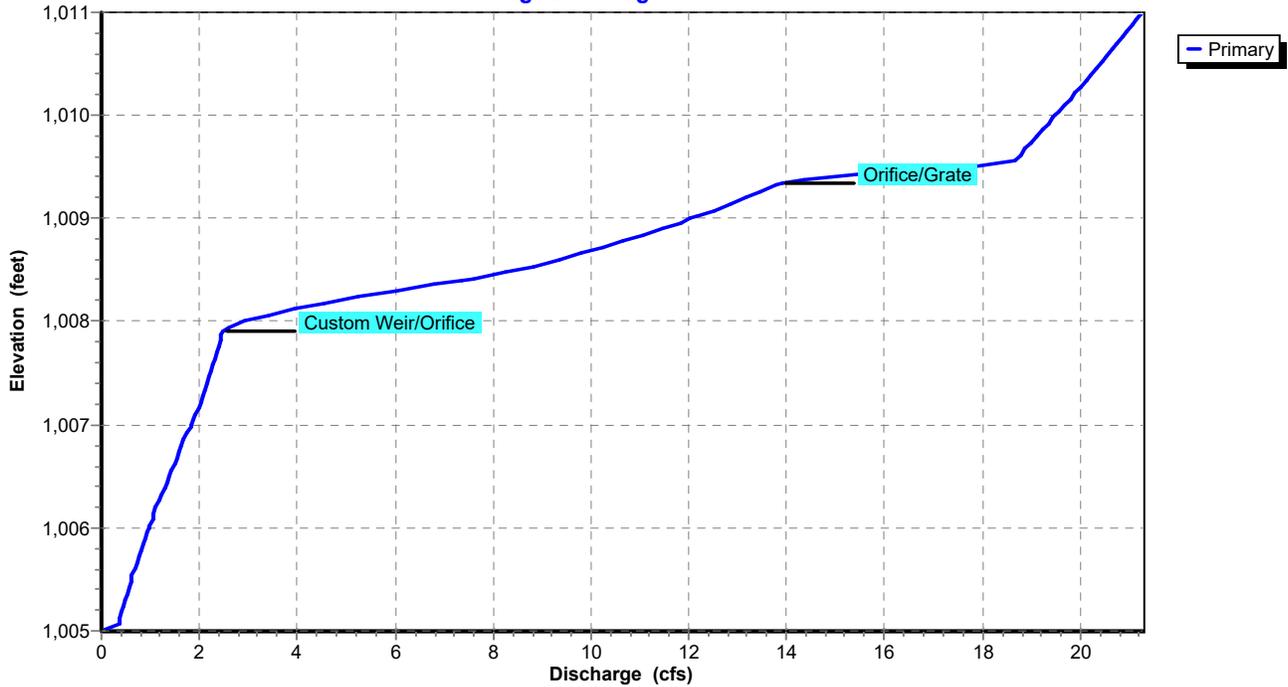
Pond 15P: EDDB #1

Hydrograph



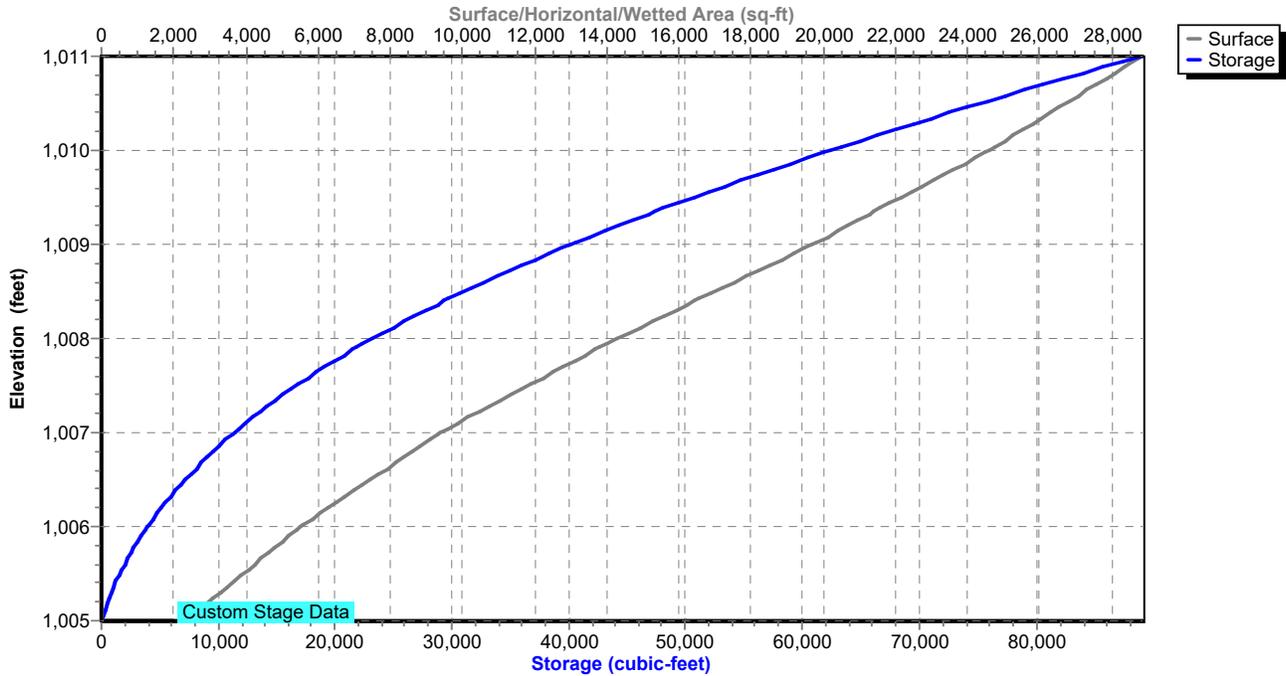
Pond 15P: EDDB #1

Stage-Discharge



### Pond 15P: EDDB #1

#### Stage-Area-Storage



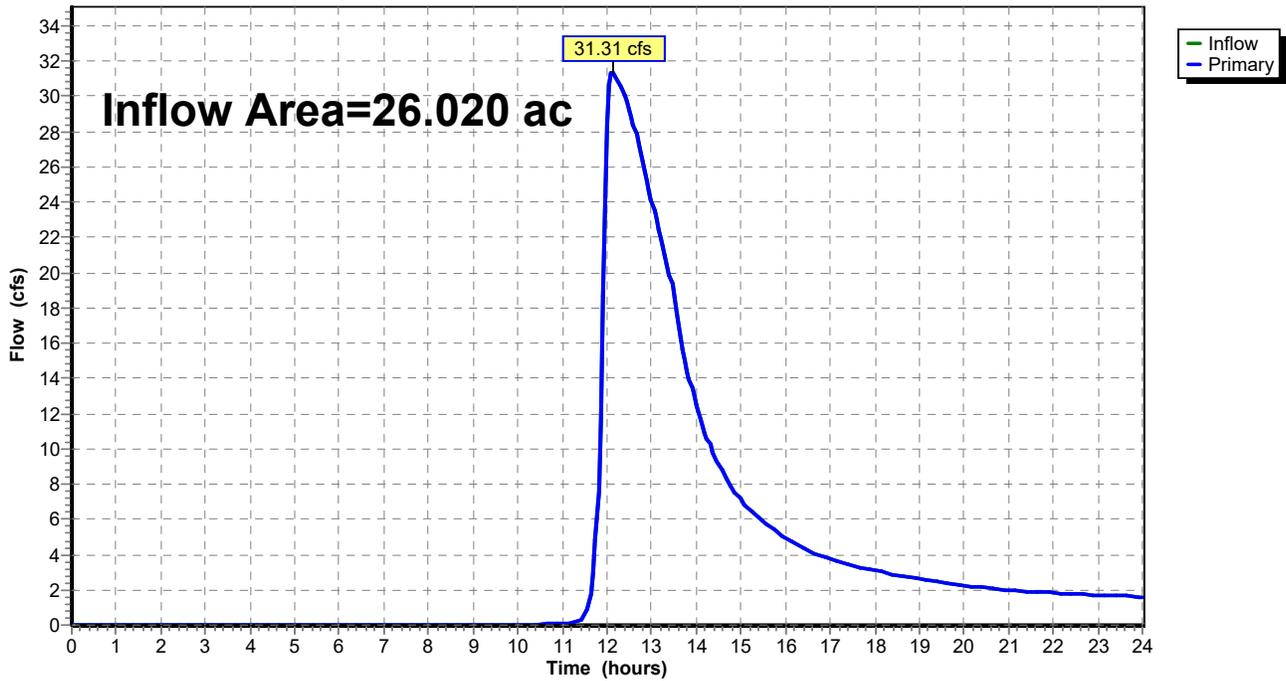
### Summary for Link 12L: RP-4

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 3.33" for 10-Year event  
Inflow = 31.31 cfs @ 12.13 hrs, Volume= 7.212 af  
Primary = 31.31 cfs @ 12.13 hrs, Volume= 7.212 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link 12L: RP-4

Hydrograph



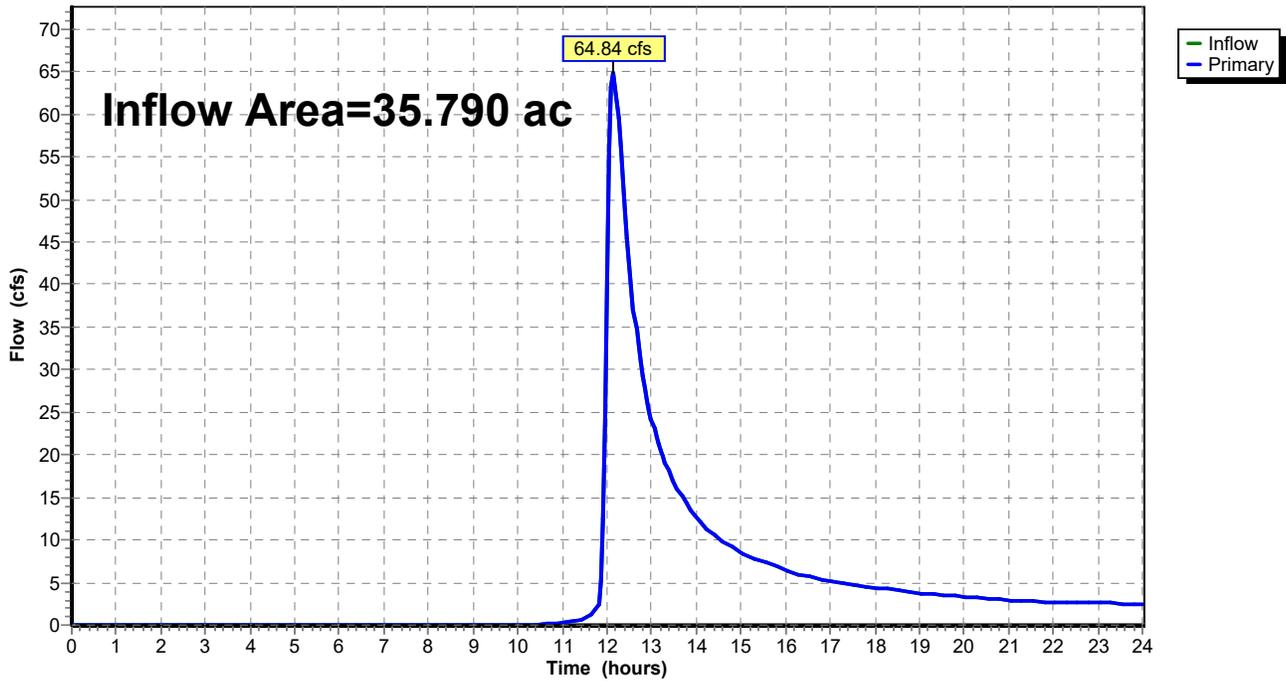
### Summary for Link 14L: RP-3

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 3.10" for 10-Year event  
Inflow = 64.84 cfs @ 12.15 hrs, Volume= 9.232 af  
Primary = 64.84 cfs @ 12.15 hrs, Volume= 9.232 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link 14L: RP-3

Hydrograph



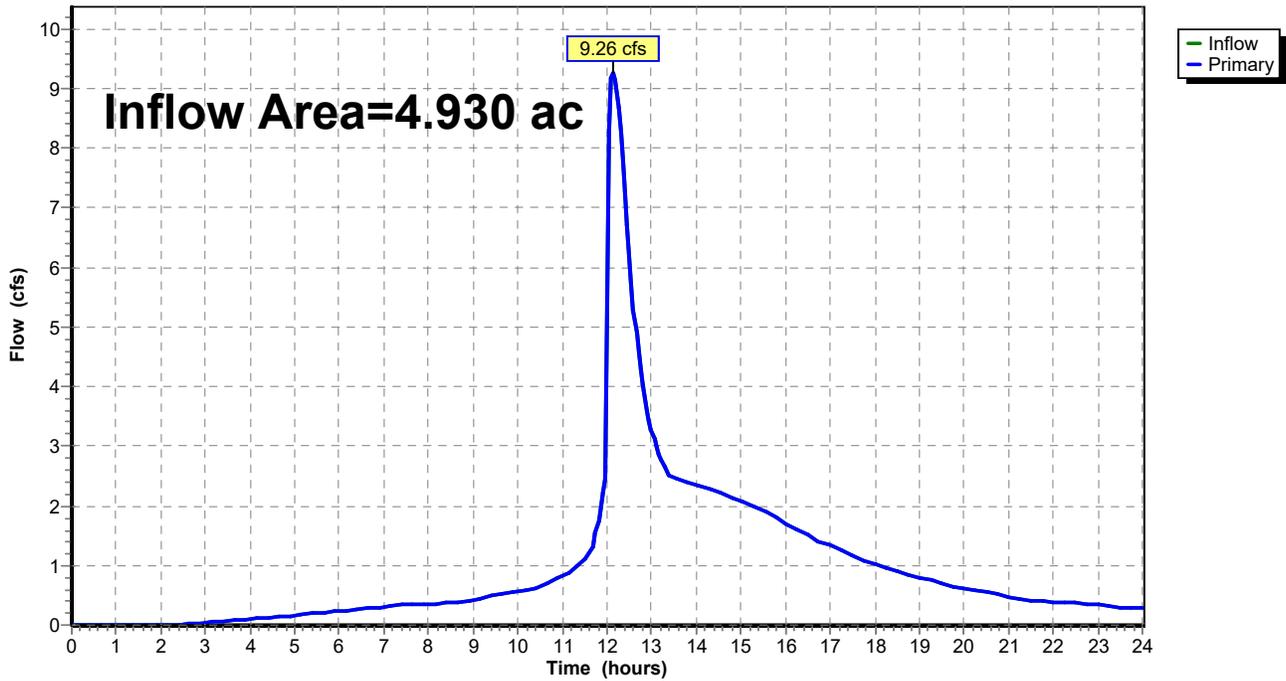
### Summary for Link 15L: RP-1

Inflow Area = 4.930 ac, 85.00% Impervious, Inflow Depth > 4.59" for 10-Year event  
Inflow = 9.26 cfs @ 12.14 hrs, Volume= 1.887 af  
Primary = 9.26 cfs @ 12.14 hrs, Volume= 1.887 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link 15L: RP-1

Hydrograph



**Summary for Subcatchment 11S: Onsite 5**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 197.63 cfs @ 11.95 hrs, Volume= 9.971 af, Depth> 6.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 100-Year Rainfall=7.70"

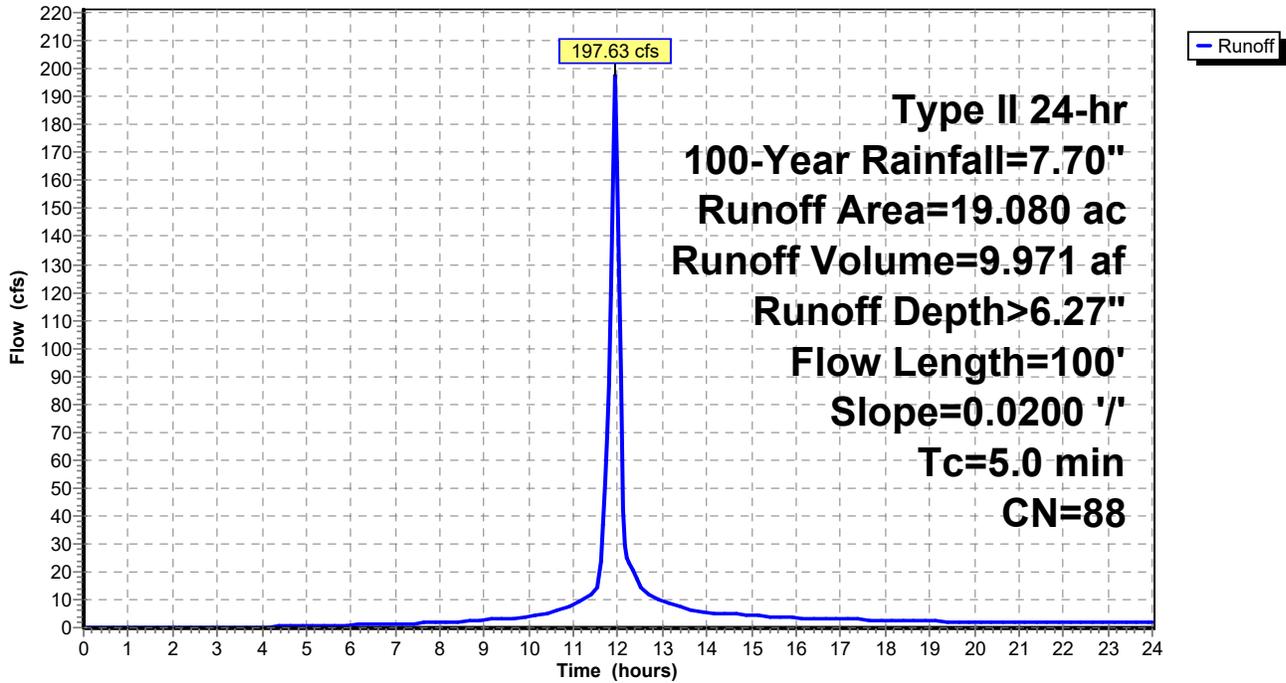
Area (ac)	CN	Description
* 19.080	88	Apartments, 65% imp, HSG C
6.678		35.00% Pervious Area
12.402		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
3.9					<b>Direct Entry, Pipe flow</b>
5.0	100	Total			

**Subcatchment 11S: Onsite 5**

Hydrograph



**Summary for Subcatchment 12S: EX OFF**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 71.89 cfs @ 11.95 hrs, Volume= 3.627 af, Depth> 6.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 100-Year Rainfall=7.70"

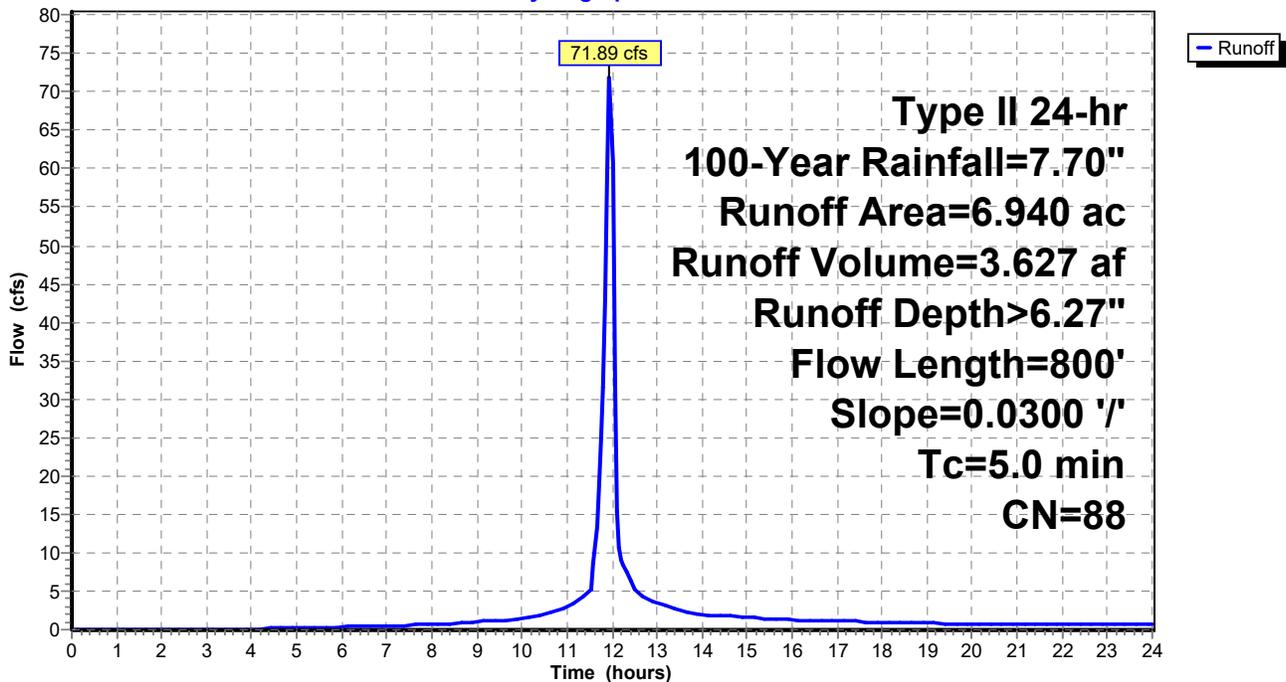
Area (ac)	CN	Description
* 6.940	88	Future Multi-Family, 65% imp, HSG C
2.429		35.00% Pervious Area
4.511		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0300	1.72		<b>Sheet Flow, Sheet flow</b> Smooth surfaces n= 0.011 P2= 3.60"
4.0	700		2.92		<b>Direct Entry, Pipe flow</b>
5.0	800	Total			

**Subcatchment 12S: EX OFF**

Hydrograph



**Summary for Subcatchment 13S: Onsite 3**

Runoff = 114.13 cfs @ 11.99 hrs, Volume= 6.267 af, Depth> 6.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 100-Year Rainfall=7.70"

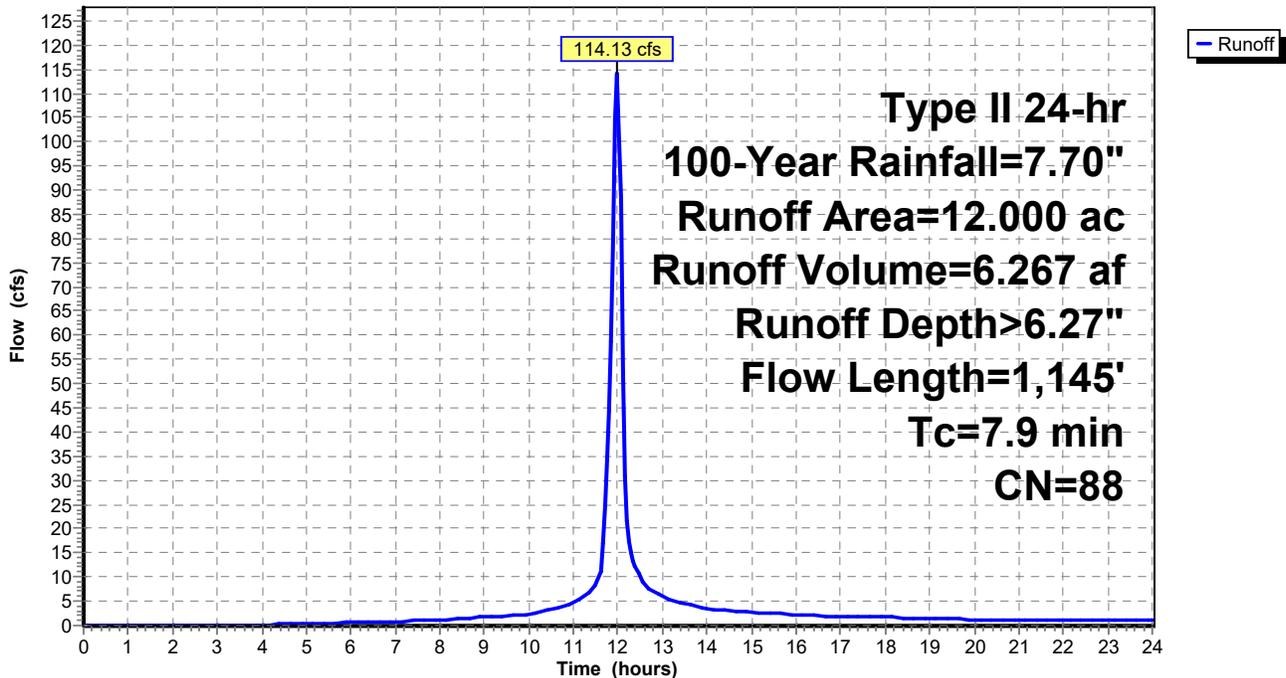
Area (ac)	CN	Description
* 12.000	88	1/8 acre lots, 65% imp, HSG D
4.200		35.00% Pervious Area
7.800		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
6.8	1,045	0.0250	2.55		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
7.9	1,145	Total			

**Subcatchment 13S: Onsite 3**

Hydrograph



**Summary for Subcatchment 14S: Onsite 4**

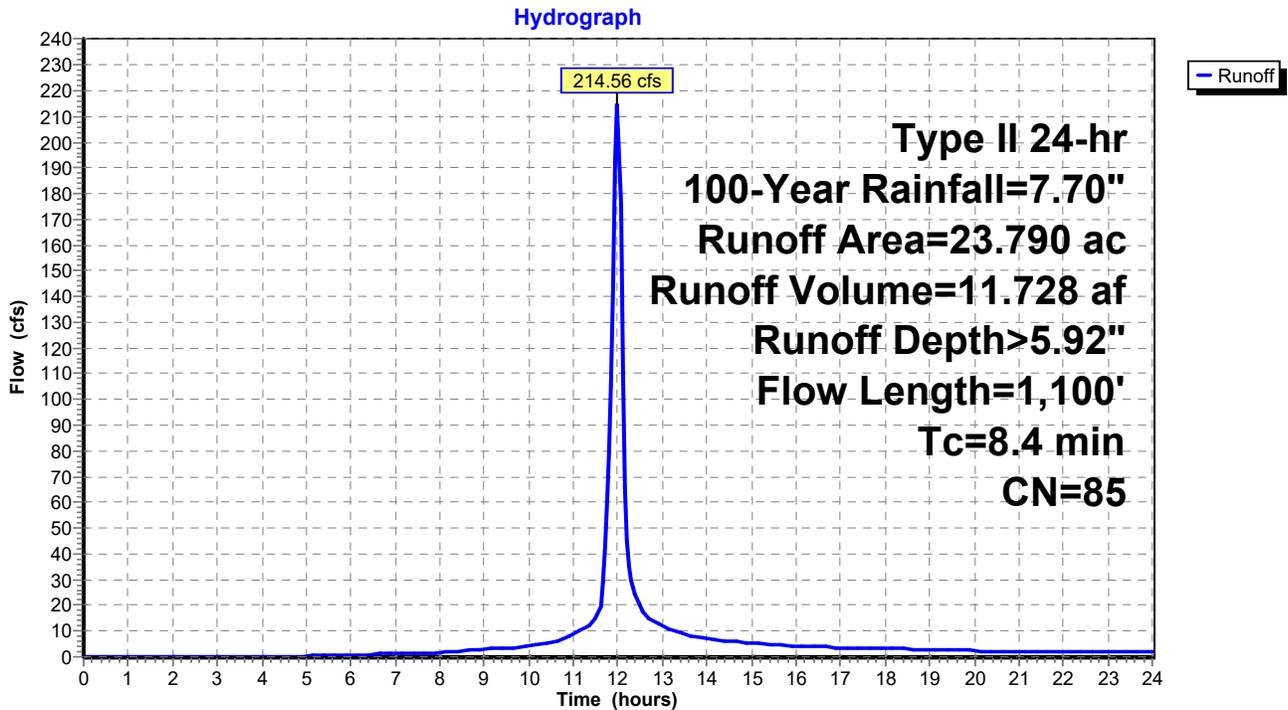
Runoff = 214.56 cfs @ 11.99 hrs, Volume= 11.728 af, Depth> 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 100-Year Rainfall=7.70"

Area (ac)	CN	Description
* 11.250	82	SINGLE FAMILY LOTS
* 12.540	88	1/8 acre lots, 65% imp, HSG D
23.790	85	Weighted Average
15.639		65.74% Pervious Area
8.151		34.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0205	1.47		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
7.3	1,000	0.0200	2.28		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
8.4	1,100	Total			

**Subcatchment 14S: Onsite 4**



**Summary for Subcatchment 15S: Onsite 2**

Runoff = 50.65 cfs @ 11.98 hrs, Volume= 2.866 af, Depth> 6.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 100-Year Rainfall=7.70"

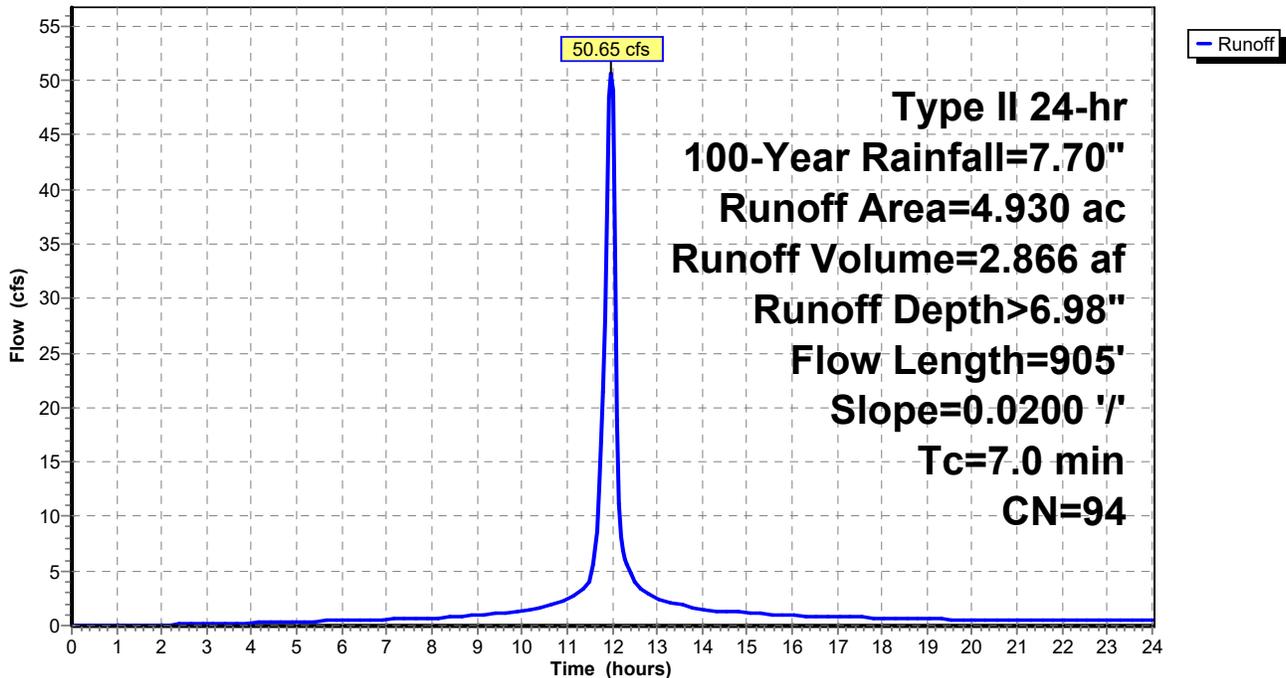
Area (ac)	CN	Description
* 4.930	94	Urban commercial, 85% imp, HSG D
0.739		15.00% Pervious Area
4.190		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
5.9	805	0.0200	2.28		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
7.0	905	Total			

**Subcatchment 15S: Onsite 2**

Hydrograph



**Summary for Pond 12P: EWDB #1**

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 6.27" for 100-Year event  
 Inflow = 269.52 cfs @ 11.95 hrs, Volume= 13.597 af  
 Outflow = 42.24 cfs @ 12.15 hrs, Volume= 12.143 af, Atten= 84%, Lag= 12.1 min  
 Primary = 42.24 cfs @ 12.15 hrs, Volume= 12.143 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 998.94' @ 12.15 hrs Surf.Area= 79,565 sf Storage= 292,814 cf

Plug-Flow detention time= 144.6 min calculated for 12.143 af (89% of inflow)  
 Center-of-Mass det. time= 91.2 min ( 869.8 - 778.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	994.80'	561,663 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
994.80	66,251	0	0
996.80	68,192	134,443	134,443
997.00	69,233	13,743	148,186
998.00	74,497	71,865	220,051
999.00	79,862	77,180	297,230
1,000.00	85,328	82,595	379,825
1,001.00	90,894	88,111	467,936
1,002.00	96,560	93,727	561,663

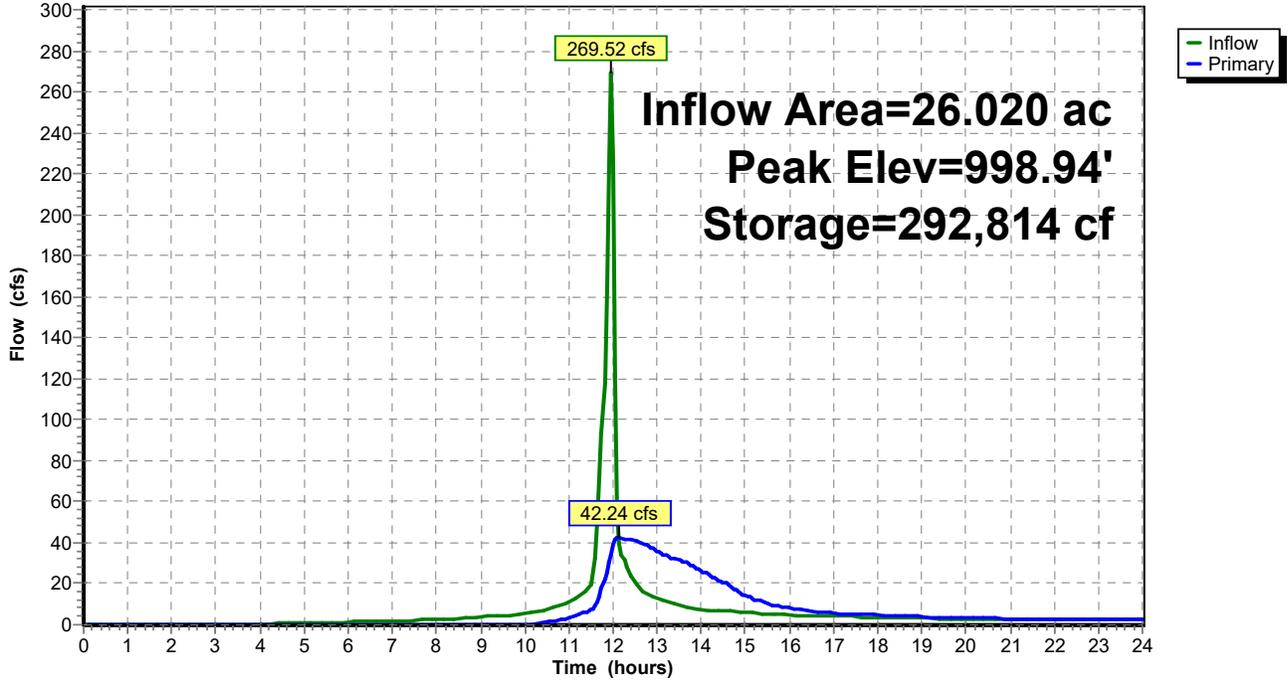
Device	Routing	Invert	Outlet Devices
#1	Primary	994.50'	<b>30.0" Round Culvert</b> L= 80.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 994.50' / 993.90' S= 0.0075 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	994.80'	<b>20.0 deg x 0.70' rise Sharp-Crested Vee/Trap Weir</b> Cv= 2.69 (C= 3.36)
#3	Device 1	995.50'	<b>5.0' long x 3.00' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 3.0' Crest Height
#4	Device 1	998.50'	<b>60.0" x 60.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=42.24 cfs @ 12.15 hrs HW=998.94' (Free Discharge)

- 1=Culvert (Inlet Controls 42.24 cfs @ 8.60 fps)
- 2=Sharp-Crested Vee/Trap Weir (Passes < 0.84 cfs potential flow)
- 3=Sharp-Crested Rectangular Weir (Passes < 100.01 cfs potential flow)
- 4=Orifice/Grate (Passes < 19.33 cfs potential flow)

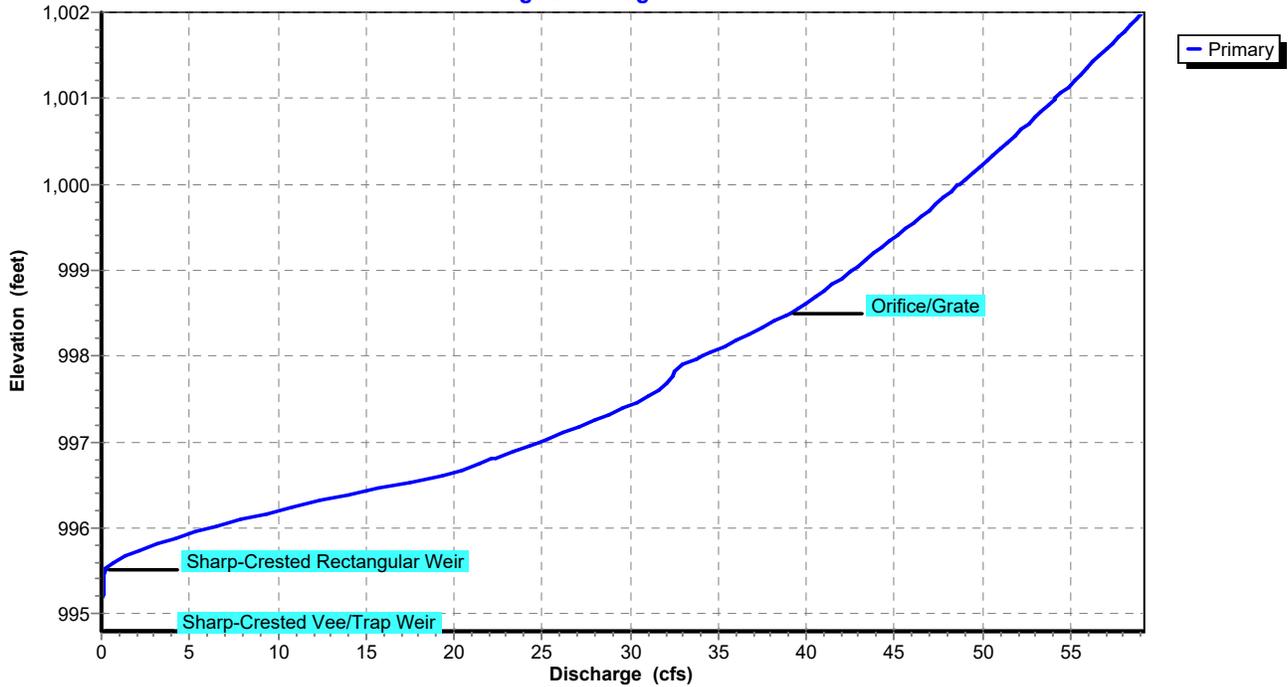
### Pond 12P: EWDB #1

Hydrograph



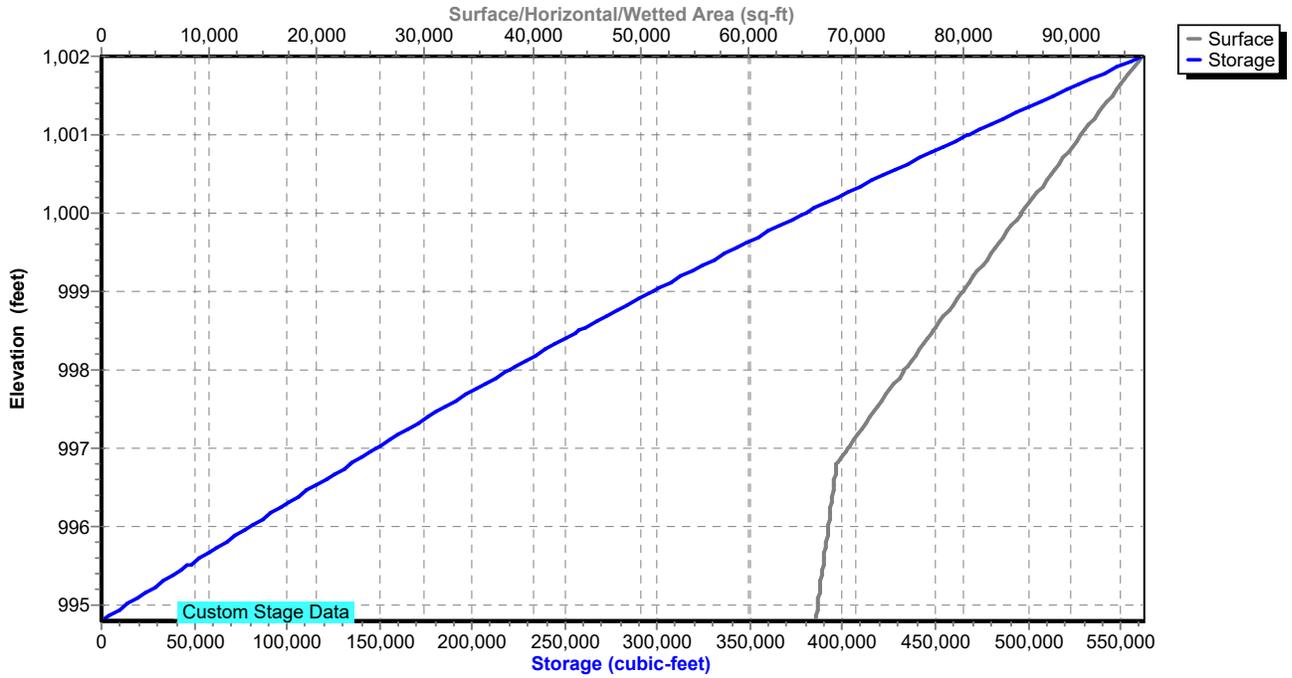
### Pond 12P: EWDB #1

Stage-Discharge



### Pond 12P: EWDB #1

#### Stage-Area-Storage



**Summary for Pond 13P: EWDB #2**

Inflow Area = 12.000 ac, 65.00% Impervious, Inflow Depth > 6.27" for 100-Year event  
 Inflow = 114.13 cfs @ 11.99 hrs, Volume= 6.267 af  
 Outflow = 31.93 cfs @ 12.16 hrs, Volume= 5.566 af, Atten= 72%, Lag= 10.2 min  
 Primary = 31.93 cfs @ 12.16 hrs, Volume= 5.566 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 995.26' @ 12.16 hrs Surf.Area= 29,917 sf Storage= 125,836 cf

Plug-Flow detention time= 141.9 min calculated for 5.554 af (89% of inflow)  
 Center-of-Mass det. time= 87.4 min ( 868.3 - 780.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	990.00'	148,828 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
990.00	20,951	0	0
992.00	20,952	41,903	41,903
992.01	21,802	214	42,117
993.00	24,155	22,749	64,865
996.00	31,820	83,963	148,828

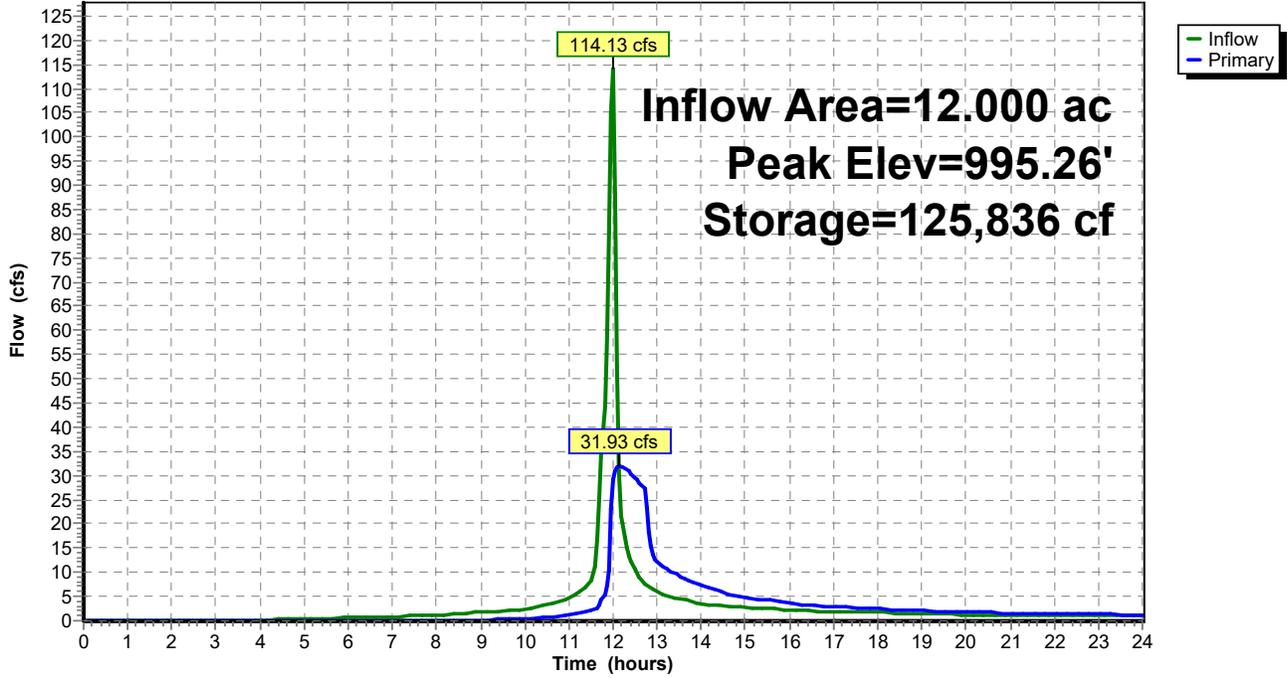
Device	Routing	Invert	Outlet Devices
#1	Primary	989.80'	<b>24.0" Round Culvert</b> L= 144.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 989.80' / 984.00' S= 0.0403 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	990.00'	<b>20.0 deg x 3.70' rise Sharp-Crested Vee/Trap Weir</b> Cv= 2.69 (C= 3.36)
#3	Device 1	993.70'	<b>60.0" x 60.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=31.91 cfs @ 12.16 hrs HW=995.25' (Free Discharge)

- ↑ **1=Culvert** (Inlet Controls 31.91 cfs @ 10.16 hrs)
- ↑ **2=Sharp-Crested Vee/Trap Weir** (Passes < 20.07 cfs potential flow)
- ↑ **3=Orifice/Grate** (Passes < 126.11 cfs potential flow)

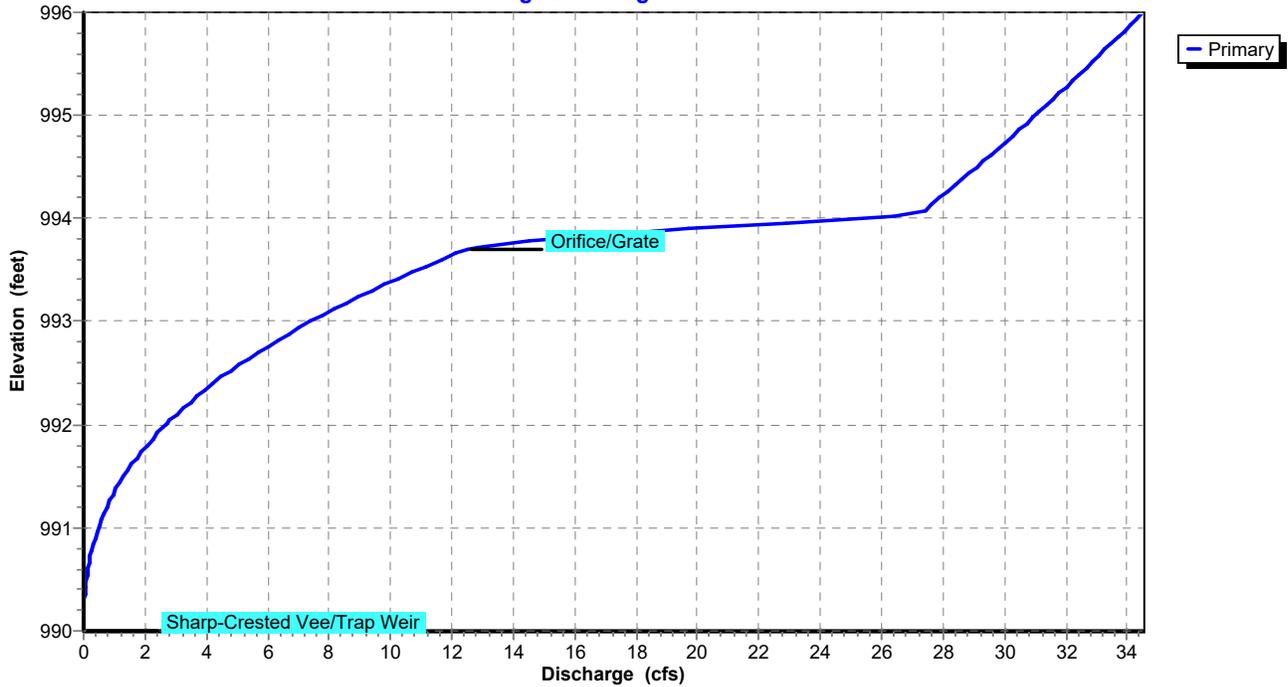
### Pond 13P: EWDB #2

Hydrograph



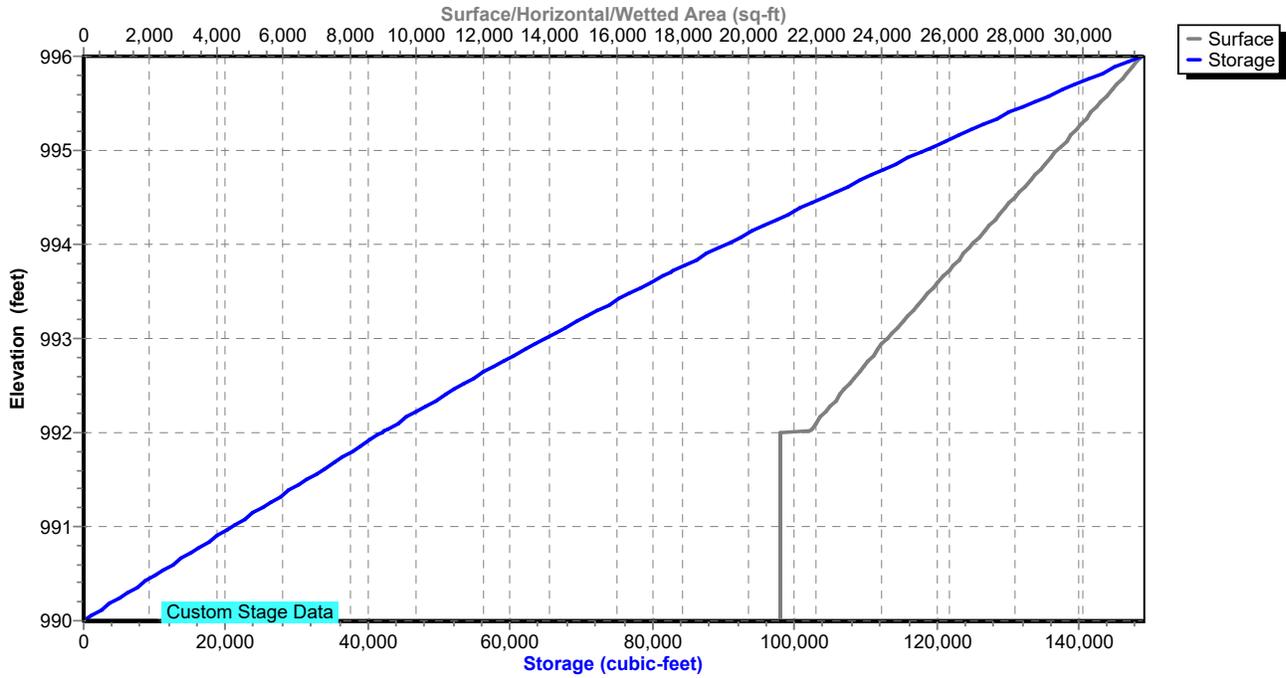
### Pond 13P: EWDB #2

Stage-Discharge



### Pond 13P: EWDB #2

#### Stage-Area-Storage



**Summary for Pond 14P: EWDB #3**

[79] Warning: Submerged Pond 13P Primary device # 1 INLET by 0.11'

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 5.80" for 100-Year event  
 Inflow = 243.27 cfs @ 12.00 hrs, Volume= 17.293 af  
 Outflow = 82.42 cfs @ 12.19 hrs, Volume= 15.874 af, Atten= 66%, Lag= 11.7 min  
 Primary = 82.42 cfs @ 12.19 hrs, Volume= 15.874 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 989.91' @ 12.19 hrs Surf.Area= 46,779 sf Storage= 226,688 cf

Plug-Flow detention time= 86.7 min calculated for 15.841 af (92% of inflow)  
 Center-of-Mass det. time= 44.5 min ( 859.5 - 815.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	983.50'	463,800 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
983.50	29,620	0	0
985.50	29,626	59,246	59,246
985.51	30,649	301	59,547
986.00	32,044	15,360	74,907
988.00	38,421	70,465	145,372
990.00	47,178	85,599	230,971
991.00	52,031	49,605	280,576
992.00	57,384	54,708	335,283
993.00	64,631	61,008	396,291
994.00	70,388	67,510	463,800

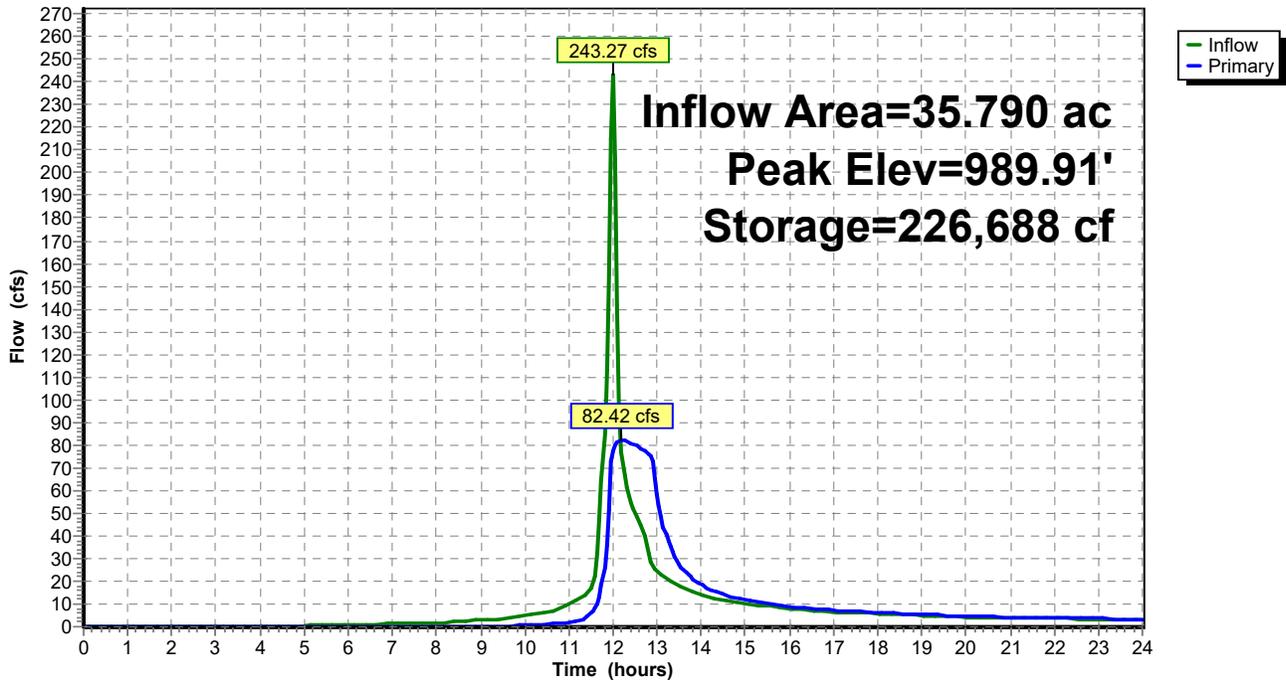
Device	Routing	Invert	Outlet Devices
#1	Primary	979.00'	<b>36.0" Round Culvert</b> L= 191.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 979.00' / 976.78' S= 0.0116 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Device 1	983.50'	<b>20.0 deg x 2.00' rise Sharp-Crested Vee/Trap Weir</b> Cv= 2.69 (C= 3.36)
#3	Device 1	985.50'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 985.50 988.00 Width (feet) 5.00 5.00
#4	Device 1	988.00'	<b>60.0" x 60.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=82.40 cfs @ 12.19 hrs HW=989.90' (Free Discharge)

- 1=Culvert (Inlet Controls 82.40 cfs @ 11.66 fps)
- 2=Sharp-Crested Vee/Trap Weir (Passes < 8.00 cfs potential flow)
- 3=Custom Weir/Orifice (Passes < 108.33 cfs potential flow)
- 4=Orifice/Grate (Passes < 166.12 cfs potential flow)

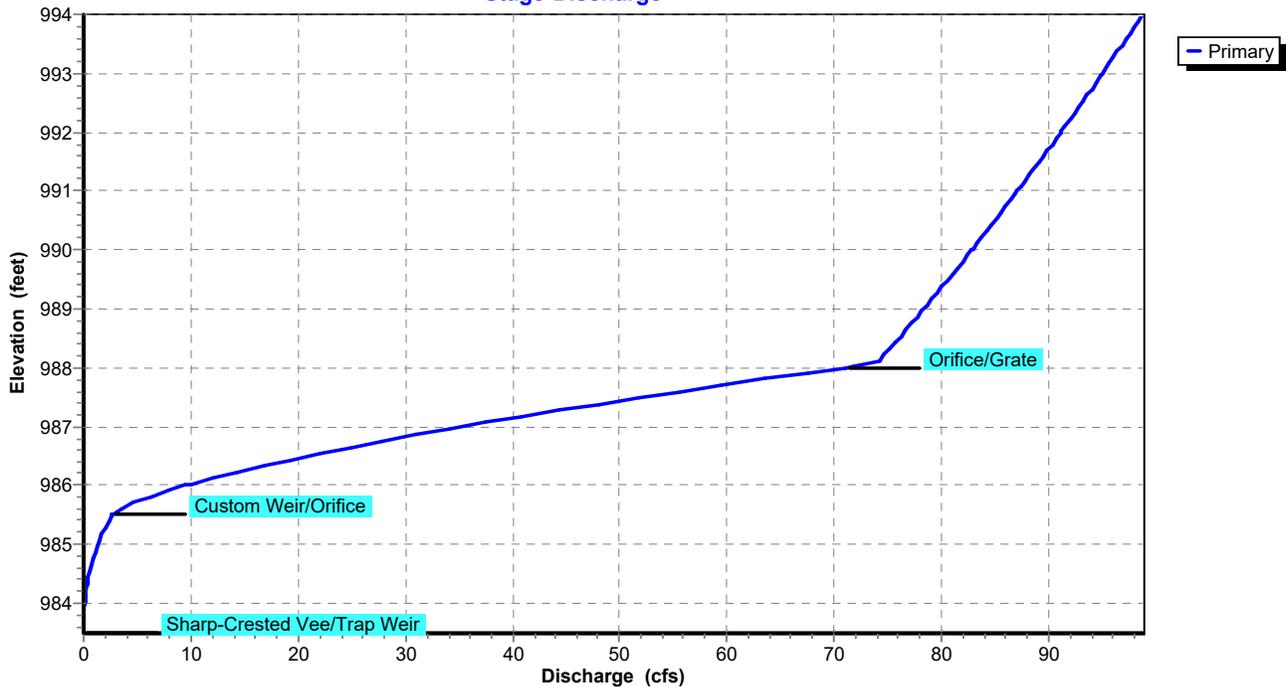
### Pond 14P: EWDB #3

Hydrograph



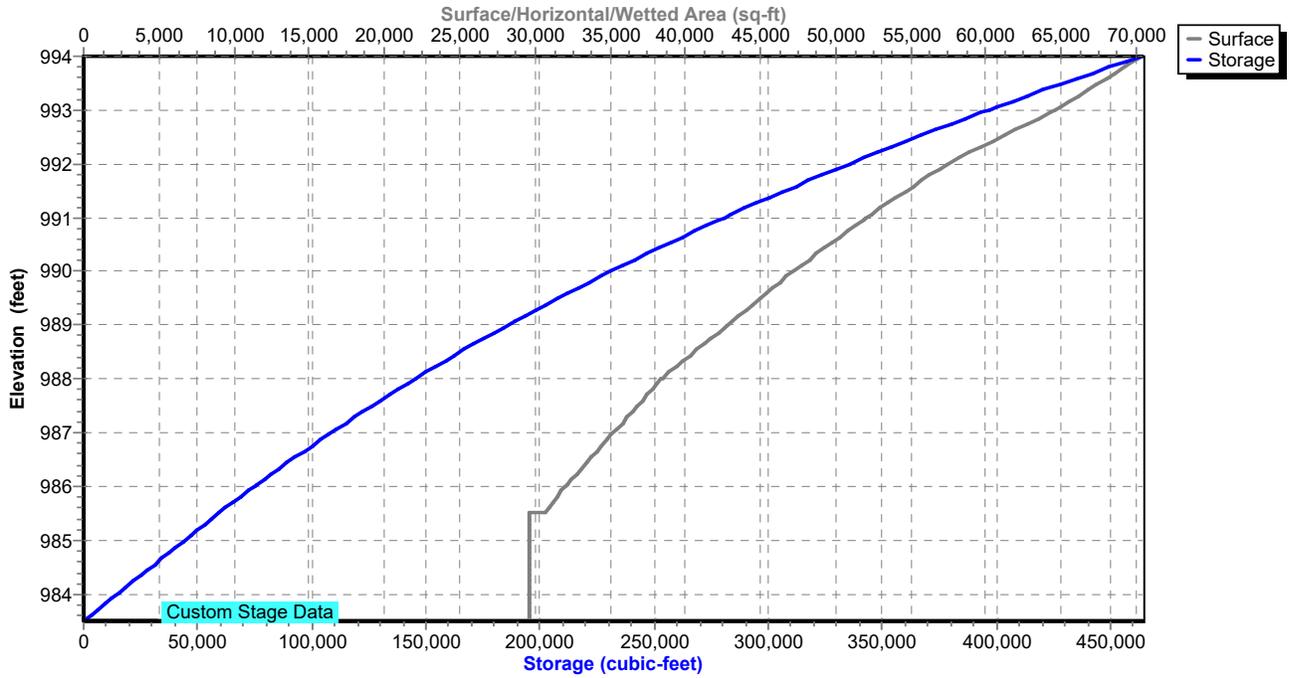
### Pond 14P: EWDB #3

Stage-Discharge



### Pond 14P: EWDB #3

#### Stage-Area-Storage



**Summary for Pond 15P: Eddb #1**

[95] Warning: Outlet Device #4 rise exceeded

Inflow Area = 4.930 ac, 85.00% Impervious, Inflow Depth > 6.98" for 100-Year event  
 Inflow = 50.65 cfs @ 11.98 hrs, Volume= 2.866 af  
 Outflow = 14.32 cfs @ 12.13 hrs, Volume= 2.847 af, Atten= 72%, Lag= 9.4 min  
 Primary = 14.32 cfs @ 12.13 hrs, Volume= 2.847 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 1,009.38' @ 12.13 hrs Surf.Area= 21,569 sf Storage= 48,039 cf

Plug-Flow detention time= 77.3 min calculated for 2.841 af (99% of inflow)  
 Center-of-Mass det. time= 72.8 min ( 831.6 - 758.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	1,005.00'	89,114 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,005.00	2,349	0	0
1,006.00	5,514	3,932	3,932
1,007.00	9,388	7,451	11,383
1,008.00	14,288	11,838	23,221
1,009.00	19,717	17,003	40,223
1,010.00	24,607	22,162	62,385
1,011.00	28,850	26,729	89,114

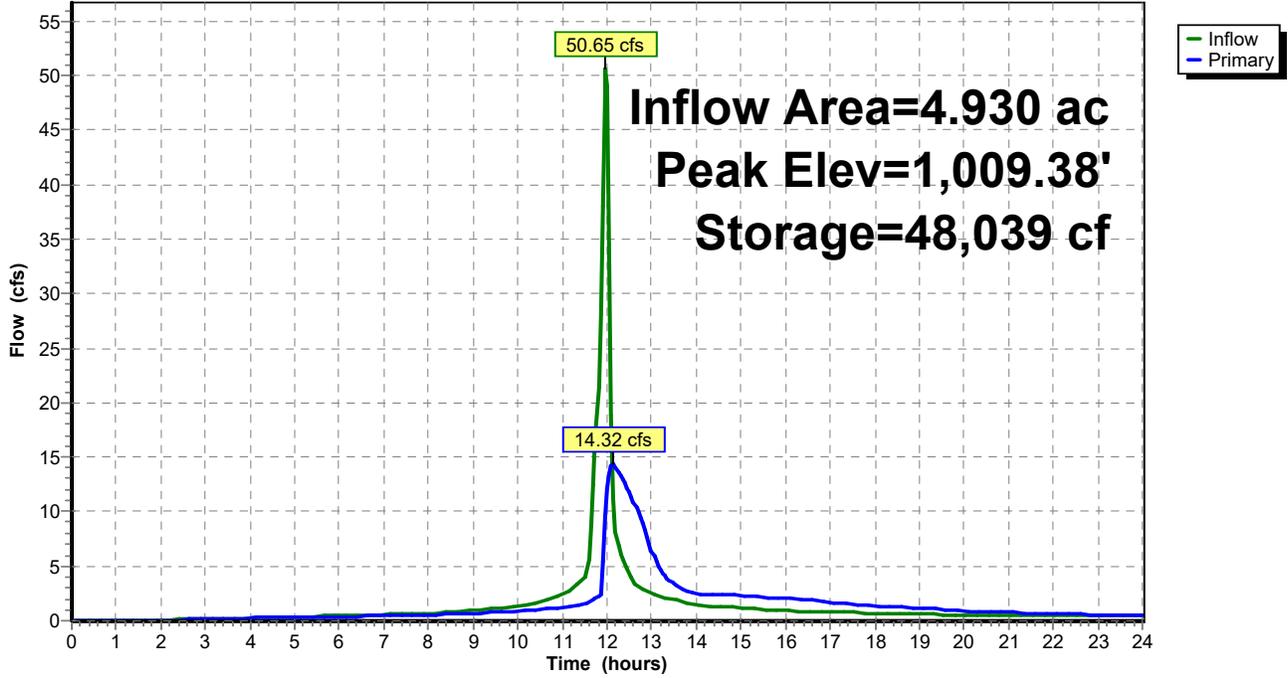
Device	Routing	Invert	Outlet Devices
#1	Primary	1,004.00'	<b>18.0" Round Culvert</b> L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 1,004.00' / 1,003.25' S= 0.0150 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#2	Device 1	1,004.40'	<b>8.0" Round 8" PVC</b> L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,004.40' / 1,004.20' S= 0.0067 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#3	Device 2	1,004.20'	<b>1.0" Vert. 15" RISER X 7.00 columns</b> X 9 rows with 4.0" cc spacing C= 0.600
#4	Device 1	1,007.90'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 1,007.90 1,008.40 Width (feet) 4.00 4.00
#5	Device 1	1,009.35'	<b>48.0" x 48.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=14.24 cfs @ 12.13 hrs HW=1,009.37' (Free Discharge)

- 1=Culvert (Passes 14.24 cfs of 18.30 cfs potential flow)
- 2=8" PVC (Passes 3.20 cfs of 3.62 cfs potential flow)
- 3=15" RISER (Orifice Controls 3.20 cfs @ 9.30 fps)
- 4=Custom Weir/Orifice (Orifice Controls 10.85 cfs @ 5.43 fps)
- 5=Orifice/Grate (Weir Controls 0.19 cfs @ 0.51 fps)

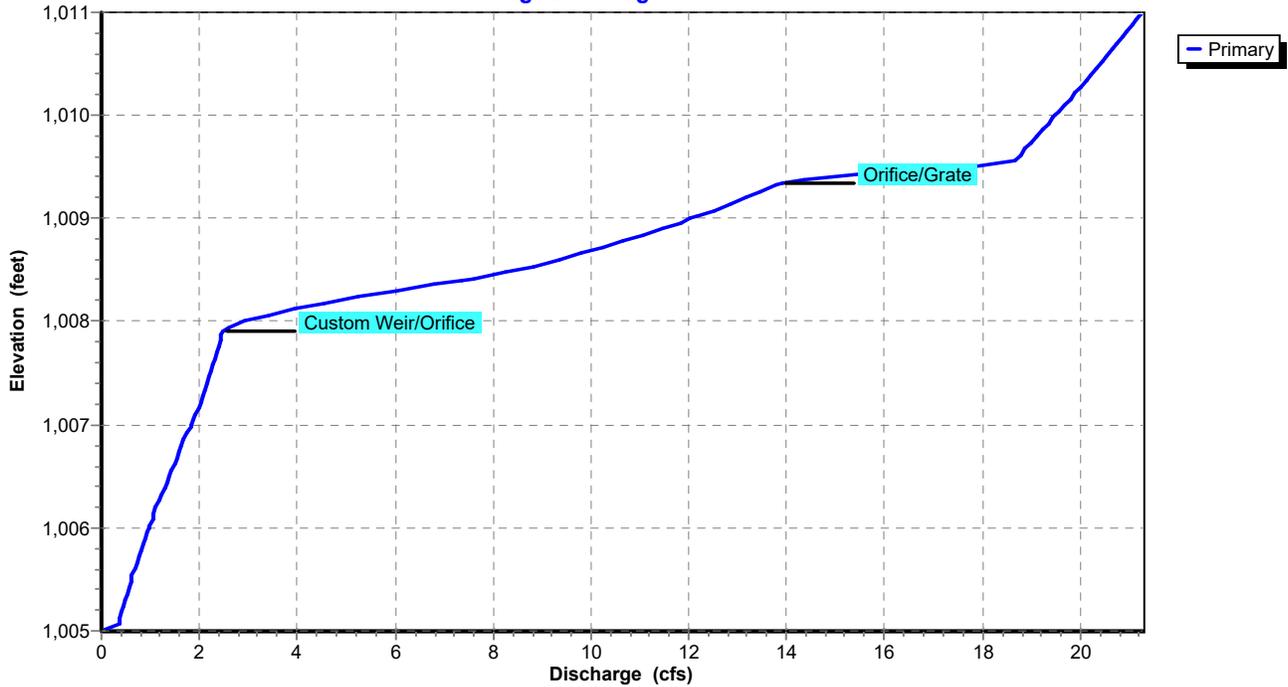
### Pond 15P: EDDB #1

Hydrograph



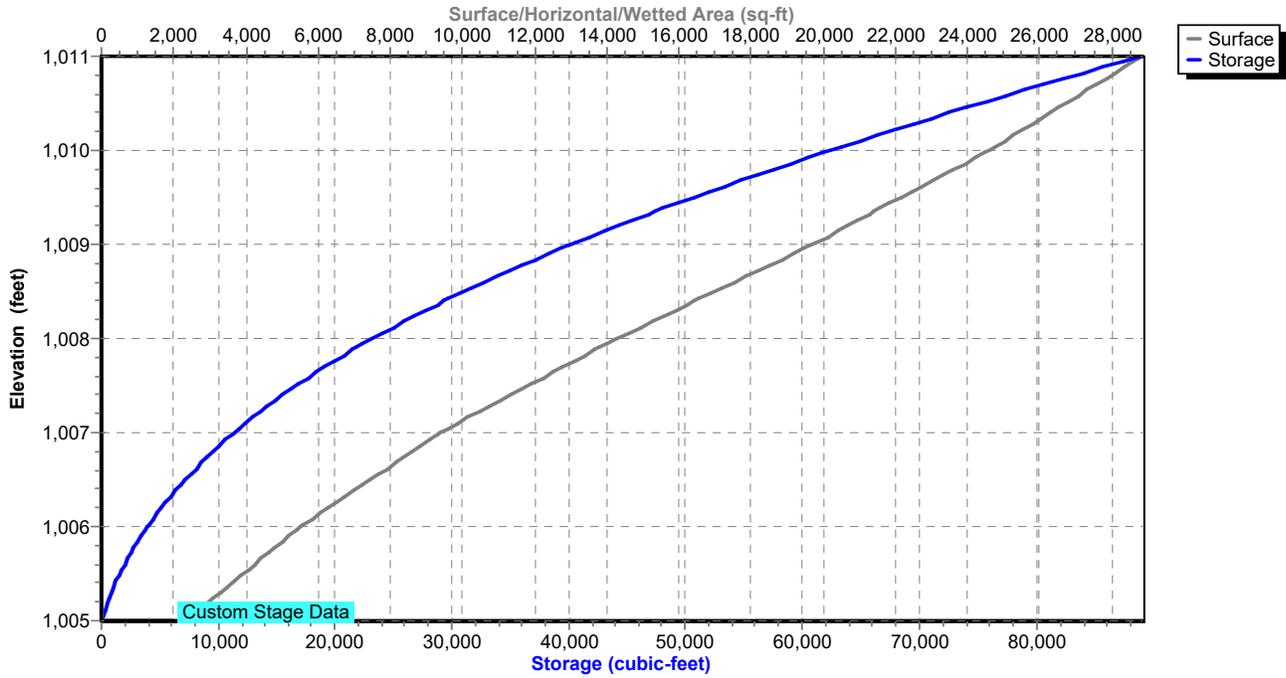
### Pond 15P: EDDB #1

Stage-Discharge



### Pond 15P: EDDB #1

#### Stage-Area-Storage



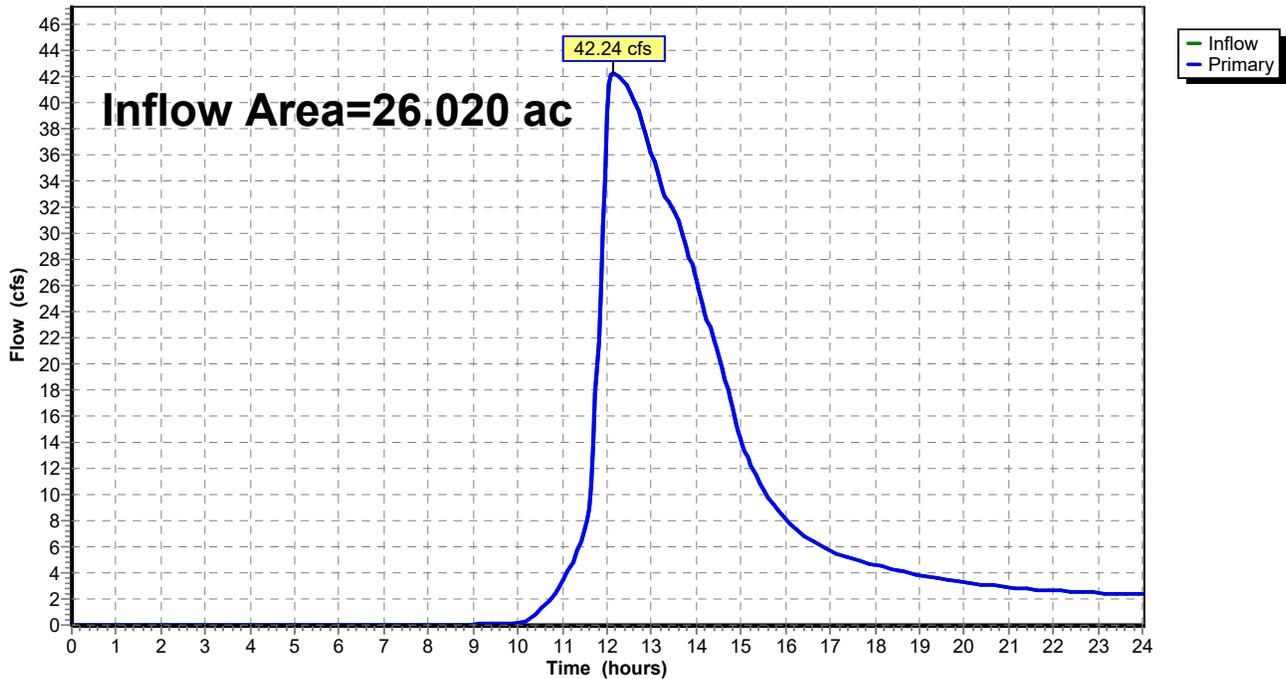
### Summary for Link 12L: RP-4

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 5.60" for 100-Year event  
Inflow = 42.24 cfs @ 12.15 hrs, Volume= 12.143 af  
Primary = 42.24 cfs @ 12.15 hrs, Volume= 12.143 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link 12L: RP-4

Hydrograph



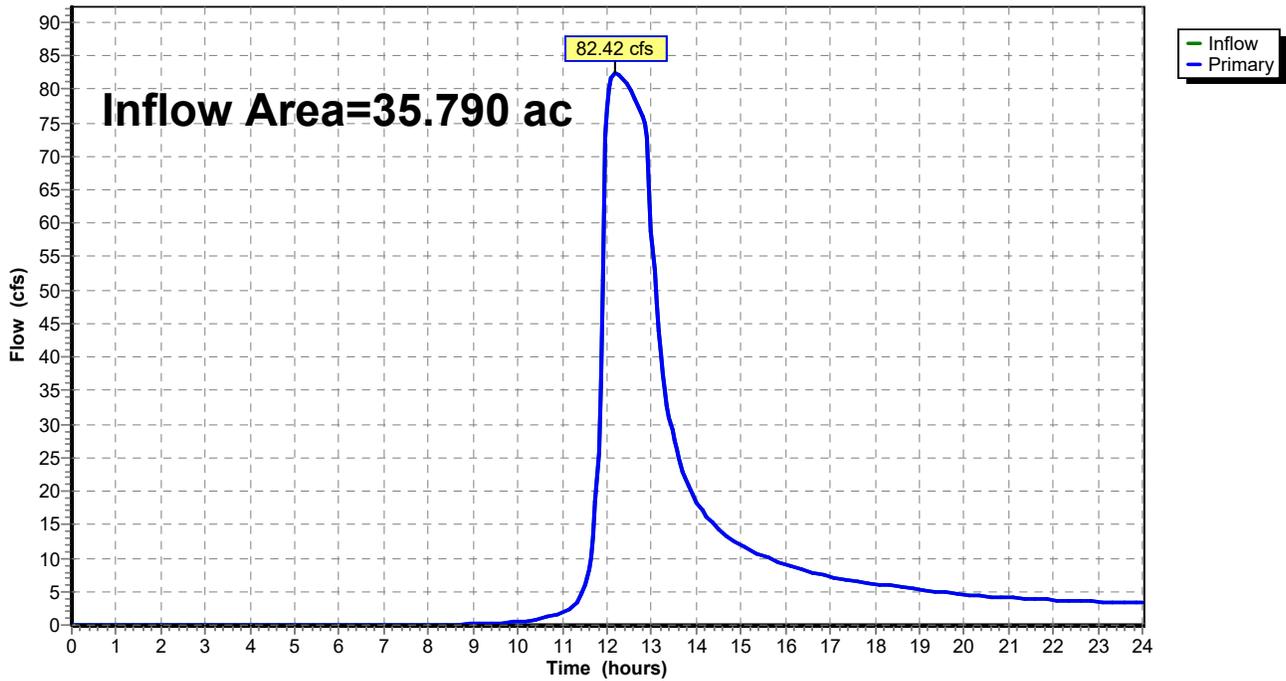
### Summary for Link 14L: RP-3

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 5.32" for 100-Year event  
Inflow = 82.42 cfs @ 12.19 hrs, Volume= 15.874 af  
Primary = 82.42 cfs @ 12.19 hrs, Volume= 15.874 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link 14L: RP-3

Hydrograph



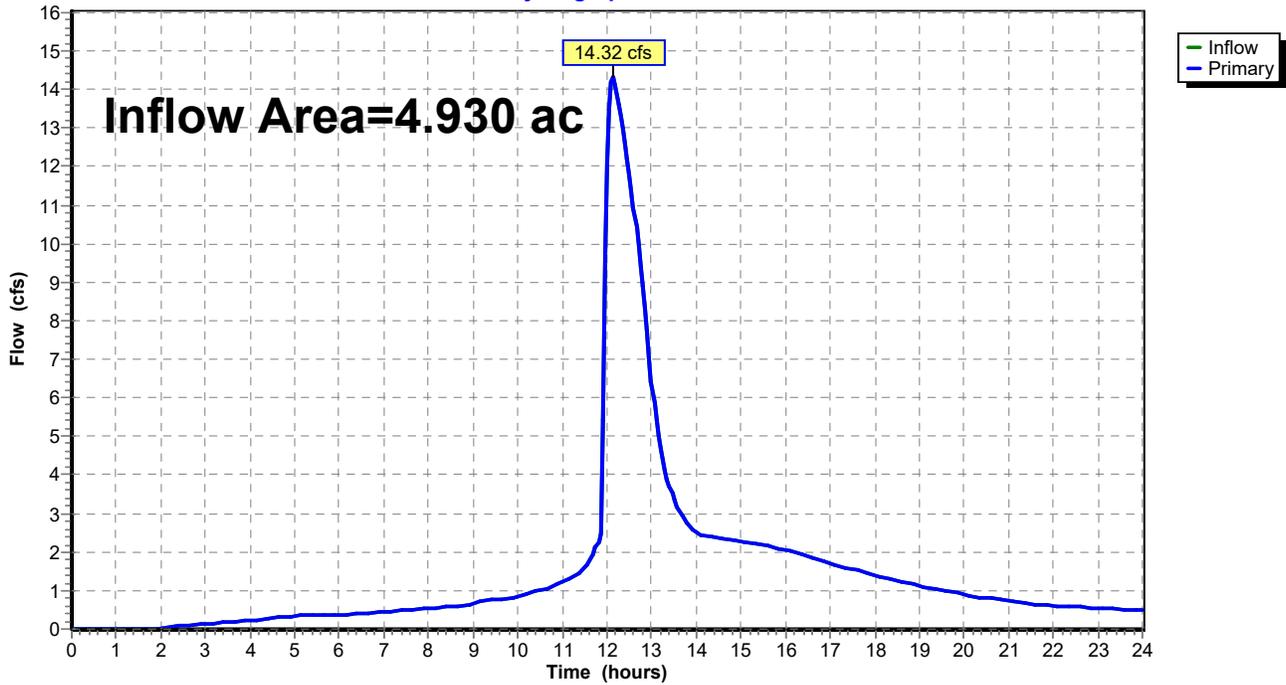
### Summary for Link 15L: RP-1

Inflow Area = 4.930 ac, 85.00% Impervious, Inflow Depth > 6.93" for 100-Year event  
Inflow = 14.32 cfs @ 12.13 hrs, Volume= 2.847 af  
Primary = 14.32 cfs @ 12.13 hrs, Volume= 2.847 af, Atten= 0%, Lag= 0.0 min

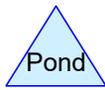
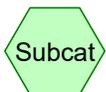
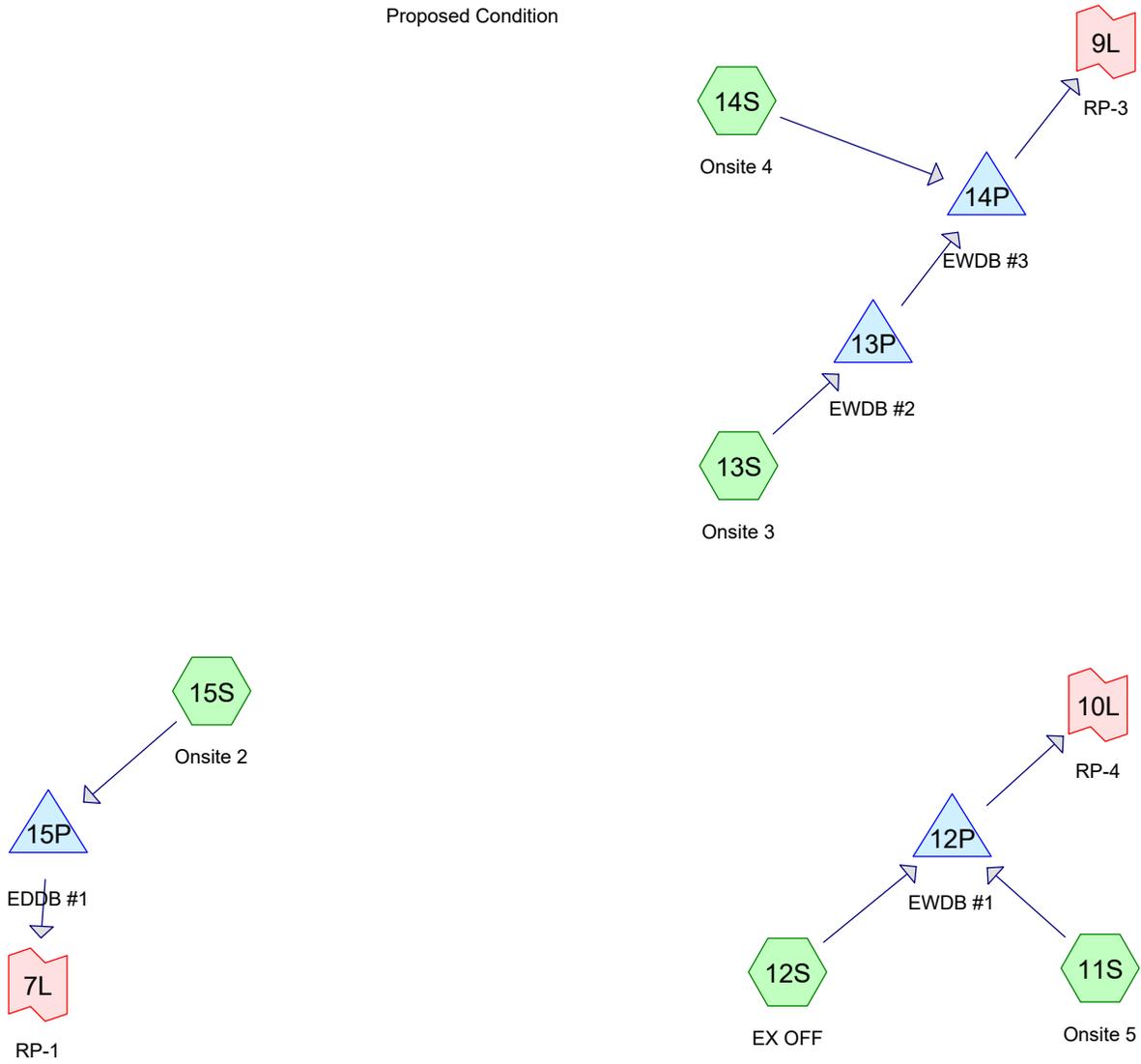
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link 15L: RP-1

Hydrograph



Proposed Condition



**22-102-HYDRO-PRO CLOGGED**

Type II 24-hr 100-Year Rainfall=7.70"

Prepared by Schlagel

Printed 5/11/2023

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**Summary for Subcatchment 11S: Onsite 5**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 197.63 cfs @ 11.95 hrs, Volume= 9.971 af, Depth> 6.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type II 24-hr 100-Year Rainfall=7.70"

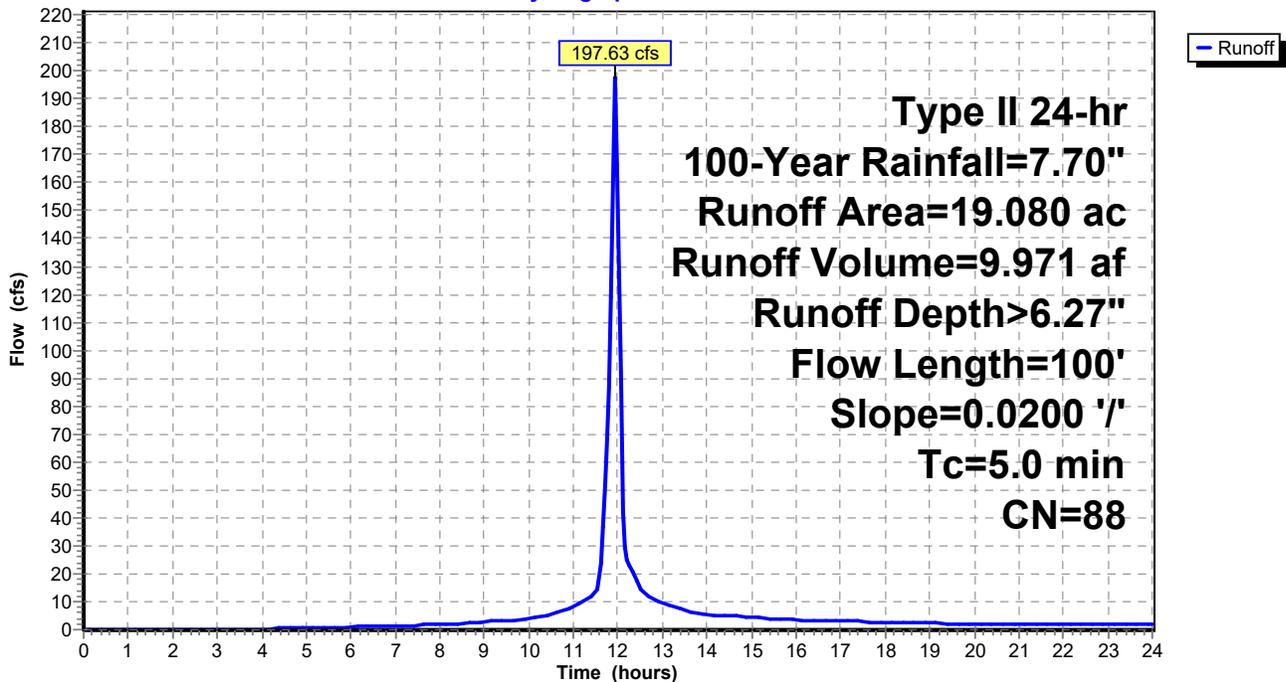
Area (ac)	CN	Description
* 19.080	88	Apartments, 65% imp, HSG C
6.678		35.00% Pervious Area
12.402		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
3.9					<b>Direct Entry, Pipe flow</b>
5.0	100	Total			

**Subcatchment 11S: Onsite 5**

Hydrograph



**22-102-HYDRO-PRO CLOGGED**

Type II 24-hr 100-Year Rainfall=7.70"

Prepared by Schlagel

Printed 5/11/2023

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**Summary for Subcatchment 12S: EX OFF**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 71.89 cfs @ 11.95 hrs, Volume= 3.627 af, Depth> 6.27"

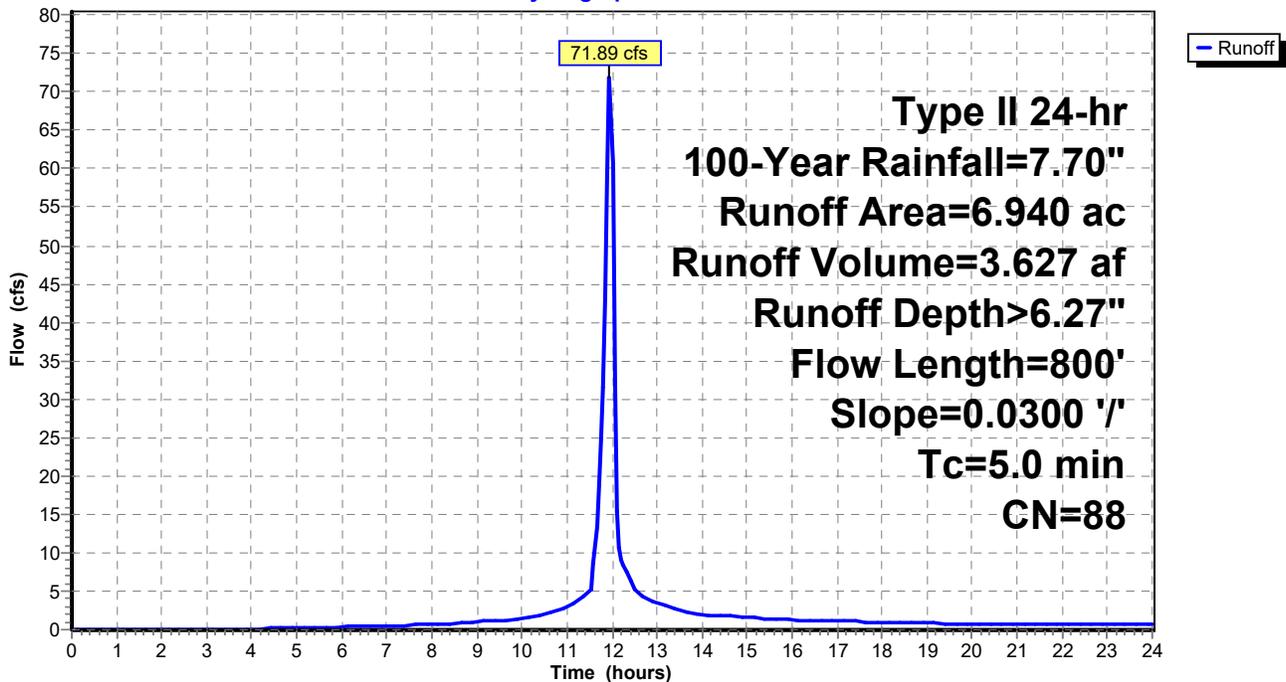
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-Year Rainfall=7.70"

Area (ac)	CN	Description
* 6.940	88	Future Multi-Family, 65% imp, HSG C
2.429		35.00% Pervious Area
4.511		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0300	1.72		<b>Sheet Flow, Sheet flow</b> Smooth surfaces n= 0.011 P2= 3.60"
4.0	700		2.92		<b>Direct Entry, Pipe flow</b>
5.0	800	Total			

**Subcatchment 12S: EX OFF**

Hydrograph



**22-102-HYDRO-PRO CLOGGED**

Type II 24-hr 100-Year Rainfall=7.70"

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**Summary for Subcatchment 13S: Onsite 3**

Runoff = 114.13 cfs @ 11.99 hrs, Volume= 6.267 af, Depth> 6.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-Year Rainfall=7.70"

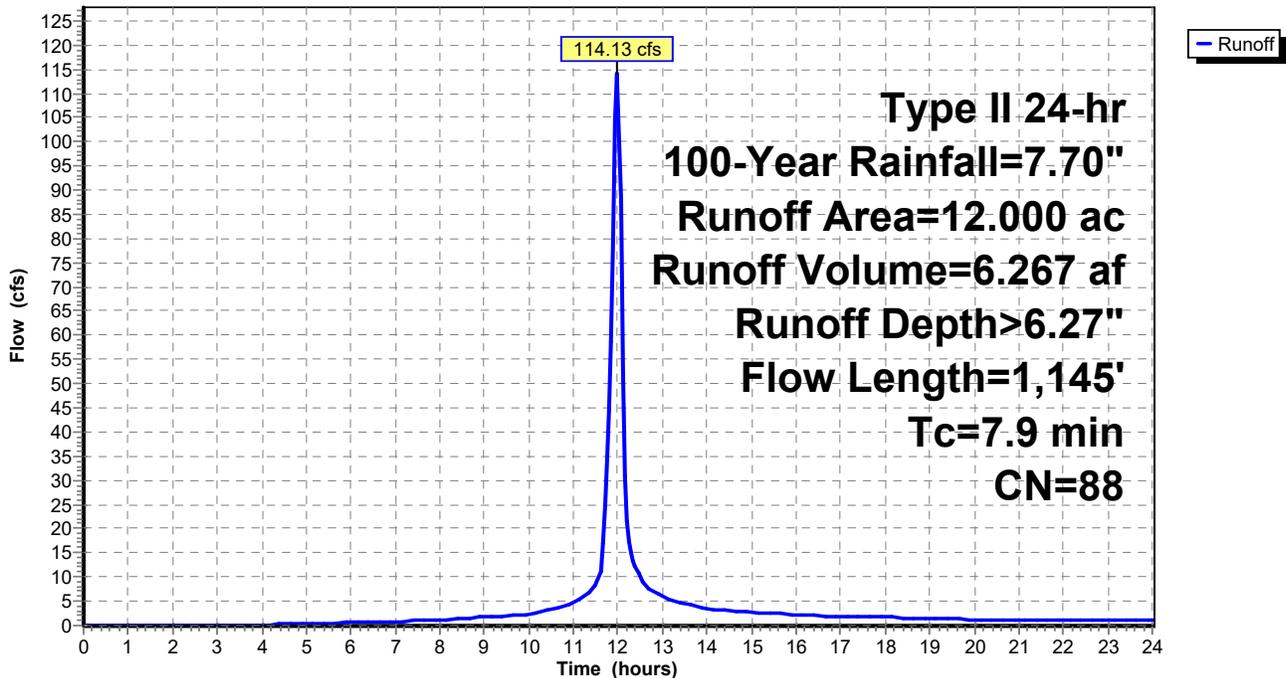
Area (ac)	CN	Description
* 12.000	88	1/8 acre lots, 65% imp, HSG D
4.200		35.00% Pervious Area
7.800		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
6.8	1,045	0.0250	2.55		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
7.9	1,145	Total			

**Subcatchment 13S: Onsite 3**

Hydrograph



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Type II 24-hr 100-Year Rainfall=7.70"

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**Summary for Subcatchment 14S: Onsite 4**

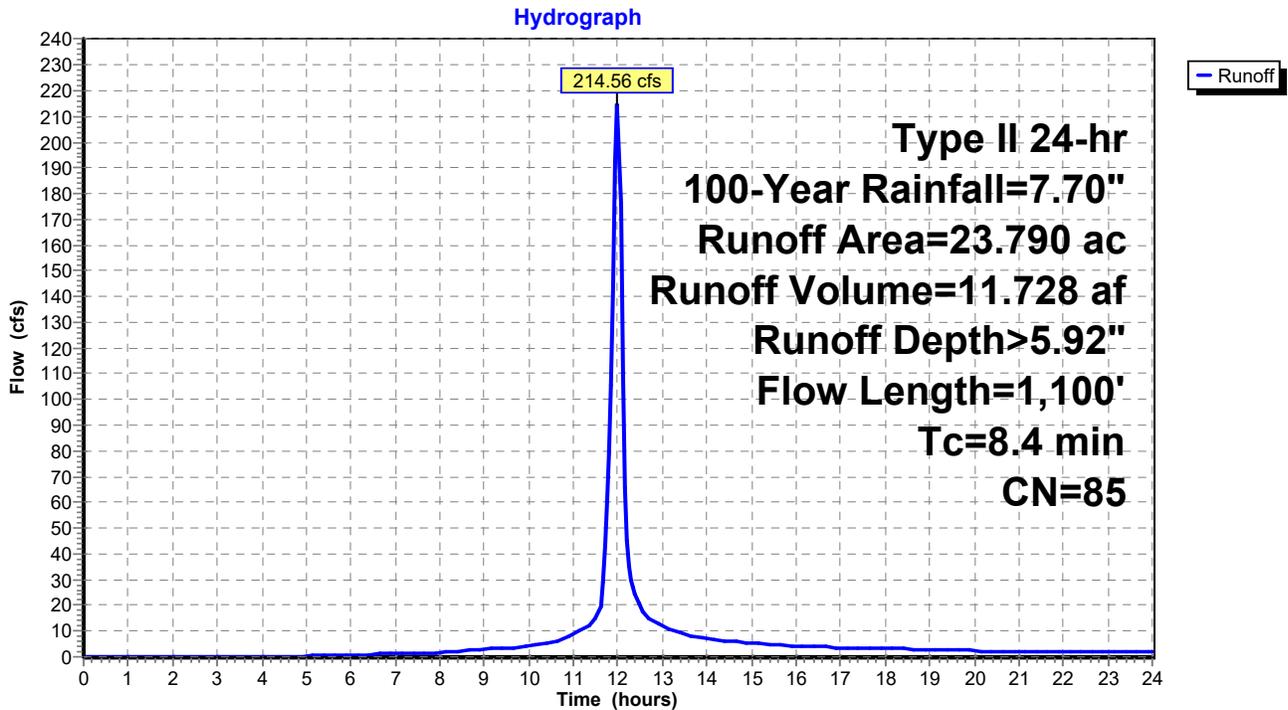
Runoff = 214.56 cfs @ 11.99 hrs, Volume= 11.728 af, Depth> 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-Year Rainfall=7.70"

Area (ac)	CN	Description
* 11.250	82	SINGLE FAMILY LOTS
* 12.540	88	1/8 acre lots, 65% imp, HSG D
23.790	85	Weighted Average
15.639		65.74% Pervious Area
8.151		34.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0205	1.47		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
7.3	1,000	0.0200	2.28		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
8.4	1,100	Total			

**Subcatchment 14S: Onsite 4**



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**Summary for Subcatchment 15S: Onsite 2**

Runoff = 50.95 cfs @ 11.98 hrs, Volume= 2.915 af, Depth> 7.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-Year Rainfall=7.70"

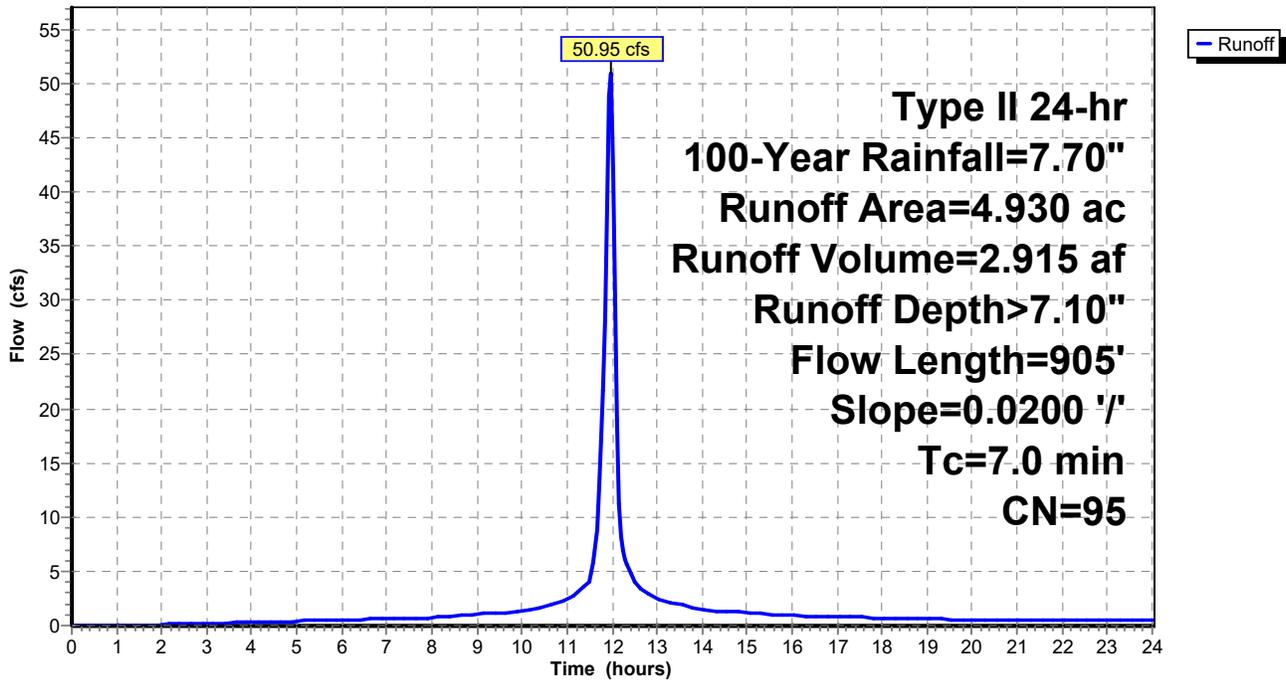
Area (ac)	CN	Description
4.930	95	Urban commercial, 85% imp, HSG D
0.739		15.00% Pervious Area
4.190		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.60"
5.9	805	0.0200	2.28		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
7.0	905	Total			

**Subcatchment 15S: Onsite 2**

Hydrograph



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**Summary for Pond 12P: EWDB #1**

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 6.27" for 100-Year event  
 Inflow = 269.52 cfs @ 11.95 hrs, Volume= 13.597 af  
 Outflow = 149.87 cfs @ 12.04 hrs, Volume= 11.918 af, Atten= 44%, Lag= 5.5 min  
 Primary = 149.87 cfs @ 12.04 hrs, Volume= 11.918 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 1,001.54' @ 12.04 hrs Surf.Area= 93,928 sf Storage= 224,967 cf

Plug-Flow detention time= 114.4 min calculated for 11.894 af (87% of inflow)  
 Center-of-Mass det. time= 56.1 min ( 834.6 - 778.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	998.94'	338,216 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

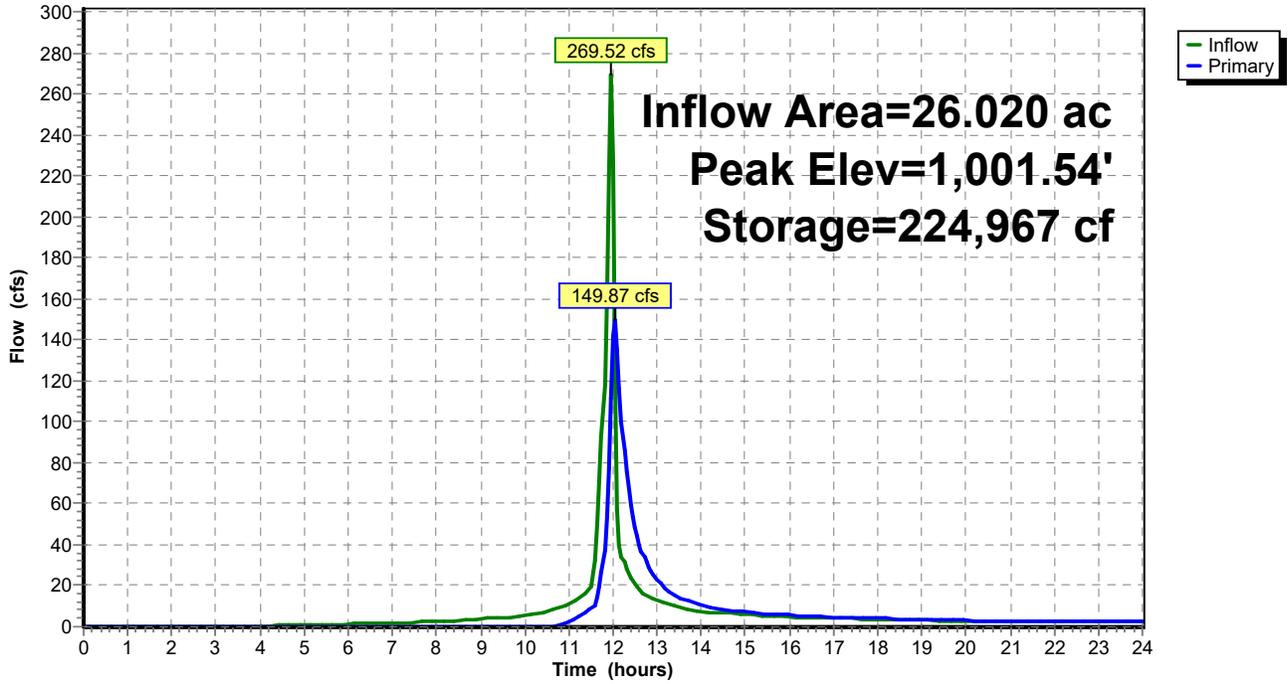
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
998.94	79,537	0	0
999.00	79,862	4,782	4,782
1,000.00	85,328	82,595	87,377
1,001.00	90,894	88,111	175,488
1,002.00	96,560	93,727	269,215
1,002.70	100,587	69,001	338,216

Device	Routing	Invert	Outlet Devices
#1	Primary	999.70'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 999.70 1,002.70 Width (feet) 14.00 32.00

**Primary OutFlow** Max=148.47 cfs @ 12.04 hrs HW=1,001.53' (Free Discharge)  
 ↑1=Custom Weir/Orifice (Weir Controls 148.47 cfs @ 4.18 fps)

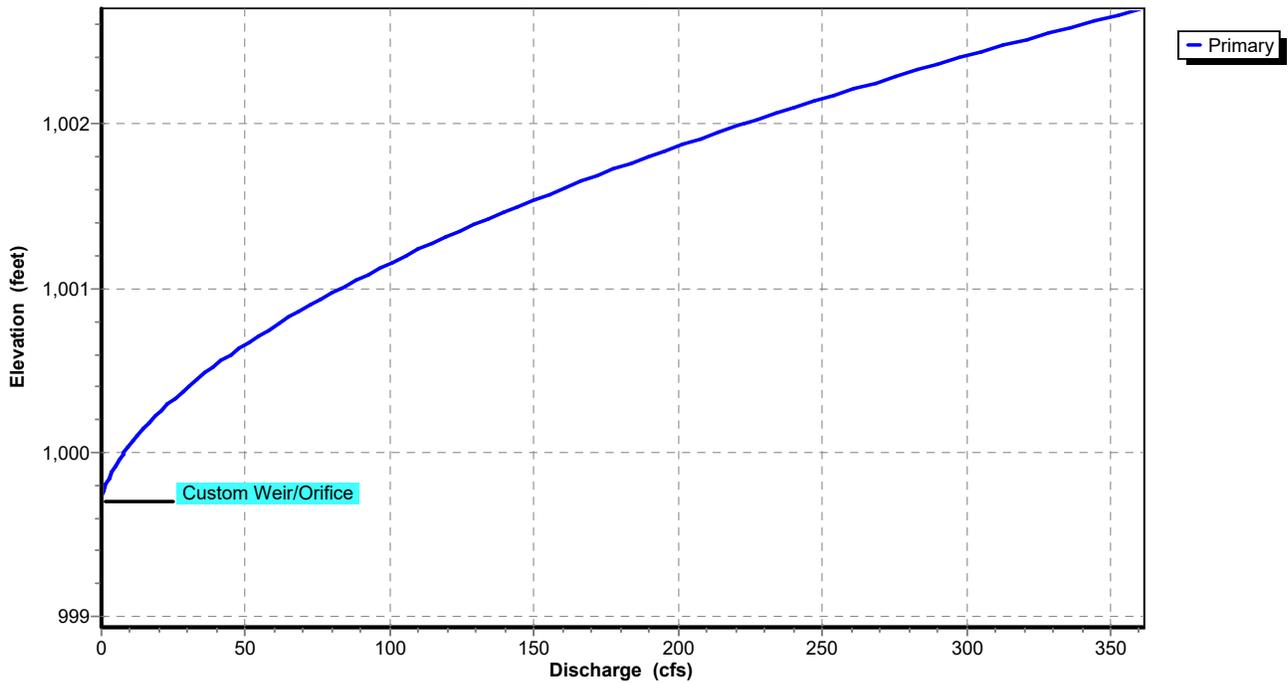
Pond 12P: EWDB #1

Hydrograph

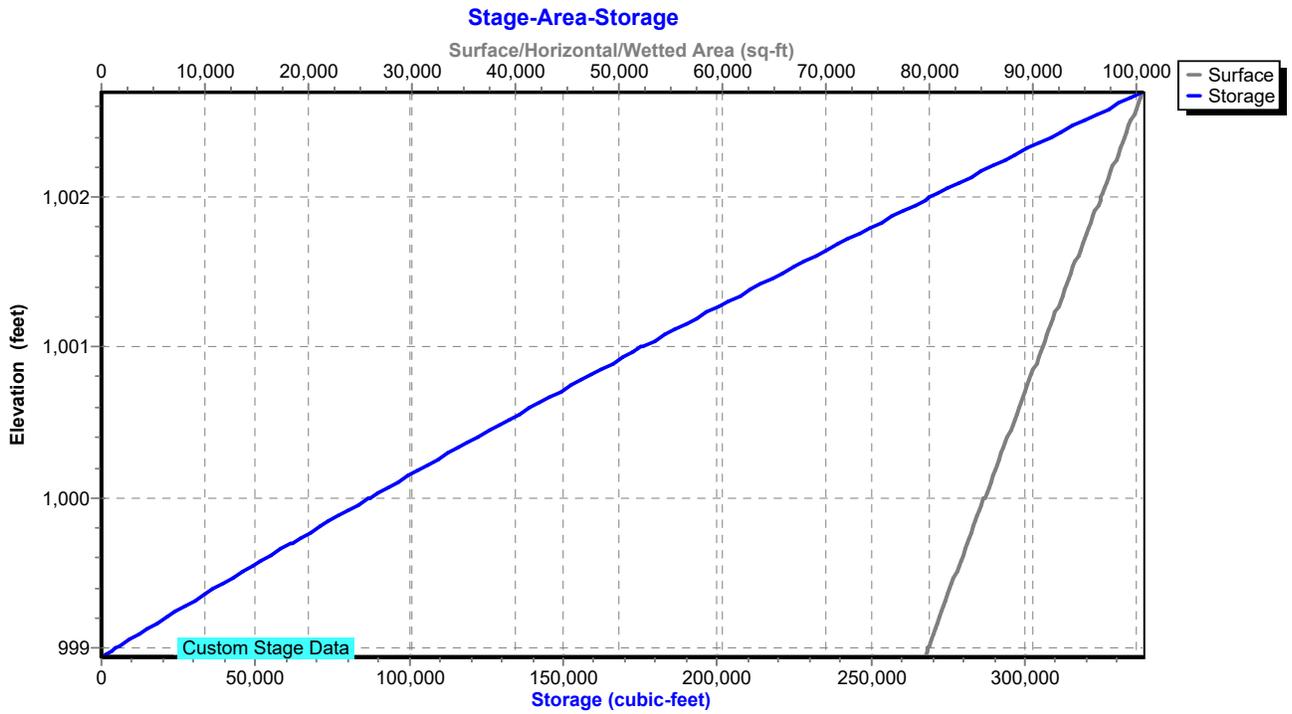


Pond 12P: EWDB #1

Stage-Discharge



### Pond 12P: EWDB #1



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**Summary for Pond 13P: EWDB #2**

Inflow Area = 12.000 ac, 65.00% Impervious, Inflow Depth > 6.27" for 100-Year event  
 Inflow = 114.13 cfs @ 11.99 hrs, Volume= 6.267 af  
 Outflow = 108.88 cfs @ 12.01 hrs, Volume= 5.350 af, Atten= 5%, Lag= 1.4 min  
 Primary = 108.88 cfs @ 12.01 hrs, Volume= 5.350 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 996.94' @ 12.01 hrs Surf.Area= 35,157 sf Storage= 54,430 cf

Plug-Flow detention time= 106.5 min calculated for 5.350 af (85% of inflow)  
 Center-of-Mass det. time= 40.8 min ( 821.6 - 780.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	995.26'	93,078 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

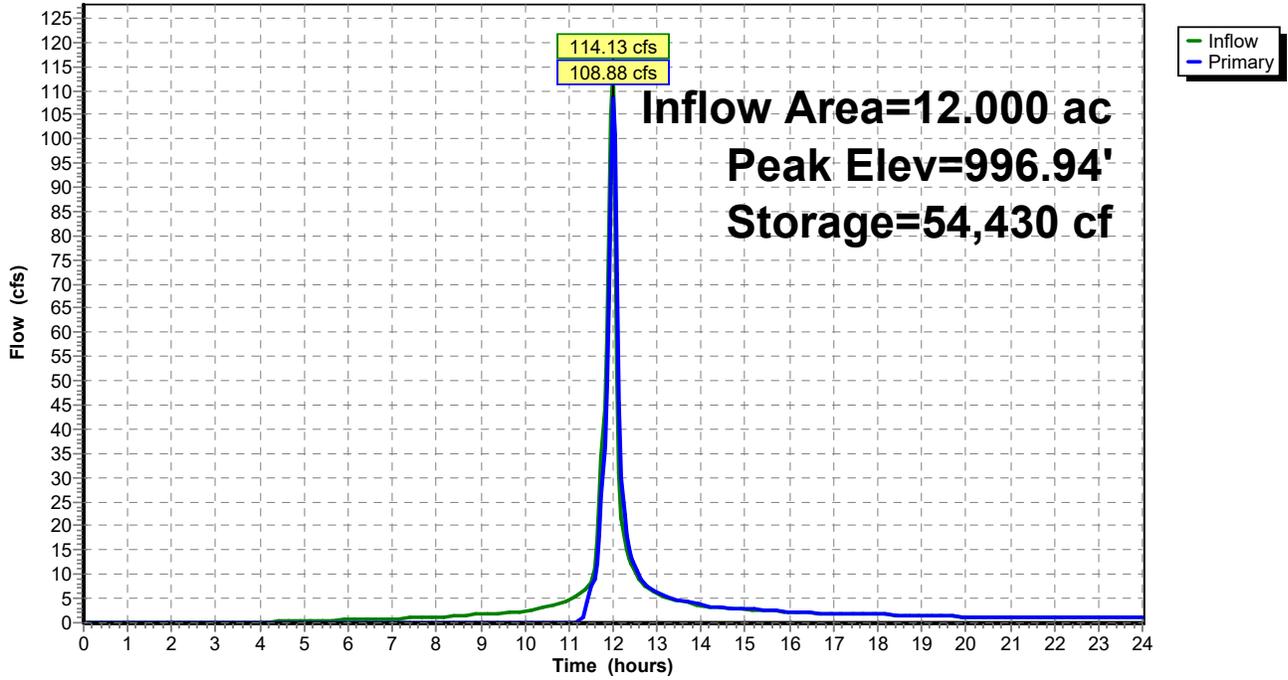
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
995.26	29,855	0	0
996.00	31,820	22,820	22,820
996.50	34,150	16,493	39,312
997.00	35,304	17,364	56,676
998.00	37,500	36,402	93,078

Device	Routing	Invert	Outlet Devices
#1	Primary	996.50'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 996.50 998.00 Width (feet) 114.00 126.00

**Primary OutFlow** Max=106.81 cfs @ 12.01 hrs HW=996.93' (Free Discharge)  
 ↑1=Custom Weir/Orifice (Weir Controls 106.81 cfs @ 2.14 fps)

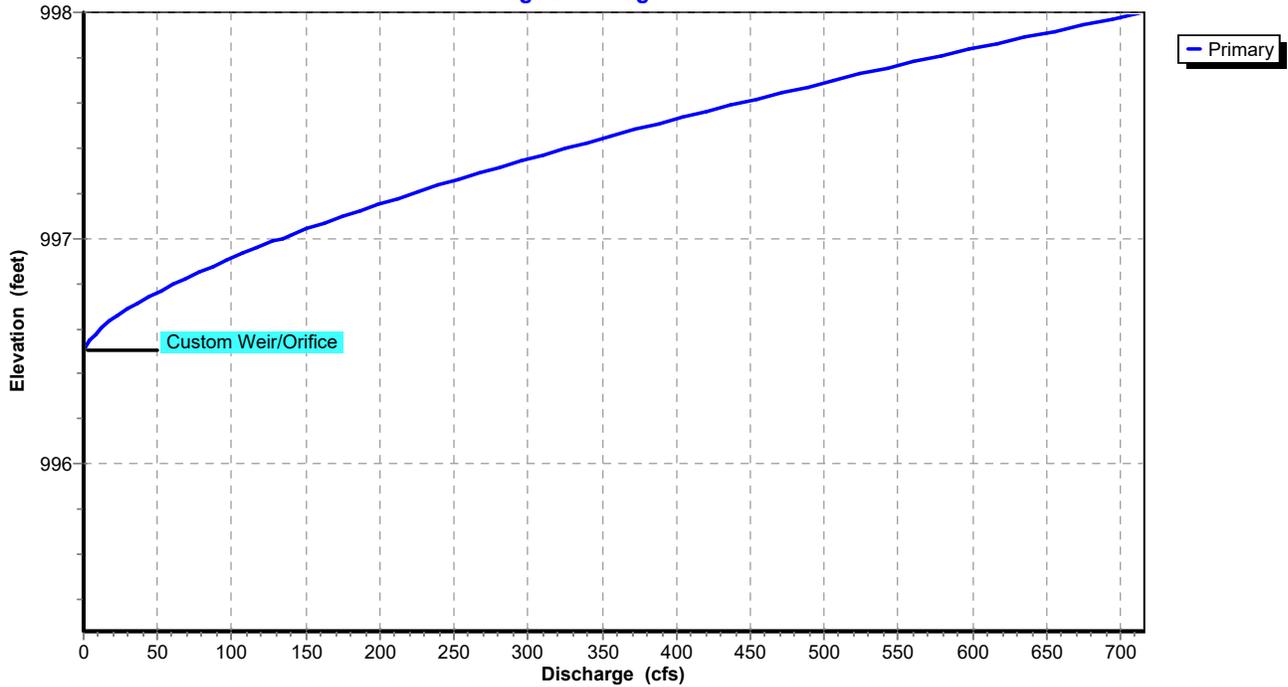
Pond 13P: EWDB #2

Hydrograph

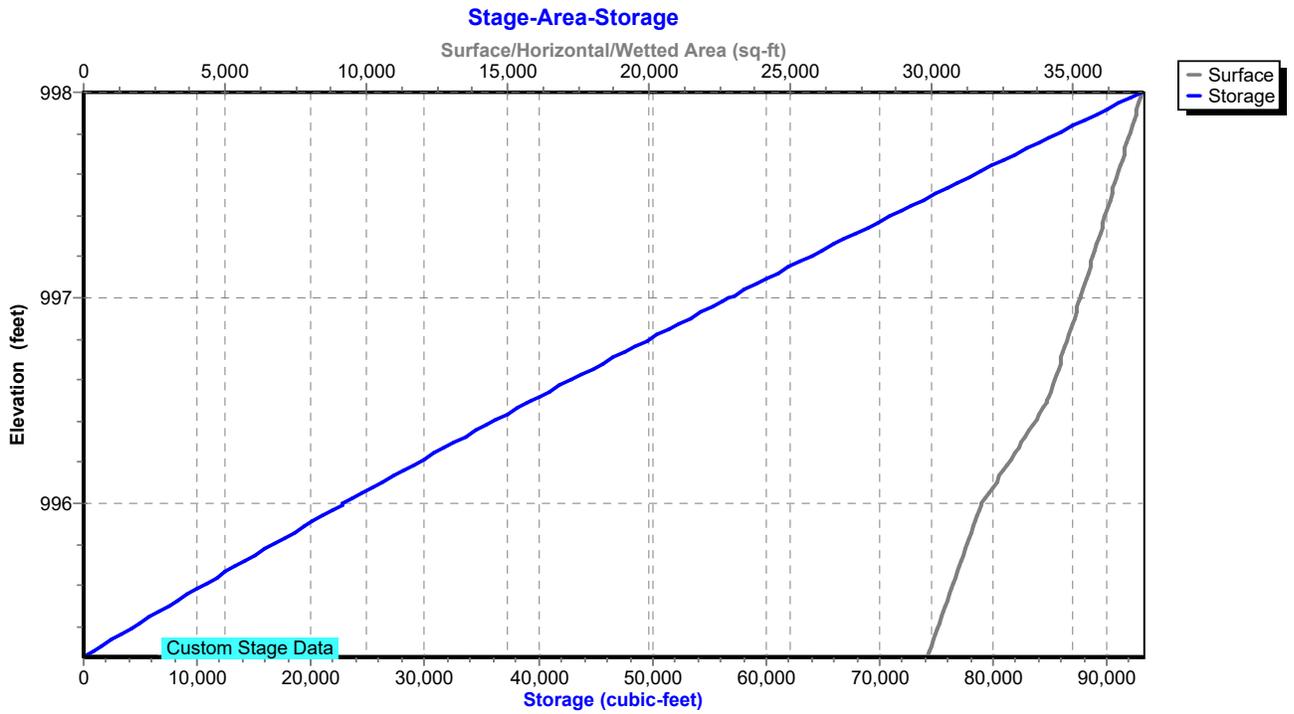


Pond 13P: EWDB #2

Stage-Discharge



Pond 13P: EWDB #2



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**Summary for Pond 14P: EWDB #3**

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 5.73" for 100-Year event  
 Inflow = 322.41 cfs @ 12.00 hrs, Volume= 17.077 af  
 Outflow = 307.82 cfs @ 12.02 hrs, Volume= 15.803 af, Atten= 5%, Lag= 1.5 min  
 Primary = 307.82 cfs @ 12.02 hrs, Volume= 15.803 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 991.76' @ 12.02 hrs Surf.Area= 56,091 sf Storage= 94,835 cf

Plug-Flow detention time= 62.0 min calculated for 15.803 af (93% of inflow)  
 Center-of-Mass det. time= 22.4 min ( 822.1 - 799.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	989.91'	237,058 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
989.91	46,798	0	0
990.00	47,178	4,229	4,229
991.00	52,031	49,605	53,833
992.00	57,384	54,708	108,541
993.00	64,631	61,008	169,548
994.00	70,388	67,510	237,058

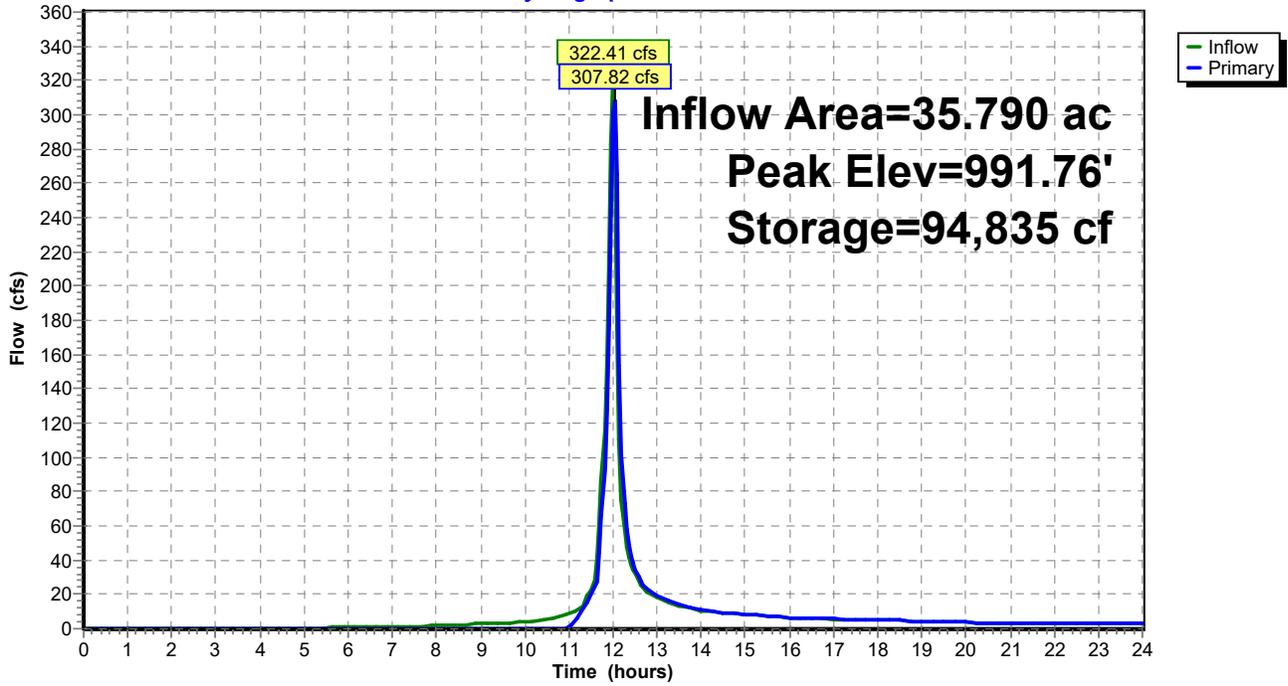
Device	Routing	Invert	Outlet Devices
#1	Primary	991.00'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 991.00 993.00 Width (feet) 140.00 156.00

**Primary OutFlow** Max=300.33 cfs @ 12.02 hrs HW=991.75' (Free Discharge)

↑1=Custom Weir/Orifice (Weir Controls 300.33 cfs @ 2.82 fps)

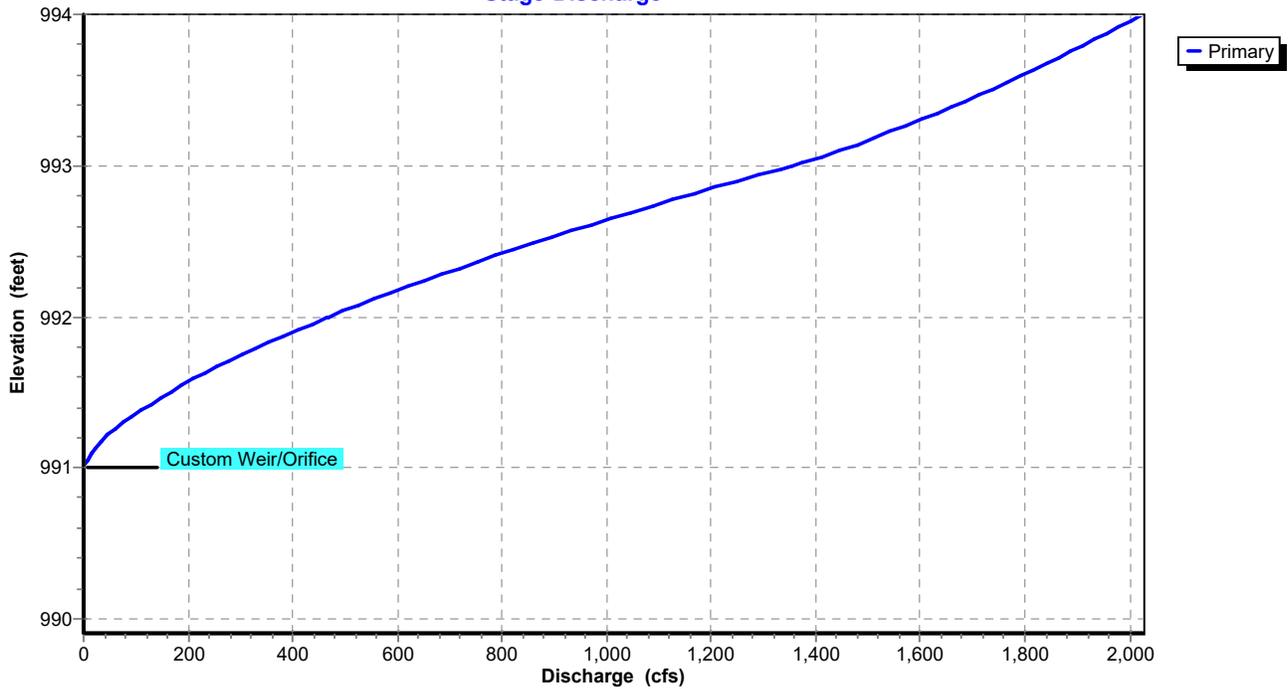
Pond 14P: EWDB #3

Hydrograph



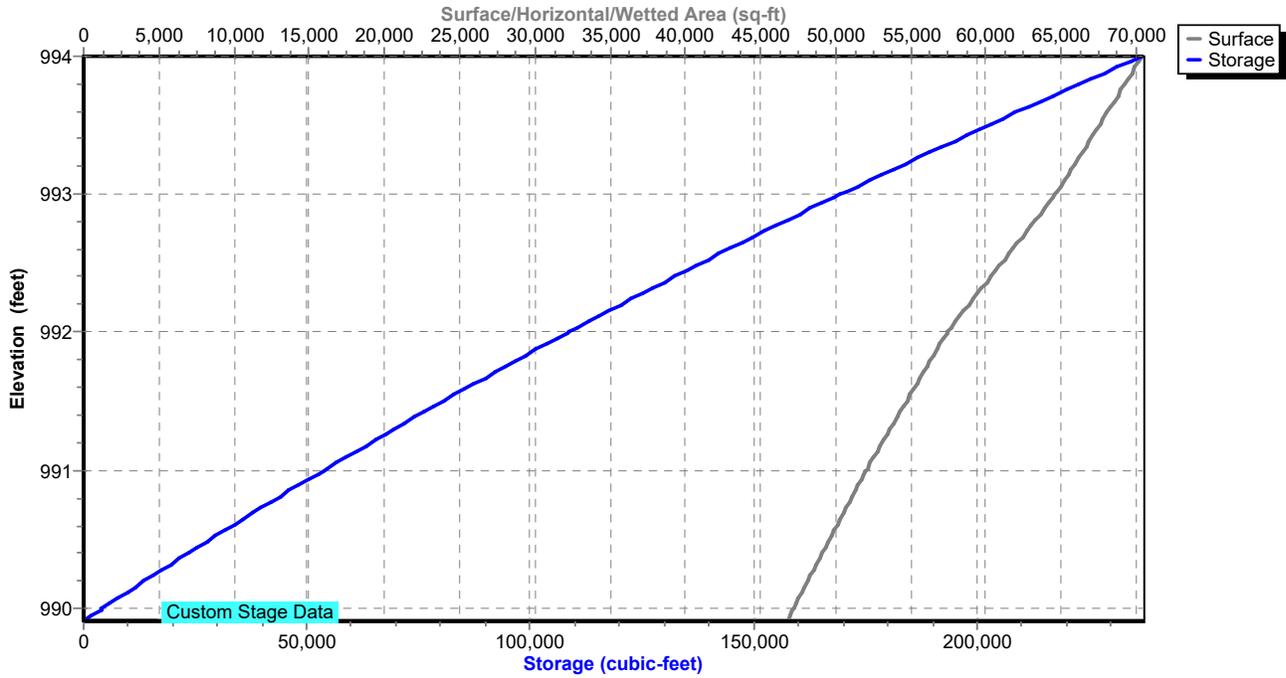
Pond 14P: EWDB #3

Stage-Discharge



### Pond 14P: EWDB #3

#### Stage-Area-Storage



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**Summary for Pond 15P: Eddb #1**

Inflow Area = 4.930 ac, 85.00% Impervious, Inflow Depth > 7.10" for 100-Year event  
 Inflow = 50.95 cfs @ 11.98 hrs, Volume= 2.915 af  
 Outflow = 48.94 cfs @ 12.00 hrs, Volume= 2.307 af, Atten= 4%, Lag= 1.3 min  
 Primary = 48.94 cfs @ 12.00 hrs, Volume= 2.307 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 1,010.65' @ 12.00 hrs Surf.Area= 27,357 sf Storage= 32,916 cf

Plug-Flow detention time= 145.4 min calculated for 2.307 af (79% of inflow)  
 Center-of-Mass det. time= 64.4 min ( 818.7 - 754.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	1,009.30'	42,807 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

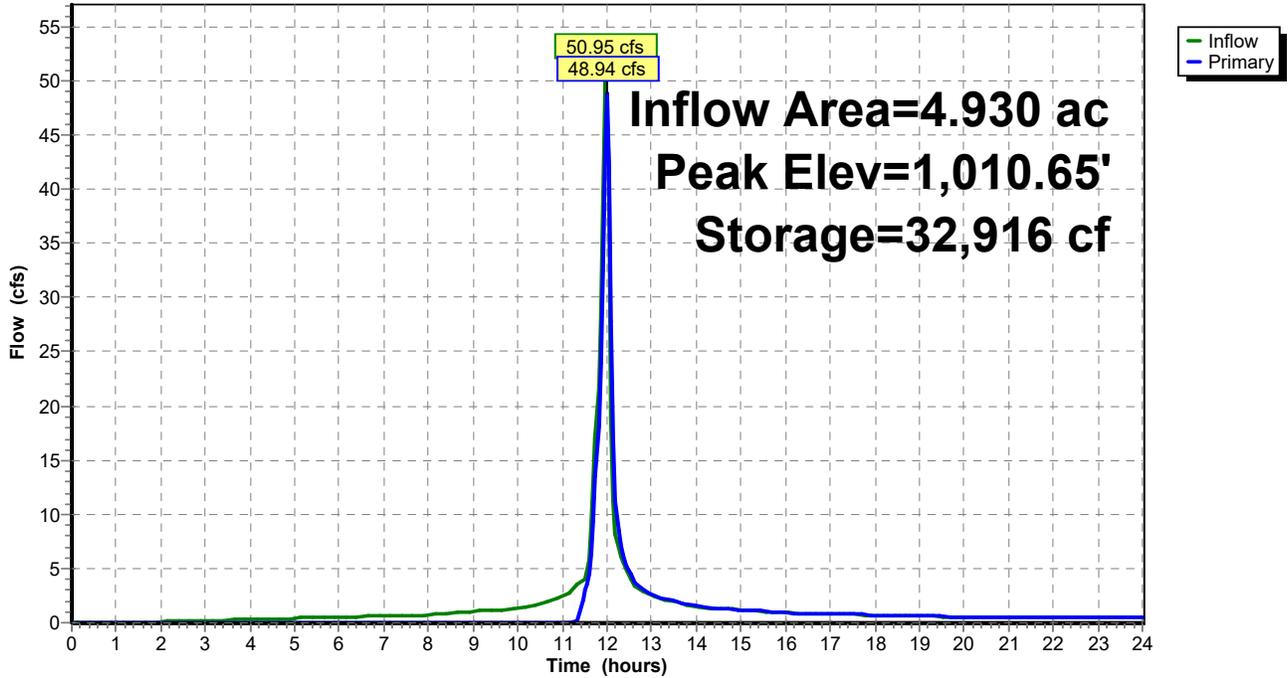
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,009.30	21,331	0	0
1,010.00	24,607	16,078	16,078
1,011.00	28,850	26,729	42,807

Device	Routing	Invert	Outlet Devices
#1	Primary	1,010.40'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 1,010.40 1,012.40 Width (feet) 120.00 136.00

**Primary OutFlow** Max=48.67 cfs @ 12.00 hrs HW=1,010.65' (Free Discharge)  
 ↑1=Custom Weir/Orifice (Weir Controls 48.67 cfs @ 1.63 fps)

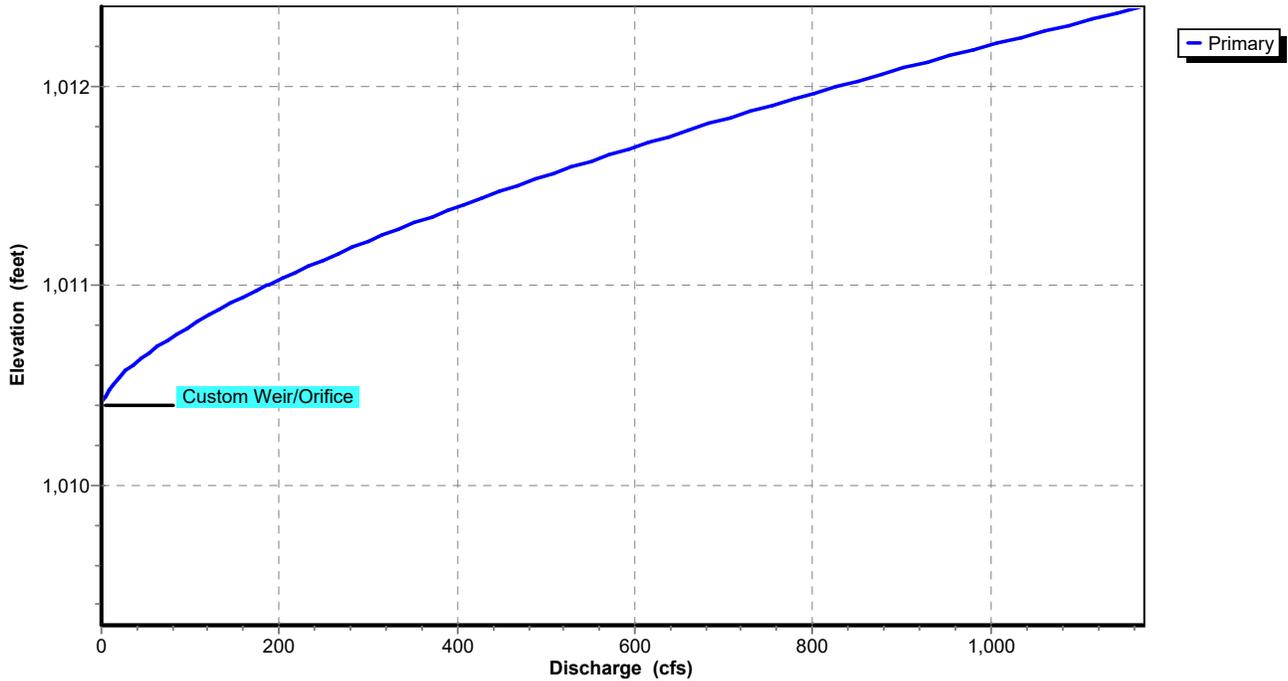
### Pond 15P: EDDB #1

Hydrograph



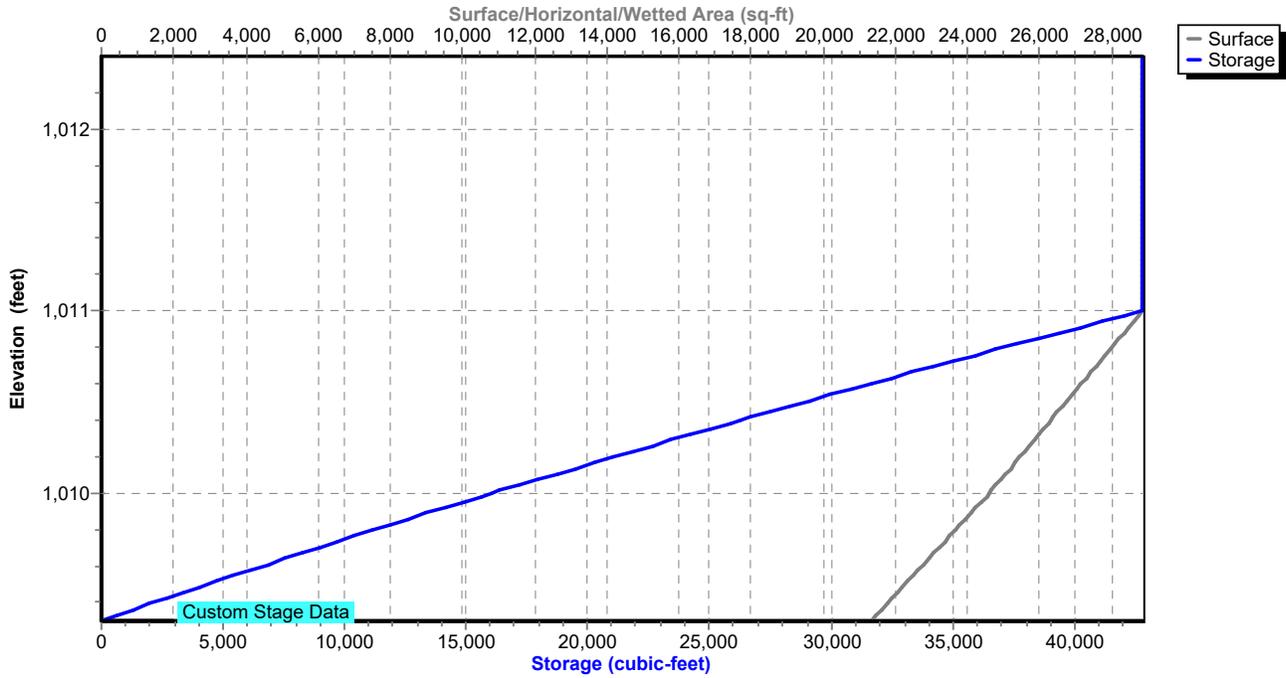
### Pond 15P: EDDB #1

Stage-Discharge



### Pond 15P: EDDB #1

#### Stage-Area-Storage



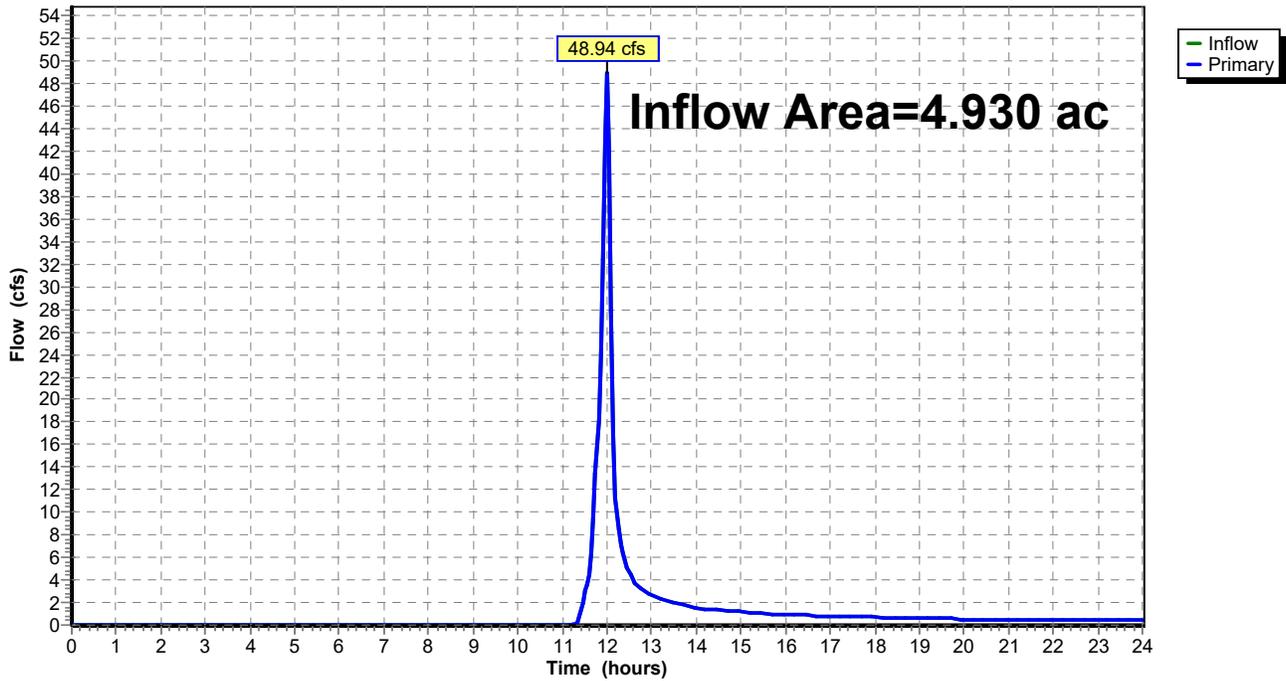
Summary for Link 7L: RP-1

Inflow Area = 4.930 ac, 85.00% Impervious, Inflow Depth > 5.62" for 100-Year event  
Inflow = 48.94 cfs @ 12.00 hrs, Volume= 2.307 af  
Primary = 48.94 cfs @ 12.00 hrs, Volume= 2.307 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link 7L: RP-1

Hydrograph



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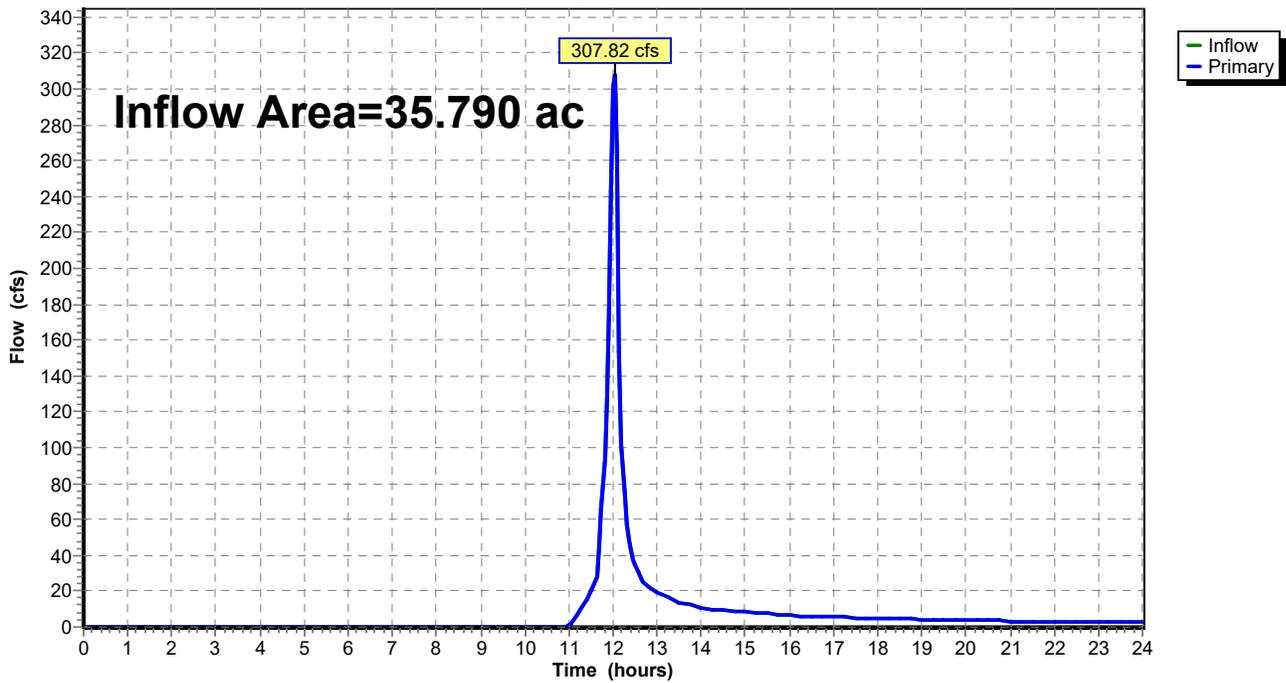
**Summary for Link 9L: RP-3**

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 5.30" for 100-Year event  
Inflow = 307.82 cfs @ 12.02 hrs, Volume= 15.803 af  
Primary = 307.82 cfs @ 12.02 hrs, Volume= 15.803 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

**Link 9L: RP-3**

Hydrograph



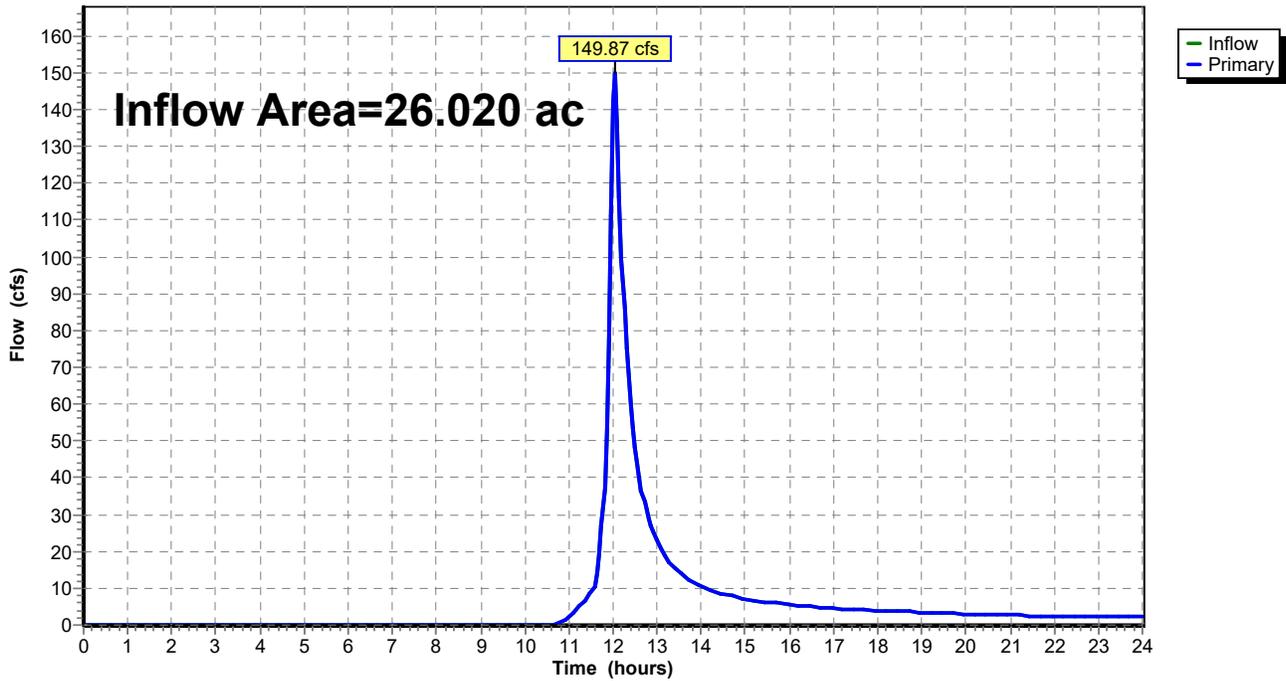
Summary for Link 10L: RP-4

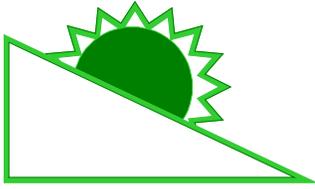
Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 5.50" for 100-Year event  
Inflow = 149.87 cfs @ 12.04 hrs, Volume= 11.918 af  
Primary = 149.87 cfs @ 12.04 hrs, Volume= 11.918 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link 10L: RP-4

Hydrograph





# TERRA TECHNOLOGIES

Engineers

Scientists

Permit Specialists

## Blackwell Parcel

### *Wetland Delineation And Jurisdictional Assessment*



Prepared for

Griffin Riley Property Group  
21 SE 29<sup>th</sup> Terrace  
Lee's Summit, MO 64082

March 2022

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- Figure 4a – Jurisdictional Assessment Figure
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**APPENDICES**

A Photographic Documentation

B Wetland Determination Data Forms

## **1.0 INTRODUCTION**

Terra Technologies is retained by the applicant, Griffin Riley Property Group, to conduct a wetlands delineation and jurisdictional assessment of wetlands and other waters of the U.S. within the project site located in Lee's Summit, Jackson County, Missouri. The property is owned by Fort Hays State University Foundation at One Tiger Place PO Box 1060 Hays, KS 67601. In accordance with Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers (USACE) administers the permitting of dredge and fill activities in waters of the U.S., including wetlands. Most activities that would result in the placement of dredge or fill material in waters of the U.S. require a Section 404 Permit from the USACE. The information contained in this report will serve to delineate the presence and extents of jurisdictional waters of the U.S. within the project site.

## **2.0 PROJECT LOCATION, LAND USE, AND DESCRIPTION**

The subject area is approximately 60.41 acres in size and is located in Section 11 of Township 47N Range 31W in the southern portion of Jackson County, Missouri (see Figures 1a & 1b [Google, 2019]).

The USGS topographic map published by the U.S. Geological Survey (USGS) indicates two ponds and one stream feature on the site (see Figure 1c [Google, 2019]).

The project site consists mainly of agricultural land and forested land. It is bordered by a school to the north, by forested land to the east, by Blue Parkway to the south, and by residential land and commercial land to the west (see Figure 1d [Google, 2019]). The subject site resides in the Central Irregular Plains Level III Ecoregion and the Wooded Osage Plains Level IV Ecoregion as mapped by the United States Environmental Protection Agency (Giffith *et al.*, 2008).

According to the Federal Emergency Management Agency, the parcel is not within the mapped 100-year floodplain (see Figure 1e [Google, 2019]). The site is shown by the U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) as having four ponds and one riverine wetland (see Figure 2 [Google, 2019]).

The U.S. Department of Agriculture (USDA) National Resources Conservation Service (NRCS) mapped the soils on the site as Arisburg silt loam, 1-5% slopes (map unit 10000); Arisburg-Urban land complex, 1-5% slopes (map unit 10082); Sampsel silty clay loam, 5-9% slopes (map unit 10117); Sharpsburg-Urban land complex, 2-5% slopes (map unit 10128); Udarents-Urban land-Sampsel complex, 5-9% slopes (map unit 10181), and; Udarents-Urban land-Polo complex, 5-9% slopes (map unit 10183) (see Figure 3 [Soil Survey Staff, 2022]). The Arisburg and the Arisburg-Urban land soils are listed as hydric and the remaining soils are listed as nonhydric according to the NRCS Web Soil Survey.

### **3.0 FIELD EFFORTS**

On February 11<sup>th</sup>, 2022 scientists with Terra Technologies completed site inspections to identify, delineate and map the locations of wetlands and other water bodies, and to document existing site conditions.

#### **3.1 Stream Delineation**

The delineation of streams was conducted through the inspection and characterization of channel characteristics, including a defined bed and bank and the presence of an ordinary high water mark (OHWM). Upon verification of an OHWM, physical attributes are measured and observed to determine channel width and depth and the extent of stream flow. Ephemeral channels carry flow for short durations after rain and snowmelt events and are typically void of pools. Ephemeral channels can exist with pools but do not receive adequate ground water following rain events to maintain pool presence. Intermittent channels carry flow for intermediate durations and often contain pools. Pool formation is supported from the transport of ground water to the pools between periods of precipitation. Intermittent pools are often determined to have a pool to pool base flow originating from the ground water source. Perennial channels represent higher order streams that carry flow for extended durations and are observed to maintain constant pooling. Perennial channels are often associated with the inflow of one or more consistent ground water sources and are typically fed by ephemeral and intermittent channels.

#### **3.2 Wetland Delineation**

Wetland delineation was performed according to the methods and procedures described in the USACE *Wetlands Delineation Manual* (Environmental Laboratory, 1987) and the *Regional*

*Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0)* (USACE, 2010). The presence of wetlands was ascertained by the observation of all three delineative criteria: 1) a predominance of hydrophytic (water-loving) plant species, 2) hydric soil indicators, and 3) wetland hydrology indicators. Wetland delineation sample points were established at multiple observation points in representative areas of the project. Wetland boundaries were determined in the field and surveyed using a Garmin eTrex Legend C Global Positioning System (GPS) to an approximate accuracy of 10 feet.

The methods used to evaluate the three mandatory wetland criteria (hydrophytic vegetation, hydric soil, and wetland hydrology) are described as follows:

### **Hydrophytic Vegetation Indicators**

The hydrophytic vegetation criterion for wetland determination is met when more than 50 percent of the dominant plant species at a given site are obligate, facultative wetland, or facultative species according to the plant list published by the USACE (Lichvar et al, 2016), the vegetation has a prevalence index score of  $\leq 3.0$ , the vegetation displays certain morphological adaptations, or is problematic hydrophytic vegetation that is determined to be hydrophytic using our best professional judgment. A semi-quantitative (routine determination) or quantitative (comprehensive determination) estimate is made of the dominant plant species for each vegetation stratum (herb, shrub, vine, and tree). Vegetative sampling is conducted using a graduated series of plots for each stratum (5-foot radius for herbaceous species, 15-foot radius for saplings and shrubs and 30-foot radius for trees and woody vines). A wetland boundary is determined based on the percentage of wetland species versus upland vegetation per vegetation strata identified during the on-site investigation. The indicator status of the vegetation, as listed in Lichvar et al (2016), is used to determine if an area is dominated by hydrophytic or upland species. Taxonomic nomenclature follows that used in Lichvar et al (2016).

### **Hydric Soil Indicators**

Hydric soil is defined by the USACE as soil that is formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. An area is considered to have hydric soil when the National Technical Committee for Hydric Soils criteria are met. These conditions

relate to soil types, soil drainage characteristics, water table levels, and frequency of flooding. The presence or absence of hydric soils throughout the specified reach was determined by collecting soil cores using a 1 ¼-inch diameter stainless steel sampling tube. Soil samples were analyzed per the Munsell soil color charts (Gretag/Macbeth, 2010), USDA soil texture, consistency, moisture content, special features, and horizon designation.

### **Wetland Hydrology Indicators**

Wetland hydrology is defined by the USACE as permanent or periodic inundation or prolonged soil saturation sufficient to create anaerobic conditions in the soil. Weather data, season of the year, and field observations of hydrologic indicators (water-stained leaves, high-water marks, saturated or inundated soils, *etc.*) are used to determine whether or not the wetland hydrology criterion is satisfied for the area of investigation.

### **3.3 Jurisdictional Assessment**

Opinions about the jurisdictional nature of a wetland or other water of the U.S. are based upon the Clean Water Act and appropriate case law, most importantly to this project being the 1985 *United States v. Riverside Bayview Homes, Inc.*, the 2001 *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers*, and the 2006 *Rapanos v. United States & Carabell v. United States* rulings. Additionally, the December 2, 2008 U.S. Environmental Protection Agency / USACE guidance document titled *Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in Rapanos v. United States & Carabell v. United States* and prior history of USACE Kansas City District jurisdictional rulings and guidance were utilized. Despite our best professional judgment, the USACE retains the sole authority to determine the jurisdiction of waters of the U.S.

### **4.0 DELINEATED WATERS OF THE U.S. & JURISDICTIONAL ASSESSMENT**

A total of 0.48 acre of wetlands, 230 lineal feet of ephemeral stream channel, and 0.49 acre of pond, were delineated within the subject area as shown in Figures 4a and 4b. Photographs of the project site are included in Appendix A and wetland determination data sheets are included in Appendix B. Figures 4a and 4b show the locations of photo points and wetland delineation sample points provided in Appendix A and Appendix B.

## **4.1 Stream Channels**

One ephemeral stream channel exists within the subject area.

Ephemeral #1 is a stream originating in the southeastern portion of the subject area and generally flows to the northeast. It has an OHWM which averages two feet in width and banks averaging two feet tall and four feet wide. The substrate predominantly consists of sediment, gravel, and cobble. It extends at the stream centerline approximately 230 lineal feet within the subject area and has a drainage area of approximately 14 acres. Within the assessed site, the stream is surrounded by a vegetated riparian corridor dominated by honey suckle (*Lonicera maackii*), Virginia wild rye (*Elymus virginicus*), and Osage orange (*Maclura pomifera*). Surface water from Ephemeral #1 flows to the northeast into an unnamed tributary. The unnamed tributary flows to the northwest into the East Fork Little Blue River. The East Fork Little Blue River flows to the northwest into the Little Blue River which then flows to the northeast into the Missouri River. This provides a direct surface water connection to downstream traditional navigable waters which makes it likely Ephemeral #1 will be considered a jurisdictional water of the United States.

**Table 1. Stream Summary**

<b>Stream ID</b>	<b>Lineal Feet Within Subject Area</b>	<b>Likely Jurisdictional?</b>
Ephemeral #1	230	Yes
<b><i>TOTAL</i></b>	<b><i>230</i></b>	-

## **4.2 Wetlands**

A discussion of each delineated wetland follows:

Wetland #1 is an approximately 0.10-acre emergent wetland located in the northeastern portion of the subject area. It is dominated by hummocked fescue (*Schedonorus arundinaceus*). Wetland hydrology was found in this location because of the observation of the geomorphic position, drainage patterns, surface water, and saturation. Observations of the soil at this location determined it to have the hydric soil indicator redox dark surface. This wetland receives water as sheet flow from the surrounding lands as well as more concentrated flows from an erosional feature to the southwest. Surface water from this wetland flows to

the northeast through an upland swale and into a stormwater sewer system. The surface flow from the stormwater sewer system generally flows to the northeast and into an unnamed tributary. The unnamed tributary flows to the northwest into the East Fork Little Blue River. The East Fork Little Blue River flows to the northwest into the Little Blue River which then flows to the northeast into the Missouri River. This provides a direct surface water connection to downstream traditional navigable waters which makes it likely Wetland #1 will be considered a jurisdictional water of the United States.

Wetland #2 is an approximately 0.06-acre forested wetland located in the northeastern portion of the subject area. It is dominated by black willow (*Salix nigra*) and Frank's sedge (*Carex frankii*). Wetland hydrology was found in this location because of the observation of the geomorphic position, inundation visible on aerial imagery, and the FAC-neutral test. Observations of the soil at this location determined it to have the hydric soil indicator depleted matrix. This wetland receives water as sheet flow from the surrounding lands as well as more concentrated flows from an erosional feature to the southeast. Surface water from this wetland flows to the northeast through an erosional feature and into Wetland #1. The surface water then follows the same path as Wetland #1 to the Missouri River. This provides a direct surface water connection to downstream traditional navigable waters which makes it likely Wetland #2 will be considered a jurisdictional water of the United States.

Wetland #3 is an approximately 0.05-acre emergent wetland located in the northcentral portion of the subject area. It is dominated by hummocked fescue. Wetland hydrology was found in this location because of the observation of the geomorphic position and saturation. Observations of the soil at this location determined it to have the hydric soil indicator redox dark surface. This wetland receives water as sheet flow from the surrounding lands. Surface water from this wetland flows to the northeast into Pond #1. Pond #1 flows to the northeast into an erosional feature which then flows to the northwest into Wetland #2. Wetland #2 flows to the northeast through an erosional feature and into Wetland #1. The surface water then follows the same path as Wetland #1 to the Missouri River. This provides a direct surface water connection to downstream traditional navigable waters which makes it likely Wetland #3 will be considered a jurisdictional water of the United States.

Wetland #4 is an approximately 0.12-acre emergent wetland located in the southeastern portion of the subject area. It is dominated by hummocked fescue. Wetland hydrology was found in this location because of the observation of the geomorphic position, drainage patterns, surface water, and saturation. Observations of the soil at this location determined it

to have the hydric soil indicator depleted matrix. This wetland receives water as sheet flow from the surrounding lands as well as more concentrated flows from a pipe outlet to the southwest. Surface water from this wetland flows to the northeast into Ephemeral #1. Surface water from Ephemeral #1 flows to the northeast into an unnamed tributary. The unnamed tributary flows to the northwest into the East Fork Little Blue River. The East Fork Little Blue River flows to the northwest into the Little Blue River which then flows to the northeast into the Missouri River. This provides a direct surface water connection to downstream traditional navigable waters which makes it likely Wetland #4 will be considered a jurisdictional water of the United States.

Wetland #5 is an approximately 0.09-acre forested wetland located in the southeastern portion of the subject area. It is dominated by black willow, reed canary grass (*Phalaris arundinacea*), and Pennsylvania smartweed (*Persicaria pensylvanica*). Wetland hydrology was found in this location because of the observation of the geomorphic position and the FAC neutral test. Observations of the soil at this location determined it to have the hydric soil indicator depleted matrix. This wetland receives water as sheet flow from the surrounding lands. Surface water from this wetland flows to the southeast through the old pond dam overflow into the spillway which curves to the northeast around the pond dam and then into an erosional feature. The erosional feature flows to the northeast into Ephemeral #1. Ephemeral #1 flows to the northeast into an unnamed tributary. The unnamed tributary flows to the northwest into the East Fork Little Blue River. The East Fork Little Blue River flows to the northwest into the Little Blue River which then flows to the northeast into the Missouri River. This provides a direct surface water connection to downstream traditional navigable waters which makes it likely Wetland #5 will be considered a jurisdictional water of the United States.

Wetland #6 is an approximately 0.06-acre forested wetland located in the eastern portion of the subject area. It is dominated by black willow. Wetland hydrology was found in this location because of the observation of the geomorphic position, the FAC neutral test, and saturation. Observations of the soil at this location determined it to have the hydric soil indicator depleted matrix. This wetland receives water as sheet flow from the surrounding lands. This wetland is an isolated wetland which was constructed in an upland location and has no clear surface water path to traditional navigable waters. Because this wetland is an isolated wetland, it is likely this wetland will not be determined to be a jurisdictional water of the United States.

**Table 2. Wetland Summary**

<i>Wetland ID</i>	<i>Size (Acres)</i>	<i>Wetland Type</i>	<i>Likely Jurisdictional?</i>
1	0.10	Emergent	Yes
2	0.06	Forested	Yes
3	0.05	Emergent	Yes
4	0.12	Emergent	Yes
5	0.09	Forested	Yes
6	0.06	Forested	No
<b>Total Amount of Wetlands</b>	<b>0.48</b>	-	-
<b>Total Amount of Likely Jurisdictional Wetlands</b>	<b>0.42</b>	-	-

### **4.3 Ponds**

Three ponds were present within the subject site.

Pond #1 is 0.08-acre and is located in the northcentral portion of the subject area. This pond was likely built for agricultural purposes. Pond #1 receives water as sheet flow from the surrounding lands. This pond was built in an upland area that was not in the location of a historic stream or other water feature and is not adjacent to a stream. For these reasons, it is likely that this pond will be considered a preamble water. Therefore, it is likely that this pond will not be considered to be jurisdictional water of the United States.

Pond #2 is 0.39-acre and is located in the central portion of the subject area. This pond was likely built for agricultural purposes. Pond #2 receives water as sheet flow from the surrounding lands. This pond was built in an upland area that was not in the location of a historic stream or other water feature and is not adjacent to a stream. For these reasons, it is likely that this pond will be considered a preamble water. Therefore, it is likely that this pond will not be considered to be jurisdictional water of the United States.

Pond #3 is 0.02-acre and is located in the southern portion of the subject area. While not confirmed, it is assumed that this feature was created as the effluent pond for the historic farmstead to the south of the subject area. Pond #3 does not have a drainage area that flows into it nor does it have an outlet or connection to a traditional navigable water, making it an isolated water. Additionally, this pond was built in an upland area that was not in the location of a historic stream or other water feature and is not adjacent to a stream, making it a

preamble water. For these reasons, it is likely that this pond will not be considered to be a jurisdictional water of the United States.

**Table 3. Pond Summary**

<i>Pond ID</i>	<i>Size (Acres)</i>	<i>Likely Jurisdictional?</i>
1	0.08	No
2	0.39	No
3	0.02	No
<b><i>Total Pond Acreage</i></b>	0.49	-
<b><i>Total Amount of Likely Jurisdictional Ponds</i></b>	<b>0.00</b>	-

## **5.0 CONCLUSIONS**

This jurisdictional assessment represents an evaluation of potential jurisdictional environs within the subject area at the time of observation, subject to review and approval by USACE regulatory authorities. As presented above, there are six wetlands totaling 0.48-acre, one ephemeral stream channel totaling 230 lineal feet, and three ponds totaling 0.49 acre delineated on the parcel. It is likely that the stream and all the wetlands except for Wetland #6 will be considered to be jurisdictional waters of the United States. Wetland #6 is an isolated wetland and likely will not be considered a jurisdictional water of the United States. Pond #1, Pond #2, and Pond #3 will likely be determined to be preamble waters that are not considered jurisdictional waters of the United States.

## **6.0 REFERENCES**

Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A176 912

Google Inc. 2019. Google Earth Pro (Version 7.3.2.5776) [Software]. <http://www.google.com/earth/download/gep/agree.html>

Gretag/Macbeth. 2010. Munsell® color. New Windsor, New York.

Griffith, G.E., J.M. Omernik (Lead Author) and M. McGinley (Topic Editor). 2008. December 2011. Ecoregions of Kansas and Nebraska (EPA). In: Encyclopedia of Earth. Eds. Cutler J. Cleveland (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment). [First published in the Encyclopedia of Earth December 11, 2008; Last revised Date December 11, 2008; <[http://www.eoearth.org/article/Ecoregions\\_of\\_Kansas\\_and\\_Nebraska\\_\(EPA\)](http://www.eoearth.org/article/Ecoregions_of_Kansas_and_Nebraska_(EPA))>

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**QUALIFICATIONS OF STAFF**

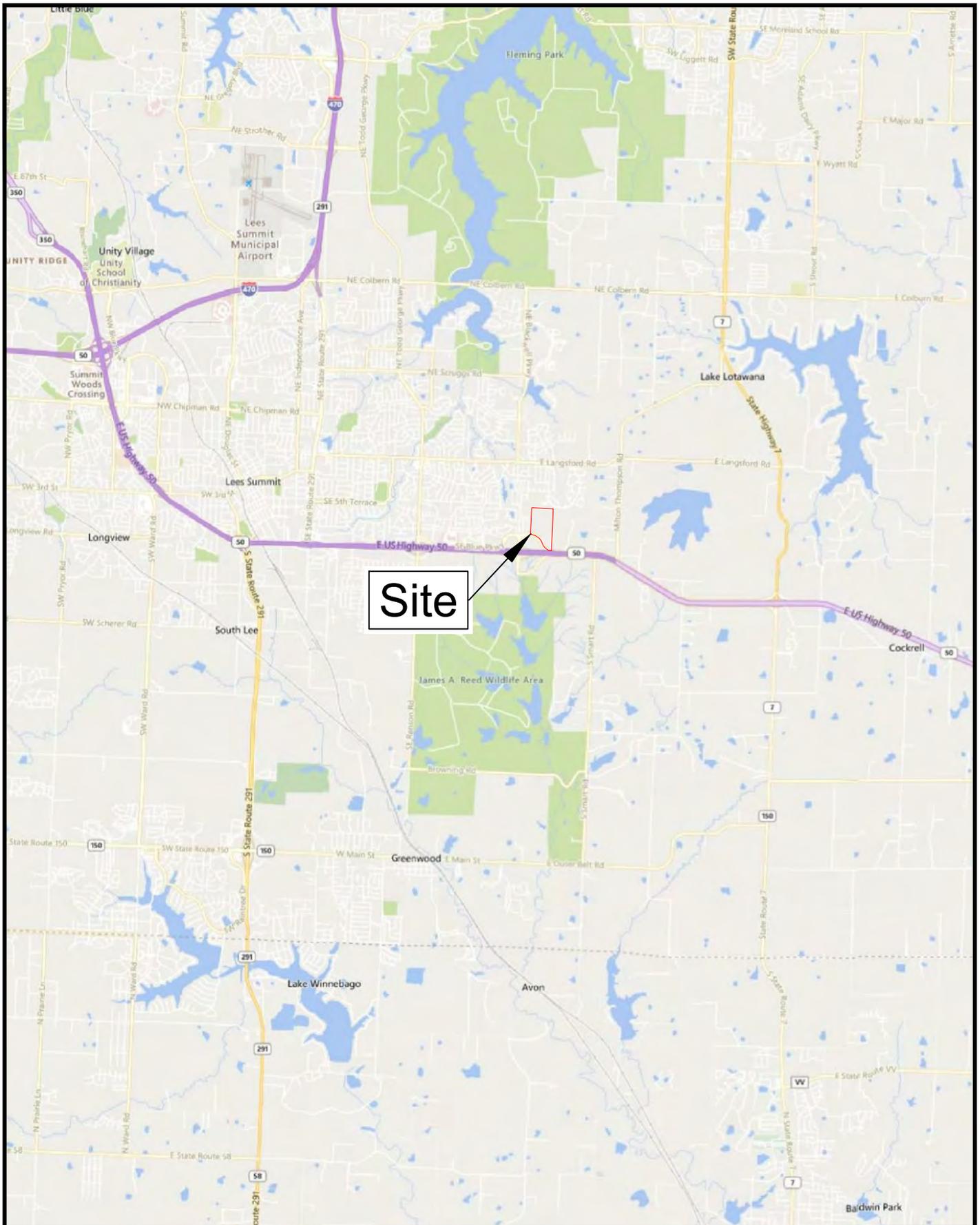
Curricula vitae and project experience is on file with the US Army Corps of Engineers.

Sincerely,

TERRA TECHNOLOGIES INC.

Melanie Stonecypher  
Environmental Scientist

Danny DeAngelo  
Senior Environmental Scientist



Site

Revisions		
No.	Description	Date



**Terra Technologies**  
6240 West 135th Street, Suite 100, Overland Park, KS 66223

Blackwell Parcel  
Lee's Summit, Jackson County,  
Missouri

Site Location Map

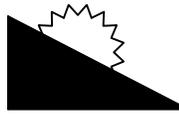
DRAWING	DATE
FIG 1a	MAR 2022

T47N R31W



Site

Revisions		
No.	Description	Date

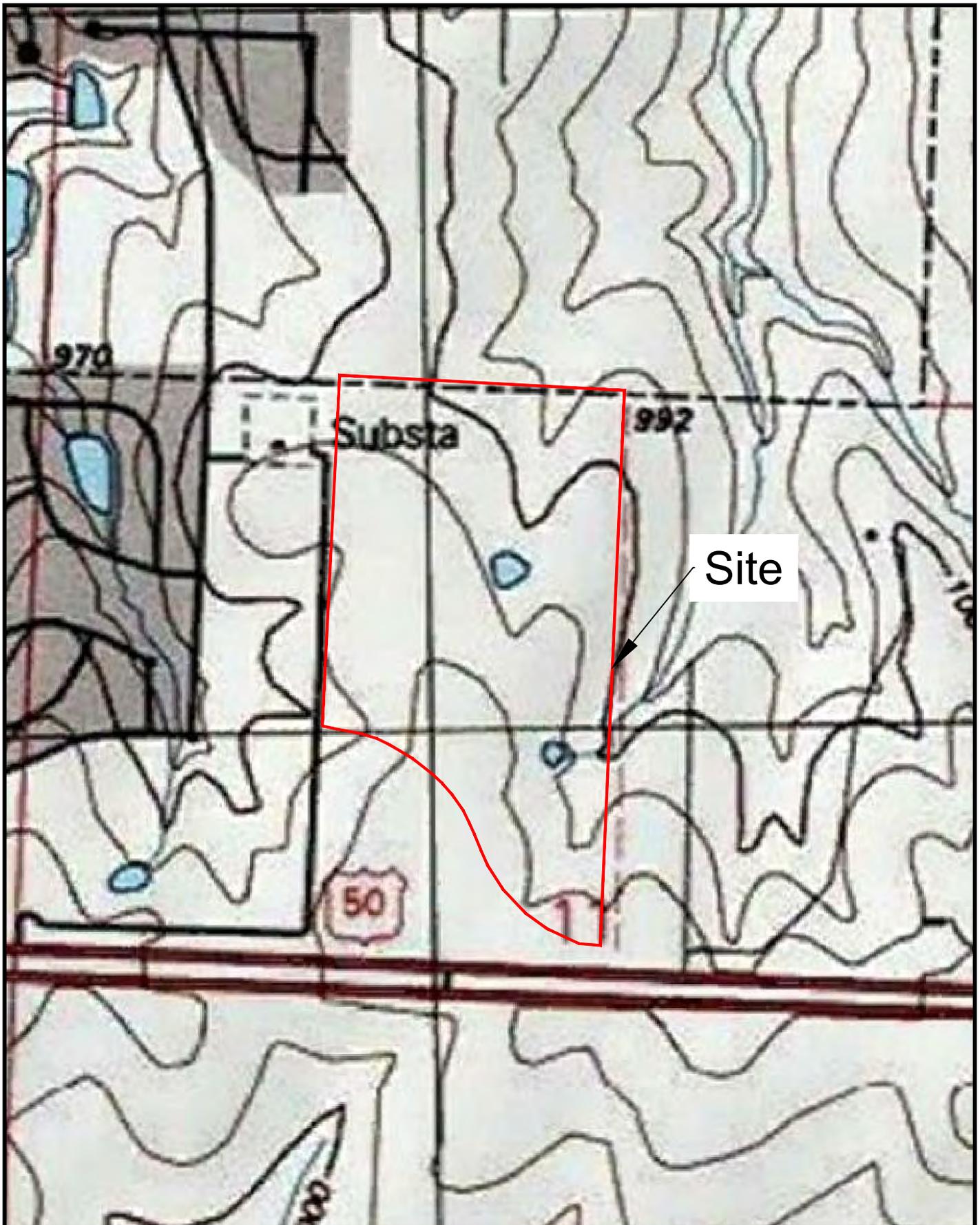


**Terra  
Technologies**  
6240 West 135th Street, Suite 100, Overland Park, KS 66223

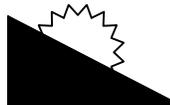
Blackwell Parcel  
Lee's Summit, Jackson County,  
Missouri

Section, Township,  
Range

DRAWING	DATE
FIG 1b	MAR 2022



Revisions		
No.	Description	Date



**Terra  
Technologies**  
6240 West 135th Street, Suite 100, Overland Park, KS 66223

Blackwell Parcel  
Lee's Summit, Jackson County,  
Missouri

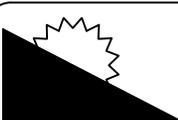
USGS Topography

DRAWING	DATE
FIG 1c	MAR 2022



Site

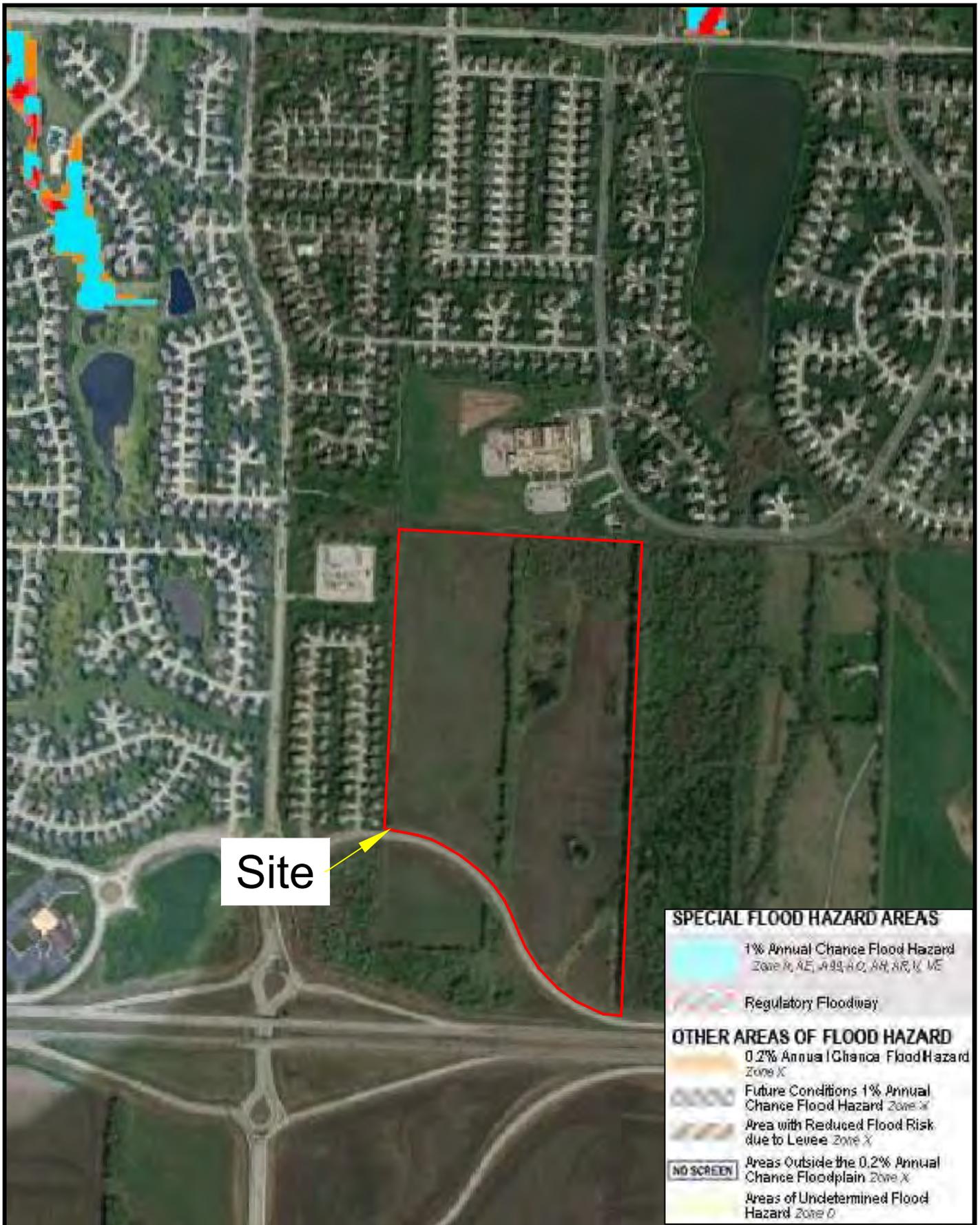
Revisions		
No.	Description	Date



**Terra  
Technologies**  
6240 West 135th Street, Suite 100, Overland Park, KS 66223

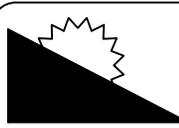
Blackwell Parcel  
Lee's Summit, Jackson County,  
Missouri

Aerial Photograph  
DRAWING DATE  
FIG 1d FEB 2022



Site

Revisions		
No.	Description	Date



**Terra Technologies**  
6240 West 135th Street, Suite 100, Overland Park, KS 66223

Blackwell Parcel  
Lee's Summit, Jackson County,  
Missouri

100-year  
Floodplain Map

DRAWING	DATE
FIG 1e	FEB 2022



Site

**Wetland Types**

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

Revisions		
No.	Description	Date



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Blackwell Parcel  
Lee's Summit, Jackson County,  
Missouri

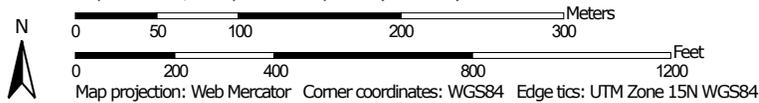
National Wetlands  
Inventory Map

DRAWING	DATE
FIG 2	MAR 2022

Hydric Rating by Map Unit—Jackson County, Missouri  
(Figure 3)



Map Scale: 1:4,620 if printed on A portrait (8.5" x 11") sheet.



## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

#### Soil Rating Polygons

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available

#### Soil Rating Lines

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available

#### Soil Rating Points

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available

### 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: Jackson County, Missouri  
Survey Area Data: Version 23, Sep 1, 2021

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

Date(s) aerial images were photographed: Sep 6, 2019—Nov 16, 2019

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.

## Hydric Rating by Map Unit

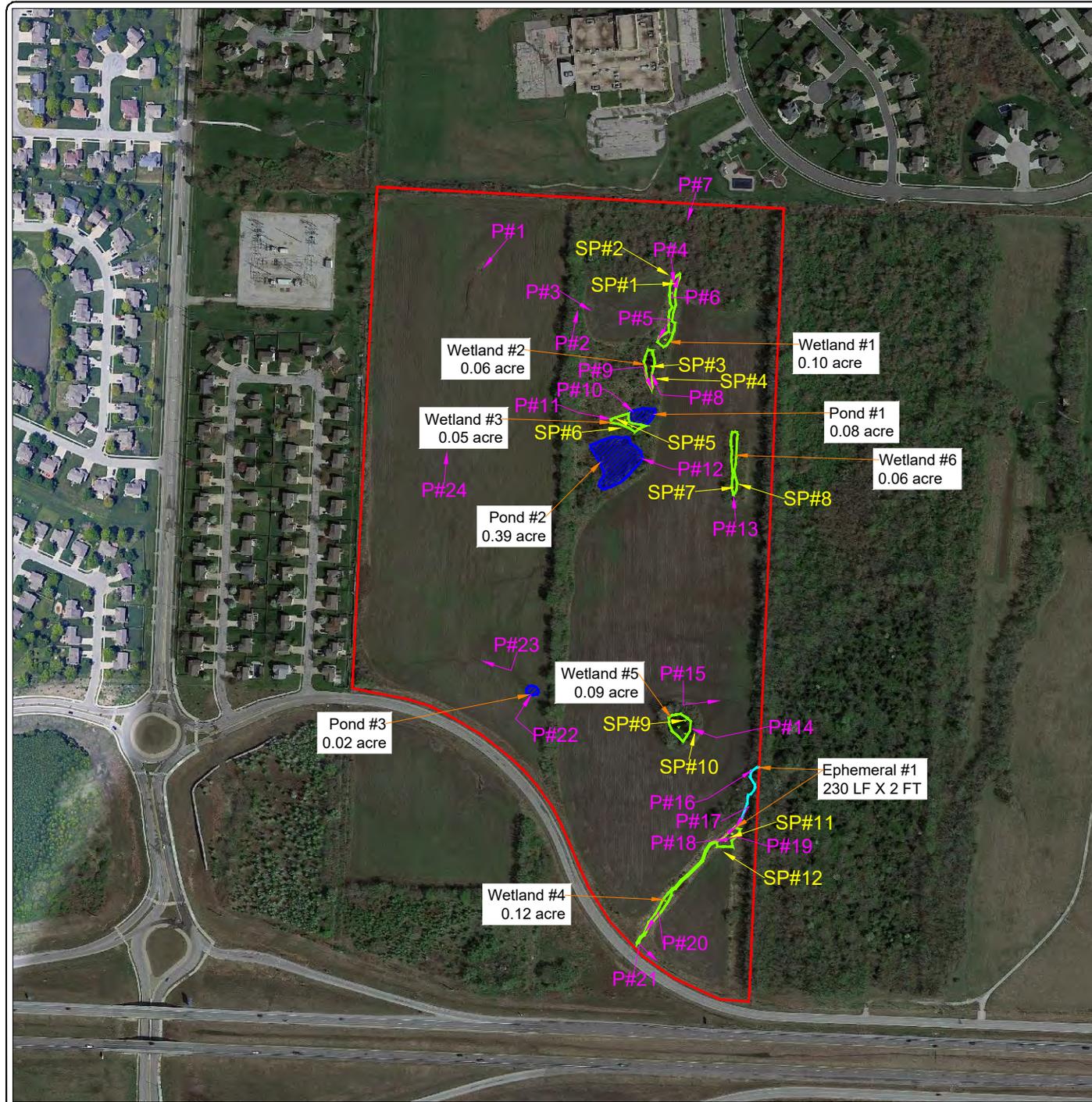
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10000	Arisburg silt loam, 1 to 5 percent slopes	3	34.7	57.5%
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	3	0.6	1.0%
10117	Sampsel silty clay loam, 5 to 9 percent slopes	0	20.8	34.4%
10128	Sharpsburg-Urban land complex, 2 to 5 percent slopes	0	1.0	1.7%
10181	Udarents-Urban land-Sampsel complex, 5 to 9 percent slopes	0	2.5	4.1%
10183	Udarents-Urban land-Polo complex, 5 to 9 percent slopes	0	0.8	1.3%
<b>Totals for Area of Interest</b>			<b>60.4</b>	<b>100.0%</b>

### Rating Options

*Aggregation Method: Percent Present*

*Component Percent Cutoff: None Specified*

*Tie-break Rule: Lower*



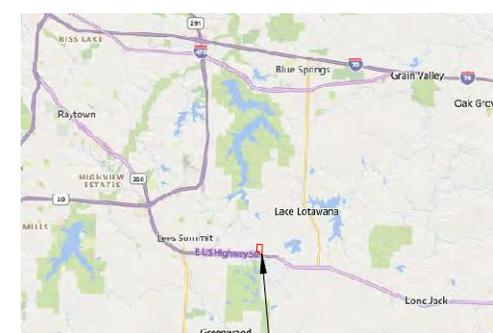
**JURISDICTIONAL ASSESSMENT**

Wetland 1: 0.10 acre, Lat. 38.90781, Long. -94.31287  
 Wetland 2: 0.06 acre, Lat. 38.90733, Long. -94.31313  
 Wetland 3: 0.05 acre, Lat. 38.90681, Long. -94.31337  
 Wetland 4: 0.12 acre, Lat. 38.90321, Long. -94.31224  
 Wetland 5: 0.09 acre, Lat. 38.90416, Long. -94.31279  
 Wetland 6: 0.06 acre, Lat. 38.90649, Long. -94.31219 (Non-Jurisdictional)  
**TOTAL WETLAND AREA: 0.48 Acres**

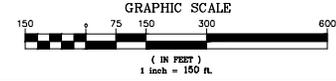
**Ephemeral 1: 230 LF X 2 FT, Lat. 38.90351, Long. -94.31205**  
**TOTAL EPHEMERAL LENGTH: 230 LF**

Pond 1: 0.08 acre, Lat. 38.90687, Long. -94.31321 (Non-Jurisdictional)  
 Pond 2: 0.39 acre, Lat. 38.90651, Long. -94.31352 (Non-Jurisdictional)  
 Pond 3: 0.02 acre, Lat. 38.90449, Long. -94.31445 (Non-Jurisdictional)  
**TOTAL POND AREA: 0.49 Acres**

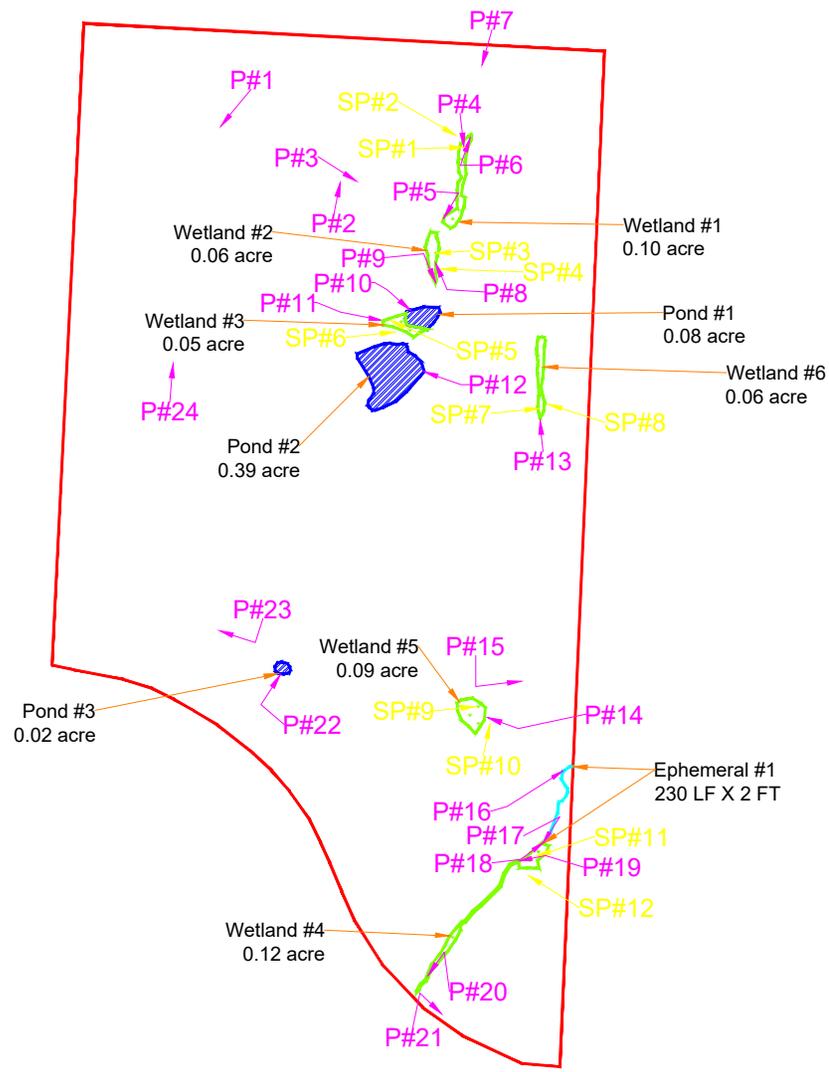
FIGURE 4a



**Site Location**  
 T475-R31W-S11  
 Lee's Summit, Jackson County, Missouri  
 60.41 Acres  
 Lat. 38.90615  
 Long. -94.31385



PROJECT	JURISDICTIONAL ASSESSMENT
CLIENT	BLACKWELL PARCEL
CLIENT	GRIFFIN RILEY PROPERTY GROUP
DATE	03/31/22
CHECKED BY	DJD
DRAWN BY	MAS
SHEET NO.	JA
JOB NO.	XXX

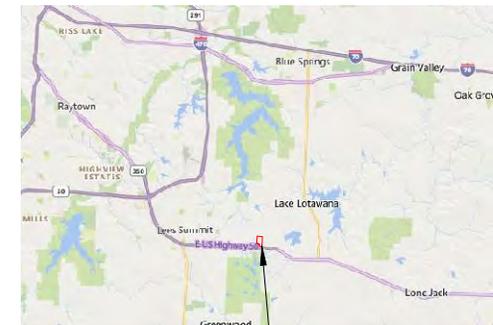


**JURISDICTIONAL ASSESSMENT**

Wetland 1: 0.10 acre, Lat. 38.90781, Long. -94.31287  
 Wetland 2: 0.06 acre, Lat. 38.90733, Long. -94.31313  
 Wetland 3: 0.05 acre, Lat. 38.90681, Long. -94.31337  
 Wetland 4: 0.12 acre, Lat. 38.90321, Long. -94.31224  
 Wetland 5: 0.09 acre, Lat. 38.90416, Long. -94.31279  
**Wetland 6: 0.06 acre, Lat. 38.90649, Long. -94.31219 (Non-Jurisdictional)**  
**TOTAL WETLAND AREA: 0.48 Acres**

**Ephemeral 1: 230 LF X 2 FT, Lat. 38.90351, Long. -94.31205**  
**TOTAL EPHEMERAL LENGTH: 230 LF**

Pond 1: 0.08 acre, Lat. 38.90687, Long. -94.31321 (Non-Jurisdictional)  
 Pond 2: 0.39 acre, Lat. 38.90651, Long. -94.31352 (Non-Jurisdictional)  
 Pond 3: 0.02 acre, Lat. 38.90449, Long. -94.31445 (Non-Jurisdictional)  
**TOTAL POND AREA: 0.49 Acres**



**Site Location**  
 T475-R31W-S11  
 Lee's Summit, Jackson County, Missouri  
 60.41 Acres  
 Lat. 38.90615  
 Long. -94.31385

GRAPHIC SCALE  
 150 75 150 300 600  
 ( IN FEET )  
 1 inch = 150 ft.

FIGURE 4b

PROJECT	JURISDICTIONAL ASSESSMENT (WITHOUT PHOTO)
CLIENT	BLACKWELL PARCEL
OWNER	GRIFFIN RILEY PROPERTY GROUP
DATE	03/31/22
CHECKED BY	DJD
DRAWN BY	MAS
SHEET NO.	JA
JOB NO.	XXX

# PHOTO LOG

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing southwest showing the erosional feature within the agricultural field.	
PHOTO #: 1	

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing northeast showing the upland fence line dominated by Osage orange ( <i>Maclura pomifera</i> ) and honeysuckle ( <i>Lonicera maackii</i> ) at this location.	
PHOTO #: 2	

# PHOTO LOG

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing southeast showing the upland fallow field dominated by Japanese bristle grass ( <i>Setaria faberi</i> ).	
PHOTO #: 3	

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing southeast showing Wetland #1.	
PHOTO #: 4	

# PHOTO LOG

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing southwest showing an erosional feature flowing into Wetland #1.	
PHOTO #: 5	

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing northeast showing Wetland #1 flowing into an upland swale dominated by honeysuckle, honey locust ( <i>Gleditsia triacanthos</i> ), and Osage orange.	
PHOTO #: 6	

# PHOTO LOG

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing southwest showing the upland swale surface water from Wetland #1 flows through before flowing offsite.	
PHOTO #: 7	

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing northwest showing Wetland #2.	
PHOTO #: 8	

# PHOTO LOG

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing southeast showing an erosional feature flowing into Wetland #2 at this location.	 A photograph showing a field of tall, dry, yellowish-brown grasses in the foreground. In the background, there is a line of bare trees under a cloudy sky. The terrain appears to be a wetland or a similar natural area.
PHOTO #: 9	

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing southeast showing Pond #1.	 A photograph of a pond or wetland area. The water is dark and reflects the surrounding trees. The trees are bare and have dark trunks. The sky is overcast and grey. The foreground shows some dry grass and reeds.
PHOTO #: 10	

# PHOTO LOG

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing southeast showing Wetland #3.	
PHOTO #: 11	

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing northwest showing Pond #2.	
PHOTO #: 12	

# PHOTO LOG

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing northwest showing Wetland #6.	
PHOTO #: 13	

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing northwest showing Wetland #5.	
PHOTO #: 14	

# PHOTO LOG

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing northeast showing an erosional feature within the agricultural field.	
PHOTO #: 15	

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing northeast looking downstream on Ephemeral #1 as it flows offsite.	
PHOTO #: 16	

# PHOTO LOG

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing southwest showing Wetland #4.	
PHOTO #: 17	

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing northeast looking downstream on Ephemeral #1 as it flows out of Wetland #4.	
PHOTO #: 18	

# PHOTO LOG

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing southwest showing an erosional feature flowing through Wetland #4 at this location.	
PHOTO #: 19	

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing southwest showing water flowing into Wetland #4 from a pipe outlet.	
PHOTO #: 20	

# PHOTO LOG

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing southeast showing an erosional feature within a roadside ditch at this location.	
PHOTO #: 21	

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing northeast showing Pond #3.	
PHOTO #: 22	

# PHOTO LOG

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing northwest showing an erosional feature within the agricultural field.	
PHOTO #: 23	

DATE: 02/11/22	SITE NAME: BLACKWELL PARCEL
TAKEN BY: MS	
COMMENTS:  Photograph facing north showing a well-drained agricultural field at this location.	
PHOTO #: 24	

**WETLAND DETERMINATION DATA FORM - Midwest Region**

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	1
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM	xxs xxxxxxxe xxxxxxxn	Lat:	38.90804	Long:	-94.31286
Soil Map Unit Name:	Sampsel silty clay loam, 5-9% slopes	NWI classification:		Datum:	NAD 83
Are climatic / hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Remarks.)					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N significantly disturbed? Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N naturally problematic? (If needed, explain answers in Remarks.)					

**SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
Hydric Soil Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>					
Wetland Hydrology Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>					
Remarks:									

**VEGETATION - Use scientific names of plants.**

Tree Stratum (Plot size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:	
1					Number of Dominant Species That Are OBL, FACW, or FAC:	1 (A)
2						
3						
4						
5						
6						
7						
8						
		0	= Total Cover		Total Number of Dominant Species Across All Strata:	1 (B)
Sapling/Shrub Stratum (Plot Size: 15ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Prevalence Index worksheet:	
1					Percent of Dominant Species That Are OBL, FACW, or FAC	100.00 (AB)
2						
3						
4						
5						
6						
		0	= Total Cover		Total % Cover of:	
Herb Stratum (Plot Size: 5ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Prevalence Index worksheet:	
1	Schedonorus arundinaceus (hummocked)	98	Y	FAC	OBL Species	0 x 1 = 0
2					FACW Species	0 x 2 = 0
3					FAC Species	98 x 3 = 294
4					FACU Species	0 x 4 = 0
5					UPL Species	0 x 5 = 0
6					Column Totals:	98 (A) 294 (B)
7						
8						
9						
10					Prevalence Index = B/A	3.00
11					Hydrophytic Vegetation Indicators:	
12					<input checked="" type="checkbox"/>	1 - Rapid Test for Hydrophytic Vegetation
13					<input checked="" type="checkbox"/>	2 - Dominance Test is > 50%
14					<input checked="" type="checkbox"/>	3 - Prevalence Index is <= 3.0 <sup>1</sup>
15					<input checked="" type="checkbox"/>	4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)
16					<input checked="" type="checkbox"/>	Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
		98	= Total Cover		<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
Woody Vine Stratum (Plot Size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Hydrophytic Vegetation Present?	
1					Yes	<input checked="" type="checkbox"/>
2					No	<input type="checkbox"/>
3						
		0	= Total Cover			
Remarks:						

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)										
Depth (inches)	Horizon	Matrix		Redox Features					Texture	Remarks
		Color (moist)	%	Color (moist)	%	Abundance/Contrast	Type <sup>1</sup>	Loc <sup>2</sup>		
0-3	A	10YR 2/1	100						Silty Clay Loam	
3-15	A	10YR 3/1	95	10YR 3/6	5	Common / Prominent	C	PL	Silty Clay Loam	
<sup>1</sup> Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or coated Sand Grains.						<sup>2</sup> Location: PL= Pore Lining, M=Matrix.				
<b>Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)</b>						<b>Indicators for Problematic Hydric Soils<sup>3</sup>:</b>				
		Histosol (A1)				Sandy Gleyed Matrix (S4)			Coast Prairie Redox (A16)	
		Histic Epipedon (A2)				Sandy Redox (S5)			Iron-Manganese Masses (F12)	
		Black Histic (A3)				Stripped Matrix (S6)			Other (Explain in Remarks)	
		Hydrogen Sulfide (A4)				Loamy Mucky Mineral (F1)				
		Stratified Layers (A5)				Loamy Gleyed Matrix (F2)				
		2 cm Muck (A10)				Depleted Matrix (F3)				
		Depleted Below Dark Surface (A11)		X		Redox Dark Surface (F6)				
		Thick Dark Surface (A12)				Depleted Dark Surface (F7)				
		Sandy Mucky Mineral (S1)				Redox Depressions (F8)				
		5 cm Mucky Peat or Peat (S3)								(3) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.
Restrictive Layer (if observed):										
Type:										
Depth (inches):										
						Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>				
Remarks:										

HYDROLOGY

Wetland Hydrology Indicators:										
Primary Indicators (minimum of one required; check all that apply)						Secondary Indicators (minimum of two required)				
<input checked="" type="checkbox"/>	Surface water (A1)				Water-stained leaves (B9)				<input type="checkbox"/>	Surface soil cracks (B6)
<input type="checkbox"/>	High water table (A2)				Aquatic Fauna (B13)				<input checked="" type="checkbox"/>	Drainage patterns (B10)
<input checked="" type="checkbox"/>	Saturation (A3)				True Aquatic Plants (B14)				<input type="checkbox"/>	Dry-Season Water Table (C2)
<input type="checkbox"/>	Water marks (B1)				Hydrogen sulfide odor (C1)				<input type="checkbox"/>	Crayfish burrows (C8)
<input type="checkbox"/>	Sediment deposits (B2)				Oxidized rhizospheres on living roots (C3)				<input type="checkbox"/>	Saturation visible on aerial imagery (C9)
<input type="checkbox"/>	Drift deposits (B3)				Presence of reduced iron (C4)				<input type="checkbox"/>	Stunted or Stressed Plants (D2)
<input type="checkbox"/>	Algal mat or crust (B4)				Recent Iron Reduction in Tilled Soils (C6)				<input checked="" type="checkbox"/>	Geomorphic position (D2)
<input type="checkbox"/>	Iron deposits (B5)				Thin muck surface (C7)				<input type="checkbox"/>	FAC-neutral test (D5)
<input type="checkbox"/>	Inundation visible on aerial imagery (B7)				Gauge or Well Data (D9)				<input type="checkbox"/>	Other (explain in Remarks)
<input type="checkbox"/>	Sparsely Vegetated Concave Surface (B8)				Other (explain in Remarks)				<input type="checkbox"/>	
<b>Field Observations:</b>										
Surface Water Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>	Depth (inches)	<input type="text" value="0-2"/>	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>			
Water Table Present?	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Depth (inches)	<input type="text" value=""/>				
Saturation Present? (includes capillary fringe)	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>	Depth (inches)	<input type="text" value="0-3"/>				
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:										
Remarks:										

## WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022		
Applicant/Owner:	Griffin Riley Property Group		State:	MO	Sampling Point:	2	
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID:			
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3		
GPS: UTM	xxs xxxxxxxe xxxxxxxn	Lat:	38.90812	Long:	-94.31293	Datum:	NAD 83
Soil Map Unit Name:	Sampsel silty clay loam, 5-9% slopes		NWI classification:	N/A			
Are climatic / hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Remarks.)							
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N significantly disturbed? Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>							
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N naturally problematic? (If needed, explain answers in Remarks.)							

### SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Hydric Soil Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>			
Wetland Hydrology Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>			
Remarks:					

### VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:	
1					Number of Dominant Species That Are OBL, FACW, or FAC: <input type="text" value="0"/> (A)	
2						
3						
4						
5						
6						
7						
8						
		0	= Total Cover		Total Number of Dominant Species Across All Strata: <input type="text" value="1"/> (B)	
Sapling/Shrub Stratum (Plot Size: 15ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Prevalence Index worksheet:	
1					Total % Cover of:	
2						
3						
4						
5						
6						
		0	= Total Cover		OBL Species <input type="text" value="0"/> x 1 = <input type="text" value="0"/>	
					FACW Species <input type="text" value="0"/> x 2 = <input type="text" value="0"/>	
					FAC Species <input type="text" value="0"/> x 3 = <input type="text" value="0"/>	
					FACU Species <input type="text" value="100"/> x 4 = <input type="text" value="400"/>	
					UPL Species <input type="text" value="0"/> x 5 = <input type="text" value="0"/>	
					Column Totals: <input type="text" value="100"/> (A) <input type="text" value="400"/> (B)	
					Prevalence Index = B/A <input type="text" value="4.00"/>	
Herb Stratum (Plot Size: 5ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Hydrophytic Vegetation Indicators:	
1	Setaria faberi	90	Y	FACU	<input checked="" type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is > 50% <input checked="" type="checkbox"/> 3 - Prevalence Index is <= 3.0 <sup>1</sup> <input checked="" type="checkbox"/> 4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)	
2	Ambrosia artemisiifolia	10	N	FACU		
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
		100	= Total Cover		Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)	
Woody Vine Stratum (Plot Size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Hydrophytic Vegetation Present?	
1					Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
2						
3						
		0	= Total Cover			
Remarks:						



**WETLAND DETERMINATION DATA FORM - Midwest Region**

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	3
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	Concave	Slope (%):	0-3
GPS: UTM	xxs xxxxxxxe xxxxxxxn	Lat:	38.90732	Long:	-94.3131
Soil Map Unit Name:	Sampsel silty clay loam, 5-9% slopes	NWI classification:		Datum:	NAD 83
Are climatic / hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Remarks.)					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N significantly disturbed? Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N naturally problematic? (If needed, explain answers in Remarks.)					

**SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
Hydric Soil Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>					
Wetland Hydrology Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>					
Remarks:									

**VEGETATION - Use scientific names of plants.**

Tree Stratum (Plot size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:	
1	Salix nigra	40	Y	OBL	Number of Dominant Species That Are OBL, FACW, or FAC:	2 (A)
2						
3						
4						
5						
6						
7						
8						
		40	= Total Cover		Total Number of Dominant Species Across All Strata:	2 (B)
Sapling/Shrub Stratum (Plot Size: 15ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Prevalence Index worksheet:	
1					Total % Cover of:	OBL Species 70 x 1 = 70
2						
3						
4						
5						
6						
		0	= Total Cover		FACW Species 0 x 2 = 0	
Herb Stratum (Plot Size: 5ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	FAC Species 0 x 3 = 0	
1	Carex frankii	30	Y	OBL	FACU Species 0 x 4 = 0	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
		30	= Total Cover		UPL Species 0 x 5 = 0	
					Column Totals: 70 (A)	70 (B)
					Prevalence Index = B/A	1.00
Woody Vine Stratum (Plot Size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Hydrophytic Vegetation Indicators:	
1					<input checked="" type="checkbox"/>	1 - Rapid Test for Hydrophytic Vegetation
2					<input checked="" type="checkbox"/>	2 - Dominance Test is > 50%
3					<input checked="" type="checkbox"/>	3 - Prevalence Index is <= 3.0 <sup>1</sup>
		0	= Total Cover		<input checked="" type="checkbox"/>	4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)
					<input checked="" type="checkbox"/>	Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
					<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
					Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Remarks:						



**WETLAND DETERMINATION DATA FORM - Midwest Region**

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	4
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID:	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM	xxs xxxxxxxe xxxxxxxn	Lat:	38.90721	Long:	-94.31305
Soil Map Unit Name:	Sampsel silty clay loam, 5-9% slopes	NWI classification:		Datum:	NAD 83
Are climatic / hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Remarks.)					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N significantly disturbed? Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N naturally problematic? (If needed, explain answers in Remarks.)					

**SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Hydric Soil Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>			
Wetland Hydrology Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>			
Remarks:					

**VEGETATION - Use scientific names of plants.**

Tree Stratum (Plot size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:	
1 Maclura pomifera	40	Y	FACU	Number of Dominant Species That Are OBL, FACW, or FAC: <input type="text" value="0"/> (A)	
2					
3					
4					
5					
6					
7					
8					
40 = Total Cover				Total Number of Dominant Species Across All Strata: <input type="text" value="3"/> (B)	
Sapling/Shrub Stratum (Plot Size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status	Prevalence Index worksheet:	
1 Symphoricarpos orbiculatus	30	Y	FACU	Percent of Dominant Species That Are OBL, FACW, or FAC: <input type="text" value="0.00"/> (AB)	
2 Lonicera maackii	20	Y	UPL		
3					
4					
5					
6					
50 = Total Cover				Total % Cover of:	
				OBL Species <input type="text" value="0"/> x 1 = <input type="text" value="0"/>	
				FACW Species <input type="text" value="0"/> x 2 = <input type="text" value="0"/>	
				FAC Species <input type="text" value="0"/> x 3 = <input type="text" value="0"/>	
				FACU Species <input type="text" value="70"/> x 4 = <input type="text" value="280"/>	
				UPL Species <input type="text" value="20"/> x 5 = <input type="text" value="100"/>	
				Column Totals: <input type="text" value="90"/> (A) <input type="text" value="380"/> (B)	
				Prevalence Index = B/A <input type="text" value="4.22"/>	
Herb Stratum (Plot Size: 5ft radius)	Absolute % Cover	Dominant Species?	Indicator Status	Hydrophytic Vegetation Indicators:	
1				1 - Rapid Test for Hydrophytic Vegetation 2 - Dominance Test is > 50% 3 - Prevalence Index is <= 3.0 <sup>1</sup> 4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet) Problematic Hydrophytic Vegetation <sup>1</sup> (Explain) <sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
0 = Total Cover				Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Woody Vine Stratum (Plot Size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status		
1					
2					
3					
0 = Total Cover					
Remarks:					



**WETLAND DETERMINATION DATA FORM - Midwest Region**

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	5
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID:	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM	xxs xxxxxxxe xxxxxxxn	Lat:	38.90686	Long:	-94.3135
Soil Map Unit Name:	Sampsel silty clay loam, 5-9% slopes	NWI classification:		Datum:	NAD 83
Are climatic / hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Remarks.)					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N significantly disturbed? Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N naturally problematic? (If needed, explain answers in Remarks.)					

**SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
Hydric Soil Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>					
Wetland Hydrology Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>					
Remarks:									

**VEGETATION - Use scientific names of plants.**

Tree Stratum (Plot size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:	
1					Number of Dominant Species That Are OBL, FACW, or FAC:	1 (A)
2						
3						
4						
5						
6						
7						
8						
		0	= Total Cover		Total Number of Dominant Species Across All Strata:	1 (B)
Sapling/Shrub Stratum (Plot Size: 15ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Prevalence Index worksheet:	
1					Total % Cover of:	
2						
3						
4						
5						
6						
		0	= Total Cover		OBL Species	0 x 1 = 0
					FACW Species	0 x 2 = 0
					FAC Species	99 x 3 = 297
					FACU Species	0 x 4 = 0
					UPL Species	0 x 5 = 0
					Column Totals:	99 (A) 297 (B)
					Prevalence Index = B/A	3.00
Herb Stratum (Plot Size: 5ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Hydrophytic Vegetation Indicators:	
1	Schedonorus arundinaceus (hummocked)	99	Y	FAC	<input checked="" type="checkbox"/>	1 - Rapid Test for Hydrophytic Vegetation
2					<input checked="" type="checkbox"/>	2 - Dominance Test is > 50%
3					<input checked="" type="checkbox"/>	3 - Prevalence Index is <= 3.0 <sup>1</sup>
4					<input type="checkbox"/>	4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)
5					<input type="checkbox"/>	Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
6					<input type="checkbox"/>	<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
		99	= Total Cover			
Woody Vine Stratum (Plot Size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Hydrophytic Vegetation Present?	
1					Yes	<input checked="" type="checkbox"/>
2					No	<input type="checkbox"/>
3						
		0	= Total Cover			
Remarks:						



**WETLAND DETERMINATION DATA FORM - Midwest Region**

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	6
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	2-5
GPS: UTM	xxs xxxxxxxe xxxxxxxn	Lat:	38.90678	Long:	-94.31347
Soil Map Unit Name:	Sampsel silty clay loam, 5-9% slopes	NWI classification:		Datum:	NAD 83
Are climatic / hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Remarks.)					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N significantly disturbed? Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N naturally problematic? (If needed, explain answers in Remarks.)					

**SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Hydric Soil Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>			
Wetland Hydrology Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>			
Remarks:					

**VEGETATION - Use scientific names of plants.**

Tree Stratum (Plot size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:	
1 Maclura pomifera	10	Y	FACU	Number of Dominant Species That Are OBL, FACW, or FAC: <input type="text" value="0"/> (A)	
2					
3					
4					
5					
6					
7					
8					
10 = Total Cover				Total Number of Dominant Species Across All Strata: <input type="text" value="2"/> (B)	
Sapling/Shrub Stratum (Plot Size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status	Prevalence Index worksheet:	
1 Lonicera maackii	50	Y	UPL	Percent of Dominant Species That Are OBL, FACW, or FAC: <input type="text" value="0.00"/> (AB)	
2					
3					
4					
5					
6					
50 = Total Cover				Total % Cover of:	
				OBL Species <input type="text" value="0"/> x 1 = <input type="text" value="0"/>	
				FACW Species <input type="text" value="0"/> x 2 = <input type="text" value="0"/>	
				FAC Species <input type="text" value="0"/> x 3 = <input type="text" value="0"/>	
				FACU Species <input type="text" value="10"/> x 4 = <input type="text" value="40"/>	
				UPL Species <input type="text" value="50"/> x 5 = <input type="text" value="250"/>	
				Column Totals: <input type="text" value="60"/> (A) <input type="text" value="290"/> (B)	
				Prevalence Index = B/A <input type="text" value="4.83"/>	
Herb Stratum (Plot Size: 5ft radius)	Absolute % Cover	Dominant Species?	Indicator Status	Hydrophytic Vegetation Indicators:	
1				1 - Rapid Test for Hydrophytic Vegetation 2 - Dominance Test is > 50% 3 - Prevalence Index is <= 3.0 <sup>1</sup> 4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet) Problematic Hydrophytic Vegetation <sup>1</sup> (Explain) <sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
0 = Total Cover				Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Woody Vine Stratum (Plot Size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status		
1					
2					
3					
0 = Total Cover					
Remarks:					



**WETLAND DETERMINATION DATA FORM - Midwest Region**

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	7
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	Concave	Slope (%):	0-3
GPS: UTM	xxs xxxxxxxe xxxxxxxn	Lat:	38.90626	Long:	-94.31221
Soil Map Unit Name:	Arisburg silt loam, 1-5% slopes	NWI classification:		Datum:	NAD 83
Are climatic / hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Remarks.)					
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> significantly disturbed? Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> naturally problematic? (If needed, explain answers in Remarks.)					

**SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
Hydric Soil Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>					
Wetland Hydrology Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>					
Remarks:									

**VEGETATION - Use scientific names of plants.**

Tree Stratum (Plot size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:	
1	Salix nigra	30	Y	OBL	Number of Dominant Species That Are OBL, FACW, or FAC:	1 (A)
2						
3						
4						
5						
6						
7						
8						
		30	= Total Cover		Total Number of Dominant Species Across All Strata:	1 (B)
Sapling/Shrub Stratum (Plot Size: 15ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Prevalence Index worksheet:	
1					Total % Cover of:	OBL Species 30 x 1 = 30
2						
3						
4						
5						
6						
		0	= Total Cover		FACW Species 0 x 2 = 0	
Herb Stratum (Plot Size: 5ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	FAC Species 0 x 3 = 0	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
		0	= Total Cover		FACU Species 0 x 4 = 0	
		0	= Total Cover		UPL Species 0 x 5 = 0	
		0	= Total Cover		Column Totals: 30 (A)	30 (B)
					Prevalence Index = B/A	1.00
Hydrophytic Vegetation Indicators:						
1 - Rapid Test for Hydrophytic Vegetation					<input checked="" type="checkbox"/>	
2 - Dominance Test is > 50%					<input checked="" type="checkbox"/>	
3 - Prevalence Index is <= 3.0 <sup>1</sup>					<input checked="" type="checkbox"/>	
4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)					<input checked="" type="checkbox"/>	
Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)					<input type="checkbox"/>	
<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.						
Woody Vine Stratum (Plot Size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
1						
2						
3						
		0	= Total Cover			
Remarks:						



**WETLAND DETERMINATION DATA FORM - Midwest Region**

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	8
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM	xxs xxxxxxxe xxxxxxxn	Lat:	38.90629	Long:	-94.31213
Soil Map Unit Name:	Arisburg silt loam, 1-5% slopes	NWI classification:		Datum:	NAD 83
Are climatic / hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Remarks.)					
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> significantly disturbed? Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
Are Vegetation <input type="checkbox"/> , Soil <input type="checkbox"/> , or Hydrology <input type="checkbox"/> naturally problematic? (If needed, explain answers in Remarks.)					

**SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Hydric Soil Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>			
Wetland Hydrology Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>			
Remarks:					

**VEGETATION - Use scientific names of plants.**

Tree Stratum (Plot size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:			
1 Gleditsia triacanthos	10	Y	FACU	Number of Dominant Species That Are OBL, FACW, or FAC:	0 (A)		
2							
3							
4							
5							
6							
7							
8							
10 = Total Cover				Total Number of Dominant Species Across All Strata:	3 (B)		
Sapling/Shrub Stratum (Plot Size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status	Prevalence Index worksheet:			
1 Lonicera maackii	40	Y	UPL	Percent of Dominant Species That Are OBL, FACW, or FAC	0.00 (AB)		
2 Symphoricarpos orbiculatus	20	Y	FACU				
3							
4							
5							
6							
60 = Total Cover				Total % Cover of:			
				OBL Species	0 x 1 = 0		
				FACW Species	0 x 2 = 0		
				FAC Species	0 x 3 = 0		
				FACU Species	30 x 4 = 120		
				UPL Species	40 x 5 = 200		
				Column Totals:	70 (A) 320 (B)		
				Prevalence Index = B/A	4.57		
Herb Stratum (Plot Size: 5ft radius)	Absolute % Cover	Dominant Species?	Indicator Status	Hydrophytic Vegetation Indicators:			
1				1 - Rapid Test for Hydrophytic Vegetation 2 - Dominance Test is > 50% 3 - Prevalence Index is <= 3.0 <sup>1</sup> 4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet) Problematic Hydrophytic Vegetation <sup>1</sup> (Explain) <sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.			
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
0 = Total Cover				Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>			
Woody Vine Stratum (Plot Size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status				
1							
2							
3							
0 = Total Cover							
Remarks:							



**WETLAND DETERMINATION DATA FORM - Midwest Region**

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	9
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	Concave	Slope (%):	0-3
GPS: UTM	xxs xxxxxxxe xxxxxxxn	Lat:	38.90423	Long:	-94.31277
Soil Map Unit Name:	Sampsett silty clay loam, 5-9% slopes	NWI classification:		Datum:	NAD 83
Are climatic / hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Remarks.)					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N significantly disturbed? Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N naturally problematic? (If needed, explain answers in Remarks.)					

**SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
Hydric Soil Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>					
Wetland Hydrology Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>					
Remarks:									

**VEGETATION - Use scientific names of plants.**

Tree Stratum (Plot size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:	
1	Salix nigra	30	Y	OBL	Number of Dominant Species That Are OBL, FACW, or FAC:	3 (A)
2						
3						
4						
5						
6						
7						
8						
		30	= Total Cover		Total Number of Dominant Species Across All Strata:	3 (B)
Sapling/Shrub Stratum (Plot Size: 15ft radius)					Prevalence Index worksheet:	
1					Total % Cover of:	OBL Species 30 x 1 = 30
2						
3						
4						
5						
6						
		0	= Total Cover		FACW Species 30 x 2 = 60	
					FAC Species 0 x 3 = 0	
					FACU Species 0 x 4 = 0	
					UPL Species 0 x 5 = 0	
					Column Totals: 60 (A)	90 (B)
					Prevalence Index = B/A	1.50
Herb Stratum (Plot Size: 5ft radius)					Hydrophytic Vegetation Indicators:	
1	Phalaris arundinacea	20	Y	FACW	<input checked="" type="checkbox"/>	1 - Rapid Test for Hydrophytic Vegetation
2	Persicaria pensylvanica	10	Y	FACW	<input checked="" type="checkbox"/>	2 - Dominance Test is > 50%
3					<input checked="" type="checkbox"/>	3 - Prevalence Index is <= 3.0 <sup>1</sup>
4					<input checked="" type="checkbox"/>	4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)
5					<input checked="" type="checkbox"/>	Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
6						<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
		30	= Total Cover			
Woody Vine Stratum (Plot Size: 30ft radius)					Hydrophytic Vegetation Present?	
1					Yes	<input checked="" type="checkbox"/>
2					No	<input type="checkbox"/>
3						
		0	= Total Cover			
Remarks:						



**WETLAND DETERMINATION DATA FORM - Midwest Region**

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	10
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM	xxs xxxxxxxe xxxxxxxn	Lat:	38.90411	Long:	-94.31264
Soil Map Unit Name:	Sampsett silty clay loam, 5-9% slopes	NWI classification:		Datum:	NAD 83
Are climatic / hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Remarks.)					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N significantly disturbed? Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N naturally problematic? (If needed, explain answers in Remarks.)					

**SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Hydric Soil Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>			
Wetland Hydrology Present?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>			
Remarks:					

**VEGETATION - Use scientific names of plants.**

Tree Stratum (Plot size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:	
1 Gleditsia triacanthos	5	Y	FACU	Number of Dominant Species That Are OBL, FACW, or FAC: <input type="text" value="0"/> (A)	
2					
3					
4					
5					
6					
7					
8					
5 = Total Cover				Total Number of Dominant Species Across All Strata: <input type="text" value="4"/> (B)	
Sapling/Shrub Stratum (Plot Size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status	Prevalence Index worksheet:	
1 Lonicera maackii	30	Y	UPL	Percent of Dominant Species That Are OBL, FACW, or FAC: <input type="text" value="0.00"/> (AB)	
2					
3					
4					
5					
6					
30 = Total Cover				Total % Cover of:	
				OBL Species <input type="text" value="0"/> x 1 = <input type="text" value="0"/>	
				FACW Species <input type="text" value="0"/> x 2 = <input type="text" value="0"/>	
				FAC Species <input type="text" value="0"/> x 3 = <input type="text" value="0"/>	
				FACU Species <input type="text" value="20"/> x 4 = <input type="text" value="80"/>	
				UPL Species <input type="text" value="30"/> x 5 = <input type="text" value="150"/>	
				Column Totals: <input type="text" value="50"/> (A) <input type="text" value="230"/> (B)	
				Prevalence Index = B/A <input type="text" value="4.60"/>	
Herb Stratum (Plot Size: 5ft radius)	Absolute % Cover	Dominant Species?	Indicator Status	Hydrophytic Vegetation Indicators:	
1 Schedonorus arundinaceus	10	Y	FACU	<input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> 2 - Dominance Test is > 50% <input type="checkbox"/> 3 - Prevalence Index is <= 3.0 <sup>1</sup> <input type="checkbox"/> 4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)	
2 Setaria faberi	5	Y	FACU		
3					
4					
5					
6					
15 = Total Cover				<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
Woody Vine Stratum (Plot Size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status	Hydrophytic Vegetation Present?	
1				Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
2					
3					
0 = Total Cover					
Remarks:					



**WETLAND DETERMINATION DATA FORM - Midwest Region**

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	11
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM	xxs xxxxxxxe xxxxxxxn	Lat:	38.90321	Long:	-94.31224
Soil Map Unit Name:	Sampsett silty clay loam, 5-9% slopes	NWI classification:		Datum:	NAD 83
Are climatic / hydrologic conditions on the site typical for this time of year? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> (If no, explain in Remarks.)					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N significantly disturbed? Are "Normal Circumstances" present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
Are Vegetation <input type="checkbox"/> N, Soil <input type="checkbox"/> N, or Hydrology <input type="checkbox"/> N naturally problematic? (If needed, explain answers in Remarks.)					

**SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
Hydric Soil Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>					
Wetland Hydrology Present?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>					
Remarks:									

**VEGETATION - Use scientific names of plants.**

Tree Stratum (Plot size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:	
1					Number of Dominant Species That Are OBL, FACW, or FAC:	1 (A)
2						
3						
4						
5						
6						
7						
8						
		0	= Total Cover		Total Number of Dominant Species Across All Strata:	1 (B)
Sapling/Shrub Stratum (Plot Size: 15ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Prevalence Index worksheet:	
1					Percent of Dominant Species That Are OBL, FACW, or FAC	100.00 (AB)
2						
3						
4						
5						
6						
		0	= Total Cover		Total % Cover of:	
Herb Stratum (Plot Size: 5ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Prevalence Index worksheet:	
1	Schedonorus arundinaceus (hummocked)	99	Y	FAC	OBL Species	0 x 1 = 0
2					FACW Species	0 x 2 = 0
3					FAC Species	99 x 3 = 297
4					FACU Species	0 x 4 = 0
5					UPL Species	0 x 5 = 0
6					Column Totals:	99 (A) 297 (B)
		99	= Total Cover		Prevalence Index = B/A	3.00
Woody Vine Stratum (Plot Size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Hydrophytic Vegetation Indicators:	
1					1 - Rapid Test for Hydrophytic Vegetation	
2					<input checked="" type="checkbox"/> 2 - Dominance Test is > 50%	
3					<input checked="" type="checkbox"/> 3 - Prevalence Index is <= 3.0 <sup>1</sup>	
					<input checked="" type="checkbox"/> 4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)	
		0	= Total Cover		Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)	
					<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
					Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Remarks:						



## WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	12
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID:	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM	xxs xxxxxxxe xxxxxxxn	Lat:	38.90308	Long:	-94.31231
Datum:	NAD 83	NWI classification:	N/A		
Soil Map Unit Name:	Sampsett silty clay loam, 5-9% slopes				
Are climatic / hydrologic conditions on the site typical for this time of year?	Yes	X	No	(If no, explain in Remarks.)	
Are Vegetation	Y	, Soil	N	, or Hydrology	N significantly disturbed?
Are "Normal Circumstances" present?	Yes	No	X		
Are Vegetation	N	, Soil	N	, or Hydrology	N naturally problematic?
(If needed, explain answers in Remarks.)					

### SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>
Hydric Soil Present?	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>					
Wetland Hydrology Present?	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>					
Remarks:	The vegetation at this location was disregarded because the current agricultural production significantly disturbs the plant community through the removal of any natural vegetation and the cultivation of crops. Since the natural plant community is unnaturally altered the vegetation was not taken into account at this sampling location and the determination of wetland conditions was made solely based on the hydrology and soils present.								

### VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:	
1					Number of Dominant Species That Are OBL, FACW, or FAC:	0 (A)
2						
3						
4						
5						
6						
7						
8						
		0 = Total Cover			Total Number of Dominant Species Across All Strata:	0 (B)
Sapling/Shrub Stratum (Plot Size: 15ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Prevalence Index worksheet:	
1					Percent of Dominant Species That Are OBL, FACW, or FAC	0 (AB)
2						
3						
4						
5						
6						
		0 = Total Cover			Total % Cover of:	
					OBL Species	0 x 1 = 0
					FACW Species	0 x 2 = 0
					FAC Species	0 x 3 = 0
					FACU Species	0 x 4 = 0
					UPL Species	0 x 5 = 0
					Column Totals:	0 (A) 0 (B)
					Prevalence Index = B/A	
Herb Stratum (Plot Size: 5ft radius)		Absolute % Cover	Dominant Species?	Indicator Status	Hydrophytic Vegetation Indicators:	
1					1 - Rapid Test for Hydrophytic Vegetation 2 - Dominance Test is > 50% 3 - Prevalence Index is <= 3.0 <sup>1</sup> 4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet) Problematic Hydrophytic Vegetation <sup>1</sup> (Explain) <sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
		0 = Total Cover			Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Woody Vine Stratum (Plot Size: 30ft radius)		Absolute % Cover	Dominant Species?	Indicator Status		
1						
2						
3						
		0 = Total Cover				
Remarks:						

