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ENGINEERS PLANNERS SURVEYORS LANDSCAPE ARCHITECTS

# Final Stormwater Management Plan

## prepared for

## Cornerstone at Bailey Farms, 1st Plat

**1300 SE Ranson Road**
**Lee's Summit, MO 64081**

**November 5, 2021**
**April 18, 2022**

## prepared by

## SCHLAGEL & ASSOCIATES, P.A.

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**Schlagel & Associates Project 21-136**

## for

## Clayton Properties Group Inc., DBA Summit Homes
## 120 SE 30th Street
## Lee's Summit, Missouri

*STATE OF MISSOURI*
*JAMES L. LONG*
*NUMBER*
*PE-2014010495*
*PROFESSIONAL ENGINEER*

4/18/2022

April 18, 2022

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

**RE:    Manor at Bailey Farms, 1st Plat**
**1300 SE Ranson Road**
**Lee's Summit, MO 64081**

Dear Gene Williams,

We are submitting the enclosed final stormwater management study in support of the final development plan for the Manor at Bailey Farms 1st Plat. 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 an 88.70 acre single-family proposed parcel located in Lee's Summit, MO at the intersection of SE Bailey Road and SE Ranson 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. Two Extended Dry Detention Basins (EDDB) 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 the City of Lee's Summit, Missouri requirements.

This project includes requesting a waiver for a small area located in the southeast corner of the site to allow free-release off-site without additional detention facilities to be implemented.

Sincerely,


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


Nick Augustine, E.I.T.                                                                    Jim Long, P.E.
Design Engineer                                                                        Project Engineer

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## 1.0 GENERAL INFORMATION

Summit Homes is proposing to develop the 888.64 acres of land located in Section 16, Township 47 North, Range 31 West, Jackson County, Missouri. This analysis includes the 0.75 ac. Bailey Farms, Homestead located in the northeast corner of the site. The property is located at the intersection of SE Bailey Road and SE Ranson Road. The proposed development consists of single-family lots 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 facility and associated infrastructure. Detailed designs are provided with permit documents.

### 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 feet. 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.

<center>* * * * *</center>

## 2.0 EXISTING CONDITIONS ANALYSIS

The site lies within the Big Creek Watershed. The existing site contains one watershed which has a release point located at the southwest corner of the site.

Offsite stormwater comes into the site from the east and drains to the same release point previously mentioned. See Existing Offsite #1 on Sheet A.1 – Existing Drainage Map included in Appendix A.

## 2.1    TRIBUTARY AREAS

The existing drainage tributary areas are shown in Appendix A, Sheet A.1. The site release points have been identified as:

      Release Point 1 (RP-1) - The full site release point.

      Release Point 2 (RP-2) – The location where Bailey Farms site releases directly to the drainage channel that parallels the southern property line.  Includes Exist. On-Site #2 area

      Release Point 3 (RP-3) – The point at the southwest corner of the site.  Includes Exist. On-Site #3

      Release Point 4 (RP-4) – The centrally located point where the majority of the site drains too.  Includes Exist. On-Site #1 and Exist. Off-Site #1 (Area east of Ranson Road) drainage areas.

      The tributary areas are delineated according to the existing topography.

## 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.

Cover types for existing conditions were considered to be "pasture/grassland" in good 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 74 and 80 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

Following TR-55 through HydroCAD the 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. Appropriate runoff coefficient curve numbers were based upon aerial photography, site inspection, and the soil types present on site.  See NRCS Soils Report included in Appendix B.  Detailed calculations with composite curve numbers and time of concentration can be found in the HydroCAD Model Output in Appendix B.  Note these flow rates are for informational purposes and not used in the final analysis as the site will be designed to meet the Comprehensive Control rates as defined in APWA 5600.

*Table 2-1 Existing Flow Rates*

| Drainage Sub-Basin | Area, ac. | CN | Storm Event | Runoff, cfs |
|---|---|---|---|---|
| Existing On-Site #1 | 64.82 | 77 | 2-YR | 56.78 |
| | | | 10-YR | 118.07 |
| | | | 100-YR | 206.11 |
| Existing On-Site #2 | 6.42 | 76 | 2-YR | 10.50 |
| | | | 10-YR | 21.81 |
| | | | 100-YR | 38.02 |
| Existing On-Site #3 | 17.54 | 77 | 2-YR | 18.79 |
| | | | 10-YR | 38.90 |
| | | | 100-YR | 67.74 |
| Existing Off-Site #1 | 18.43 | 77 | 2-YR | 31.32 |
| | | | 10-YR | 63.84 |
| | | | 100-YR | 110.11 |

Referring to Sheet A.1 – Existing Drainage Map.

>    RP-1 - Represents the total outfall for the site which is located in the southwest corner of the site.

>    RP-2 - Represents the release point fir the run-off for Exist. On-Site #2 which is located in the southeast corner of the site.  This area discharges into the existing drainage channel that parallels the southern property line.

>    RP-3 - Represents the run-off for Exist. On-Site #3 which is the point of convergence for this are just before exiting the site in the southwest corner.

>    RP-4 - Represents the point of convergence between the main tributary running north/south along the west property line and the minor tributary running east/west in the middle of the site.  It includes the Off-Site #1.

## 2.4    DOWNSTREAM DRAINAGE ISSUES

The existing downstream drainage system has been reviewed with the preliminary 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 number 29095C0438G.

### 2.4.1        Agency Review

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

### 2.4.2        Corps of Engineers Review

The Approved jurisdictional determination map is included in Appendix A.   The assessment indicates there are two wetlands and two intermittent streams on the site. Grading activites will be restricted in these areas.

### 2.4.3        FEMA Requirements

No FEMA identified floodplain is located on the proposed property per Flood Insurance Rate Map Panel No. 29095C0430G. There is currently no work proposed in the regulated floodplain. Please see the attached FEMA FIRMette in Appendix A, Figure A.4.

### 2.4.4        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 are similar to the existing condition sub-basins. And are broken down accordingly, refer to Sheet A.3 – Proposed Drainage Map included in Appendix A:

> On-site #1 – Which is the northern portion of the site draining to EDDB-1 which will be constructed with Cornerstone at Bailey Farms, 1st Plat.
>
> On-site #2 – Which is the southern portion of the site draining to EDDB-2 which will be constructed with Manor at Bailey Farms,1st Plat.
>
> On-site #3 – The southeastern portion of the site that discharges to the drainage channel that flows parallel with our southern property line.
>
> On-site #4 – Which is the central portion of the site.  It includes the drainage channel located within a stream buffer.  This will be direct release, no detention for this drainage area.  Off-site #1 drains through On-Site #4.

The proposed detention basins will both be dry and used for water quality compliance. Both proposed dry detention basins have been sized to detain the 2, 10, and 100-year storm events for on-site drainage.  Discharge rates are based on Comprehensive Control per APWA 5608.4.C.1.a.

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.

A stream buffer protection zone will be located on the west side of the property and through a portion of the centrally located drainage channel. The proposed buffer zones will meet the requirements provided in APWA Section 5600. Drainage areas have been delineated to determine the required width of the stream buffer zones.

## 3.1    STREAM BUFFERS

Referring to Sheet A.4 – Stream Buffer Map there will be two stream buffers on the site.

Drainage Area 1 - 125.2 ac. to Point 1 will require a 60' stream buffer.  This buffer will extend from Bailey Farms northwest property line to Point 1.

Sub-Drainage Area 1 – 37.8 ac. to Point 3 will not require a stream buffer.  The drainage that is carried from the east side of Ranson Road will be transported through a storm pipe system and discharged at approximately Point 3.

Sub-Drainage Area 2 – 55.1 ac. to Point 1 includes Sub-Drainage Area 1.  This will require a 60' stream buffer from Point 3 to Point 1.

Drainage Area 2 – 199.3 ac. to Point 2 includes all of Drainage Area 1 and the sub-drainage area of 55.1 ac.   This will require a 100' buffer which will extend from Point 1 to Point 2.

The buffer widths stated above are to be on each side of the channel measured from the ordinary high-water mark or surveyed top of bank.

## 3.2    TRIBUTARY AREAS

As stated previously the developed site will be divided into four sub-basins.  Please refer to Sheet A.3 – Proposed Drainage Map included in Appendix A.

## 3.3    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 all post-development conditions. Cover types for the proposed conditions were considered to be 1/8 acre lots, 1/4 acre lots, ½ acre lots, open space, and urban commercial (used for the amenity site) all in good condition.

Time of concentration was established in a similar manner as the existing conditions. Shallow concentrated flow lengths were shortened.  Most of the shallow concentrated flow is now along paved drainage ways.  Detailed calculations with composite curve

numbers and time of concentration can be found in the HydroCAD Model Output in Appendix B.

## 3.4    DEVELOPED RELEASE RATES

Developed release rates will follow the Comprehensive Control per APWA 5608.4.C.1.a for the 2-Year, 10-Year, and 100-Year design storms.

- 50% (2 yr) storm peak rate less than or equal to 0.5 cfs per site acre
- 10% (10 yr) storm peak rate less than or equal to 2.0 cfs per site acre
- 1% (100 yr) storm peak rate less than or equal to 3.0 cfs per site acre

The offsite release rates for Off-Site #1 will be calculated using HydroCAD and added to the site developed release rates under Comprehensive Control.

*Table 3-1 Allowable Release Rate Calculations*

| Release Point | Area (Acres) | Storm Event | Allowable On-Site Release Rate, cfs (A) | Allowable Off-Site Release Rate, cfs (B) | Allowable Release Rate, cfs (A+B) |
|---|---|---|---|---|---|
| | | | Allowable Release Rate Calculations | | |
| Total Site | 88.64 | 2-YR | 44.35 | 30.84 | **75.19** |
| RP-1 | | 10-YR | 177.4 | 62.92 | **240.32** |
| See Note 1 | | 100-YR | 266.1 | 108.57 | **374.67** |
| South Bypass | 2.38 | 2-YR | 8.14 | 0 | **8.14** |
| RP-2 | | 10-YR | 11.39 | 0 | **11.39** |
| See Note 2 | | 100-YR | 20.48 | 0 | **20.48** |
| Manor | 29.34 | 2-YR | 14.67 | 0 | **14.67** |
| RP-3 | | 10-YR | 58.68 | 0 | **58.68** |
| EDDB-2 (5P-HydroCAD) | | 100-YR | 88.02 | 0 | **88.02** |
| Cornerstone and Retreat | 31.71 | 2-YR | 15.86 | 0 | **15.86** |
| RP-4 | | 10-YR | 63.42 | 0 | **63.42** |
| EDDB-1 (4P in HydroCAD) | | 100-YR | 95.13 | 0 | **95.13** |

Note 1.     Release rate for the offsite area of 18.43 ac. is generated from HydroCAD.  See HydroCAD output included with this study.  (5S OFF-SITE #1 in HydroCAD).

Note 2.     Release rate based on the existing drainage area of 6.42 ac. using the rational method (Q=kCiA).  Calculations are in Section 3.4.  Note that in the evaluation of the total run-off from the site this drainage area was evaluated under the comprehensive control rates.

## 3.5     DETENTION AND WATER QUAILTY 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.

Detention will be provided in two locations:

EDDB 1 – Will provide detention for the northern drainage areas and will be constructed with Cornerstone at Bailey Farms, 1st Plat.

EDDB 2 – Will provide detention for the southern drainage areas and will be constructed with Manor at Bailey Farms, 1st Plat.

Both detention basins will be sized to comply with the Comprehensive Control Rates from the total development of the Bailey Farms subdivision.

### 3.5.1   EDDB-1 for Cornerstone at Bailey Farms, 1st Plat

This is the analysis of the detention and water quality to be constructed with Cornerstone at Bailey Farms, 1st Plat.

Referring to Sheet A.3 – Proposed Drainage Map, the proposed drainage area to this detention basin is 31.71 acres.  Using HydroCAD, the design storms for the 2, 10 and 100 year storms are routed through the basin to reduce the peak storm rates to meet the comprehensive control requirements.  The control structure will be a combination of culverts, weirs associated with a storm inlet and an orifice whose primary function is to

control the water quality event.  A perforated standpipe will be utilized to help keep the orifice plate from clogging.  See the attached Plan Sheet 34 – Detention Basin Details for details on the control structure.

The stage-storage and discharge rates are shown in the table below. Additional information can be found in the HydroCAD output located in Appendix B

*Table 3-2 Detention Basin Stage-Storage-Discharge Rate Table*

| | | Surface Area, sf | Incremental Storage, cf | Cummulative Storage, cf | Discharge Rate, cfs |
|---|---|---|---|---|---|
| Orifice FL | 994.16 | 0 | 0 | 0 | 0.00 |
| FL at Riser | 995.67 | 0 | 0 | 0 | 0.00 |
| | 996.00 | 700 | 115 | 115 | 0.10 |
| | 997.00 | 7,200 | 3,950 | 4,065 | 0.37 |
| | 998.00 | 12,000 | 9,600 | 13,665 | 0.42 |
| | 999.00 | 17,900 | 14,950 | 28,615 | 0.48 |
| | 1000.00 | 27,000 | 22,450 | 51,065 | 0.53 |
| | 1001.00 | 36,000 | 31,500 | 82,565 | 0.60 |
| | 1002.00 | 40,000 | 38,000 | 120,565 | 7.62 |
| | 1003.00 | 44,800 | 42,400 | 162,965 | 13.20 |
| | 1004.00 | 48,700 | 46,750 | 209,715 | 17.34 |
| | 1005.00 | 53,000 | 50,850 | 260,565 | 75.51 |
| | 1006.00 | 57,000 | 55,000 | 315,565 | 79.13 |
| | 1007.00 | 61,000 | 59,000 | 374,565 | 82.00 |

Storm water run-off is delivered to the detention via a storm sewer pipe system and overland flow.  Below is the inflow-outflow summary table with water surface elevations for each of the design storms.

*__Table 3-3 Detention Basin Inflow/Outflow Summary__*

| Release Point | Area (Acres) | Storm Event | Inflow to Basin, cfs | Discharge Rate from Basin, cfs | Water Surface Elevation |
|---|---|---|---|---|---|
| Cornerstone RP-4 EDDB-1 (4P In HydroCAD) | 31.71 | 2-YR | 107.19 | 13.32 | 1003.03 |
| | | 10-YR | 173.27 | 60.26 | 1004.79 |
| | | 100-YR | 260.19 | 81.35 | 1006.64 |
| | | WQV | 29.17 | 0.54 | 1000.17 |

Water Quality

Refer to the MARC-BMP Manual worksheets for extended dry detention basins included in Appendix C for design of the water quality outlet orifice. Per the Worksheet, the water quality outlet calculates to require a 3.53" orifice. This design will use a 2.90" orifice resulting in a maximum discharge rate of 0.54 cfs. Meeting the MARC-BMP requirement shown in the worksheet included in Appendix A.

### 3.5.2   EDDB-2 for Manor at Bailey Farms, 1st Plat

**This analysis of the EDDB 1 is provided for informational purposes.  Refer to the stormwater report specific to EDDB 1 "Manor at Bailey Farms, 1st Plat" for the final analysis.**

~~This is the analysis of the detention and water quality to be constructed with Manor at Bailey Farms, 1st Plat.~~

~~Referring to Sheet A.3 – Proposed Drainage Map, the proposed drainage area to this detention basin is 29.69 acres.  Using HydroCAD, the design storms for the 2, 10 and 100 year storms are routed through the basin to reduce the peak storm rates to meet the comprehensive control requirements.  The control structure will be a combination of culverts, weirs associated with a storm inlet and an orifice whose primary function is to control the water quality event.  A perforated standpipe will be utilized to help keep the orifice from clogging.  See the attached Plan Sheet 34 – Detention Basin Design for details on the control structure.~~

~~The stage-storage and discharge rates are shown in the table below. Additional information can be found in the HydroCAD output located in Appendix B.~~

*Table 3-4 Detention Basin Stage-Storage-Discharge Rate Table*

|  |  | Surface Area, sf | Incremental Storage, cf | Cummulative Storage, cf | Discharge Rate, cfs |
|---|---|---|---|---|---|
| Orifice FL | 986.62 | 0 | 0 | 0 | 0.00 |
| FL at Riser | 988.16 | 0 | 0 | 0 | 0.00 |
|  | 989.00 | 800 | 336 | 336 | 0.24 |
|  | 990.00 | 4,200 | 2,500 | 2,836 | 0.30 |
|  | 991.00 | 10,400 | 7,300 | 10,136 | 0.34 |
|  | 992.00 | 21,600 | 16,000 | 26,136 | 0.38 |
|  | 993.00 | 37,600 | 29,600 | 55,736 | 0.41 |
|  | 994.00 | 41,700 | 39,650 | 95,386 | 5.75 |
|  | 995.00 | 46,000 | 43,850 | 139,236 | 11.63 |
|  | 996.00 | 49,700 | 47,850 | 187,086 | 53.08 |

| | | | | |
|---|---|---|---|---|
| 997.00 | 53,200 | 51,450 | 238,536 | 73.80 |
| 998.00 | 56,900 | 55,050 | 293,586 | 77.49 |
| 999.00 | 60,400 | 58,650 | 352,236 | 82.00 |

Storm water run-off is delivered to the detention via a storm sewer pipe system and overland flow. Below is the inflow-outflow summary table with water surface elevations for each of the design storms.

### *Table 3-5 Detention Basin Inflow/Outflow Summary*

| Release Point | Area (Acres) | Storm Event | Inflow to Basin, cfs | Discharge Rate from Basin, cfs | Water Surface Elevation |
|---|---|---|---|---|---|
| Manor RP-3 EDDB2 (5P In HydroCAD) | 29.34 | 2-YR | 86.05 | 9.97 | 994.63 |
| | | 10-YR | 148.68 | 58.14 | 996.06 |
| | | 100-YR | 232.03 | 76.98 | 997.86 |
| | | WQV | 17.13 | 0.38 | 992.24 |

Water Quality

Refer to the MARC-BMP Manual worksheets for extended dry detention basins included in Appendix C for design of the water quality outlet orifice. Per the Worksheet, the water quality outlet calculates to require a 3.22" orifice. This design will require a 2.50" orifice resulting in a maximum discharge rate of 0.54 cfs. Meeting the MARC-BMP requirement shown in the worksheet included in Appendix A.

## 3.6    DRAINAGE AREA FOR ON-SITE #3 AT RELEASE POINT #2

On-site #3 will be released un-detained into the existing drainage channel to the south. Referring to Sheet A1 – Existing Drainage Map and Sheet A2 – Developed Drainage Area the pre-developed drainage area is 6.42 acres.  The developed drainage area will reduce this to 2.38 acres.  Table 3.6 shows the comprehensive rates compared to the discharge rates from HydroCAD.  It can be seen that the 2 year rates have not been reduced to meet the comprehensive requirements.

*Table 3-6 Comprehensive Rates v. Developed Discharge Rates*

|  | Area, ac. | 2-yr, cfs | 10-yr, cfs | 100-yr, cfs |
|---|---|---|---|---|
| Pre-Developed, Comprehensive | 6.42 | 3.21 | 12.84 | 19.26 |
| Developed, HydroCAD | 2.38 | 7.15 | 12.33 | 19.23 |
| Difference |  | -3.94 | 0.51 | 0.03 |

Using the rational-method to analyze this drainage area shows a significant reduction in stormwater run-off.  See Table 3.8 below. This is expected as there is more than a 60% reduction in the drainage area. Also, note that the developed drainage area will be only the homes themselves.  The streets will all be captured by a storm sewer system and conveyed to the EDDB-2 at the southwest corner of the site.

*Table 3-7 Pre-Developed and Developed Discharge Rates*

| Pre-Developed Run-Off Calculations | | | | |
|---|---|---|---|---|
| | Tc, min. | Storm Event | Rainfall Intensity, in/hr | Q, cfs |
| Tc, min. | 16.7 | 2-yr | 3.52 | 8.14 |
| C-factor[1] | 0.36 | 10-yr | 4.93 | 11.39 |
| Drainage Area, ac. | 6.42 | 100-yr | 7.09 | 20.48 |
| [1] Equivalent c-factor based on a CN = 76 from TR-55 and Soil Survey | | | | |
| Developed Run-Off Calculations | | | | |
| | Tc, min. | Storm Event | Rainfall Intensity, in/hr | Q, cfs |
| Tc, min. | 12.7 | 2-yr | 4.01 | 4.87 |
| C-factor | 0.51 | 10-yr | 5.56 | 6.75 |
| Drainage Area, ac. | 2.38 | 100-yr | 7.88 | 11.96 |

## 3.7    TOTAL SITE DISCHARGE

To meet Comprehensive Control rates as stated in APWA 5600 the two detention basins have been designed to enable the entire site to meet these rates.  Referring to Sheet A.3 – Proposed Drainage there are two drainage areas that will be un-detained - On-Site #3 and On-Site #4.   Detention has been designed to adequately control and reduce the total run-off from the site to the Comprehensive Control rates.

The Off-Site #1 drainage area collects at a point on the east side of Ranson Road where a culvert conveys the run-off to the Bailey Farms site, through On-Site #4.

### *Table 3-8 Required & Proposed Runoff Comparison*

| Release Point | Area (Acres) | Storm Event | Allowable Release Rate, cfs | Proposed Release Rate, cfs |
|---|---|---|---|---|
| Total Site RP-1 | 88.64 | 2-YR | 75.19 | 75.14 |
| | | 10-YR | 240.32 | 214.00 |
| | | 100-YR | 374.67 | 369.46 |
| South Bypass RP-2 | 2.38 | 2-YR | 8.14 | 7.15 |
| | | 10-YR | 11.39 | 12.33 |
| | | 100-YR | 20.48 | 19.23 |
| Manor  RP-3  EDDB-2 (5P-HydroCAD) | 29.34 | 2-YR | 14.67 | 9.97 |
| | | 10-YR | 58.68 | 58.14 |
| | | 100-YR | 88.02 | 76.98 |
| Cornerstone and Retreat  RP-4  EDDB-1 (4P in HydroCAD) | 31.71 | 2-YR | 15.86 | 13.32 |
| | | 10-YR | 63.42 | 60.26 |
| | | 100-YR | 95.13 | 81.35 |

It can be seen in Table 3.9 that the developed site has been designed to reduce the additional run-off peak flow rates to the Comprehensive Control Rates:

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.

Stormwater runoff for On-Site #1 is mitigated and detained by Extended Dry Detention Basin 1 located on the west side of the property and discharges to RP-4.   Stormwater runoff for On-Site #2 is mitigated and detained by Extended Dry Detention Basin 2 located in the southwest corner of the site and discharges to RP-3.  Stormwater run-off from On-Site #4 free releases from the site at RP-3.  RP-2, RP-3, and RP-4 all converge to RP-1 located in the southwest corner of the site.

Proposed stormwater drainage structures will be located throughout the site to capture and convey proposed stormwater runoff to both dry detention basins. The Water Quality volume for both 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 with an orifice located in the 4'x5' storm structures. Perforated riser pipe will be utilized to help reduce the clogging at the orifices.

Emergency spillways haven been provided for each basin per Section 5600 of the Design and Construction Manual. Each Emergency Spillway will be set 0.5 feet above the 100-year water surface elevation and designed to carry the 100-year storm event assuming a 100% clogged condition and full basin. An additional 1 foot of freeboard will be provided from the water surface elevation in the spillway to the top of dam.   Using HydroCAD, all primary discharge devices have been removed to simulate the clogged situation.  The water surface elevation was set at the flowline of the emergency spillway to simulate that the basin is completely full prior to the storm event.  Table 3-9 below summarizes the analysis.  HydroCAD output is included in Appendix B.   Also, refer to the included Sheet 34 – Detention Basin Design of the Manor at Bailey Farms, 1st Plat for detailed calculations.

*Table 3-9 Emergency Spillway Analysis*

| | Storm Event | Inflow to Basin, cfs | Emergency Spillway Elevation | Emergency Spillway Length, ft | Clogged Surface Elevation |
|---|---|---|---|---|---|
| Manor | 100-YR | 232.03 | 998.36 | 160.0 | 998.92 |
| Cornerstone | 100-YR | 260.19 | 1007.14 | 216.0 | 1007.64 |

Release Point 2 (RP-2) does not meet the allowable release rate required by the comprehensive control requirements for the 2-year storm event. This area has been reduced from 6.42 acres to 2.38 acres and consists of houses and their backyards only. Given this reduction in drainage area and the entire site is collectively meeting comprehensive control requirements, we will be requesting a waiver for this peripheral drainage area to avoid adding additional detention facilities.

* * * * *

## 4.0 SUMMARY AND RECOMMENDATIONS

The proposed drainage site is an 88.70-acre single-family parcel of land located in Lee's Summit, MO at the intersection of SE Bailey Road and SE Ranson 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. Two extended dry 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.

The project includes a request for modification to the stream setback to allow transition grading. There is sufficient space to allow for the existing stream to flow naturally. Any proposed construction activities with this development will not disrupt the natural movement of this stream. This project is also requested a waiver for a small area located in the southeast corner of the site to allow free-release off-site without additional detention facilities to be implemented.

* * * *

**Appendix A**

Bailey Farms, Homestead

Bailey Farms

BAILEY FARMS
HYDRO MAPS

1300 SE RANSON ROAD  LEE'S SUMMIT, MISSOURI

EXISTING
CONDTIONS
AERIAL MAP

SHEET

A.1

SCALE:1" = 250'

N

EXIST. ON-SITE #1
AREA = 64.82 ACRES
CN = 77

EXIST. OFF-SITE #1
AREA = 18.43 ACRES
CN = 77

RP-4

EXIST. ON-SITE #3
AREA = 17.54 ACRES
CN = 77

EXIST. ON-SITE #2
AREA = 6.42 ACRES
CN = 76

RP-3

RP-1

RP-2

SE BAILEY ROAD
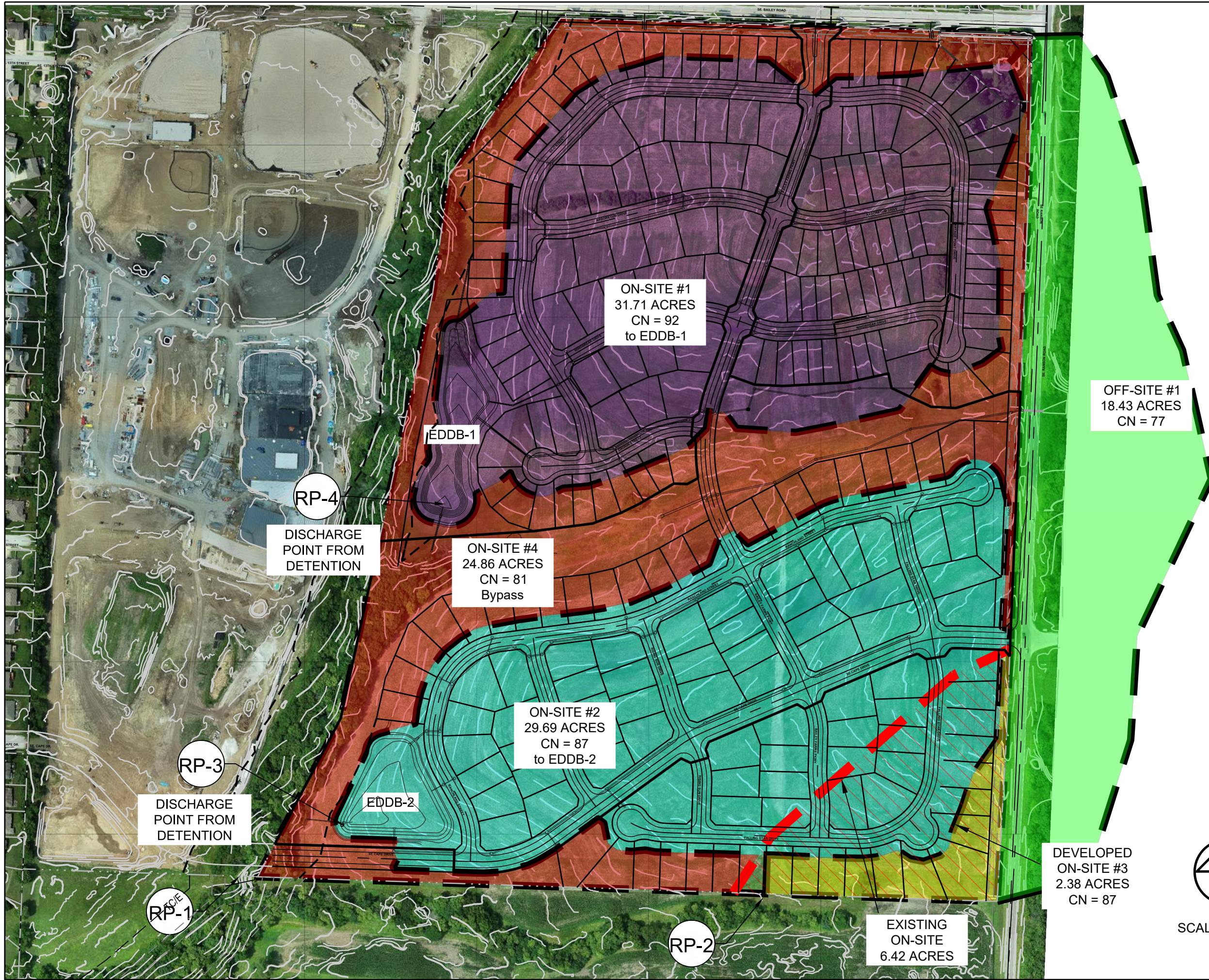
SE. RANSON ROAD

SCALE:1" = 250'

BAILEY FARMS
HYDRO MAPS

1300 SE RANSON ROAD  LEE'S SUMMIT, MISSOURI

DRAWN BY: JLL
DATE PREPARED: 4/18/2022
PROJ. NUMBER: 21-130

EXISTING
DRAINAGE MAP

SHEET

A.2

I:\PROJECTS\2021\21-130\3.0 Design\4.0 Civil\2.0 Hydro\21-130-HYDRO EX.dwg, 4/18/2022 1:46:00 PM, 1:1

**ON-SITE #1**
31.71 ACRES
CN = 92
to EDDB-1

EDDB-1

**OFF-SITE #1**
18.43 ACRES
CN = 77

RP-4

DISCHARGE POINT FROM DETENTION

**ON-SITE #4**
24.86 ACRES
CN = 81
Bypass

RP-3

**ON-SITE #2**
29.69 ACRES
CN = 87
to EDDB-2

EDDB-2

DISCHARGE POINT FROM DETENTION

RP-1

**DEVELOPED ON-SITE #3**
2.38 ACRES
CN = 87

RP-2

**EXISTING ON-SITE**
6.42 ACRES

SCALE:1" = 250'

N

BAILEY FARMS
HYDRO MAPS

1300 SE RANSON ROAD  LEE'S SUMMIT, MISSOURI

DRAWN BY: JLL
DATE PREPARED: 4/18/2022
PROJ. NUMBER: 21-130

PROPOSED
DRAINAGE MAP

SHEET

**A.3**

I:\PROJECTS\2021\21-130\3.0 Design\4.0 Civil\2.0 Hydro\21-130 HYDRO-PRO.dwg, 4/18/2022 1:46:42 PM, 1:1
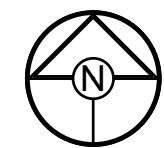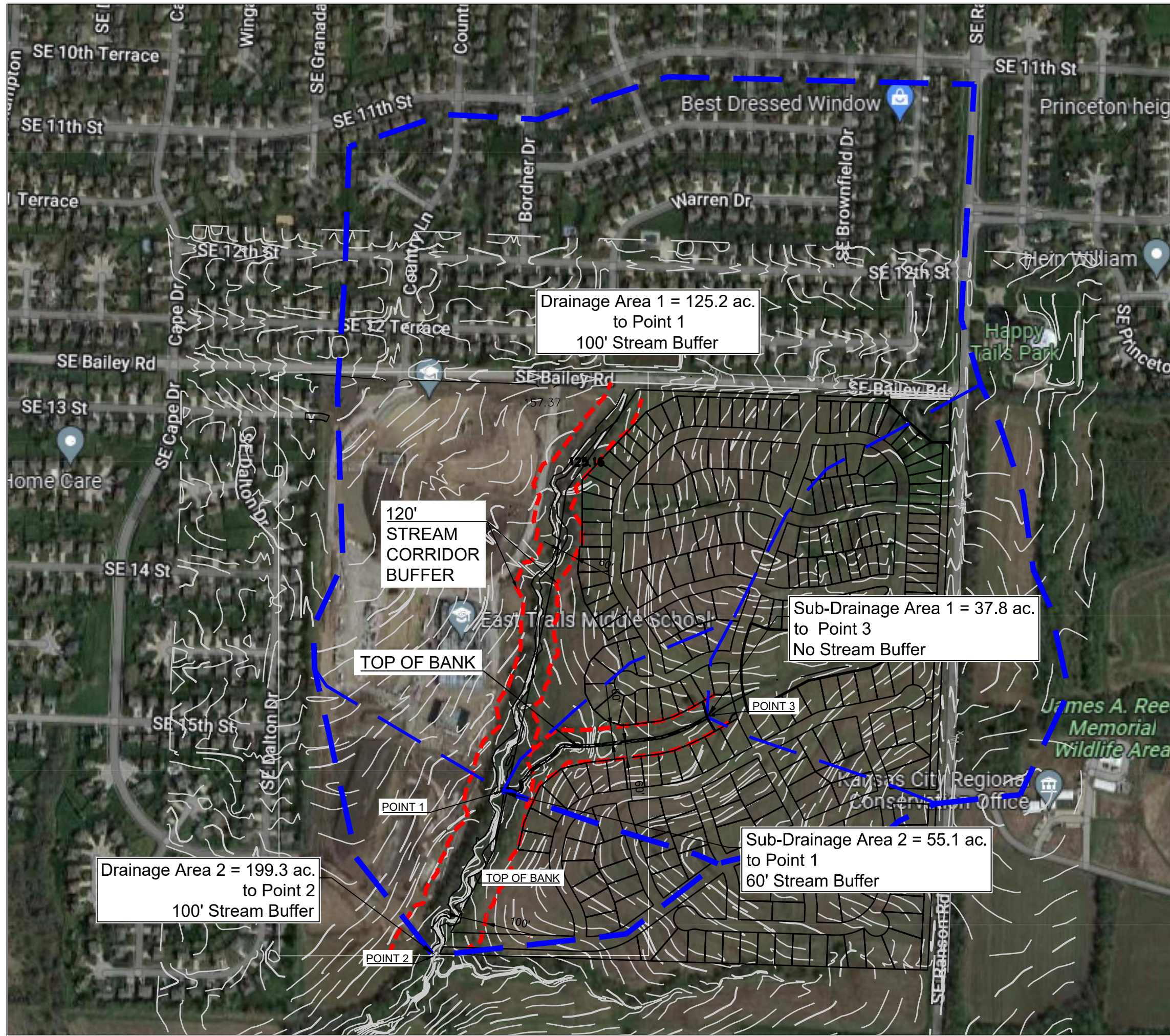
Drainage Area 1 = 125.2 ac.
to Point 1
100' Stream Buffer

120'
STREAM
CORRIDOR
BUFFER

Sub-Drainage Area 1 = 37.8 ac.
to Point 3
No Stream Buffer

TOP OF BANK

POINT 3

Sub-Drainage Area 2 = 55.1 ac.
to Point 1
60' Stream Buffer

POINT 1

Drainage Area 2 = 199.3 ac.
to Point 2
100' Stream Buffer

TOP OF BANK

POINT 2

SCALE:1" = 400'

N

BAILEY FARMS
HYDRO MAPS

1300 SE RANSON ROAD  LEE'S SUMMIT, MISSOURI

DRAWN BY:
JLL

DATE PREPARED:
4/18/2022

PROJ. NUMBER:
21-130

STREAM
CORRIDOR MAP

SHEET

A.4

**Extended Dry Detention Basin           1**
(EDDB-1 To be reviewed during construction of Cornerstone at Bailey Farms, 1st Plat)
**Water Quality Volume Calculation**

WQV = P * 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 |
|---|---|---|---|---|---|---|---|
| 1/8 Acre Lots | 65 | 11.14 | 7.24 | 0.66 | 0.64 | 7.35 | 7.07 |
| 1/4 Acre Lots | 38 | 19.33 | 7.35 | 0.66 | 0.39 | 12.76 | 7.58 |
| Commercial/Clubhouse Area | 85 | 1.24 | 1.05 | 0.81 | 0.82 | 1.00 | 1.01 |
| **Total** | | **31.71** | **15.64** | | | **21.11** | **15.66** |

Rv = Sum(Rv*A)/Total Area = 15.66 / 31.71 =          0.494

C = Sum(C*A)/Total Area = 21.11 / 31.71 =          0.666

**II. Determine Water Quality Volume**

WQV = P * Rv = 1.37 * 0.4939     **0.677 in**

**III. Determine Total Water Quality Volume**

Total Watershed Area (AT) =          31.71 acres
WQV =          0.677 in

WQV = (31.71 * 0.676)/12 =          **1.79 ac-ft**

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

Designer:        N. AUGUSTINE
Checked b        J. LONG
Company:        Schlagel
Date:        4/18/2022
Project:        21-136
Location:        Lee's Summit

**EDDB -1**
(To be reviewed with construction of
Cornerstone at Bailey Farms, 1st Plat)

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

Step 1) Tributary Area to EDDB, $A_T$ (ac.)        $A_T$ (ac.) =        31.71

Step 2) Calculate WQv using method in Section 6.1        WQv (ac-ft) =        1.79

Step 3) Add 20 percent to account for silt and sand sediment deposition in the basin    $V_{design}$ (ac-ft) =        2.15

**IIa. Water Quality Outlet Type**

       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

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

Step 1) Depth of water quality volume at outlet, $Z_{WQ}$ (ft.)        $Z_{WQ}$ (ft.) =        4.50

Step 2) Average head of Water Quality volume over invert of orifice, $H_{WQ}$ (ft)        $H_{WQ}$ (ft.) =        2.25
       $H_{WQ} = 0.5 * Z_{WQ}$

Step 3) Average water quality outflow rate, $Q_{WQ}$ (cfs)        $Q_{WQ}$ (cfs) =        0.54
       $Q_{WQ} = (WQv * 43,560)/(40 * 3600)$

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) =        3.53 calculated
       $D_O = 12 * 2 *(Q_{WQ}/C_O * \pi * (2 *g *H)^{0.5}))^{0.5}$        2.9 used

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.) =        4.50

Step 2) Recommended maximum outlet area per row, $A_O$ (in²)        $A_O$ (in²) =        1.55
       $A_O = (WQv)/(0.013 * Z_{WQ}^2 + 0.22 * Z_{WQ} - 0.10)$        10.99

Step 3) Circular perforation diameter per row assuming a single column, $D_1$ (in)        $D_1$ (in) =        1.41

Step 4) Number of Columns, $n_c$                                                       $n_c$ =      20.00

Step 5) Design circular perforation diameter (should be between 1 and 2 inches), $D_{perf}$ (in)   $D_{perf}$ (in) =      1.00

Step 6) Horizontal perforation column spacing when $n_c$ > 1, center to center, $S_c$      $S_c$ (in)=      4.00

         If $D_{perf}$ >/= 1.0 in, $S_c$ =4

Step 7) Number of rows (4" vertical spacing between perforations, center to center), $n_r$      $n_r$ =      13

---

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

Step 1) Depth of water quality volume at outlet, $Z_{WQ}$ (ft.)                                     $Z_{WQ}$ (ft.) =      4.50

Step 2) Average head of Water Quality volume over invert of V-notch, $H_{WQ}$ (ft)      $H_{WQ}$ (ft.) =      2.25

         $H_{WQ} = 0.5 * Z_{WQ}$

Step 3) Average water quality outflow rate, $Q_{WQ}$ (cfs)                             $Q_{WQ}$ (cfs) =      0.54

         $Q_{WQ} = (WQv * 43,560)/(40 * 3600)$

Step 4) V-notch weir coefficient, $C_V$                                               $C_V$ =      2.69

Step 5) V-notch weir angle, θ (deg)

         $\theta = 2 * (180/\pi) * \arctan(Q_{WQ} / C_V * H_{WQ}^{5/2}))$      θ (deg) =      20.0

         V-notch angle should be at least 20 degeres. Set to 20 degrees if
         calculated angle is smaller.

Step 6) Top width of V-notch weir                                          $W_V$ =      1.59

         $W_V = 2 * Z_{WQ} * TAN(\theta/2)$

Step 7) To calculate v-notch angle for EDDB with and irregular stage-volume relationship, use the V-notch Weir Worksheet

---

**III. Flood Control**

Refer to APWA Specifications Section 5608

## Extended Dry Detention Basin      2

(EDDB-1 To be reviewed during construction of Manor at Bailey Farms, 1st Plat)
**Water Quality Volume Calculation**

WQV = P * 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 |
|---|---|---|---|---|---|---|---|
| 1/4 Acre Lots | 38 | 29.69 | 11.28 | 0.66 | 0.39 | 19.60 | 11.64 |
| **Total** | | **29.69** | **11.28** | | | **19.60** | **11.64** |

Rv = Sum(Rv*A)/Total Area = 11.63 / 29.69 =      0.392

C = Sum(C*A)/Total Area = 19.59 / 29.69 =      0.660

### II. Determine Water Quality Volume

WQV = P * Rv = 1.37 * 0.392 =      **0.537 in**

### III. Determine Total Water Quality Volume

Total Watershed Area (AT) =      29.69 acres
WQV =      0.537 in

WQV = (29.69 * 0.537)/12 =      **1.33 ac-ft**

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

| | | |
|---|---|---|
| Designer: | N. AUGUSTINE | |
| Checked b | J. LONG | |
| Company: | Schlagel | |
| Date: | 4/18/2022 | |
| Project: | 21-130 | |
| Location: | Lee's Summit | |

**EDDB -2**
(To be reviewed with construction of
Manor at Bailey Farms, 1st Plat)

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

Step 1) Tributary Area to EDDB, $A_T$ (ac.)              $A_T$ (ac.) =       29.69

Step 2) Calculate WQv using method in Section 6.1       WQv (ac-ft) =       1.33

Step 3) Add 20 percent to account for silt and sand sediment deposition in the basin    $V_{design}$ (ac-ft) =       1.59

          13.88
**IIa. Water**         27

        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

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

Step 1) Depth of water quality volume at outlet, $Z_{WQ}$ (ft.)       $Z_{WQ}$ (ft.) =       3.62

Step 2) Average head of Water Quality volume over invert of orifice, $H_{WQ}$ (ft)       $H_{WQ}$ (ft.) =       1.81
        $H_{WQ} = 0.5 * Z_{WQ}$

Step 3) Average water quality outflow rate, $Q_{WQ}$ (cfs)       $Q_{WQ}$ (cfs) =       0.40
        $Q_{WQ} = (WQv * 43,560)/(40 * 3600)$

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) =       3.22 Calculated
        $D_O = 12 * 2 *(Q_{WQ}/C_O * \pi * (2 *g *H)^{0.5}))^{0.5}$             2.5 Used

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.) =       5.64

Step 2) Recommended maximum outlet area per row, $A_O$ (in²)       $A_O$ (in²) =       0.85
        $A_O = (WQv)/(0.013 * Z_{WQ}^2 + 0.22 * Z_{WQ} -0.10)$

Step 3) Circular perforation diameter per row assuming a single column, $D_1$ (in)       $D_1$ (in) =       1.04

Step 4) Number of Columns, $n_c$       $n_c$ =       1.00

Step 5) Design circular perforation diameter (should be between 1 and 2 inches), $D_{perf}$ (in)   $D_{perf}$ (in) =            2.00

Step 6) Horizontal perforation column spacing when $n_c > 1$, center to center, $S_c$            $S_c$ (in)=            4.00
    If $D_{perf}$ >/= 1.0 in, $S_c$ =4

Step 7) Number of rows (4" vertical spacing between perforations, center to center), $n_r$            $n_r$ =            17

---

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

Step 1) Depth of water quality volume at outlet,  $Z_{WQ}$  (ft.)            $Z_{WQ}$ (ft.) =            5.64

Step 2) Average head of Water Quality volume over invert of V-notch, $H_{WQ}$ (ft)            $H_{WQ}$ (ft.) =            2.82
    $H_{WQ} = 0.5 * Z_{WQ}$

Step 3) Average water quality outflow rate, $Q_{WQ}$ (cfs)            $Q_{WQ}$ (cfs) =            0.40
    $Q_{WQ} = (WQv * 43,560)/(40 * 3600)$

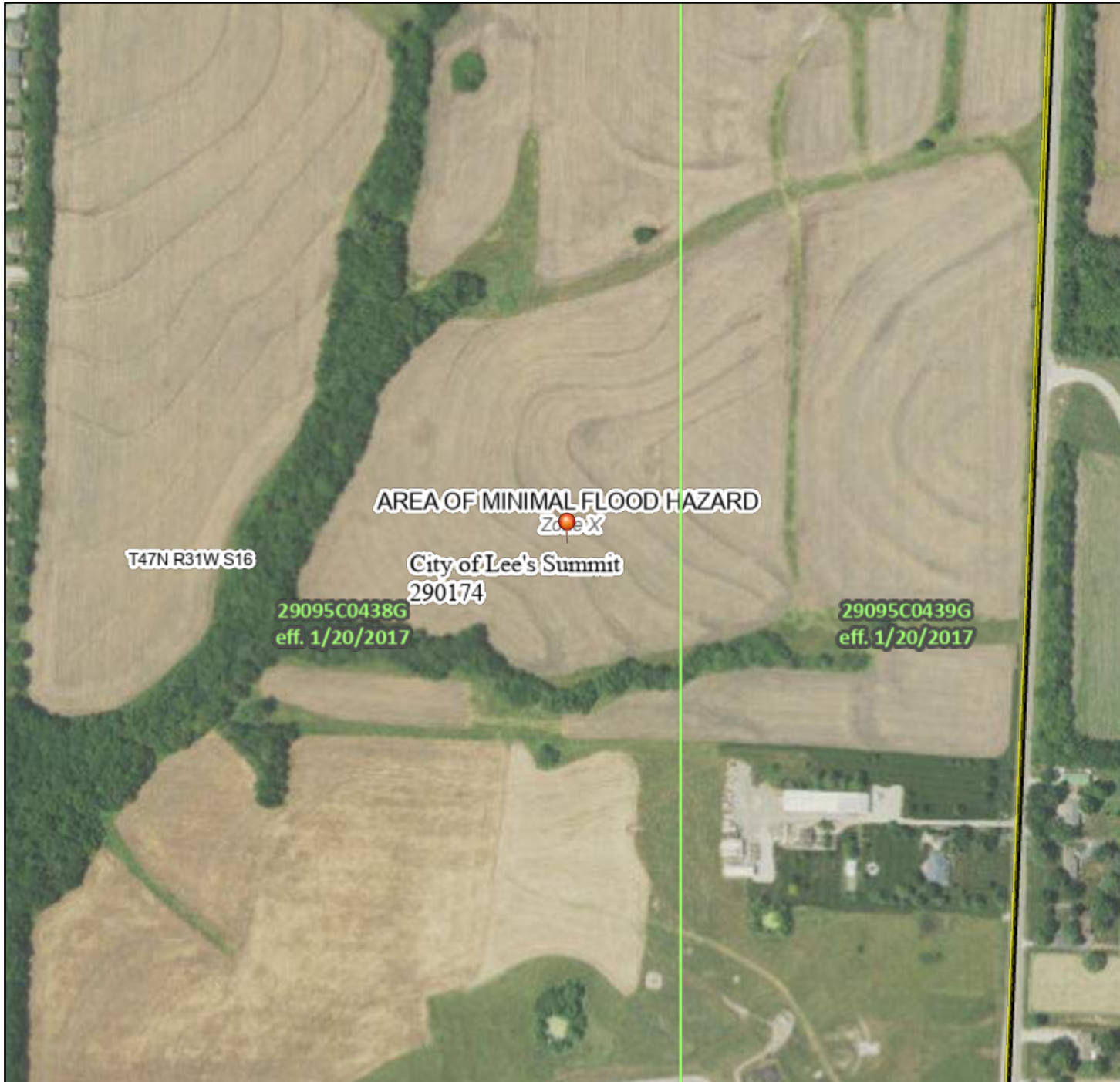Step 4) V-notch weir coefficient, $C_V$            $C_V$ =            2.69

Step 5) V-notch weir angle, $\theta$ (deg)
    $\theta = 2 * \arctan(Q_{WQ} / C_V * H_{WQ}^{5/2}))$            $\theta$ (deg) =            20.0
    V-notch angle should be at least 20 degeres. Set to 20 degrees if
    calculated angle is smaller.

Step 6) Top width of V-notch weir            $W_V$ =            1.99
    $W_V = 2 * Z_{WQ} * TAN(\theta/2)$

Step 7) To calculate v-notch angle for EDDB with and irregular stage-volume relationship, use the V-notch Weir Worksheet

---

**III. Flood Control**

Refer to APWA Specifications Section 5608

FEMA

AREA OF MINIMAL FLOOD HAZARD
Zone X

City of Lee's Summit
290174

T47N R31W S16

29095C0438G
eff. 1/20/2017

29095C0439G
eff. 1/20/2017

NWK-2020-828
Approved Jurisdictional Determination

Figure A.5

Pipe

Wetland 1

Pipe

Intermittent 1

Pipe

Wetland 3

Wetland 2

Pipe

Intermittent 2

Wetland 4

Ephemeral 1
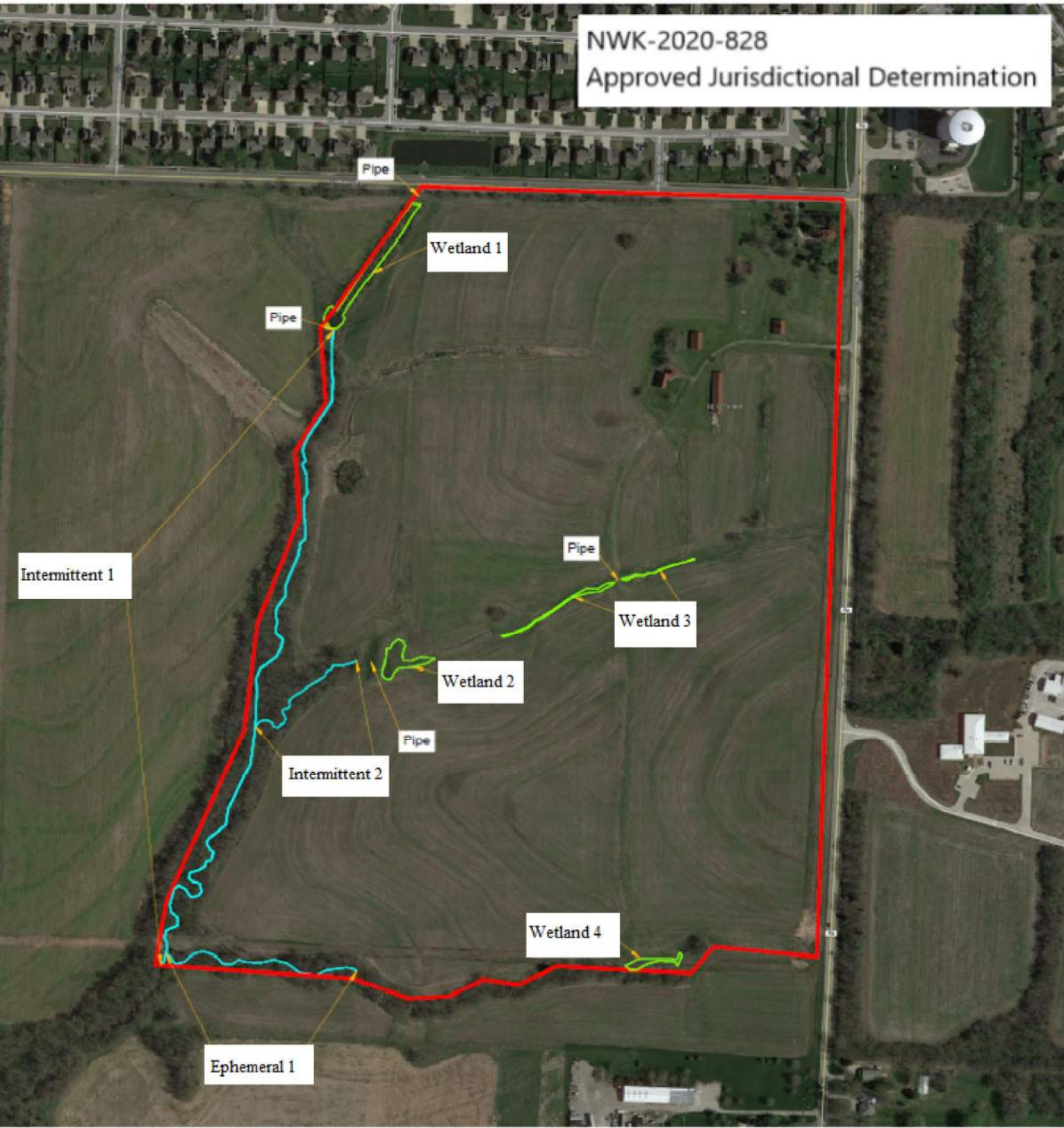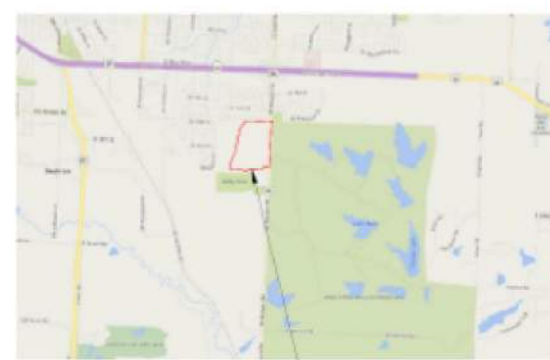
Site Location
T47N-R31W-S16
Lee's Summit, Jackson County, Missouri
95.92 Acres
Lat. 38.89207
Long. -94.34343

GRAPHIC SCALE

**Appendix B**
**NRCS Soil Resource Report**
**HydroCAD Model Output Reports**
**Existing Conditions**
**Developed Conditions**
**Clogged Conditions**

![USDA logo] 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
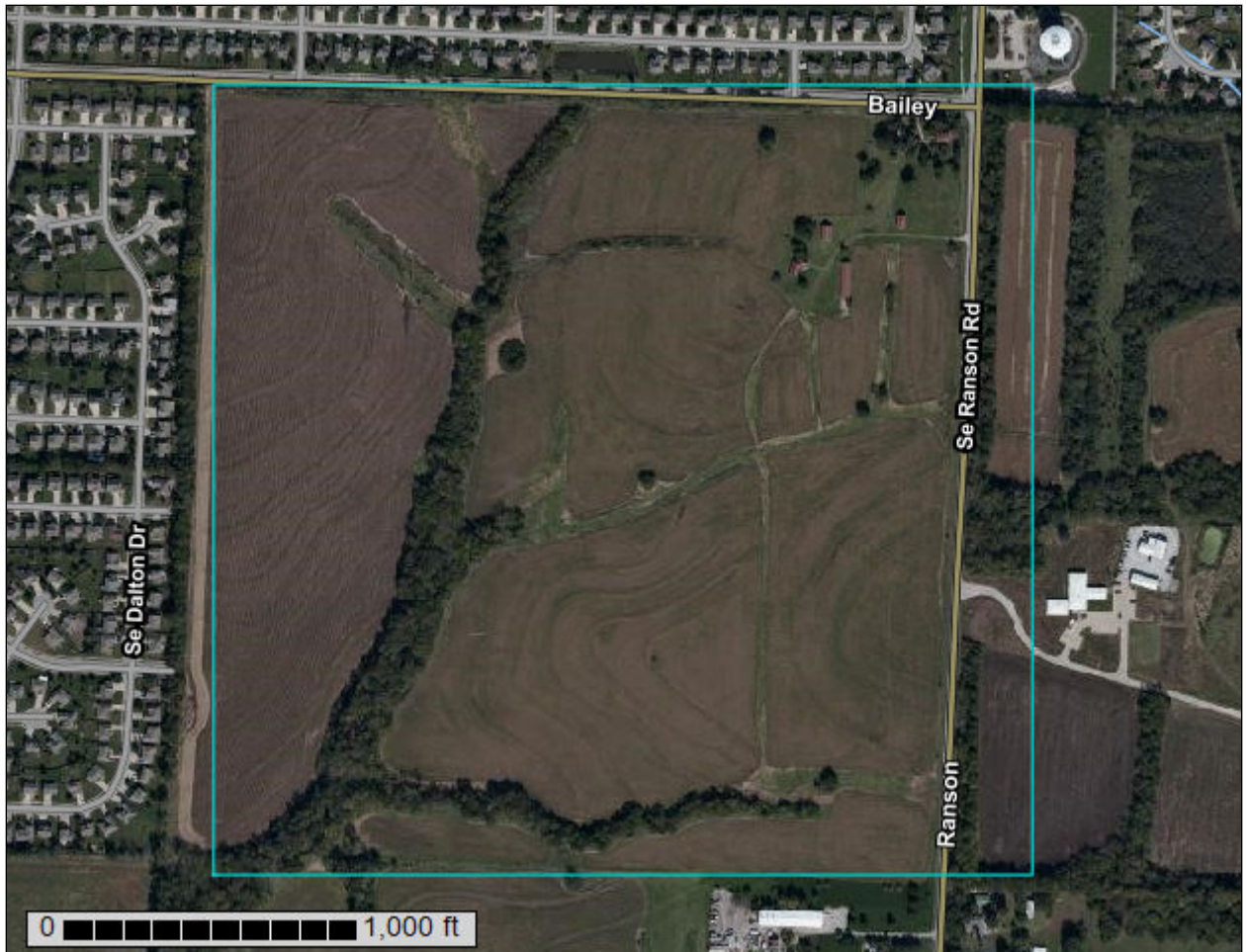
# Preface

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).

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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# Contents

# How Soil Surveys Are Made

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

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

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

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.

Map Scale: 1:6,940 if printed on A landscape (11" x 8.5") sheet.

Meters
0  100  200  400  600

Feet
0  300  600  1200  1800

N

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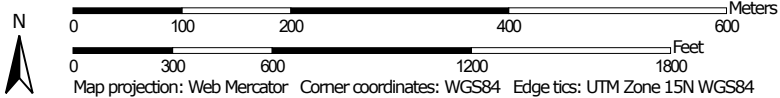
# MAP LEGEND

### 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 | 62.9 | 36.4% |
| 10082 | Arisburg-Urban land complex, 1 to 5 percent slopes | 28.0 | 16.2% |
| 10117 | Sampsel silty clay loam, 5 to 9 percent slopes | 82.1 | 47.5% |
| **Totals for Area of Interest** | | **173.0** | **100.0%** |

# Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

# 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

**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

# Soil Information for All Uses

## 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.

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.
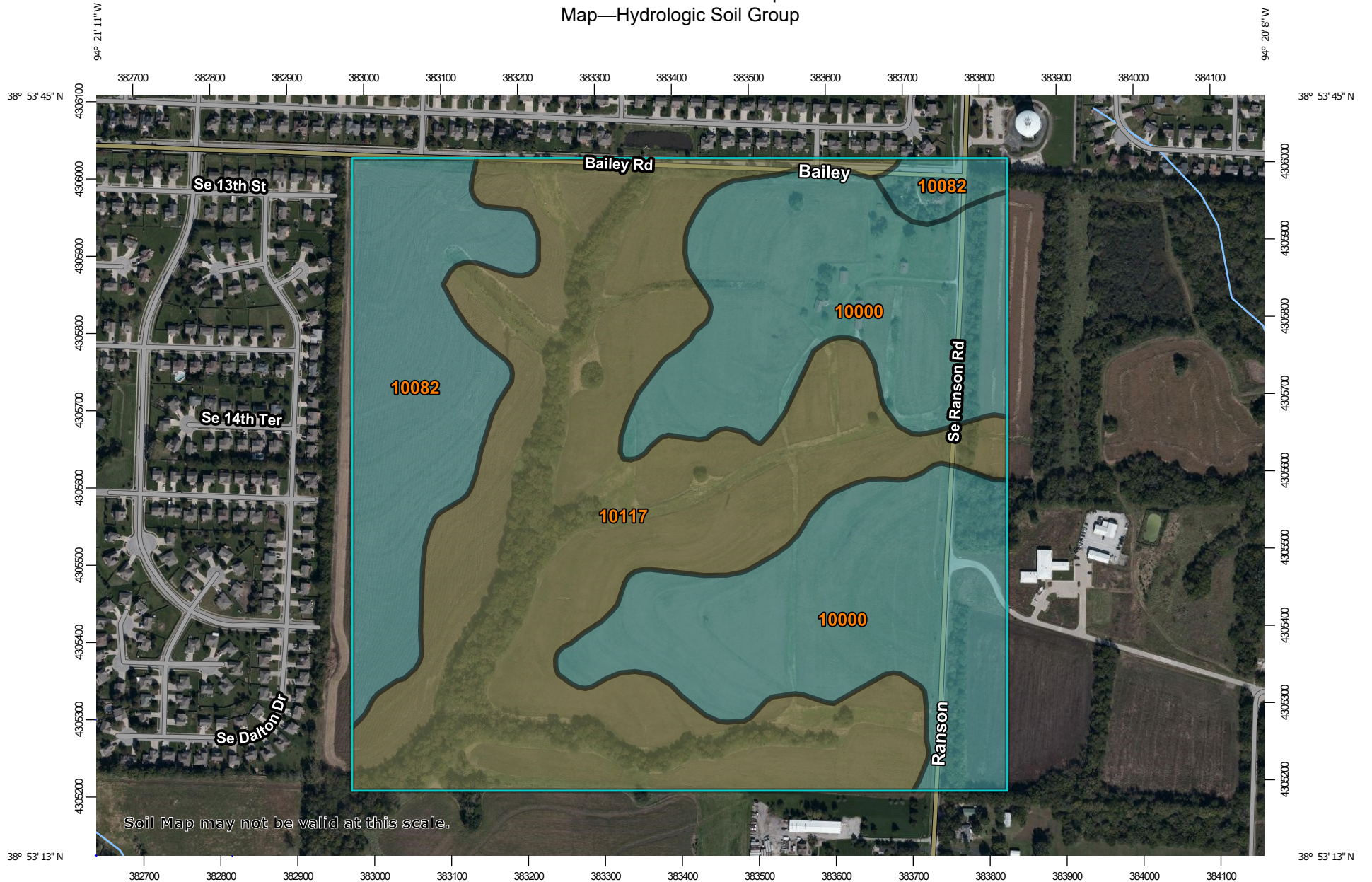
94° 21' 11" W

94° 20' 8" W

38° 53' 45" N

382700  382800  382900  383000  383100  383200  383300  383400  383500  383600  383700  383800  383900  384000  384100

4306100
4306000
4305900
4305800
4305700
4305600
4305500
4305400
4305300
4305200

Se 13th St

Bailey Rd

Bailey

10082

10000

Se 14th Ter

10082

Se Ranson Rd

10117

Se Dalton Dr

10000

Ranson

Soil Map may not be valid at this scale.

38° 53' 13" N

382700  382800  382900  383000  383100  383200  383300  383400  383500  383600  383700  383800  383900  384000  384100

94° 21' 11" W

94° 20' 8" W

38° 53' 13" N

N

Map Scale: 1:6,940 if printed on A landscape (11" x 8.5") sheet.

Meters
0    100    200    400    600

Feet
0    300    600    1200    1800

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

20
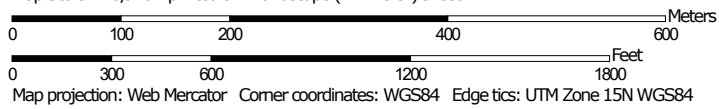
# MAP LEGEND

**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
- C
- C/D
- D
- 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.

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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 | 62.9 | 36.4% |
| 10082 | Arisburg-Urban land complex, 1 to 5 percent slopes | C | 28.0 | 16.2% |
| 10117 | Sampsel silty clay loam, 5 to 9 percent slopes | C/D | 82.1 | 47.5% |
| **Totals for Area of Interest** | | | **173.0** | **100.0%** |

## Rating Options—Hydrologic Soil Group

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

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# HydroCAD - Pre-Developed
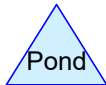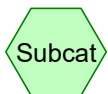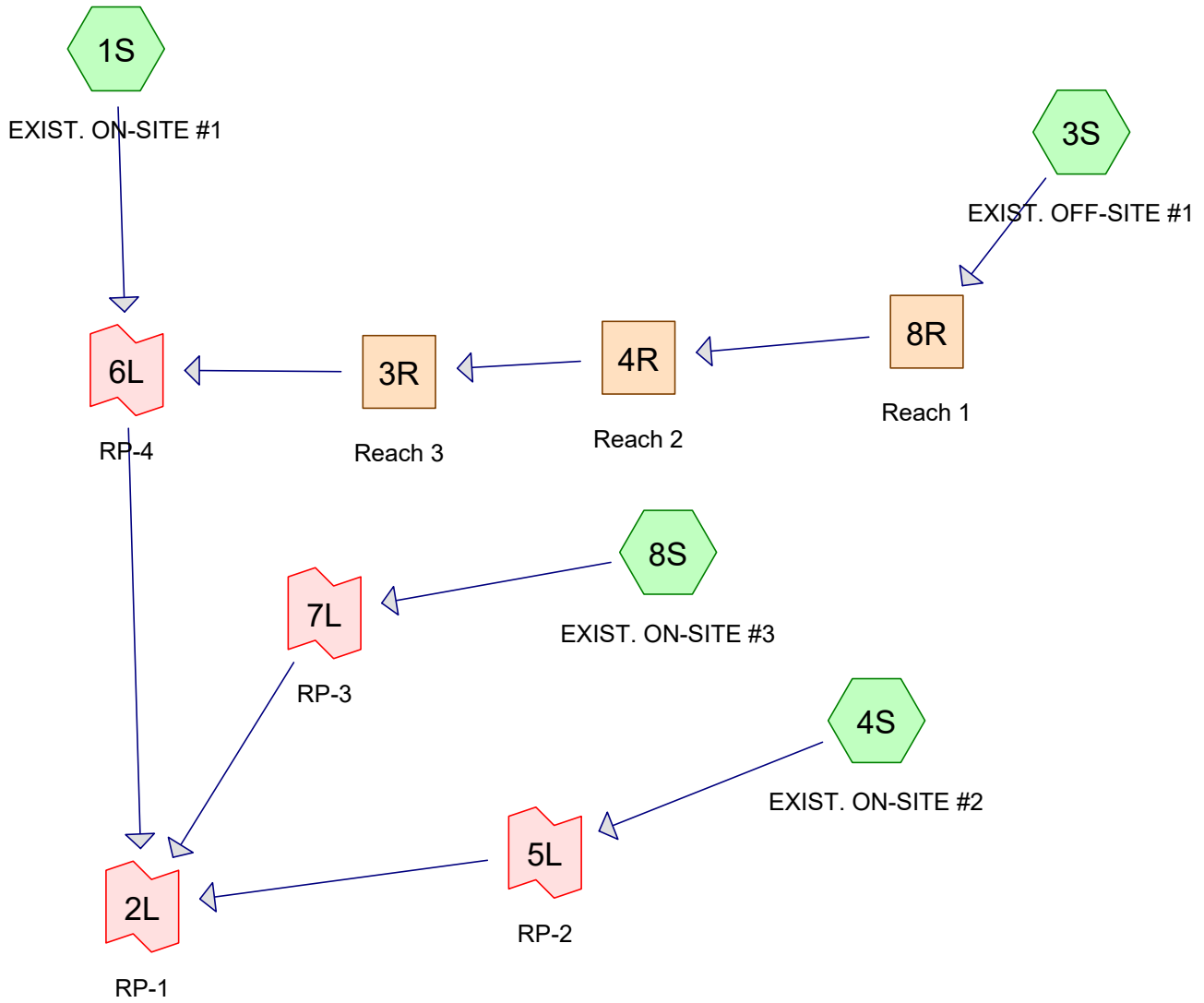
1S

EXIST. ON-SITE #1

3S

EXIST. OFF-SITE #1

6L

RP-4

3R

Reach 3

4R

Reach 2

8R

Reach 1

8S

EXIST. ON-SITE #3

7L

RP-3

4S

EXIST. ON-SITE #2

2L

RP-1

5L

RP-2

Subcat    Reach    Pond    Link

## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---:|---:|---|
| 48.870 | 74 | Pasture/grassland/range, Good, HSG C  (1S, 4S, 8S) |
| 39.910 | 80 | Pasture/grassland/range, Good, HSG D  (1S, 4S, 8S) |
| 15.640 | 76 | Woods/grass comb., Fair, HSG C  (3S) |
| 2.790 | 82 | Woods/grass comb., Fair, HSG D  (3S) |

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Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method  -  Pond routing by Stor-Ind method

**Subcatchment1S: EXIST. ON-SITE #1**       Runoff Area=64.820 ac   0.00% Impervious   Runoff Depth=1.43"
Flow Length=3,450'   Tc=47.2 min   CN=77   Runoff=56.78 cfs  7.727 af

**Subcatchment3S: EXIST. OFF-SITE #1**       Runoff Area=18.430 ac   0.00% Impervious   Runoff Depth=1.43"
Flow Length=1,147'   Slope=0.0210 '/'   Tc=17.1 min   CN=77   Runoff=31.32 cfs  2.197 af

**Subcatchment4S: EXIST. ON-SITE #2**       Runoff Area=6.420 ac   0.00% Impervious   Runoff Depth=1.37"
Flow Length=1,020'   Slope=0.0300 '/'   Tc=16.7 min   CN=76   Runoff=10.50 cfs  0.730 af

**Subcatchment8S: EXIST. ON-SITE #3**       Runoff Area=17.540 ac   0.00% Impervious   Runoff Depth=1.43"
Flow Length=1,930'   Tc=35.6 min   CN=77   Runoff=18.79 cfs  2.091 af

**Reach 3R: Reach 3**                    Avg. Flow Depth=0.92'   Max Vel=3.48 fps   Inflow=27.94 cfs  2.197 af
n=0.030   L=1,041.0'   S=0.0088 '/'   Capacity=2,150.14 cfs   Outflow=25.62 cfs  2.197 af

**Reach 4R: Reach 2**                    Avg. Flow Depth=0.66'   Max Vel=3.55 fps   Inflow=30.23 cfs  2.197 af
n=0.030   L=853.0'   S=0.0225 '/'   Capacity=1,999.47 cfs   Outflow=27.94 cfs  2.197 af

**Reach 8R: Reach 1**                    Avg. Flow Depth=0.27'   Max Vel=5.05 fps   Inflow=31.32 cfs  2.197 af
n=0.012   L=875.0'   S=0.0147 '/'   Capacity=1,475.63 cfs   Outflow=30.23 cfs  2.197 af

**Link 2L: RP-1**                                      Inflow=101.93 cfs  12.745 af
Primary=101.93 cfs  12.745 af

**Link 5L: RP-2**                                      Inflow=10.50 cfs  0.730 af
Primary=10.50 cfs  0.730 af

**Link 6L: RP-4**                                      Inflow=82.34 cfs  9.924 af
Primary=82.34 cfs  9.924 af

**Link 7L: RP-3**                                      Inflow=18.79 cfs  2.091 af
Primary=18.79 cfs  2.091 af

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## Summary for Subcatchment 1S: EXIST. ON-SITE #1

Runoff     =     56.78 cfs @  12.48 hrs,  Volume=          7.727 af,  Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr  2-Year Rainfall=3.50"

| Area (ac) | CN | Description |
|---|---|---|
| 34.840 | 74 | Pasture/grassland/range, Good, HSG C |
| 29.980 | 80 | Pasture/grassland/range, Good, HSG D |
| 64.820 | 77 | Weighted Average |
| 64.820 |  | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 |  | **Sheet Flow,** |
|  |  |  |  |  | Grass: Short   n= 0.150   P2= 3.60" |
| 24.7 | 2,132 | 0.0255 | 1.44 |  | **Shallow Concentrated Flow,** |
|  |  |  |  |  | Cultivated Straight Rows   Kv= 9.0 fps |
| 14.1 | 1,218 | 0.0092 | 1.44 |  | **Shallow Concentrated Flow,** |
|  |  |  |  |  | Grassed Waterway   Kv= 15.0 fps |
| 47.2 | 3,450 |  |  |  | Total |

## Subcatchment 1S: EXIST. ON-SITE #1

**Hydrograph**

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## Summary for Subcatchment 3S: EXIST. OFF-SITE #1

Runoff     =      31.32 cfs @  12.10 hrs,  Volume=          2.197 af,  Depth=  1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr  2-Year Rainfall=3.50"

| Area (ac) | CN | Description |
|---|---|---|
| 15.640 | 76 | Woods/grass comb., Fair, HSG C |
| 2.790 | 82 | Woods/grass comb., Fair, HSG D |
| 18.430 | 77 | Weighted Average |
| 18.430 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.1 | 100 | 0.0210 | 0.18 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 8.0 | 1,047 | 0.0210 | 2.17 | | **Shallow Concentrated Flow,** Grassed Waterway   Kv= 15.0 fps |
| 17.1 | 1,147 | | | | Total |

### Subcatchment 3S: EXIST. OFF-SITE #1

**Hydrograph**



Type II 24-hr
2-Year Rainfall=3.50"
Runoff Area=18.430 ac
Runoff Volume=2.197 af
Runoff Depth=1.43"
Flow Length=1,147'
Slope=0.0210 '/'
Tc=17.1 min
CN=77

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## Summary for Subcatchment 4S: EXIST. ON-SITE #2

Runoff      =        10.50 cfs @   12.10 hrs,  Volume=          0.730 af,  Depth=  1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr  2-Year Rainfall=3.50"

| Area (ac) | CN | Description |
|---|---|---|
| 4.200 | 74 | Pasture/grassland/range, Good, HSG C |
| 2.220 | 80 | Pasture/grassland/range, Good, HSG D |
| 6.420 | 76 | Weighted Average |
| 6.420 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.6 | 80 | 0.0300 | 0.20 | | **Sheet Flow,** |
| | | | | | Grass: Short   n= 0.150   P2= 3.60" |
| 10.1 | 940 | 0.0300 | 1.56 | | **Shallow Concentrated Flow,** |
| | | | | | Cultivated Straight Rows   Kv= 9.0 fps |
| 16.7 | 1,020 | Total | | | |

## Subcatchment 4S: EXIST. ON-SITE #2

### Hydrograph



Type II 24-hr
2-Year Rainfall=3.50"
Runoff Area=6.420 ac
Runoff Volume=0.730 af
Runoff Depth=1.37"
Flow Length=1,020'
Slope=0.0300 '/'
Tc=16.7 min
CN=76

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## Summary for Subcatchment 8S: EXIST. ON-SITE #3

Runoff     =       18.79 cfs @   12.32 hrs,  Volume=           2.091 af,  Depth=  1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr  2-Year Rainfall=3.50"

| Area (ac) | CN | Description |
|---|---|---|
| 9.830 | 74 | Pasture/grassland/range, Good, HSG C |
| 7.710 | 80 | Pasture/grassland/range, Good, HSG D |
| 17.540 | 77 | Weighted Average |
| 17.540 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.3 | 100 | 0.0265 | 0.20 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 27.3 | 1,830 | 0.0255 | 1.12 | | **Shallow Concentrated Flow,** Short Grass Pasture   Kv= 7.0 fps |
| 35.6 | 1,930 | Total | | | |

### Subcatchment 8S: EXIST. ON-SITE #3

**Hydrograph**

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## Summary for Reach 3R: Reach 3

Inflow Area =        18.430 ac,   0.00% Impervious,  Inflow Depth =   1.43"    for  2-Year event
Inflow      =      27.94 cfs @  12.30 hrs,  Volume=            2.197 af
Outflow     =      25.62 cfs @  12.45 hrs,  Volume=            2.197 af,  Atten= 8%,  Lag= 8.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.48 fps,  Min. Travel Time= 5.0 min
Avg. Velocity = 0.89 fps,  Avg. Travel Time= 19.5 min

Peak Storage= 7,741 cf @ 12.37 hrs
Average Depth at Peak Storage= 0.92'
Bank-Full Depth= 6.40'  Flow Area= 252.4 sf,  Capacity= 2,150.14 cfs

Custom cross-section,  Length= 1,041.0'  Slope= 0.0088 '/'   (110 Elevation Intervals)
Constant n= 0.030  Earth, grassed & winding
Inlet Invert= 989.92',  Outlet Invert= 980.77'



‡

| Offset | Elevation | Chan.Depth |
|--------|-----------|------------|
| (feet) | (feet) | (feet) |
| 0.00 | 996.29 | 0.00 |
| 7.00 | 996.00 | 0.29 |
| 12.99 | 994.06 | 2.23 |
| 13.24 | 994.00 | 2.29 |
| 14.48 | 993.84 | 2.45 |
| 28.84 | 992.00 | 4.29 |
| 29.66 | 991.71 | 4.58 |
| 36.75 | 990.00 | 6.29 |
| 39.18 | 989.92 | 6.37 |
| 39.90 | 989.89 | 6.40 |
| 42.20 | 989.97 | 6.32 |
| 43.14 | 990.00 | 6.29 |
| 43.91 | 990.40 | 5.89 |
| 46.34 | 992.00 | 4.29 |
| 53.90 | 993.41 | 2.88 |
| 56.74 | 994.00 | 2.29 |
| 62.76 | 994.22 | 2.07 |
| 76.31 | 994.65 | 1.64 |
| 100.00 | 996.29 | 0.00 |

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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.03 | 0.0 | 1.6 | 25 | 0.01 |
| 0.08 | 0.2 | 4.5 | 184 | 0.09 |
| 0.11 | 0.3 | 6.4 | 355 | 0.22 |
| 0.51 | 3.4 | 9.0 | 3,521 | 8.20 |
| 1.82 | 19.8 | 16.9 | 20,607 | 102.00 |
| 2.11 | 24.7 | 18.3 | 25,700 | 139.72 |
| 3.52 | 62.5 | 37.1 | 65,011 | 410.25 |
| 3.95 | 79.1 | 42.6 | 82,369 | 555.08 |
| 4.11 | 85.9 | 44.7 | 89,447 | 617.31 |
| 4.17 | 88.6 | 46.6 | 92,223 | 631.78 |
| 4.33 | 96.2 | 51.5 | 100,189 | 678.51 |
| 4.76 | 121.1 | 66.4 | 126,018 | 838.92 |
| 6.11 | 225.0 | 90.3 | 234,197 | 1,919.54 |
| 6.40 | 252.4 | 101.5 | 262,697 | 2,150.14 |

## Reach 3R: Reach 3

**Hydrograph**



Inflow Area=18.430 ac
Avg. Flow Depth=0.92'
Max Vel=3.48 fps
n=0.030
L=1,041.0'
S=0.0088 '/'
Capacity=2,150.14 cfs

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## Reach 3R: Reach 3

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## Summary for Reach 4R: Reach 2

Inflow Area =       18.430 ac,   0.00% Impervious,  Inflow Depth =   1.43"    for  2-Year event
Inflow     =       30.23 cfs @   12.18 hrs,  Volume=          2.197 af
Outflow    =       27.94 cfs @   12.30 hrs,  Volume=          2.197 af,  Atten= 8%,  Lag= 7.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.55 fps,  Min. Travel Time= 4.0 min
Avg. Velocity = 1.27 fps,  Avg. Travel Time= 11.2 min

Peak Storage= 6,789 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 3.24'  Flow Area= 204.3 sf,  Capacity= 1,999.47 cfs

Custom cross-section,  Length= 853.0'  Slope= 0.0225 '/'   (106 Elevation Intervals)
Constant n= 0.030  Earth, grassed & winding
Inlet Invert= 1,009.12',  Outlet Invert= 989.90'



‡

| Offset (feet) | Elevation (feet) | Chan.Depth (feet) |
|---|---|---|
| 0.00 | 1,009.14 | 0.00 |
| 22.15 | 1,008.00 | 1.14 |
| 24.54 | 1,007.80 | 1.34 |
| 25.18 | 1,007.74 | 1.40 |
| 49.26 | 1,006.00 | 3.14 |
| 49.59 | 1,005.90 | 3.24 |
| 50.51 | 1,005.99 | 3.15 |
| 52.13 | 1,005.99 | 3.15 |
| 53.24 | 1,006.00 | 3.14 |
| 91.41 | 1,007.74 | 1.40 |
| 98.60 | 1,008.00 | 1.14 |
| 108.78 | 1,008.27 | 0.87 |
| 117.07 | 1,008.47 | 0.67 |
| 117.16 | 1,008.47 | 0.67 |
| 134.91 | 1,008.89 | 0.25 |
| 135.00 | 1,009.14 | 0.00 |

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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.09 | 0.1 | 2.9 | 47 | 0.03 |
| 0.10 | 0.1 | 4.0 | 77 | 0.06 |
| 1.84 | 61.2 | 66.4 | 52,179 | 430.84 |
| 1.90 | 65.2 | 68.7 | 55,628 | 468.55 |
| 2.10 | 79.7 | 76.6 | 67,995 | 608.70 |
| 2.37 | 102.4 | 92.0 | 87,382 | 818.03 |
| 2.57 | 122.0 | 104.3 | 104,091 | 1,007.45 |
| 2.99 | 171.2 | 130.2 | 146,042 | 1,527.76 |
| 3.24 | 204.3 | 135.4 | 174,303 | 1,999.47 |

### Reach 4R: Reach 2

**Hydrograph**



Inflow Area=18.430 ac
Avg. Flow Depth=0.66'
Max Vel=3.55 fps
n=0.030
L=853.0'
S=0.0225 '/'
Capacity=1,999.47 cfs

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## Reach 4R: Reach 2



Stage-Discharge

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## Summary for Reach 8R: Reach 1

Inflow Area =       18.430 ac,   0.00% Impervious,  Inflow Depth =   1.43"    for  2-Year event
Inflow      =       31.32 cfs @  12.10 hrs,  Volume=         2.197 af
Outflow     =       30.23 cfs @  12.18 hrs,  Volume=         2.197 af,  Atten= 3%,  Lag= 4.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.05 fps,  Min. Travel Time= 2.9 min
Avg. Velocity = 1.38 fps,  Avg. Travel Time= 10.6 min

Peak Storage= 5,243 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 1.86'  Flow Area= 89.8 sf,  Capacity= 1,475.63 cfs

Custom cross-section,  Length= 875.0'   Slope= 0.0147 '/'   (108 Elevation Intervals)
Constant n= 0.012  Concrete pipe, finished
Inlet Invert= 1,021.96',  Outlet Invert= 1,009.12'

‡

| Offset | Elevation | Chan.Depth |
|-------:|----------:|-----------:|
| (feet) | (feet) | (feet) |
| 6.08 | 1,023.78 | 0.00 |
| 9.16 | 1,023.55 | 0.23 |
| 11.33 | 1,023.58 | 0.20 |
| 11.39 | 1,023.57 | 0.21 |
| 15.58 | 1,023.21 | 0.57 |
| 22.68 | 1,022.85 | 0.93 |
| 26.25 | 1,022.76 | 1.02 |
| 30.78 | 1,022.00 | 1.78 |
| 35.77 | 1,021.93 | 1.85 |
| 36.49 | 1,021.92 | 1.86 |
| 37.38 | 1,021.93 | 1.85 |
| 42.61 | 1,021.97 | 1.81 |
| 45.38 | 1,021.97 | 1.81 |
| 54.65 | 1,022.00 | 1.78 |
| 58.89 | 1,022.15 | 1.63 |
| 59.16 | 1,022.15 | 1.63 |
| 60.04 | 1,022.18 | 1.60 |
| 63.66 | 1,022.37 | 1.41 |
| 70.33 | 1,022.84 | 0.94 |
| 84.24 | 1,023.78 | 0.00 |

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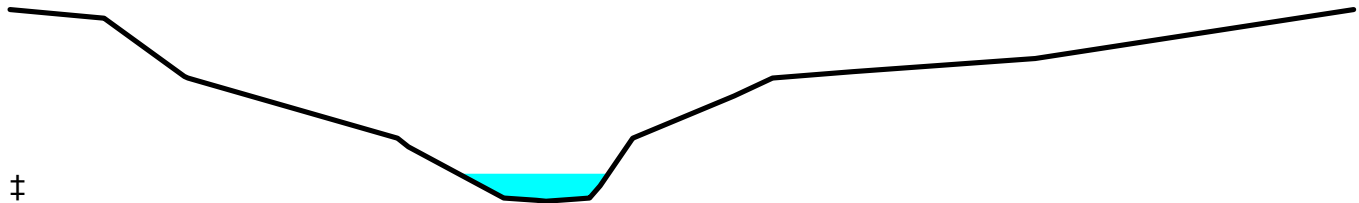*Type II 24-hr  2-Year Rainfall=3.50"*
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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.01 | 0.0 | 1.6 | 7 | 0.00 |
| 0.05 | 0.2 | 12.5 | 205 | 0.25 |
| 0.08 | 0.8 | 23.9 | 682 | 1.19 |
| 0.23 | 4.7 | 29.3 | 4,152 | 21.15 |
| 0.26 | 5.6 | 30.4 | 4,934 | 27.55 |
| 0.45 | 11.9 | 35.1 | 10,372 | 86.23 |
| 0.84 | 27.1 | 43.0 | 23,687 | 297.75 |
| 0.92 | 30.7 | 47.3 | 26,843 | 344.59 |
| 0.93 | 31.2 | 47.9 | 27,258 | 350.85 |
| 1.29 | 50.6 | 60.3 | 44,272 | 674.94 |
| 1.63 | 72.6 | 69.4 | 63,526 | 1,122.85 |
| 1.65 | 74.0 | 71.6 | 64,757 | 1,134.97 |
| 1.66 | 74.7 | 72.7 | 65,388 | 1,145.01 |
| 1.86 | 89.8 | 78.3 | 78,572 | 1,475.63 |

## Reach 8R: Reach 1

**Hydrograph**



Inflow Area=18.430 ac
Avg. Flow Depth=0.27'
Max Vel=5.05 fps
n=0.012
L=875.0'
S=0.0147 '/'
Capacity=1,475.63 cfs

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# Reach 8R: Reach 1



Stage-Discharge

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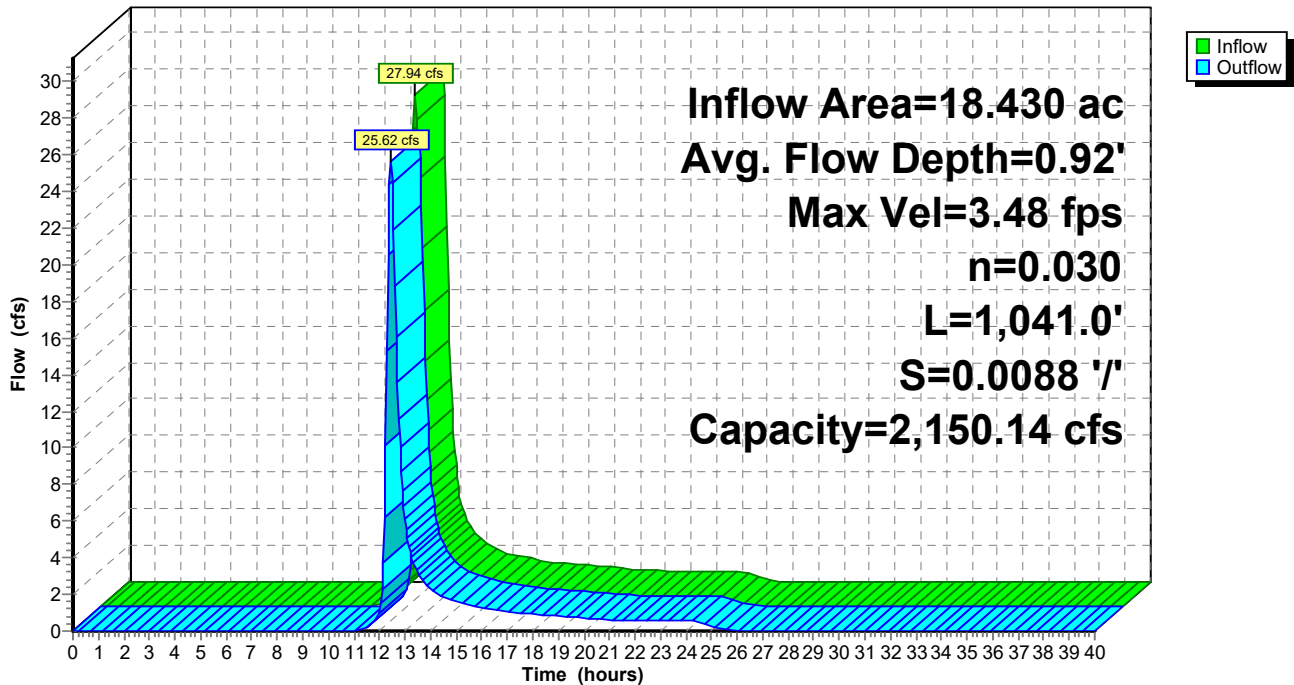*Type II 24-hr  2-Year Rainfall=3.50"*
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## Summary for Link 2L: RP-1

Inflow Area =      107.210 ac,    0.00% Impervious,  Inflow Depth =   1.43"    for  2-Year event
Inflow     =      101.93 cfs @   12.44 hrs,  Volume=          12.745 af
Primary    =      101.93 cfs @   12.44 hrs,  Volume=          12.745 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 2L: RP-1

**21-130-HYDRO-EX**
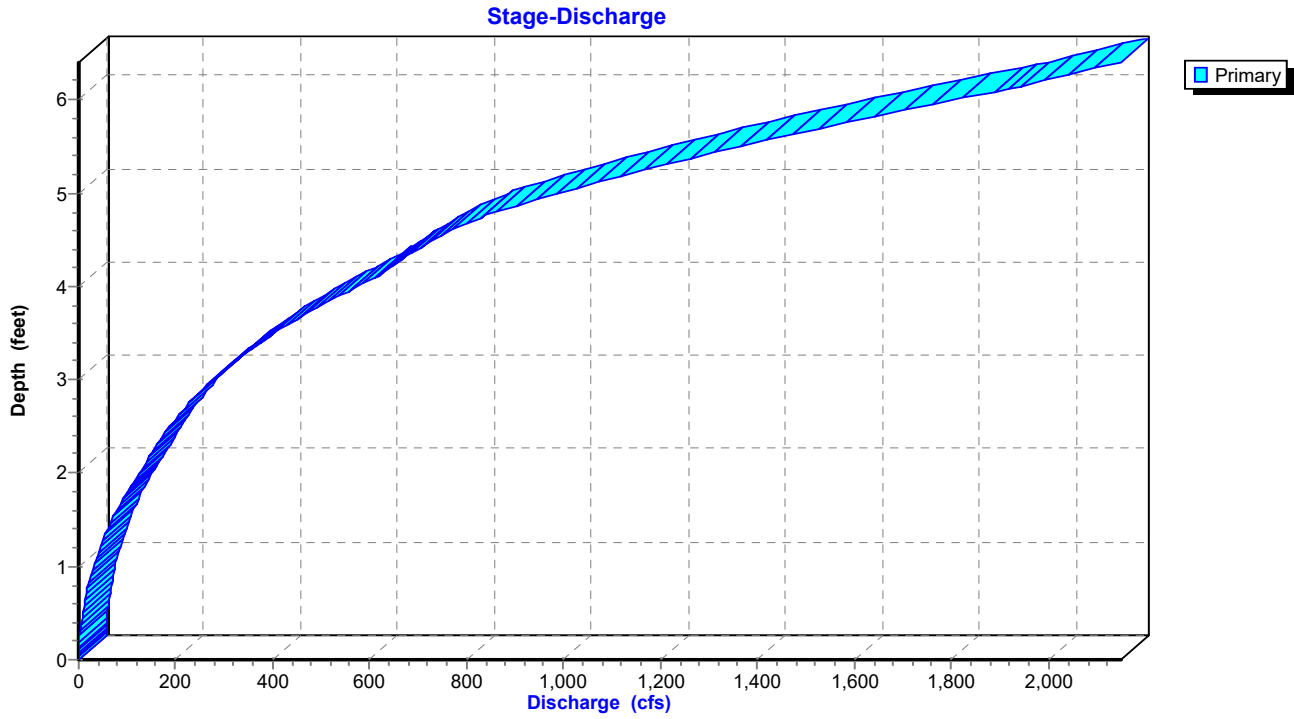Prepared by Schlagel and Assoc.
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## Summary for Link 5L: RP-2

Inflow Area =        6.420 ac,    0.00% Impervious,  Inflow Depth =   1.37"    for  2-Year event
Inflow      =      10.50 cfs @   12.10 hrs,  Volume=            0.730 af
Primary   =      10.50 cfs @   12.10 hrs,  Volume=            0.730 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 5L: RP-2

**Hydrograph**



Inflow Area=6.420 ac

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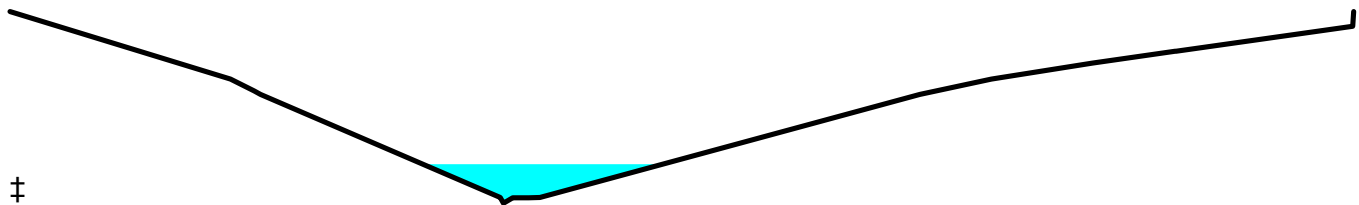Printed  4/15/2022
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## Summary for Link 6L: RP-4

Inflow Area =       83.250 ac,    0.00% Impervious,  Inflow Depth =   1.43"    for  2-Year event
Inflow      =      82.34 cfs @   12.46 hrs,  Volume=            9.924 af
Primary     =      82.34 cfs @   12.46 hrs,  Volume=            9.924 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 6L: RP-4

**Hydrograph**

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## Summary for Link 7L: RP-3

Inflow Area =       17.540 ac,    0.00% Impervious,  Inflow Depth =   1.43"    for  2-Year event
Inflow      =      18.79 cfs @   12.32 hrs,  Volume=          2.091 af
Primary     =      18.79 cfs @   12.32 hrs,  Volume=          2.091 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 7L: RP-3



Hydrograph

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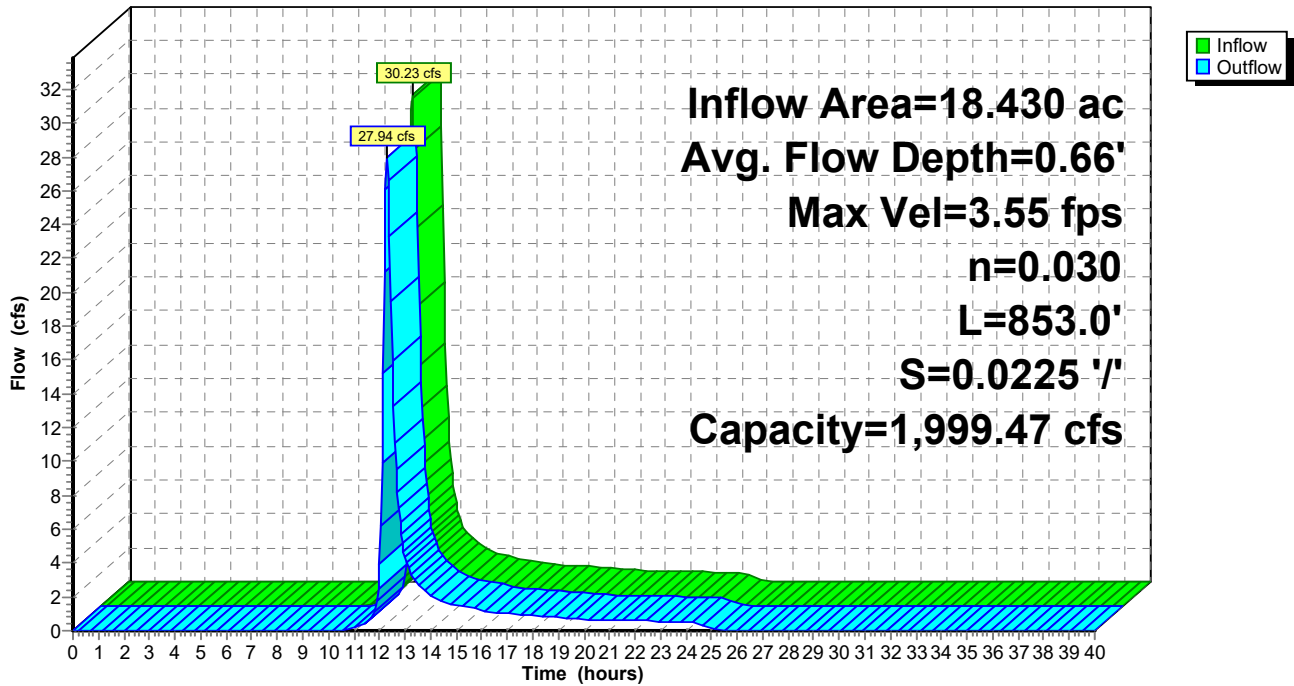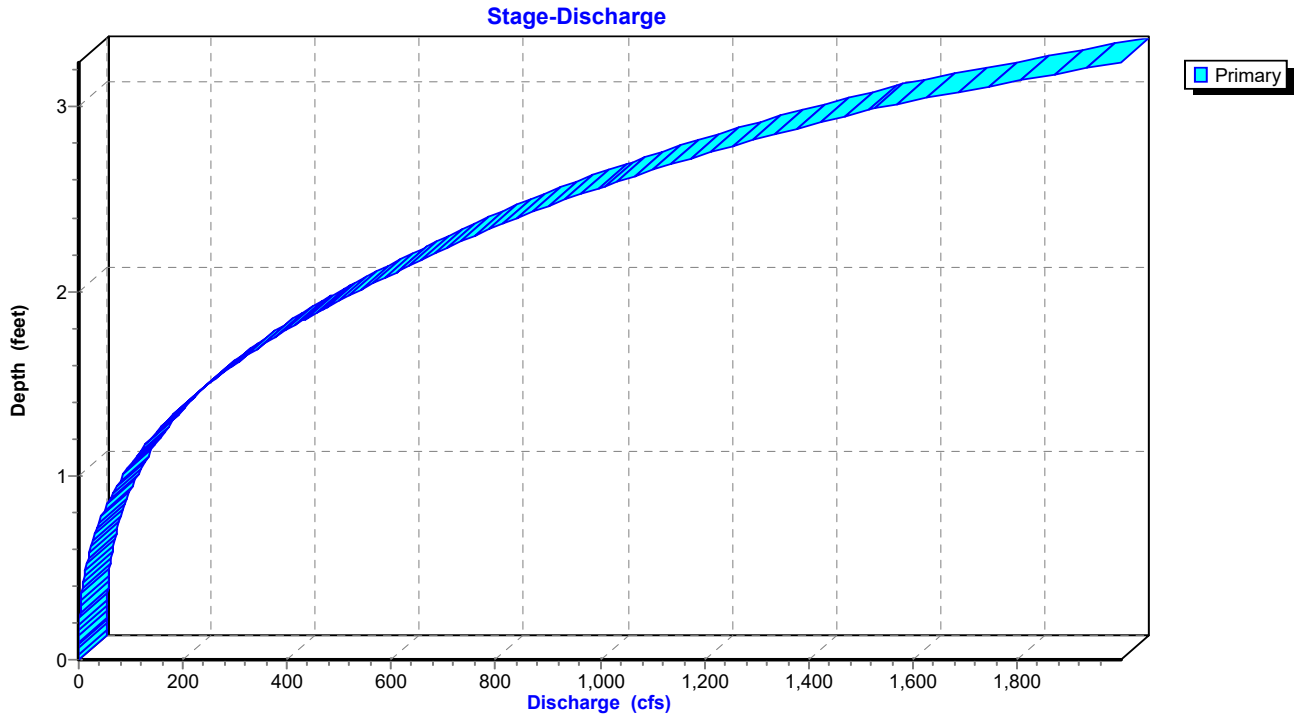Bailey Farms - PreDeveloped
*Type II 24-hr  10-Year Rainfall=5.30"*
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Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method  -  Pond routing by Stor-Ind method

**Subcatchment1S: EXIST. ON-SITE #1**     Runoff Area=64.820 ac   0.00% Impervious   Runoff Depth=2.88"
Flow Length=3,450'  Tc=47.2 min   CN=77   Runoff=118.07 cfs  15.535 af

**Subcatchment3S: EXIST. OFF-SITE #1**     Runoff Area=18.430 ac   0.00% Impervious   Runoff Depth=2.88"
Flow Length=1,147'  Slope=0.0210 '/'  Tc=17.1 min   CN=77   Runoff=63.84 cfs  4.417 af

**Subcatchment4S: EXIST. ON-SITE #2**     Runoff Area=6.420 ac   0.00% Impervious   Runoff Depth=2.78"
Flow Length=1,020'  Slope=0.0300 '/'  Tc=16.7 min   CN=76   Runoff=21.81 cfs  1.490 af

**Subcatchment8S: EXIST. ON-SITE #3**     Runoff Area=17.540 ac   0.00% Impervious   Runoff Depth=2.88"
Flow Length=1,930'  Tc=35.6 min   CN=77   Runoff=38.90 cfs  4.204 af

**Reach 3R: Reach 3**     Avg. Flow Depth=1.35'  Max Vel=4.36 fps  Inflow=58.82 cfs  4.417 af
n=0.030   L=1,041.0'  S=0.0088 '/'  Capacity=2,150.14 cfs  Outflow=55.15 cfs  4.417 af

**Reach 4R: Reach 2**     Avg. Flow Depth=0.87'  Max Vel=4.28 fps  Inflow=61.90 cfs  4.417 af
n=0.030   L=853.0'  S=0.0225 '/'  Capacity=1,999.47 cfs  Outflow=58.82 cfs  4.417 af

**Reach 8R: Reach 1**     Avg. Flow Depth=0.38'  Max Vel=6.50 fps  Inflow=63.84 cfs  4.417 af
n=0.012   L=875.0'  S=0.0147 '/'  Capacity=1,475.63 cfs  Outflow=61.90 cfs  4.417 af

**Link 2L: RP-1**     Inflow=213.45 cfs  25.645 af
Primary=213.45 cfs  25.645 af

**Link 5L: RP-2**     Inflow=21.81 cfs  1.490 af
Primary=21.81 cfs  1.490 af

**Link 6L: RP-4**     Inflow=170.41 cfs  19.951 af
Primary=170.41 cfs  19.951 af

**Link 7L: RP-3**     Inflow=38.90 cfs  4.204 af
Primary=38.90 cfs  4.204 af

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## Summary for Subcatchment 1S: EXIST. ON-SITE #1

Runoff     =     118.07 cfs @  12.46 hrs,  Volume=          15.535 af,  Depth= 2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr  10-Year Rainfall=5.30"

| Area (ac) | CN | Description |
|---|---|---|
| 34.840 | 74 | Pasture/grassland/range, Good, HSG C |
| 29.980 | 80 | Pasture/grassland/range, Good, HSG D |
| 64.820 | 77 | Weighted Average |
| 64.820 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 24.7 | 2,132 | 0.0255 | 1.44 | | **Shallow Concentrated Flow,** Cultivated Straight Rows   Kv= 9.0 fps |
| 14.1 | 1,218 | 0.0092 | 1.44 | | **Shallow Concentrated Flow,** Grassed Waterway   Kv= 15.0 fps |
| 47.2 | 3,450 | | | | Total |

### Subcatchment 1S: EXIST. ON-SITE #1

**Hydrograph**



Type II 24-hr
10-Year Rainfall=5.30"
Runoff Area=64.820 ac
Runoff Volume=15.535 af
Runoff Depth=2.88"
Flow Length=3,450'
Tc=47.2 min
CN=77

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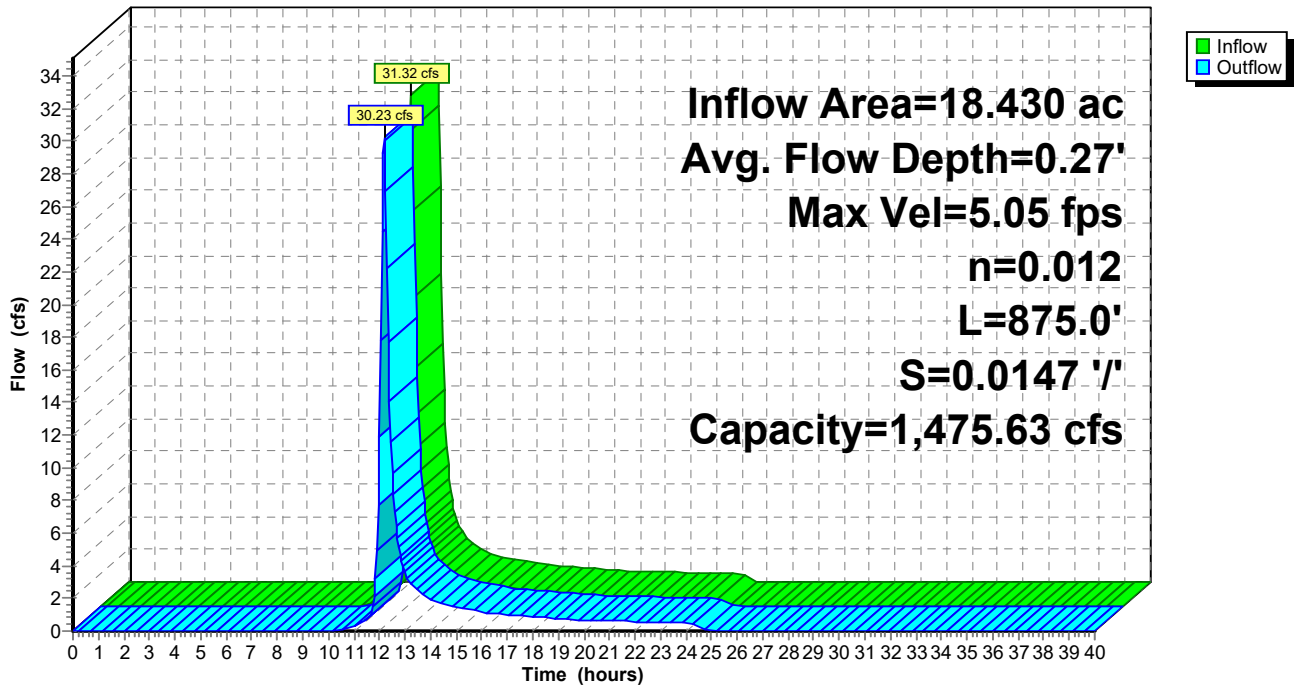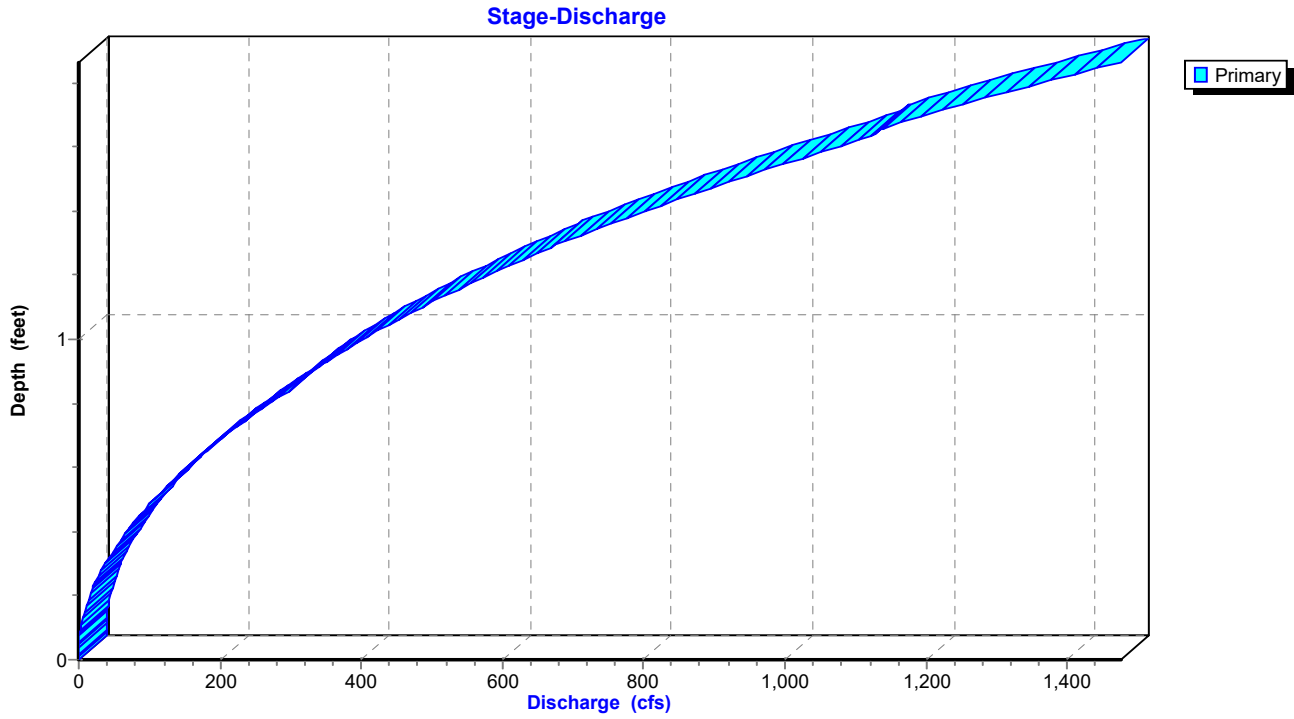Bailey Farms - PreDeveloped
*Type II 24-hr  10-Year Rainfall=5.30"*
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## Summary for Subcatchment 3S: EXIST. OFF-SITE #1

Runoff     =     63.84 cfs @  12.10 hrs,  Volume=          4.417 af,  Depth=  2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr  10-Year Rainfall=5.30"

| Area (ac) | CN | Description |
|---|---|---|
| 15.640 | 76 | Woods/grass comb., Fair, HSG C |
| 2.790 | 82 | Woods/grass comb., Fair, HSG D |
| 18.430 | 77 | Weighted Average |
| 18.430 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.1 | 100 | 0.0210 | 0.18 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 8.0 | 1,047 | 0.0210 | 2.17 | | **Shallow Concentrated Flow,** Grassed Waterway   Kv= 15.0 fps |
| 17.1 | 1,147 | | | | Total |

### Subcatchment 3S: EXIST. OFF-SITE #1

**Hydrograph**



Type II 24-hr
10-Year Rainfall=5.30"
Runoff Area=18.430 ac
Runoff Volume=4.417 af
Runoff Depth=2.88"
Flow Length=1,147'
Slope=0.0210 '/'
Tc=17.1 min
CN=77

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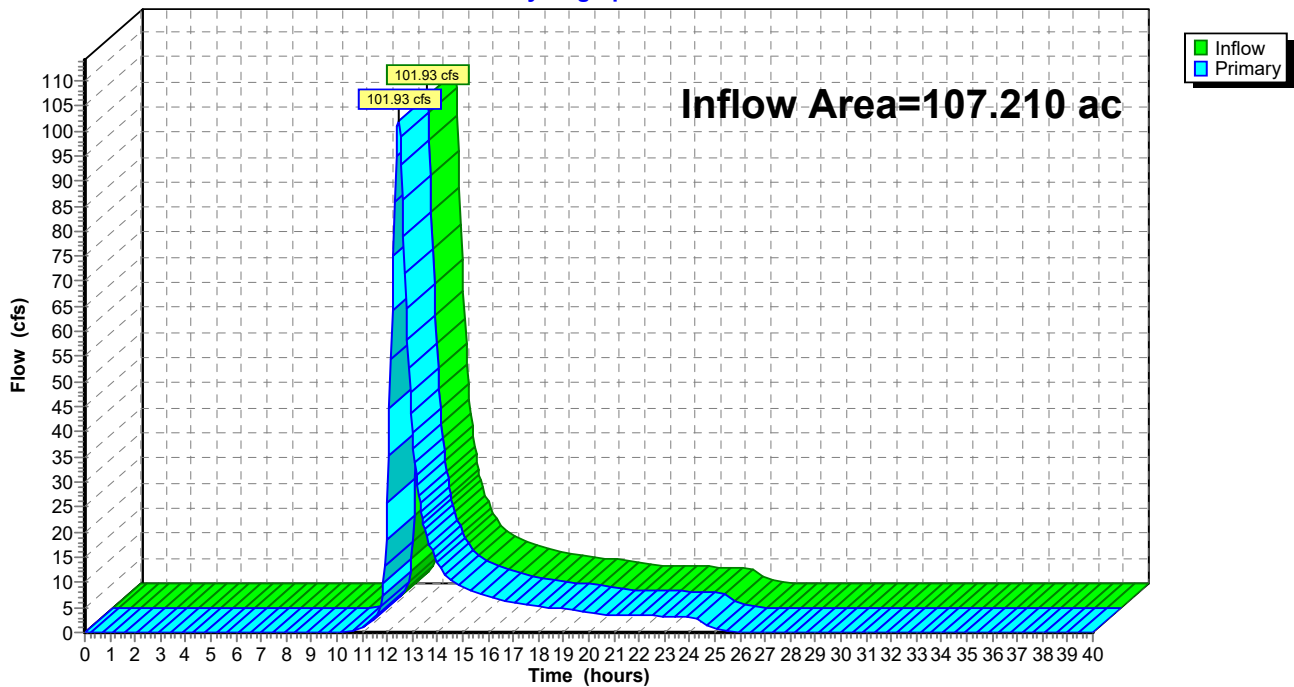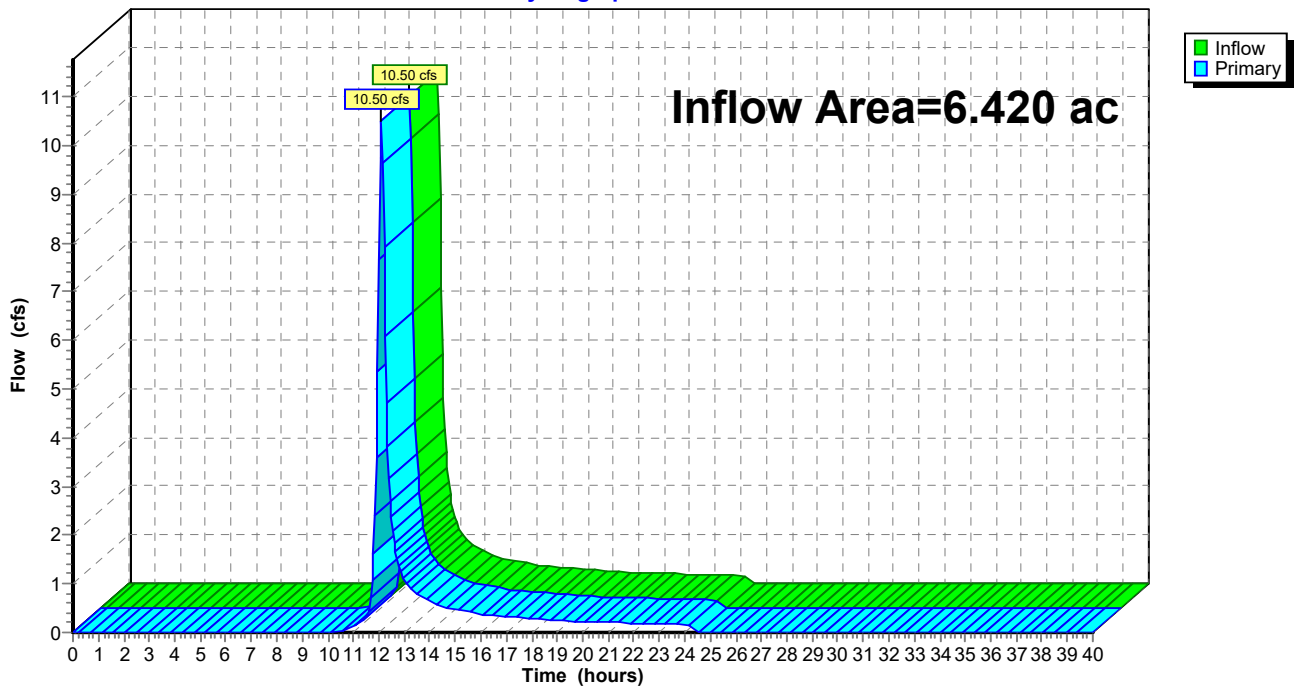Printed  4/15/2022
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## Summary for Subcatchment 4S: EXIST. ON-SITE #2

Runoff     =       21.81 cfs @  12.09 hrs,  Volume=          1.490 af,  Depth=  2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr  10-Year Rainfall=5.30"

| Area (ac) | CN | Description |
|---|---|---|
| 4.200 | 74 | Pasture/grassland/range, Good, HSG C |
| 2.220 | 80 | Pasture/grassland/range, Good, HSG D |
| 6.420 | 76 | Weighted Average |
| 6.420 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.6 | 80 | 0.0300 | 0.20 | | **Sheet Flow,** |
| | | | | | Grass: Short   n= 0.150   P2= 3.60" |
| 10.1 | 940 | 0.0300 | 1.56 | | **Shallow Concentrated Flow,** |
| | | | | | Cultivated Straight Rows   Kv= 9.0 fps |
| 16.7 | 1,020 | | | | Total |

## Subcatchment 4S: EXIST. ON-SITE #2

**Hydrograph**



Type II 24-hr
10-Year Rainfall=5.30"
Runoff Area=6.420 ac
Runoff Volume=1.490 af
Runoff Depth=2.78"
Flow Length=1,020'
Slope=0.0300 '/'
Tc=16.7 min
CN=76

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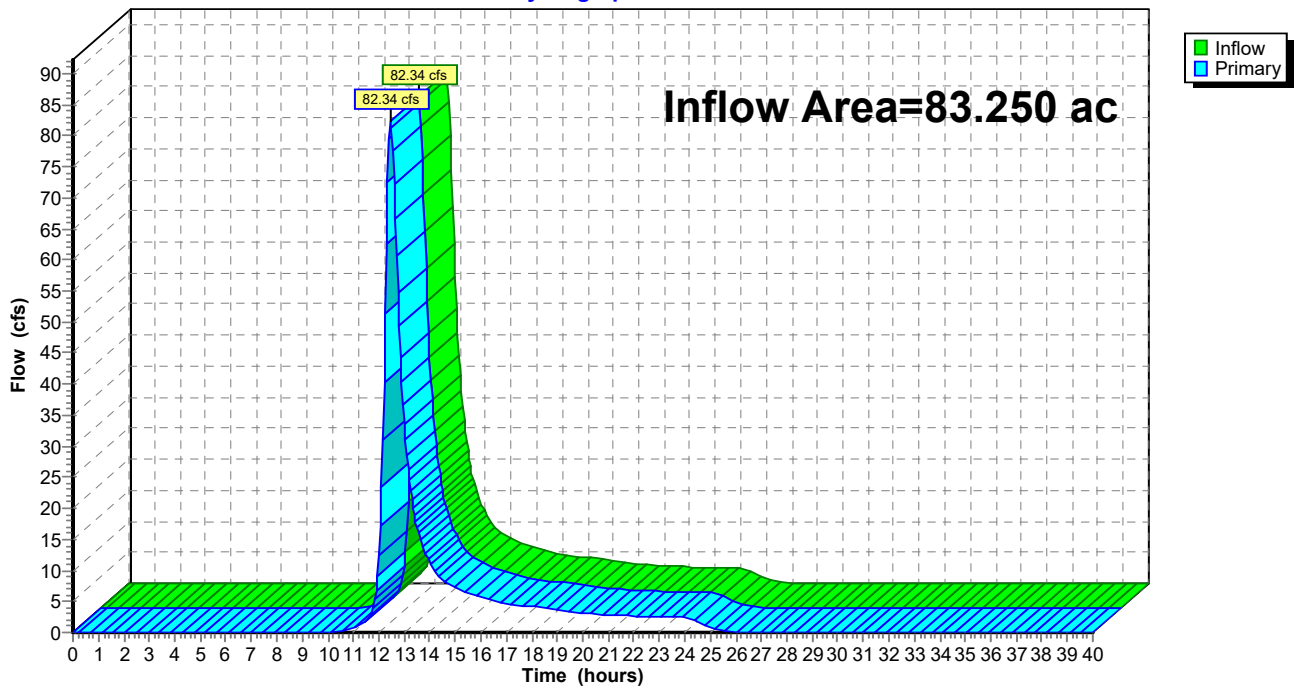*Type II 24-hr  10-Year Rainfall=5.30"*
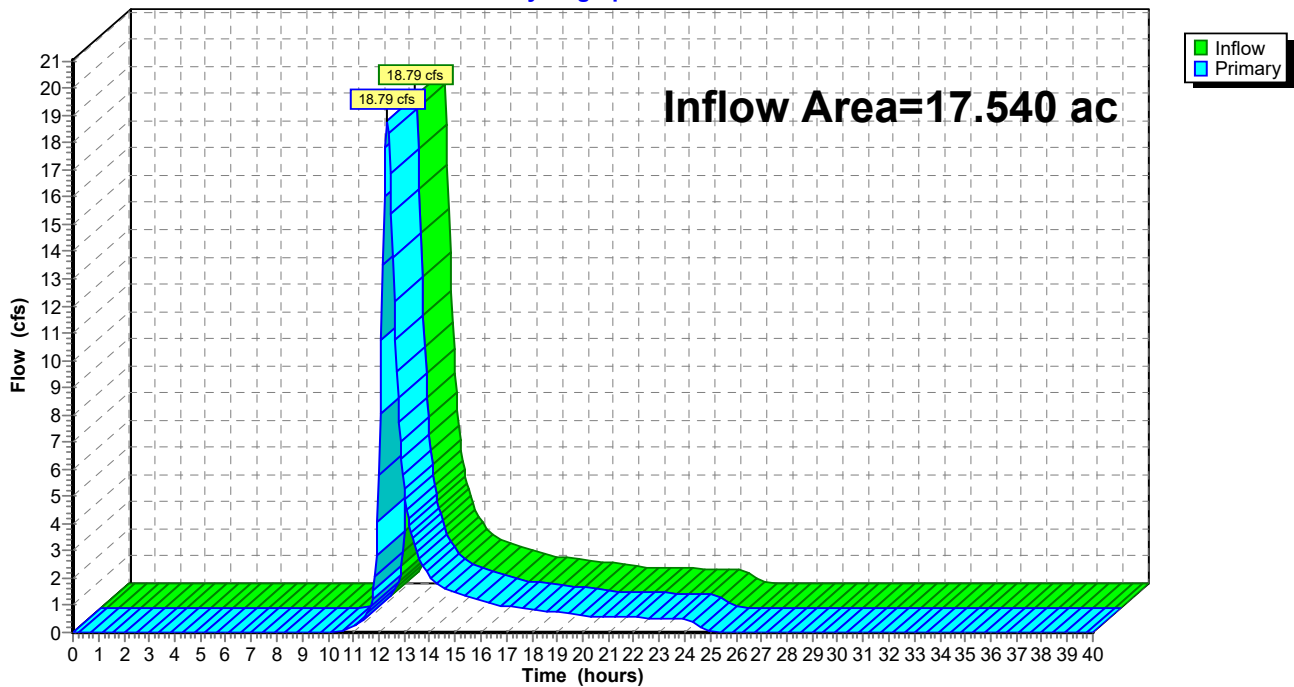Printed  4/15/2022
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## Summary for Subcatchment 8S: EXIST. ON-SITE #3

Runoff      =         38.90 cfs @  12.31 hrs,  Volume=            4.204 af,  Depth=  2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr  10-Year Rainfall=5.30"

| Area (ac) | CN | Description |
|---|---|---|
| 9.830 | 74 | Pasture/grassland/range, Good, HSG C |
| 7.710 | 80 | Pasture/grassland/range, Good, HSG D |
| 17.540 | 77 | Weighted Average |
| 17.540 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.3 | 100 | 0.0265 | 0.20 | | **Sheet Flow,** |
| | | | | | Grass: Short   n= 0.150   P2= 3.60" |
| 27.3 | 1,830 | 0.0255 | 1.12 | | **Shallow Concentrated Flow,** |
| | | | | | Short Grass Pasture   Kv= 7.0 fps |
| 35.6 | 1,930 | Total | | | |

## Subcatchment 8S: EXIST. ON-SITE #3

**Hydrograph**



Type II 24-hr
10-Year Rainfall=5.30"
Runoff Area=17.540 ac
Runoff Volume=4.204 af
Runoff Depth=2.88"
Flow Length=1,930'
Tc=35.6 min
CN=77

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## Summary for Reach 3R: Reach 3

Inflow Area =        18.430 ac,    0.00% Impervious,  Inflow Depth =  2.88"    for  10-Year event
Inflow      =      58.82 cfs @  12.26 hrs,  Volume=          4.417 af
Outflow     =      55.15 cfs @  12.37 hrs,  Volume=          4.417 af,  Atten= 6%,  Lag= 7.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.36 fps,  Min. Travel Time= 4.0 min
Avg. Velocity = 1.06 fps,  Avg. Travel Time= 16.4 min

Peak Storage= 13,333 cf @ 12.31 hrs
Average Depth at Peak Storage= 1.35'
Bank-Full Depth= 6.40'  Flow Area= 252.4 sf,  Capacity= 2,150.14 cfs

Custom cross-section,  Length= 1,041.0'   Slope= 0.0088 '/'   (110 Elevation Intervals)
Constant n= 0.030  Earth, grassed & winding
Inlet Invert= 989.92',  Outlet Invert= 980.77'



‡

| Offset | Elevation | Chan.Depth |
|-------:|----------:|-----------:|
| (feet) | (feet) | (feet) |
| 0.00 | 996.29 | 0.00 |
| 7.00 | 996.00 | 0.29 |
| 12.99 | 994.06 | 2.23 |
| 13.24 | 994.00 | 2.29 |
| 14.48 | 993.84 | 2.45 |
| 28.84 | 992.00 | 4.29 |
| 29.66 | 991.71 | 4.58 |
| 36.75 | 990.00 | 6.29 |
| 39.18 | 989.92 | 6.37 |
| 39.90 | 989.89 | 6.40 |
| 42.20 | 989.97 | 6.32 |
| 43.14 | 990.00 | 6.29 |
| 43.91 | 990.40 | 5.89 |
| 46.34 | 992.00 | 4.29 |
| 53.90 | 993.41 | 2.88 |
| 56.74 | 994.00 | 2.29 |
| 62.76 | 994.22 | 2.07 |
| 76.31 | 994.65 | 1.64 |
| 100.00 | 996.29 | 0.00 |

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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.03 | 0.0 | 1.6 | 25 | 0.01 |
| 0.08 | 0.2 | 4.5 | 184 | 0.09 |
| 0.11 | 0.3 | 6.4 | 355 | 0.22 |
| 0.51 | 3.4 | 9.0 | 3,521 | 8.20 |
| 1.82 | 19.8 | 16.9 | 20,607 | 102.00 |
| 2.11 | 24.7 | 18.3 | 25,700 | 139.72 |
| 3.52 | 62.5 | 37.1 | 65,011 | 410.25 |
| 3.95 | 79.1 | 42.6 | 82,369 | 555.08 |
| 4.11 | 85.9 | 44.7 | 89,447 | 617.31 |
| 4.17 | 88.6 | 46.6 | 92,223 | 631.78 |
| 4.33 | 96.2 | 51.5 | 100,189 | 678.51 |
| 4.76 | 121.1 | 66.4 | 126,018 | 838.92 |
| 6.11 | 225.0 | 90.3 | 234,197 | 1,919.54 |
| 6.40 | 252.4 | 101.5 | 262,697 | 2,150.14 |

### Reach 3R: Reach 3

**Hydrograph**



Inflow Area=18.430 ac
Avg. Flow Depth=1.35'
Max Vel=4.36 fps
n=0.030
L=1,041.0'
S=0.0088 '/'
Capacity=2,150.14 cfs

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## Reach 3R: Reach 3



**Stage-Discharge**

Legend: Primary

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## Summary for Reach 4R: Reach 2

Inflow Area =        18.430 ac,   0.00% Impervious,  Inflow Depth =  2.88"    for  10-Year event
Inflow      =      61.90 cfs @  12.16 hrs,  Volume=            4.417 af
Outflow     =      58.82 cfs @  12.26 hrs,  Volume=            4.417 af,  Atten= 5%,  Lag= 5.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.28 fps,  Min. Travel Time= 3.3 min
Avg. Velocity = 1.45 fps,  Avg. Travel Time= 9.8 min

Peak Storage= 11,793 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.87'
Bank-Full Depth= 3.24'  Flow Area= 204.3 sf,  Capacity= 1,999.47 cfs

Custom cross-section,  Length= 853.0'   Slope= 0.0225 '/'   (106 Elevation Intervals)
Constant n= 0.030  Earth, grassed & winding
Inlet Invert= 1,009.12',  Outlet Invert= 989.90'

‡

| Offset | Elevation | Chan.Depth |
|--------|-----------|------------|
| (feet) | (feet) | (feet) |
| 0.00 | 1,009.14 | 0.00 |
| 22.15 | 1,008.00 | 1.14 |
| 24.54 | 1,007.80 | 1.34 |
| 25.18 | 1,007.74 | 1.40 |
| 49.26 | 1,006.00 | 3.14 |
| 49.59 | 1,005.90 | 3.24 |
| 50.51 | 1,005.99 | 3.15 |
| 52.13 | 1,005.99 | 3.15 |
| 53.24 | 1,006.00 | 3.14 |
| 91.41 | 1,007.74 | 1.40 |
| 98.60 | 1,008.00 | 1.14 |
| 108.78 | 1,008.27 | 0.87 |
| 117.07 | 1,008.47 | 0.67 |
| 117.16 | 1,008.47 | 0.67 |
| 134.91 | 1,008.89 | 0.25 |
| 135.00 | 1,009.14 | 0.00 |

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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.09 | 0.1 | 2.9 | 47 | 0.03 |
| 0.10 | 0.1 | 4.0 | 77 | 0.06 |
| 1.84 | 61.2 | 66.4 | 52,179 | 430.84 |
| 1.90 | 65.2 | 68.7 | 55,628 | 468.55 |
| 2.10 | 79.7 | 76.6 | 67,995 | 608.70 |
| 2.37 | 102.4 | 92.0 | 87,382 | 818.03 |
| 2.57 | 122.0 | 104.3 | 104,091 | 1,007.45 |
| 2.99 | 171.2 | 130.2 | 146,042 | 1,527.76 |
| 3.24 | 204.3 | 135.4 | 174,303 | 1,999.47 |

### Reach 4R: Reach 2

**Hydrograph**



Inflow Area=18.430 ac
Avg. Flow Depth=0.87'
Max Vel=4.28 fps
n=0.030
L=853.0'
S=0.0225 '/'
Capacity=1,999.47 cfs

61.90 cfs
58.82 cfs

Inflow
Outflow

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# Reach 4R: Reach 2

**Stage-Discharge**

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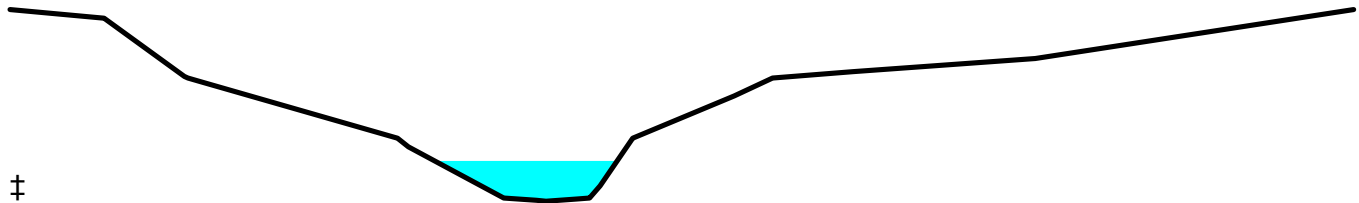Printed  4/15/2022
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## Summary for Reach 8R: Reach 1

Inflow Area =        18.430 ac,   0.00% Impervious,  Inflow Depth =  2.88"    for  10-Year event
Inflow        =      63.84 cfs @  12.10 hrs,  Volume=            4.417 af
Outflow      =      61.90 cfs @  12.16 hrs,  Volume=            4.417 af,  Atten= 3%,  Lag= 3.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.50 fps,  Min. Travel Time= 2.2 min
Avg. Velocity = 1.61 fps,  Avg. Travel Time= 9.1 min

Peak Storage= 8,403 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 1.86'  Flow Area= 89.8 sf,  Capacity= 1,475.63 cfs

Custom cross-section,  Length= 875.0'   Slope= 0.0147 '/'   (108 Elevation Intervals)
Constant n= 0.012  Concrete pipe, finished
Inlet Invert= 1,021.96',  Outlet Invert= 1,009.12'

‡

| Offset | Elevation | Chan.Depth |
|---:|---:|---:|
| (feet) | (feet) | (feet) |
| 6.08 | 1,023.78 | 0.00 |
| 9.16 | 1,023.55 | 0.23 |
| 11.33 | 1,023.58 | 0.20 |
| 11.39 | 1,023.57 | 0.21 |
| 15.58 | 1,023.21 | 0.57 |
| 22.68 | 1,022.85 | 0.93 |
| 26.25 | 1,022.76 | 1.02 |
| 30.78 | 1,022.00 | 1.78 |
| 35.77 | 1,021.93 | 1.85 |
| 36.49 | 1,021.92 | 1.86 |
| 37.38 | 1,021.93 | 1.85 |
| 42.61 | 1,021.97 | 1.81 |
| 45.38 | 1,021.97 | 1.81 |
| 54.65 | 1,022.00 | 1.78 |
| 58.89 | 1,022.15 | 1.63 |
| 59.16 | 1,022.15 | 1.63 |
| 60.04 | 1,022.18 | 1.60 |
| 63.66 | 1,022.37 | 1.41 |
| 70.33 | 1,022.84 | 0.94 |
| 84.24 | 1,023.78 | 0.00 |

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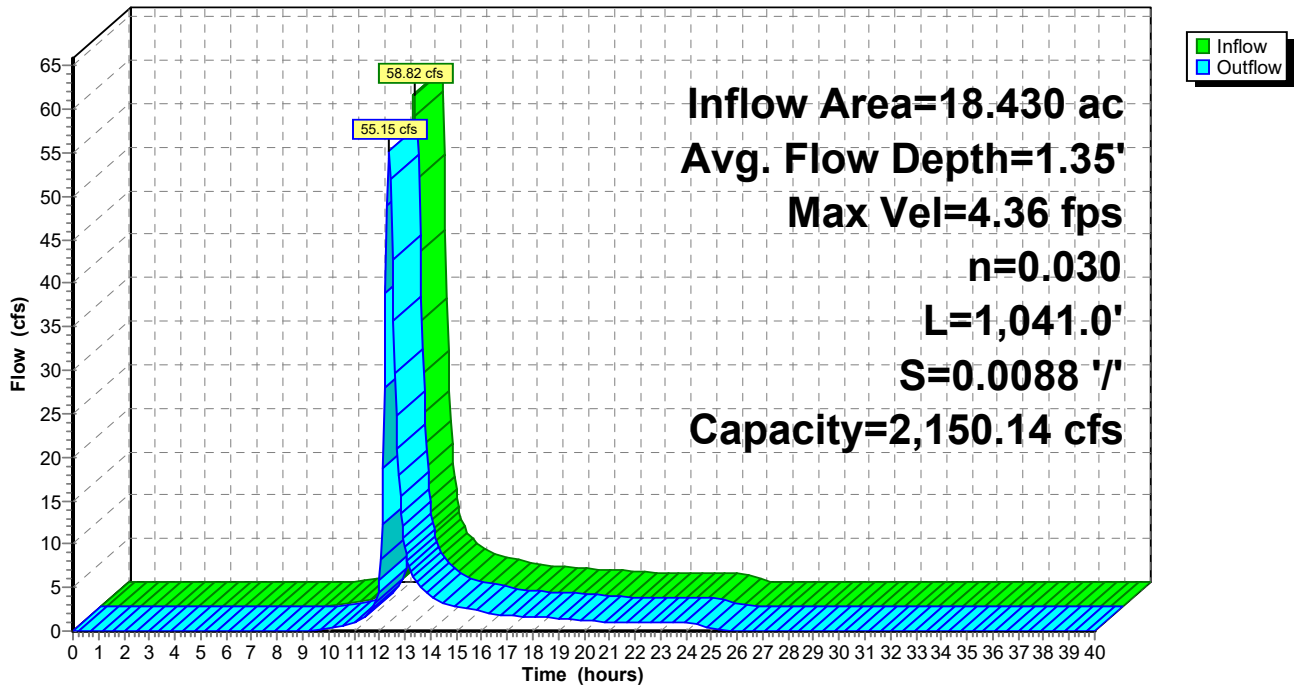*Type II 24-hr  10-Year Rainfall=5.30"*
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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.01 | 0.0 | 1.6 | 7 | 0.00 |
| 0.05 | 0.2 | 12.5 | 205 | 0.25 |
| 0.08 | 0.8 | 23.9 | 682 | 1.19 |
| 0.23 | 4.7 | 29.3 | 4,152 | 21.15 |
| 0.26 | 5.6 | 30.4 | 4,934 | 27.55 |
| 0.45 | 11.9 | 35.1 | 10,372 | 86.23 |
| 0.84 | 27.1 | 43.0 | 23,687 | 297.75 |
| 0.92 | 30.7 | 47.3 | 26,843 | 344.59 |
| 0.93 | 31.2 | 47.9 | 27,258 | 350.85 |
| 1.29 | 50.6 | 60.3 | 44,272 | 674.94 |
| 1.63 | 72.6 | 69.4 | 63,526 | 1,122.85 |
| 1.65 | 74.0 | 71.6 | 64,757 | 1,134.97 |
| 1.66 | 74.7 | 72.7 | 65,388 | 1,145.01 |
| 1.86 | 89.8 | 78.3 | 78,572 | 1,475.63 |

## Reach 8R: Reach 1

**Hydrograph**



Inflow Area=18.430 ac
Avg. Flow Depth=0.38'
Max Vel=6.50 fps
n=0.012
L=875.0'
S=0.0147 '/'
Capacity=1,475.63 cfs

**21-130-HYDRO-EX**
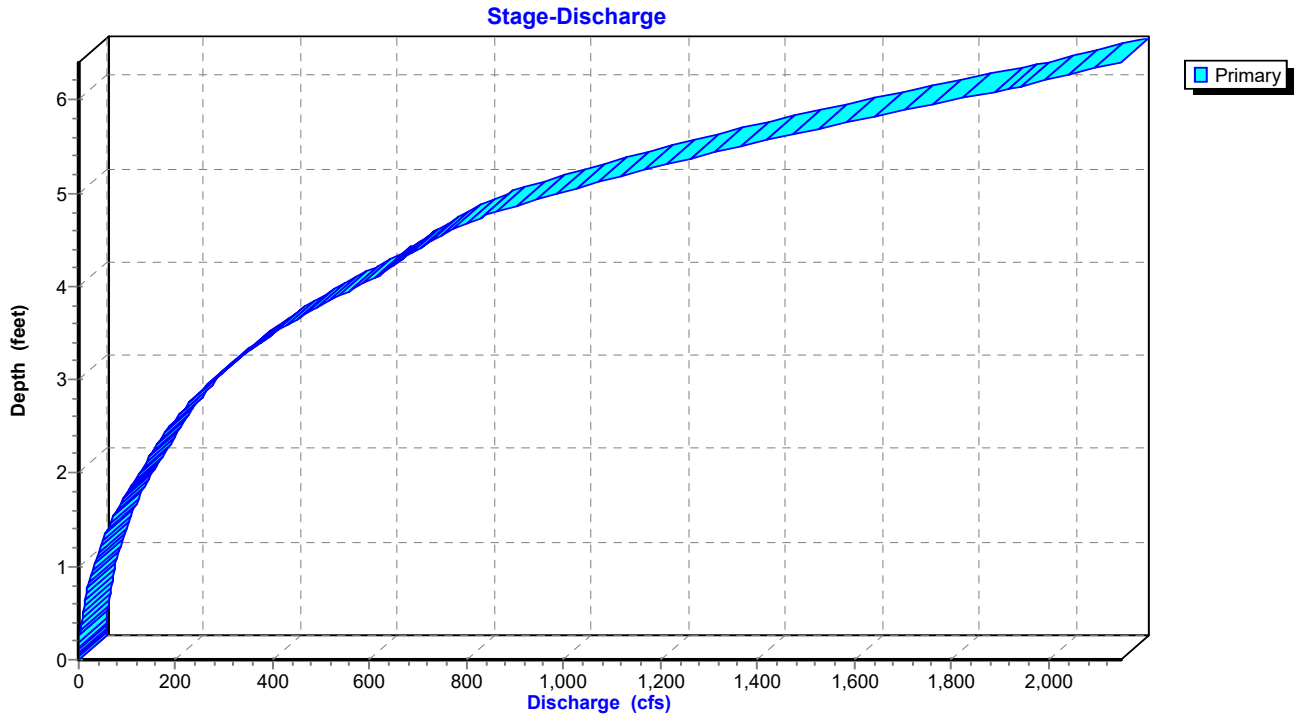Prepared by Schlagel and Assoc.
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## Reach 8R: Reach 1



Stage-Discharge

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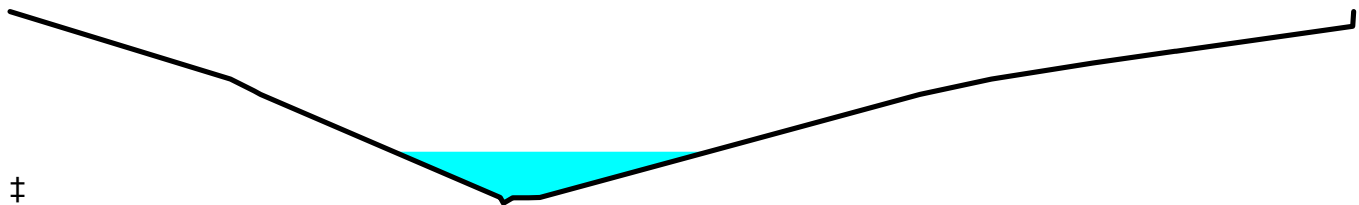Printed  4/15/2022
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## Summary for Link 2L: RP-1

Inflow Area =      107.210 ac,    0.00% Impervious,  Inflow Depth =   2.87"    for  10-Year event
Inflow      =     213.45 cfs @   12.39 hrs,  Volume=          25.645 af
Primary     =     213.45 cfs @   12.39 hrs,  Volume=          25.645 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 2L: RP-1

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## Summary for Link 5L: RP-2

Inflow Area =        6.420 ac,    0.00% Impervious,  Inflow Depth =  2.78"    for  10-Year event
Inflow     =      21.81 cfs @   12.09 hrs,  Volume=              1.490 af
Primary    =      21.81 cfs @   12.09 hrs,  Volume=              1.490 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 5L: RP-2

**Hydrograph**

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## Summary for Link 6L: RP-4

Inflow Area =        83.250 ac,    0.00% Impervious,  Inflow Depth =   2.88"    for  10-Year event
Inflow      =      170.41 cfs @   12.41 hrs,  Volume=              19.951 af
Primary    =      170.41 cfs @   12.41 hrs,  Volume=              19.951 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 6L: RP-4

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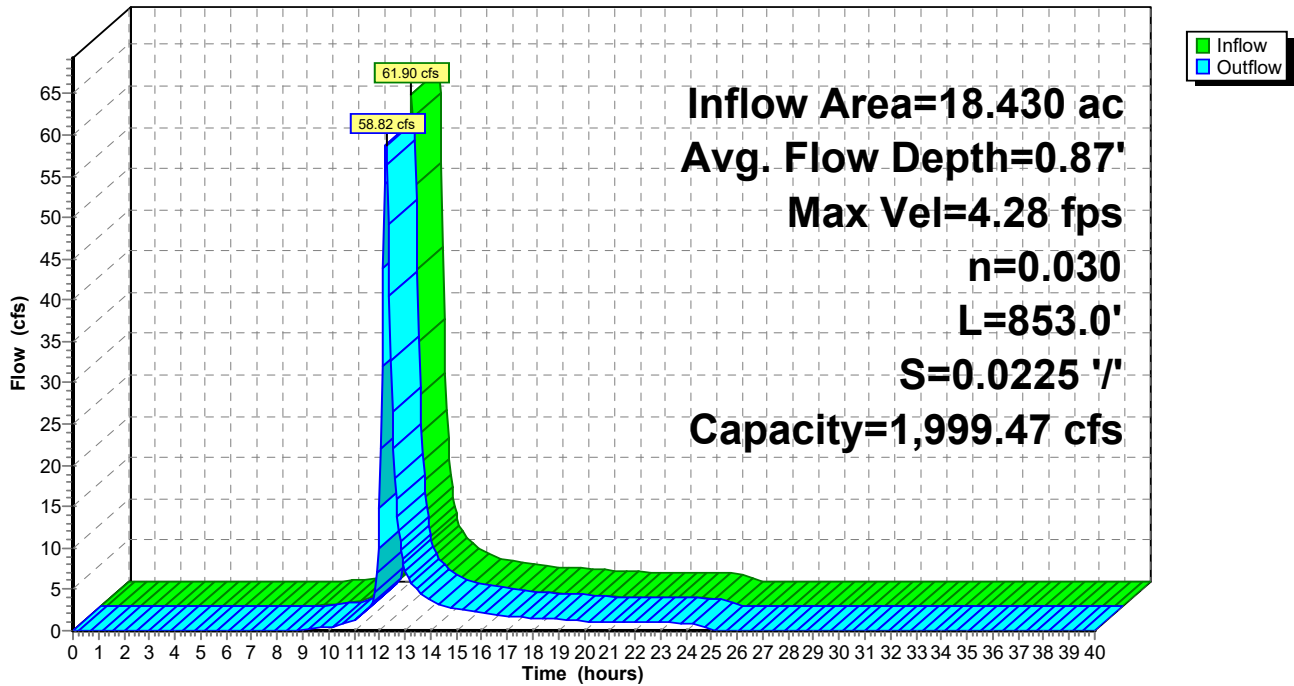*Type II 24-hr  10-Year Rainfall=5.30"*
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## Summary for Link 7L: RP-3

Inflow Area =      17.540 ac,    0.00% Impervious,  Inflow Depth =   2.88"    for  10-Year event
Inflow      =     38.90 cfs @   12.31 hrs,  Volume=          4.204 af
Primary    =     38.90 cfs @   12.31 hrs,  Volume=          4.204 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 7L: RP-3



Hydrograph

Inflow Area=17.540 ac

**21-130-HYDRO-EX**
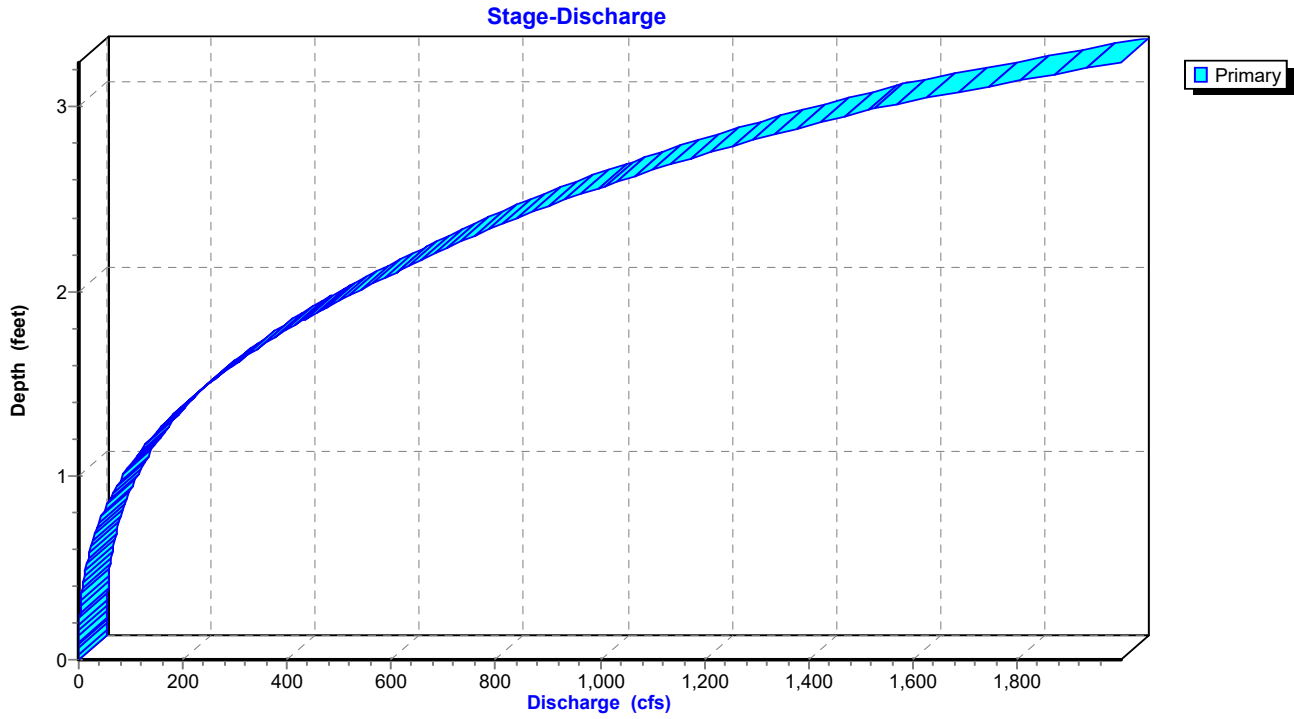Prepared by Schlagel and Assoc.
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Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method  -  Pond routing by Stor-Ind method

**Subcatchment1S: EXIST. ON-SITE #1**      Runoff Area=64.820 ac   0.00% Impervious   Runoff Depth=5.00″
Flow Length=3,450'   Tc=47.2 min   CN=77   Runoff=206.11 cfs  27.008 af

**Subcatchment3S: EXIST. OFF-SITE #1**      Runoff Area=18.430 ac   0.00% Impervious   Runoff Depth=5.00″
Flow Length=1,147'   Slope=0.0210 '/'   Tc=17.1 min   CN=77   Runoff=110.11 cfs  7.679 af

**Subcatchment4S: EXIST. ON-SITE #2**      Runoff Area=6.420 ac   0.00% Impervious   Runoff Depth=4.89″
Flow Length=1,020'   Slope=0.0300 '/'   Tc=16.7 min   CN=76   Runoff=38.02 cfs  2.614 af

**Subcatchment8S: EXIST. ON-SITE #3**      Runoff Area=17.540 ac   0.00% Impervious   Runoff Depth=5.00″
Flow Length=1,930'   Tc=35.6 min   CN=77   Runoff=67.74 cfs  7.308 af

**Reach 3R: Reach 3**      Avg. Flow Depth=1.80'   Max Vel=5.10 fps   Inflow=103.03 cfs  7.679 af
n=0.030   L=1,041.0'   S=0.0088 '/'   Capacity=2,150.14 cfs   Outflow=98.34 cfs  7.679 af

**Reach 4R: Reach 2**      Avg. Flow Depth=1.08'   Max Vel=4.91 fps   Inflow=106.97 cfs  7.679 af
n=0.030   L=853.0'   S=0.0225 '/'   Capacity=1,999.47 cfs   Outflow=103.03 cfs  7.679 af

**Reach 8R: Reach 1**      Avg. Flow Depth=0.50'   Max Vel=7.87 fps   Inflow=110.11 cfs  7.679 af
n=0.012   L=875.0'   S=0.0147 '/'   Capacity=1,475.63 cfs   Outflow=106.97 cfs  7.679 af

**Link 2L: RP-1**      Inflow=372.07 cfs  44.609 af
Primary=372.07 cfs  44.609 af

**Link 5L: RP-2**      Inflow=38.02 cfs  2.614 af
Primary=38.02 cfs  2.614 af

**Link 6L: RP-4**      Inflow=294.00 cfs  34.687 af
Primary=294.00 cfs  34.687 af

**Link 7L: RP-3**      Inflow=67.74 cfs  7.308 af
Primary=67.74 cfs  7.308 af

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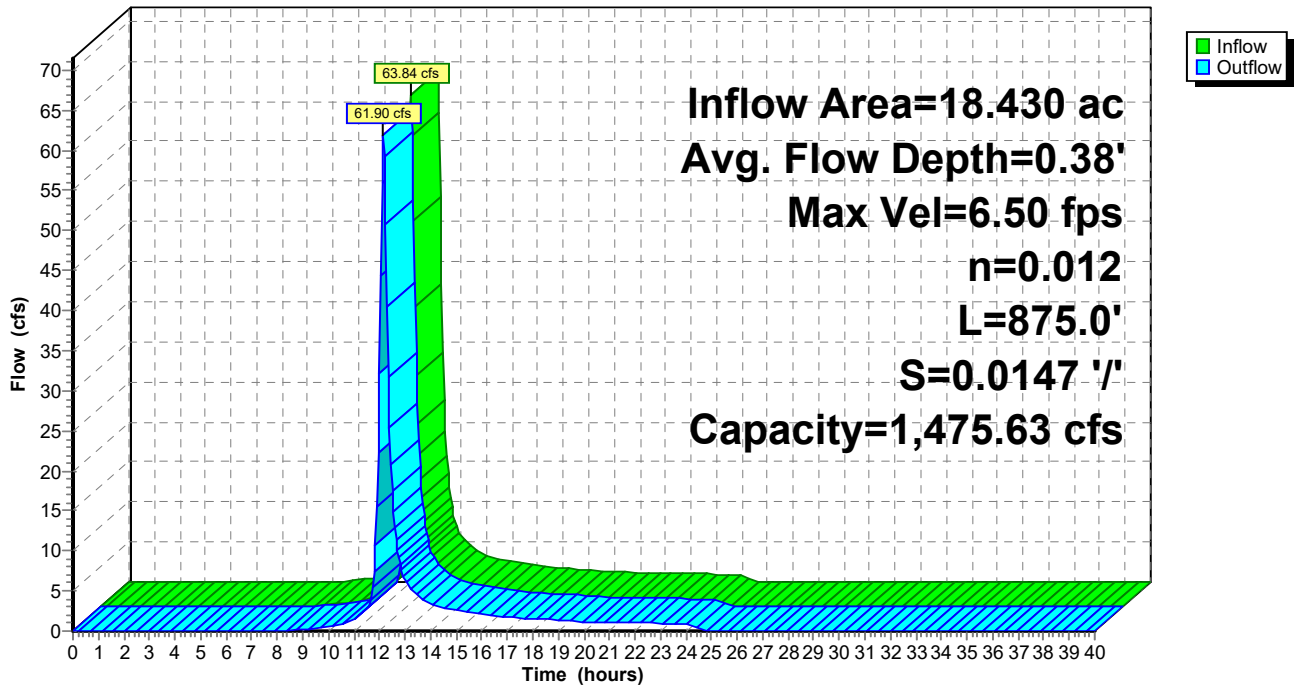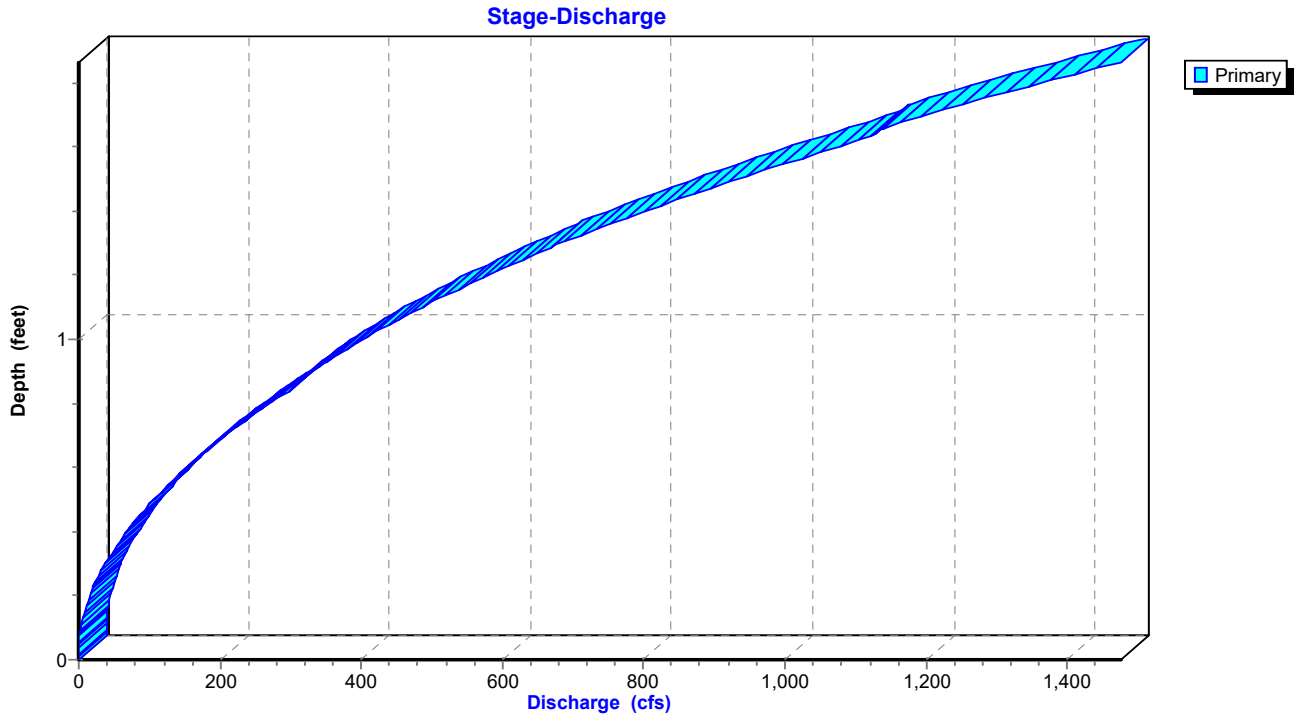Bailey Farms - PreDeveloped
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## Summary for Subcatchment 1S: EXIST. ON-SITE #1

Runoff     =     206.11 cfs @  12.45 hrs,  Volume=          27.008 af,  Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr  100-Year Rainfall=7.70"

| Area (ac) | CN | Description |
|---|---|---|
| 34.840 | 74 | Pasture/grassland/range, Good, HSG C |
| 29.980 | 80 | Pasture/grassland/range, Good, HSG D |
| 64.820 | 77 | Weighted Average |
| 64.820 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 | | **Sheet Flow,** Grass: Short  n= 0.150  P2= 3.60" |
| 24.7 | 2,132 | 0.0255 | 1.44 | | **Shallow Concentrated Flow,** Cultivated Straight Rows  Kv= 9.0 fps |
| 14.1 | 1,218 | 0.0092 | 1.44 | | **Shallow Concentrated Flow,** Grassed Waterway  Kv= 15.0 fps |
| 47.2 | 3,450 | | | | Total |

### Subcatchment 1S: EXIST. ON-SITE #1

**Hydrograph**



Type II 24-hr
100-Year Rainfall=7.70"
Runoff Area=64.820 ac
Runoff Volume=27.008 af
Runoff Depth=5.00"
Flow Length=3,450'
Tc=47.2 min
CN=77

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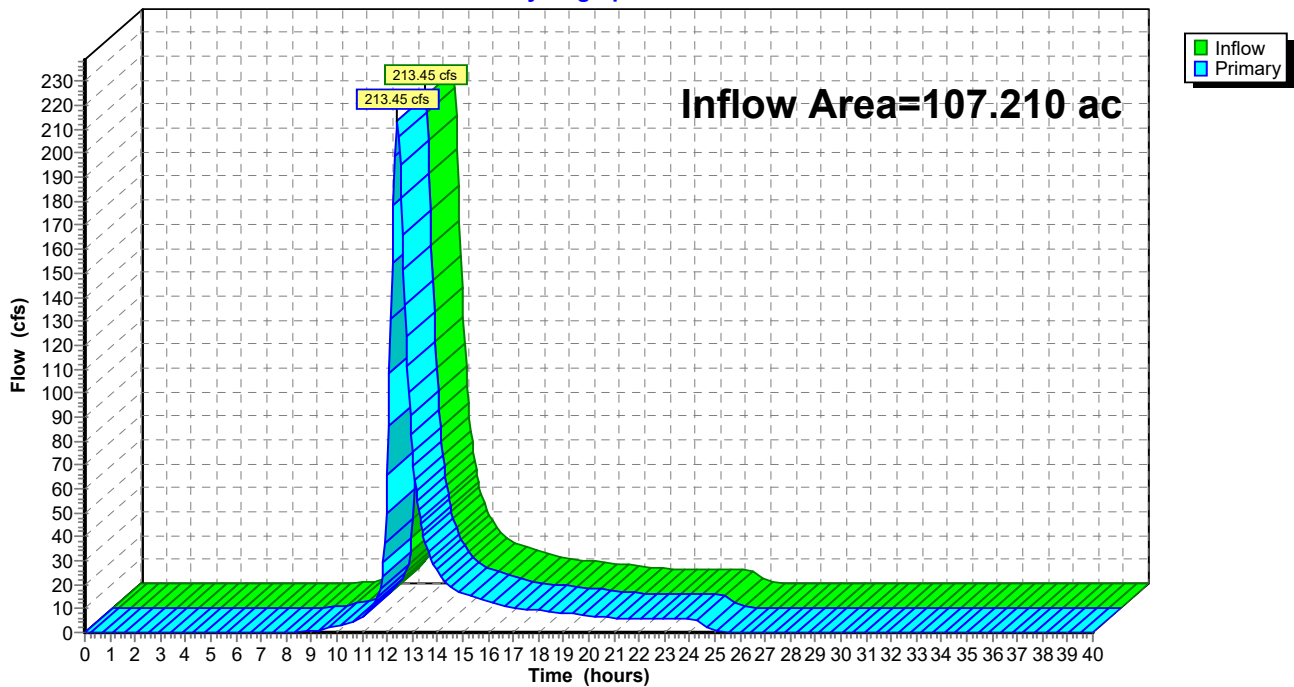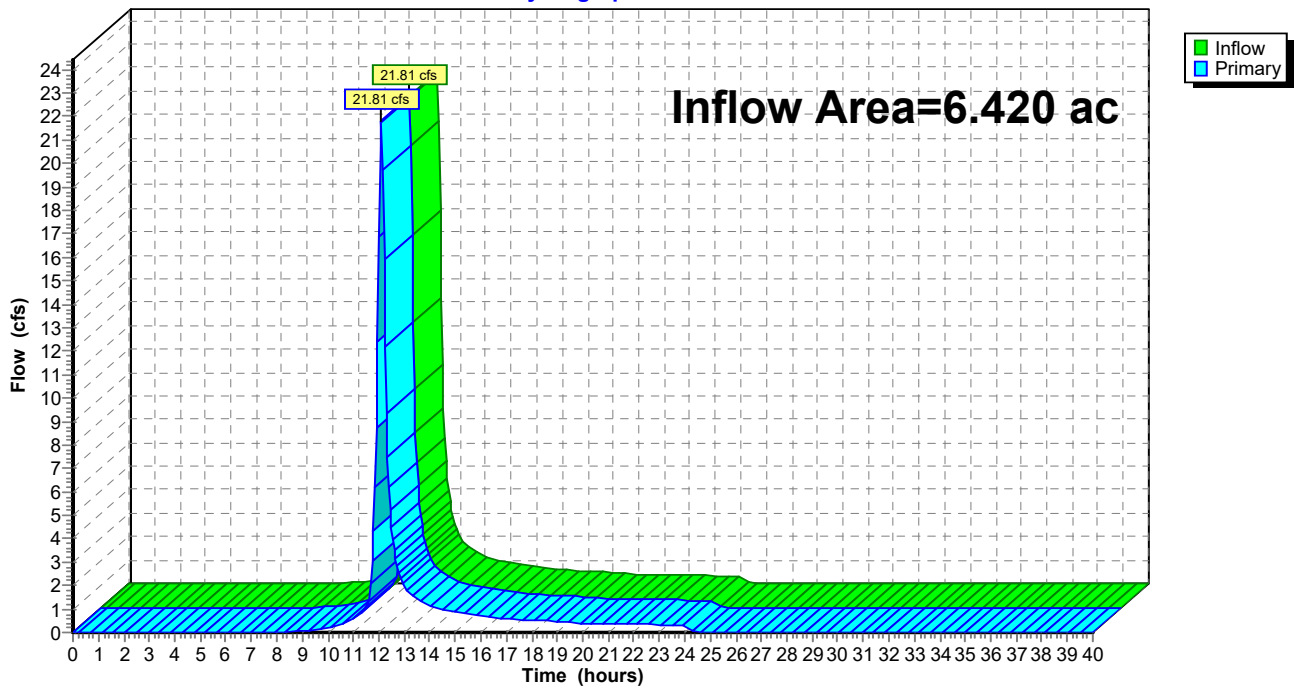*Type II 24-hr  100-Year Rainfall=7.70"*
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## Summary for Subcatchment 3S: EXIST. OFF-SITE #1

Runoff      =      110.11 cfs @  12.09 hrs,  Volume=            7.679 af,  Depth=  5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr  100-Year Rainfall=7.70"

| Area (ac) | CN | Description |
|---|---|---|
| 15.640 | 76 | Woods/grass comb., Fair, HSG C |
| 2.790 | 82 | Woods/grass comb., Fair, HSG D |
| 18.430 | 77 | Weighted Average |
| 18.430 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.1 | 100 | 0.0210 | 0.18 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 8.0 | 1,047 | 0.0210 | 2.17 | | **Shallow Concentrated Flow,** Grassed Waterway   Kv= 15.0 fps |
| 17.1 | 1,147 | | | | Total |

### Subcatchment 3S: EXIST. OFF-SITE #1

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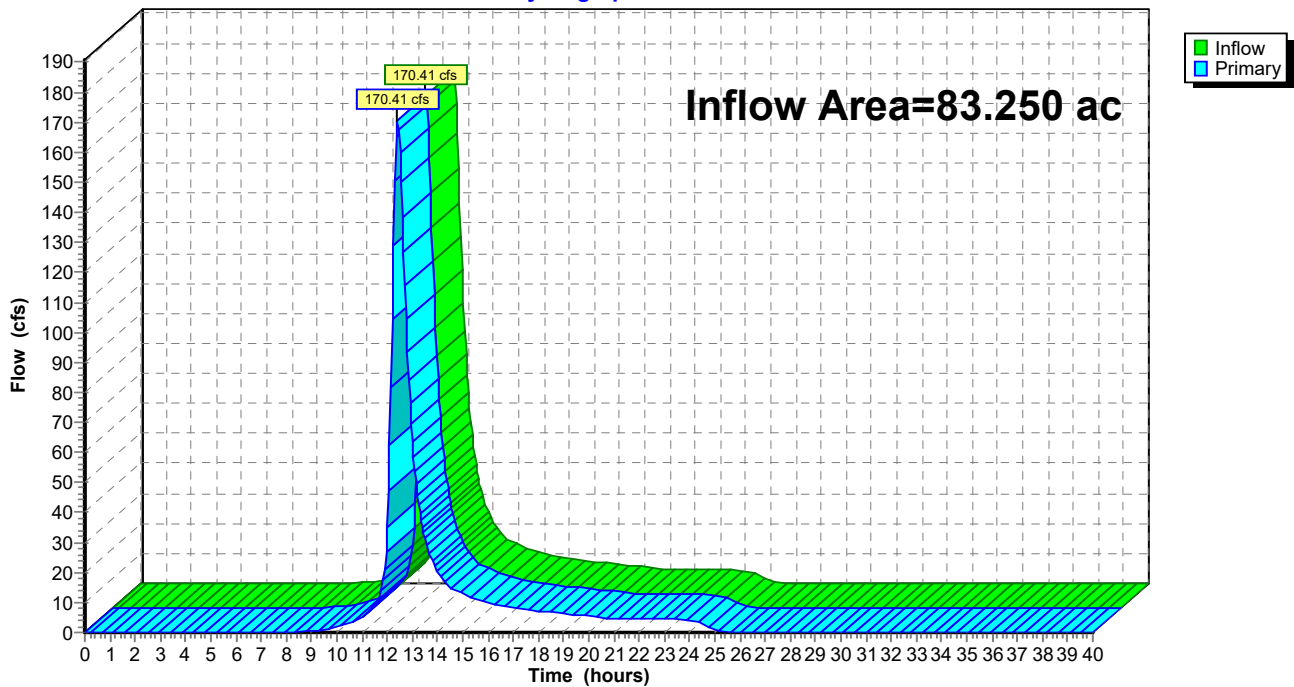*Type II 24-hr  100-Year Rainfall=7.70"*
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## Summary for Subcatchment 4S: EXIST. ON-SITE #2

Runoff      =      38.02 cfs @  12.09 hrs,  Volume=          2.614 af,  Depth=  4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr  100-Year Rainfall=7.70"

| Area (ac) | CN | Description |
|---|---|---|
| 4.200 | 74 | Pasture/grassland/range, Good, HSG C |
| 2.220 | 80 | Pasture/grassland/range, Good, HSG D |
| 6.420 | 76 | Weighted Average |
| 6.420 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.6 | 80 | 0.0300 | 0.20 | | **Sheet Flow,** |
| | | | | | Grass: Short   n= 0.150   P2= 3.60" |
| 10.1 | 940 | 0.0300 | 1.56 | | **Shallow Concentrated Flow,** |
| | | | | | Cultivated Straight Rows   Kv= 9.0 fps |
| 16.7 | 1,020 | Total | | | |

## Subcatchment 4S: EXIST. ON-SITE #2

**Hydrograph**



Type II 24-hr
100-Year Rainfall=7.70"
Runoff Area=6.420 ac
Runoff Volume=2.614 af
Runoff Depth=4.89"
Flow Length=1,020'
Slope=0.0300 '/'
Tc=16.7 min
CN=76

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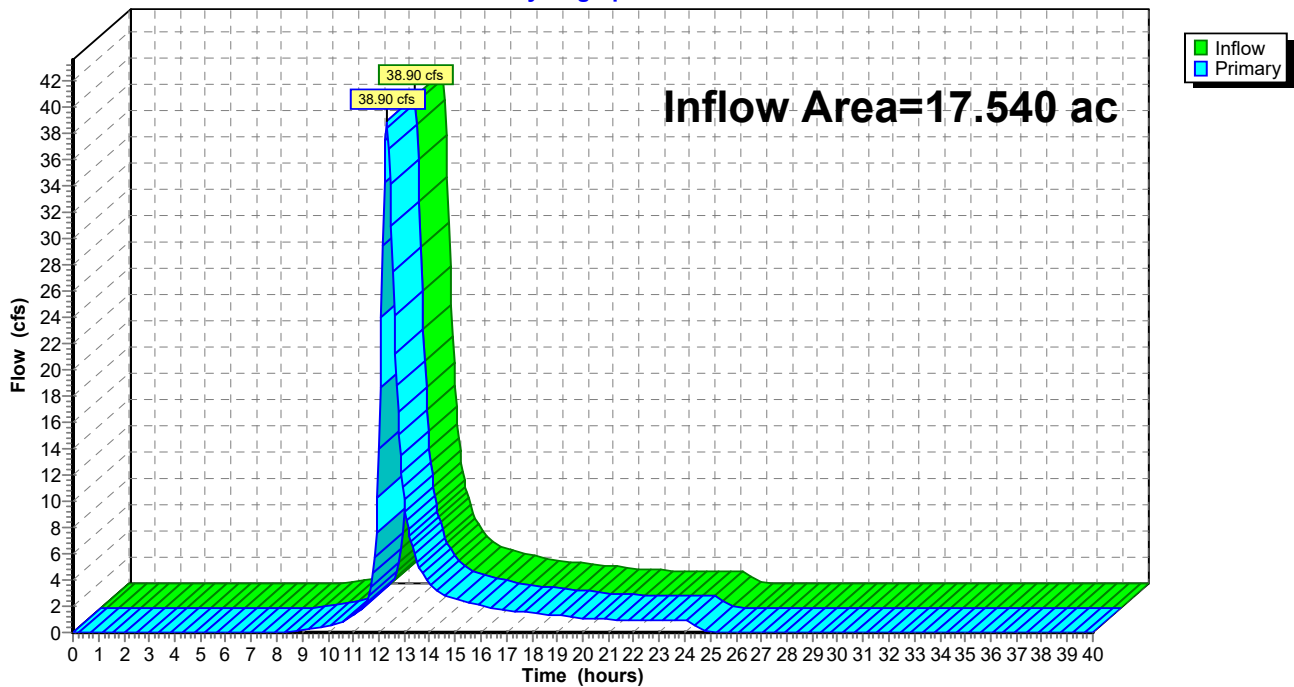*Type II 24-hr  100-Year Rainfall=7.70"*
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## Summary for Subcatchment 8S: EXIST. ON-SITE #3

Runoff      =      67.74 cfs @  12.31 hrs,  Volume=          7.308 af,  Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr  100-Year Rainfall=7.70"

| Area (ac) | CN | Description |
|---|---|---|
| 9.830 | 74 | Pasture/grassland/range, Good, HSG C |
| 7.710 | 80 | Pasture/grassland/range, Good, HSG D |
| 17.540 | 77 | Weighted Average |
| 17.540 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.3 | 100 | 0.0265 | 0.20 | | **Sheet Flow,** |
| | | | | | Grass: Short   n= 0.150   P2= 3.60" |
| 27.3 | 1,830 | 0.0255 | 1.12 | | **Shallow Concentrated Flow,** |
| | | | | | Short Grass Pasture   Kv= 7.0 fps |
| 35.6 | 1,930 | Total | | | |

### Subcatchment 8S: EXIST. ON-SITE #3



**Type II 24-hr
100-Year Rainfall=7.70"
Runoff Area=17.540 ac
Runoff Volume=7.308 af
Runoff Depth=5.00"
Flow Length=1,930'
Tc=35.6 min
CN=77**

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## Summary for Reach 3R: Reach 3

Inflow Area =        18.430 ac,    0.00% Impervious,  Inflow Depth =  5.00"    for  100-Year event
Inflow     =      103.03 cfs @  12.23 hrs,  Volume=            7.679 af
Outflow    =       98.34 cfs @  12.33 hrs,  Volume=            7.679 af,  Atten= 5%,  Lag= 5.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.10 fps,  Min. Travel Time= 3.4 min
Avg. Velocity = 1.23 fps,  Avg. Travel Time= 14.2 min

Peak Storage= 20,194 cf @ 12.27 hrs
Average Depth at Peak Storage= 1.80'
Bank-Full Depth= 6.40'  Flow Area= 252.4 sf,  Capacity= 2,150.14 cfs

Custom cross-section,  Length= 1,041.0'   Slope= 0.0088 '/'   (110 Elevation Intervals)
Constant n= 0.030  Earth, grassed & winding
Inlet Invert= 989.92',  Outlet Invert= 980.77'

‡

| Offset<br>(feet) | Elevation<br>(feet) | Chan.Depth<br>(feet) |
|---|---|---|
| 0.00 | 996.29 | 0.00 |
| 7.00 | 996.00 | 0.29 |
| 12.99 | 994.06 | 2.23 |
| 13.24 | 994.00 | 2.29 |
| 14.48 | 993.84 | 2.45 |
| 28.84 | 992.00 | 4.29 |
| 29.66 | 991.71 | 4.58 |
| 36.75 | 990.00 | 6.29 |
| 39.18 | 989.92 | 6.37 |
| 39.90 | 989.89 | 6.40 |
| 42.20 | 989.97 | 6.32 |
| 43.14 | 990.00 | 6.29 |
| 43.91 | 990.40 | 5.89 |
| 46.34 | 992.00 | 4.29 |
| 53.90 | 993.41 | 2.88 |
| 56.74 | 994.00 | 2.29 |
| 62.76 | 994.22 | 2.07 |
| 76.31 | 994.65 | 1.64 |
| 100.00 | 996.29 | 0.00 |

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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.03 | 0.0 | 1.6 | 25 | 0.01 |
| 0.08 | 0.2 | 4.5 | 184 | 0.09 |
| 0.11 | 0.3 | 6.4 | 355 | 0.22 |
| 0.51 | 3.4 | 9.0 | 3,521 | 8.20 |
| 1.82 | 19.8 | 16.9 | 20,607 | 102.00 |
| 2.11 | 24.7 | 18.3 | 25,700 | 139.72 |
| 3.52 | 62.5 | 37.1 | 65,011 | 410.25 |
| 3.95 | 79.1 | 42.6 | 82,369 | 555.08 |
| 4.11 | 85.9 | 44.7 | 89,447 | 617.31 |
| 4.17 | 88.6 | 46.6 | 92,223 | 631.78 |
| 4.33 | 96.2 | 51.5 | 100,189 | 678.51 |
| 4.76 | 121.1 | 66.4 | 126,018 | 838.92 |
| 6.11 | 225.0 | 90.3 | 234,197 | 1,919.54 |
| 6.40 | 252.4 | 101.5 | 262,697 | 2,150.14 |

### Reach 3R: Reach 3



**Inflow Area=18.430 ac**
**Avg. Flow Depth=1.80'**
**Max Vel=5.10 fps**
**n=0.030**
**L=1,041.0'**
**S=0.0088 '/'**
**Capacity=2,150.14 cfs**

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## Reach 3R: Reach 3

**Stage-Discharge**

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## Summary for Reach 4R: Reach 2

Inflow Area =      18.430 ac,   0.00% Impervious,  Inflow Depth =  5.00"    for  100-Year event
Inflow      =     106.97 cfs @   12.15 hrs,  Volume=          7.679 af
Outflow     =     103.03 cfs @   12.23 hrs,  Volume=          7.679 af,  Atten= 4%,  Lag= 5.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.91 fps,  Min. Travel Time= 2.9 min
Avg. Velocity = 1.62 fps,  Avg. Travel Time= 8.8 min

Peak Storage= 17,892 cf @ 12.18 hrs
Average Depth at Peak Storage= 1.08'
Bank-Full Depth= 3.24'  Flow Area= 204.3 sf,  Capacity= 1,999.47 cfs

Custom cross-section,  Length= 853.0'   Slope= 0.0225 '/'   (106 Elevation Intervals)
Constant n= 0.030  Earth, grassed & winding
Inlet Invert= 1,009.12',  Outlet Invert= 989.90'

‡

| Offset (feet) | Elevation (feet) | Chan.Depth (feet) |
|---|---|---|
| 0.00 | 1,009.14 | 0.00 |
| 22.15 | 1,008.00 | 1.14 |
| 24.54 | 1,007.80 | 1.34 |
| 25.18 | 1,007.74 | 1.40 |
| 49.26 | 1,006.00 | 3.14 |
| 49.59 | 1,005.90 | 3.24 |
| 50.51 | 1,005.99 | 3.15 |
| 52.13 | 1,005.99 | 3.15 |
| 53.24 | 1,006.00 | 3.14 |
| 91.41 | 1,007.74 | 1.40 |
| 98.60 | 1,008.00 | 1.14 |
| 108.78 | 1,008.27 | 0.87 |
| 117.07 | 1,008.47 | 0.67 |
| 117.16 | 1,008.47 | 0.67 |
| 134.91 | 1,008.89 | 0.25 |
| 135.00 | 1,009.14 | 0.00 |

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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.09 | 0.1 | 2.9 | 47 | 0.03 |
| 0.10 | 0.1 | 4.0 | 77 | 0.06 |
| 1.84 | 61.2 | 66.4 | 52,179 | 430.84 |
| 1.90 | 65.2 | 68.7 | 55,628 | 468.55 |
| 2.10 | 79.7 | 76.6 | 67,995 | 608.70 |
| 2.37 | 102.4 | 92.0 | 87,382 | 818.03 |
| 2.57 | 122.0 | 104.3 | 104,091 | 1,007.45 |
| 2.99 | 171.2 | 130.2 | 146,042 | 1,527.76 |
| 3.24 | 204.3 | 135.4 | 174,303 | 1,999.47 |

## Reach 4R: Reach 2

**Hydrograph**



Inflow Area=18.430 ac
Avg. Flow Depth=1.08'
Max Vel=4.91 fps
n=0.030
L=853.0'
S=0.0225 '/'
Capacity=1,999.47 cfs

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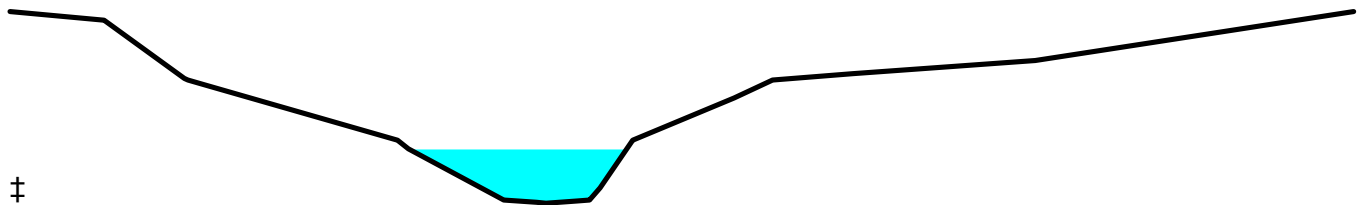Printed  4/15/2022
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## Reach 4R: Reach 2



Stage-Discharge

## Summary for Reach 8R: Reach 1

Inflow Area = 18.430 ac, 0.00% Impervious, Inflow Depth = 5.00" for 100-Year event
Inflow = 110.11 cfs @ 12.09 hrs, Volume= 7.679 af
Outflow = 106.97 cfs @ 12.15 hrs, Volume= 7.679 af, Atten= 3%, Lag= 3.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.87 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 1.86 fps, Avg. Travel Time= 7.8 min

Peak Storage= 12,079 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 1.86' Flow Area= 89.8 sf, Capacity= 1,475.63 cfs

Custom cross-section, Length= 875.0' Slope= 0.0147 '/' (108 Elevation Intervals)
Constant n= 0.012 Concrete pipe, finished
Inlet Invert= 1,021.96', Outlet Invert= 1,009.12'

‡

| Offset | Elevation | Chan.Depth |
|---|---|---|
| (feet) | (feet) | (feet) |
| 6.08 | 1,023.78 | 0.00 |
| 9.16 | 1,023.55 | 0.23 |
| 11.33 | 1,023.58 | 0.20 |
| 11.39 | 1,023.57 | 0.21 |
| 15.58 | 1,023.21 | 0.57 |
| 22.68 | 1,022.85 | 0.93 |
| 26.25 | 1,022.76 | 1.02 |
| 30.78 | 1,022.00 | 1.78 |
| 35.77 | 1,021.93 | 1.85 |
| 36.49 | 1,021.92 | 1.86 |
| 37.38 | 1,021.93 | 1.85 |
| 42.61 | 1,021.97 | 1.81 |
| 45.38 | 1,021.97 | 1.81 |
| 54.65 | 1,022.00 | 1.78 |
| 58.89 | 1,022.15 | 1.63 |
| 59.16 | 1,022.15 | 1.63 |
| 60.04 | 1,022.18 | 1.60 |
| 63.66 | 1,022.37 | 1.41 |
| 70.33 | 1,022.84 | 0.94 |
| 84.24 | 1,023.78 | 0.00 |

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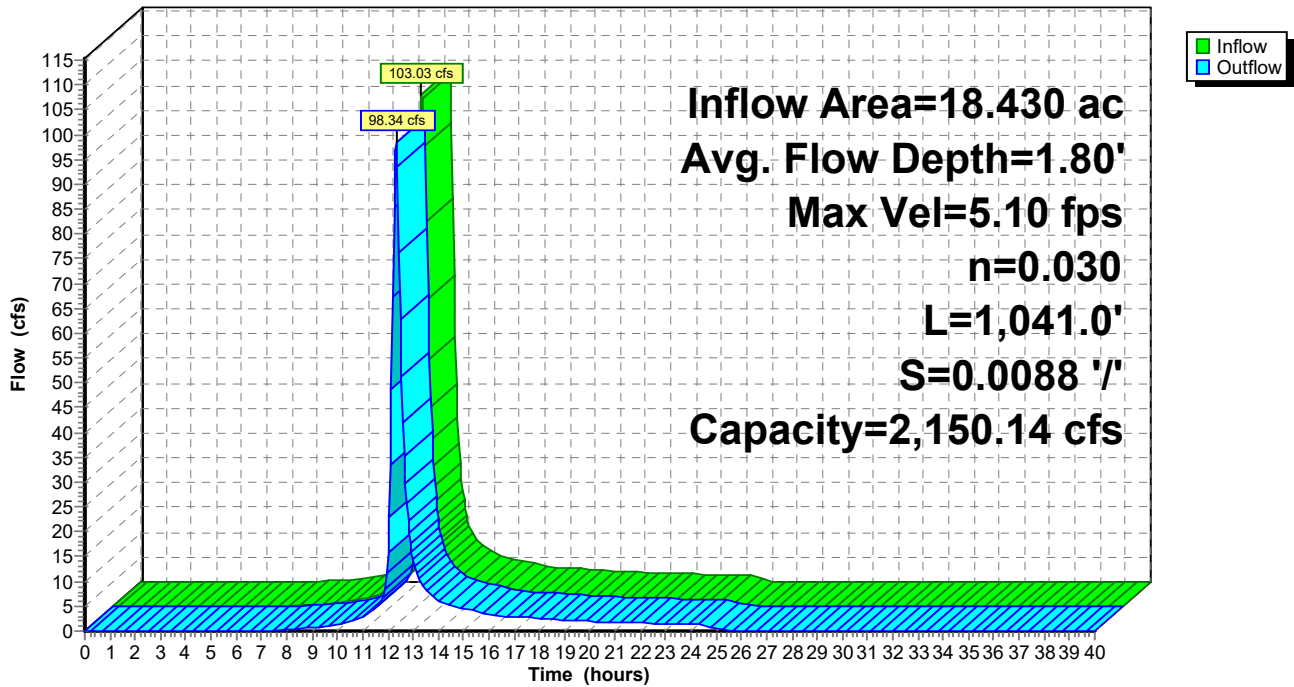*Type II 24-hr  100-Year Rainfall=7.70"*
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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.01 | 0.0 | 1.6 | 7 | 0.00 |
| 0.05 | 0.2 | 12.5 | 205 | 0.25 |
| 0.08 | 0.8 | 23.9 | 682 | 1.19 |
| 0.23 | 4.7 | 29.3 | 4,152 | 21.15 |
| 0.26 | 5.6 | 30.4 | 4,934 | 27.55 |
| 0.45 | 11.9 | 35.1 | 10,372 | 86.23 |
| 0.84 | 27.1 | 43.0 | 23,687 | 297.75 |
| 0.92 | 30.7 | 47.3 | 26,843 | 344.59 |
| 0.93 | 31.2 | 47.9 | 27,258 | 350.85 |
| 1.29 | 50.6 | 60.3 | 44,272 | 674.94 |
| 1.63 | 72.6 | 69.4 | 63,526 | 1,122.85 |
| 1.65 | 74.0 | 71.6 | 64,757 | 1,134.97 |
| 1.66 | 74.7 | 72.7 | 65,388 | 1,145.01 |
| 1.86 | 89.8 | 78.3 | 78,572 | 1,475.63 |

## Reach 8R: Reach 1

**Hydrograph**



Inflow Area=18.430 ac
Avg. Flow Depth=0.50'
Max Vel=7.87 fps
n=0.012
L=875.0'
S=0.0147 '/'
Capacity=1,475.63 cfs

Legend: ■ Inflow  ■ Outflow

110.11 cfs
106.97 cfs

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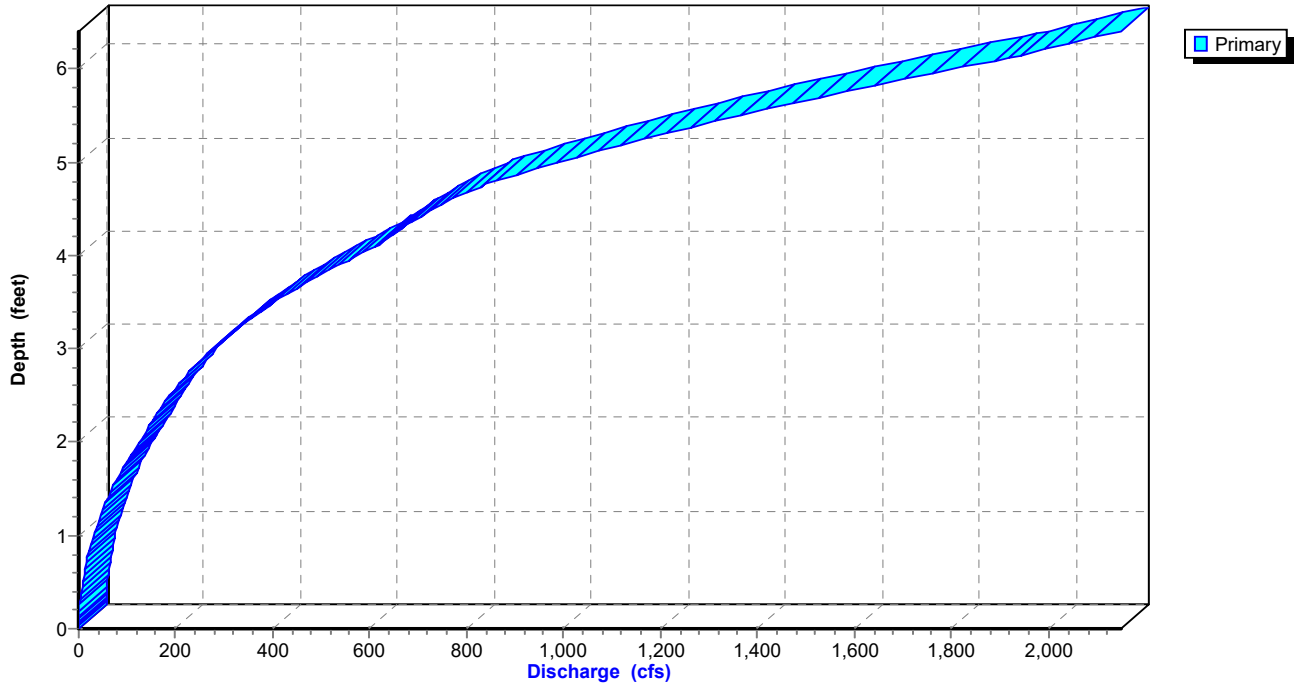Bailey Farms - PreDeveloped
*Type II 24-hr  100-Year Rainfall=7.70"*
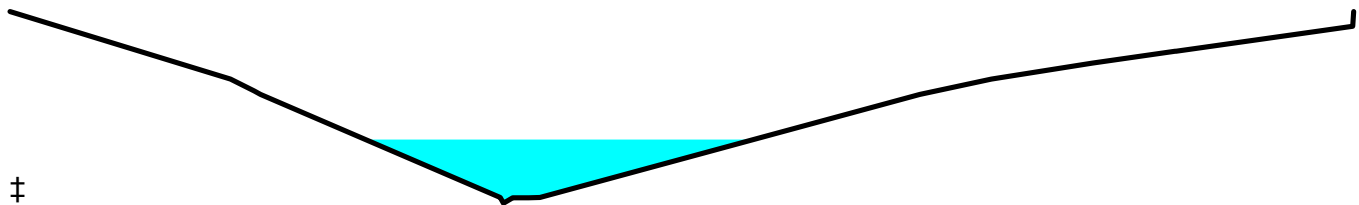Printed  4/15/2022
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# Reach 8R: Reach 1
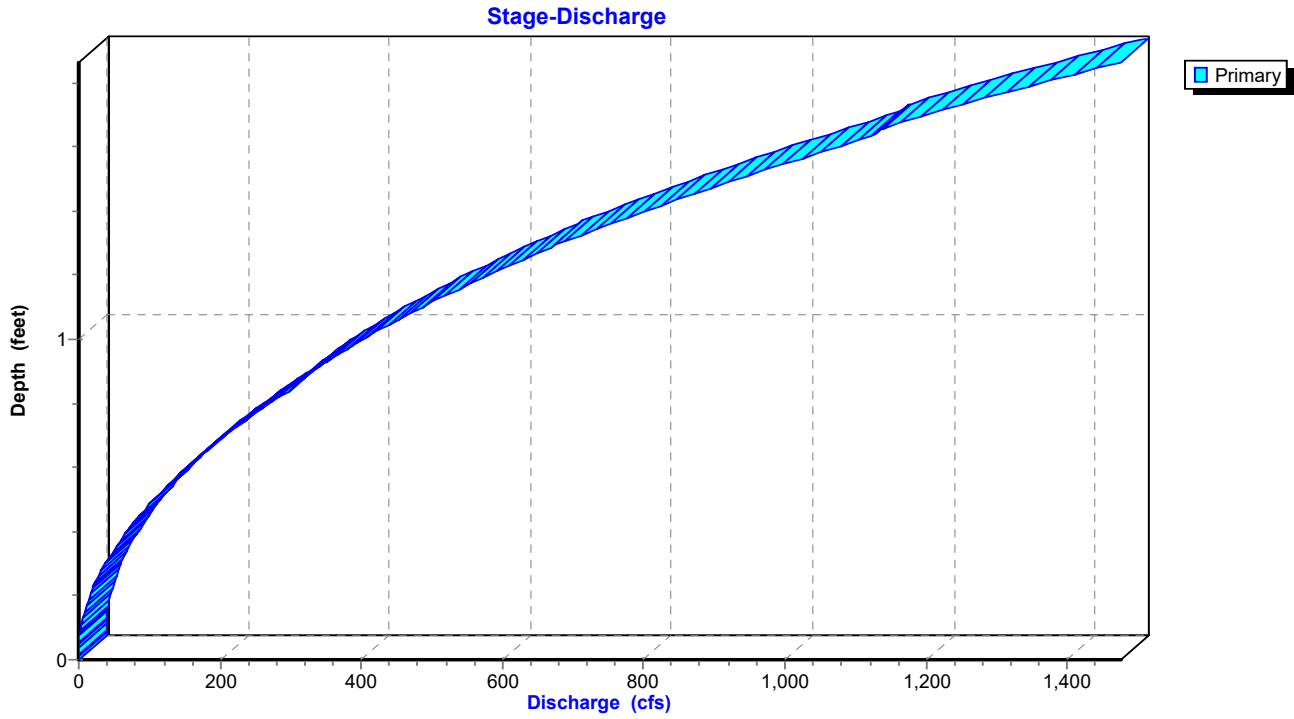


Stage-Discharge

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## Summary for Link 2L: RP-1

Inflow Area =      107.210 ac,    0.00% Impervious,  Inflow Depth =   4.99"    for  100-Year event
Inflow      =      372.07 cfs @   12.36 hrs,  Volume=          44.609 af
Primary     =      372.07 cfs @   12.36 hrs,  Volume=          44.609 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 2L: RP-1
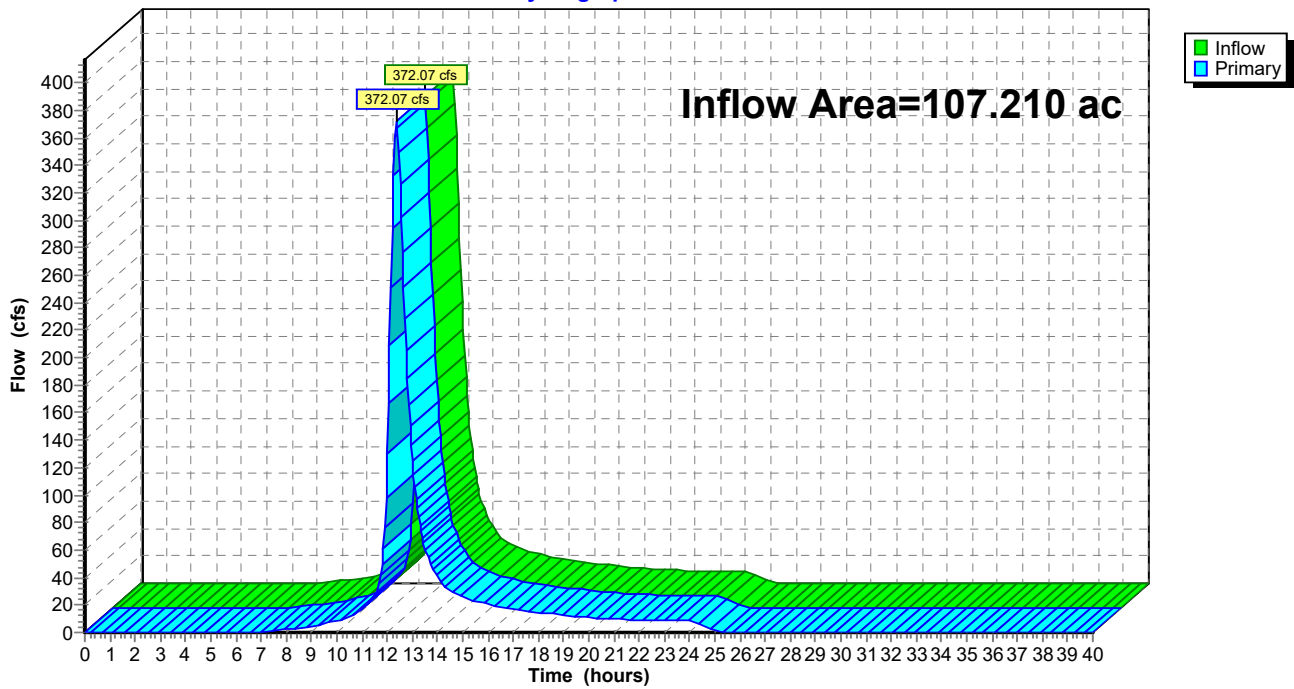
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## Summary for Link 5L: RP-2

Inflow Area =        6.420 ac,    0.00% Impervious,  Inflow Depth =   4.89"    for  100-Year event
Inflow     =      38.02 cfs @   12.09 hrs,  Volume=          2.614 af
Primary    =      38.02 cfs @   12.09 hrs,  Volume=          2.614 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 5L: RP-2

**Hydrograph**



Inflow Area=6.420 ac

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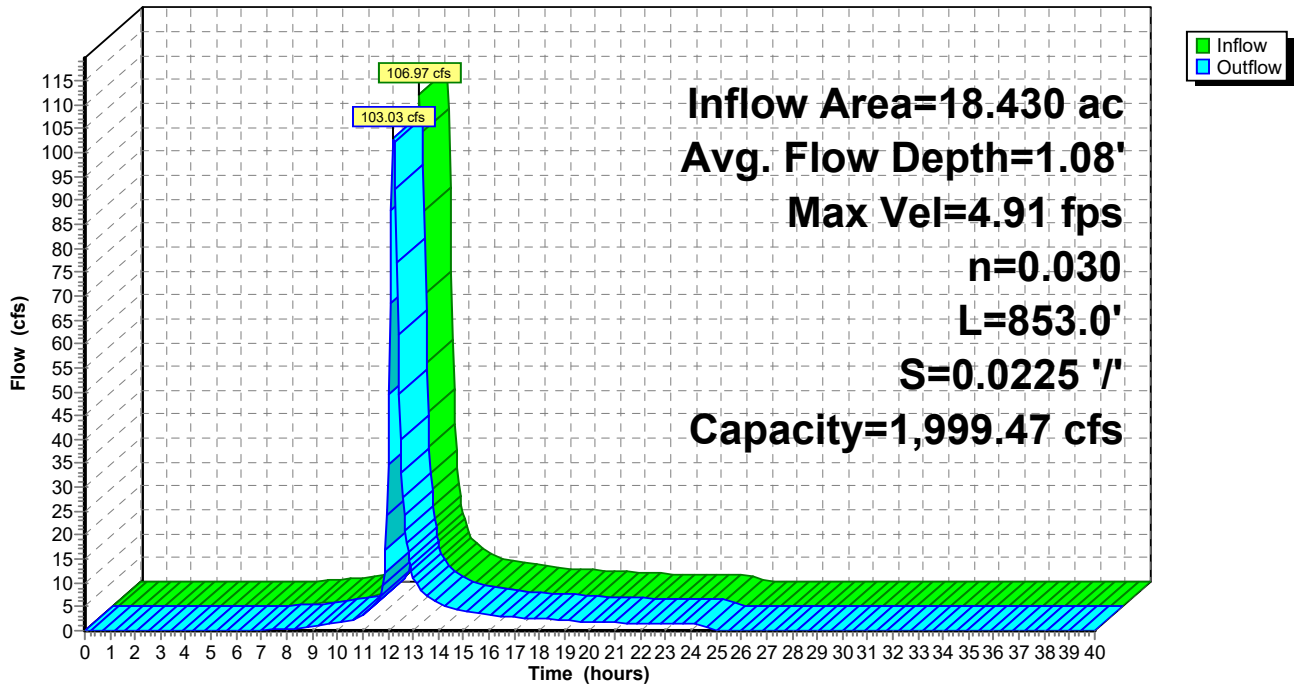*Type II 24-hr  100-Year Rainfall=7.70"*
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## Summary for Link 6L: RP-4

Inflow Area =        83.250 ac,    0.00% Impervious,  Inflow Depth =   5.00"    for  100-Year event
Inflow      =      294.00 cfs @   12.38 hrs,  Volume=           34.687 af
Primary     =      294.00 cfs @   12.38 hrs,  Volume=           34.687 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 6L: RP-4

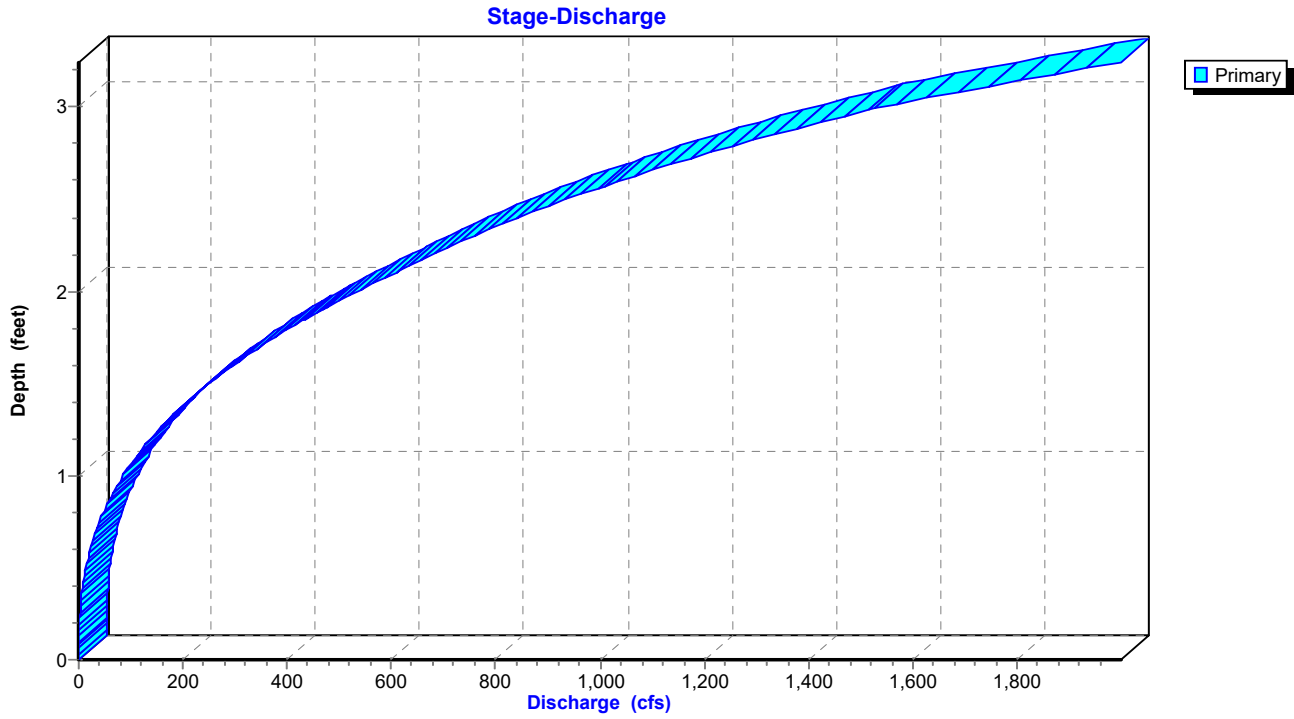**21-130-HYDRO-EX**
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## Summary for Link 7L: RP-3

Inflow Area =        17.540 ac,    0.00% Impervious,  Inflow Depth =   5.00"    for  100-Year event
Inflow      =       67.74 cfs @   12.31 hrs,  Volume=              7.308 af
Primary    =       67.74 cfs @   12.31 hrs,  Volume=              7.308 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 7L: RP-3

**Hydrograph**

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Proposed Condition

1S
ON-SITE #1

4P
EDDB #1 Cornerstone

5L
RP-4

6S
ON-SITE #4 (Bypass)

5S
OFF-SITE #1

8R
REACH 1 (through Pipe System)

7R
Reach 2

6R
Reach 3

7S
ON-SITE #2

5P
EDDB #2 Manor

4L
RP-3

3S
ON-SITE #3 (Bypass)

3L
RP-2

2L
RP-1

Subcat   Reach   Pond   Link

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## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 32.070 | 87 | 1/4 acre lots, 38% imp, HSG D  (3S, 7S) |
| 11.140 | 92 | 1/8 acre lots, 65% imp, HSG D  (1S) |
| 22.730 | 80 | >75% Grass cover, Good, HSG D  (6S) |
| 19.330 | 92 | Duplex/Townhomes  (1S) |
| 3.190 | 95 | Urban commercial, 85% imp, HSG D  (1S, 6S) |
| 15.640 | 76 | Woods/grass comb., Fair, HSG C  (5S) |
| 2.790 | 82 | Woods/grass comb., Fair, HSG D  (5S) |

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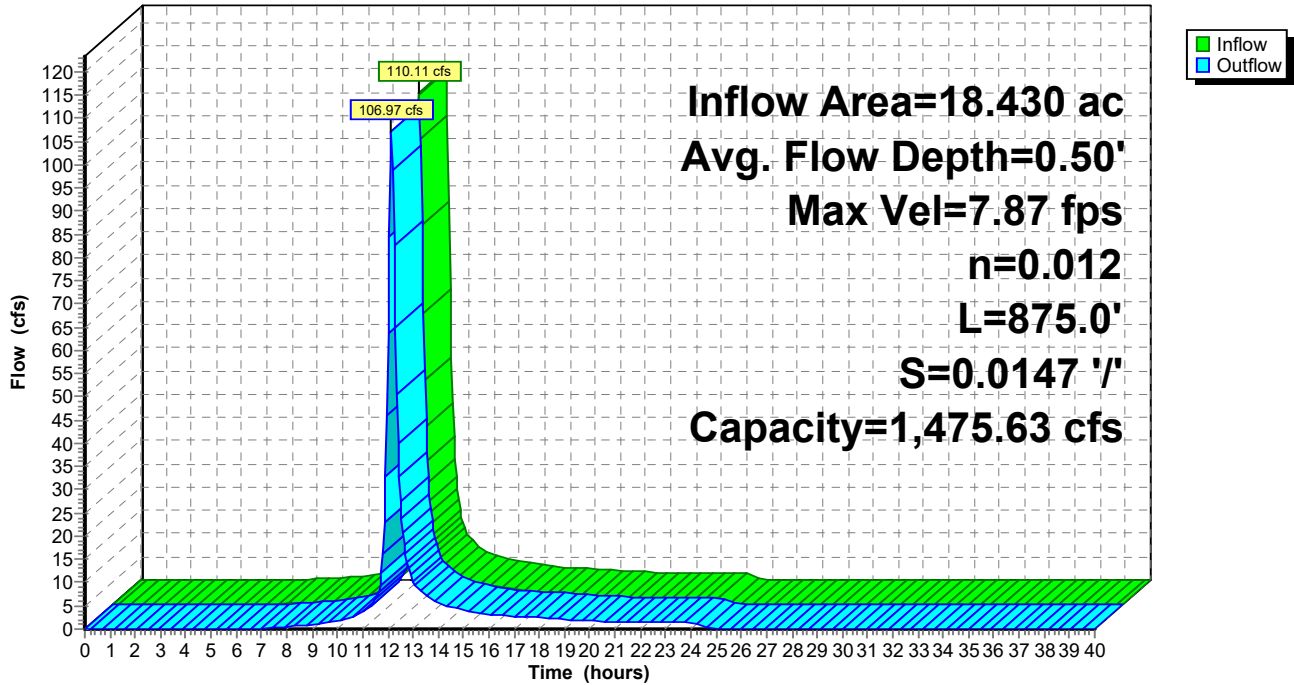Bailey Farms - Developed
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Page 3

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method  -  Pond routing by Stor-Ind method

**Subcatchment 1S: ON-SITE #1**　　　　Runoff Area=31.710 ac  26.16% Impervious  Runoff Depth=2.64"
　　　　Flow Length=1,186'  Slope=0.0250 '/'  Tc=14.0 min  CN=92  Runoff=107.19 cfs  6.968 af

**Subcatchment 3S: ON-SITE #3 (Bypass)**　　　Runoff Area=2.380 ac  38.00% Impervious  Runoff Depth=2.18"
　　　　Flow Length=1,110'  Tc=12.7 min  CN=87  Runoff=7.15 cfs  0.433 af

**Subcatchment 5S: OFF-SITE #1**　　　　Runoff Area=18.430 ac  0.00% Impervious  Runoff Depth=1.43"
　　　　Flow Length=1,247'  Tc=17.6 min  CN=77  Runoff=30.84 cfs  2.197 af

**Subcatchment 6S: ON-SITE #4 (Bypass)**　　　Runoff Area=24.680 ac  6.72% Impervious  Runoff Depth=1.71"
　　　　Flow Length=1,186'  Slope=0.0250 '/'  Tc=15.5 min  CN=81  Runoff=53.19 cfs  3.514 af

**Subcatchment 7S: ON-SITE #2**　　　　Runoff Area=29.690 ac  38.00% Impervious  Runoff Depth=2.18"
　　　　Flow Length=1,769'  Slope=0.0250 '/'  Tc=13.8 min  CN=87  Runoff=86.05 cfs  5.400 af

**Reach 6R: Reach 3**　　　　Avg. Flow Depth=0.91'  Max Vel=3.48 fps  Inflow=27.77 cfs  2.197 af
　　　　n=0.030  L=1,041.0'  S=0.0088 '/'  Capacity=2,150.14 cfs  Outflow=25.59 cfs  2.197 af

**Reach 7R: Reach 2**　　　　Avg. Flow Depth=0.66'  Max Vel=3.55 fps  Inflow=29.97 cfs  2.197 af
　　　　n=0.030  L=853.0'  S=0.0225 '/'  Capacity=1,999.47 cfs  Outflow=27.77 cfs  2.197 af

**Reach 8R: REACH 1 (through Pipe**　　Avg. Flow Depth=1.19'  Max Vel=11.56 fps  Inflow=30.84 cfs  2.197 af
　　　36.0" Round Pipe  n=0.012  L=1,067.0'  S=0.0159 '/'  Capacity=91.10 cfs  Outflow=29.97 cfs  2.197 af

**Pond 4P: EDDB #1 Cornerstone**　　　Peak Elev=1,003.03'  Storage=164,409 cf  Inflow=107.19 cfs  6.968 af
　　　　Outflow=13.32 cfs  6.025 af

**Pond 5P: EDDB #2 Manor**　　　　Peak Elev=994.63'  Storage=122,558 cf  Inflow=86.05 cfs  5.400 af
　　　　Outflow=9.97 cfs  4.497 af

**Link 2L: RP-1**　　　　Inflow=75.14 cfs  16.666 af
　　　　Primary=75.14 cfs  16.666 af

**Link 3L: RP-2**　　　　Inflow=7.15 cfs  0.433 af
　　　　Primary=7.15 cfs  0.433 af

**Link 4L: RP-3**　　　　Inflow=9.97 cfs  4.497 af
　　　　Primary=9.97 cfs  4.497 af

**Link 5L: RP-4**　　　　Inflow=13.32 cfs  6.025 af
　　　　Primary=13.32 cfs  6.025 af

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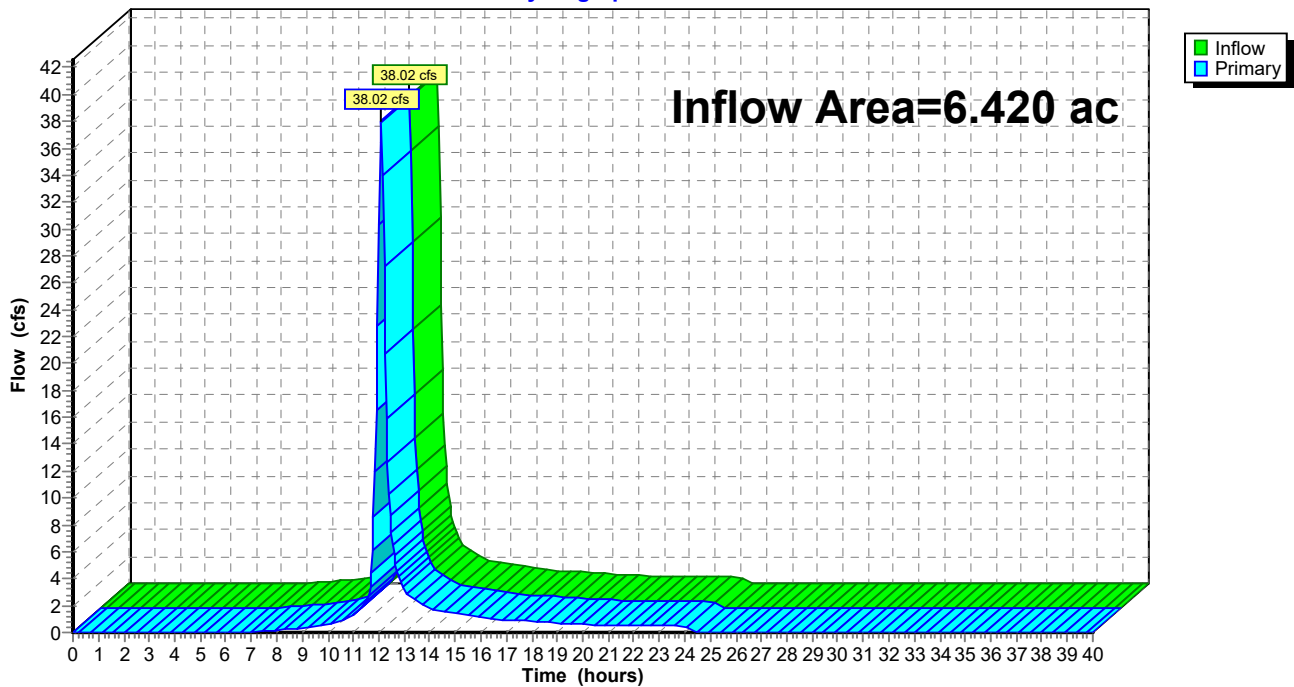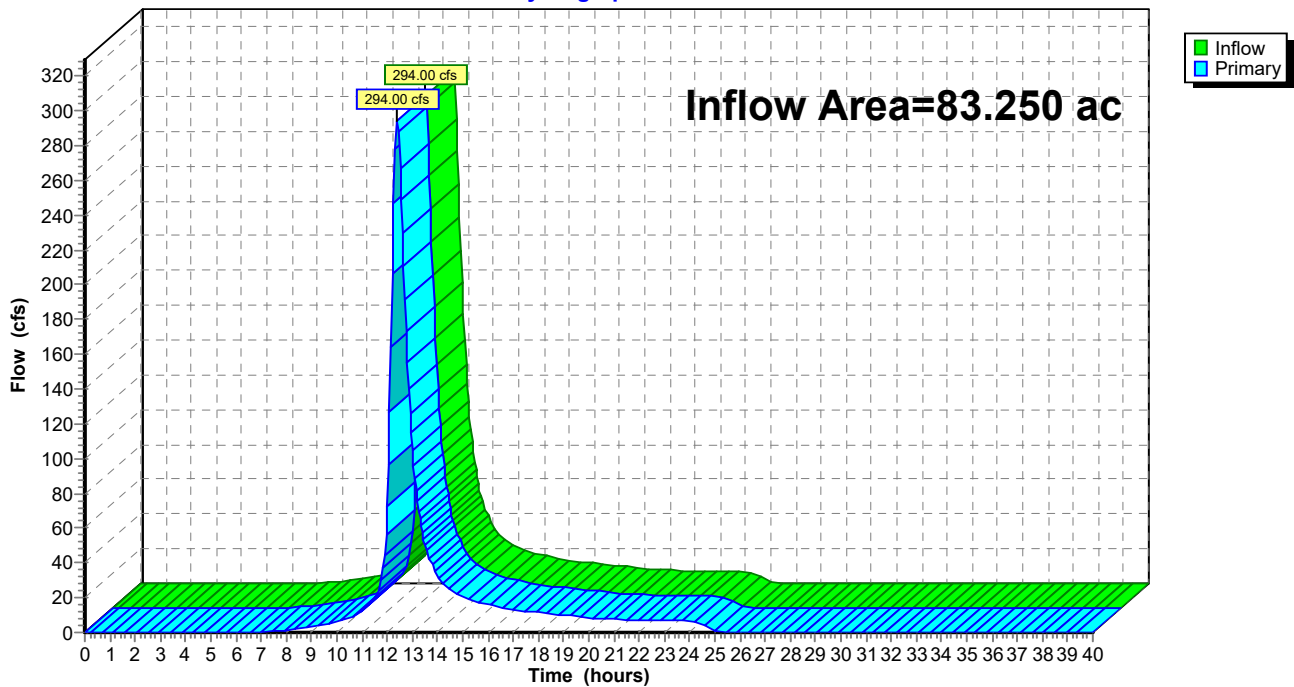*Type II 24-hr  2-Year Rainfall=3.50"*
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## Summary for Subcatchment 1S: ON-SITE #1

Runoff      =      107.19 cfs @  12.05 hrs,  Volume=          6.968 af,  Depth=  2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  2-Year Rainfall=3.50"

| | Area (ac) | CN | Description |
|---|---|---|---|
| * | 19.330 | 92 | Duplex/Townhomes |
| | 11.140 | 92 | 1/8 acre lots, 65% imp, HSG D |
| | 1.240 | 95 | Urban commercial, 85% imp, HSG D |
| | 31.710 | 92 | Weighted Average |
| | 23.415 | | 73.84% Pervious Area |
| | 8.295 | | 26.16% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 5.6 | 1,086 | 0.0250 | 3.21 | | **Shallow Concentrated Flow,** Paved   Kv= 20.3 fps |
| 14.0 | 1,186 | | | | Total |

### Subcatchment 1S: ON-SITE #1

**Hydrograph**



Type II 24-hr
2-Year Rainfall=3.50"
Runoff Area=31.710 ac
Runoff Volume=6.968 af
Runoff Depth=2.64"
Flow Length=1,186'
Slope=0.0250 '/'
Tc=14.0 min
CN=92

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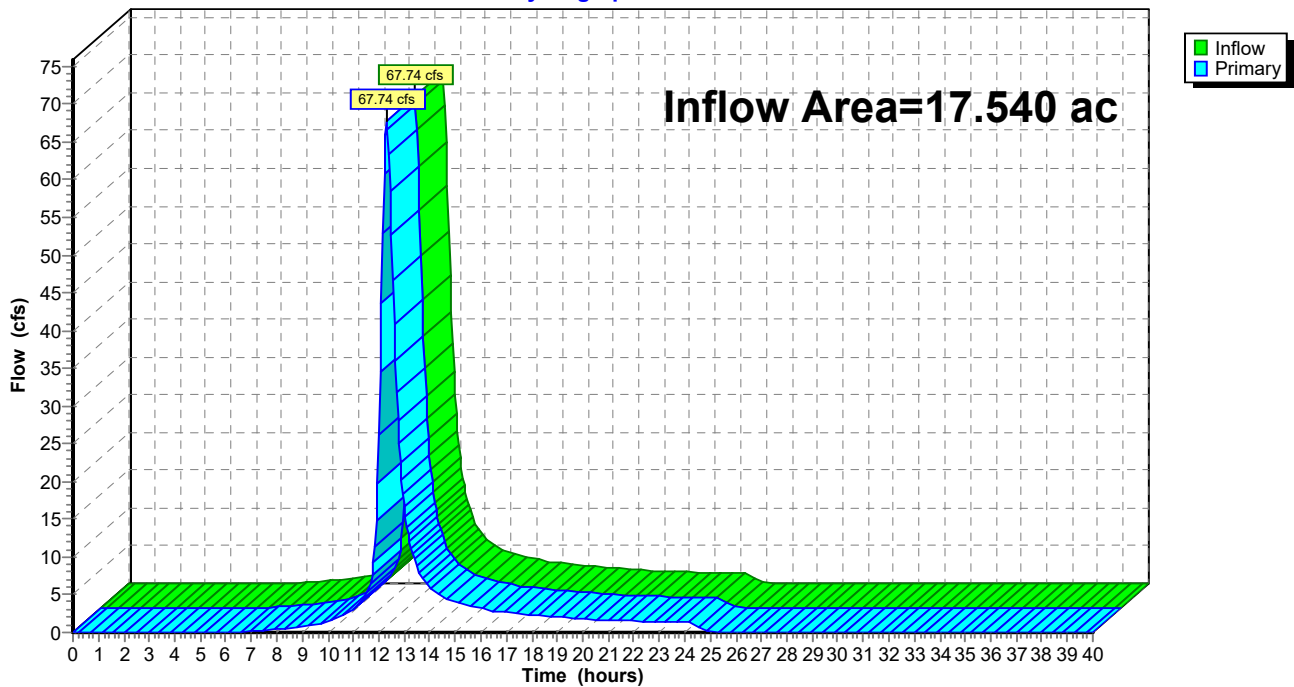*Type II 24-hr  2-Year Rainfall=3.50"*
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## Summary for Subcatchment 3S: ON-SITE #3 (Bypass)

Runoff      =        7.15 cfs @   12.04 hrs,  Volume=          0.433 af,  Depth=  2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  2-Year Rainfall=3.50"

| Area (ac) | CN | Description |
|---|---|---|
| 2.380 | 87 | 1/4 acre lots, 38% imp, HSG D |
| 1.476 | | 62.00% Pervious Area |
| 0.904 | | 38.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.9 | 50 | 0.0250 | 0.17 | | **Sheet Flow,** n= 0.150   P2= 3.60" |
| 7.8 | 1,060 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved   Kv= 16.1 fps |
| 12.7 | 1,110 | Total | | | |

### Subcatchment 3S: ON-SITE #3 (Bypass)



**Type II 24-hr
2-Year Rainfall=3.50"
Runoff Area=2.380 ac
Runoff Volume=0.433 af
Runoff Depth=2.18"
Flow Length=1,110'
Tc=12.7 min
CN=87**

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# Summary for Subcatchment 5S: OFF-SITE #1

Runoff    =    30.84 cfs @  12.11 hrs,  Volume=    2.197 af,  Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  2-Year Rainfall=3.50"

| Area (ac) | CN | Description |
|---|---|---|
| 15.640 | 76 | Woods/grass comb., Fair, HSG C |
| 2.790 | 82 | Woods/grass comb., Fair, HSG D |
| 18.430 | 77 | Weighted Average |
| 18.430 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 9.2 | 1,147 | 0.0192 | 2.08 | | **Shallow Concentrated Flow,** Grassed Waterway   Kv= 15.0 fps |
| 17.6 | 1,247 | Total | | | |

## Subcatchment 5S: OFF-SITE #1

**Hydrograph**



Type II 24-hr
2-Year Rainfall=3.50"
Runoff Area=18.430 ac
Runoff Volume=2.197 af
Runoff Depth=1.43"
Flow Length=1,247'
Tc=17.6 min
CN=77

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## Summary for Subcatchment 6S: ON-SITE #4 (Bypass)

Runoff    =    53.19 cfs @   12.08 hrs,  Volume=        3.514 af,  Depth=  1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  2-Year Rainfall=3.50"

| Area (ac) | CN | Description |
|---|---|---|
| 22.730 | 80 | >75% Grass cover, Good, HSG D |
| 1.950 | 95 | Urban commercial, 85% imp, HSG D |
| 24.680 | 81 | Weighted Average |
| 23.023 | | 93.28% Pervious Area |
| 1.657 | | 6.72% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 7.1 | 1,086 | 0.0250 | 2.55 | | **Shallow Concentrated Flow,** Unpaved   Kv= 16.1 fps |
| 15.5 | 1,186 | | | | Total |

### Subcatchment 6S: ON-SITE #4 (Bypass)

**Hydrograph**

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## Summary for Subcatchment 7S: ON-SITE #2

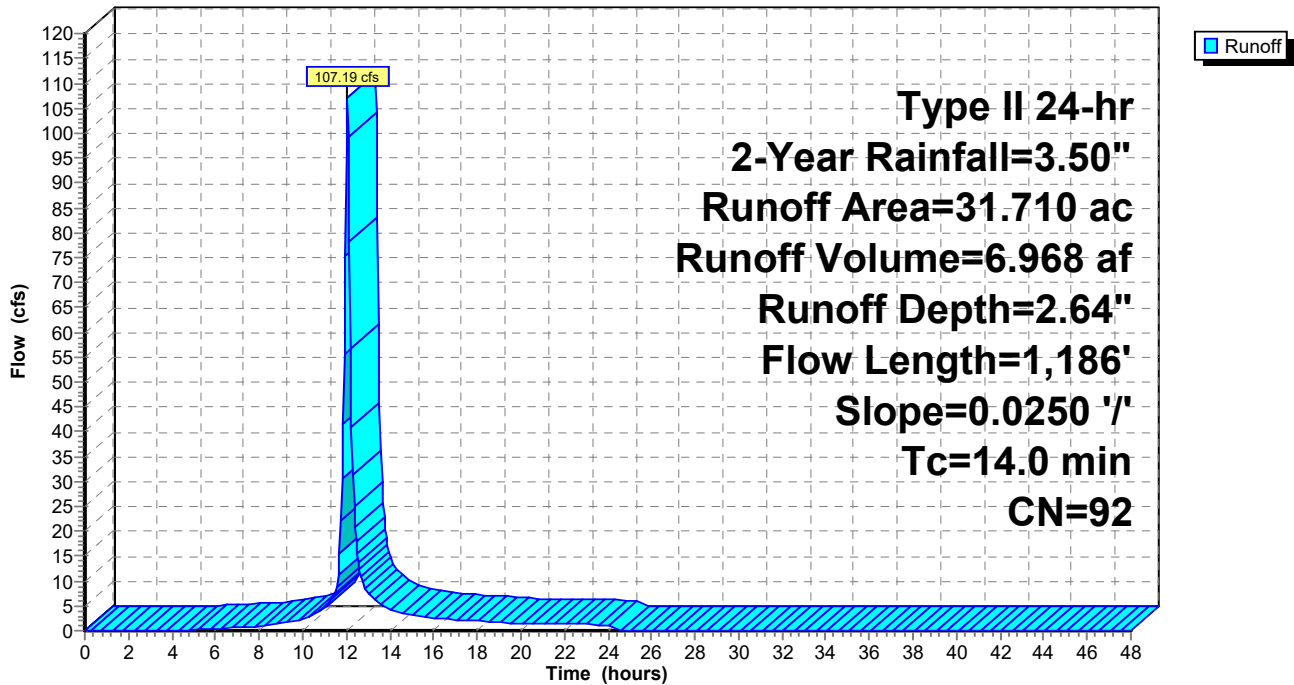Runoff       =        86.05 cfs @  12.06 hrs,  Volume=        5.400 af,  Depth=  2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  2-Year Rainfall=3.50"

| Area (ac) | CN | Description |
|---|---|---|
| 29.690 | 87 | 1/4 acre lots, 38% imp, HSG D |
| 18.408 | | 62.00% Pervious Area |
| 11.282 | | 38.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.9 | 50 | 0.0250 | 0.17 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 8.9 | 1,719 | 0.0250 | 3.21 | | **Shallow Concentrated Flow,** Paved   Kv= 20.3 fps |
| 13.8 | 1,769 | | | | Total |

### Subcatchment 7S: ON-SITE #2

**Hydrograph**



Type II 24-hr
2-Year Rainfall=3.50"
Runoff Area=29.690 ac
Runoff Volume=5.400 af
Runoff Depth=2.18"
Flow Length=1,769'
Slope=0.0250 '/'
Tc=13.8 min
CN=87

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## Summary for Reach 6R: Reach 3

Inflow Area =        18.430 ac,   0.00% Impervious,  Inflow Depth =  1.43"    for  2-Year event
Inflow      =     27.77 cfs @  12.27 hrs,  Volume=           2.197 af
Outflow    =     25.59 cfs @  12.42 hrs,  Volume=           2.197 af,  Atten= 8%,  Lag= 8.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.48 fps,  Min. Travel Time= 5.0 min
Avg. Velocity = 0.90 fps,  Avg. Travel Time= 19.4 min

Peak Storage= 7,714 cf @ 12.33 hrs
Average Depth at Peak Storage= 0.91'
Bank-Full Depth= 6.40'  Flow Area= 252.4 sf,  Capacity= 2,150.14 cfs

Custom cross-section,  Length= 1,041.0'   Slope= 0.0088 '/'   (110 Elevation Intervals)
Constant n= 0.030  Earth, grassed & winding
Inlet Invert= 989.92',  Outlet Invert= 980.77'

‡

| Offset | Elevation | Chan.Depth |
|---|---|---|
| (feet) | (feet) | (feet) |
| 0.00 | 996.29 | 0.00 |
| 7.00 | 996.00 | 0.29 |
| 12.99 | 994.06 | 2.23 |
| 13.24 | 994.00 | 2.29 |
| 14.48 | 993.84 | 2.45 |
| 28.84 | 992.00 | 4.29 |
| 29.66 | 991.71 | 4.58 |
| 36.75 | 990.00 | 6.29 |
| 39.18 | 989.92 | 6.37 |
| 39.90 | 989.89 | 6.40 |
| 42.20 | 989.97 | 6.32 |
| 43.14 | 990.00 | 6.29 |
| 43.91 | 990.40 | 5.89 |
| 46.34 | 992.00 | 4.29 |
| 53.90 | 993.41 | 2.88 |
| 56.74 | 994.00 | 2.29 |
| 62.76 | 994.22 | 2.07 |
| 76.31 | 994.65 | 1.64 |
| 100.00 | 996.29 | 0.00 |

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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.03 | 0.0 | 1.6 | 25 | 0.01 |
| 0.08 | 0.2 | 4.5 | 184 | 0.09 |
| 0.11 | 0.3 | 6.4 | 355 | 0.22 |
| 0.51 | 3.4 | 9.0 | 3,521 | 8.20 |
| 1.82 | 19.8 | 16.9 | 20,607 | 102.00 |
| 2.11 | 24.7 | 18.3 | 25,700 | 139.72 |
| 3.52 | 62.5 | 37.1 | 65,011 | 410.25 |
| 3.95 | 79.1 | 42.6 | 82,369 | 555.08 |
| 4.11 | 85.9 | 44.7 | 89,447 | 617.31 |
| 4.17 | 88.6 | 46.6 | 92,223 | 631.78 |
| 4.33 | 96.2 | 51.5 | 100,189 | 678.51 |
| 4.76 | 121.1 | 66.4 | 126,018 | 838.92 |
| 6.11 | 225.0 | 90.3 | 234,197 | 1,919.54 |
| 6.40 | 252.4 | 101.5 | 262,697 | 2,150.14 |

### Reach 6R: Reach 3

**Hydrograph**



Legend:
- Inflow
- Outflow

27.77 cfs
25.59 cfs

**Inflow Area=18.430 ac**
**Avg. Flow Depth=0.91'**
**Max Vel=3.48 fps**
**n=0.030**
**L=1,041.0'**
**S=0.0088 '/'**
**Capacity=2,150.14 cfs**

Flow (cfs) vs. Time (hours)

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# Reach 6R: Reach 3

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## Summary for Reach 7R: Reach 2

Inflow Area =      18.430 ac,   0.00% Impervious,  Inflow Depth =   1.43"    for  2-Year event
Inflow     =      29.97 cfs @  12.15 hrs,  Volume=         2.197 af
Outflow    =      27.77 cfs @  12.27 hrs,  Volume=         2.197 af,  Atten= 7%,  Lag= 7.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.55 fps,  Min. Travel Time= 4.0 min
Avg. Velocity = 1.30 fps,  Avg. Travel Time= 10.9 min

Peak Storage= 6,767 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 3.24'  Flow Area= 204.3 sf,  Capacity= 1,999.47 cfs

Custom cross-section,  Length= 853.0'  Slope= 0.0225 '/'   (106 Elevation Intervals)
Constant n= 0.030  Earth, grassed & winding
Inlet Invert= 1,009.12',  Outlet Invert= 989.90'



‡

| Offset | Elevation | Chan.Depth |
|-------:|----------:|-----------:|
| (feet) | (feet) | (feet) |
| 0.00 | 1,009.14 | 0.00 |
| 22.15 | 1,008.00 | 1.14 |
| 24.54 | 1,007.80 | 1.34 |
| 25.18 | 1,007.74 | 1.40 |
| 49.26 | 1,006.00 | 3.14 |
| 49.59 | 1,005.90 | 3.24 |
| 50.51 | 1,005.99 | 3.15 |
| 52.13 | 1,005.99 | 3.15 |
| 53.24 | 1,006.00 | 3.14 |
| 91.41 | 1,007.74 | 1.40 |
| 98.60 | 1,008.00 | 1.14 |
| 108.78 | 1,008.27 | 0.87 |
| 117.07 | 1,008.47 | 0.67 |
| 117.16 | 1,008.47 | 0.67 |
| 134.91 | 1,008.89 | 0.25 |
| 135.00 | 1,009.14 | 0.00 |

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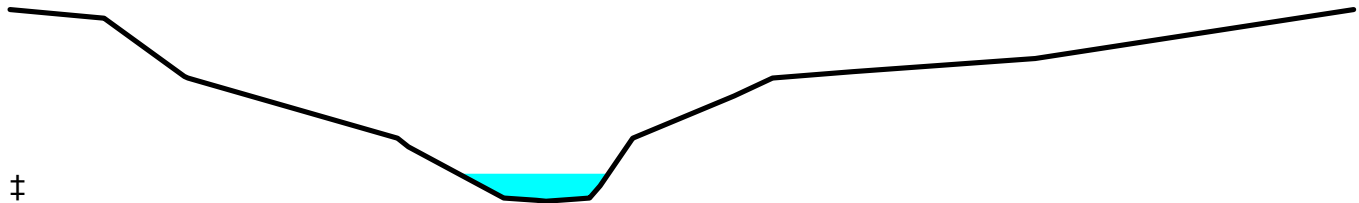Printed  4/18/2022
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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---:|---:|---:|---:|---:|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.09 | 0.1 | 2.9 | 47 | 0.03 |
| 0.10 | 0.1 | 4.0 | 77 | 0.06 |
| 1.84 | 61.2 | 66.4 | 52,179 | 430.84 |
| 1.90 | 65.2 | 68.7 | 55,628 | 468.55 |
| 2.10 | 79.7 | 76.6 | 67,995 | 608.70 |
| 2.37 | 102.4 | 92.0 | 87,382 | 818.03 |
| 2.57 | 122.0 | 104.3 | 104,091 | 1,007.45 |
| 2.99 | 171.2 | 130.2 | 146,042 | 1,527.76 |
| 3.24 | 204.3 | 135.4 | 174,303 | 1,999.47 |

### Reach 7R: Reach 2

**Hydrograph**



Inflow Area=18.430 ac
Avg. Flow Depth=0.66'
Max Vel=3.55 fps
n=0.030
L=853.0'
S=0.0225 '/'
Capacity=1,999.47 cfs

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## Reach 7R: Reach 2



Stage-Discharge

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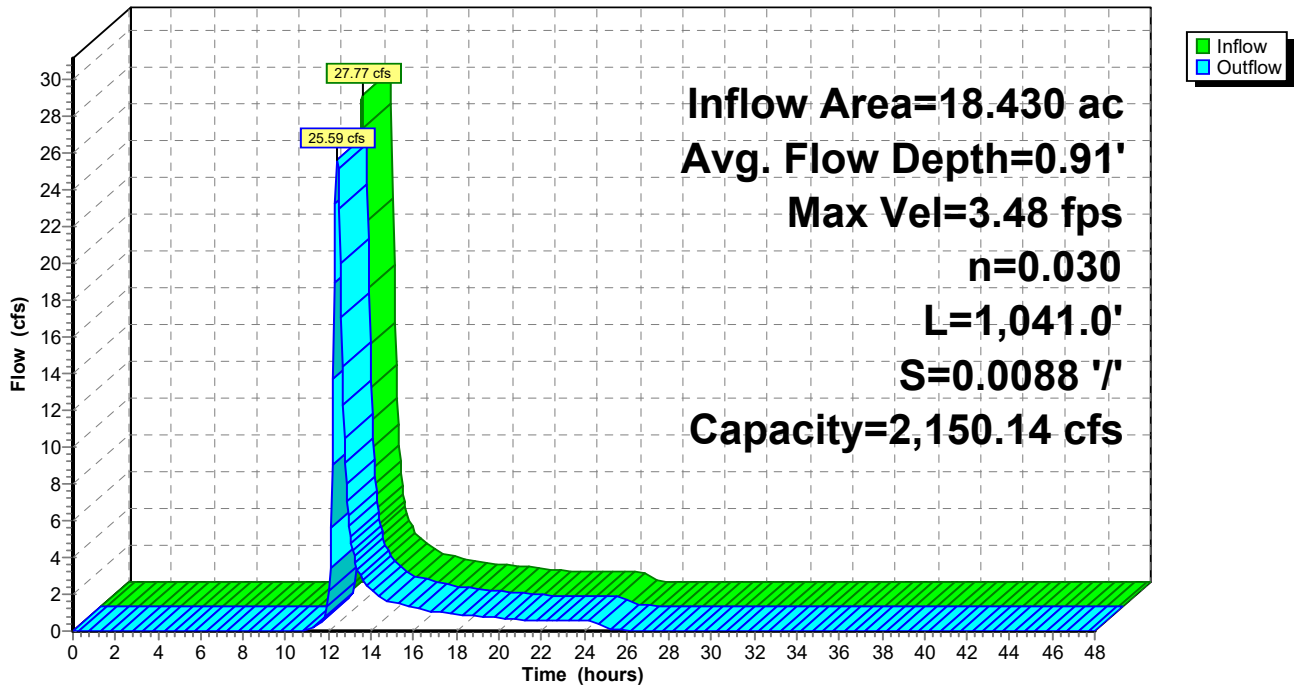*Type II 24-hr  2-Year Rainfall=3.50"*
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## Summary for Reach 8R: REACH 1 (through Pipe System)

Inflow Area =        18.430 ac,    0.00% Impervious,  Inflow Depth =   1.43"    for  2-Year event
Inflow      =        30.84 cfs @   12.11 hrs,  Volume=            2.197 af
Outflow     =        29.97 cfs @   12.15 hrs,  Volume=            2.197 af,  Atten= 3%,  Lag= 2.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.56 fps,  Min. Travel Time= 1.5 min
Avg. Velocity = 4.01 fps,  Avg. Travel Time= 4.4 min

Peak Storage= 2,798 cf @ 12.13 hrs
Average Depth at Peak Storage= 1.19'
Bank-Full Depth= 3.00'  Flow Area= 7.1 sf,  Capacity= 91.10 cfs

36.0"  Round Pipe
n= 0.012  Concrete pipe, finished
Length= 1,067.0'   Slope= 0.0159 '/'
Inlet Invert= 1,021.96',  Outlet Invert= 1,005.00'

### Reach 8R: REACH 1 (through Pipe System)



**Hydrograph**

Inflow Area=18.430 ac
Avg. Flow Depth=1.19'
Max Vel=11.56 fps
36.0"
Round Pipe
n=0.012
L=1,067.0'
S=0.0159 '/'
Capacity=91.10 cfs

■ Inflow
■ Outflow

30.84 cfs
29.97 cfs
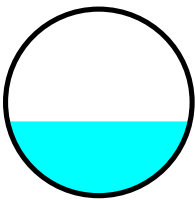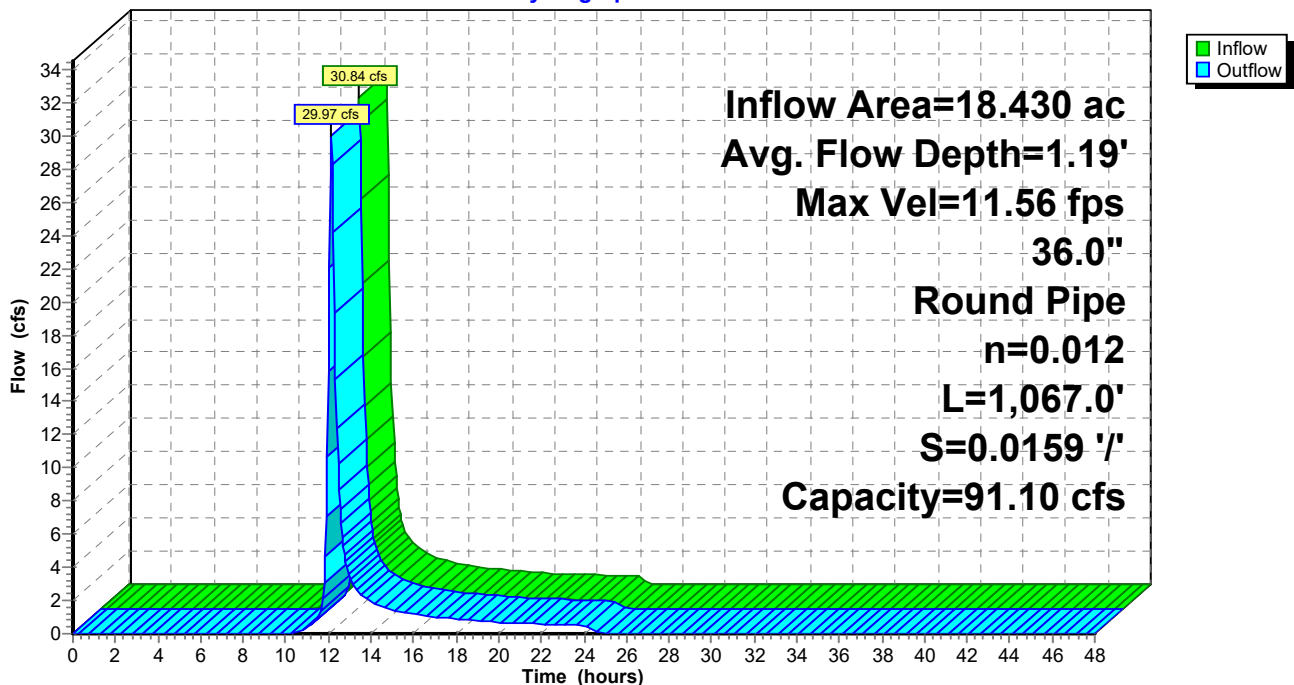
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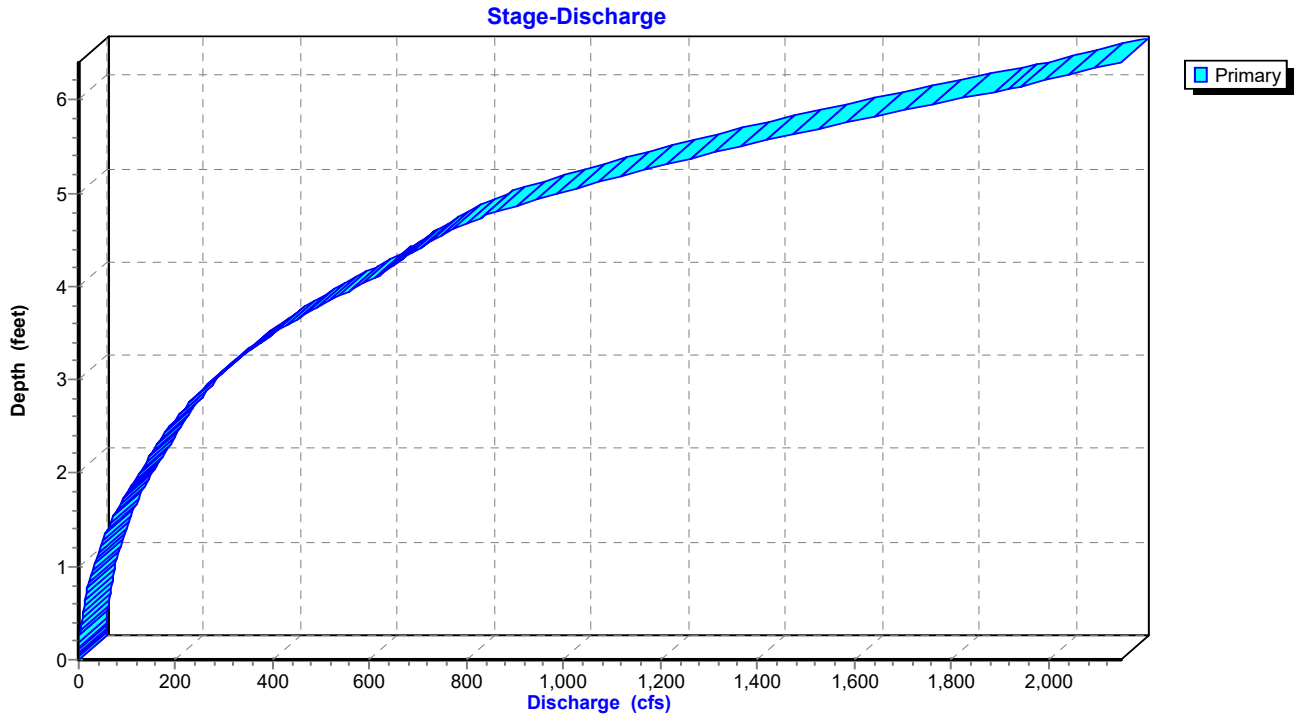Prepared by Schlagel and Assoc.
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## Reach 8R: REACH 1 (through Pipe System)



Stage-Discharge

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## Summary for Pond 4P: EDDB #1 Cornerstone

Inflow Area =      31.710 ac,  26.16% Impervious,  Inflow Depth = 2.64"    for  2-Year event
Inflow     =    107.19 cfs @  12.05 hrs,  Volume=          6.968 af
Outflow    =     13.32 cfs @  12.57 hrs,  Volume=          6.025 af,  Atten= 88%,  Lag= 30.8 min
Primary    =     13.32 cfs @  12.57 hrs,  Volume=          6.025 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,003.03' @ 12.57 hrs   Surf.Area= 44,926 sf   Storage= 164,409 cf

Plug-Flow detention time= 398.2 min calculated for 6.025 af (86% of inflow)
Center-of-Mass det. time= 334.8 min ( 1,133.6 - 798.8 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 995.67' | 374,566 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 995.67 | 0 | 0 | 0 |
| 996.00 | 700 | 116 | 116 |
| 997.00 | 7,200 | 3,950 | 4,066 |
| 998.00 | 12,000 | 9,600 | 13,666 |
| 999.00 | 17,900 | 14,950 | 28,616 |
| 1,000.00 | 27,000 | 22,450 | 51,066 |
| 1,001.00 | 36,000 | 31,500 | 82,566 |
| 1,002.00 | 40,000 | 38,000 | 120,566 |
| 1,003.00 | 44,800 | 42,400 | 162,966 |
| 1,004.00 | 48,700 | 46,750 | 209,716 |
| 1,005.00 | 53,000 | 50,850 | 260,566 |
| 1,006.00 | 57,000 | 55,000 | 315,566 |
| 1,007.00 | 61,000 | 59,000 | 374,566 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 993.54' | **30.0"  Round 30" Culvert** L= 87.0'  RCP, sq.cut end projecting,  Ke= 0.500 Inlet / Outlet Invert= 993.54' / 993.11'  S= 0.0049 '/'  Cc= 0.900 n= 0.012  Concrete pipe, finished,  Flow Area= 4.91 sf |
| #2 | Device 1 | 994.16' | **2.9" Vert. WQ Orifice**  C= 0.600 |
| #3 | Device 2 | 994.36' | **8.0"  Round 8" PVC Pipe** L= 20.0'  RCP, groove end projecting,  Ke= 0.200 Inlet / Outlet Invert= 994.36' / 994.16'  S= 0.0100 '/'  Cc= 0.900 n= 0.012,  Flow Area= 0.35 sf |
| #4 | Device 3 | 995.67' | **1.0" Vert. Riser Pipe X 8.00 columns** X 9 rows with 4.0" cc spacing C= 0.600 |
| #5 | Device 1 | 1,001.05' | **48.0" W x 6.0" H Vert. Opening in Box**  C= 0.600 |
| #6 | Device 1 | 1,004.00' | **60.0" x 48.0" Horiz. Open Top of Box**  C= 0.600 Limited to weir flow at low heads |

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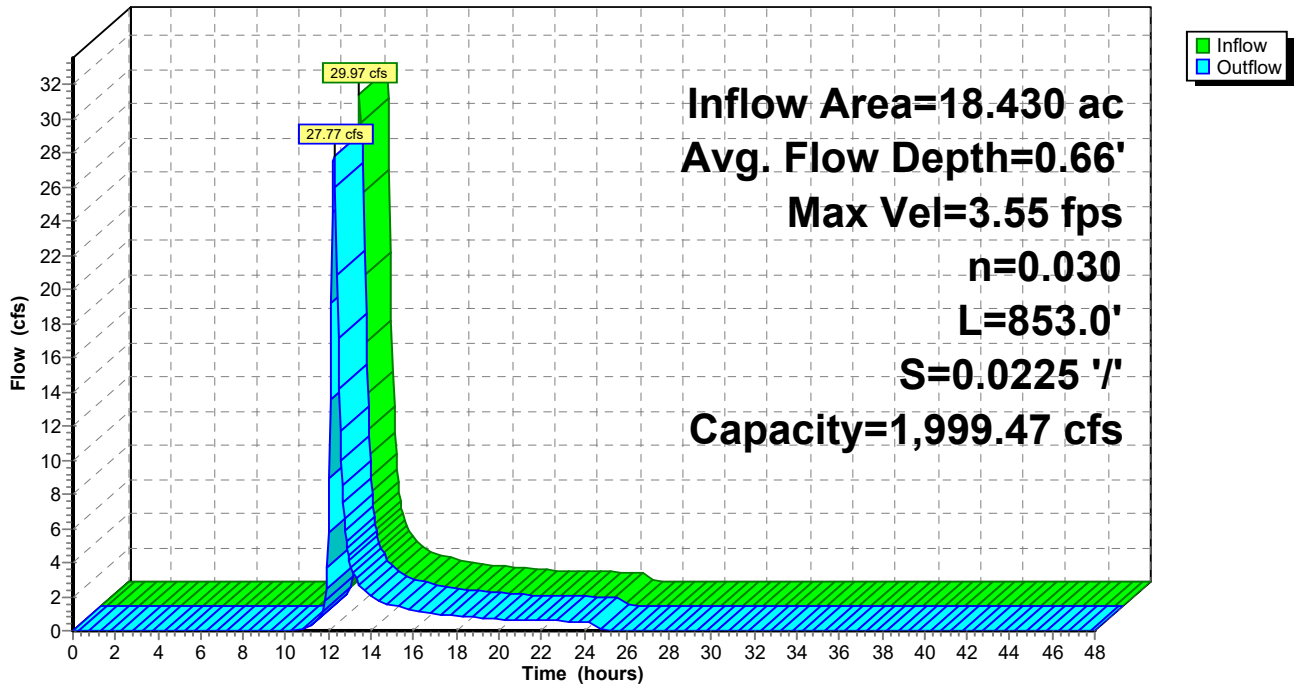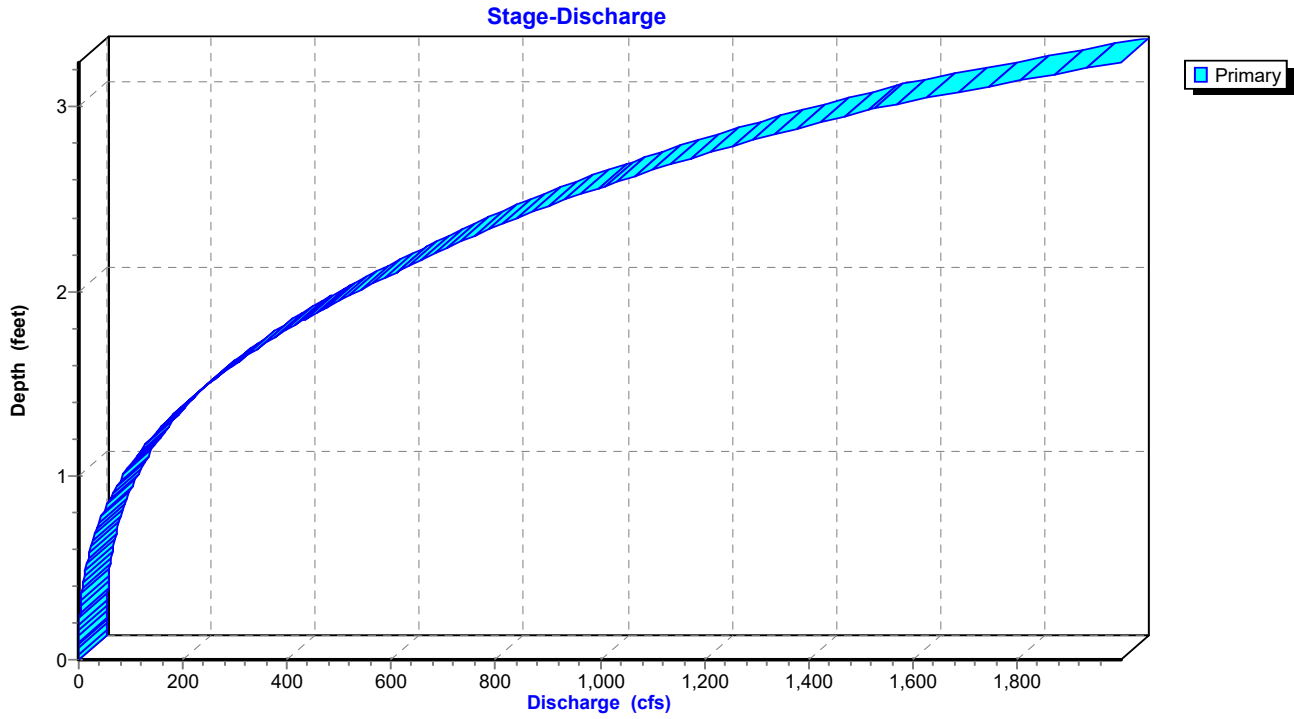*Type II 24-hr  2-Year Rainfall=3.50"*
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**Primary OutFlow** Max=13.31 cfs @ 12.57 hrs  HW=1,003.03'   (Free Discharge)
└─**1=30" Culvert** (Passes 13.31 cfs of 67.85 cfs potential flow)
   └─**2=WQ Orifice**  (Orifice Controls 0.65 cfs @ 14.24 fps)
      └─**3=8" PVC Pipe** (Passes 0.65 cfs of 5.51 cfs potential flow)
         └─**4=Riser Pipe** (Passes 0.65 cfs of 4.61 cfs potential flow)
   ├─**5=Opening in Box** (Orifice Controls 12.66 cfs @ 6.33 fps)
   └─**6=Open Top of Box** ( Controls 0.00 cfs)

## Pond 4P: EDDB #1 Cornerstone

**Hydrograph**



Inflow Area=31.710 ac
Peak Elev=1,003.03'
Storage=164,409 cf

107.19 cfs

13.32 cfs

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## Pond 4P: EDDB #1 Cornerstone



Stage-Discharge

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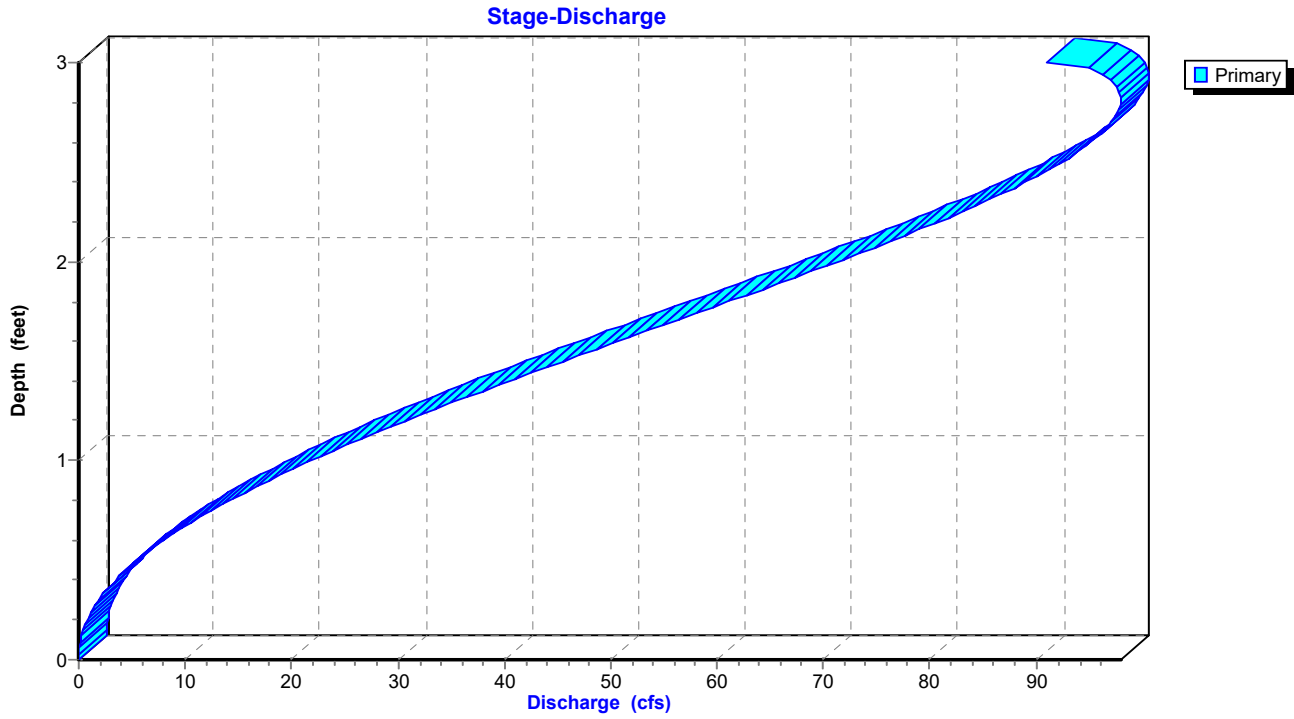Prepared by Schlagel and Assoc.
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## Summary for Pond 5P: EDDB #2 Manor

Inflow Area =      29.690 ac,  38.00% Impervious,  Inflow Depth =  2.18"    for  2-Year event
Inflow      =     86.05 cfs @  12.06 hrs,  Volume=          5.400 af
Outflow     =      9.97 cfs @  12.62 hrs,  Volume=          4.497 af,  Atten= 88%,  Lag= 33.7 min
Primary     =      9.97 cfs @  12.62 hrs,  Volume=          4.497 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 994.63' @ 12.62 hrs   Surf.Area= 44,414 sf   Storage= 122,558 cf

Plug-Flow detention time= 407.5 min calculated for 4.492 af (83% of inflow)
Center-of-Mass det. time= 335.4 min ( 1,154.7 - 819.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---------------------|
| #1 | 988.16' | 352,236 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 988.16 | 0 | 0 | 0 |
| 989.00 | 800 | 336 | 336 |
| 990.00 | 4,200 | 2,500 | 2,836 |
| 991.00 | 10,400 | 7,300 | 10,136 |
| 992.00 | 21,600 | 16,000 | 26,136 |
| 993.00 | 37,600 | 29,600 | 55,736 |
| 994.00 | 41,700 | 39,650 | 95,386 |
| 995.00 | 46,000 | 43,850 | 139,236 |
| 996.00 | 49,700 | 47,850 | 187,086 |
| 997.00 | 53,200 | 51,450 | 238,536 |
| 998.00 | 56,900 | 55,050 | 293,586 |
| 999.00 | 60,400 | 58,650 | 352,236 |

| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|----------------|
| #1 | Primary | 986.00' | **30.0" Round 30" Culvert** L= 77.0'  RCP, sq.cut end projecting,  Ke= 0.500 Inlet / Outlet Invert= 986.00' / 985.62'  S= 0.0049 '/'  Cc= 0.900 n= 0.012  Concrete pipe, finished,  Flow Area= 4.91 sf |
| #2 | Device 1 | 986.62' | **2.5" Vert. WQ Orifice**   C= 0.600 |
| #3 | Device 2 | 986.86' | **8.0"  Round 8" PVC Pipe** L= 20.0'  RCP, sq.cut end projecting,  Ke= 0.500 Inlet / Outlet Invert= 986.86' / 986.62'  S= 0.0120 '/'  Cc= 0.900 n= 0.012  Corrugated PP, smooth interior,  Flow Area= 0.35 sf |
| #4 | Device 3 | 988.16' | **1.0" Vert. Riser Pipe X 8.00 columns** X 8 rows with 4.0" cc spacing C= 0.600 |
| #5 | Device 1 | 993.40' | **48.0" W x 6.0" H Vert. Opening in Box**  C= 0.600 |
| #6 | Device 1 | 995.25' | **60.0" x 48.0" Horiz. Open Top of Box**  C= 0.600 Limited to weir flow at low heads |

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**Primary OutFlow** Max=9.97 cfs @ 12.62 hrs  HW=994.63'   (Free Discharge)
└─**1=30" Culvert** (Passes 9.97 cfs of 64.21 cfs potential flow)
 └─**2=WQ Orifice** (Orifice Controls 0.46 cfs @ 13.54 fps)
  └─**3=8" PVC Pipe** (Passes 0.46 cfs of 4.58 cfs potential flow)
   └─**4=Riser Pipe** (Passes 0.46 cfs of 3.85 cfs potential flow)
 └─**5=Opening in Box** (Orifice Controls 9.51 cfs @ 4.75 fps)
 └─**6=Open Top of Box** ( Controls 0.00 cfs)

### Pond 5P: EDDB #2 Manor

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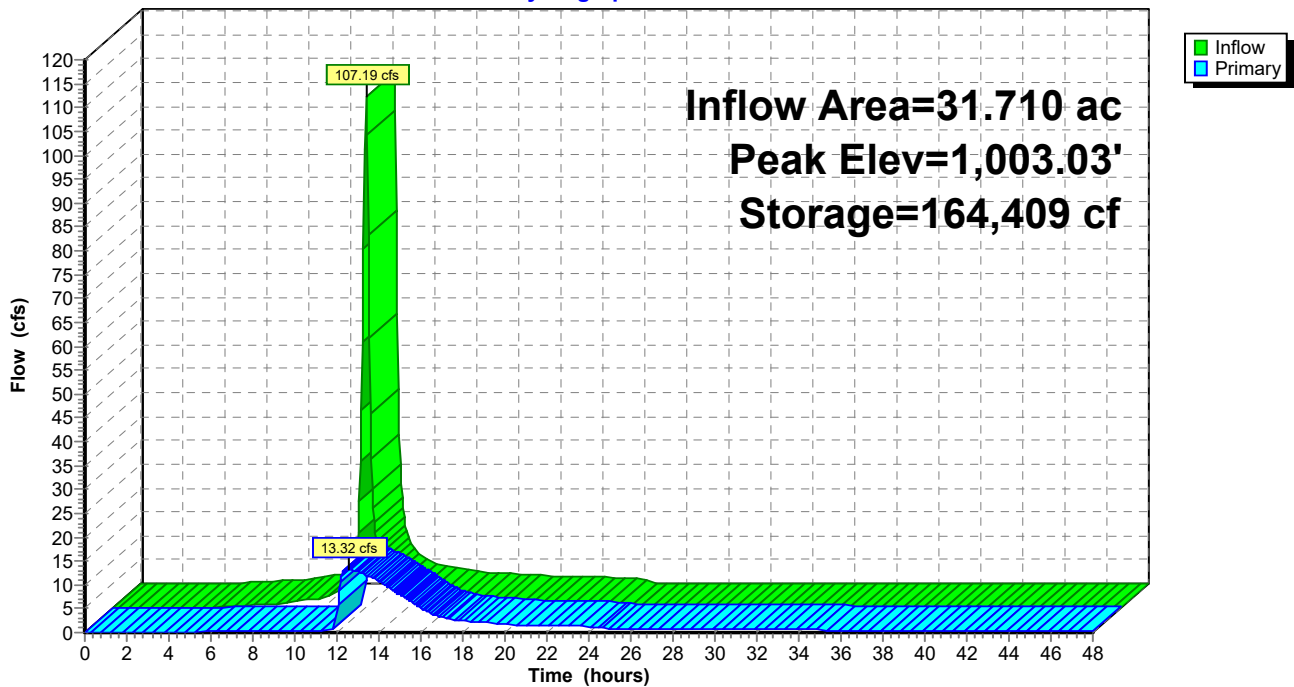*Type II 24-hr  2-Year Rainfall=3.50″*
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## Pond 5P: EDDB #2 Manor



**Stage-Discharge**

**21-130-HYDRO-PRO orifice plate option**
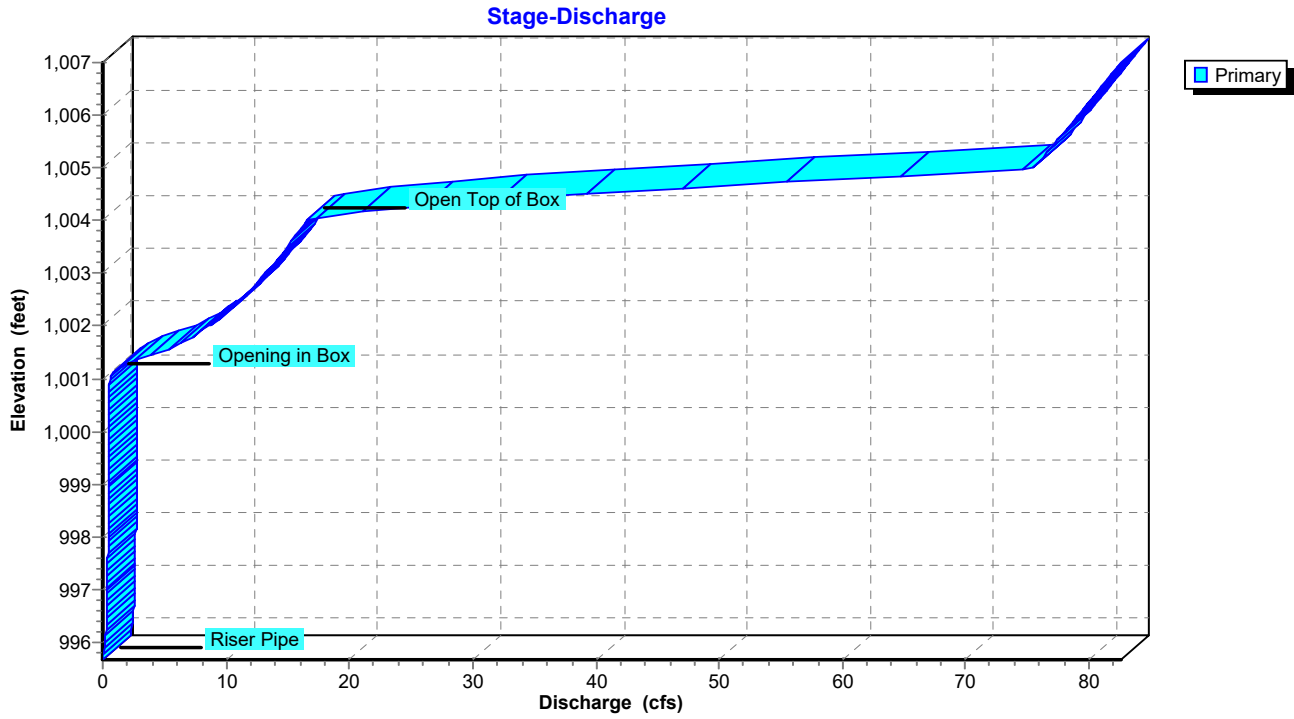Prepared by Schlagel and Assoc.
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*Type II 24-hr  2-Year Rainfall=3.50"*
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## Summary for Link 2L: RP-1

Inflow Area =      106.890 ac,  20.71% Impervious,  Inflow Depth >   1.87"    for  2-Year event
Inflow      =       75.14 cfs @   12.12 hrs,  Volume=          16.666 af
Primary     =       75.14 cfs @   12.12 hrs,  Volume=          16.666 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 2L: RP-1

**Hydrograph**

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## Summary for Link 3L: RP-2

Inflow Area =       2.380 ac,  38.00% Impervious,  Inflow Depth =  2.18"    for  2-Year event
Inflow      =     7.15 cfs @   12.04 hrs,  Volume=          0.433 af
Primary     =     7.15 cfs @   12.04 hrs,  Volume=          0.433 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 3L: RP-2

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## Summary for Link 4L: RP-3

Inflow Area =        29.690 ac,  38.00% Impervious,  Inflow Depth >  1.82″    for  2-Year event
Inflow      =        9.97 cfs @  12.62 hrs,  Volume=              4.497 af
Primary     =        9.97 cfs @  12.62 hrs,  Volume=              4.497 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

**Link 4L: RP-3**

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## Summary for Link 5L: RP-4

Inflow Area =      31.710 ac,  26.16% Impervious,  Inflow Depth >  2.28"    for  2-Year event
Inflow      =      13.32 cfs @   12.57 hrs,  Volume=          6.025 af
Primary     =      13.32 cfs @   12.57 hrs,  Volume=          6.025 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 5L: RP-4

**Hydrograph**

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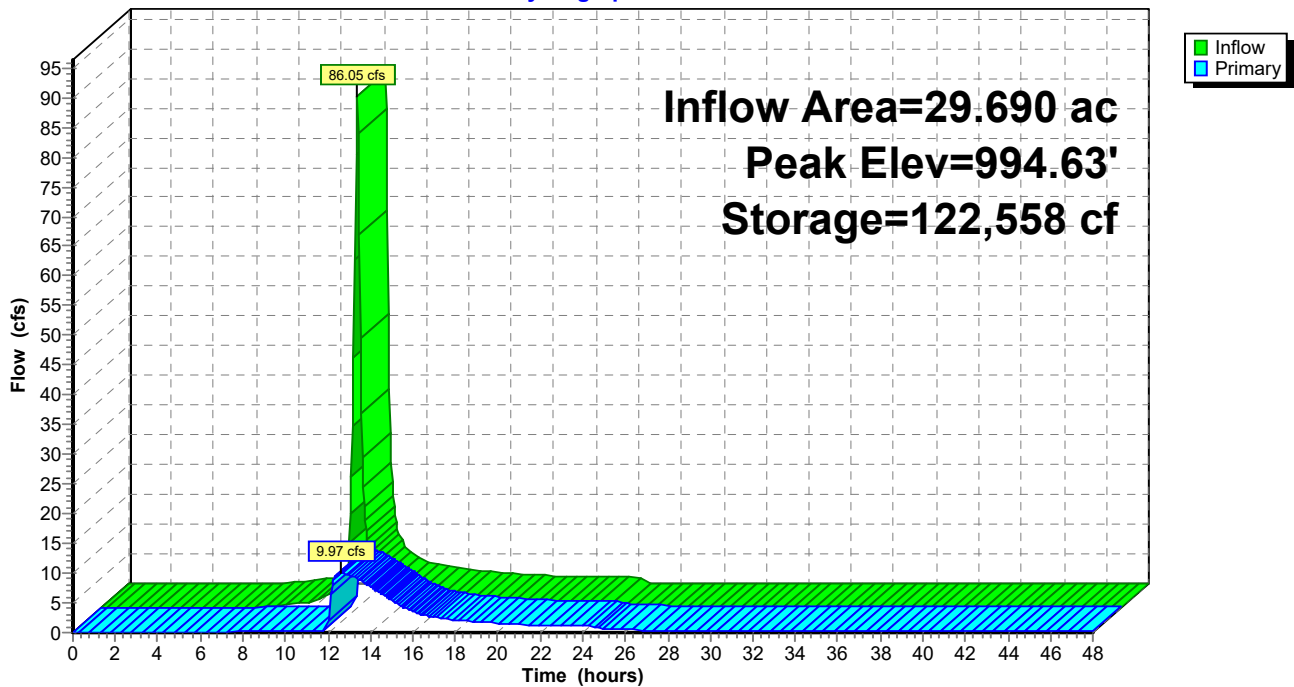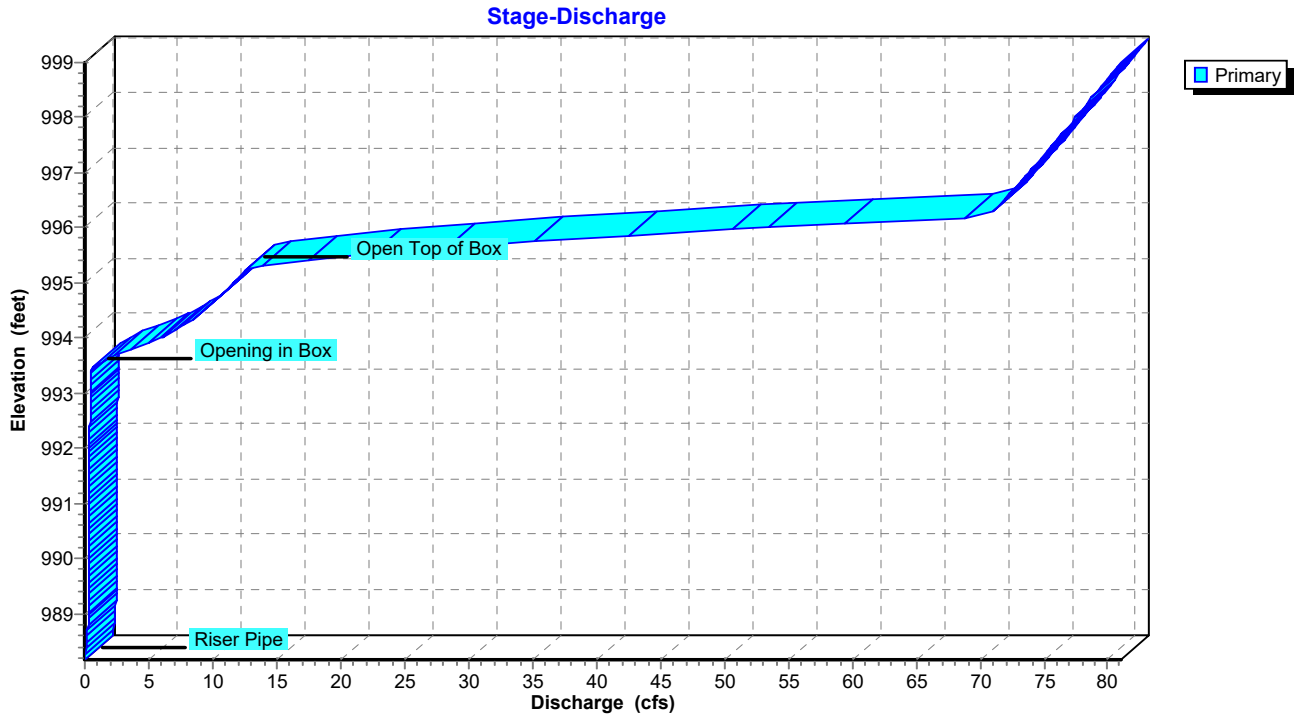*Type II 24-hr  10-Year Rainfall=5.30"*
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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method  -  Pond routing by Stor-Ind method

**Subcatchment1S: ON-SITE #1**  Runoff Area=31.710 ac  26.16% Impervious  Runoff Depth=4.38"
Flow Length=1,186'  Slope=0.0250 '/'  Tc=14.0 min  CN=92  Runoff=173.27 cfs 11.581 af

**Subcatchment3S: ON-SITE #3 (Bypass)**  Runoff Area=2.380 ac  38.00% Impervious  Runoff Depth=3.85"
Flow Length=1,110'  Tc=12.7 min  CN=87  Runoff=12.33 cfs 0.764 af

**Subcatchment5S: OFF-SITE #1**  Runoff Area=18.430 ac  0.00% Impervious  Runoff Depth=2.88"
Flow Length=1,247'  Tc=17.6 min  CN=77  Runoff=62.92 cfs 4.417 af

**Subcatchment6S: ON-SITE #4 (Bypass)**  Runoff Area=24.680 ac  6.72% Impervious  Runoff Depth=3.25"
Flow Length=1,186'  Slope=0.0250 '/'  Tc=15.5 min  CN=81  Runoff=100.98 cfs 6.688 af

**Subcatchment7S: ON-SITE #2**  Runoff Area=29.690 ac  38.00% Impervious  Runoff Depth=3.85"
Flow Length=1,769'  Slope=0.0250 '/'  Tc=13.8 min  CN=87  Runoff=148.68 cfs 9.527 af

**Reach 6R: Reach 3**  Avg. Flow Depth=1.35'  Max Vel=4.35 fps  Inflow=58.33 cfs 4.417 af
n=0.030  L=1,041.0'  S=0.0088 '/'  Capacity=2,150.14 cfs  Outflow=54.88 cfs 4.417 af

**Reach 7R: Reach 2**  Avg. Flow Depth=0.87'  Max Vel=4.26 fps  Inflow=61.28 cfs 4.417 af
n=0.030  L=853.0'  S=0.0225 '/'  Capacity=1,999.47 cfs  Outflow=58.33 cfs 4.417 af

**Reach 8R: REACH 1 (through Pipe**  Avg. Flow Depth=1.82'  Max Vel=13.85 fps  Inflow=62.92 cfs 4.417 af
36.0" Round Pipe  n=0.012  L=1,067.0'  S=0.0159 '/'  Capacity=91.10 cfs  Outflow=61.28 cfs 4.417 af

**Pond 4P: EDDB #1 Cornerstone**  Peak Elev=1,004.79'  Storage=249,634 cf  Inflow=173.27 cfs 11.581 af
Outflow=60.26 cfs 10.616 af

**Pond 5P: EDDB #2 Manor**  Peak Elev=996.06'  Storage=189,935 cf  Inflow=148.68 cfs 9.527 af
Outflow=58.14 cfs 8.604 af

**Link 2L: RP-1**  Inflow=214.00 cfs 31.088 af
Primary=214.00 cfs 31.088 af

**Link 3L: RP-2**  Inflow=12.33 cfs 0.764 af
Primary=12.33 cfs 0.764 af

**Link 4L: RP-3**  Inflow=58.14 cfs 8.604 af
Primary=58.14 cfs 8.604 af

**Link 5L: RP-4**  Inflow=60.26 cfs 10.616 af
Primary=60.26 cfs 10.616 af

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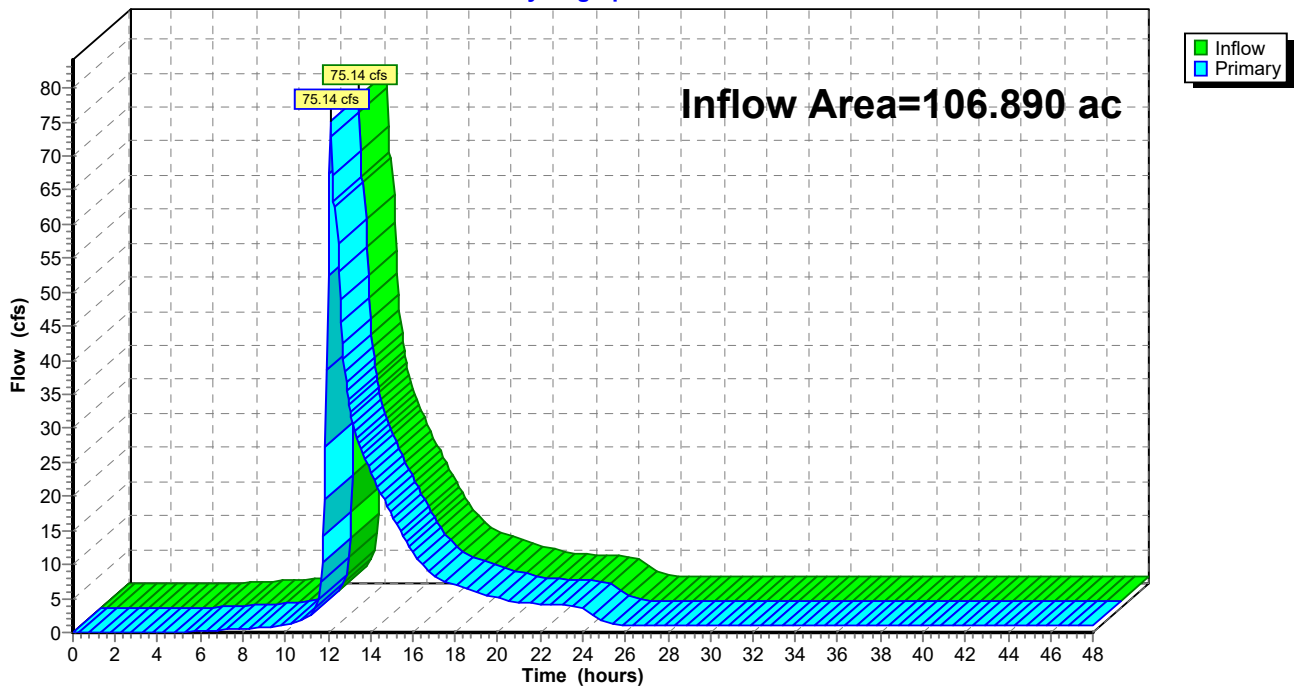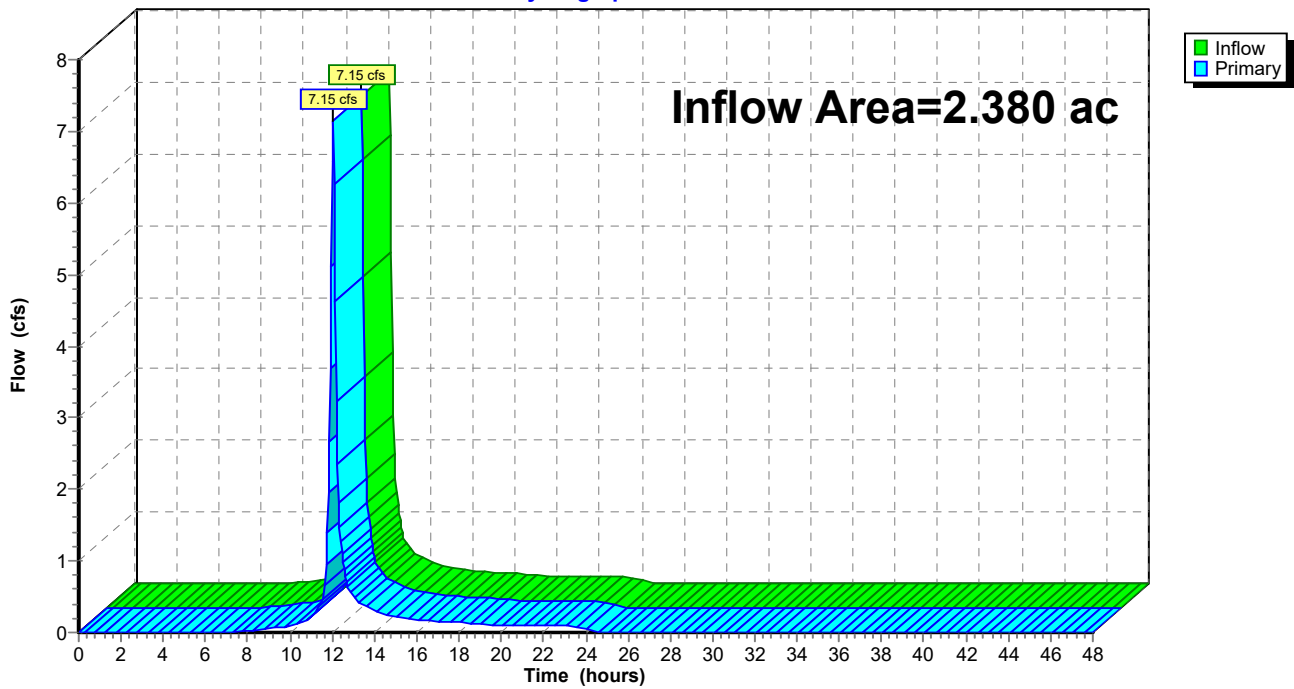*Type II 24-hr  10-Year Rainfall=5.30"*
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## Summary for Subcatchment 1S: ON-SITE #1

Runoff     =     173.27 cfs @  12.05 hrs,  Volume=          11.581 af,  Depth= 4.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  10-Year Rainfall=5.30"

| | Area (ac) | CN | Description |
|---|---|---|---|
| * | 19.330 | 92 | Duplex/Townhomes |
| | 11.140 | 92 | 1/8 acre lots, 65% imp, HSG D |
| | 1.240 | 95 | Urban commercial, 85% imp, HSG D |
| | 31.710 | 92 | Weighted Average |
| | 23.415 | | 73.84% Pervious Area |
| | 8.295 | | 26.16% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 | | **Sheet Flow,** Grass: Short  n= 0.150  P2= 3.60" |
| 5.6 | 1,086 | 0.0250 | 3.21 | | **Shallow Concentrated Flow,** Paved  Kv= 20.3 fps |
| 14.0 | 1,186 | | | | Total |

### Subcatchment 1S: ON-SITE #1



Type II 24-hr
10-Year Rainfall=5.30"
Runoff Area=31.710 ac
Runoff Volume=11.581 af
Runoff Depth=4.38"
Flow Length=1,186'
Slope=0.0250 '/'
Tc=14.0 min
CN=92

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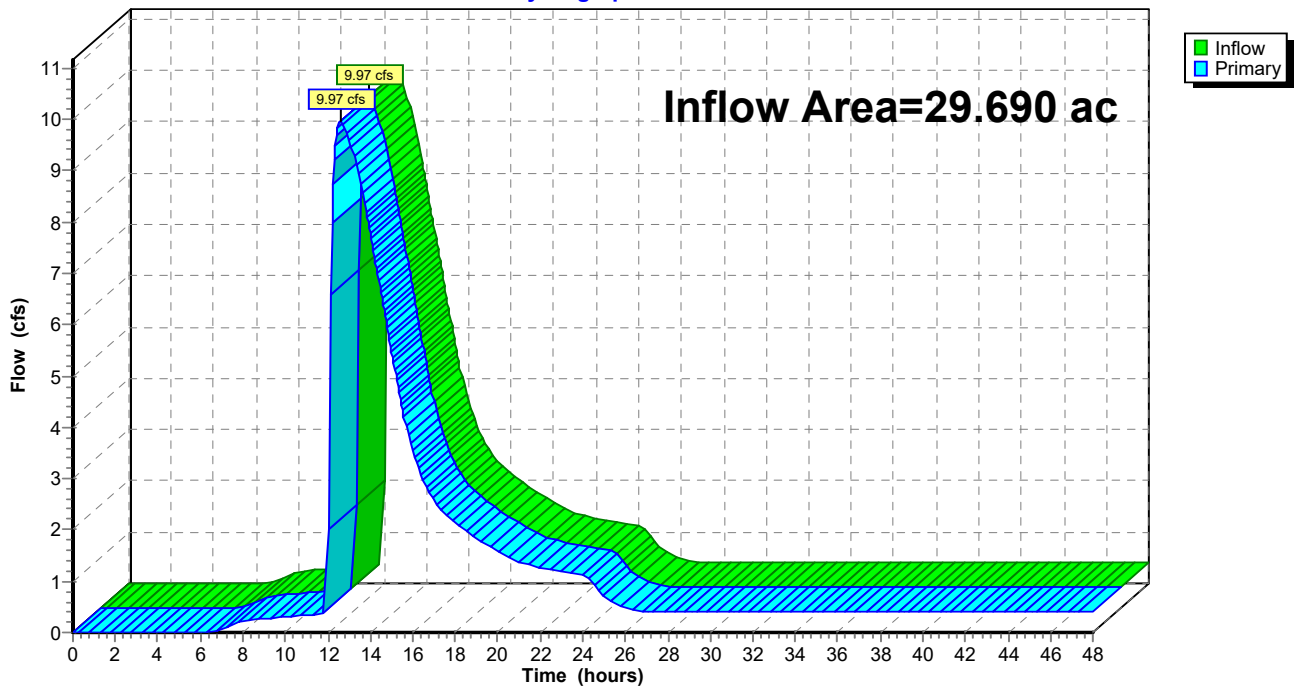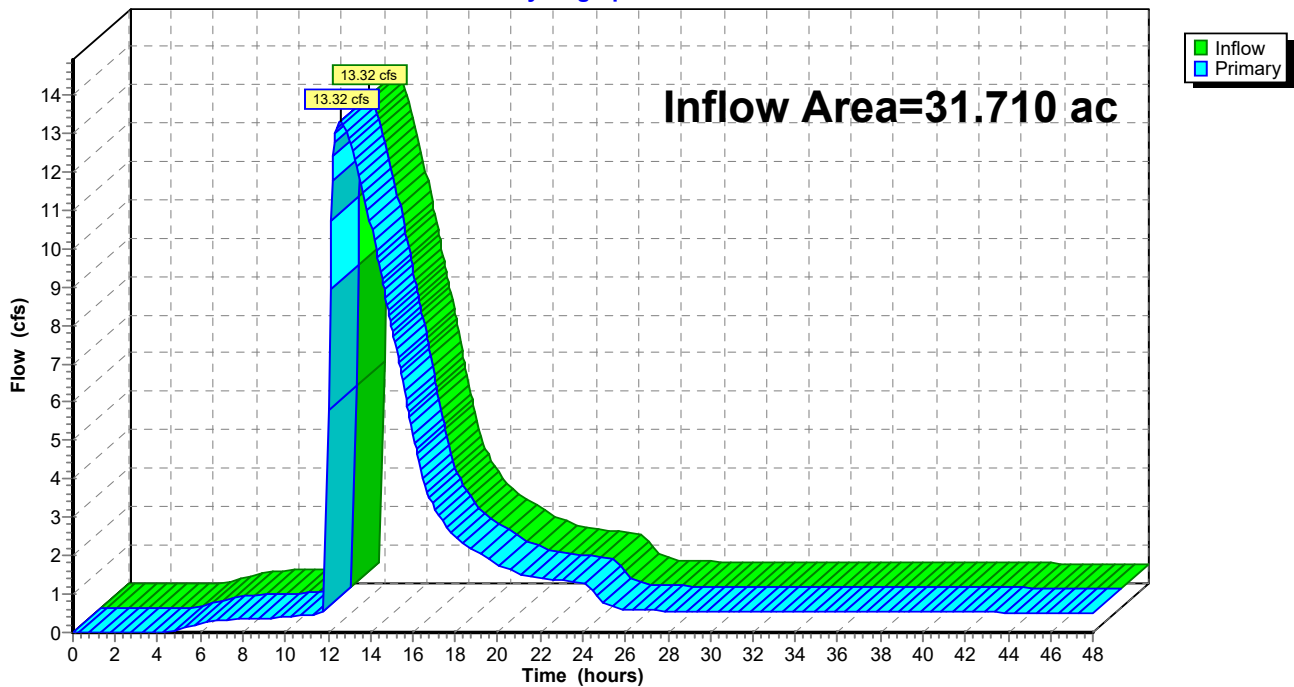Printed  4/18/2022
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## Summary for Subcatchment 3S: ON-SITE #3 (Bypass)

Runoff      =      12.33 cfs @  12.04 hrs,  Volume=          0.764 af,  Depth=  3.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  10-Year Rainfall=5.30"

| Area (ac) | CN | Description |
|---|---|---|
| 2.380 | 87 | 1/4 acre lots, 38% imp, HSG D |
| 1.476 | | 62.00% Pervious Area |
| 0.904 | | 38.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.9 | 50 | 0.0250 | 0.17 | | **Sheet Flow,** |
| | | | | | n= 0.150  P2= 3.60" |
| 7.8 | 1,060 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** |
| | | | | | Unpaved  Kv= 16.1 fps |
| 12.7 | 1,110 | Total | | | |

### Subcatchment 3S: ON-SITE #3 (Bypass)

**Hydrograph**



Type II 24-hr
10-Year Rainfall=5.30"
Runoff Area=2.380 ac
Runoff Volume=0.764 af
Runoff Depth=3.85"
Flow Length=1,110'
Tc=12.7 min
CN=87

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## Summary for Subcatchment 5S: OFF-SITE #1

Runoff     =      62.92 cfs @  12.10 hrs,  Volume=          4.417 af,  Depth=  2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  10-Year Rainfall=5.30"

| Area (ac) | CN | Description |
|---|---|---|
| 15.640 | 76 | Woods/grass comb., Fair, HSG C |
| 2.790 | 82 | Woods/grass comb., Fair, HSG D |
| 18.430 | 77 | Weighted Average |
| 18.430 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 9.2 | 1,147 | 0.0192 | 2.08 | | **Shallow Concentrated Flow,** Grassed Waterway   Kv= 15.0 fps |
| 17.6 | 1,247 | | | | Total |

### Subcatchment 5S: OFF-SITE #1

**Hydrograph**



Type II 24-hr
10-Year Rainfall=5.30"
Runoff Area=18.430 ac
Runoff Volume=4.417 af
Runoff Depth=2.88"
Flow Length=1,247'
Tc=17.6 min
CN=77

62.92 cfs

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## Summary for Subcatchment 6S: ON-SITE #4 (Bypass)

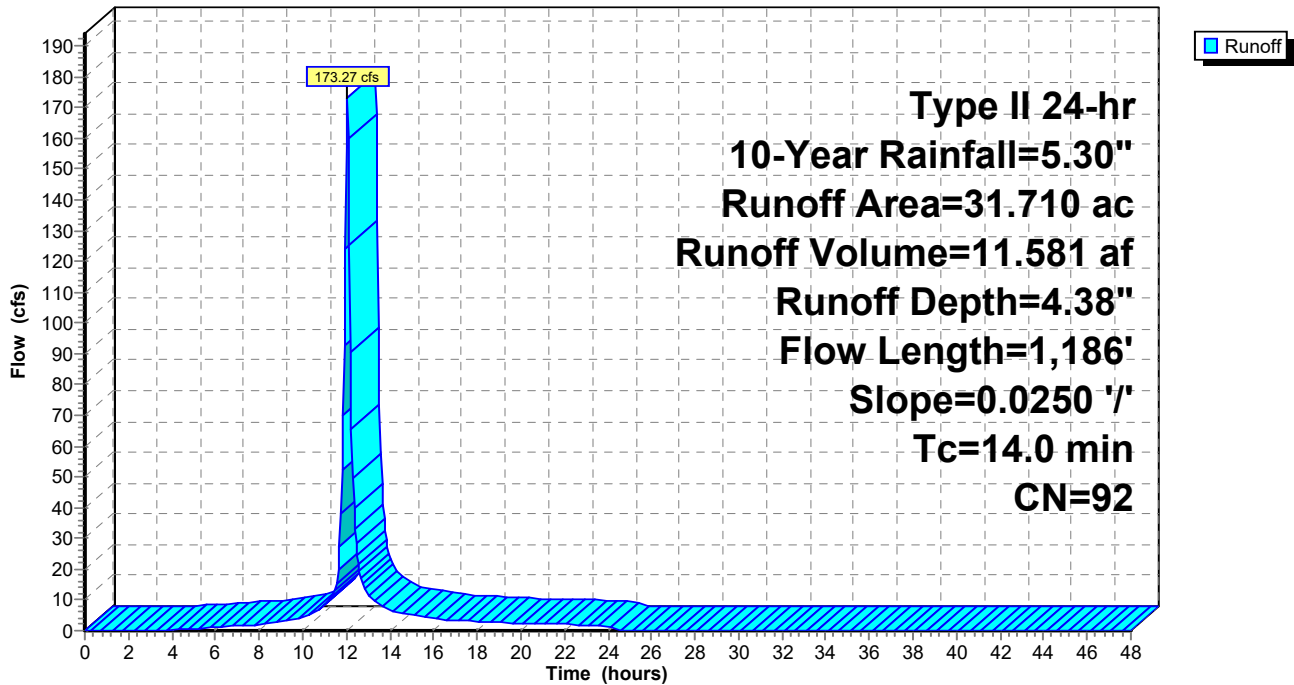Runoff     =     100.98 cfs @  12.07 hrs,  Volume=          6.688 af,  Depth= 3.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  10-Year Rainfall=5.30"

| Area (ac) | CN | Description |
|---|---|---|
| 22.730 | 80 | >75% Grass cover, Good, HSG D |
| 1.950 | 95 | Urban commercial, 85% imp, HSG D |
| 24.680 | 81 | Weighted Average |
| 23.023 | | 93.28% Pervious Area |
| 1.657 | | 6.72% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 7.1 | 1,086 | 0.0250 | 2.55 | | **Shallow Concentrated Flow,** Unpaved   Kv= 16.1 fps |
| 15.5 | 1,186 | | | | Total |

## Subcatchment 6S: ON-SITE #4 (Bypass)



**Hydrograph**

Type II 24-hr
10-Year Rainfall=5.30"
Runoff Area=24.680 ac
Runoff Volume=6.688 af
Runoff Depth=3.25"
Flow Length=1,186'
Slope=0.0250 '/'
Tc=15.5 min
CN=81

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## Summary for Subcatchment 7S: ON-SITE #2

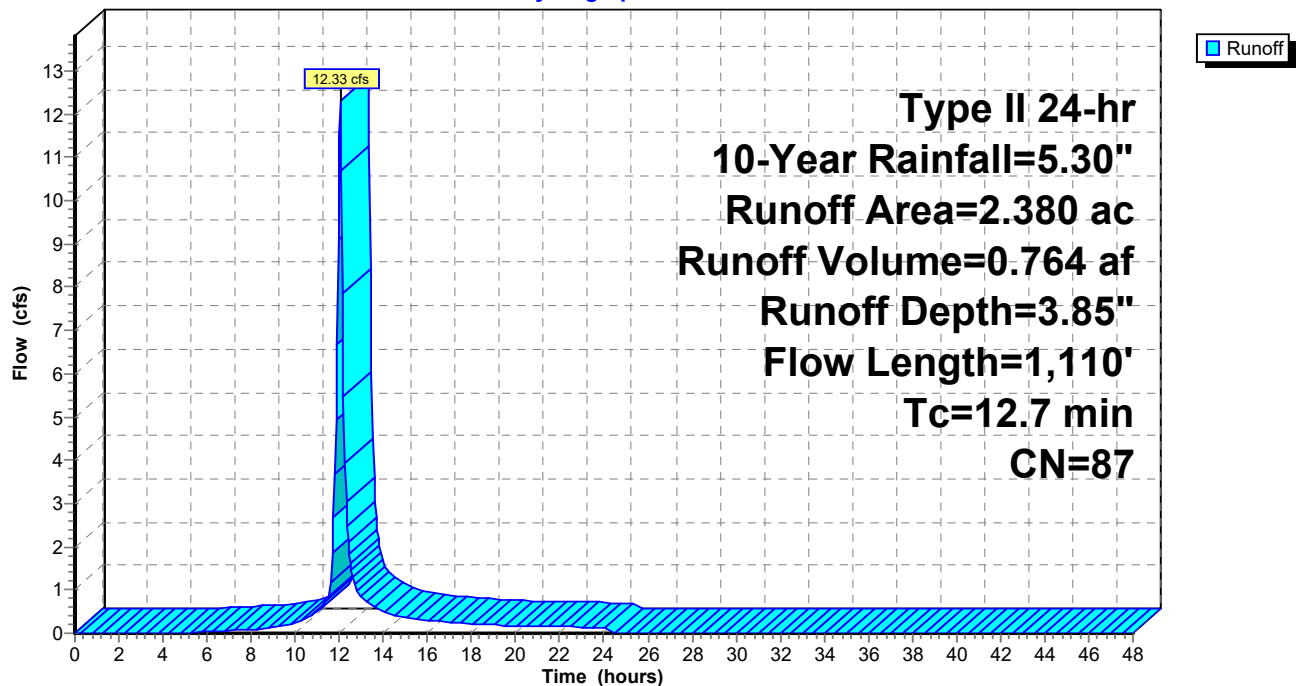Runoff     =     148.68 cfs @  12.05 hrs,  Volume=          9.527 af,  Depth=  3.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  10-Year Rainfall=5.30"

| Area (ac) | CN | Description |
|---|---|---|
| 29.690 | 87 | 1/4 acre lots, 38% imp, HSG D |
| 18.408 | | 62.00% Pervious Area |
| 11.282 | | 38.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.9 | 50 | 0.0250 | 0.17 | | **Sheet Flow,** Grass: Short  n= 0.150  P2= 3.60" |
| 8.9 | 1,719 | 0.0250 | 3.21 | | **Shallow Concentrated Flow,** Paved  Kv= 20.3 fps |
| 13.8 | 1,769 | | Total | | |

### Subcatchment 7S: ON-SITE #2

**Hydrograph**



Type II 24-hr
10-Year Rainfall=5.30"
Runoff Area=29.690 ac
Runoff Volume=9.527 af
Runoff Depth=3.85"
Flow Length=1,769'
Slope=0.0250 '/'
Tc=13.8 min
CN=87

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## Summary for Reach 6R: Reach 3

Inflow Area =       18.430 ac,   0.00% Impervious,  Inflow Depth =  2.88"    for  10-Year event
Inflow      =      58.33 cfs @   12.24 hrs,  Volume=           4.417 af
Outflow     =      54.88 cfs @   12.36 hrs,  Volume=            4.417 af,  Atten= 6%,  Lag= 7.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.35 fps,  Min. Travel Time= 4.0 min
Avg. Velocity = 1.06 fps,  Avg. Travel Time= 16.3 min

Peak Storage= 13,270 cf @ 12.29 hrs
Average Depth at Peak Storage= 1.35'
Bank-Full Depth= 6.40'  Flow Area= 252.4 sf,  Capacity= 2,150.14 cfs

Custom cross-section,  Length= 1,041.0'   Slope= 0.0088 '/'   (110 Elevation Intervals)
Constant n= 0.030  Earth, grassed & winding
Inlet Invert= 989.92',  Outlet Invert= 980.77'

‡

| Offset (feet) | Elevation (feet) | Chan.Depth (feet) |
|---|---|---|
| 0.00 | 996.29 | 0.00 |
| 7.00 | 996.00 | 0.29 |
| 12.99 | 994.06 | 2.23 |
| 13.24 | 994.00 | 2.29 |
| 14.48 | 993.84 | 2.45 |
| 28.84 | 992.00 | 4.29 |
| 29.66 | 991.71 | 4.58 |
| 36.75 | 990.00 | 6.29 |
| 39.18 | 989.92 | 6.37 |
| 39.90 | 989.89 | 6.40 |
| 42.20 | 989.97 | 6.32 |
| 43.14 | 990.00 | 6.29 |
| 43.91 | 990.40 | 5.89 |
| 46.34 | 992.00 | 4.29 |
| 53.90 | 993.41 | 2.88 |
| 56.74 | 994.00 | 2.29 |
| 62.76 | 994.22 | 2.07 |
| 76.31 | 994.65 | 1.64 |
| 100.00 | 996.29 | 0.00 |

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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.03 | 0.0 | 1.6 | 25 | 0.01 |
| 0.08 | 0.2 | 4.5 | 184 | 0.09 |
| 0.11 | 0.3 | 6.4 | 355 | 0.22 |
| 0.51 | 3.4 | 9.0 | 3,521 | 8.20 |
| 1.82 | 19.8 | 16.9 | 20,607 | 102.00 |
| 2.11 | 24.7 | 18.3 | 25,700 | 139.72 |
| 3.52 | 62.5 | 37.1 | 65,011 | 410.25 |
| 3.95 | 79.1 | 42.6 | 82,369 | 555.08 |
| 4.11 | 85.9 | 44.7 | 89,447 | 617.31 |
| 4.17 | 88.6 | 46.6 | 92,223 | 631.78 |
| 4.33 | 96.2 | 51.5 | 100,189 | 678.51 |
| 4.76 | 121.1 | 66.4 | 126,018 | 838.92 |
| 6.11 | 225.0 | 90.3 | 234,197 | 1,919.54 |
| 6.40 | 252.4 | 101.5 | 262,697 | 2,150.14 |

## Reach 6R: Reach 3

**Hydrograph**



Inflow Area=18.430 ac
Avg. Flow Depth=1.35'
Max Vel=4.35 fps
n=0.030
L=1,041.0'
S=0.0088 '/'
Capacity=2,150.14 cfs

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## Reach 6R: Reach 3



Stage-Discharge

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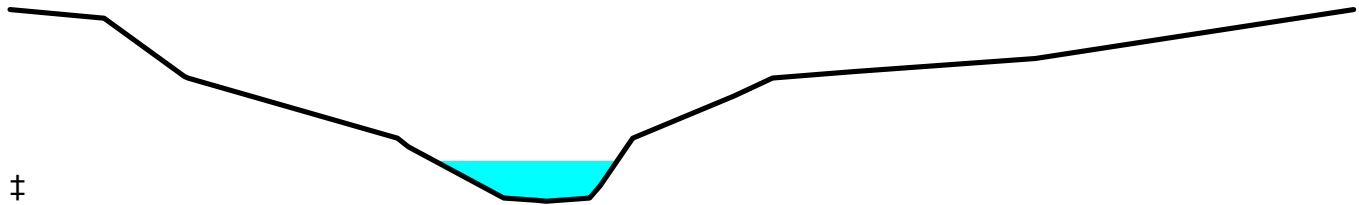Printed  4/18/2022
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## Summary for Reach 7R: Reach 2

Inflow Area =      18.430 ac,   0.00% Impervious,  Inflow Depth =  2.88"    for  10-Year event
Inflow      =     61.28 cfs @  12.14 hrs,  Volume=          4.417 af
Outflow     =     58.33 cfs @  12.24 hrs,  Volume=          4.417 af,  Atten= 5%,  Lag= 5.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.26 fps,  Min. Travel Time= 3.3 min
Avg. Velocity = 1.48 fps,  Avg. Travel Time= 9.6 min

Peak Storage= 11,715 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.87'
Bank-Full Depth= 3.24'  Flow Area= 204.3 sf,  Capacity= 1,999.47 cfs

Custom cross-section,  Length= 853.0'  Slope= 0.0225 '/'   (106 Elevation Intervals)
Constant n= 0.030  Earth, grassed & winding
Inlet Invert= 1,009.12',  Outlet Invert= 989.90'

‡

| Offset<br>(feet) | Elevation<br>(feet) | Chan.Depth<br>(feet) |
|---:|---:|---:|
| 0.00 | 1,009.14 | 0.00 |
| 22.15 | 1,008.00 | 1.14 |
| 24.54 | 1,007.80 | 1.34 |
| 25.18 | 1,007.74 | 1.40 |
| 49.26 | 1,006.00 | 3.14 |
| 49.59 | 1,005.90 | 3.24 |
| 50.51 | 1,005.99 | 3.15 |
| 52.13 | 1,005.99 | 3.15 |
| 53.24 | 1,006.00 | 3.14 |
| 91.41 | 1,007.74 | 1.40 |
| 98.60 | 1,008.00 | 1.14 |
| 108.78 | 1,008.27 | 0.87 |
| 117.07 | 1,008.47 | 0.67 |
| 117.16 | 1,008.47 | 0.67 |
| 134.91 | 1,008.89 | 0.25 |
| 135.00 | 1,009.14 | 0.00 |

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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.09 | 0.1 | 2.9 | 47 | 0.03 |
| 0.10 | 0.1 | 4.0 | 77 | 0.06 |
| 1.84 | 61.2 | 66.4 | 52,179 | 430.84 |
| 1.90 | 65.2 | 68.7 | 55,628 | 468.55 |
| 2.10 | 79.7 | 76.6 | 67,995 | 608.70 |
| 2.37 | 102.4 | 92.0 | 87,382 | 818.03 |
| 2.57 | 122.0 | 104.3 | 104,091 | 1,007.45 |
| 2.99 | 171.2 | 130.2 | 146,042 | 1,527.76 |
| 3.24 | 204.3 | 135.4 | 174,303 | 1,999.47 |

### Reach 7R: Reach 2

**Hydrograph**



Inflow Area=18.430 ac
Avg. Flow Depth=0.87'
Max Vel=4.26 fps
n=0.030
L=853.0'
S=0.0225 '/'
Capacity=1,999.47 cfs

61.28 cfs
58.33 cfs

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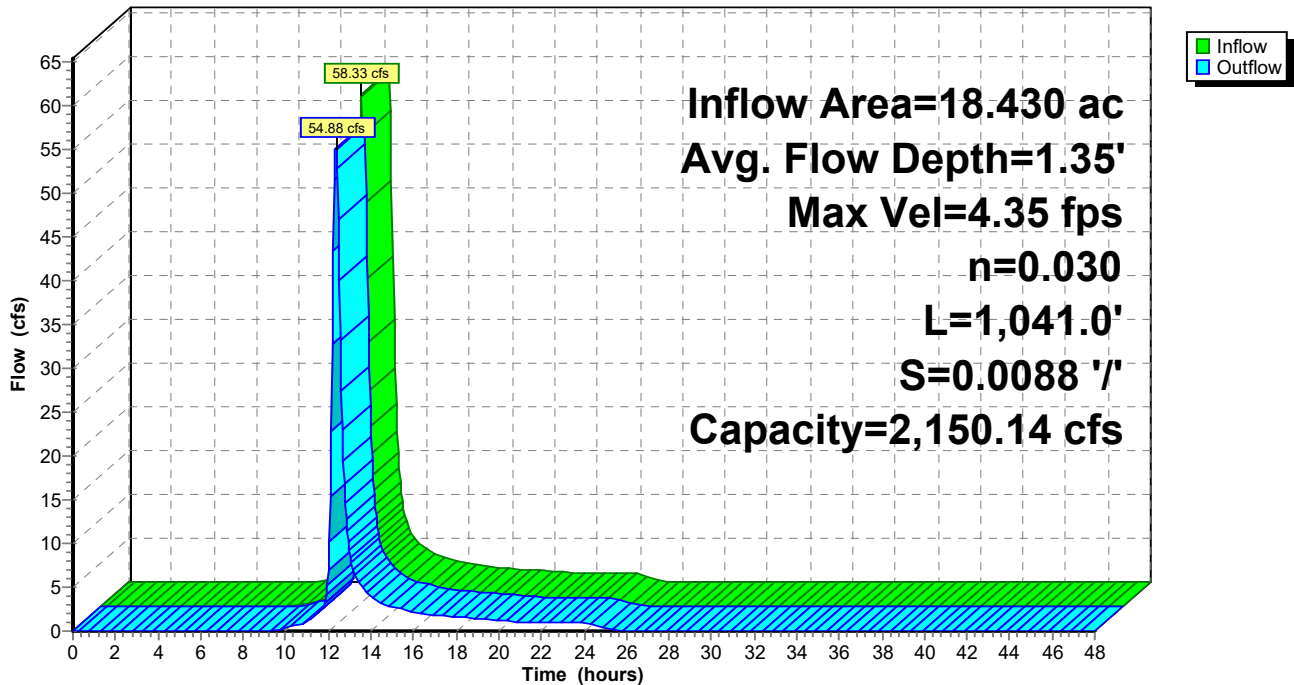*Type II 24-hr  10-Year Rainfall=5.30"*
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## Reach 7R: Reach 2



Stage-Discharge

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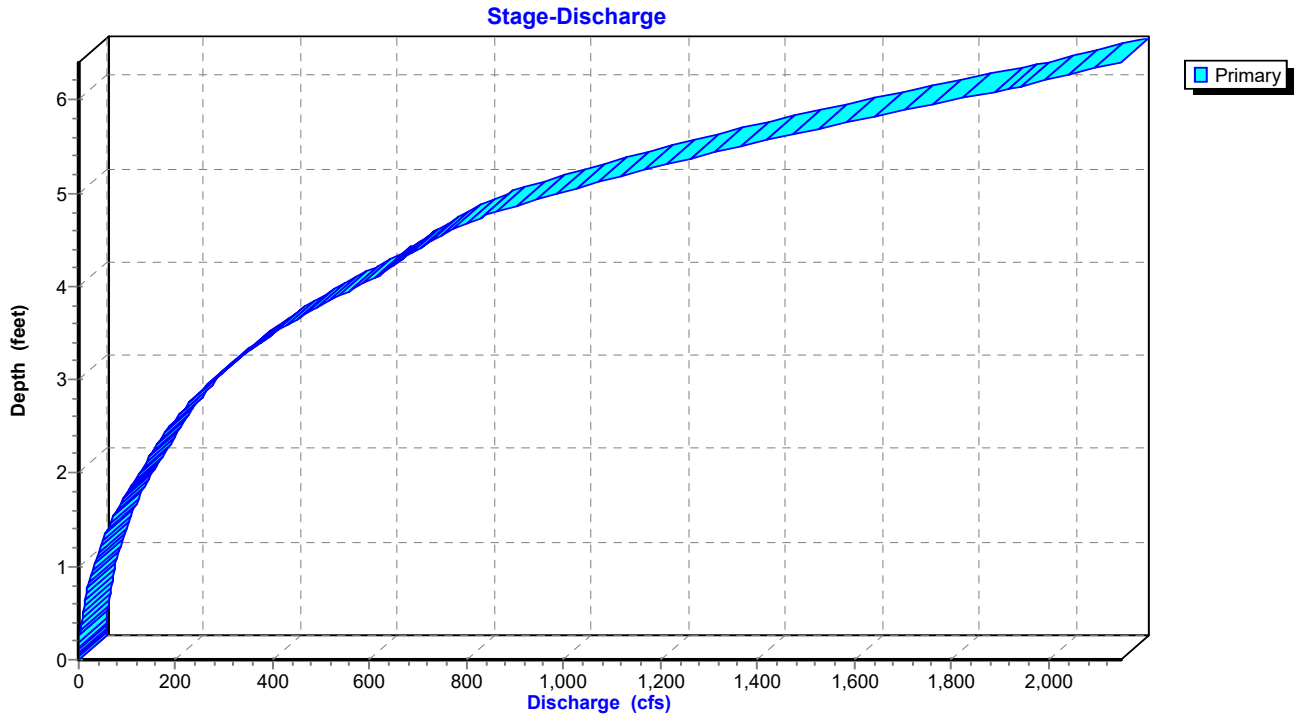Prepared by Schlagel and Assoc.
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## Summary for Reach 8R: REACH 1 (through Pipe System)

Inflow Area =        18.430 ac,    0.00% Impervious,  Inflow Depth =  2.88"    for  10-Year event
Inflow      =      62.92 cfs @   12.10 hrs,  Volume=            4.417 af
Outflow     =      61.28 cfs @   12.14 hrs,  Volume=            4.417 af,  Atten= 3%,  Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.85 fps,  Min. Travel Time= 1.3 min
Avg. Velocity = 4.64 fps,  Avg. Travel Time= 3.8 min

Peak Storage= 4,795 cf @ 12.12 hrs
Average Depth at Peak Storage= 1.82'
Bank-Full Depth= 3.00'  Flow Area= 7.1 sf,  Capacity= 91.10 cfs

36.0"  Round Pipe
n= 0.012  Concrete pipe, finished
Length= 1,067.0'   Slope= 0.0159 '/'
Inlet Invert= 1,021.96',  Outlet Invert= 1,005.00'

## Reach 8R: REACH 1 (through Pipe System)



**Hydrograph**

Inflow Area=18.430 ac
Avg. Flow Depth=1.82'
Max Vel=13.85 fps
36.0"
Round Pipe
n=0.012
L=1,067.0'
S=0.0159 '/'
Capacity=91.10 cfs

Legend: ■ Inflow  ■ Outflow

62.92 cfs
61.28 cfs
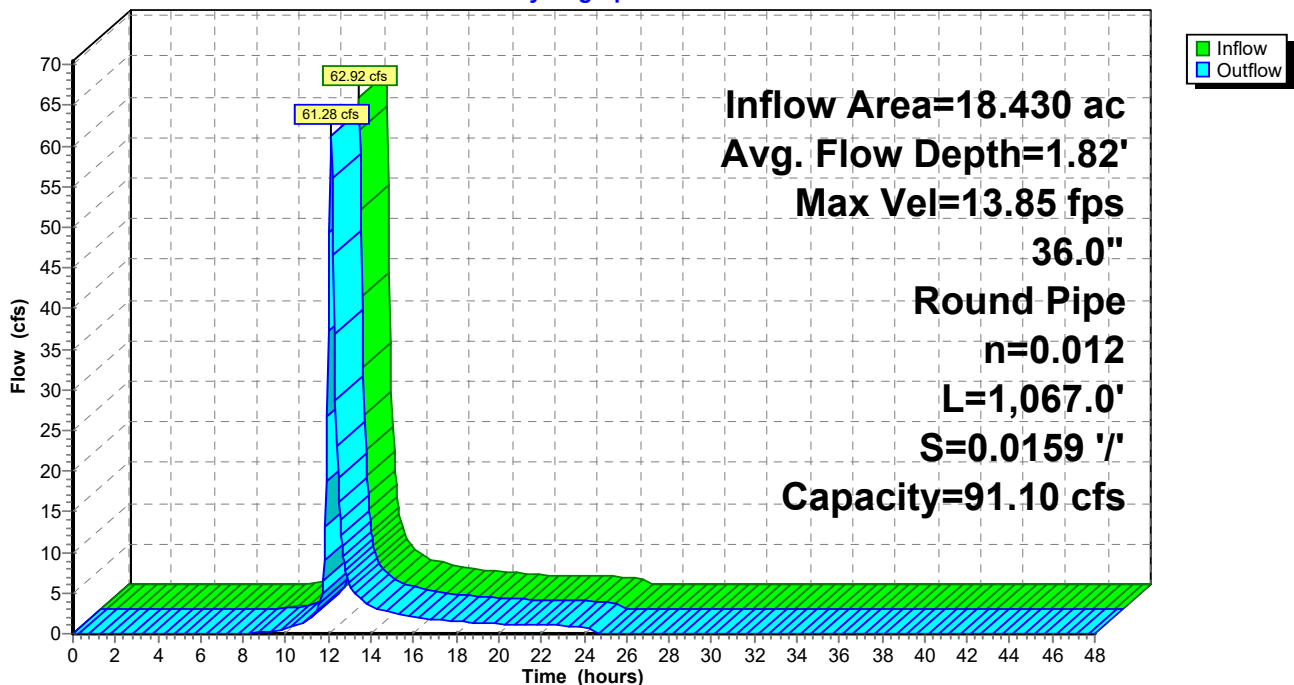
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*Type II 24-hr  10-Year Rainfall=5.30"*
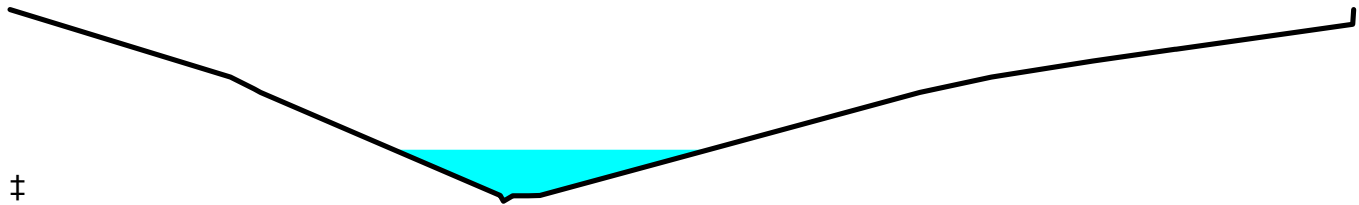Printed  4/18/2022
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## Reach 8R: REACH 1 (through Pipe System)



Stage-Discharge

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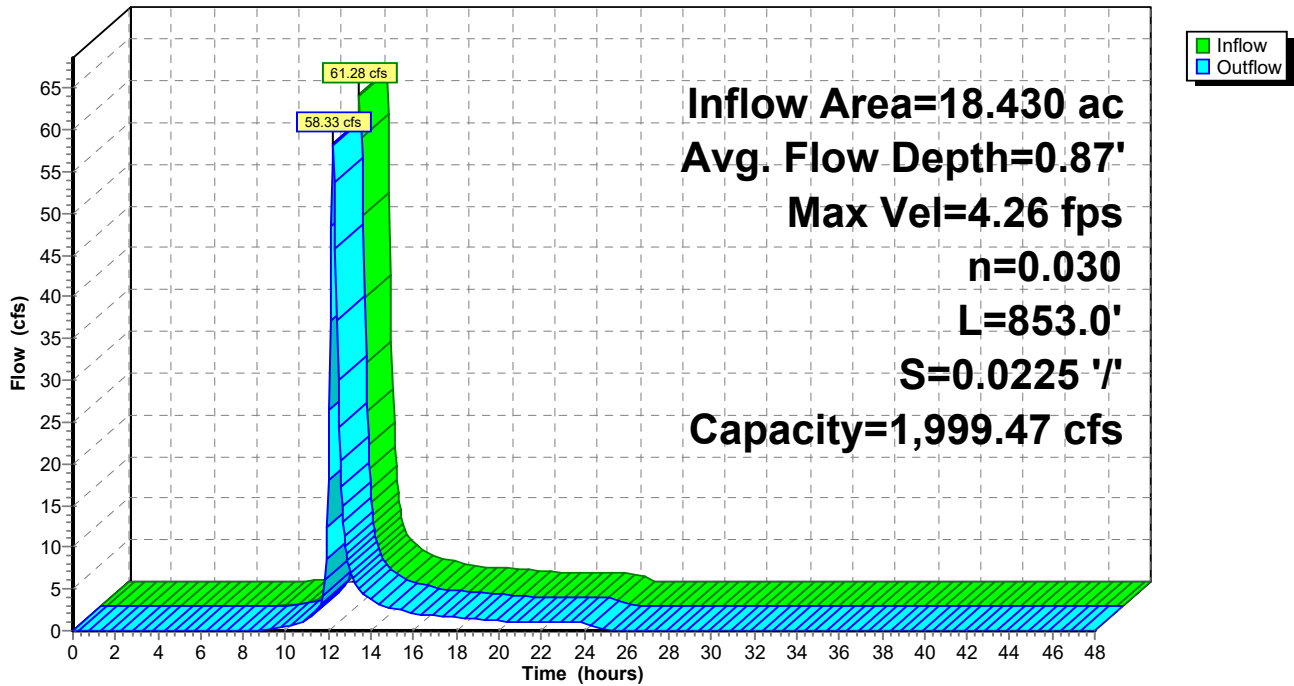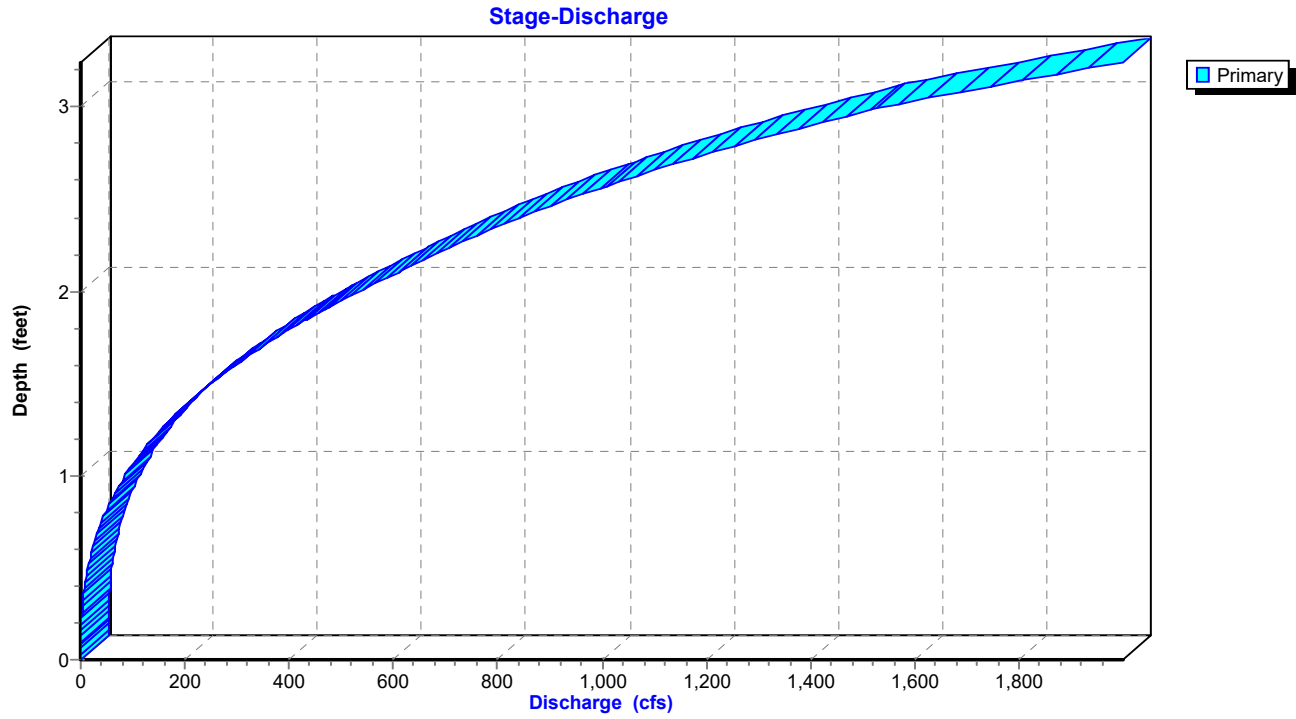*Type II 24-hr  10-Year Rainfall=5.30"*
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## Summary for Pond 4P: EDDB #1 Cornerstone

Inflow Area =      31.710 ac,  26.16% Impervious,  Inflow Depth =  4.38"    for  10-Year event
Inflow     =    173.27 cfs @  12.05 hrs,  Volume=         11.581 af
Outflow    =     60.26 cfs @  12.27 hrs,  Volume=         10.616 af,  Atten= 65%,  Lag= 13.1 min
Primary    =     60.26 cfs @  12.27 hrs,  Volume=         10.616 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,004.79' @ 12.27 hrs   Surf.Area= 52,106 sf   Storage= 249,634 cf

Plug-Flow detention time= 282.2 min calculated for 10.616 af (92% of inflow)
Center-of-Mass det. time= 237.4 min ( 1,022.3 - 784.9 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 995.67' | 374,566 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 995.67 | 0 | 0 | 0 |
| 996.00 | 700 | 116 | 116 |
| 997.00 | 7,200 | 3,950 | 4,066 |
| 998.00 | 12,000 | 9,600 | 13,666 |
| 999.00 | 17,900 | 14,950 | 28,616 |
| 1,000.00 | 27,000 | 22,450 | 51,066 |
| 1,001.00 | 36,000 | 31,500 | 82,566 |
| 1,002.00 | 40,000 | 38,000 | 120,566 |
| 1,003.00 | 44,800 | 42,400 | 162,966 |
| 1,004.00 | 48,700 | 46,750 | 209,716 |
| 1,005.00 | 53,000 | 50,850 | 260,566 |
| 1,006.00 | 57,000 | 55,000 | 315,566 |
| 1,007.00 | 61,000 | 59,000 | 374,566 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 993.54' | **30.0"  Round 30" Culvert** <br> L= 87.0'  RCP, sq.cut end projecting,  Ke= 0.500 <br> Inlet / Outlet Invert= 993.54' / 993.11'   S= 0.0049 '/'   Cc= 0.900 <br> n= 0.012  Concrete pipe, finished,  Flow Area= 4.91 sf |
| #2 | Device 1 | 994.16' | **2.9" Vert. WQ Orifice**   C= 0.600 |
| #3 | Device 2 | 994.36' | **8.0"  Round 8" PVC Pipe** <br> L= 20.0'  RCP, groove end projecting,  Ke= 0.200 <br> Inlet / Outlet Invert= 994.36' / 994.16'   S= 0.0100 '/'   Cc= 0.900 <br> n= 0.012,  Flow Area= 0.35 sf |
| #4 | Device 3 | 995.67' | **1.0" Vert. Riser Pipe X 8.00 columns** <br> X 9 rows with 4.0" cc spacing C= 0.600 |
| #5 | Device 1 | 1,001.05' | **48.0" W x 6.0" H Vert. Opening in Box**  C= 0.600 |
| #6 | Device 1 | 1,004.00' | **60.0" x 48.0" Horiz. Open Top of Box**  C= 0.600 <br> Limited to weir flow at low heads |

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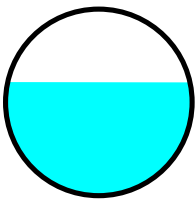Printed  4/18/2022
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**Primary OutFlow** Max=59.41 cfs @ 12.27 hrs  HW=1,004.78'   (Free Discharge)
└─**1=30" Culvert** (Passes 59.41 cfs of 74.71 cfs potential flow)
  └─**2=WQ Orifice** (Orifice Controls 0.72 cfs @ 15.60 fps)
    └─**3=8" PVC Pipe** (Passes 0.72 cfs of 6.07 cfs potential flow)
      └─**4=Riser Pipe** (Passes 0.72 cfs of 5.25 cfs potential flow)
  └─**5=Opening in Box** (Orifice Controls 17.97 cfs @ 8.98 fps)
  └─**6=Open Top of Box** (Weir Controls 40.73 cfs @ 2.89 fps)

### Pond 4P: EDDB #1 Cornerstone

**Hydrograph**



Inflow Area=31.710 ac
Peak Elev=1,004.79'
Storage=249,634 cf

**21-130-HYDRO-PRO orifice plate option**
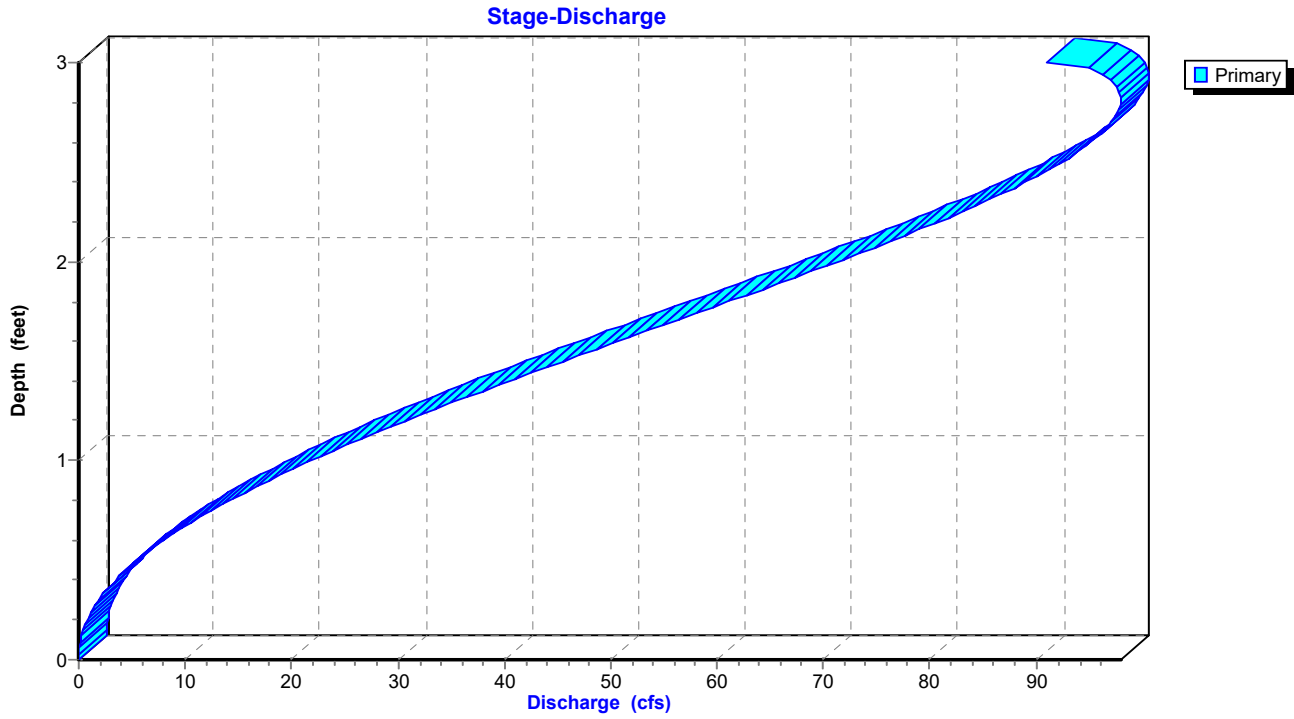Prepared by Schlagel and Assoc.
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## Pond 4P: EDDB #1 Cornerstone

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## Summary for Pond 5P: EDDB #2 Manor

Inflow Area =      29.690 ac,  38.00% Impervious,  Inflow Depth =  3.85"    for  10-Year event
Inflow      =    148.68 cfs @  12.05 hrs,  Volume=          9.527 af
Outflow   =     58.14 cfs @  12.25 hrs,  Volume=          8.604 af,  Atten= 61%,  Lag= 12.0 min
Primary   =     58.14 cfs @  12.25 hrs,  Volume=          8.604 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 996.06' @ 12.25 hrs   Surf.Area= 49,900 sf   Storage= 189,935 cf

Plug-Flow detention time= 261.1 min calculated for 8.595 af (90% of inflow)
Center-of-Mass det. time= 212.7 min ( 1,015.9 - 803.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 988.16' | 352,236 cf | **Custom Stage Data (Prismatic)**Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 988.16 | 0 | 0 | 0 |
| 989.00 | 800 | 336 | 336 |
| 990.00 | 4,200 | 2,500 | 2,836 |
| 991.00 | 10,400 | 7,300 | 10,136 |
| 992.00 | 21,600 | 16,000 | 26,136 |
| 993.00 | 37,600 | 29,600 | 55,736 |
| 994.00 | 41,700 | 39,650 | 95,386 |
| 995.00 | 46,000 | 43,850 | 139,236 |
| 996.00 | 49,700 | 47,850 | 187,086 |
| 997.00 | 53,200 | 51,450 | 238,536 |
| 998.00 | 56,900 | 55,050 | 293,586 |
| 999.00 | 60,400 | 58,650 | 352,236 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 986.00' | **30.0" Round 30" Culvert** L= 77.0'  RCP, sq.cut end projecting,  Ke= 0.500 Inlet / Outlet Invert= 986.00' / 985.62'  S= 0.0049 '/'  Cc= 0.900 n= 0.012  Concrete pipe, finished,  Flow Area= 4.91 sf |
| #2 | Device 1 | 986.62' | **2.5" Vert. WQ Orifice**  C= 0.600 |
| #3 | Device 2 | 986.86' | **8.0" Round 8" PVC Pipe** L= 20.0'  RCP, sq.cut end projecting,  Ke= 0.500 Inlet / Outlet Invert= 986.86' / 986.62'  S= 0.0120 '/'  Cc= 0.900 n= 0.012  Corrugated PP, smooth interior,  Flow Area= 0.35 sf |
| #4 | Device 3 | 988.16' | **1.0" Vert. Riser Pipe X 8.00 columns** X 8 rows with 4.0" cc spacing C= 0.600 |
| #5 | Device 1 | 993.40' | **48.0" W x 6.0" H Vert. Opening in Box**  C= 0.600 |
| #6 | Device 1 | 995.25' | **60.0" x 48.0" Horiz. Open Top of Box**  C= 0.600 Limited to weir flow at low heads |

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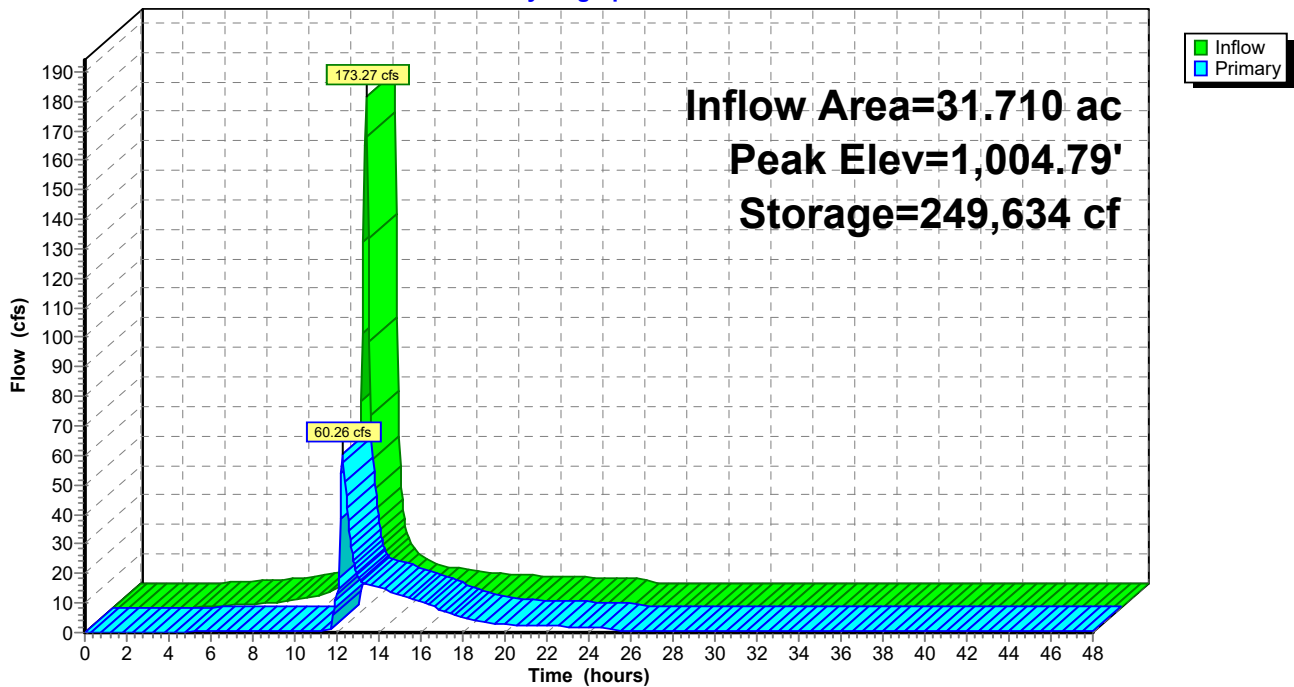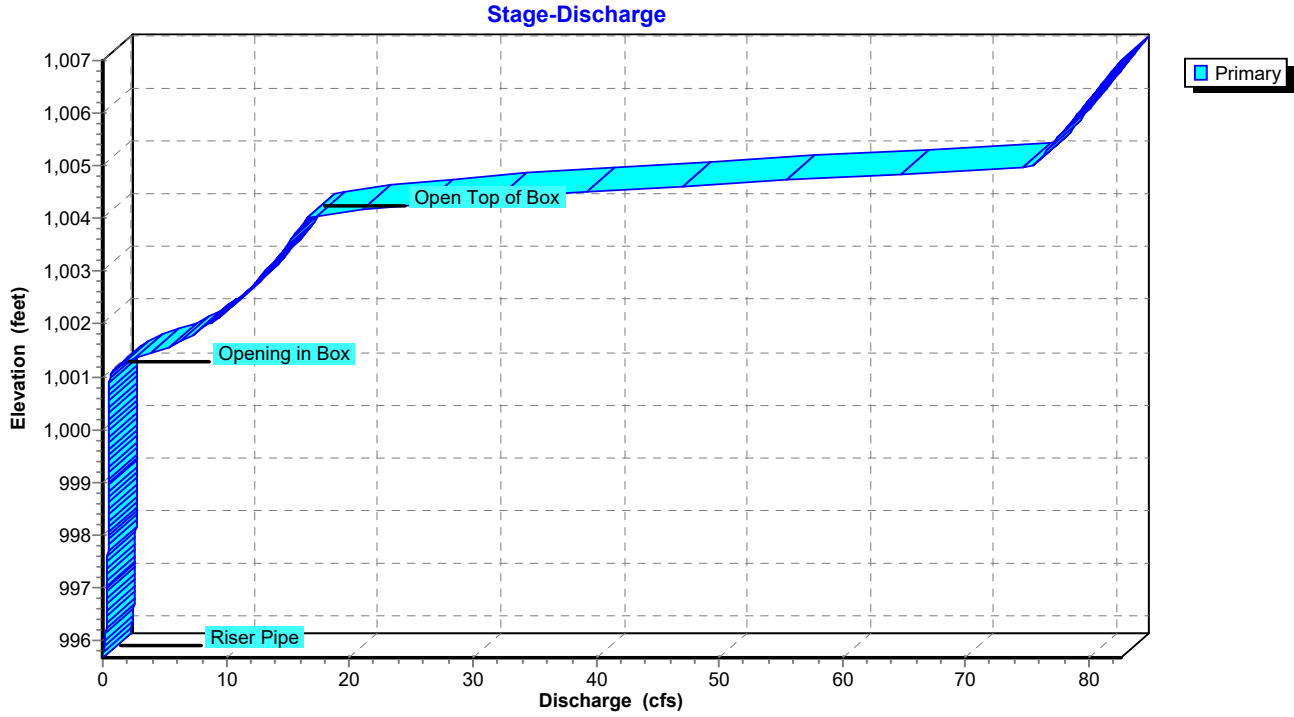*Type II 24-hr  10-Year Rainfall=5.30"*
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**Primary OutFlow** Max=58.03 cfs @ 12.25 hrs  HW=996.06'   (Free Discharge)
└─**1=30" Culvert** (Passes 58.03 cfs of 70.14 cfs potential flow)
  └─**2=WQ Orifice**  (Orifice Controls 0.50 cfs @ 14.71 fps)
    └─**3=8" PVC Pipe** (Passes 0.50 cfs of 5.00 cfs potential flow)
      └─**4=Riser Pipe** (Passes 0.50 cfs of 4.34 cfs potential flow)
  └─**5=Opening in Box** (Orifice Controls 14.93 cfs @ 7.47 fps)
  └─**6=Open Top of Box** (Weir Controls 42.60 cfs @ 2.94 fps)

### Pond 5P: EDDB #2 Manor



Inflow Area=29.690 ac
Peak Elev=996.06'
Storage=189,935 cf

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### Pond 5P: EDDB #2 Manor



Stage-Discharge

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## Summary for Link 2L: RP-1

Inflow Area =     106.890 ac,  20.71% Impervious,  Inflow Depth >  3.49"    for  10-Year event
Inflow      =     214.00 cfs @  12.23 hrs,  Volume=          31.088 af
Primary    =     214.00 cfs @  12.23 hrs,  Volume=          31.088 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 2L: RP-1

**Hydrograph**

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## Summary for Link 3L: RP-2

Inflow Area =        2.380 ac,  38.00% Impervious,  Inflow Depth =   3.85"    for  10-Year event
Inflow      =      12.33 cfs @   12.04 hrs,  Volume=          0.764 af
Primary    =      12.33 cfs @   12.04 hrs,  Volume=          0.764 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 3L: RP-2

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## Summary for Link 4L: RP-3

Inflow Area =      29.690 ac,  38.00% Impervious,  Inflow Depth >  3.48"    for  10-Year event
Inflow       =     58.14 cfs @   12.25 hrs,  Volume=             8.604 af
Primary     =     58.14 cfs @   12.25 hrs,  Volume=             8.604 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 4L: RP-3

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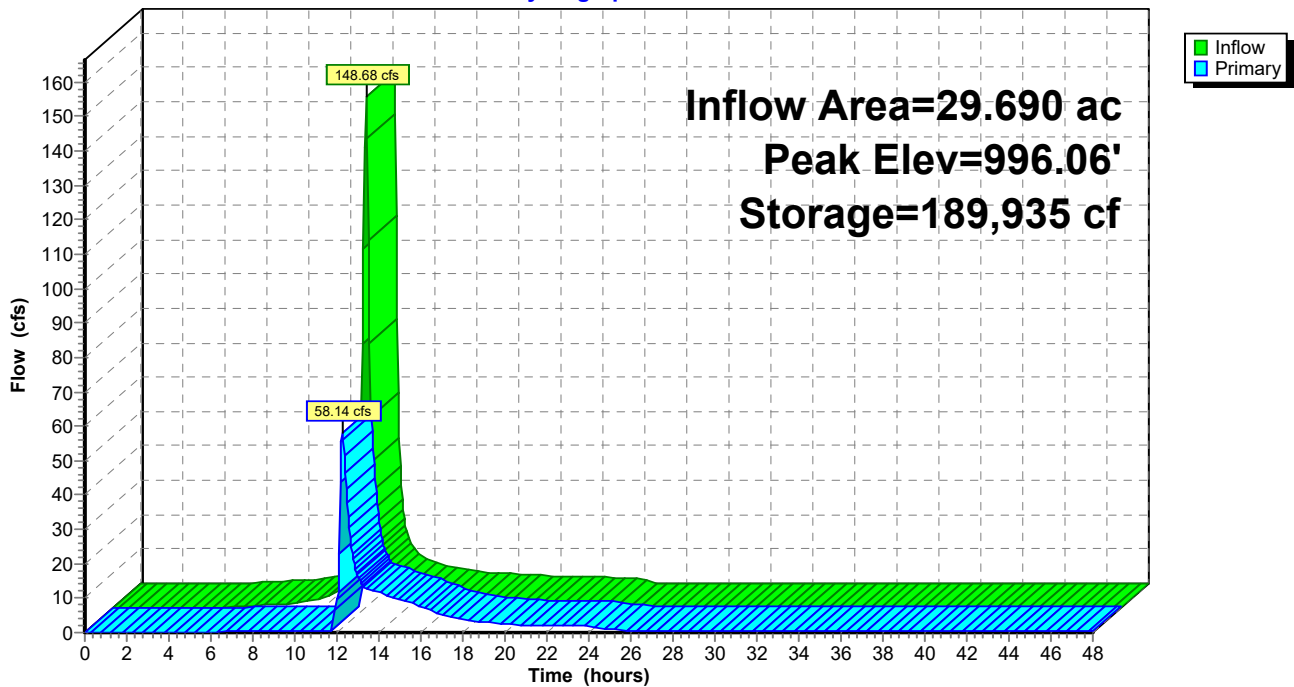*Type II 24-hr  10-Year Rainfall=5.30"*
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## Summary for Link 5L: RP-4

Inflow Area =       31.710 ac,  26.16% Impervious,  Inflow Depth >   4.02"    for  10-Year event
Inflow      =      60.26 cfs @   12.27 hrs,  Volume=          10.616 af
Primary     =      60.26 cfs @   12.27 hrs,  Volume=          10.616 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 5L: RP-4

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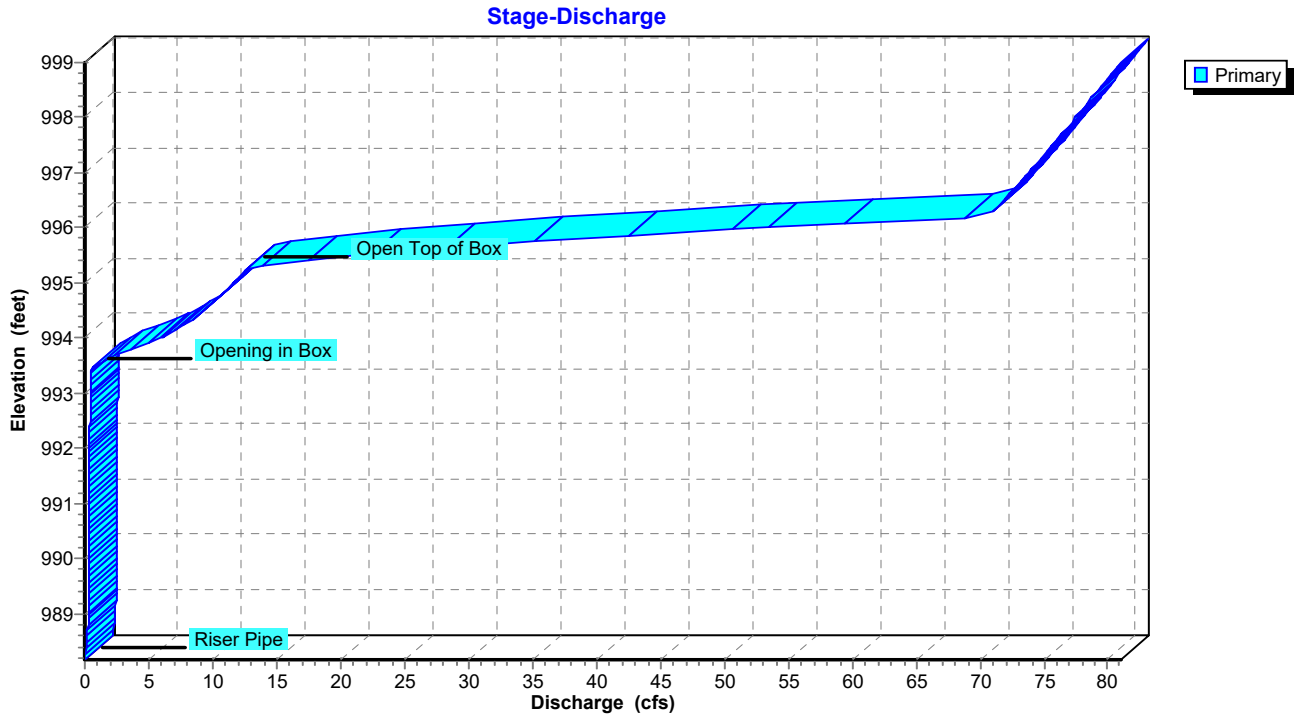Prepared by Schlagel and Assoc.
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*Type II 24-hr  100-Year Rainfall=7.70"*
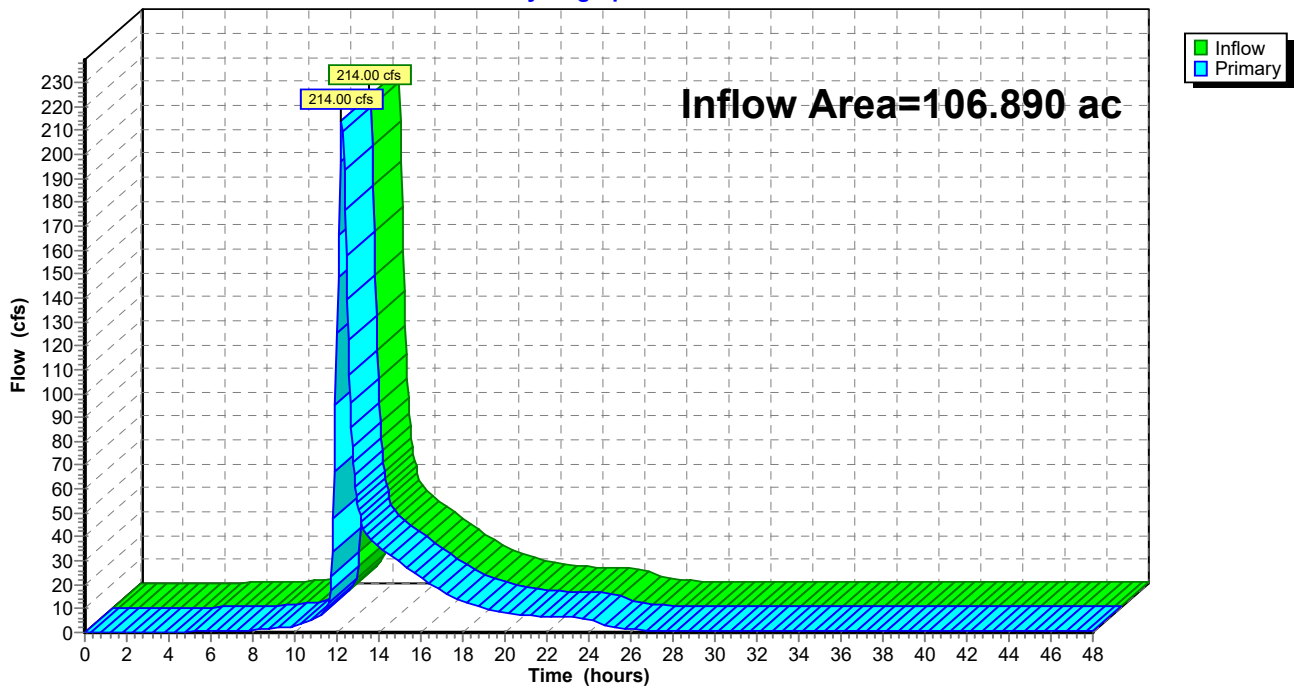Printed  4/18/2022
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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method  -  Pond routing by Stor-Ind method

**Subcatchment 1S: ON-SITE #1**          Runoff Area=31.710 ac  26.16% Impervious  Runoff Depth=6.75"
Flow Length=1,186'  Slope=0.0250 '/'  Tc=14.0 min  CN=92  Runoff=260.19 cfs  17.828 af

**Subcatchment 3S: ON-SITE #3 (Bypass)**     Runoff Area=2.380 ac  38.00% Impervious  Runoff Depth=6.16"
Flow Length=1,110'  Tc=12.7 min  CN=87  Runoff=19.23 cfs  1.221 af

**Subcatchment 5S: OFF-SITE #1**          Runoff Area=18.430 ac  0.00% Impervious  Runoff Depth=5.00"
Flow Length=1,247'  Tc=17.6 min  CN=77  Runoff=108.57 cfs  7.679 af

**Subcatchment 6S: ON-SITE #4 (Bypass)**     Runoff Area=24.680 ac  6.72% Impervious  Runoff Depth=5.46"
Flow Length=1,186'  Slope=0.0250 '/'  Tc=15.5 min  CN=81  Runoff=166.84 cfs  11.229 af

**Subcatchment 7S: ON-SITE #2**          Runoff Area=29.690 ac  38.00% Impervious  Runoff Depth=6.16"
Flow Length=1,769'  Slope=0.0250 '/'  Tc=13.8 min  CN=87  Runoff=232.03 cfs  15.236 af

**Reach 6R: Reach 3**               Avg. Flow Depth=1.72'  Max Vel=4.99 fps  Inflow=91.47 cfs  7.679 af
n=0.030  L=1,041.0'  S=0.0088 '/'  Capacity=2,150.14 cfs  Outflow=90.50 cfs  7.679 af

**Reach 7R: Reach 2**               Avg. Flow Depth=1.03'  Max Vel=4.78 fps  Inflow=92.93 cfs  7.679 af
n=0.030  L=853.0'  S=0.0225 '/'  Capacity=1,999.47 cfs  Outflow=91.47 cfs  7.679 af

**Reach 8R: REACH 1 (through Pipe**     Avg. Flow Depth=3.00'  Max Vel=14.68 fps  Inflow=108.57 cfs  7.679 af
36.0" Round Pipe  n=0.012  L=1,067.0'  S=0.0159 '/'  Capacity=91.10 cfs  Outflow=92.93 cfs  7.679 af

**Pond 4P: EDDB #1 Cornerstone**     Peak Elev=1,006.64'  Storage=352,702 cf  Inflow=260.19 cfs  17.828 af
Outflow=81.35 cfs  16.846 af

**Pond 5P: EDDB #2 Manor**          Peak Elev=997.86'  Storage=285,540 cf  Inflow=232.03 cfs  15.236 af
Outflow=76.98 cfs  14.297 af

**Link 2L: RP-1**                    Inflow=369.46 cfs  51.273 af
Primary=369.46 cfs  51.273 af

**Link 3L: RP-2**                    Inflow=19.23 cfs  1.221 af
Primary=19.23 cfs  1.221 af

**Link 4L: RP-3**                    Inflow=76.98 cfs  14.297 af
Primary=76.98 cfs  14.297 af

**Link 5L: RP-4**                    Inflow=81.35 cfs  16.846 af
Primary=81.35 cfs  16.846 af

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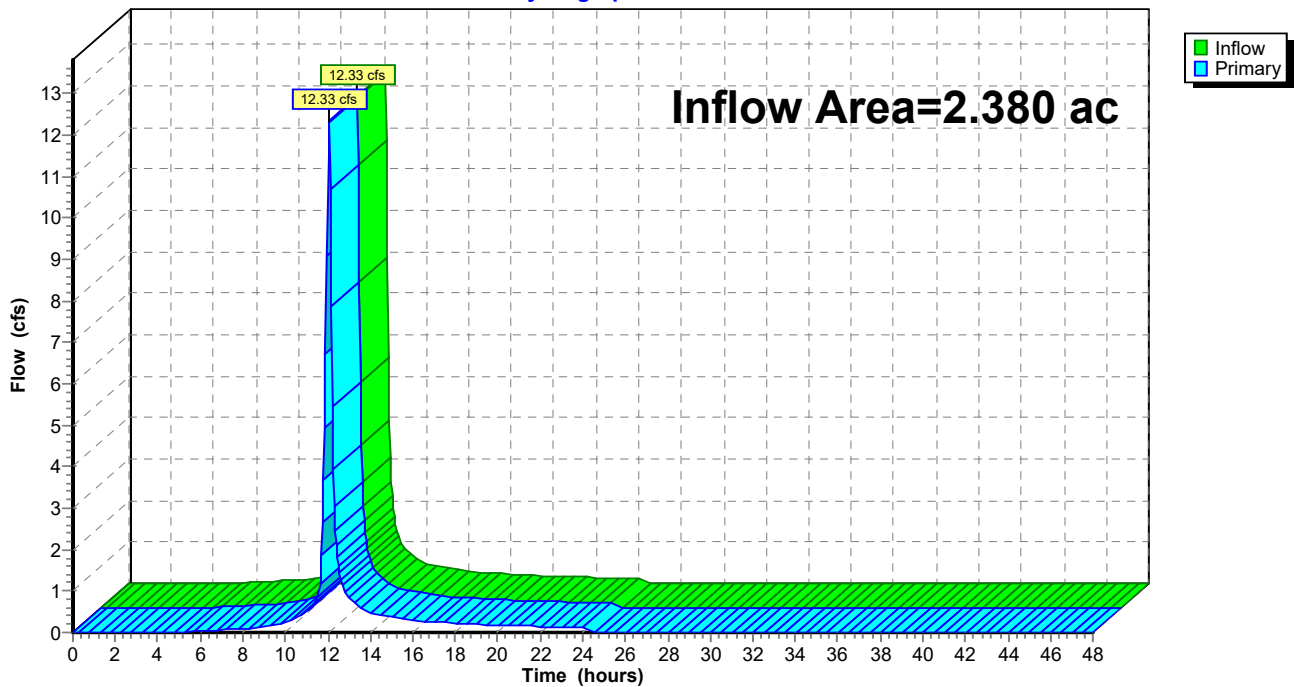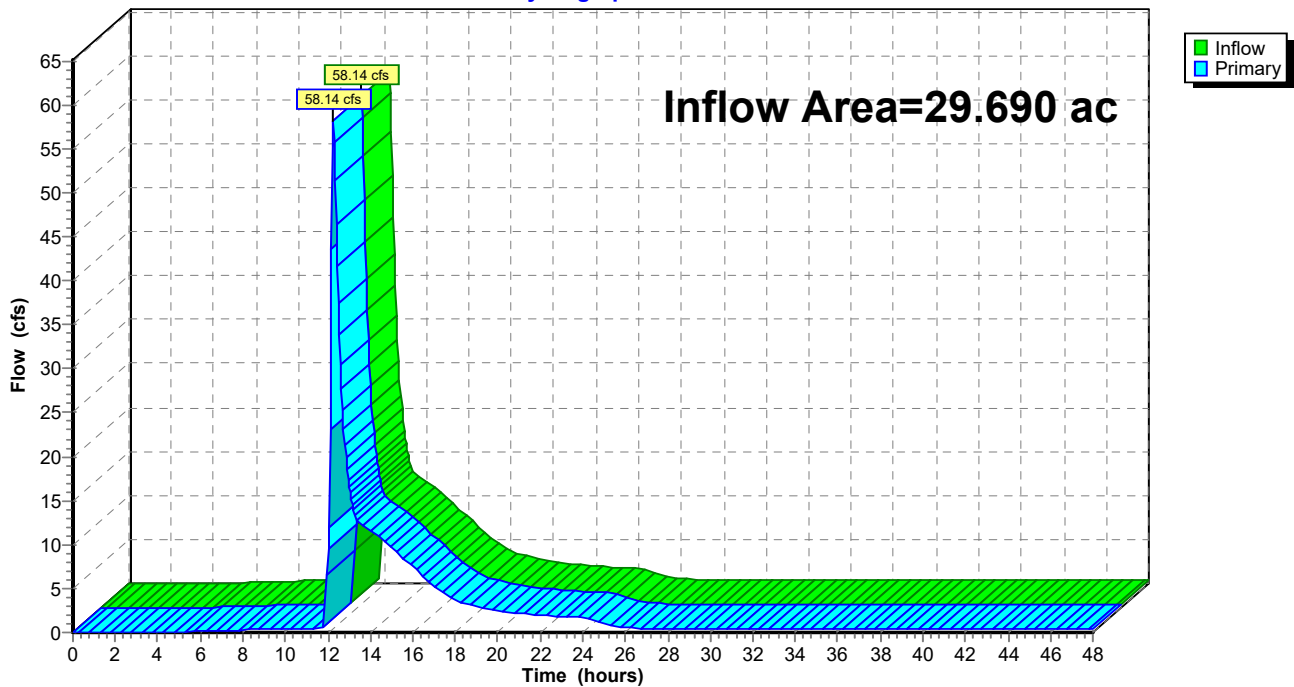*Type II 24-hr  100-Year Rainfall=7.70"*
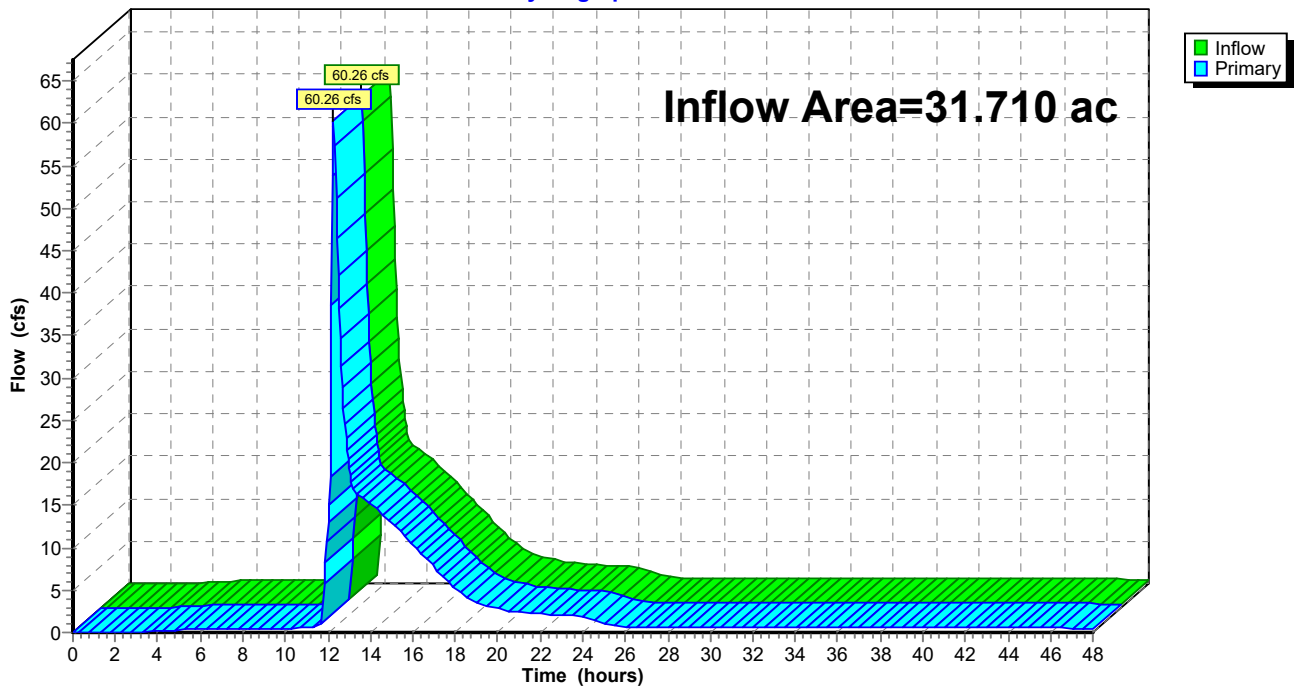Printed  4/18/2022
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## Summary for Subcatchment 1S: ON-SITE #1

Runoff     =     260.19 cfs @  12.05 hrs,  Volume=          17.828 af,  Depth= 6.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  100-Year Rainfall=7.70"

| | Area (ac) | CN | Description |
|---|---|---|---|
| * | 19.330 | 92 | Duplex/Townhomes |
| | 11.140 | 92 | 1/8 acre lots, 65% imp, HSG D |
| | 1.240 | 95 | Urban commercial, 85% imp, HSG D |
| | 31.710 | 92 | Weighted Average |
| | 23.415 | | 73.84% Pervious Area |
| | 8.295 | | 26.16% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 5.6 | 1,086 | 0.0250 | 3.21 | | **Shallow Concentrated Flow,** Paved   Kv= 20.3 fps |
| 14.0 | 1,186 | | | | Total |

### Subcatchment 1S: ON-SITE #1

**Hydrograph**



Type II 24-hr
100-Year Rainfall=7.70"
Runoff Area=31.710 ac
Runoff Volume=17.828 af
Runoff Depth=6.75"
Flow Length=1,186'
Slope=0.0250 '/'
Tc=14.0 min
CN=92

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## Summary for Subcatchment 3S: ON-SITE #3 (Bypass)

Runoff      =      19.23 cfs @   12.04 hrs,  Volume=         1.221 af,  Depth=  6.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  100-Year Rainfall=7.70"

| Area (ac) | CN | Description |
|---|---|---|
| 2.380 | 87 | 1/4 acre lots, 38% imp, HSG D |
| 1.476 | | 62.00% Pervious Area |
| 0.904 | | 38.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.9 | 50 | 0.0250 | 0.17 | | **Sheet Flow,** n= 0.150   P2= 3.60" |
| 7.8 | 1,060 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved   Kv= 16.1 fps |
| 12.7 | 1,110 | Total | | | |

### Subcatchment 3S: ON-SITE #3 (Bypass)

**Hydrograph**



Type II 24-hr
100-Year Rainfall=7.70"
Runoff Area=2.380 ac
Runoff Volume=1.221 af
Runoff Depth=6.16"
Flow Length=1,110'
Tc=12.7 min
CN=87

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## Summary for Subcatchment 5S: OFF-SITE #1

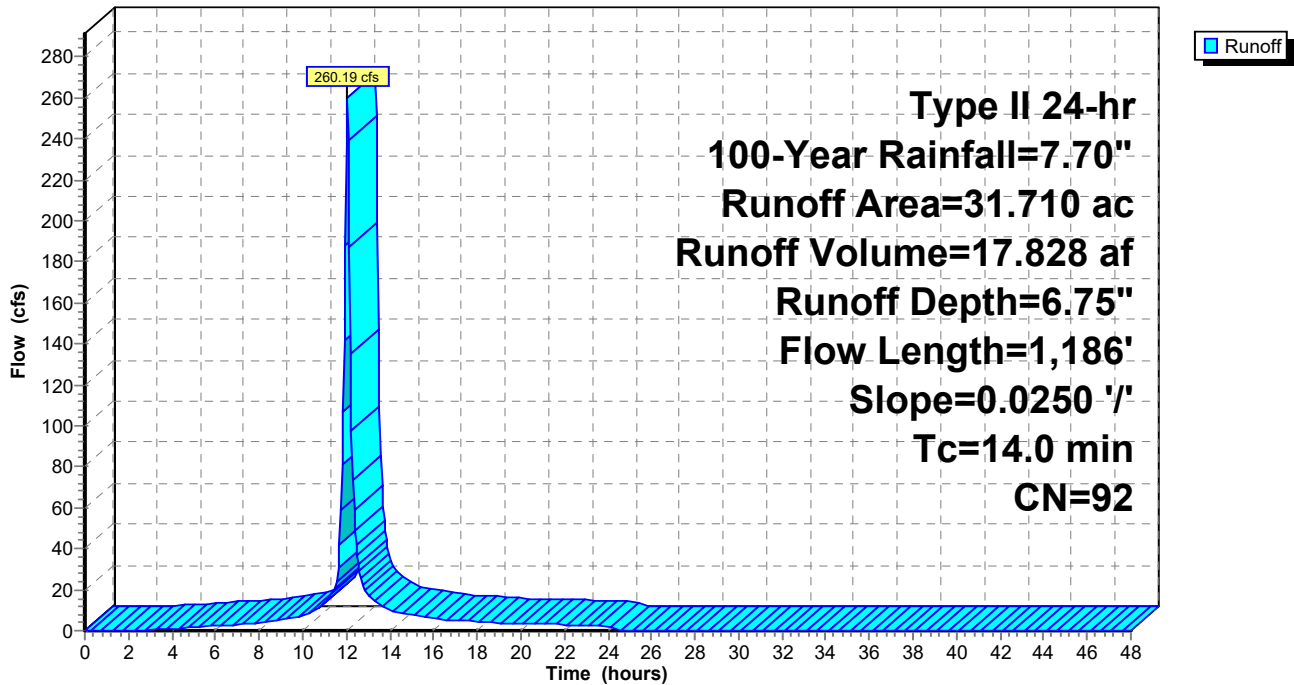Runoff      =      108.57 cfs @  12.10 hrs,  Volume=            7.679 af,  Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  100-Year Rainfall=7.70"

| Area (ac) | CN | Description |
|---|---|---|
| 15.640 | 76 | Woods/grass comb., Fair, HSG C |
| 2.790 | 82 | Woods/grass comb., Fair, HSG D |
| 18.430 | 77 | Weighted Average |
| 18.430 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 9.2 | 1,147 | 0.0192 | 2.08 | | **Shallow Concentrated Flow,** Grassed Waterway   Kv= 15.0 fps |
| 17.6 | 1,247 | Total | | | |

### Subcatchment 5S: OFF-SITE #1

**Hydrograph**



Type II 24-hr
100-Year Rainfall=7.70"
Runoff Area=18.430 ac
Runoff Volume=7.679 af
Runoff Depth=5.00"
Flow Length=1,247'
Tc=17.6 min
CN=77

108.57 cfs

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## Summary for Subcatchment 6S: ON-SITE #4 (Bypass)

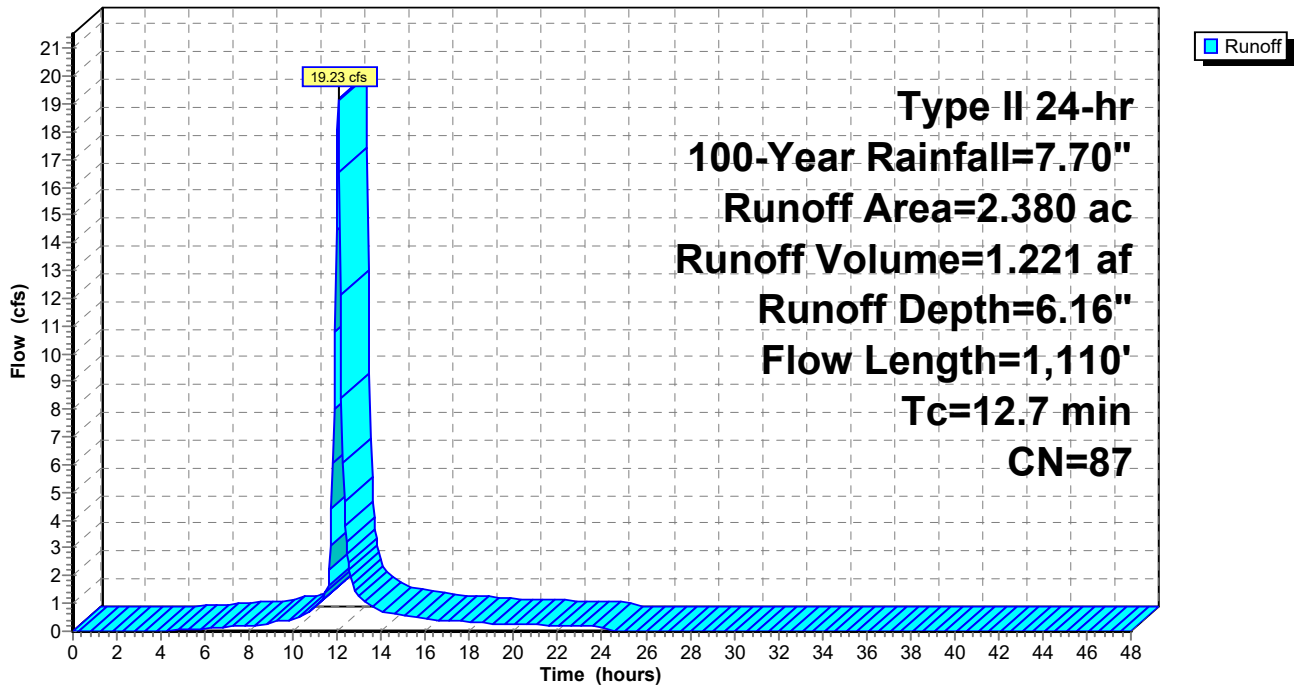Runoff    =    166.84 cfs @  12.07 hrs,  Volume=        11.229 af,  Depth= 5.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  100-Year Rainfall=7.70"

| Area (ac) | CN | Description |
|---|---|---|
| 22.730 | 80 | >75% Grass cover, Good, HSG D |
| 1.950 | 95 | Urban commercial, 85% imp, HSG D |
| 24.680 | 81 | Weighted Average |
| 23.023 | | 93.28% Pervious Area |
| 1.657 | | 6.72% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 7.1 | 1,086 | 0.0250 | 2.55 | | **Shallow Concentrated Flow,** Unpaved   Kv= 16.1 fps |
| 15.5 | 1,186 | | | | Total |

### Subcatchment 6S: ON-SITE #4 (Bypass)

**Hydrograph**



Type II 24-hr
100-Year Rainfall=7.70"
Runoff Area=24.680 ac
Runoff Volume=11.229 af
Runoff Depth=5.46"
Flow Length=1,186'
Slope=0.0250 '/'
Tc=15.5 min
CN=81

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## Summary for Subcatchment 7S: ON-SITE #2

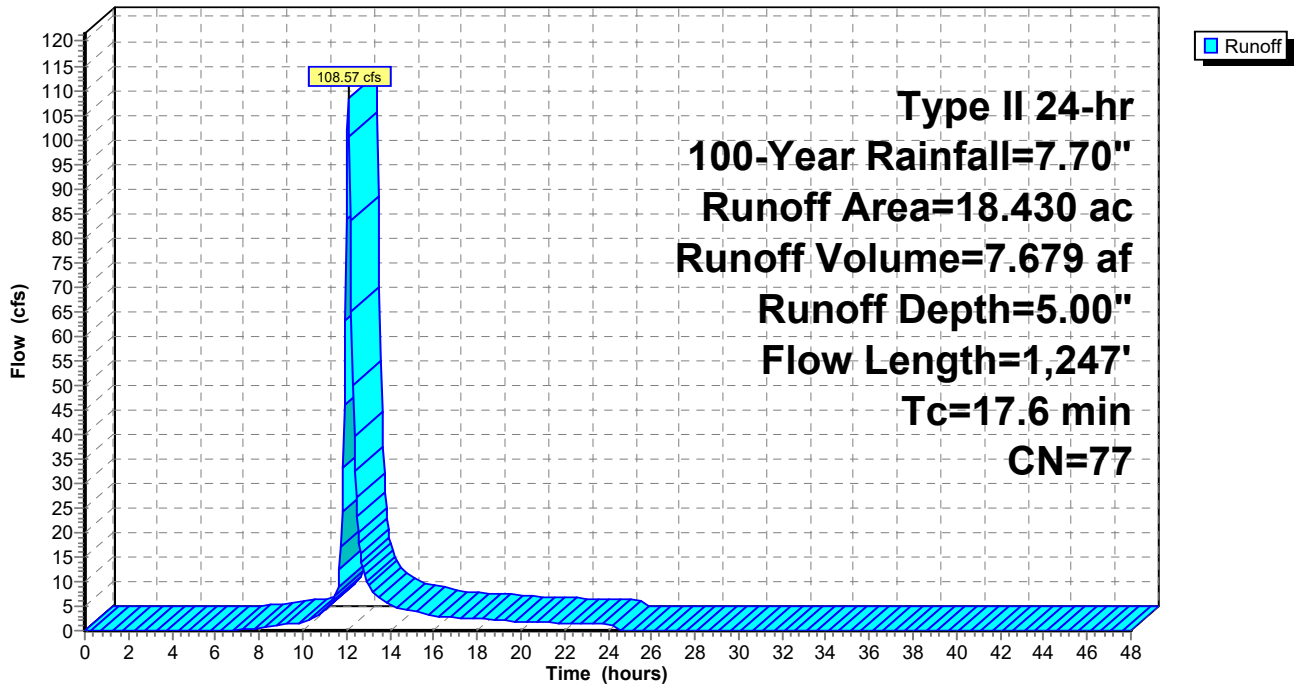Runoff    =    232.03 cfs @  12.05 hrs,  Volume=         15.236 af,  Depth=  6.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  100-Year Rainfall=7.70"

| Area (ac) | CN | Description |
|---|---|---|
| 29.690 | 87 | 1/4 acre lots, 38% imp, HSG D |
| 18.408 | | 62.00% Pervious Area |
| 11.282 | | 38.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.9 | 50 | 0.0250 | 0.17 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 8.9 | 1,719 | 0.0250 | 3.21 | | **Shallow Concentrated Flow,** Paved   Kv= 20.3 fps |
| 13.8 | 1,769 | Total | | | |

### Subcatchment 7S: ON-SITE #2

**Hydrograph**



**Type II 24-hr**
**100-Year Rainfall=7.70"**
**Runoff Area=29.690 ac**
**Runoff Volume=15.236 af**
**Runoff Depth=6.16"**
**Flow Length=1,769'**
**Slope=0.0250 '/'**
**Tc=13.8 min**
**CN=87**

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## Summary for Reach 6R: Reach 3

Inflow Area =        18.430 ac,    0.00% Impervious,  Inflow Depth =  5.00"    for  100-Year event
Inflow      =      91.47 cfs @   12.30 hrs,  Volume=            7.679 af
Outflow    =      90.50 cfs @   12.36 hrs,  Volume=            7.679 af,  Atten= 1%,  Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.99 fps,  Min. Travel Time= 3.5 min
Avg. Velocity = 1.24 fps,  Avg. Travel Time= 14.0 min

Peak Storage= 18,925 cf @ 12.30 hrs
Average Depth at Peak Storage= 1.72'
Bank-Full Depth= 6.40'  Flow Area= 252.4 sf,  Capacity= 2,150.14 cfs

Custom cross-section,  Length= 1,041.0'  Slope= 0.0088 '/'   (110 Elevation Intervals)
Constant n= 0.030  Earth, grassed & winding
Inlet Invert= 989.92',  Outlet Invert= 980.77'

‡

| Offset | Elevation | Chan.Depth |
|---|---|---|
| (feet) | (feet) | (feet) |
| 0.00 | 996.29 | 0.00 |
| 7.00 | 996.00 | 0.29 |
| 12.99 | 994.06 | 2.23 |
| 13.24 | 994.00 | 2.29 |
| 14.48 | 993.84 | 2.45 |
| 28.84 | 992.00 | 4.29 |
| 29.66 | 991.71 | 4.58 |
| 36.75 | 990.00 | 6.29 |
| 39.18 | 989.92 | 6.37 |
| 39.90 | 989.89 | 6.40 |
| 42.20 | 989.97 | 6.32 |
| 43.14 | 990.00 | 6.29 |
| 43.91 | 990.40 | 5.89 |
| 46.34 | 992.00 | 4.29 |
| 53.90 | 993.41 | 2.88 |
| 56.74 | 994.00 | 2.29 |
| 62.76 | 994.22 | 2.07 |
| 76.31 | 994.65 | 1.64 |
| 100.00 | 996.29 | 0.00 |

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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.03 | 0.0 | 1.6 | 25 | 0.01 |
| 0.08 | 0.2 | 4.5 | 184 | 0.09 |
| 0.11 | 0.3 | 6.4 | 355 | 0.22 |
| 0.51 | 3.4 | 9.0 | 3,521 | 8.20 |
| 1.82 | 19.8 | 16.9 | 20,607 | 102.00 |
| 2.11 | 24.7 | 18.3 | 25,700 | 139.72 |
| 3.52 | 62.5 | 37.1 | 65,011 | 410.25 |
| 3.95 | 79.1 | 42.6 | 82,369 | 555.08 |
| 4.11 | 85.9 | 44.7 | 89,447 | 617.31 |
| 4.17 | 88.6 | 46.6 | 92,223 | 631.78 |
| 4.33 | 96.2 | 51.5 | 100,189 | 678.51 |
| 4.76 | 121.1 | 66.4 | 126,018 | 838.92 |
| 6.11 | 225.0 | 90.3 | 234,197 | 1,919.54 |
| 6.40 | 252.4 | 101.5 | 262,697 | 2,150.14 |

### Reach 6R: Reach 3



**Hydrograph**

Inflow Area=18.430 ac
Avg. Flow Depth=1.72'
Max Vel=4.99 fps
n=0.030
L=1,041.0'
S=0.0088 '/'
Capacity=2,150.14 cfs

91.47 cfs
90.50 cfs

Legend:
Inflow
Outflow

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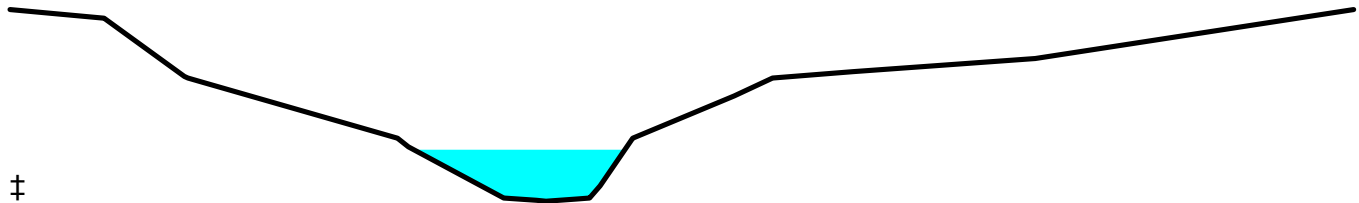Printed  4/18/2022
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## Reach 6R: Reach 3

**Stage-Discharge**

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## Summary for Reach 7R: Reach 2

Inflow Area =        18.430 ac,   0.00% Impervious,  Inflow Depth =  5.00"    for  100-Year event
Inflow      =       92.93 cfs @   12.11 hrs,  Volume=          7.679 af
Outflow     =       91.47 cfs @   12.30 hrs,  Volume=          7.679 af,  Atten= 2%,  Lag= 11.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.78 fps,  Min. Travel Time= 3.0 min
Avg. Velocity = 1.66 fps,  Avg. Travel Time= 8.6 min

Peak Storage= 16,345 cf @ 12.25 hrs
Average Depth at Peak Storage= 1.03'
Bank-Full Depth= 3.24'  Flow Area= 204.3 sf,  Capacity= 1,999.47 cfs

Custom cross-section,  Length= 853.0'   Slope= 0.0225 '/'   (106 Elevation Intervals)
Constant n= 0.030  Earth, grassed & winding
Inlet Invert= 1,009.12',  Outlet Invert= 989.90'

‡

| Offset | Elevation | Chan.Depth |
|---|---|---|
| (feet) | (feet) | (feet) |
| 0.00 | 1,009.14 | 0.00 |
| 22.15 | 1,008.00 | 1.14 |
| 24.54 | 1,007.80 | 1.34 |
| 25.18 | 1,007.74 | 1.40 |
| 49.26 | 1,006.00 | 3.14 |
| 49.59 | 1,005.90 | 3.24 |
| 50.51 | 1,005.99 | 3.15 |
| 52.13 | 1,005.99 | 3.15 |
| 53.24 | 1,006.00 | 3.14 |
| 91.41 | 1,007.74 | 1.40 |
| 98.60 | 1,008.00 | 1.14 |
| 108.78 | 1,008.27 | 0.87 |
| 117.07 | 1,008.47 | 0.67 |
| 117.16 | 1,008.47 | 0.67 |
| 134.91 | 1,008.89 | 0.25 |
| 135.00 | 1,009.14 | 0.00 |

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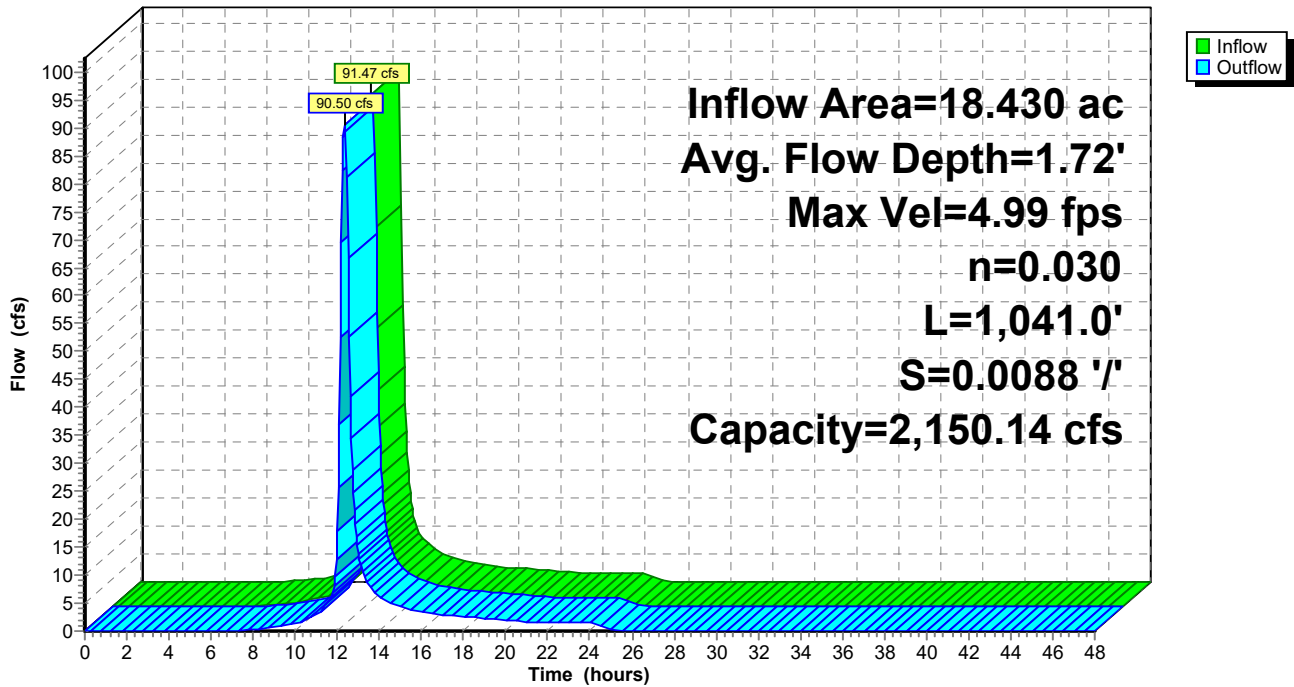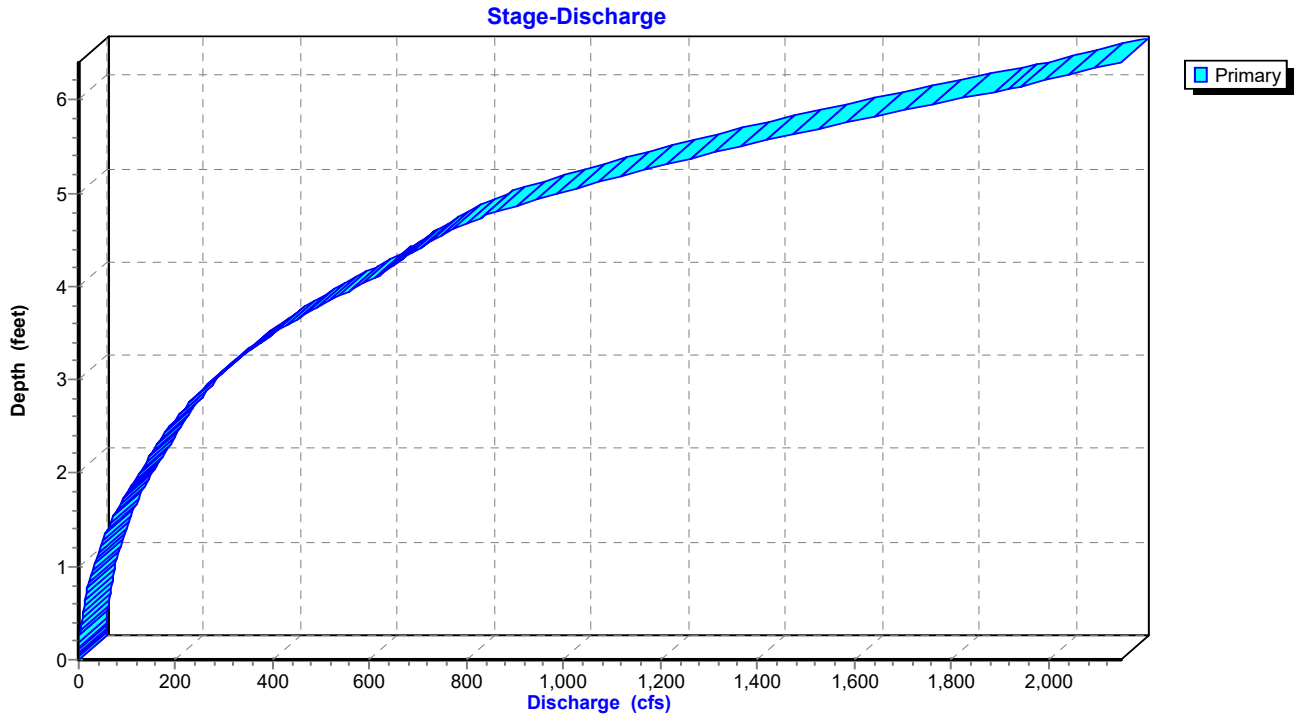Bailey Farms - Developed
*Type II 24-hr  100-Year Rainfall=7.70"*
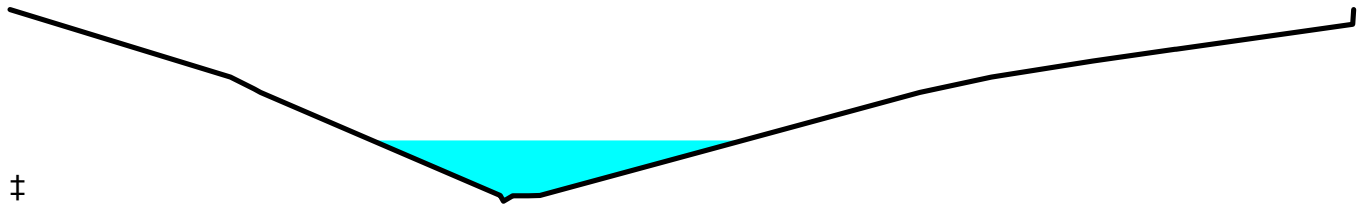Printed  4/18/2022
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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.09 | 0.1 | 2.9 | 47 | 0.03 |
| 0.10 | 0.1 | 4.0 | 77 | 0.06 |
| 1.84 | 61.2 | 66.4 | 52,179 | 430.84 |
| 1.90 | 65.2 | 68.7 | 55,628 | 468.55 |
| 2.10 | 79.7 | 76.6 | 67,995 | 608.70 |
| 2.37 | 102.4 | 92.0 | 87,382 | 818.03 |
| 2.57 | 122.0 | 104.3 | 104,091 | 1,007.45 |
| 2.99 | 171.2 | 130.2 | 146,042 | 1,527.76 |
| 3.24 | 204.3 | 135.4 | 174,303 | 1,999.47 |

### Reach 7R: Reach 2

**Hydrograph**



Inflow Area=18.430 ac
Avg. Flow Depth=1.03'
Max Vel=4.78 fps
n=0.030
L=853.0'
S=0.0225 '/'
Capacity=1,999.47 cfs

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## Reach 7R: Reach 2



Stage-Discharge

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## Summary for Reach 8R: REACH 1 (through Pipe System)

Inflow Area =        18.430 ac,    0.00% Impervious,  Inflow Depth =  5.00"    for  100-Year event
Inflow      =      108.57 cfs @   12.10 hrs,  Volume=            7.679 af
Outflow     =       92.93 cfs @   12.11 hrs,  Volume=            7.679 af,  Atten= 14%,  Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 14.68 fps,  Min. Travel Time= 1.2 min
Avg. Velocity = 5.23 fps,  Avg. Travel Time= 3.4 min

Peak Storage= 7,542 cf @ 12.10 hrs
Average Depth at Peak Storage= 3.00'
Bank-Full Depth= 3.00'  Flow Area= 7.1 sf,  Capacity= 91.10 cfs

36.0"  Round Pipe
n= 0.012  Concrete pipe, finished
Length= 1,067.0'   Slope= 0.0159 '/'
Inlet Invert= 1,021.96',  Outlet Invert= 1,005.00'

### Reach 8R: REACH 1 (through Pipe System)



**Hydrograph**

Inflow Area=18.430 ac
Avg. Flow Depth=3.00'
Max Vel=14.68 fps
36.0"
Round Pipe
n=0.012
L=1,067.0'
S=0.0159 '/'
Capacity=91.10 cfs

108.57 cfs
92.93 cfs

■ Inflow
■ Outflow
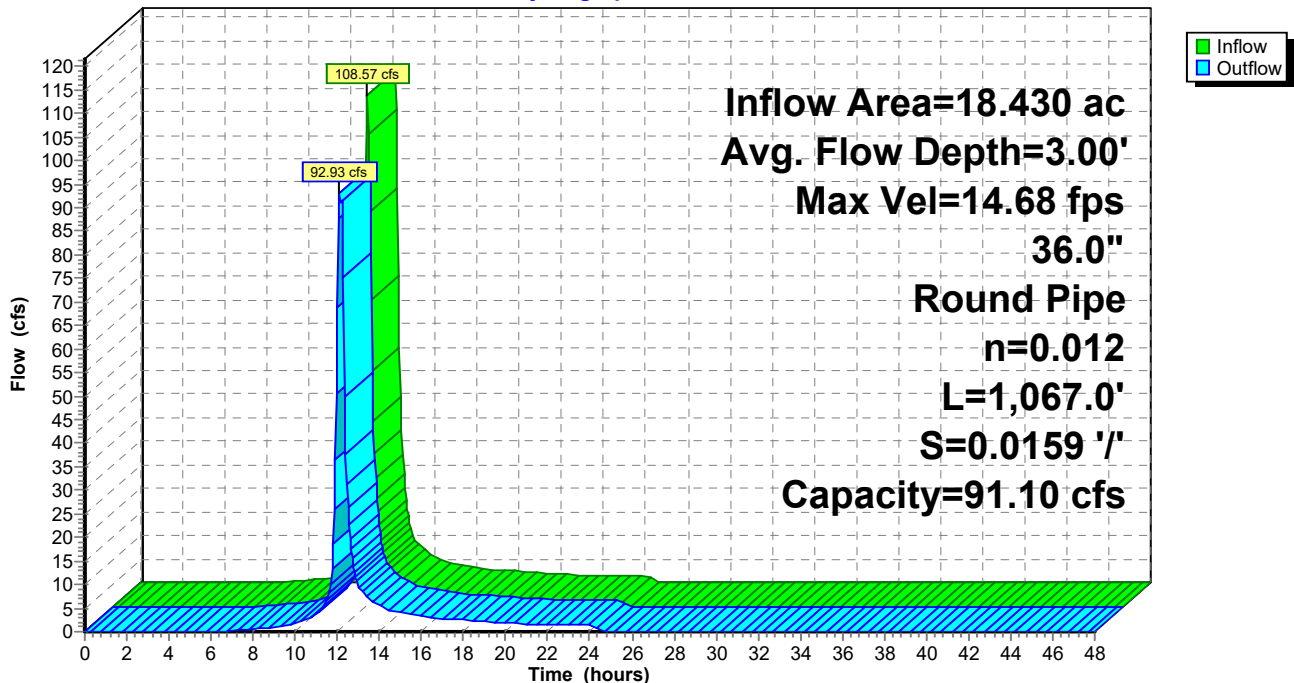
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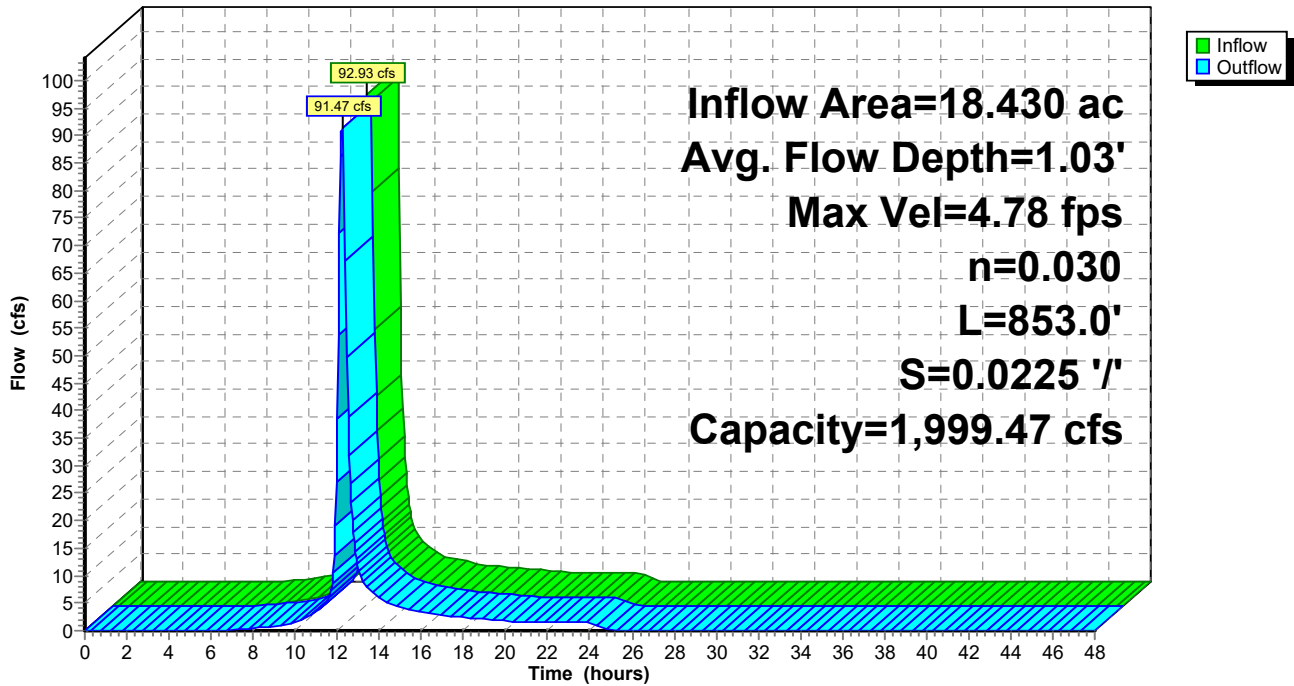*Type II 24-hr  100-Year Rainfall=7.70"*
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## Reach 8R: REACH 1 (through Pipe System)



Stage-Discharge

**21-130-HYDRO-PRO orifice plate option**
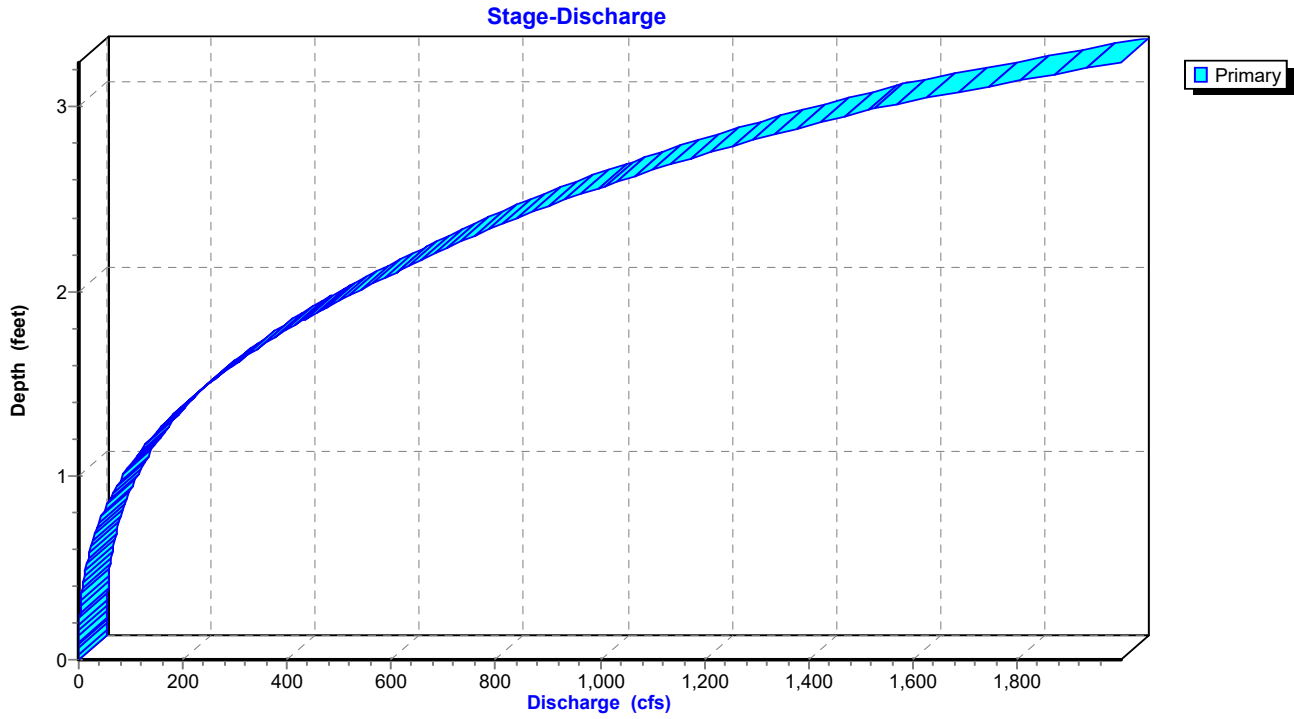Prepared by Schlagel and Assoc.
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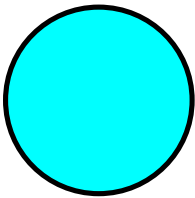Printed  4/18/2022
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## Summary for Pond 4P: EDDB #1 Cornerstone

Inflow Area =       31.710 ac,  26.16% Impervious,  Inflow Depth =  6.75"    for  100-Year event
Inflow      =   260.19 cfs @  12.05 hrs,  Volume=          17.828 af
Outflow     =    81.35 cfs @  12.29 hrs,  Volume=          16.846 af,  Atten= 69%,  Lag= 14.1 min
Primary     =    81.35 cfs @  12.29 hrs,  Volume=          16.846 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,006.64' @ 12.29 hrs   Surf.Area= 59,549 sf   Storage= 352,702 cf

Plug-Flow detention time= 212.5 min calculated for 16.846 af (94% of inflow)
Center-of-Mass det. time= 180.3 min ( 954.2 - 773.9 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 995.67' | 374,566 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 995.67 | 0 | 0 | 0 |
| 996.00 | 700 | 116 | 116 |
| 997.00 | 7,200 | 3,950 | 4,066 |
| 998.00 | 12,000 | 9,600 | 13,666 |
| 999.00 | 17,900 | 14,950 | 28,616 |
| 1,000.00 | 27,000 | 22,450 | 51,066 |
| 1,001.00 | 36,000 | 31,500 | 82,566 |
| 1,002.00 | 40,000 | 38,000 | 120,566 |
| 1,003.00 | 44,800 | 42,400 | 162,966 |
| 1,004.00 | 48,700 | 46,750 | 209,716 |
| 1,005.00 | 53,000 | 50,850 | 260,566 |
| 1,006.00 | 57,000 | 55,000 | 315,566 |
| 1,007.00 | 61,000 | 59,000 | 374,566 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 993.54' | **30.0"  Round 30" Culvert** L= 87.0'  RCP, sq.cut end projecting,  Ke= 0.500 Inlet / Outlet Invert= 993.54' / 993.11'   S= 0.0049 '/'   Cc= 0.900 n= 0.012  Concrete pipe, finished,  Flow Area= 4.91 sf |
| #2 | Device 1 | 994.16' | **2.9" Vert. WQ Orifice**   C= 0.600 |
| #3 | Device 2 | 994.36' | **8.0"  Round 8" PVC Pipe** L= 20.0'  RCP, groove end projecting,  Ke= 0.200 Inlet / Outlet Invert= 994.36' / 994.16'   S= 0.0100 '/'   Cc= 0.900 n= 0.012,  Flow Area= 0.35 sf |
| #4 | Device 3 | 995.67' | **1.0" Vert. Riser Pipe X 8.00 columns** X 9 rows with 4.0" cc spacing C= 0.600 |
| #5 | Device 1 | 1,001.05' | **48.0" W x 6.0" H Vert. Opening in Box**  C= 0.600 |
| #6 | Device 1 | 1,004.00' | **60.0" x 48.0" Horiz. Open Top of Box**  C= 0.600 Limited to weir flow at low heads |

**21-130-HYDRO-PRO orifice plate option**
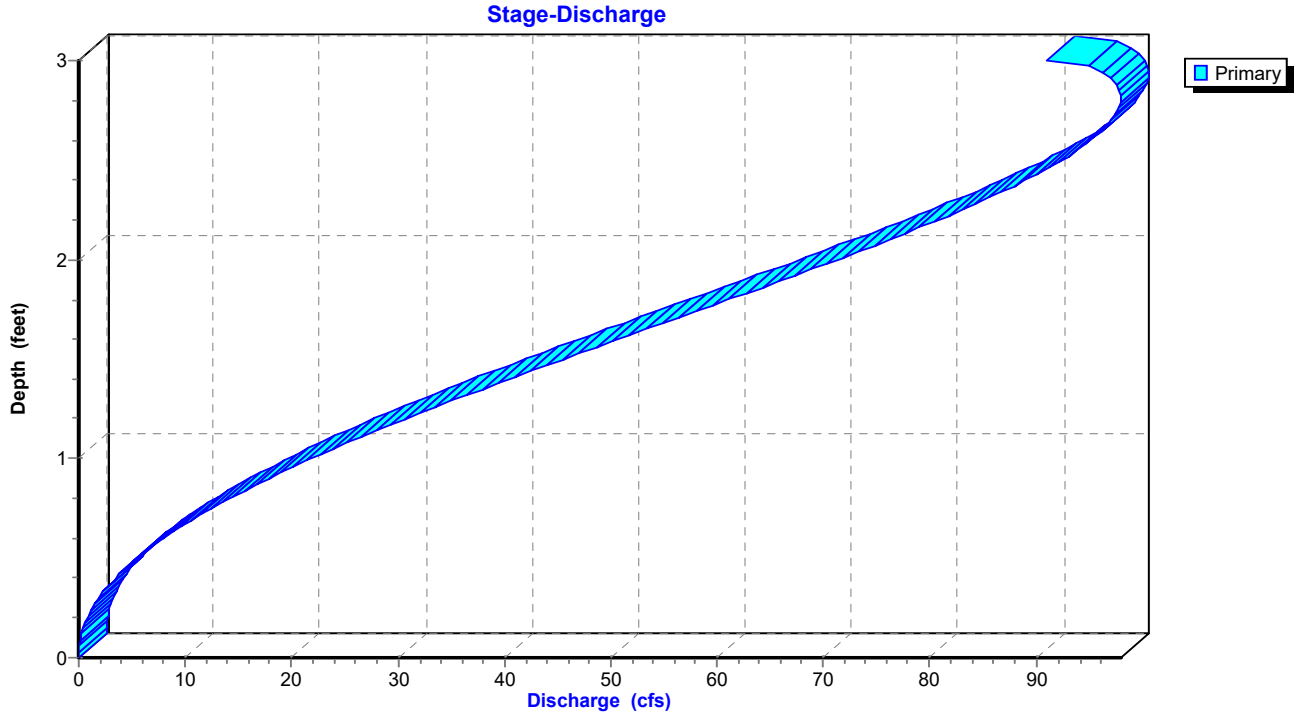Prepared by Schlagel and Assoc.
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**Primary OutFlow** Max=81.33 cfs @ 12.29 hrs  HW=1,006.63'   (Free Discharge)
└─**1=30" Culvert** (Inlet Controls 81.33 cfs @ 16.57 fps)
  └─**2=WQ Orifice** (Passes < 0.78 cfs potential flow)
    └─**3=8" PVC Pipe** (Passes < 6.61 cfs potential flow)
      └─**4=Riser Pipe** (Passes < 5.85 cfs potential flow)
  └─**5=Opening in Box** (Passes < 22.23 cfs potential flow)
  └─**6=Open Top of Box** (Passes < 156.21 cfs potential flow)

### Pond 4P: EDDB #1 Cornerstone

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## Pond 4P: EDDB #1 Cornerstone

**Stage-Discharge**

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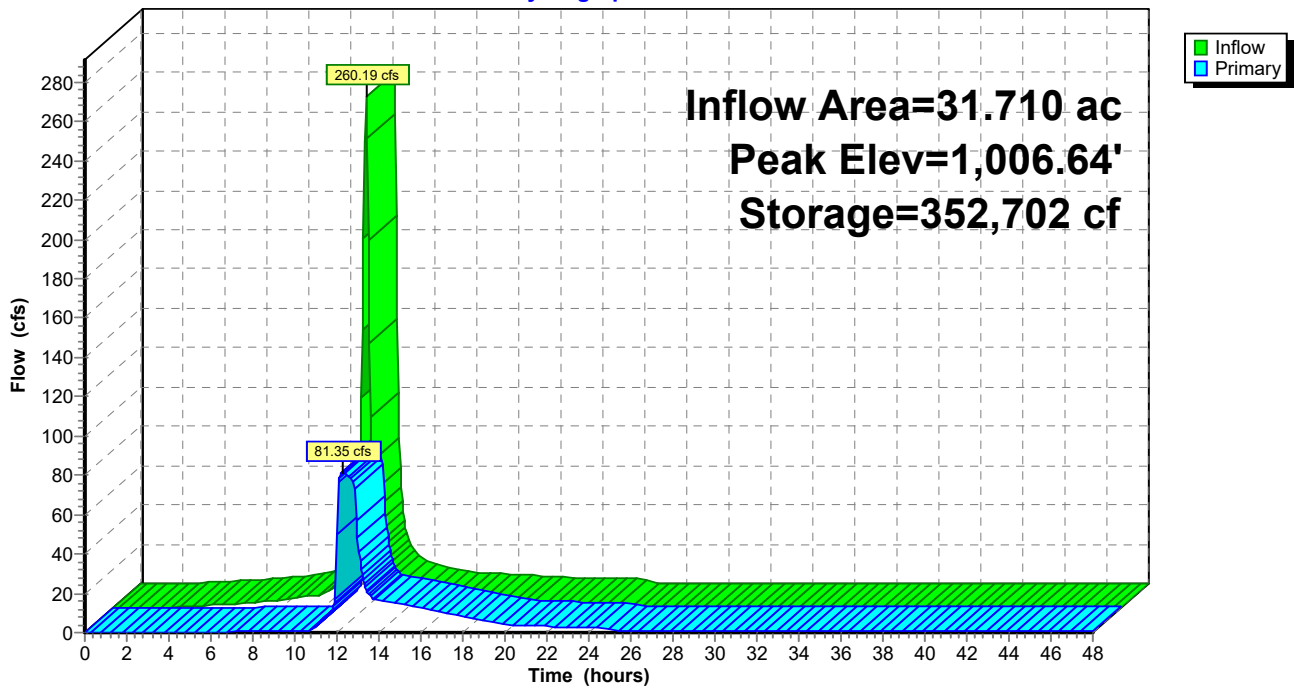*Type II 24-hr  100-Year Rainfall=7.70"*
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## Summary for Pond 5P: EDDB #2 Manor

Inflow Area =       29.690 ac,  38.00% Impervious,  Inflow Depth =  6.16"    for  100-Year event
Inflow    =    232.03 cfs @  12.05 hrs,  Volume=          15.236 af
Outflow   =     76.98 cfs @  12.27 hrs,  Volume=          14.297 af,  Atten= 67%,  Lag= 13.3 min
Primary   =     76.98 cfs @  12.27 hrs,  Volume=          14.297 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 997.86' @ 12.27 hrs   Surf.Area= 56,374 sf   Storage= 285,540 cf

Plug-Flow detention time= 188.5 min calculated for 14.283 af (94% of inflow)
Center-of-Mass det. time= 155.1 min ( 945.3 - 790.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 988.16' | 352,236 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 988.16 | 0 | 0 | 0 |
| 989.00 | 800 | 336 | 336 |
| 990.00 | 4,200 | 2,500 | 2,836 |
| 991.00 | 10,400 | 7,300 | 10,136 |
| 992.00 | 21,600 | 16,000 | 26,136 |
| 993.00 | 37,600 | 29,600 | 55,736 |
| 994.00 | 41,700 | 39,650 | 95,386 |
| 995.00 | 46,000 | 43,850 | 139,236 |
| 996.00 | 49,700 | 47,850 | 187,086 |
| 997.00 | 53,200 | 51,450 | 238,536 |
| 998.00 | 56,900 | 55,050 | 293,586 |
| 999.00 | 60,400 | 58,650 | 352,236 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 986.00' | **30.0" Round 30" Culvert** L= 77.0'  RCP, sq.cut end projecting,  Ke= 0.500  Inlet / Outlet Invert= 986.00' / 985.62'  S= 0.0049 '/'  Cc= 0.900  n= 0.012  Concrete pipe, finished,  Flow Area= 4.91 sf |
| #2 | Device 1 | 986.62' | **2.5" Vert. WQ Orifice**  C= 0.600 |
| #3 | Device 2 | 986.86' | **8.0"  Round 8" PVC Pipe** L= 20.0'  RCP, sq.cut end projecting,  Ke= 0.500  Inlet / Outlet Invert= 986.86' / 986.62'  S= 0.0120 '/'  Cc= 0.900  n= 0.012  Corrugated PP, smooth interior,  Flow Area= 0.35 sf |
| #4 | Device 3 | 988.16' | **1.0" Vert. Riser Pipe X 8.00 columns** X 8 rows with 4.0" cc spacing C= 0.600 |
| #5 | Device 1 | 993.40' | **48.0" W x 6.0" H Vert. Opening in Box**  C= 0.600 |
| #6 | Device 1 | 995.25' | **60.0" x 48.0" Horiz. Open Top of Box**  C= 0.600  Limited to weir flow at low heads |

**21-130-HYDRO-PRO orifice plate option**
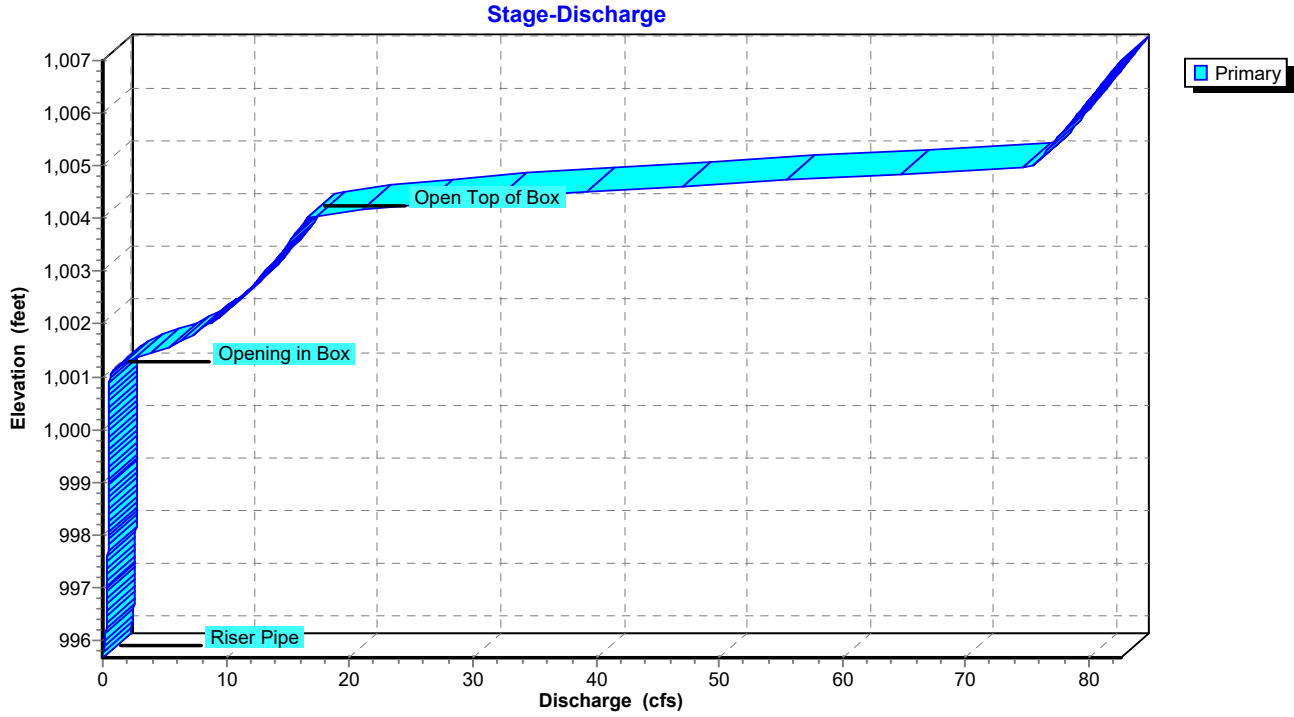
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**Primary OutFlow** Max=76.94 cfs @ 12.27 hrs  HW=997.85'   (Free Discharge)
└─**1=30" Culvert** (Inlet Controls 76.94 cfs @ 15.67 fps)
  └─**2=WQ Orifice** (Passes < 0.55 cfs potential flow)
    └─**3=8" PVC Pipe** (Passes < 5.49 cfs potential flow)
      └─**4=Riser Pipe** (Passes < 4.89 cfs potential flow)
  └─**5=Opening in Box** (Passes < 19.73 cfs potential flow)
  └─**6=Open Top of Box** (Passes < 155.20 cfs potential flow)

## Pond 5P: EDDB #2 Manor

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## Pond 5P: EDDB #2 Manor

**Stage-Discharge**

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## Summary for Link 2L: RP-1

Inflow Area =      106.890 ac,  20.71% Impervious,  Inflow Depth >  5.76"    for  100-Year event
Inflow      =     369.46 cfs @  12.10 hrs,  Volume=         51.273 af
Primary     =     369.46 cfs @  12.10 hrs,  Volume=         51.273 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 2L: RP-1

**Hydrograph**

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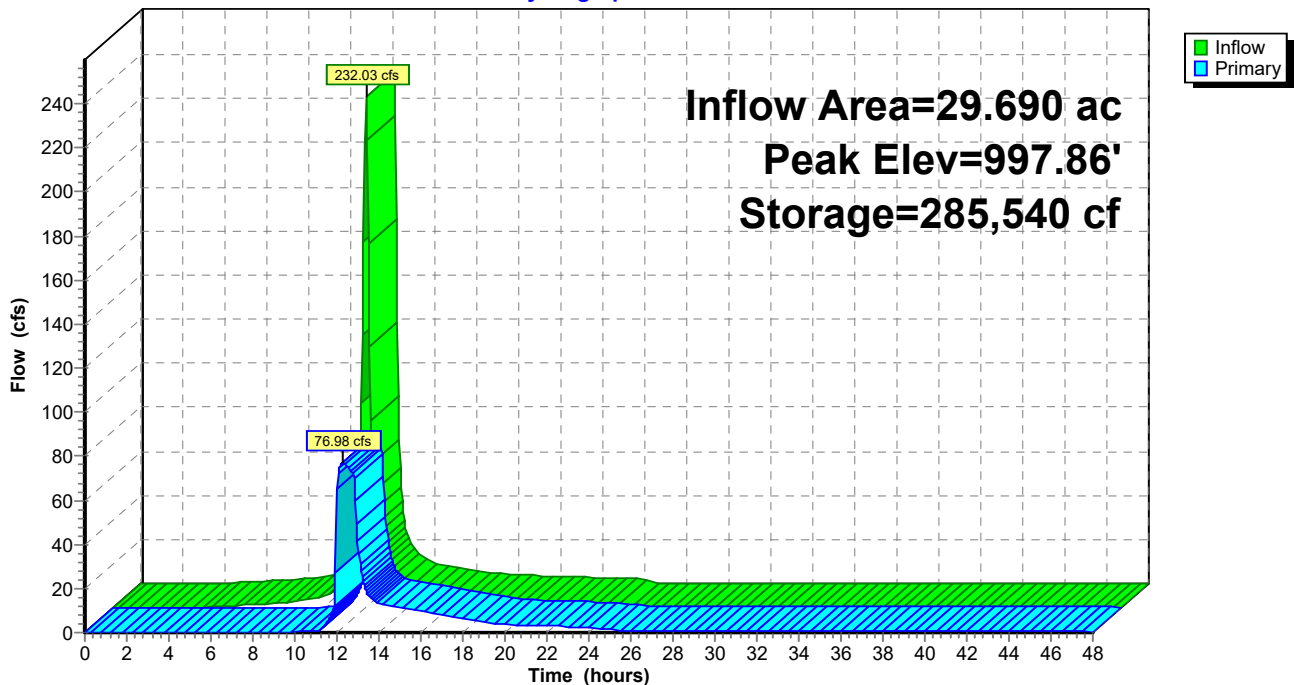*Type II 24-hr  100-Year Rainfall=7.70"*
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## Summary for Link 3L: RP-2

Inflow Area =         2.380 ac,  38.00% Impervious,  Inflow Depth =   6.16"    for  100-Year event
Inflow      =      19.23 cfs @   12.04 hrs,  Volume=              1.221 af
Primary    =      19.23 cfs @   12.04 hrs,  Volume=              1.221 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 3L: RP-2

**Hydrograph**
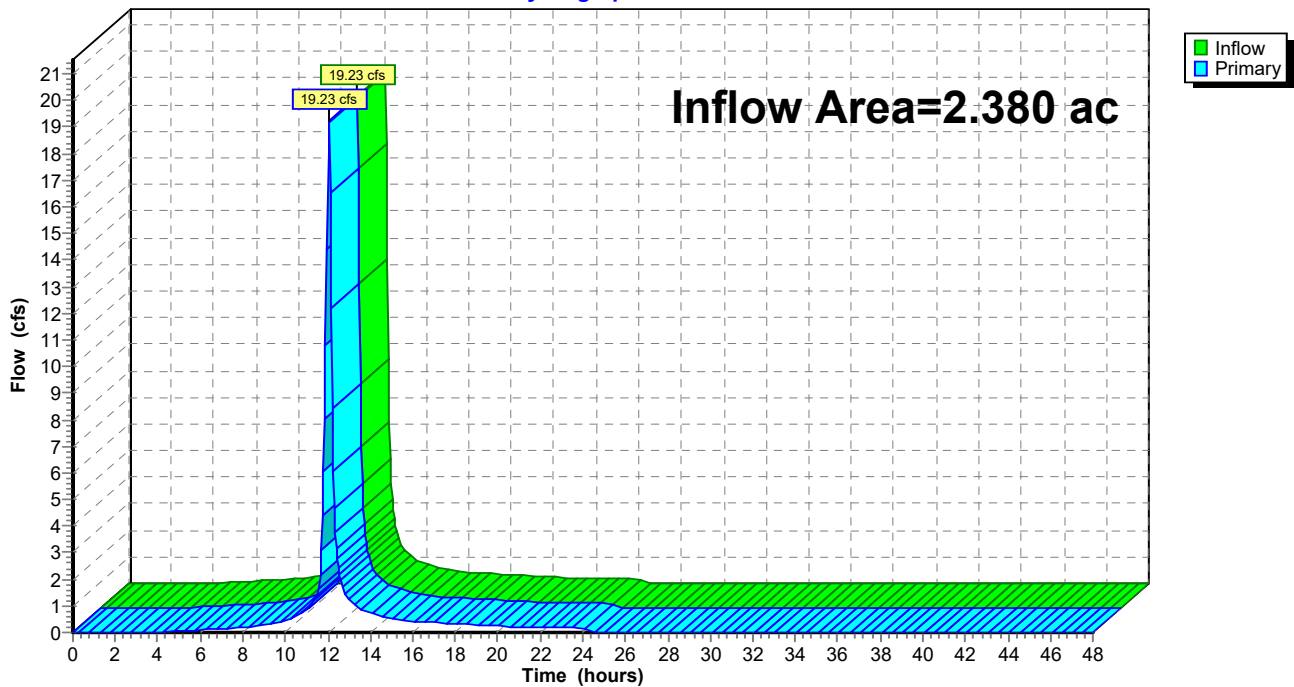
**21-130-HYDRO-PRO orifice plate option**
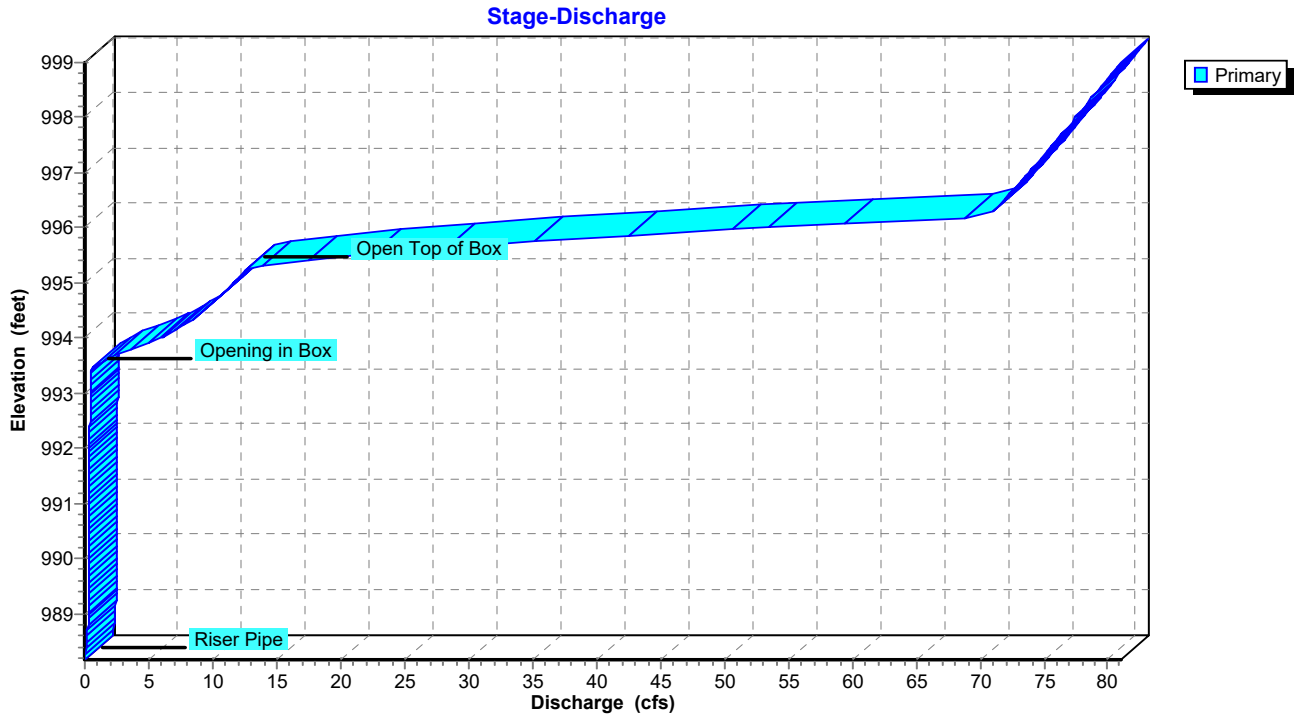Prepared by Schlagel and Assoc.
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## Summary for Link 4L: RP-3

Inflow Area =       29.690 ac,  38.00% Impervious,  Inflow Depth >  5.78"    for  100-Year event
Inflow      =      76.98 cfs @  12.27 hrs,  Volume=         14.297 af
Primary     =      76.98 cfs @  12.27 hrs,  Volume=         14.297 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 4L: RP-3

**Hydrograph**
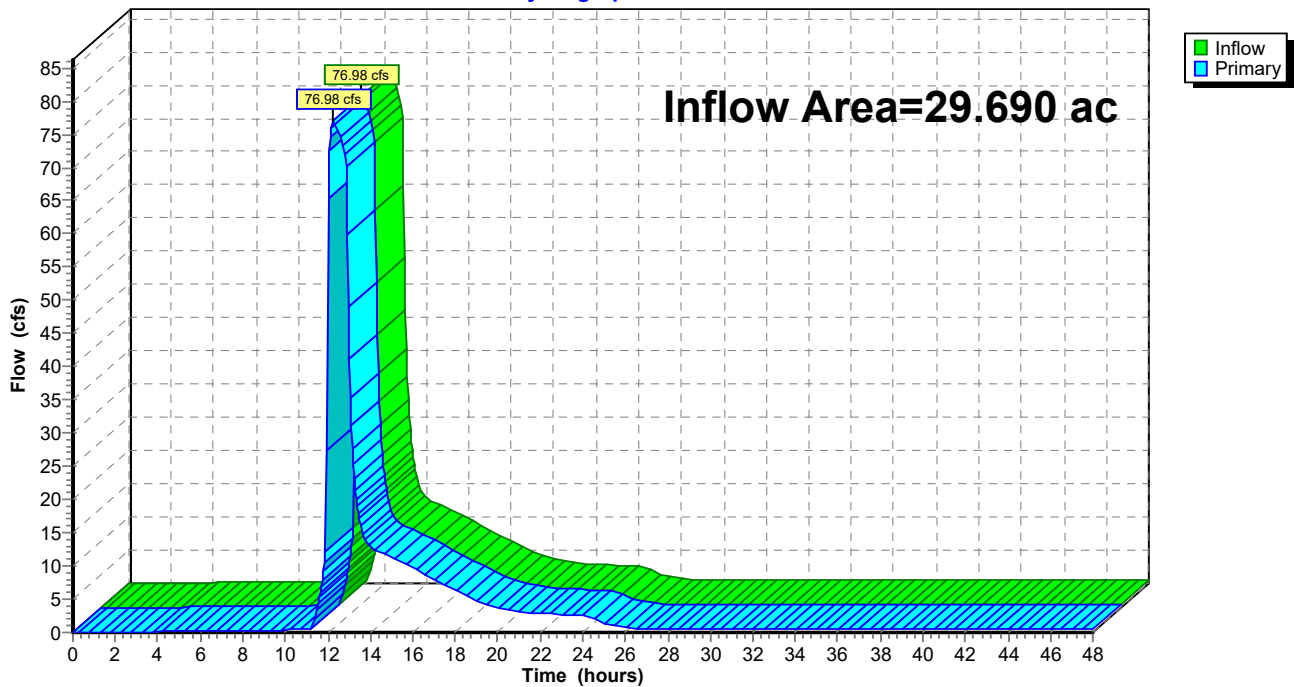


Inflow Area=29.690 ac

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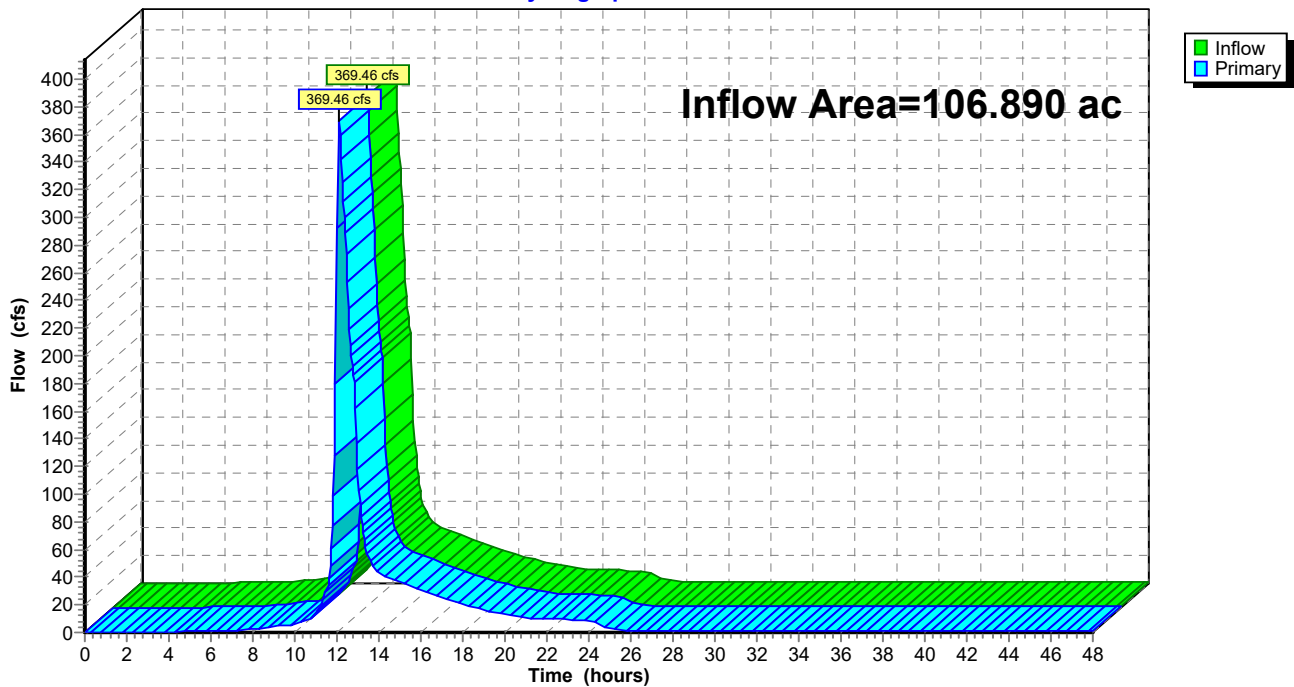Printed  4/18/2022
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## Summary for Link 5L: RP-4

Inflow Area =      31.710 ac,  26.16% Impervious,  Inflow Depth >  6.37"   for  100-Year event
Inflow     =      81.35 cfs @  12.29 hrs,  Volume=          16.846 af
Primary    =      81.35 cfs @  12.29 hrs,  Volume=          16.846 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 5L: RP-4

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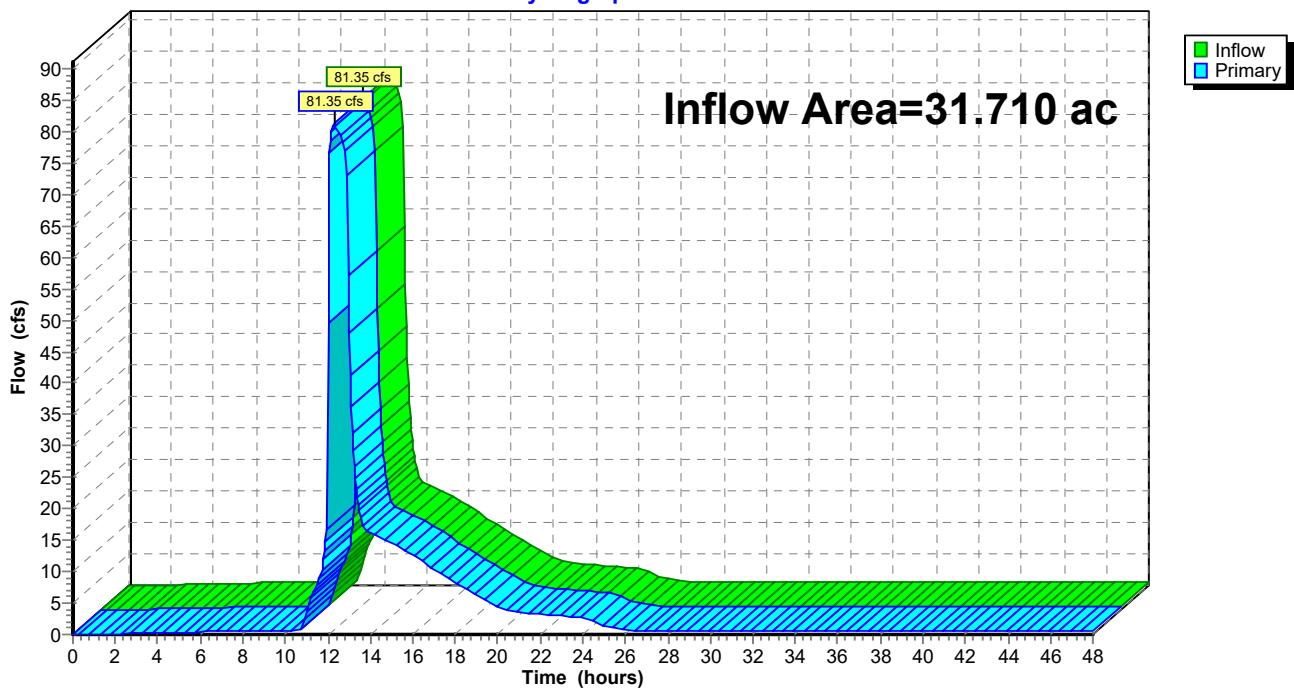
Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method  -  Pond routing by Stor-Ind method

**Subcatchment 1S: ON-SITE #1**      Runoff Area=31.710 ac   26.16% Impervious   Runoff Depth=0.69"
Flow Length=1,186'   Slope=0.0250 '/'   Tc=14.0 min   CN=92   Runoff=29.17 cfs 1.830 af

**Subcatchment 3S: ON-SITE #3 (Bypass)**      Runoff Area=2.380 ac   38.00% Impervious   Runoff Depth=0.45"
Flow Length=1,110'   Tc=12.7 min   CN=87   Runoff=1.43 cfs 0.089 af

**Subcatchment 5S: OFF-SITE #1**      Runoff Area=18.430 ac   0.00% Impervious   Runoff Depth=0.16"
Flow Length=1,247'   Tc=17.6 min   CN=77   Runoff=2.03 cfs 0.244 af

**Subcatchment 6S: ON-SITE #4 (Bypass)**      Runoff Area=24.680 ac   6.72% Impervious   Runoff Depth=0.25"
Flow Length=1,186'   Slope=0.0250 '/'   Tc=15.5 min   CN=81   Runoff=6.28 cfs 0.514 af

**Subcatchment 7S: ON-SITE #2**      Runoff Area=29.690 ac   38.00% Impervious   Runoff Depth=0.45"
Flow Length=1,769'   Slope=0.0250 '/'   Tc=13.8 min   CN=87   Runoff=17.13 cfs 1.107 af

**Reach 6R: Reach 3**      Avg. Flow Depth=0.20'   Max Vel=1.21 fps   Inflow=1.47 cfs 0.244 af
n=0.030   L=1,041.0'   S=0.0088 '/'   Capacity=2,150.14 cfs   Outflow=1.10 cfs 0.244 af

**Reach 7R: Reach 2**      Avg. Flow Depth=0.23'   Max Vel=1.65 fps   Inflow=1.90 cfs 0.244 af
n=0.030   L=853.0'   S=0.0225 '/'   Capacity=1,999.47 cfs   Outflow=1.47 cfs 0.244 af

**Reach 8R: REACH 1 (through Pipe**      Avg. Flow Depth=0.30'   Max Vel=5.18 fps   Inflow=2.03 cfs 0.244 af
36.0" Round Pipe   n=0.012   L=1,067.0'   S=0.0159 '/'   Capacity=91.10 cfs   Outflow=1.90 cfs 0.244 af

**Pond 4P: EDDB #1 Cornerstone**      Peak Elev=1,000.17'   Storage=55,660 cf   Inflow=29.17 cfs 1.830 af
Outflow=0.54 cfs 1.544 af

**Pond 5P: EDDB #2 Manor**      Peak Elev=992.24'   Storage=31,748 cf   Inflow=17.13 cfs 1.107 af
Outflow=0.39 cfs 1.083 af

**Link 2L: RP-1**      Inflow=8.39 cfs 3.473 af
Primary=8.39 cfs 3.473 af

**Link 3L: RP-2**      Inflow=1.43 cfs 0.089 af
Primary=1.43 cfs 0.089 af

**Link 4L: RP-3**      Inflow=0.39 cfs 1.083 af
Primary=0.39 cfs 1.083 af

**Link 5L: RP-4**      Inflow=0.54 cfs 1.544 af
Primary=0.54 cfs 1.544 af

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## Summary for Subcatchment 1S: ON-SITE #1

Runoff      =      29.17 cfs @  12.06 hrs,  Volume=          1.830 af,  Depth=  0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  WQV Rainfall=1.37"

|   | Area (ac) | CN | Description |
|---|---|---|---|
| * | 19.330 | 92 | Duplex/Townhomes |
|   | 11.140 | 92 | 1/8 acre lots, 65% imp, HSG D |
|   | 1.240 | 95 | Urban commercial, 85% imp, HSG D |
|   | 31.710 | 92 | Weighted Average |
|   | 23.415 |   | 73.84% Pervious Area |
|   | 8.295 |   | 26.16% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 |   | **Sheet Flow,** |
|   |   |   |   |   | Grass: Short   n= 0.150   P2= 3.60" |
| 5.6 | 1,086 | 0.0250 | 3.21 |   | **Shallow Concentrated Flow,** |
|   |   |   |   |   | Paved   Kv= 20.3 fps |
| 14.0 | 1,186 |   |   |   | Total |

## Subcatchment 1S: ON-SITE #1

**Hydrograph**



Type II 24-hr
WQV Rainfall=1.37"
Runoff Area=31.710 ac
Runoff Volume=1.830 af
Runoff Depth=0.69"
Flow Length=1,186'
Slope=0.0250 '/'
Tc=14.0 min
CN=92

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## Summary for Subcatchment 3S: ON-SITE #3 (Bypass)

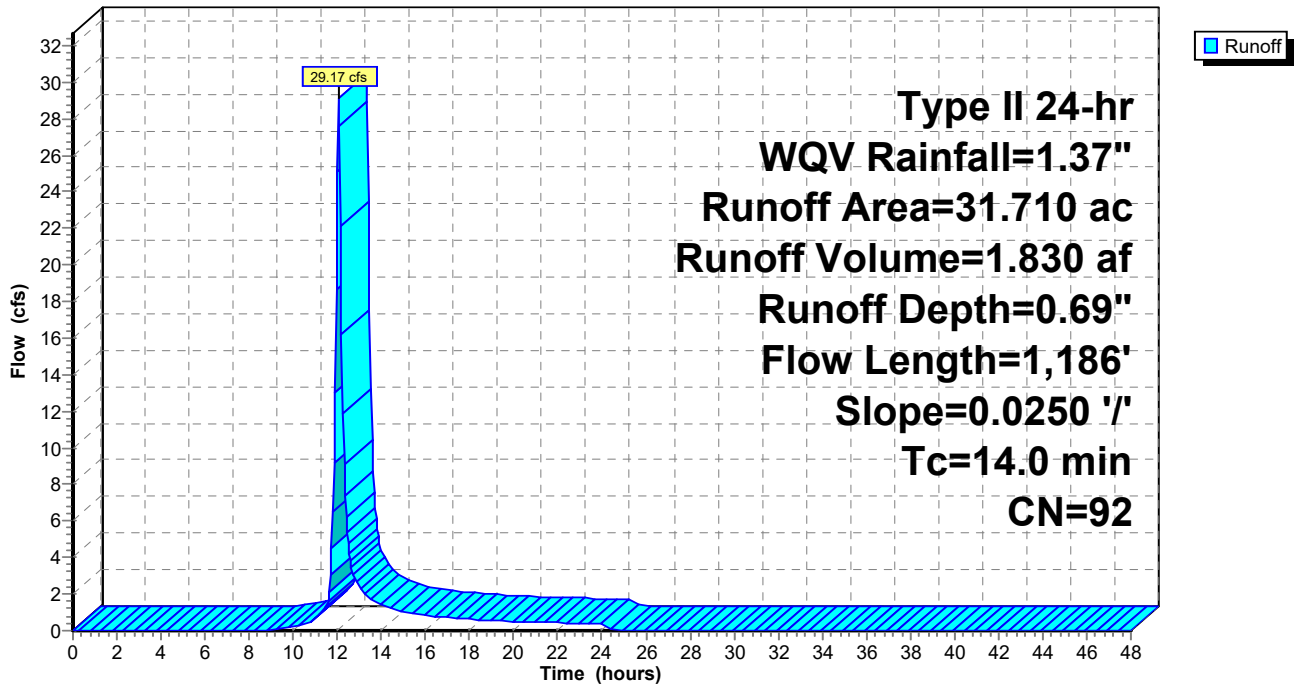Runoff    =    1.43 cfs @  12.06 hrs,  Volume=    0.089 af,  Depth=  0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  WQV Rainfall=1.37"

| Area (ac) | CN | Description |
|---|---|---|
| 2.380 | 87 | 1/4 acre lots, 38% imp, HSG D |
| 1.476 | | 62.00% Pervious Area |
| 0.904 | | 38.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.9 | 50 | 0.0250 | 0.17 | | **Sheet Flow,** n= 0.150   P2= 3.60" |
| 7.8 | 1,060 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved   Kv= 16.1 fps |
| 12.7 | 1,110 | Total | | | |

### Subcatchment 3S: ON-SITE #3 (Bypass)



**Hydrograph**

Type II 24-hr
WQV Rainfall=1.37"
Runoff Area=2.380 ac
Runoff Volume=0.089 af
Runoff Depth=0.45"
Flow Length=1,110'
Tc=12.7 min
CN=87

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## Summary for Subcatchment 5S: OFF-SITE #1

Runoff      =      2.03 cfs @  12.16 hrs,  Volume=      0.244 af,  Depth=  0.16"
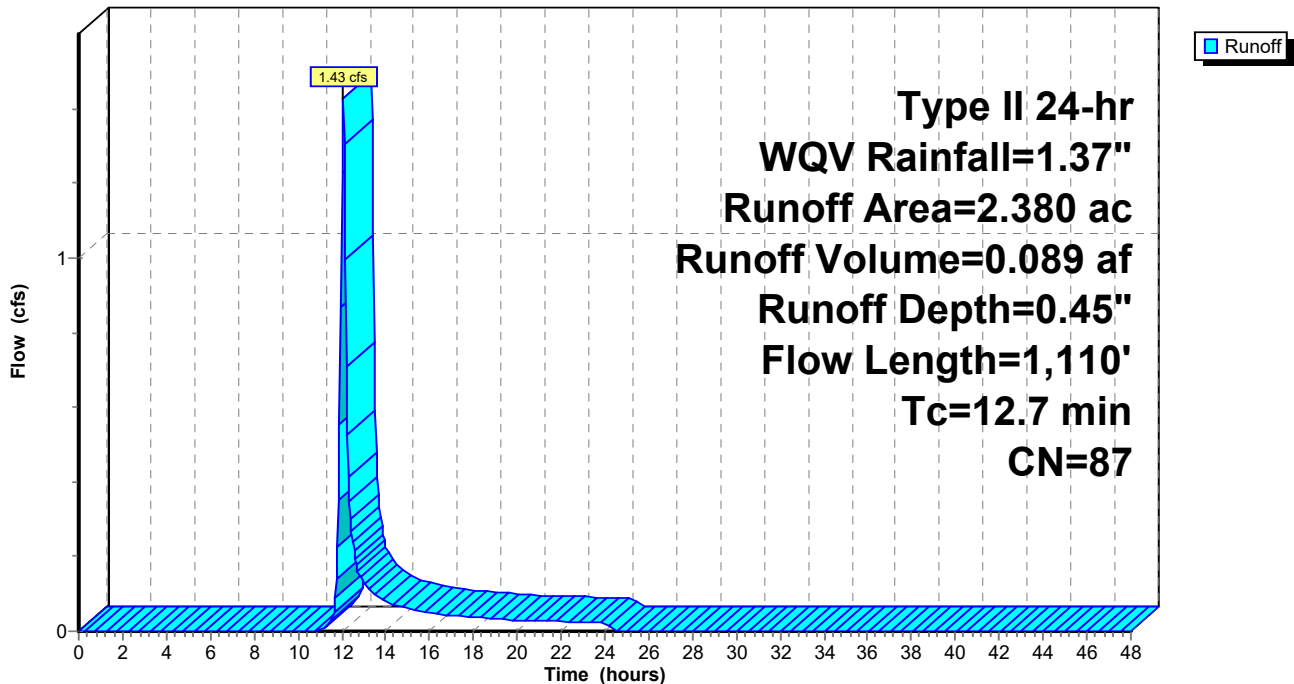
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  WQV Rainfall=1.37"

| Area (ac) | CN | Description |
|---|---|---|
| 15.640 | 76 | Woods/grass comb., Fair, HSG C |
| 2.790 | 82 | Woods/grass comb., Fair, HSG D |
| 18.430 | 77 | Weighted Average |
| 18.430 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 9.2 | 1,147 | 0.0192 | 2.08 | | **Shallow Concentrated Flow,** Grassed Waterway   Kv= 15.0 fps |
| 17.6 | 1,247 | Total | | | |

### Subcatchment 5S: OFF-SITE #1

**Hydrograph**



Type II 24-hr
WQV Rainfall=1.37"
Runoff Area=18.430 ac
Runoff Volume=0.244 af
Runoff Depth=0.16"
Flow Length=1,247'
Tc=17.6 min
CN=77

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## Summary for Subcatchment 6S: ON-SITE #4 (Bypass)

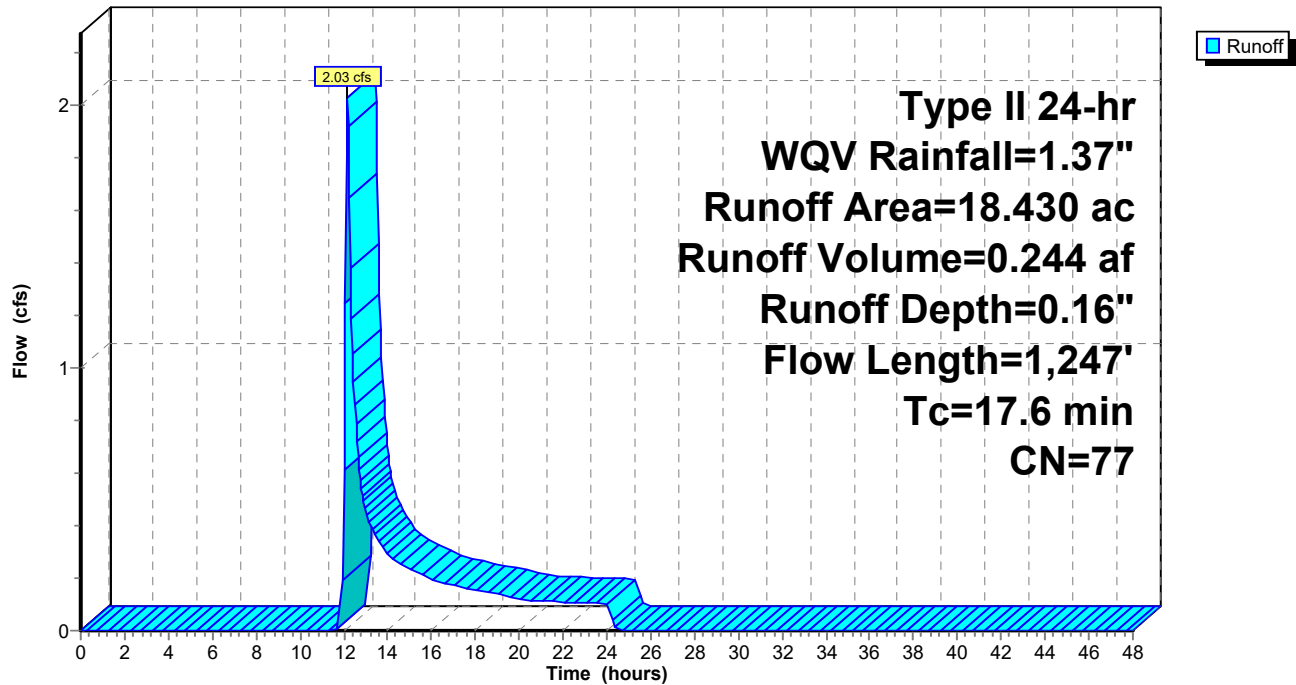Runoff    =    6.28 cfs @  12.11 hrs,  Volume=    0.514 af,  Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  WQV Rainfall=1.37"

| Area (ac) | CN | Description |
|---|---|---|
| 22.730 | 80 | >75% Grass cover, Good, HSG D |
| 1.950 | 95 | Urban commercial, 85% imp, HSG D |
| 24.680 | 81 | Weighted Average |
| 23.023 | | 93.28% Pervious Area |
| 1.657 | | 6.72% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 100 | 0.0250 | 0.20 | | **Sheet Flow,** Grass: Short  n= 0.150  P2= 3.60" |
| 7.1 | 1,086 | 0.0250 | 2.55 | | **Shallow Concentrated Flow,** Unpaved  Kv= 16.1 fps |
| 15.5 | 1,186 | | | | Total |

### Subcatchment 6S: ON-SITE #4 (Bypass)



Hydrograph

Type II 24-hr
WQV Rainfall=1.37"
Runoff Area=24.680 ac
Runoff Volume=0.514 af
Runoff Depth=0.25"
Flow Length=1,186'
Slope=0.0250 '/'
Tc=15.5 min
CN=81

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## Summary for Subcatchment 7S: ON-SITE #2

Runoff     =     17.13 cfs @  12.07 hrs,  Volume=          1.107 af,  Depth=  0.45"
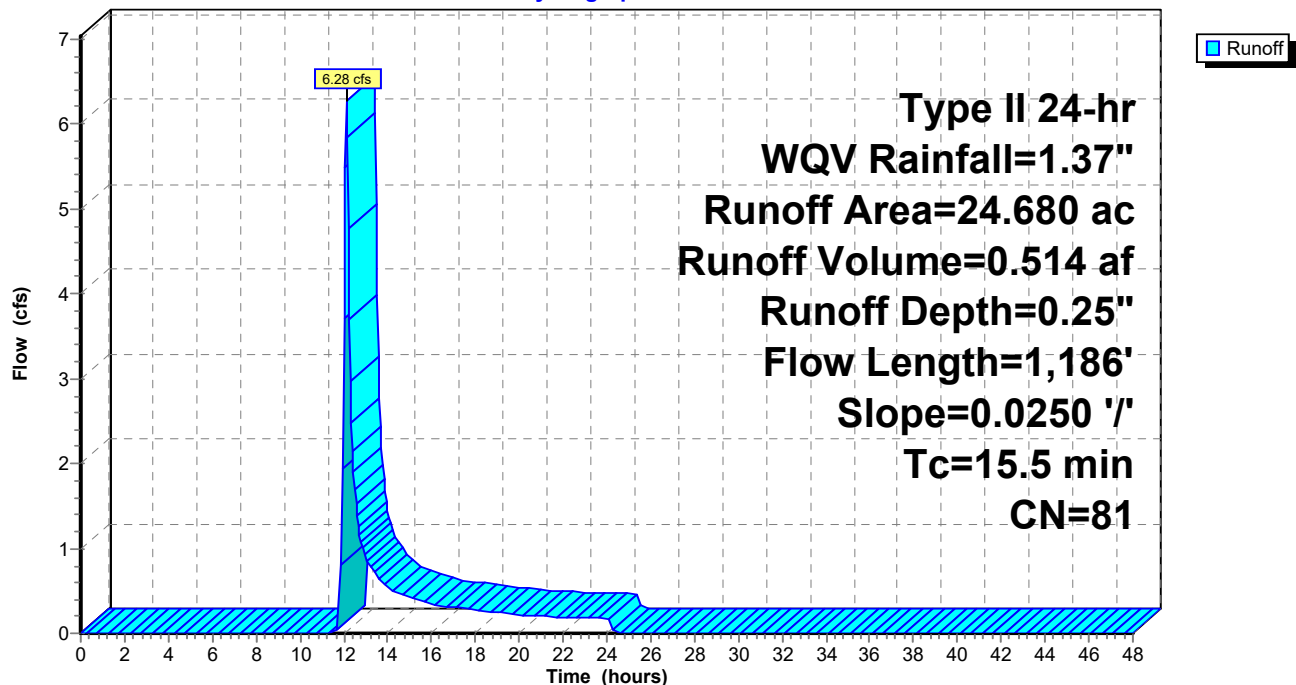
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr  WQV Rainfall=1.37"

| Area (ac) | CN | Description |
|---|---|---|
| 29.690 | 87 | 1/4 acre lots, 38% imp, HSG D |
| 18.408 | | 62.00% Pervious Area |
| 11.282 | | 38.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.9 | 50 | 0.0250 | 0.17 | | **Sheet Flow,** Grass: Short   n= 0.150   P2= 3.60" |
| 8.9 | 1,719 | 0.0250 | 3.21 | | **Shallow Concentrated Flow,** Paved   Kv= 20.3 fps |
| 13.8 | 1,769 | | | | Total |

### Subcatchment 7S: ON-SITE #2

**Hydrograph**



Type II 24-hr
WQV Rainfall=1.37"
Runoff Area=29.690 ac
Runoff Volume=1.107 af
Runoff Depth=0.45"
Flow Length=1,769'
Slope=0.0250 '/'
Tc=13.8 min
CN=87

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## Summary for Reach 6R: Reach 3

Inflow Area =        18.430 ac,   0.00% Impervious,  Inflow Depth =  0.16"    for  WQV event
Inflow       =        1.47 cfs @   12.53 hrs,  Volume=           0.244 af
Outflow     =        1.10 cfs @   12.99 hrs,  Volume=           0.244 af,  Atten= 25%,  Lag= 27.4 min
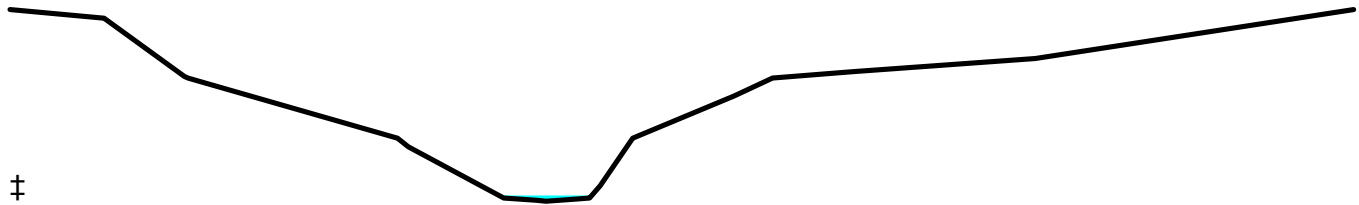
Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.21 fps,  Min. Travel Time= 14.4 min
Avg. Velocity = 0.53 fps,  Avg. Travel Time= 32.8 min

Peak Storage= 950 cf @ 12.75 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 6.40'  Flow Area= 252.4 sf,  Capacity= 2,150.14 cfs

Custom cross-section,  Length= 1,041.0'  Slope= 0.0088 '/'  (110 Elevation Intervals)
Constant n= 0.030  Earth, grassed & winding
Inlet Invert= 989.92',  Outlet Invert= 980.77'



‡

| Offset | Elevation | Chan.Depth |
|--------|-----------|------------|
| (feet) | (feet)    | (feet)     |
| 0.00   | 996.29    | 0.00       |
| 7.00   | 996.00    | 0.29       |
| 12.99  | 994.06    | 2.23       |
| 13.24  | 994.00    | 2.29       |
| 14.48  | 993.84    | 2.45       |
| 28.84  | 992.00    | 4.29       |
| 29.66  | 991.71    | 4.58       |
| 36.75  | 990.00    | 6.29       |
| 39.18  | 989.92    | 6.37       |
| 39.90  | 989.89    | 6.40       |
| 42.20  | 989.97    | 6.32       |
| 43.14  | 990.00    | 6.29       |
| 43.91  | 990.40    | 5.89       |
| 46.34  | 992.00    | 4.29       |
| 53.90  | 993.41    | 2.88       |
| 56.74  | 994.00    | 2.29       |
| 62.76  | 994.22    | 2.07       |
| 76.31  | 994.65    | 1.64       |
| 100.00 | 996.29    | 0.00       |

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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.03 | 0.0 | 1.6 | 25 | 0.01 |
| 0.08 | 0.2 | 4.5 | 184 | 0.09 |
| 0.11 | 0.3 | 6.4 | 355 | 0.22 |
| 0.51 | 3.4 | 9.0 | 3,521 | 8.20 |
| 1.82 | 19.8 | 16.9 | 20,607 | 102.00 |
| 2.11 | 24.7 | 18.3 | 25,700 | 139.72 |
| 3.52 | 62.5 | 37.1 | 65,011 | 410.25 |
| 3.95 | 79.1 | 42.6 | 82,369 | 555.08 |
| 4.11 | 85.9 | 44.7 | 89,447 | 617.31 |
| 4.17 | 88.6 | 46.6 | 92,223 | 631.78 |
| 4.33 | 96.2 | 51.5 | 100,189 | 678.51 |
| 4.76 | 121.1 | 66.4 | 126,018 | 838.92 |
| 6.11 | 225.0 | 90.3 | 234,197 | 1,919.54 |
| 6.40 | 252.4 | 101.5 | 262,697 | 2,150.14 |

## Reach 6R: Reach 3

**Hydrograph**



Inflow Area=18.430 ac
Avg. Flow Depth=0.20'
Max Vel=1.21 fps
n=0.030
L=1,041.0'
S=0.0088 '/'
Capacity=2,150.14 cfs

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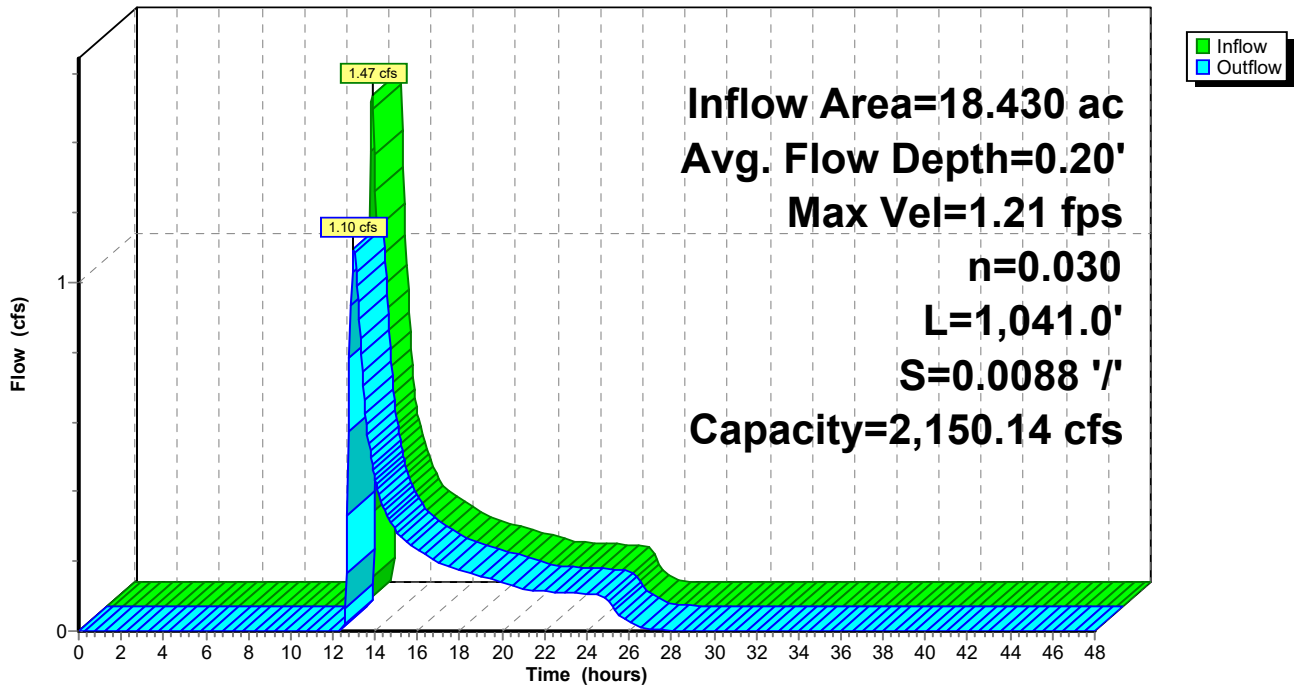Bailey Farms - Developed
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## Reach 6R: Reach 3



**Stage-Discharge**

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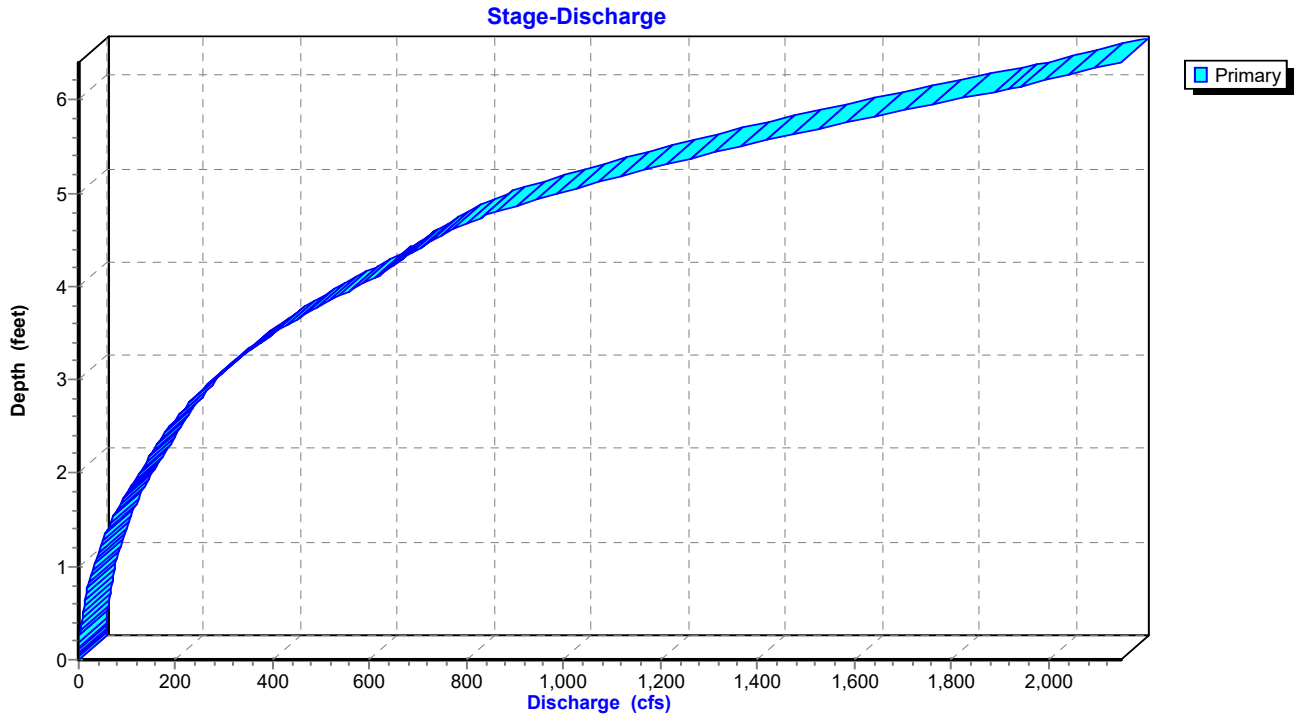Prepared by Schlagel and Assoc.
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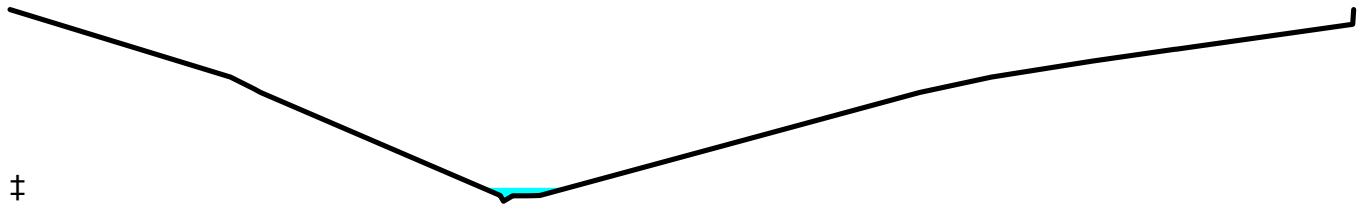
## Summary for Reach 7R: Reach 2

Inflow Area =        18.430 ac,    0.00% Impervious,  Inflow Depth =   0.16"    for  WQV event
Inflow       =        1.90 cfs @   12.27 hrs,  Volume=           0.244 af
Outflow     =        1.47 cfs @   12.53 hrs,  Volume=           0.244 af,  Atten= 23%,  Lag= 16.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.65 fps,  Min. Travel Time= 8.6 min
Avg. Velocity = 0.84 fps,  Avg. Travel Time= 16.9 min

Peak Storage= 764 cf @ 12.39 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 3.24'  Flow Area= 204.3 sf,  Capacity= 1,999.47 cfs

Custom cross-section,  Length= 853.0'   Slope= 0.0225 '/'   (106 Elevation Intervals)
Constant n= 0.030  Earth, grassed & winding
Inlet Invert= 1,009.12',  Outlet Invert= 989.90'

‡

| Offset | Elevation | Chan.Depth |
|--------|-----------|------------|
| (feet) | (feet)    | (feet)     |
| 0.00   | 1,009.14  | 0.00       |
| 22.15  | 1,008.00  | 1.14       |
| 24.54  | 1,007.80  | 1.34       |
| 25.18  | 1,007.74  | 1.40       |
| 49.26  | 1,006.00  | 3.14       |
| 49.59  | 1,005.90  | 3.24       |
| 50.51  | 1,005.99  | 3.15       |
| 52.13  | 1,005.99  | 3.15       |
| 53.24  | 1,006.00  | 3.14       |
| 91.41  | 1,007.74  | 1.40       |
| 98.60  | 1,008.00  | 1.14       |
| 108.78 | 1,008.27  | 0.87       |
| 117.07 | 1,008.47  | 0.67       |
| 117.16 | 1,008.47  | 0.67       |
| 134.91 | 1,008.89  | 0.25       |
| 135.00 | 1,009.14  | 0.00       |

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| Depth (feet) | End Area (sq-ft) | Perim. (feet) | Storage (cubic-feet) | Discharge (cfs) |
|---|---|---|---|---|
| 0.00 | 0.0 | 0.0 | 0 | 0.00 |
| 0.09 | 0.1 | 2.9 | 47 | 0.03 |
| 0.10 | 0.1 | 4.0 | 77 | 0.06 |
| 1.84 | 61.2 | 66.4 | 52,179 | 430.84 |
| 1.90 | 65.2 | 68.7 | 55,628 | 468.55 |
| 2.10 | 79.7 | 76.6 | 67,995 | 608.70 |
| 2.37 | 102.4 | 92.0 | 87,382 | 818.03 |
| 2.57 | 122.0 | 104.3 | 104,091 | 1,007.45 |
| 2.99 | 171.2 | 130.2 | 146,042 | 1,527.76 |
| 3.24 | 204.3 | 135.4 | 174,303 | 1,999.47 |

### Reach 7R: Reach 2

**Hydrograph**



Inflow Area=18.430 ac
Avg. Flow Depth=0.23'
Max Vel=1.65 fps
n=0.030
L=853.0'
S=0.0225 '/'
Capacity=1,999.47 cfs

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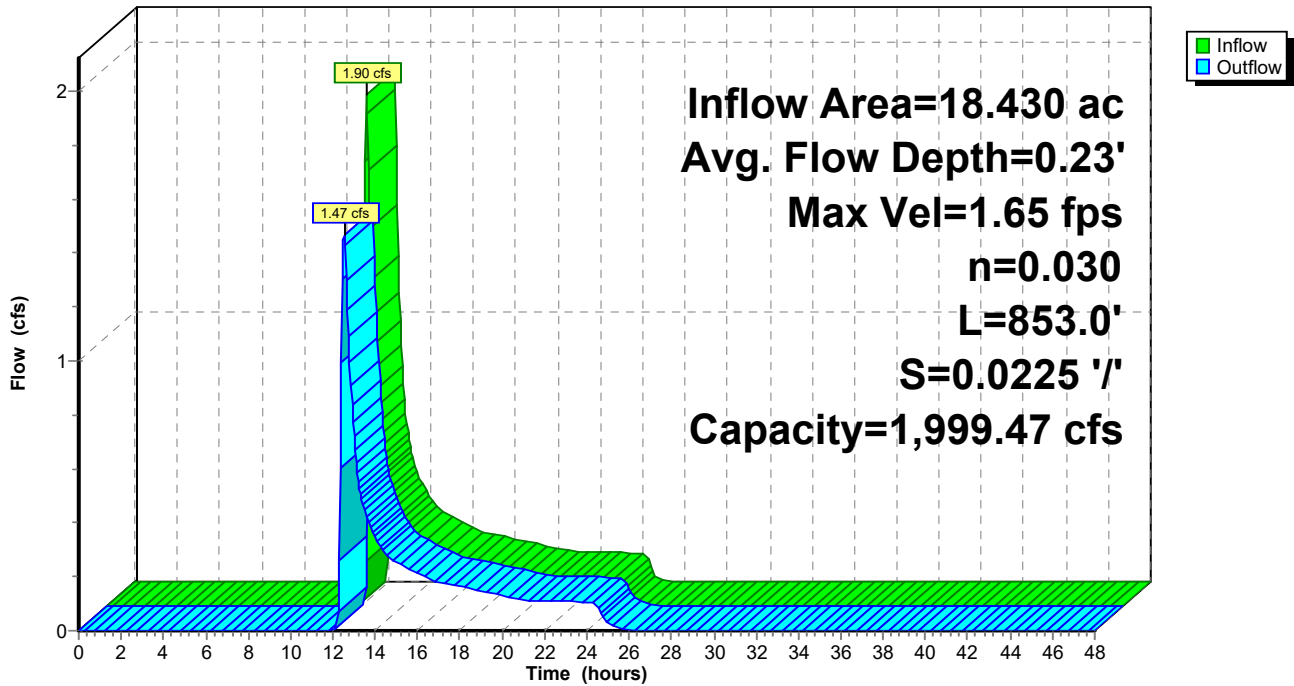*Type II 24-hr  WQV Rainfall=1.37"*
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## Reach 7R: Reach 2



Stage-Discharge

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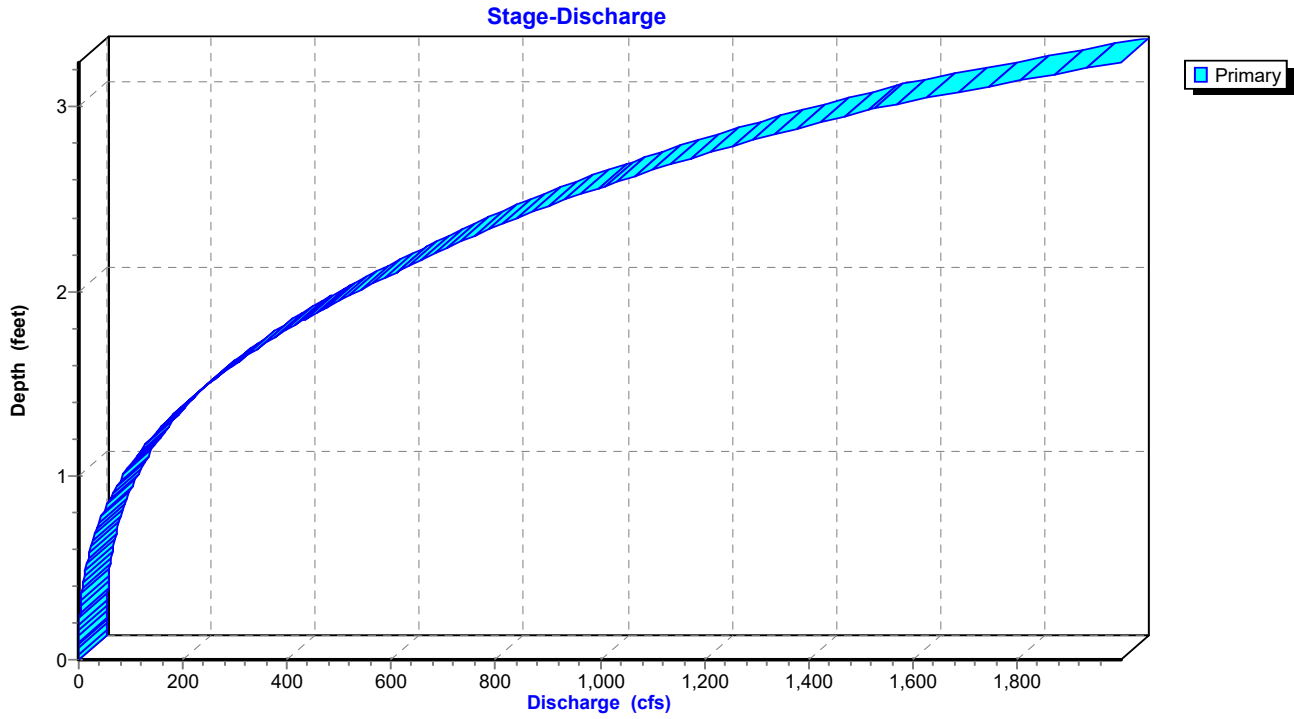Prepared by Schlagel and Assoc.
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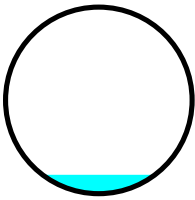
### Summary for Reach 8R: REACH 1 (through Pipe System)

Inflow Area =        18.430 ac,    0.00% Impervious,  Inflow Depth =  0.16"    for  WQV event
Inflow       =        2.03 cfs @   12.16 hrs,  Volume=              0.244 af
Outflow      =        1.90 cfs @   12.27 hrs,  Volume=              0.244 af,  Atten= 6%,  Lag= 6.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.18 fps,  Min. Travel Time= 3.4 min
Avg. Velocity = 2.44 fps,  Avg. Travel Time= 7.3 min

Peak Storage= 394 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 3.00'  Flow Area= 7.1 sf,  Capacity= 91.10 cfs

36.0"  Round Pipe
n= 0.012  Concrete pipe, finished
Length= 1,067.0'   Slope= 0.0159 '/'
Inlet Invert= 1,021.96',  Outlet Invert= 1,005.00'

### Reach 8R: REACH 1 (through Pipe System)



**Hydrograph**

Inflow Area=18.430 ac
Avg. Flow Depth=0.30'
Max Vel=5.18 fps
36.0"
Round Pipe
n=0.012
L=1,067.0'
S=0.0159 '/'
Capacity=91.10 cfs

2.03 cfs
1.90 cfs

Legend: Inflow (green), Outflow (blue)

X-axis: Time (hours)
Y-axis: Flow (cfs)
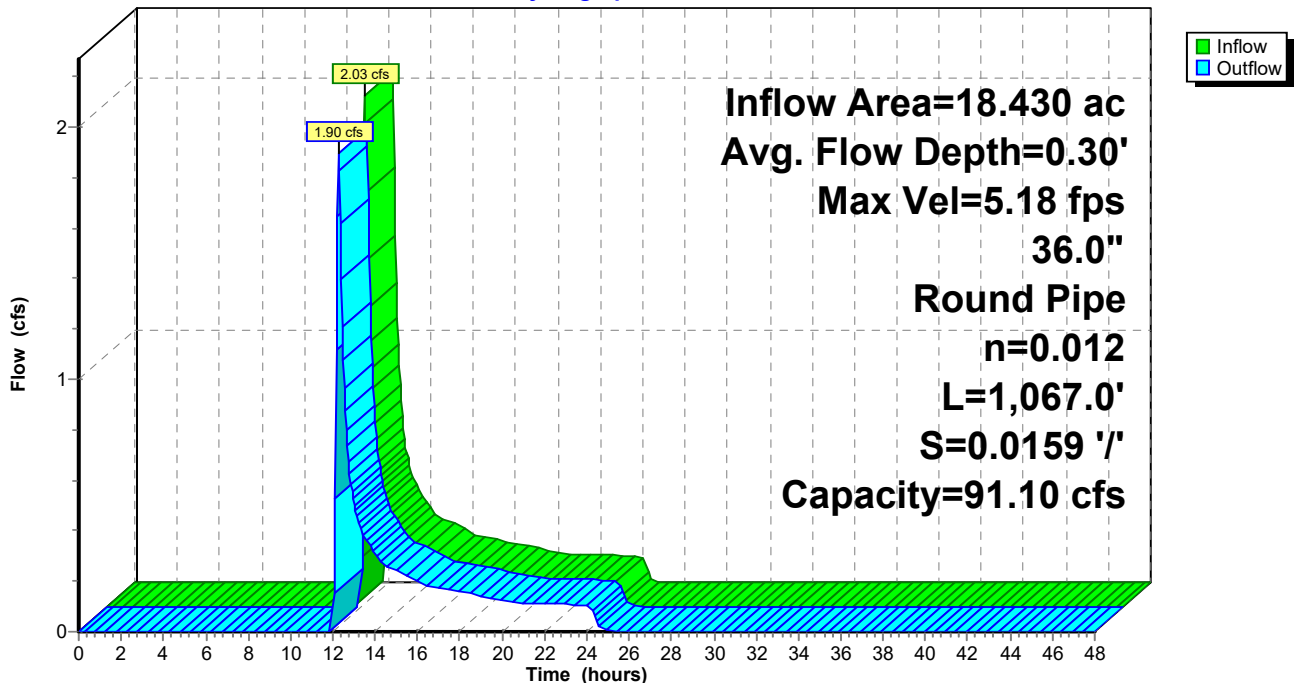
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## Reach 8R: REACH 1 (through Pipe System)

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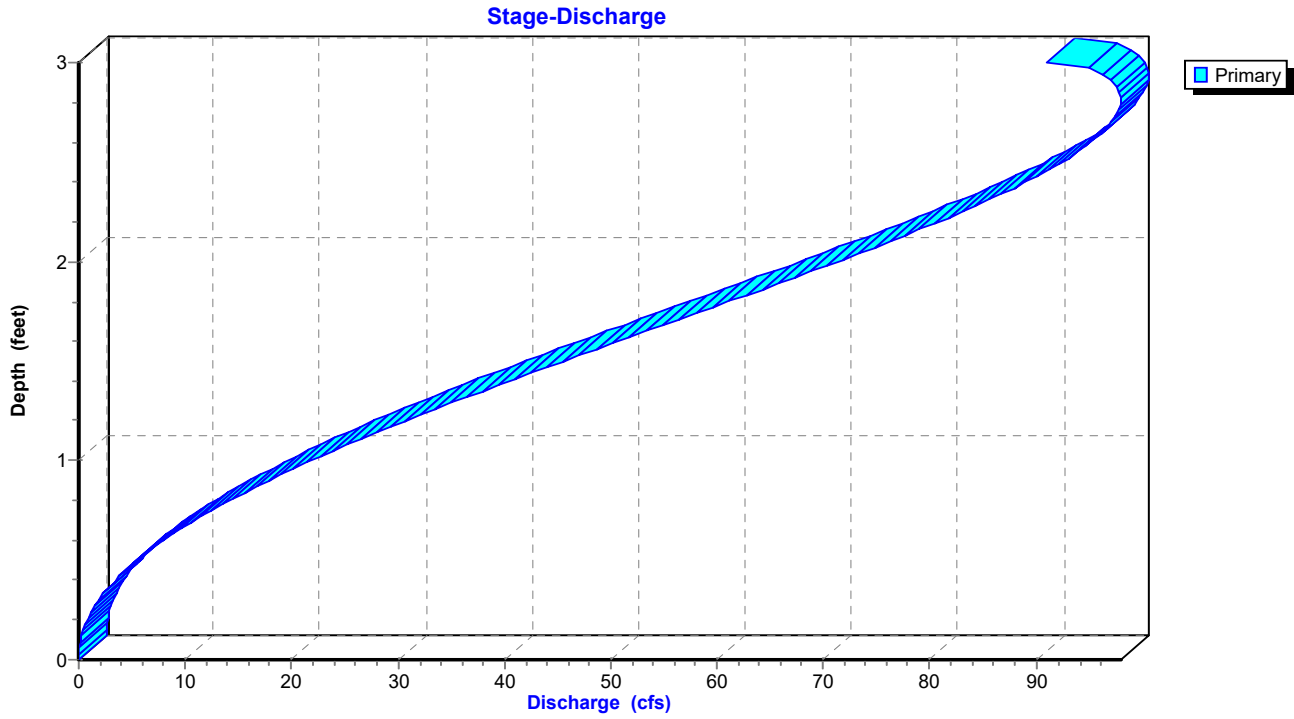Prepared by Schlagel and Assoc.
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## Summary for Pond 4P: EDDB #1 Cornerstone

Inflow Area =      31.710 ac,  26.16% Impervious,  Inflow Depth =  0.69"    for  WQV event
Inflow      =    29.17 cfs @  12.06 hrs,  Volume=          1.830 af
Outflow    =      0.54 cfs @  19.36 hrs,  Volume=          1.544 af,  Atten= 98%,  Lag= 437.9 min
Primary    =      0.54 cfs @  19.36 hrs,  Volume=          1.544 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,000.17' @ 19.36 hrs   Surf.Area= 28,490 sf   Storage= 55,660 cf

Plug-Flow detention time= 957.6 min calculated for 1.542 af (84% of inflow)
Center-of-Mass det. time= 886.9 min ( 1,723.7 - 836.8 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 995.67' | 374,566 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 995.67 | 0 | 0 | 0 |
| 996.00 | 700 | 116 | 116 |
| 997.00 | 7,200 | 3,950 | 4,066 |
| 998.00 | 12,000 | 9,600 | 13,666 |
| 999.00 | 17,900 | 14,950 | 28,616 |
| 1,000.00 | 27,000 | 22,450 | 51,066 |
| 1,001.00 | 36,000 | 31,500 | 82,566 |
| 1,002.00 | 40,000 | 38,000 | 120,566 |
| 1,003.00 | 44,800 | 42,400 | 162,966 |
| 1,004.00 | 48,700 | 46,750 | 209,716 |
| 1,005.00 | 53,000 | 50,850 | 260,566 |
| 1,006.00 | 57,000 | 55,000 | 315,566 |
| 1,007.00 | 61,000 | 59,000 | 374,566 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 993.54' | **30.0"  Round 30" Culvert** L= 87.0'  RCP, sq.cut end projecting,  Ke= 0.500 Inlet / Outlet Invert= 993.54' / 993.11'  S= 0.0049 '/'  Cc= 0.900 n= 0.012  Concrete pipe, finished,  Flow Area= 4.91 sf |
| #2 | Device 1 | 994.16' | **2.9" Vert. WQ Orifice**  C= 0.600 |
| #3 | Device 2 | 994.36' | **8.0"  Round 8" PVC Pipe** L= 20.0'  RCP, groove end projecting,  Ke= 0.200 Inlet / Outlet Invert= 994.36' / 994.16'  S= 0.0100 '/'  Cc= 0.900 n= 0.012,  Flow Area= 0.35 sf |
| #4 | Device 3 | 995.67' | **1.0" Vert. Riser Pipe X 8.00 columns** X 9 rows with 4.0" cc spacing C= 0.600 |
| #5 | Device 1 | 1,001.05' | **48.0" W x 6.0" H Vert. Opening in Box**  C= 0.600 |
| #6 | Device 1 | 1,004.00' | **60.0" x 48.0" Horiz. Open Top of Box**  C= 0.600 Limited to weir flow at low heads |

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**Primary OutFlow** Max=0.54 cfs @ 19.36 hrs  HW=1,000.17'   (Free Discharge)
└─**1=30" Culvert** (Passes 0.54 cfs of 54.80 cfs potential flow)
   └─**2=WQ Orifice** (Orifice Controls 0.54 cfs @ 11.68 fps)
      └─**3=8" PVC Pipe** (Passes 0.54 cfs of 4.45 cfs potential flow)
        └─**4=Riser Pipe** (Passes 0.54 cfs of 3.31 cfs potential flow)
  ├─**5=Opening in Box** ( Controls 0.00 cfs)
  └─**6=Open Top of Box** ( Controls 0.00 cfs)

### Pond 4P: EDDB #1 Cornerstone

**Hydrograph**

Inflow Area=31.710 ac
Peak Elev=1,000.17'
Storage=55,660 cf

29.17 cfs

0.54 cfs

Legend: Inflow (green), Primary (blue)

Flow (cfs) vs Time (hours)

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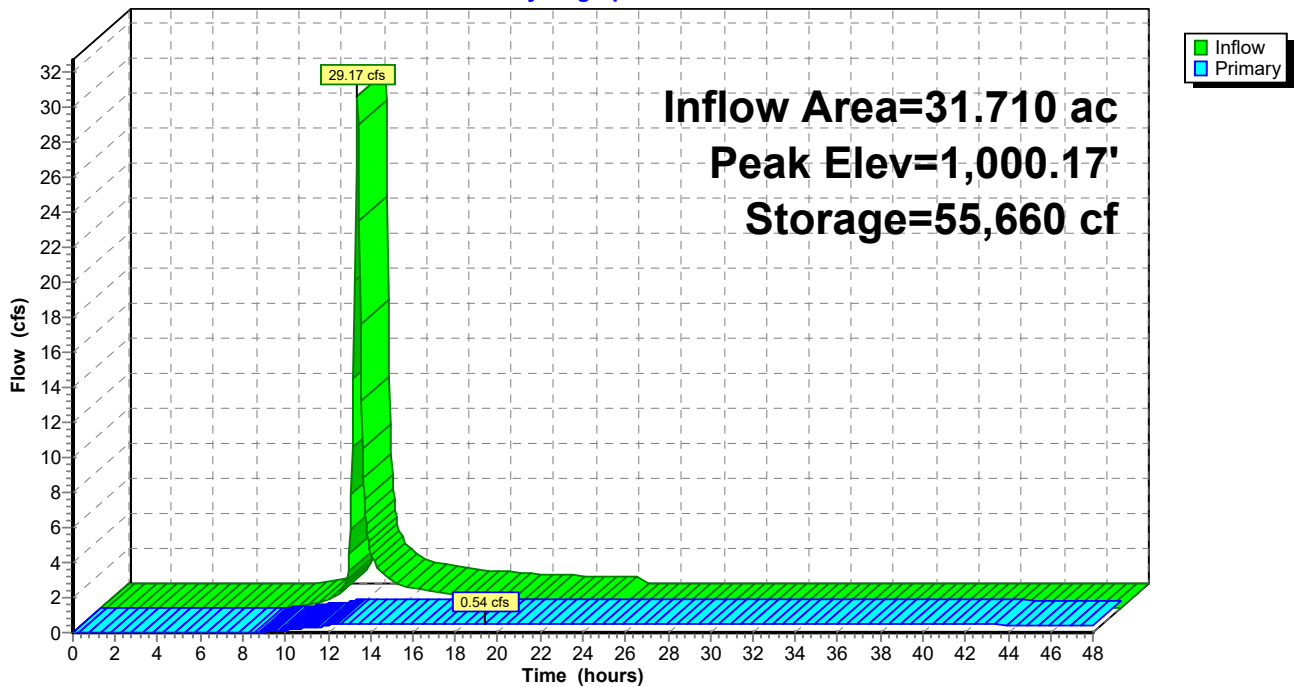*Type II 24-hr  WQV Rainfall=1.37"*
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## Pond 4P: EDDB #1 Cornerstone



**Stage-Discharge**

Legend: ▣ Primary

Labels on graph: Open Top of Box, Opening in Box, Riser Pipe

X-axis: Discharge (cfs)
Y-axis: Elevation (feet)

**21-130-HYDRO-PRO orifice plate option**
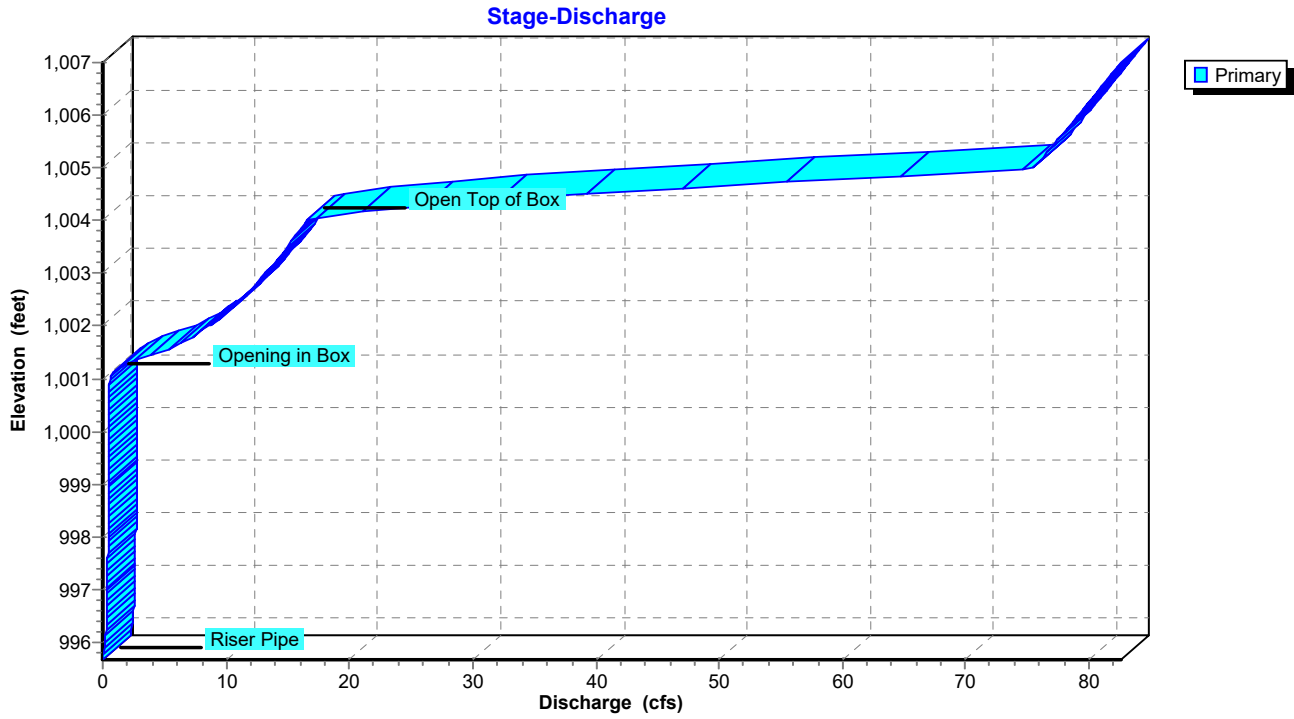Prepared by Schlagel and Assoc.
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## Summary for Pond 5P: EDDB #2 Manor

Inflow Area =      29.690 ac, 38.00% Impervious,  Inflow Depth =  0.45"   for  WQV event
Inflow     =     17.13 cfs @  12.07 hrs,  Volume=        1.107 af
Outflow   =     0.39 cfs @  19.53 hrs,  Volume=        1.083 af,  Atten= 98%,  Lag= 447.7 min
Primary   =     0.39 cfs @  19.53 hrs,  Volume=        1.083 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 992.24' @ 19.53 hrs   Surf.Area= 25,419 sf   Storage= 31,748 cf

Plug-Flow detention time= 890.2 min calculated for 1.083 af (98% of inflow)
Center-of-Mass det. time= 878.1 min ( 1,743.6 - 865.5 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 988.16' | 352,236 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 988.16 | 0 | 0 | 0 |
| 989.00 | 800 | 336 | 336 |
| 990.00 | 4,200 | 2,500 | 2,836 |
| 991.00 | 10,400 | 7,300 | 10,136 |
| 992.00 | 21,600 | 16,000 | 26,136 |
| 993.00 | 37,600 | 29,600 | 55,736 |
| 994.00 | 41,700 | 39,650 | 95,386 |
| 995.00 | 46,000 | 43,850 | 139,236 |
| 996.00 | 49,700 | 47,850 | 187,086 |
| 997.00 | 53,200 | 51,450 | 238,536 |
| 998.00 | 56,900 | 55,050 | 293,586 |
| 999.00 | 60,400 | 58,650 | 352,236 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 986.00' | **30.0"  Round 30" Culvert** L= 77.0'  RCP, sq.cut end projecting,  Ke= 0.500 Inlet / Outlet Invert= 986.00' / 985.62'  S= 0.0049 '/'  Cc= 0.900 n= 0.012  Concrete pipe, finished,  Flow Area= 4.91 sf |
| #2 | Device 1 | 986.62' | **2.5" Vert. WQ Orifice**  C= 0.600 |
| #3 | Device 2 | 986.86' | **8.0"  Round 8" PVC Pipe** L= 20.0'  RCP, sq.cut end projecting,  Ke= 0.500 Inlet / Outlet Invert= 986.86' / 986.62'  S= 0.0120 '/'  Cc= 0.900 n= 0.012  Corrugated PP, smooth interior,  Flow Area= 0.35 sf |
| #4 | Device 3 | 988.16' | **1.0" Vert. Riser Pipe X 8.00 columns** X 8 rows with 4.0" cc spacing C= 0.600 |
| #5 | Device 1 | 993.40' | **48.0" W x 6.0" H Vert. Opening in Box**  C= 0.600 |
| #6 | Device 1 | 995.25' | **60.0" x 48.0" Horiz. Open Top of Box**  C= 0.600 Limited to weir flow at low heads |

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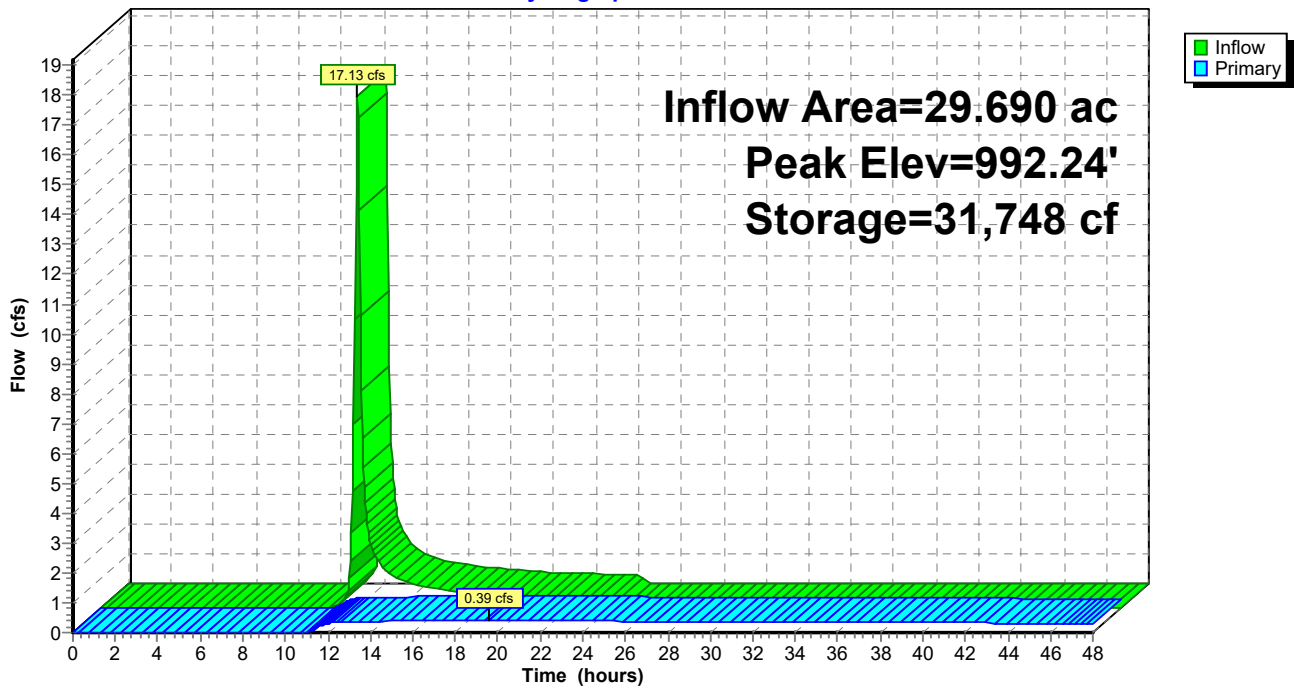*Type II 24-hr  WQV Rainfall=1.37"*
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**Primary OutFlow** Max=0.39 cfs @ 19.53 hrs  HW=992.24'   (Free Discharge)
└─**1=30" Culvert** (Passes 0.39 cfs of 52.79 cfs potential flow)
  └─**2=WQ Orifice** (Orifice Controls 0.39 cfs @ 11.31 fps)
    └─**3=8" PVC Pipe** (Passes 0.39 cfs of 3.78 cfs potential flow)
      └─**4=Riser Pipe** (Passes 0.39 cfs of 2.82 cfs potential flow)
  └─**5=Opening in Box** ( Controls 0.00 cfs)
└─**6=Open Top of Box** ( Controls 0.00 cfs)

### Pond 5P: EDDB #2 Manor

**Hydrograph**



Inflow Area=29.690 ac
Peak Elev=992.24'
Storage=31,748 cf

**21-130-HYDRO-PRO orifice plate option**
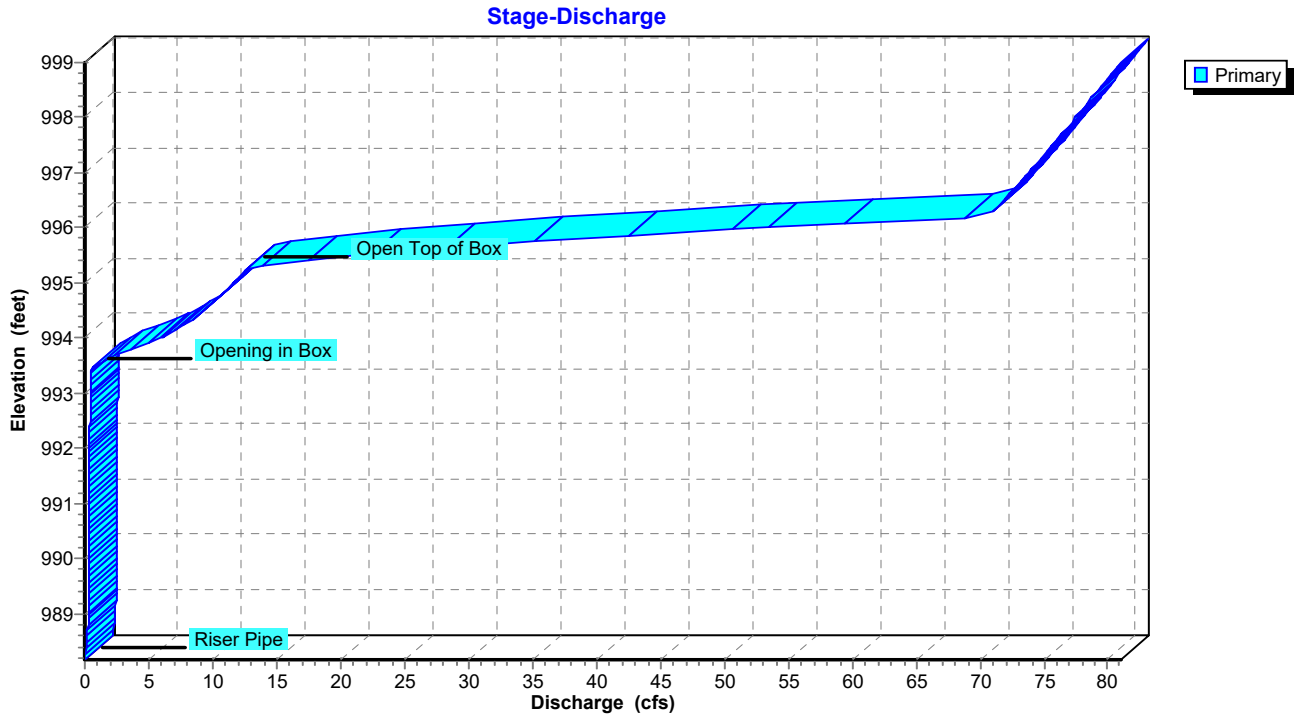Prepared by Schlagel and Assoc.
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## Pond 5P: EDDB #2 Manor

**Stage-Discharge**

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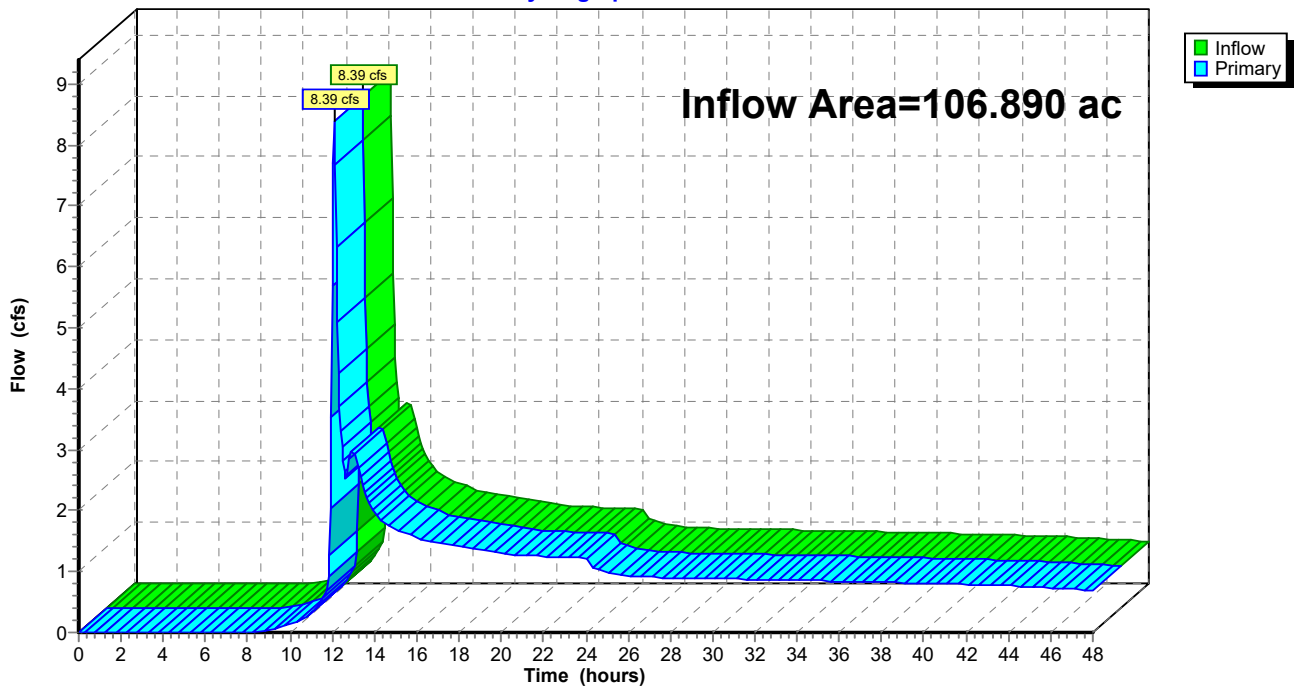
## Summary for Link 2L: RP-1

Inflow Area =      106.890 ac,  20.71% Impervious,  Inflow Depth >  0.39"    for  WQV event
Inflow      =        8.39 cfs @   12.10 hrs,  Volume=           3.473 af
Primary    =        8.39 cfs @   12.10 hrs,  Volume=           3.473 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 2L: RP-1

**Hydrograph**

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Bailey Farms - Developed
*Type II 24-hr  WQV Rainfall=1.37"*
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Page 96
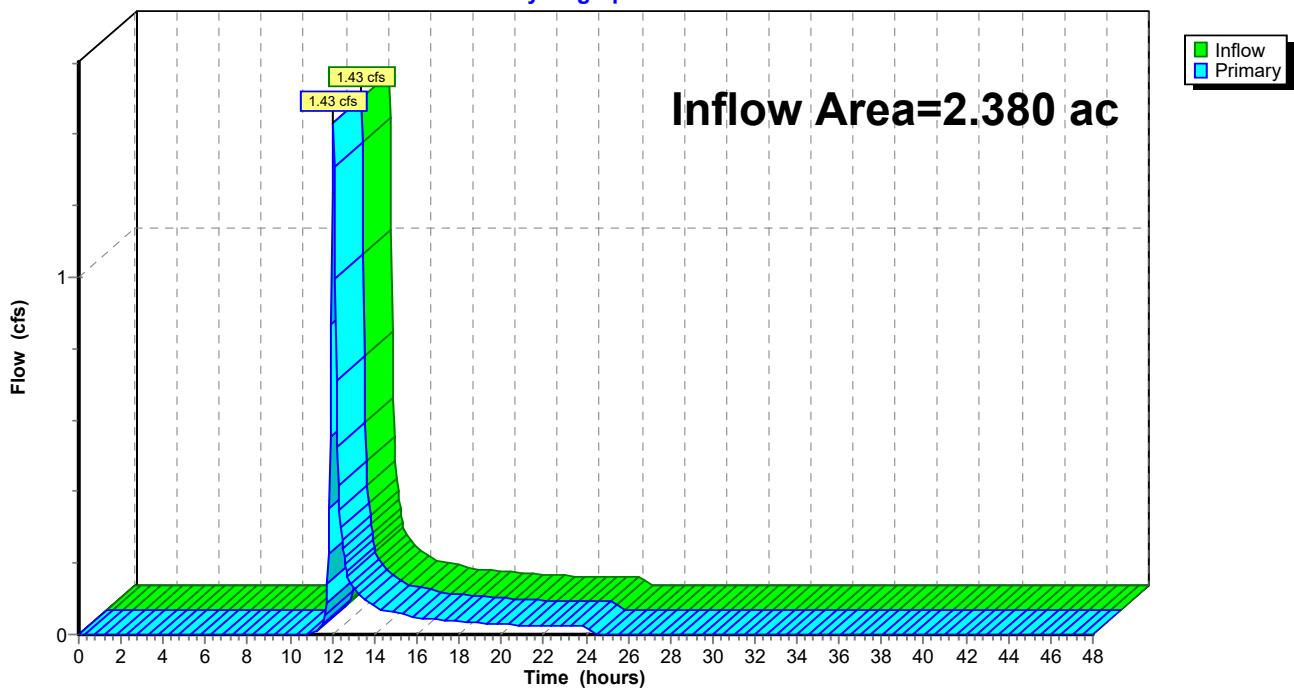
## Summary for Link 3L: RP-2

Inflow Area =        2.380 ac,  38.00% Impervious,  Inflow Depth =   0.45"    for  WQV event
Inflow     =      1.43 cfs @   12.06 hrs,  Volume=            0.089 af
Primary    =      1.43 cfs @   12.06 hrs,  Volume=            0.089 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 3L: RP-2

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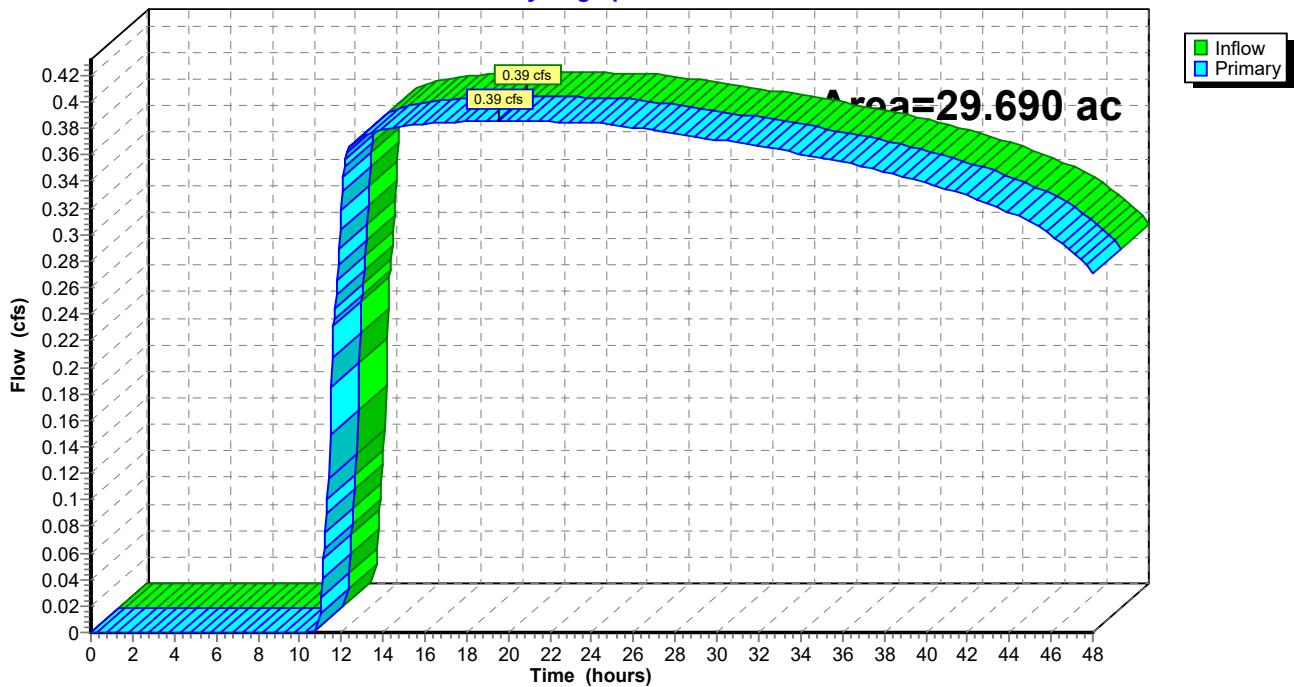
## Summary for Link 4L: RP-3

Inflow Area =        29.690 ac,  38.00% Impervious,  Inflow Depth >   0.44"    for  WQV event
Inflow      =         0.39 cfs @   19.53 hrs,  Volume=              1.083 af
Primary     =         0.39 cfs @   19.53 hrs,  Volume=              1.083 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 4L: RP-3

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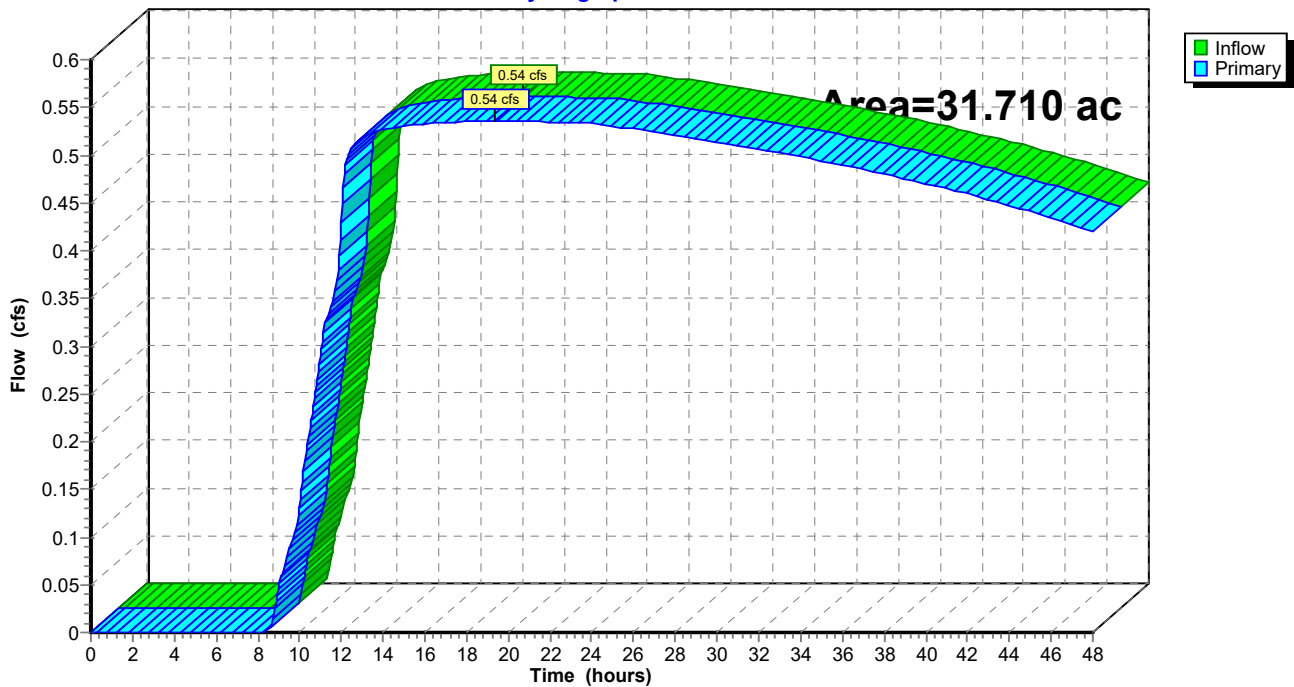Page 98

## Summary for Link 5L: RP-4

Inflow Area =        31.710 ac,  26.16% Impervious,  Inflow Depth >   0.58"    for  WQV event
Inflow      =        0.54 cfs @   19.36 hrs,  Volume=            1.544 af
Primary     =        0.54 cfs @   19.36 hrs,  Volume=            1.544 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Link 5L: RP-4

# HydroCAD - Clogged Conditions

Proposed Condition

1S
ON-SITE #1

5S
OFF-SITE #1

4P

8R
REACH 1 (through Pipe System)

EDDB #1 Cornerstone

7R
Reach 2

6R
Reach 3

5L
RP-4

7S
ON-SITE #2

5P
EDDB #2 Manor

3S
ON-SITE #3 (Bypass)

6S
ON-SITE #4 (Bypass)

4L
RP-3

3L
RP-2

2L
RP-1

Subcat    Reach    Pond    Link
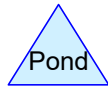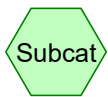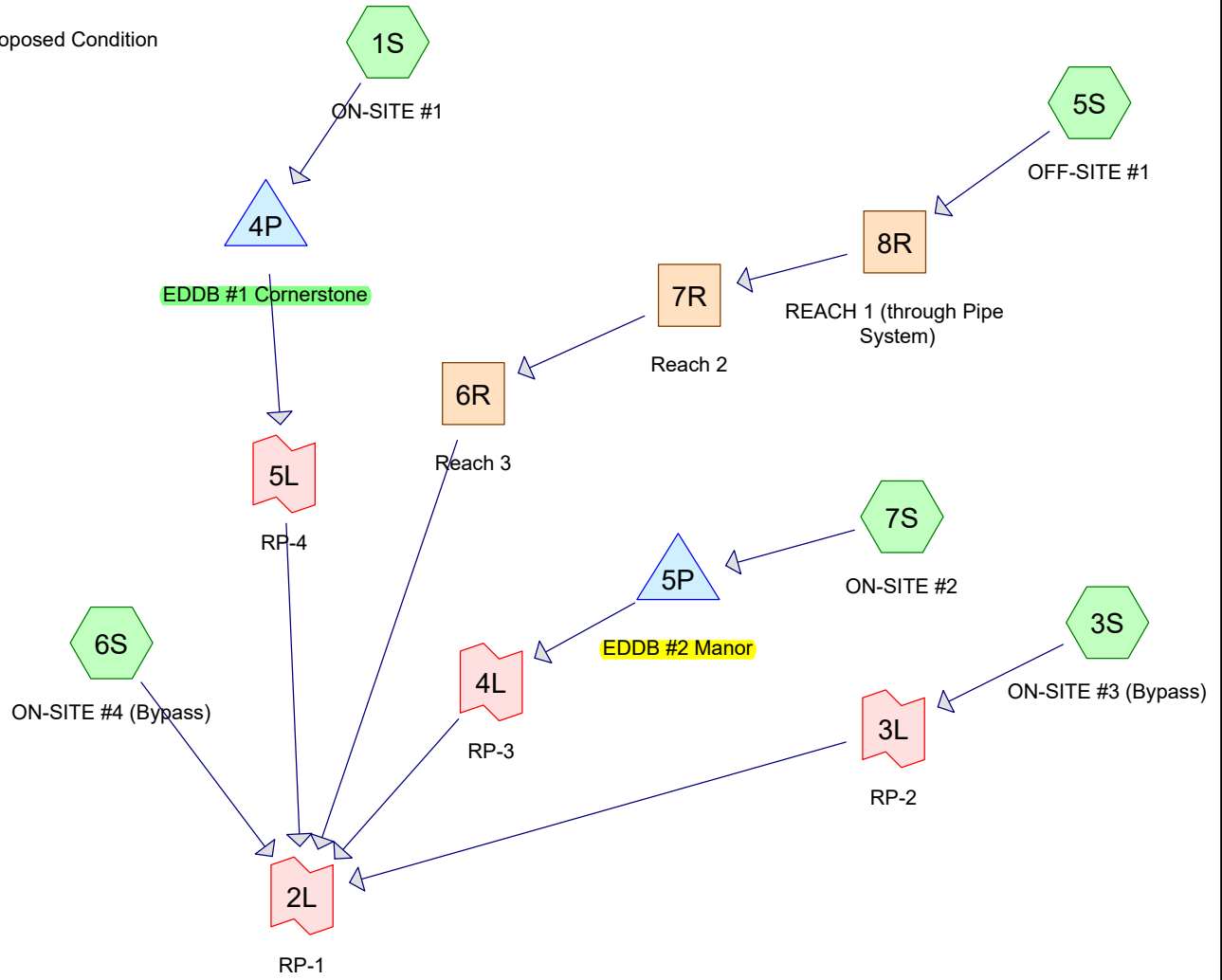
**Routing Diagram for 21-130-HYDRO-PRO orifice plate option Clogged**
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**21-130-HYDRO-PRO orifice plate option Clogged**

## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 32.070 | 87 | 1/4 acre lots, 38% imp, HSG D  (3S, 7S) |
| 11.140 | 92 | 1/8 acre lots, 65% imp, HSG D  (1S) |
| 22.730 | 80 | >75% Grass cover, Good, HSG D  (6S) |
| 19.330 | 92 | Duplex/Townhomes  (1S) |
| 3.190 | 95 | Urban commercial, 85% imp, HSG D  (1S, 6S) |
| 15.640 | 76 | Woods/grass comb., Fair, HSG C  (5S) |
| 2.790 | 82 | Woods/grass comb., Fair, HSG D  (5S) |

**21-130-HYDRO-PRO orifice plate option Clogged**

## Soil Listing (all nodes)

| Area (acres) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 0.000 | HSG A | |
| 0.000 | HSG B | |
| 15.640 | HSG C | 5S |
| 71.920 | HSG D | 1S, 3S, 5S, 6S, 7S |
| 19.330 | Other | 1S |

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## Ground Covers (all nodes)

| HSG-A (acres) | HSG-B (acres) | HSG-C (acres) | HSG-D (acres) | Other (acres) | Total (acres) | Ground Cover | Subcatchment Numbers |
|---|---|---|---|---|---|---|---|
| 0.000 | 0.000 | 0.000 | 32.070 | 0.000 | 32.070 | 1/4 acre lots, 38% imp | 3S, 7S |
| 0.000 | 0.000 | 0.000 | 11.140 | 0.000 | 11.140 | 1/8 acre lots, 65% imp | 1S |
| 0.000 | 0.000 | 0.000 | 22.730 | 0.000 | 22.730 | >75% Grass cover, Good | 6S |
| 0.000 | 0.000 | 0.000 | 0.000 | 19.330 | 19.330 | Duplex/Townhomes | 1S |
| 0.000 | 0.000 | 0.000 | 3.190 | 0.000 | 3.190 | Urban commercial, 85% imp | 1S, 6S |
| 0.000 | 0.000 | 15.640 | 2.790 | 0.000 | 18.430 | Woods/grass comb., Fair | 5S |

**21-130-HYDRO-PRO orifice plate option Clogged**
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*Type II 24-hr  100-Year Rainfall=7.70"*
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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method  -  Pond routing by Stor-Ind method

**Pond 4P: EDDB #1 Cornerstone**   Peak Elev=1,007.64'  Storage=414,456 cf  Inflow=260.19 cfs  17.828 af
Outflow=254.01 cfs  17.828 af

**Pond 5P: EDDB #2 Manor**   Peak Elev=998.91'  Storage=347,072 cf  Inflow=232.03 cfs  15.236 af
Outflow=224.75 cfs  15.236 af

**21-130-HYDRO-PRO orifice plate option Clogged**
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Bailey Farms - 100 yr Clogged
*Type II 24-hr  100-Year Rainfall=7.70"*
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## Summary for Pond 4P: EDDB #1 Cornerstone

Inflow Area =      31.710 ac,  26.16% Impervious,  Inflow Depth =  6.75"   for  100-Year event
Inflow     =    260.19 cfs @  12.05 hrs,  Volume=         17.828 af
Outflow    =    254.01 cfs @  12.08 hrs,  Volume=         17.828 af,  Atten= 2%,  Lag= 1.5 min
Primary    =    254.01 cfs @  12.08 hrs,  Volume=         17.828 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Starting Elev= 1,007.14'  Surf.Area= 61,714 sf  Storage= 383,155 cf
Peak Elev= 1,007.64' @ 12.08 hrs  Surf.Area= 64,249 sf  Storage= 414,456 cf  (31,300 cf above start)

Plug-Flow detention time= 239.8 min calculated for 9.032 af (51% of inflow)
Center-of-Mass det. time= 3.8 min ( 777.7 - 773.9 )

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---------------------|
| #1 | 995.67' | 482,088 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 995.67 | 0 | 0 | 0 |
| 996.00 | 700 | 115 | 115 |
| 997.00 | 7,200 | 3,950 | 4,065 |
| 998.00 | 12,000 | 9,600 | 13,665 |
| 999.00 | 17,900 | 14,950 | 28,615 |
| 1,000.00 | 27,000 | 22,450 | 51,065 |
| 1,001.00 | 36,000 | 31,500 | 82,565 |
| 1,002.00 | 40,000 | 38,000 | 120,565 |
| 1,003.00 | 44,800 | 42,400 | 162,965 |
| 1,004.00 | 48,700 | 46,750 | 209,715 |
| 1,005.00 | 53,000 | 50,850 | 260,565 |
| 1,006.00 | 57,000 | 55,000 | 315,566 |
| 1,007.00 | 61,000 | 59,000 | 374,566 |
| 1,008.00 | 66,100 | 63,550 | 438,116 |
| 1,008.65 | 69,200 | 43,972 | 482,088 |

| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|----------------|
| #1 | Primary | 1,007.14' | **Asymmetrical Weir, C= 3.33**<br>Offset (feet)  0.00  4.50  220.50  225.00<br>Height (feet)  1.50  0.00  0.00  1.50 |

**Primary OutFlow** Max=248.51 cfs @ 12.08 hrs  HW=1,007.63'   (Free Discharge)
└─**1=Asymmetrical Weir** (Weir Controls 248.51 cfs @ 2.31 fps)

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## Pond 4P: EDDB #1 Cornerstone

**Hydrograph**



Inflow Area=31.710 ac
Peak Elev=1,007.64'
Storage=414,456 cf

## Pond 4P: EDDB #1 Cornerstone

**Stage-Discharge**

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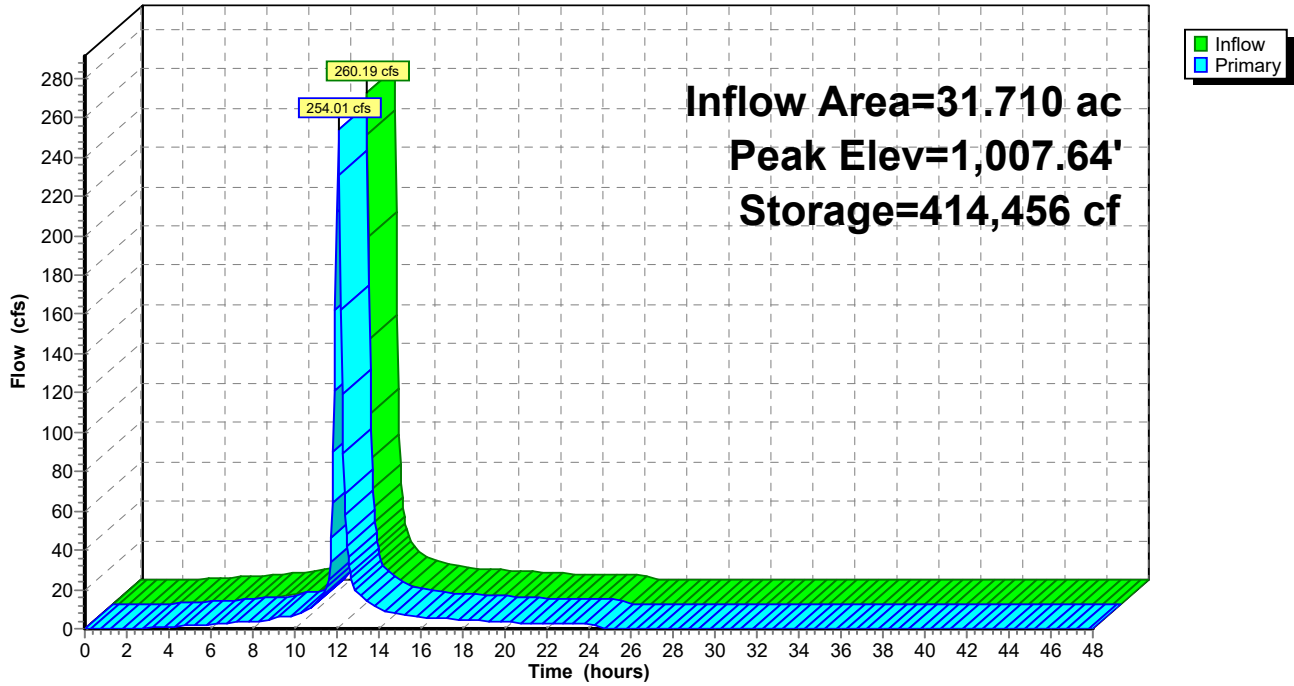
Bailey Farms - 100 yr Clogged
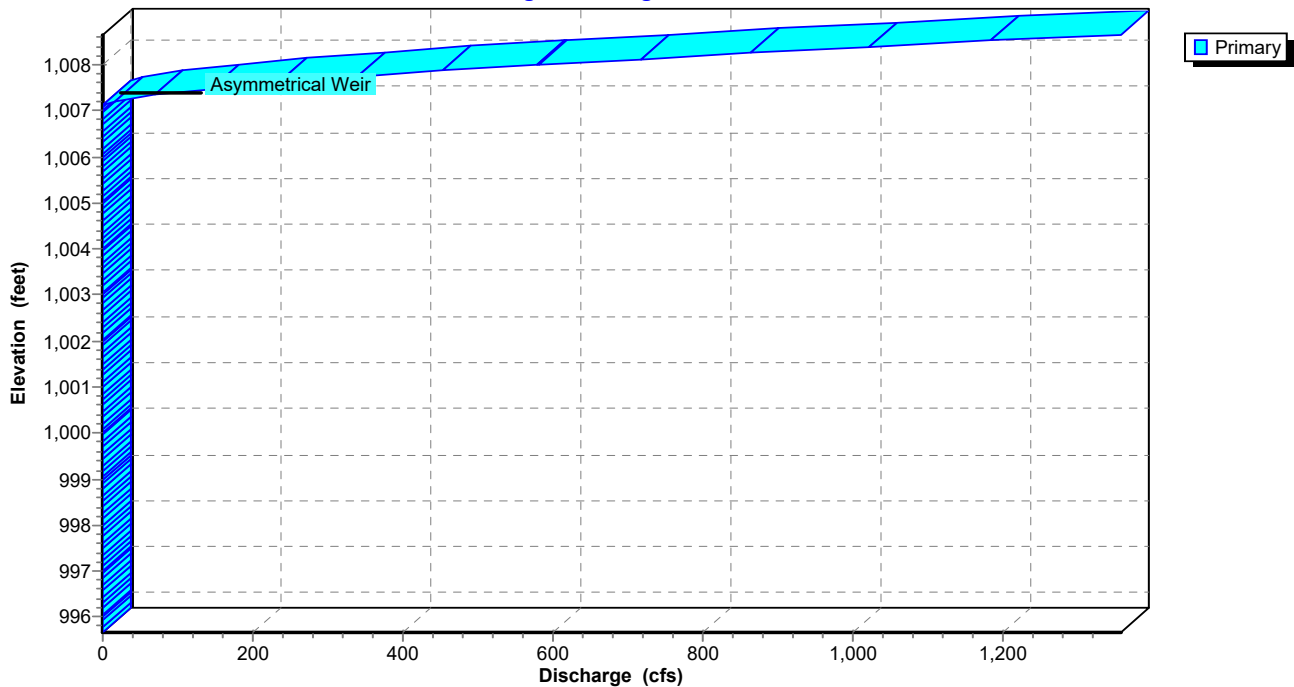*Type II 24-hr  100-Year Rainfall=7.70"*
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## Summary for Pond 5P: EDDB #2 Manor

Inflow Area =     29.690 ac, 38.00% Impervious, Inflow Depth = 6.16"   for 100-Year event
Inflow    =   232.03 cfs @  12.05 hrs, Volume=       15.236 af
Outflow   =   224.75 cfs @  12.08 hrs, Volume=       15.236 af, Atten= 3%, Lag= 1.7 min
Primary   =   224.75 cfs @  12.08 hrs, Volume=       15.236 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Starting Elev= 998.36'  Surf.Area= 58,160 sf  Storage= 314,297 cf
Peak Elev= 998.91' @ 12.08 hrs  Surf.Area= 60,100 sf  Storage= 347,072 cf  (32,775 cf above start)

Plug-Flow detention time= 222.9 min calculated for 8.020 af (53% of inflow)
Center-of-Mass det. time= 4.4 min ( 794.5 - 790.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 988.16' | 352,236 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 988.16 | 0 | 0 | 0 |
| 989.00 | 800 | 336 | 336 |
| 990.00 | 4,200 | 2,500 | 2,836 |
| 991.00 | 10,400 | 7,300 | 10,136 |
| 992.00 | 21,600 | 16,000 | 26,136 |
| 993.00 | 37,600 | 29,600 | 55,736 |
| 994.00 | 41,700 | 39,650 | 95,386 |
| 995.00 | 46,000 | 43,850 | 139,236 |
| 996.00 | 49,700 | 47,850 | 187,086 |
| 997.00 | 53,200 | 51,450 | 238,536 |
| 998.00 | 56,900 | 55,050 | 293,586 |
| 999.00 | 60,400 | 58,650 | 352,236 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 998.36' | **Asymmetrical Weir, C= 3.27**<br>Offset (feet) 0.00 4.50 169.50 174.00<br>Height (feet) 1.50 0.00 0.00 1.50 |

**Primary OutFlow** Max=220.16 cfs @ 12.08 hrs  HW=998.91'  (Free Discharge)
└─**1=Asymmetrical Weir** (Weir Controls 220.16 cfs @ 2.39 fps)

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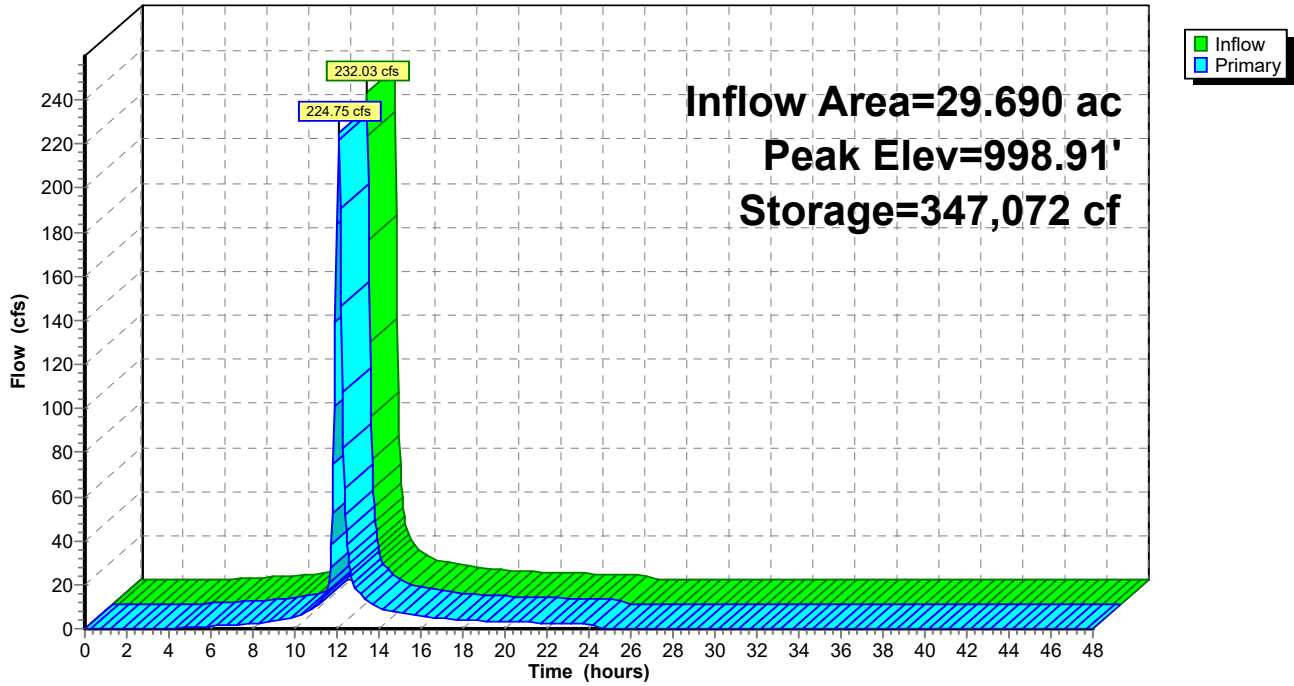
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*Type II 24-hr  100-Year Rainfall=7.70"*
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## Pond 5P: EDDB #2 Manor

**Hydrograph**



Inflow Area=29.690 ac
Peak Elev=998.91'
Storage=347,072 cf

Legend: Inflow (green), Primary (blue)

232.03 cfs
224.75 cfs

Flow (cfs) vs Time (hours)

## Pond 5P: EDDB #2 Manor

**Stage-Discharge**



Legend: Primary

Asymmetrical Weir

Elevation (feet) vs Discharge (cfs)