SCHLAGEL

ENGINEERS PLANNERS SURVEYORS LANDSCAPE ARCHITECTS

Final Stormwater Management Plan

prepared for

Manor at Bailey Farms, 1st Plat

1300 SE Ranson Road
Lee's Summit, MO 64081

November 5, 2021
April 18, 2022
May 18, 2022

prepared by

SCHLAGEL & ASSOCIATES, P.A.

14920 W 107th ST
Lenexa, Kansas
(913) 492-5158
Schlagel & Associates Project 21-130

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

5/18/2022

Executive Summary

May 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

TABLE OF CONTENTS

<u>**Page No.**</u>

* * * * *

LIST OF TABLES

Table No.	**Page No.**

* * * * *

LIST OF FIGURES AND SHEETS

* * * * *

<p style="text-align: center; color: red;">**1.0 GENERAL INFORMATION**</p>

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.

<div align="center">* * * * *</div>

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 activities 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 Release Rate Calculations		
			Allowable On-Site Release Rate, cfs (A)	Allowable Off-Site Release Rate, cfs (B)	Allowable Release Rate, cfs (A+B)
Total Site RP-1 See Note 1	88.64	2-YR	44.35	30.84	**75.19**
		10-YR	177.4	62.92	**240.32**
		100-YR	266.1	108.57	**374.67**
South Bypass RP-2 See Note 2	2.38	2-YR	8.14	0	**8.14**
		10-YR	11.39	0	**11.39**
		100-YR	20.48	0	**20.48**
Manor RP-3 EDDB-2 (5P-HydroCAD)	29.34	2-YR	14.67	0	**14.67**
		10-YR	58.68	0	**58.68**
		100-YR	88.02	0	**88.02**
Cornerstone and Retreat RP-4 EDDB-1 (4P in HydroCAD)	31.71	2-YR	15.86	0	**15.86**
		10-YR	63.42	0	**63.42**
		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 analysis of the EDDB 1 is provided for informational purposes. Refer to the stormwater report specific to EDDB 1 "Cornerstone at Bailey Farms, 1st Plat" for the final analysis.

~~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 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.

This project requests 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

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

EXISTING
CONDTIONS
AERIAL MAP

SHEET

A.1

SCALE:1" = 250'

N

I:\PROJECTS\2021\21-130\3.0 Design\4.0 Civil\2.0 Hydro\21-130 Aerial.dwg, 4/18/2022 1:45:22 PM, 1:1

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

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

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

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

RP-4

RP-3

RP-1

RP-2

SE BAILEY ROAD

SE. RANSON ROAD

SCALE:1" = 250'

N

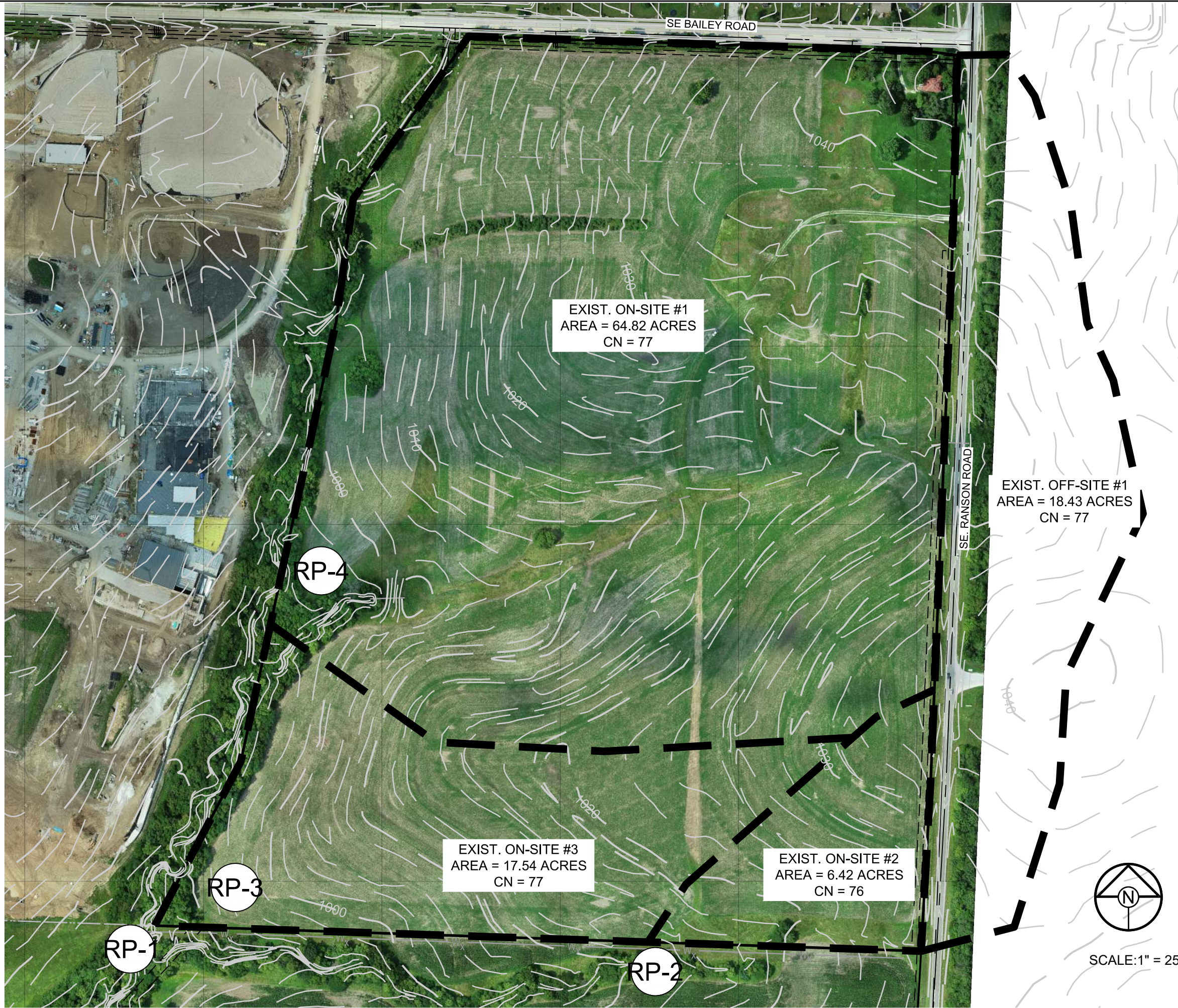**SCHLAGEL**

ENGINEERS   PLANNERS   SURVEYORS   LANDSCAPE ARCHITECTS

14920 West 107th Street   Lenexa, Kansas 66215
(913) 492-5158   Fax: (913) 492-8400
WWW.SCHLAGELASSOCIATES.COM

Missouri State Certificates of Authority
#E2002003800-F #LAC2001005237 #LS2002008859-F
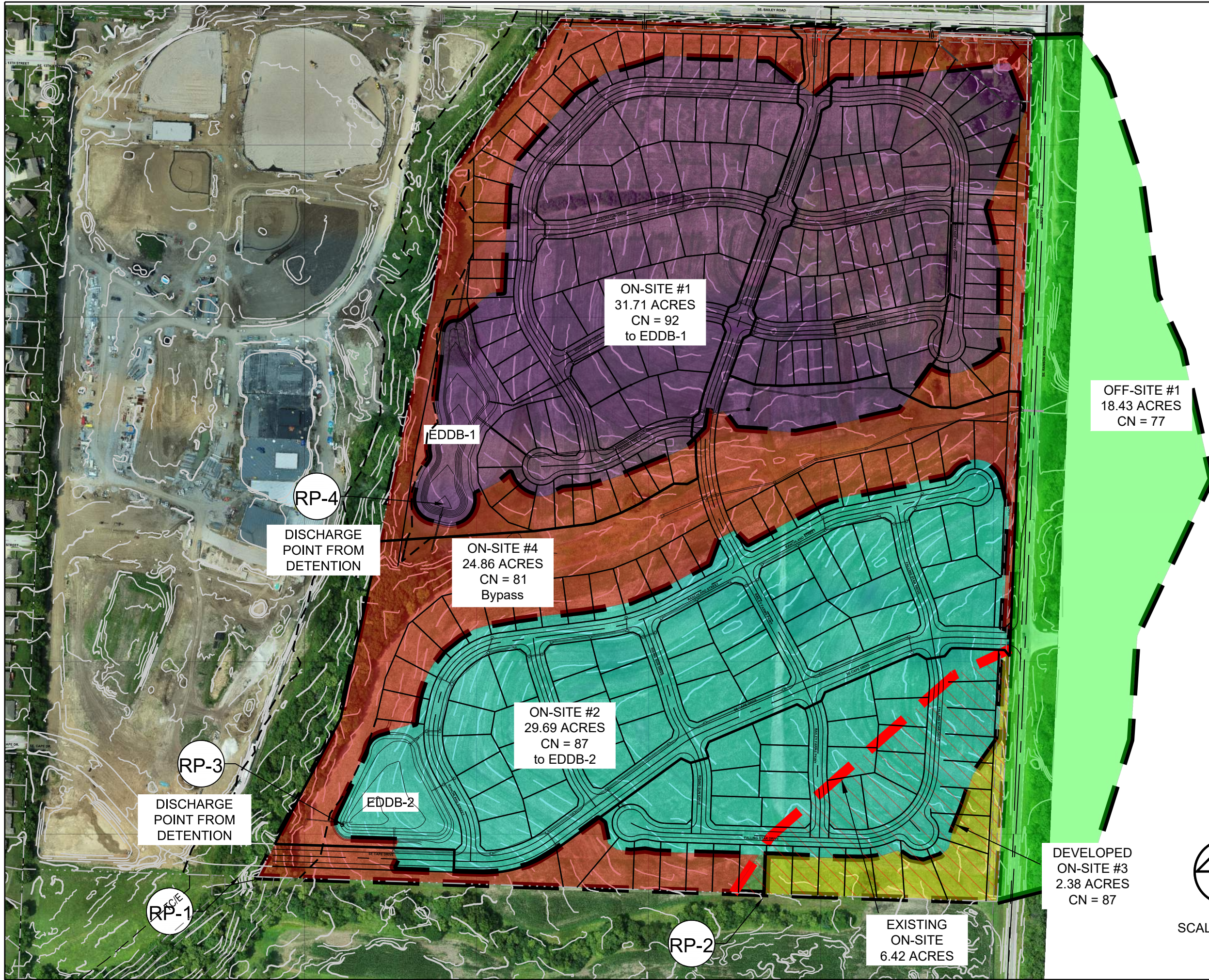
BAILEY FARMS
HYDRO MAPS

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

OFF-SITE #1
18.43 ACRES
CN = 77

EDDB-1

RP-4

DISCHARGE
POINT FROM
DETENTION

ON-SITE #4
24.86 ACRES
CN = 81
Bypass

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

RP-3

EDDB-2

DISCHARGE
POINT FROM
DETENTION

DEVELOPED
ON-SITE #3
2.38 ACRES
CN = 87

RP-1

EXISTING
ON-SITE
6.42 ACRES

RP-2

N

SCALE:1" = 250'

BAILEY FARMS
HYDRO MAPS

1300 SE RANSON ROAD LEE'S SUMMIT, MISSOURI
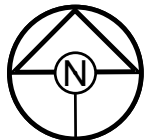
DRAWN BY:
JLL

DATE PREPARED:
4/18/2022

PROJ. NUMBER:
21-130

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

TOP OF BANK

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

POINT 3

POINT 1

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

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

TOP OF BANK

POINT 2

SCALE:1" = 400'

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 k	J. LONG	**EDDB -1**
Company:	Schlagel	
Date:	4/18/2022	(To be reviewed with construction of
Project:	21-136	Cornerstone at Bailey Farms, 1st Plat)
Location:	Lee's Summit	

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 (in^2) A_O (in^2) =   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_t > 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)   θ (deg) =   20.0
      $θ = 2 * (180/π) * arctan(Q_{WQ} / C_V * H_{WQ}^{5/2}))$
      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
      $W_V = 2 * Z_{WQ} * TAN(θ/2)$

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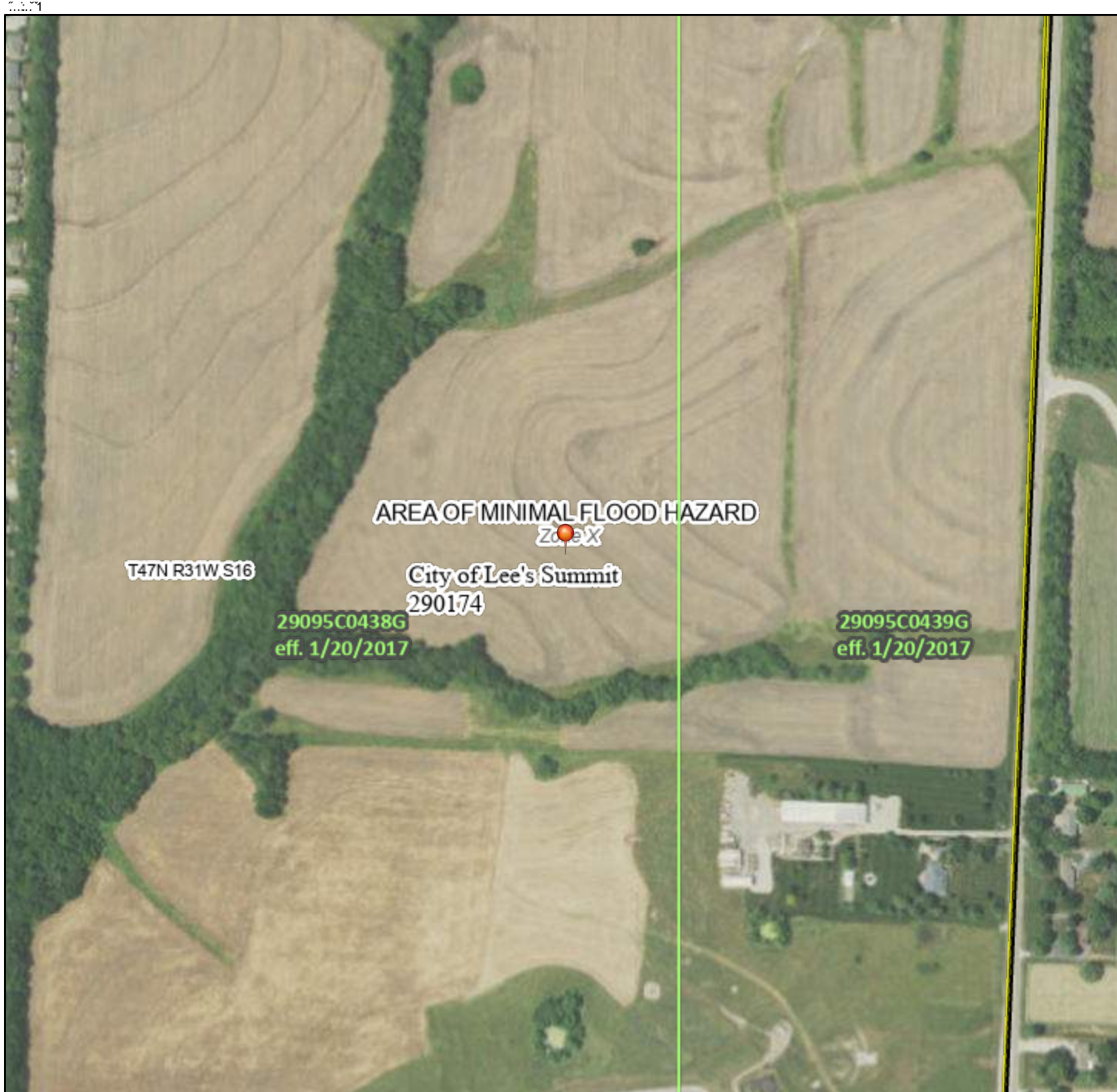
Step 5) V-notch weir angle, θ (deg)
      $\theta = 2 * \arctan(Q_{WQ} / C_V * H_{WQ}^{5/2}))$ θ (deg) =   20.0
      V-notch angle should be at least 20 degeres. Set to 20 degrees if
      calculated angle is smaller.

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

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

Figure A.4

AREA OF MINIMAL FLOOD HAZARD
Zone X

T47N R31W S16

City of Lee's Summit
290174

29095C0438G
eff. 1/20/2017

29095C0439G
eff. 1/20/2017

NWK-2020-828
Approved Jurisdictional Determination

Figure A.5

Pipe

Wetland 1

Jurisdictional

Pipe

Pipe

Pipe

Wetland 3

Intermittent 1

Jurisdictional

Wetland 2

Jurisdictional

Pipe

Intermittent 2

Jurisdictional

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

1 inch = 350 ft

From: John Kahl <jk@terratechnologies.com>
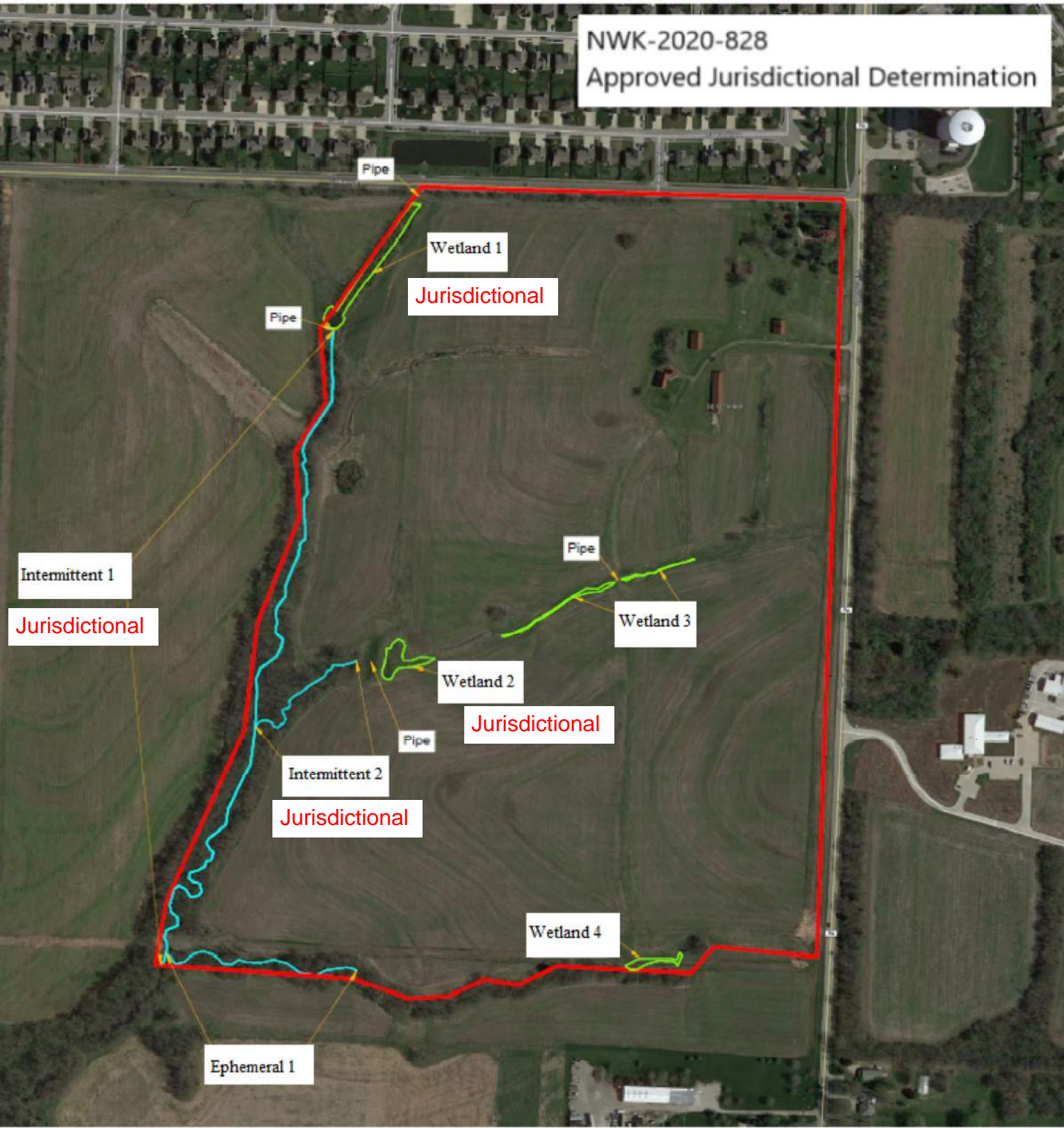**Sent:** Wednesday, March 10, 2021 10:33 AM
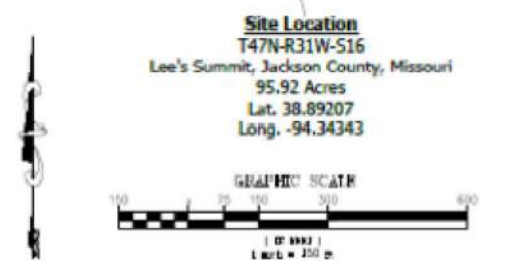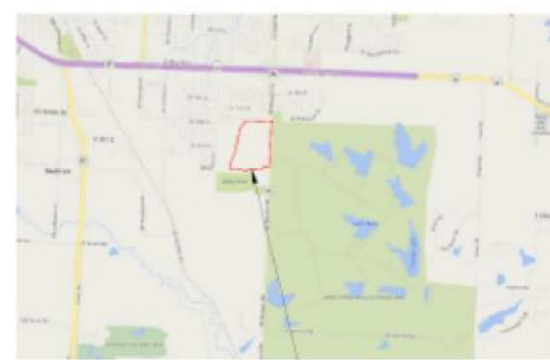**To:** Dan Foster <df@schlagelassociates.com>; Tiffany Ford <Tiffany@summithomeskc.com>
Cc: David Rinne <dr@schlagelassociates.com>; Brad Kempf <Bradley@summithomeskc.com>; Travis Ruf <Travis@summithomeskc.com>
Subject: RE: [External] 19-227 RE: Bailey Farms ACAD base file

The DWG file has been received and I have confirmed that the proposed layout will avoid all jurisdictional waters under the Clean Water Act, making 404 Permitting unnecessary under current rules.

For reference and for your records, I have attached a copy of our Jurisdictional Assessment autoCAD file that shows the identified waters in true State Plane coordinates. Only intermittent #1 & #2 and Wetland #1 &#2 are jurisdictional. All other waters identified on the site were deemed to be non-jurisdictional by the USACE.

John M. Kahl, P.E.
President

Terra Technologies Inc.
6240 W. 135th St., suite 100
Overland Park, KS 66223

913-385-9560, ext.1 – **Office**
913-652-9213 – **Direct**
816-804-1744 - **Mobile**

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

Custom Soil Resource Report for
Jackson County, Missouri

February 10, 2021
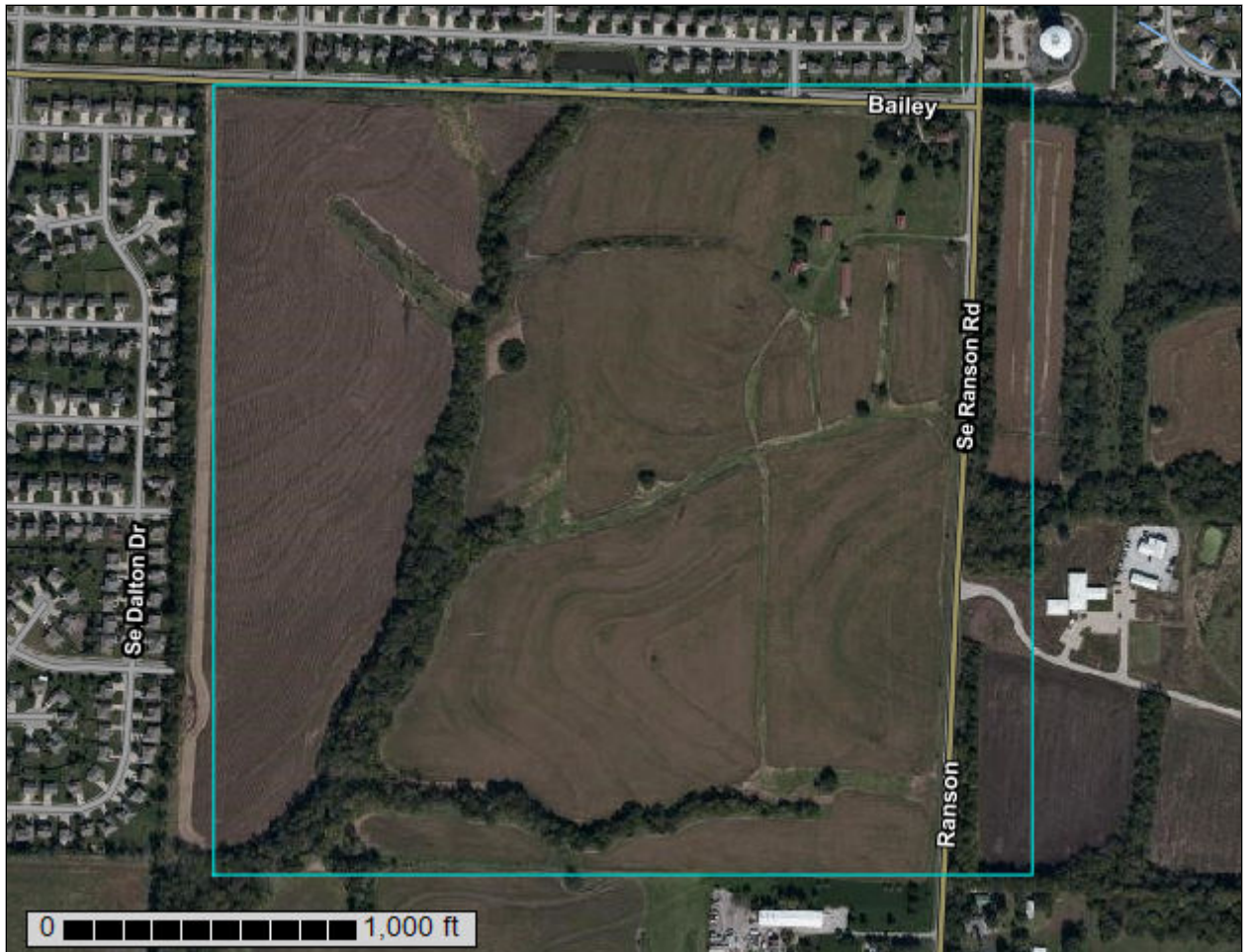
Preface

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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

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

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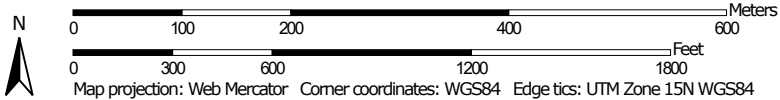
MAP LEGEND

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.
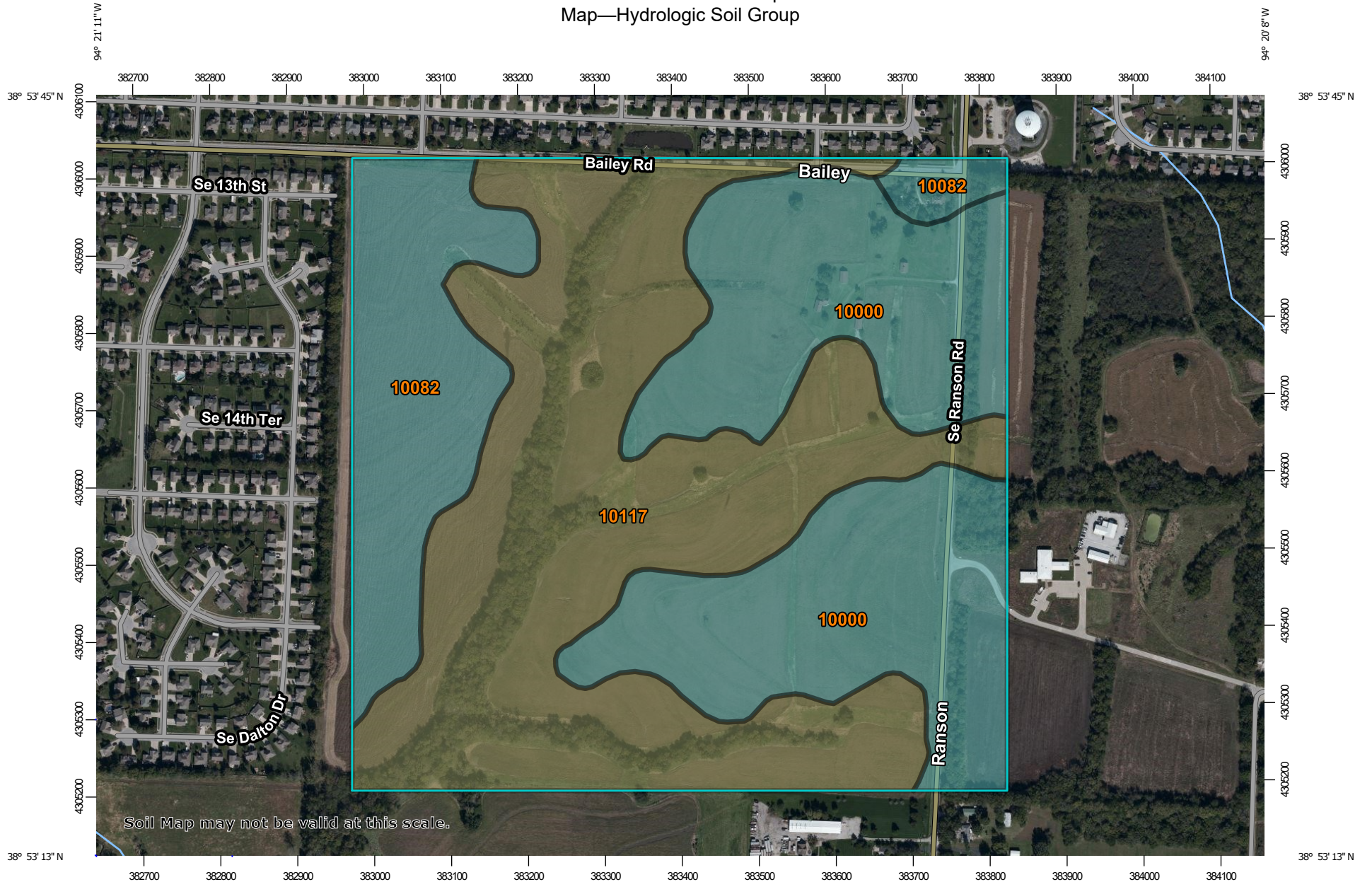
Map—Hydrologic Soil Group

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

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.

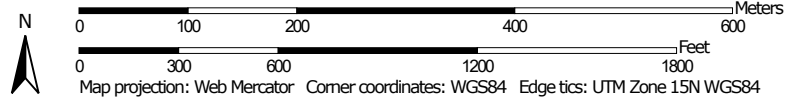Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

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

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

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

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

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

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

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10000	Arisburg silt loam, 1 to 5 percent slopes	C	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

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

HydroCAD - Pre-Developed
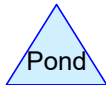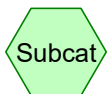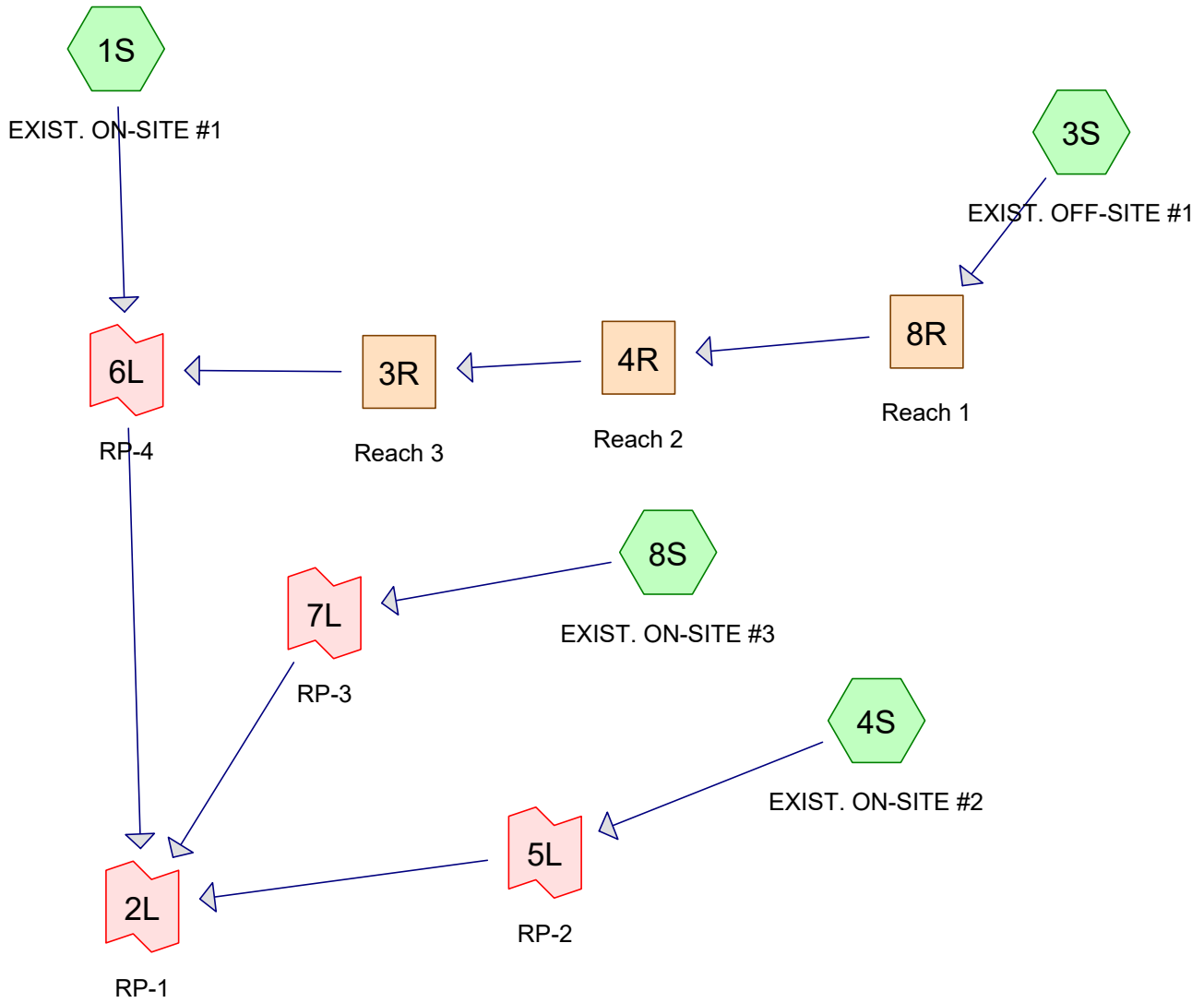
1S

EXIST. ON-SITE #1

3S

EXIST. OFF-SITE #1

6L

RP-4

3R

Reach 3

4R

Reach 2

8R

Reach 1

7L

RP-3

8S

EXIST. ON-SITE #3

4S

EXIST. ON-SITE #2

2L

RP-1

5L

RP-2

Subcat   Reach   Pond   Link

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped

Printed 4/15/2022
Page 2

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)

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50″
Printed 4/15/2022
Page 3

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/15/2022
Page 4

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

Type II 24-hr
2-Year Rainfall=3.50"
Runoff Area=64.820 ac
Runoff Volume=7.727 af
Runoff Depth=1.43"
Flow Length=3,450'
Tc=47.2 min
CN=77

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/15/2022
Page 5

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

31.32 cfs

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/15/2022
Page 6

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/15/2022
Page 7

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

Type II 24-hr
2-Year Rainfall=3.50"
Runoff Area=17.540 ac
Runoff Volume=2.091 af
Runoff Depth=1.43"
Flow Length=1,930'
Tc=35.6 min
CN=77

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/15/2022
Page 9

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/15/2022
Page 10

Reach 3R: Reach 3

Stage-Discharge

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/15/2022
Page 11

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	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

Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50"

21-130-HYDRO-EX

Prepared by Schlagel and Assoc.   Printed 4/15/2022

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC   Page 12

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50"
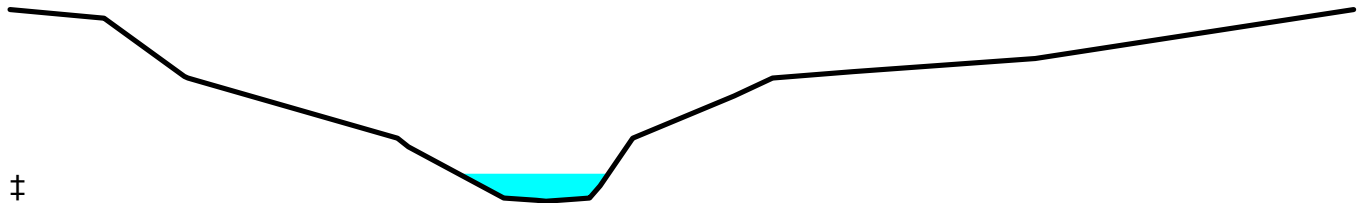Printed 4/15/2022
Page 13

Reach 4R: Reach 2

Stage-Discharge

Legend: Primary

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/15/2022
Page 14

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

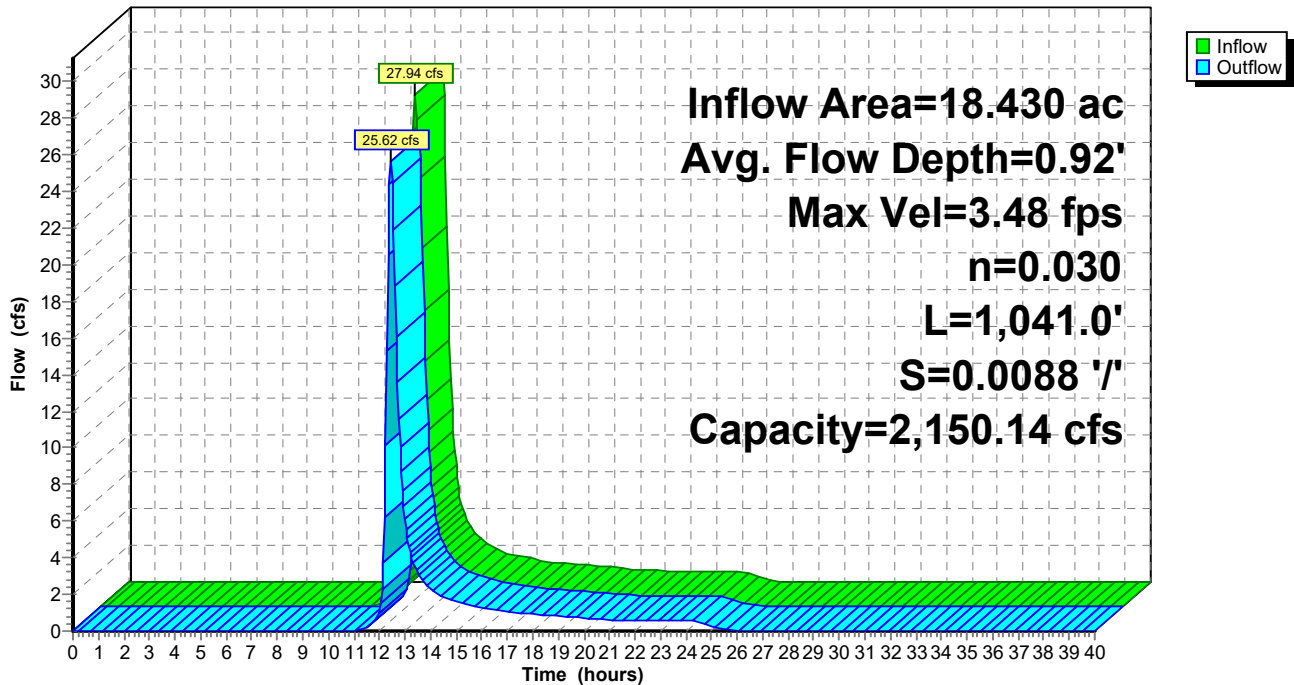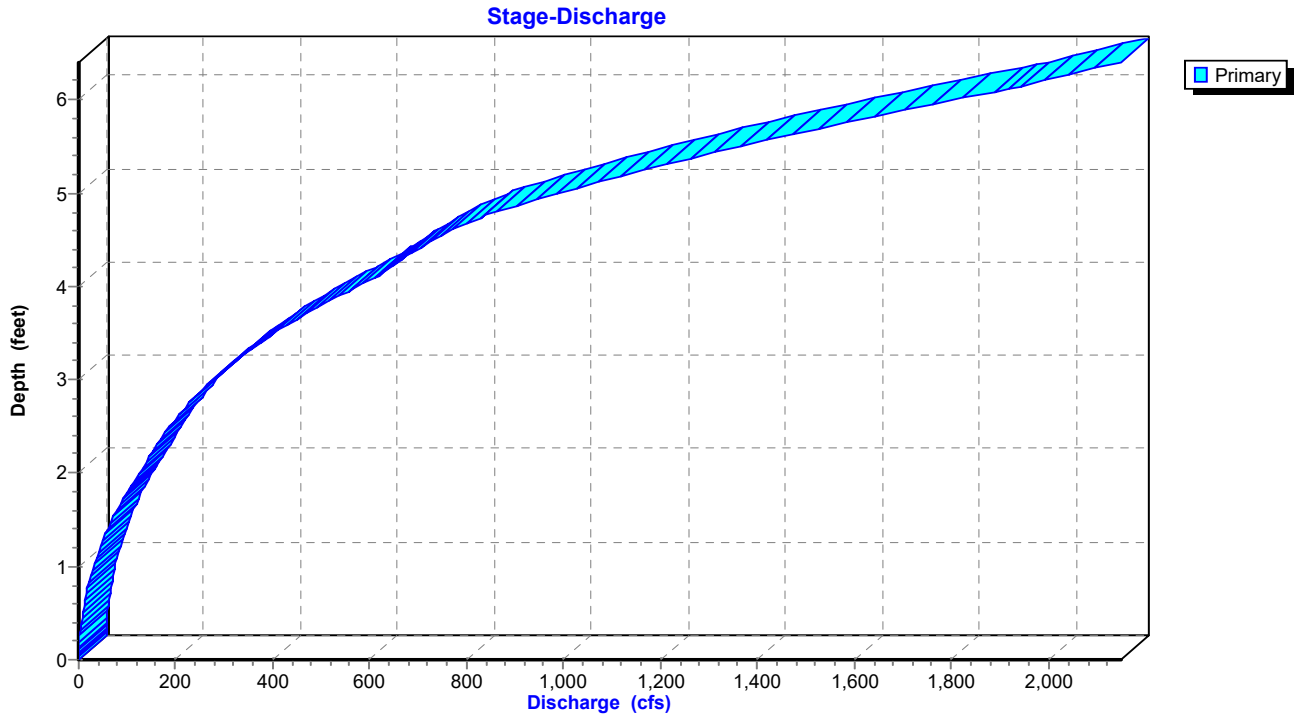Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/15/2022
Page 15

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

31.32 cfs
30.23 cfs

Inflow
Outflow

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
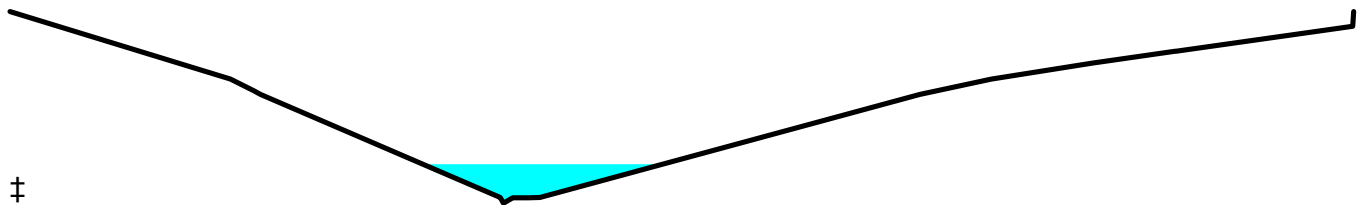*Type II 24-hr 2-Year Rainfall=3.50"*
Printed 4/15/2022
Page 16

Reach 8R: Reach 1
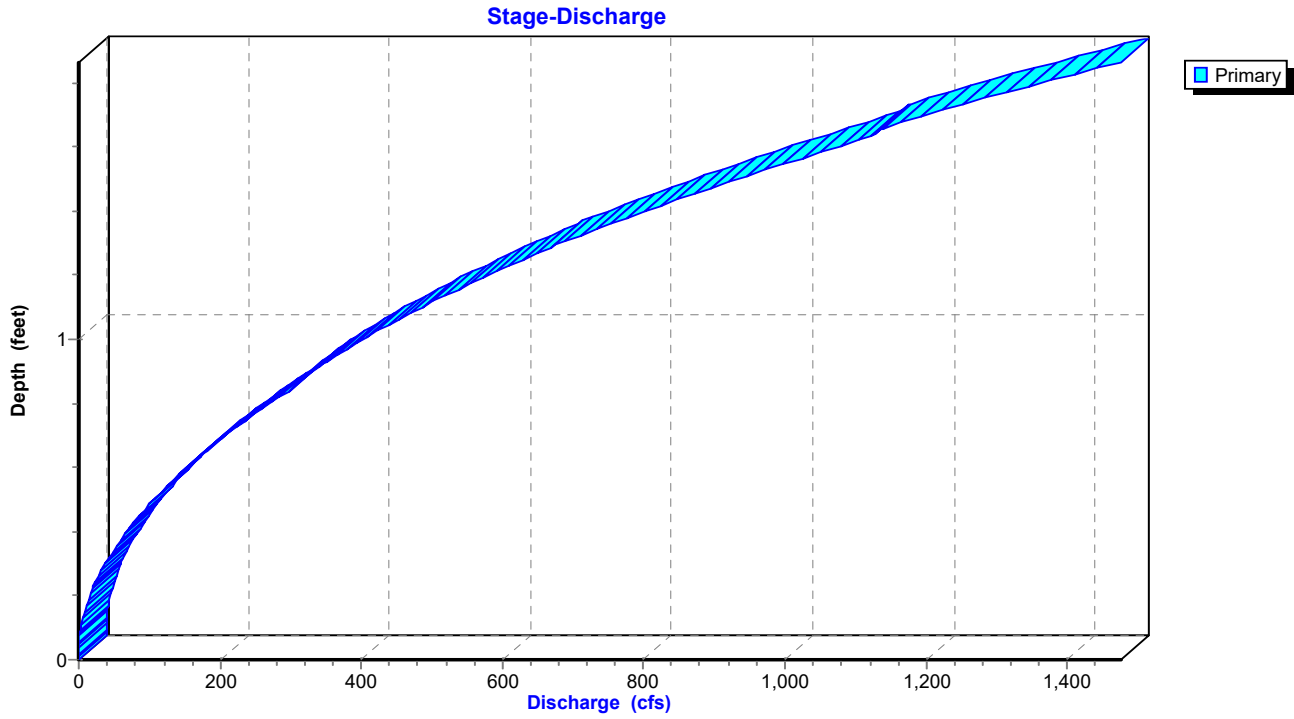
21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/15/2022
Page 17

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.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/15/2022
Page 18

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
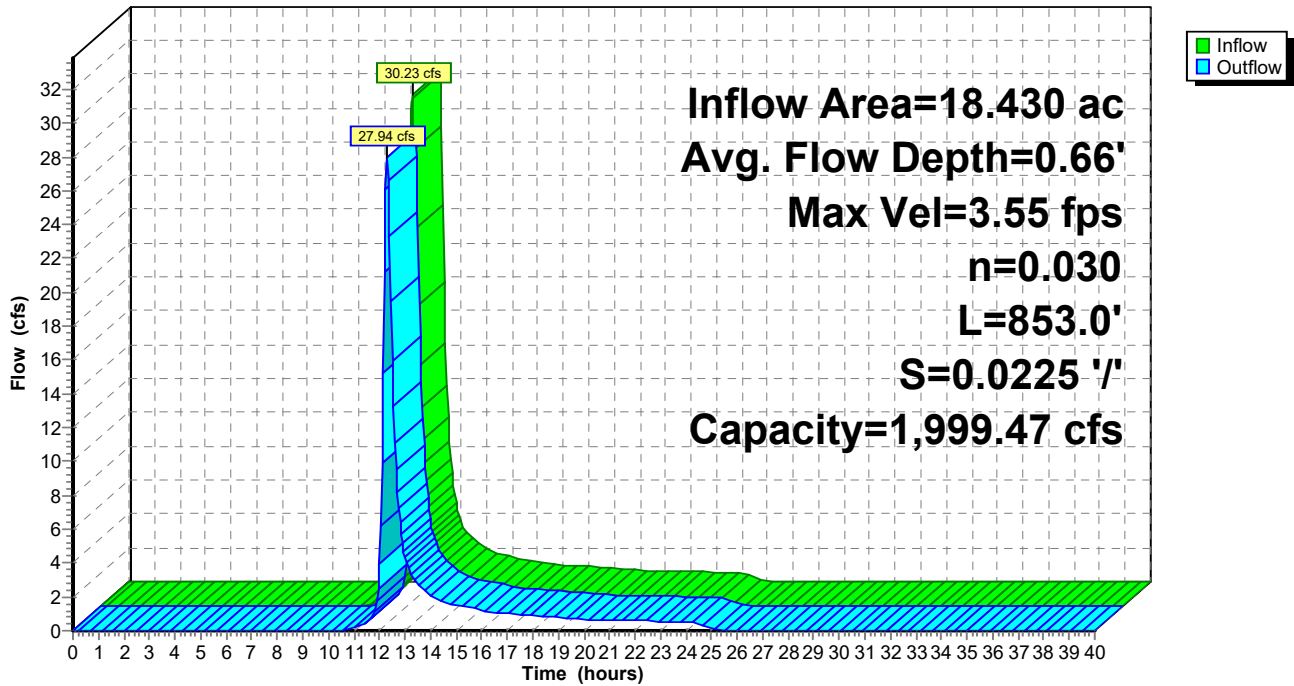*Type II 24-hr 2-Year Rainfall=3.50"*
Printed 4/15/2022
Page 19

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
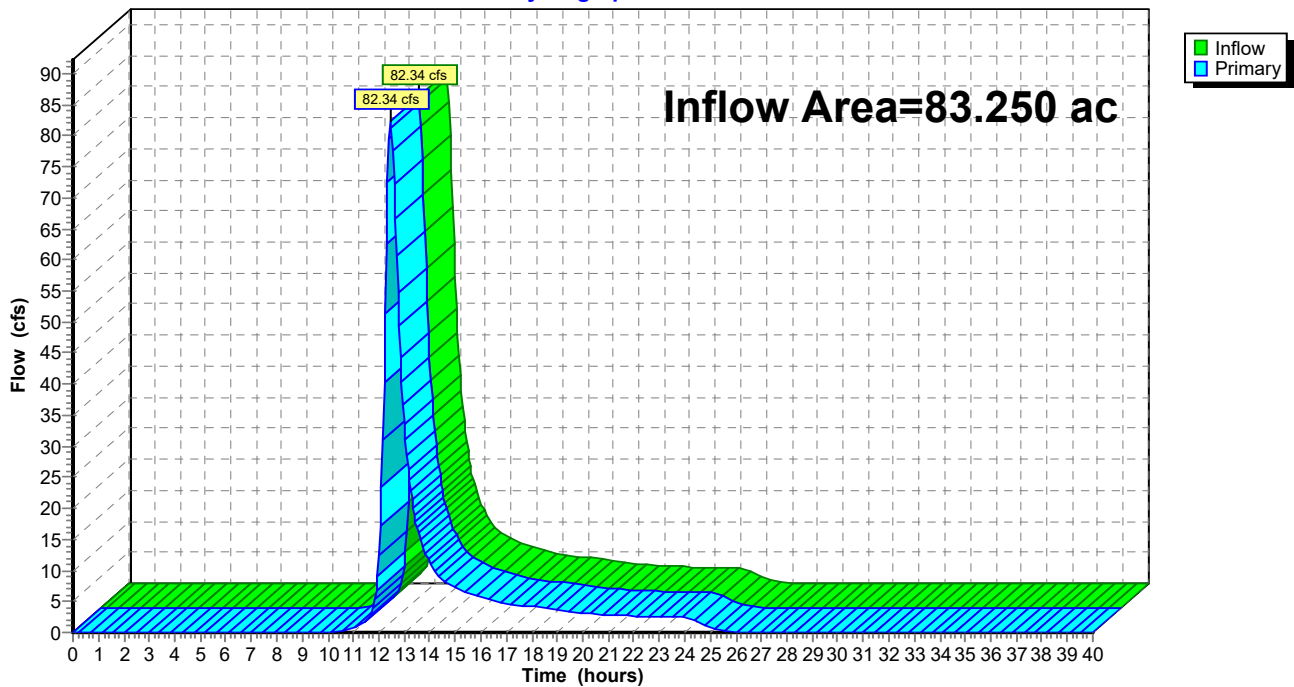
21-130-HYDRO-EX
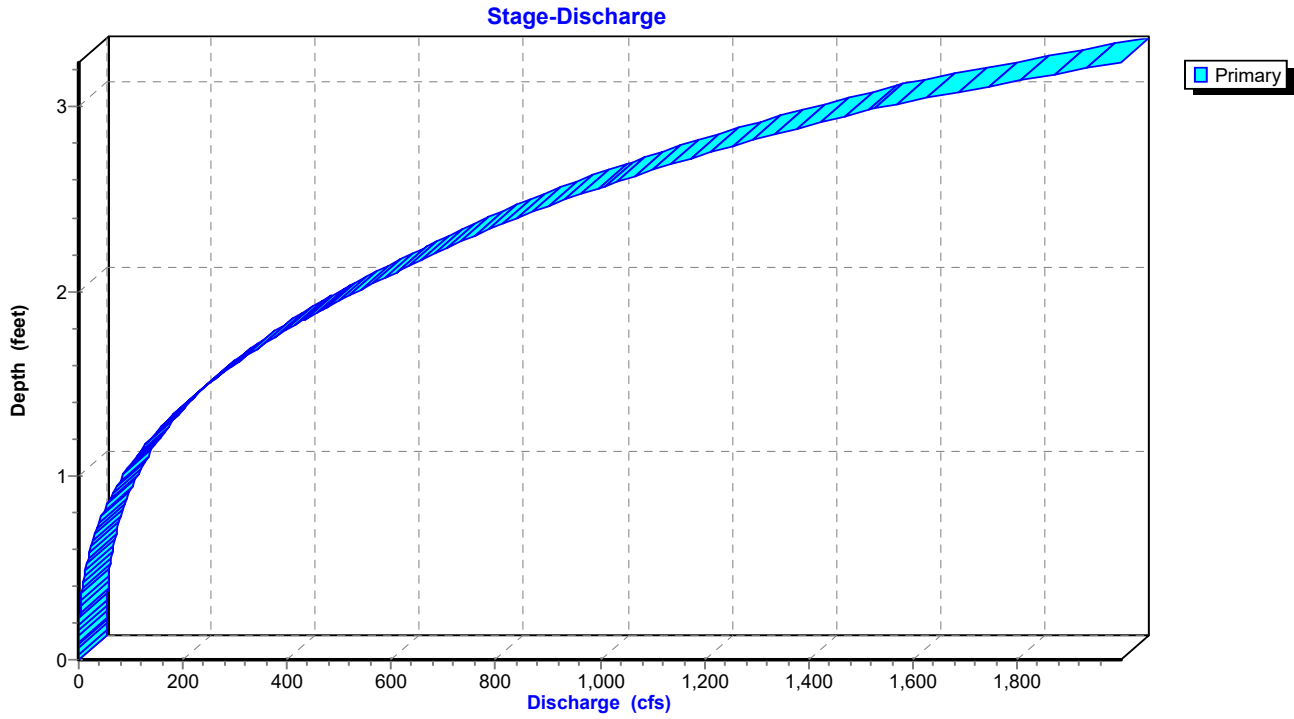Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/15/2022
Page 20

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

Inflow Area=17.540 ac

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/15/2022
Page 21

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

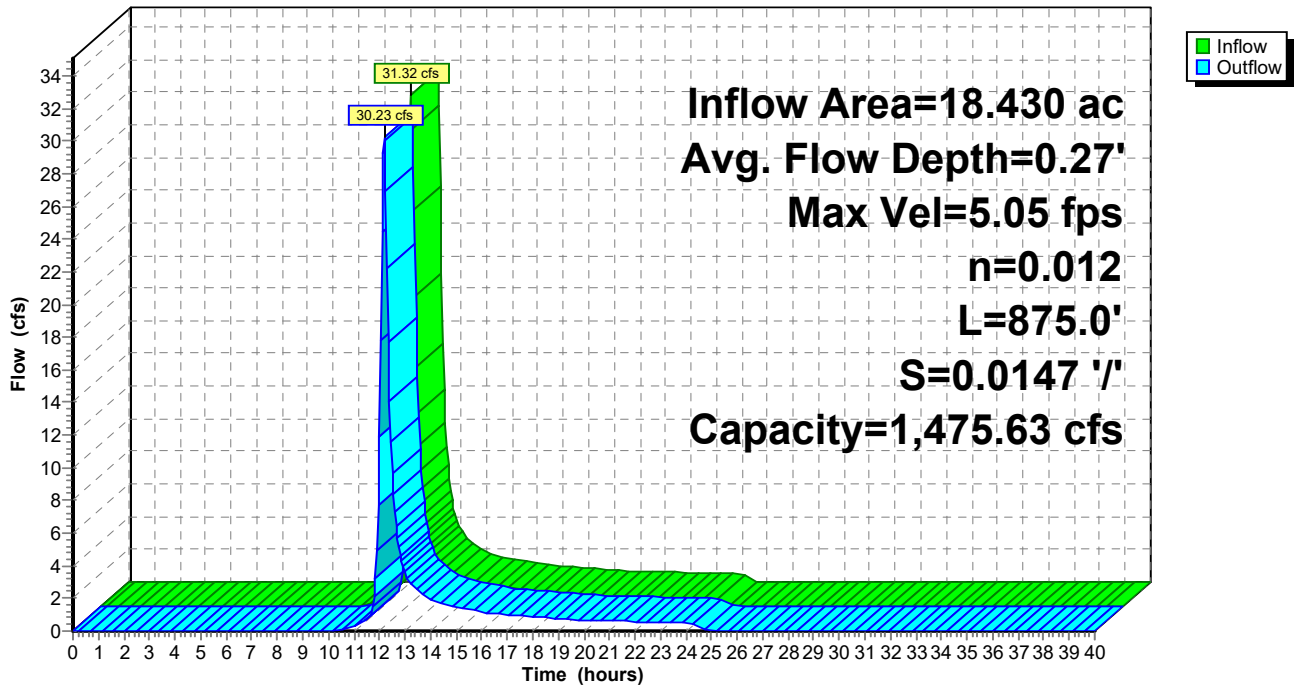Bailey Farms - PreDeveloped
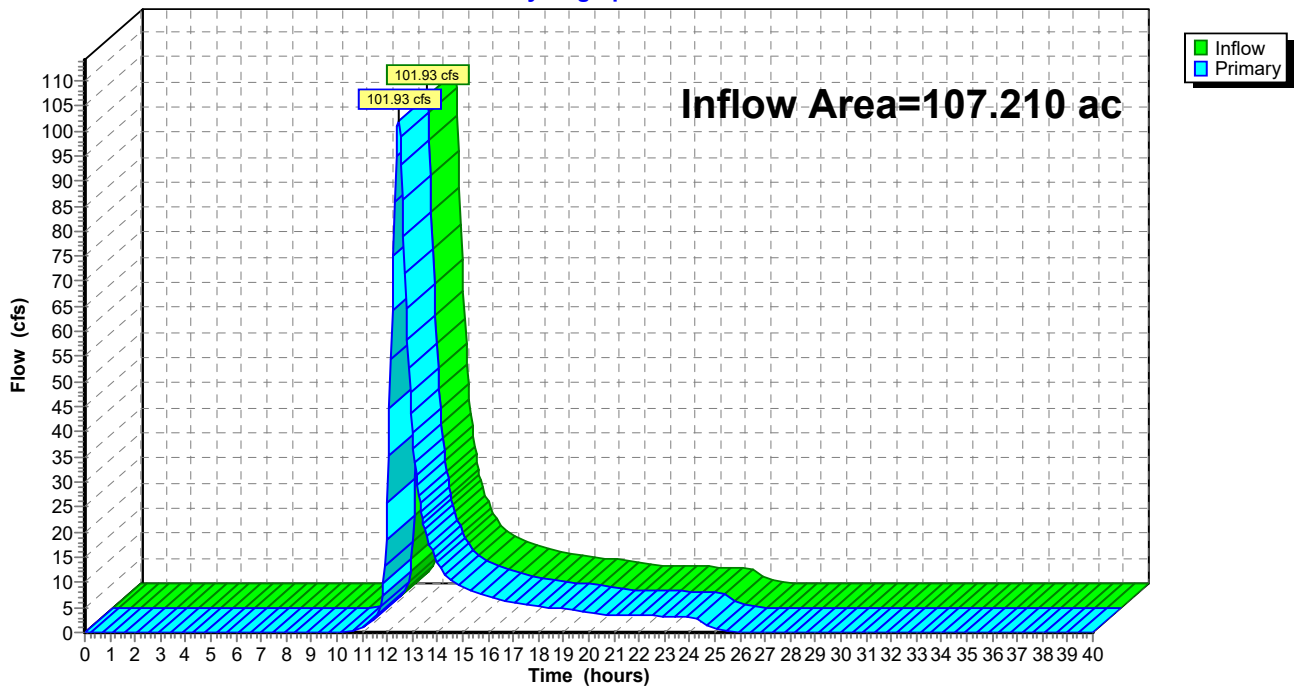*Type II 24-hr 10-Year Rainfall=5.30"*
Printed 4/15/2022
Page 22

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 10-Year Rainfall=5.30"
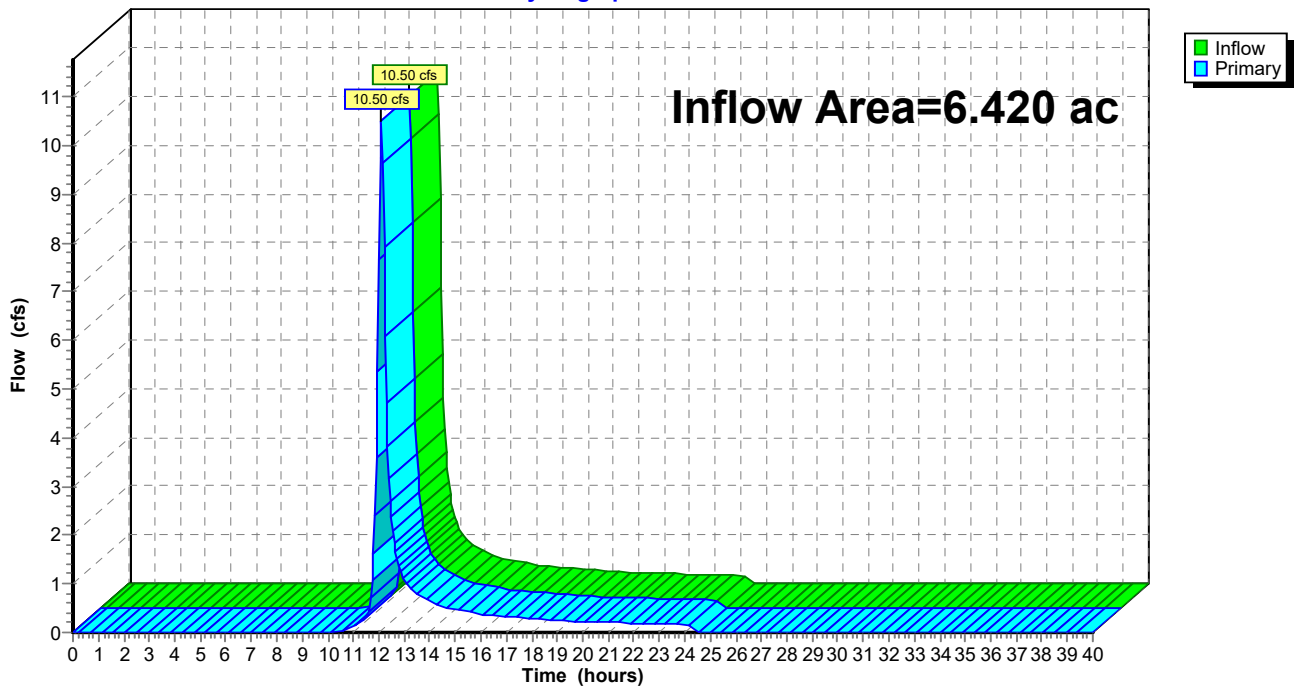Printed 4/15/2022
Page 23

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
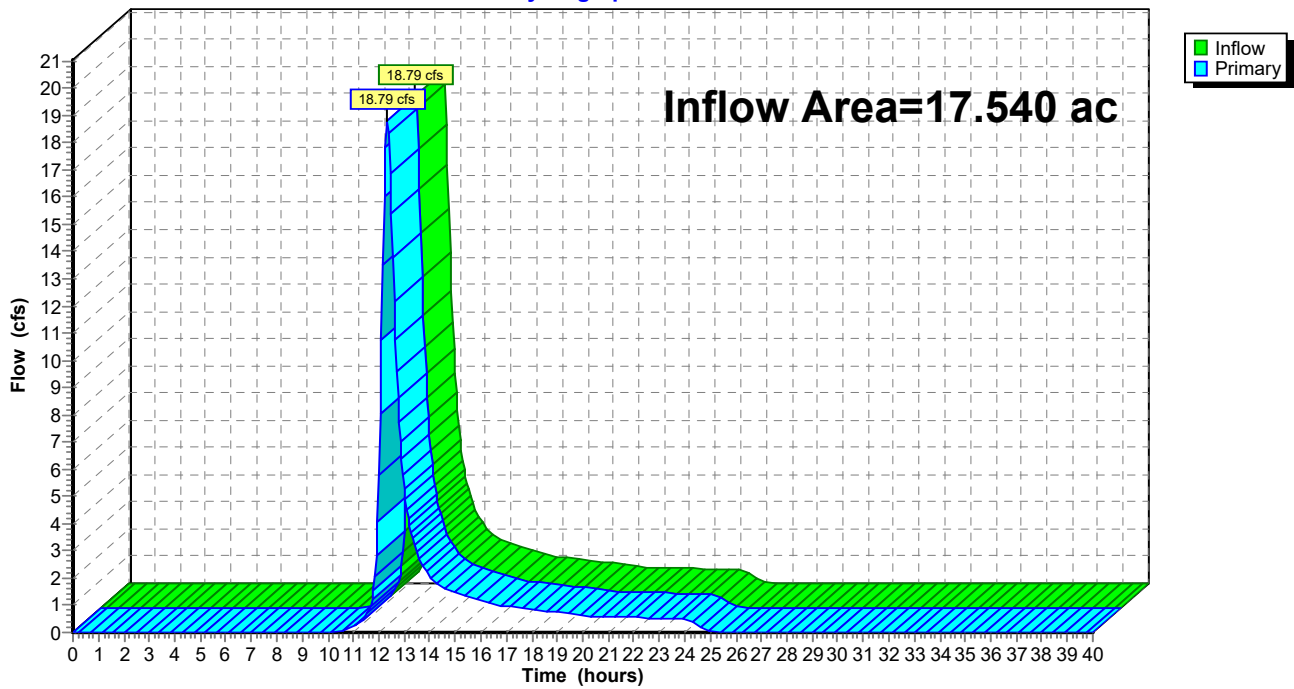HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/15/2022
Page 24

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**

21.81 cfs

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/15/2022
Page 25

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

Runoff   =   38.90 cfs @ 12.31 hrs, Volume=   4.204 af, Depth= 2.88"
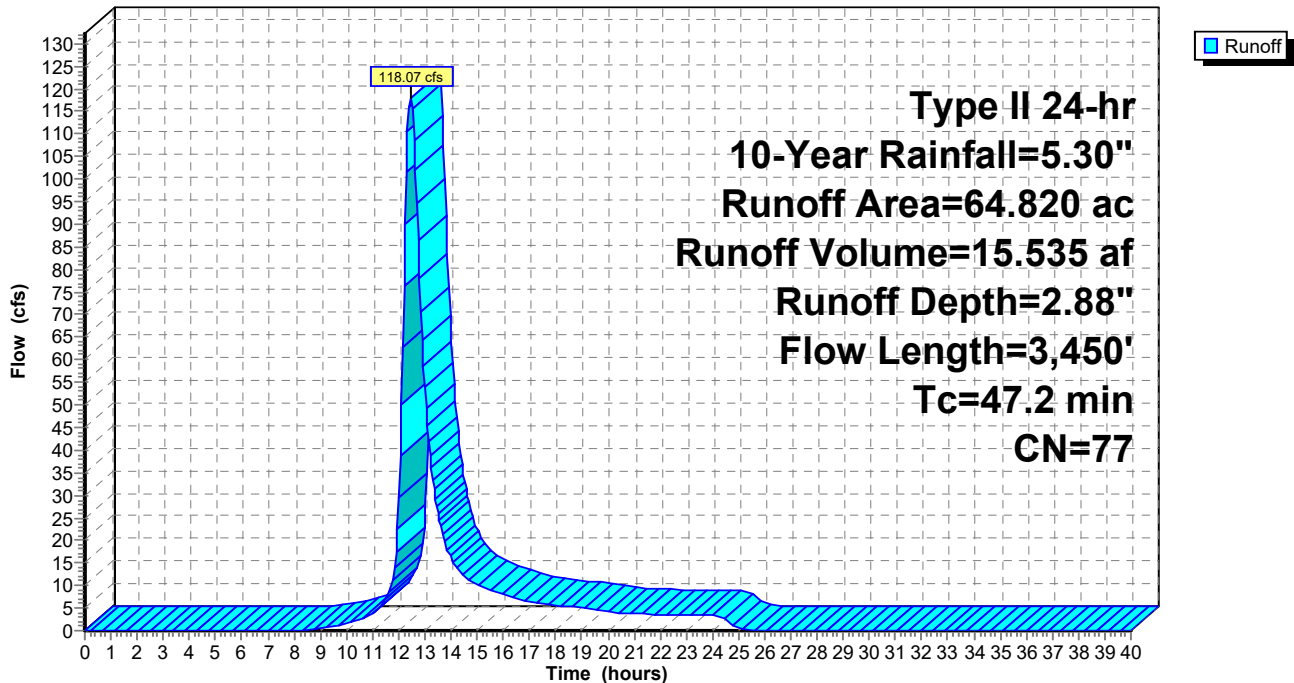
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/15/2022
Page 26

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/15/2022
Page 27

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/15/2022
Page 28

Reach 3R: Reach 3

Stage-Discharge

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 10-Year Rainfall=5.30"
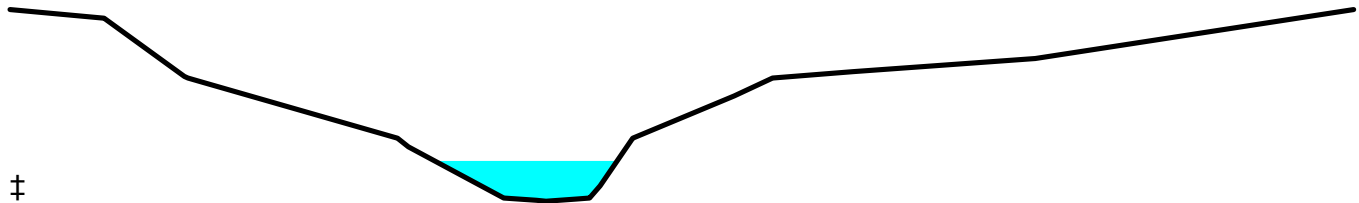Printed 4/15/2022
Page 29

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'

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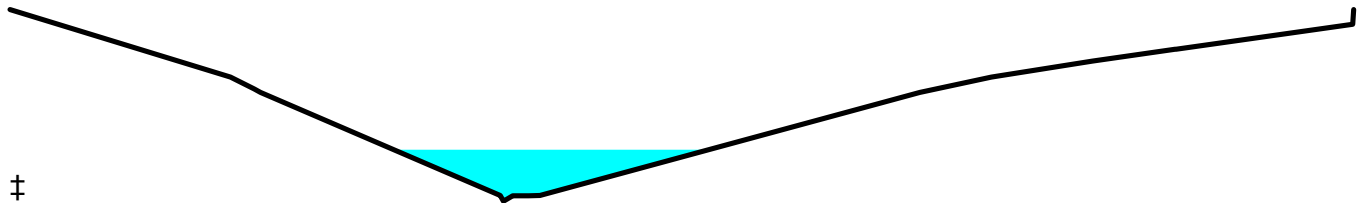
Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	1,009.14	0.00
22.15	1,008.00	1.14
24.54	1,007.80	1.34
25.18	1,007.74	1.40
49.26	1,006.00	3.14
49.59	1,005.90	3.24
50.51	1,005.99	3.15
52.13	1,005.99	3.15
53.24	1,006.00	3.14
91.41	1,007.74	1.40
98.60	1,008.00	1.14
108.78	1,008.27	0.87
117.07	1,008.47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

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

- Inflow
- Outflow

61.90 cfs
58.82 cfs

21-130-HYDRO-EX

Prepared by Schlagel and Assoc.

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped

Type II 24-hr 10-Year Rainfall=5.30″

Printed 4/15/2022

Page 31

Reach 4R: Reach 2

Stage-Discharge

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
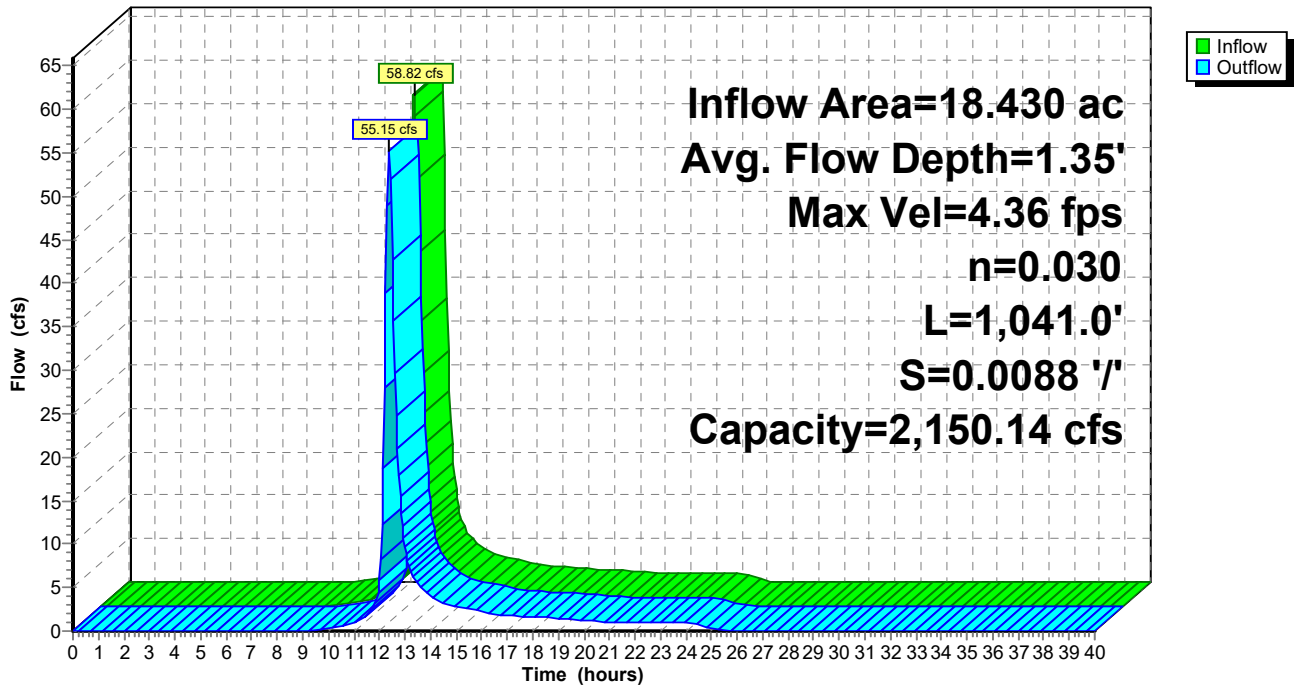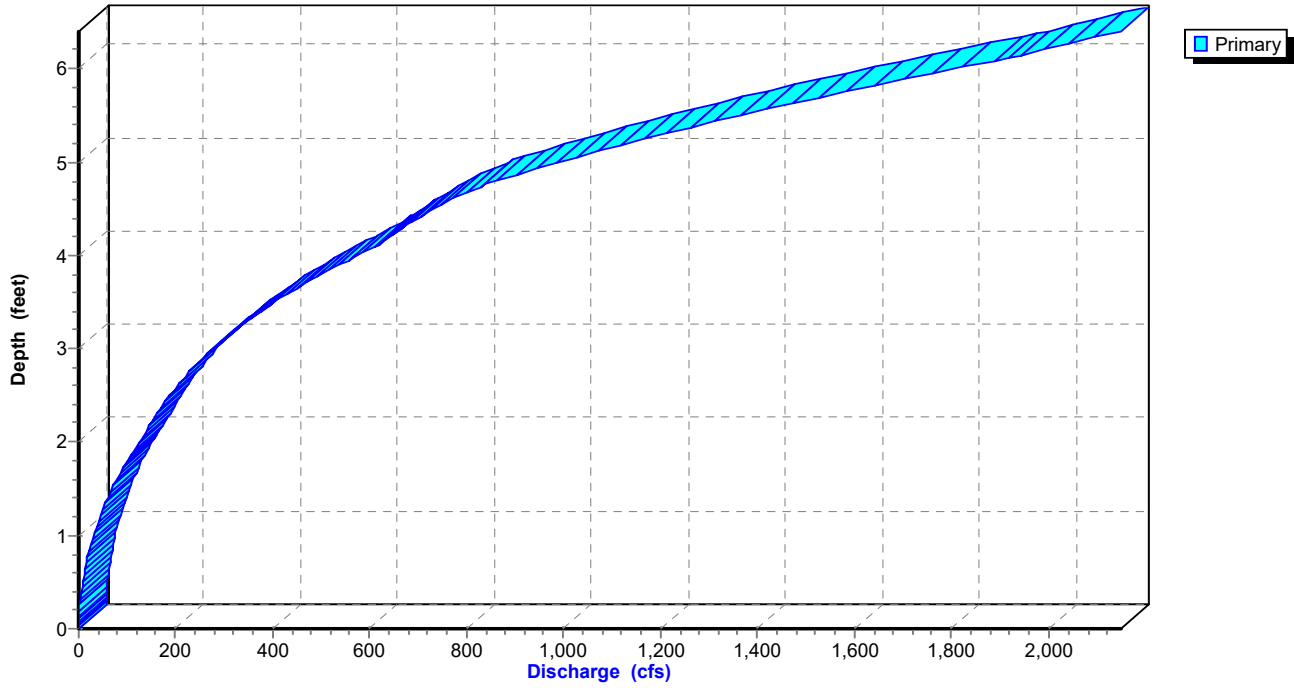*Type II 24-hr 10-Year Rainfall=5.30"*
Printed 4/15/2022
Page 32

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 (feet)	Elevation (feet)	Chan.Depth (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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
*Type II 24-hr 10-Year Rainfall=5.30"*
Printed 4/15/2022
Page 33

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.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/15/2022
Page 34

Reach 8R: Reach 1

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
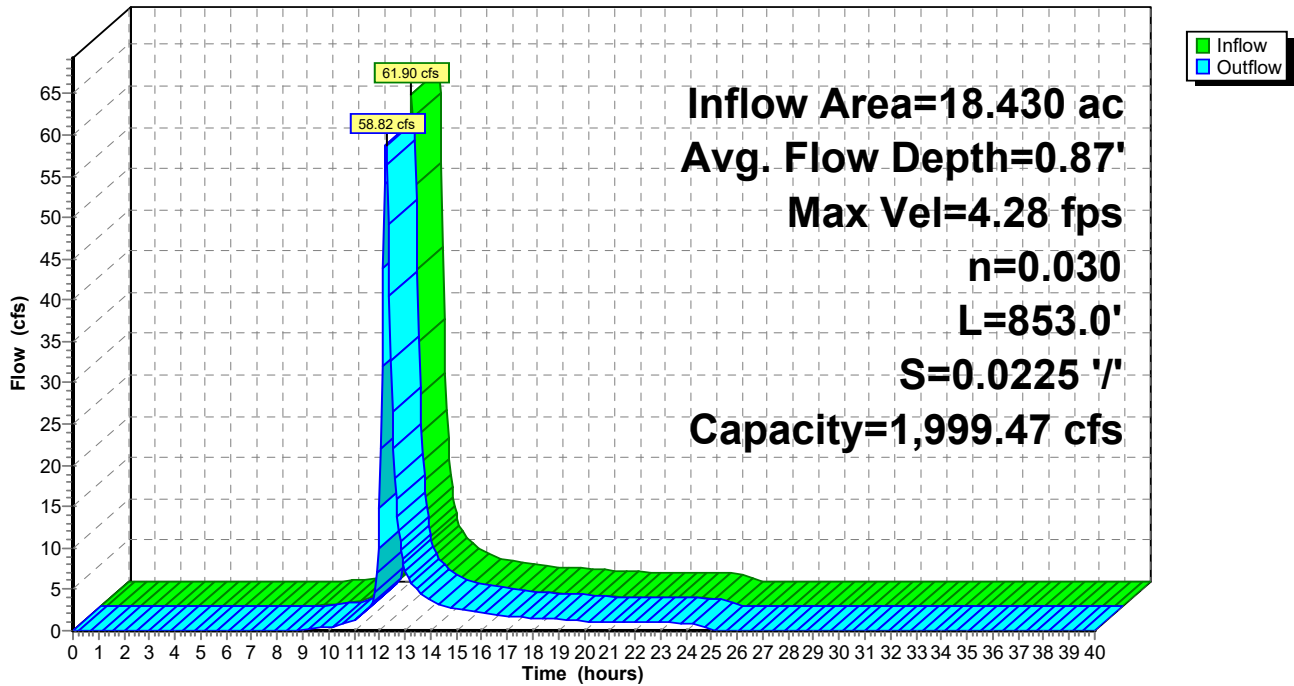*Type II 24-hr 10-Year Rainfall=5.30"*
Printed 4/15/2022
Page 35

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

21-130-HYDRO-EX
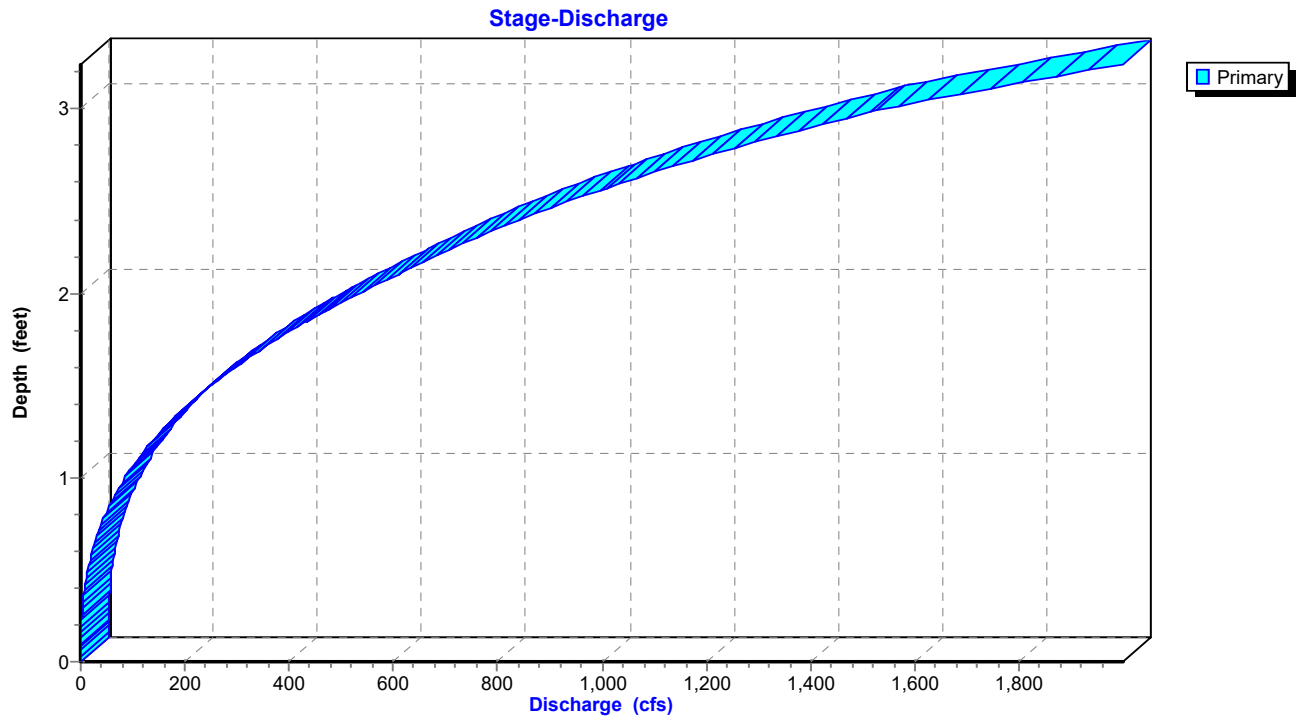Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/15/2022
Page 36

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/15/2022
Page 37
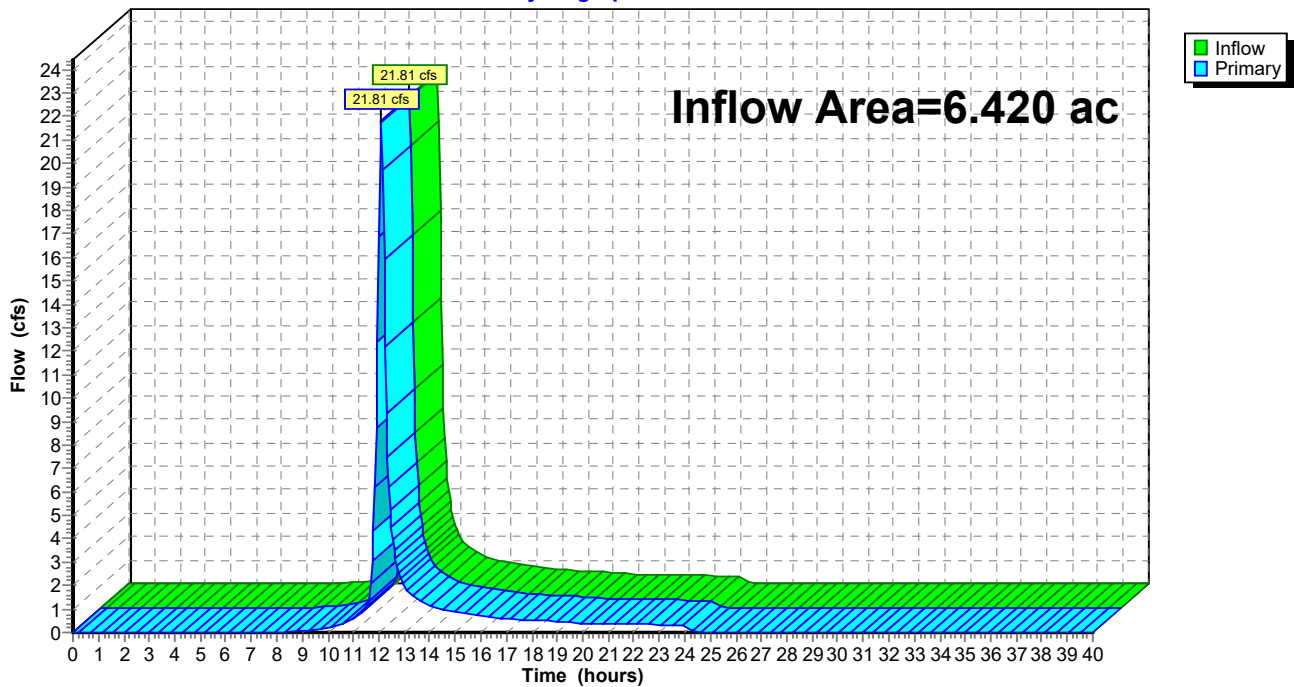
Summary for Link 6L: RP-4

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/15/2022
Page 38

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.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

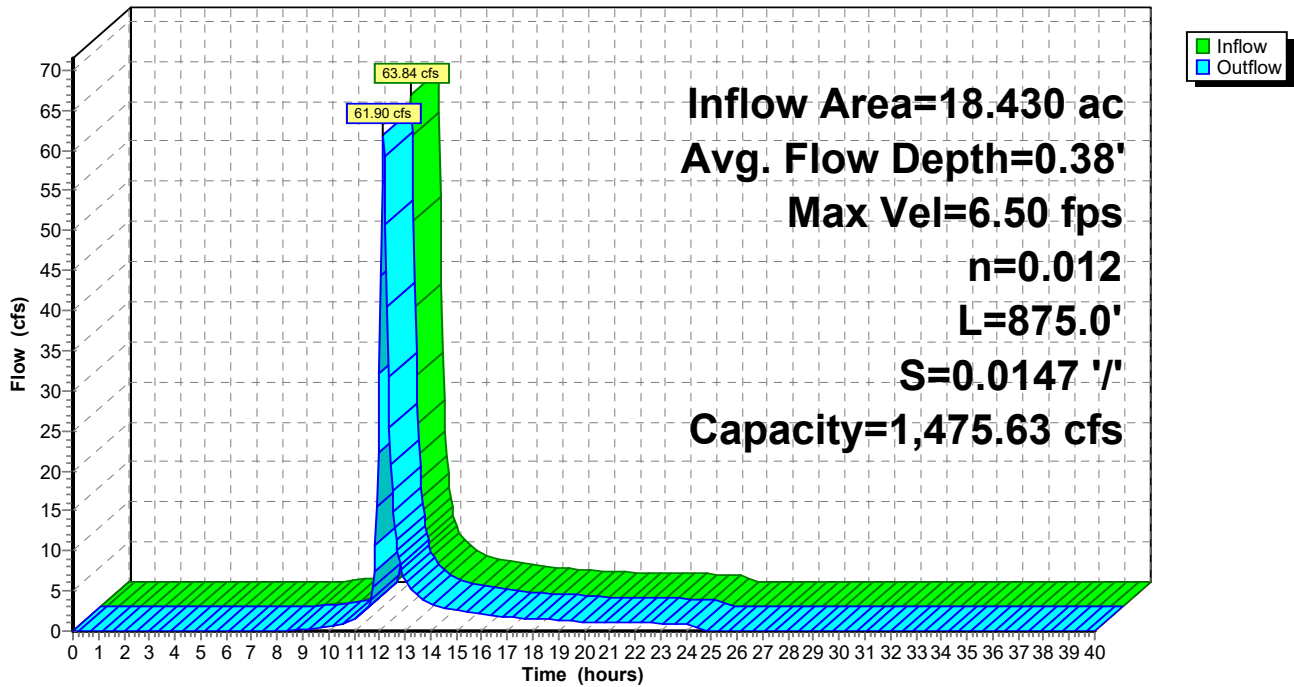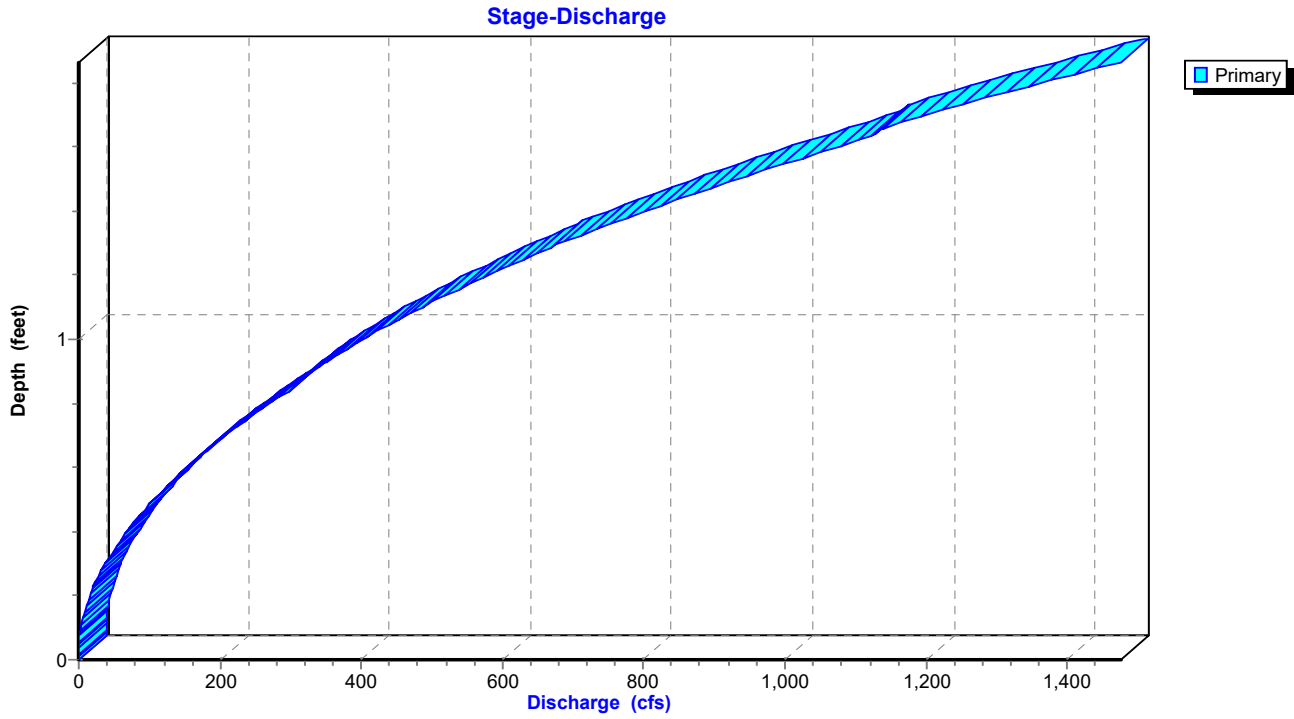Bailey Farms - PreDeveloped
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/15/2022
Page 39

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
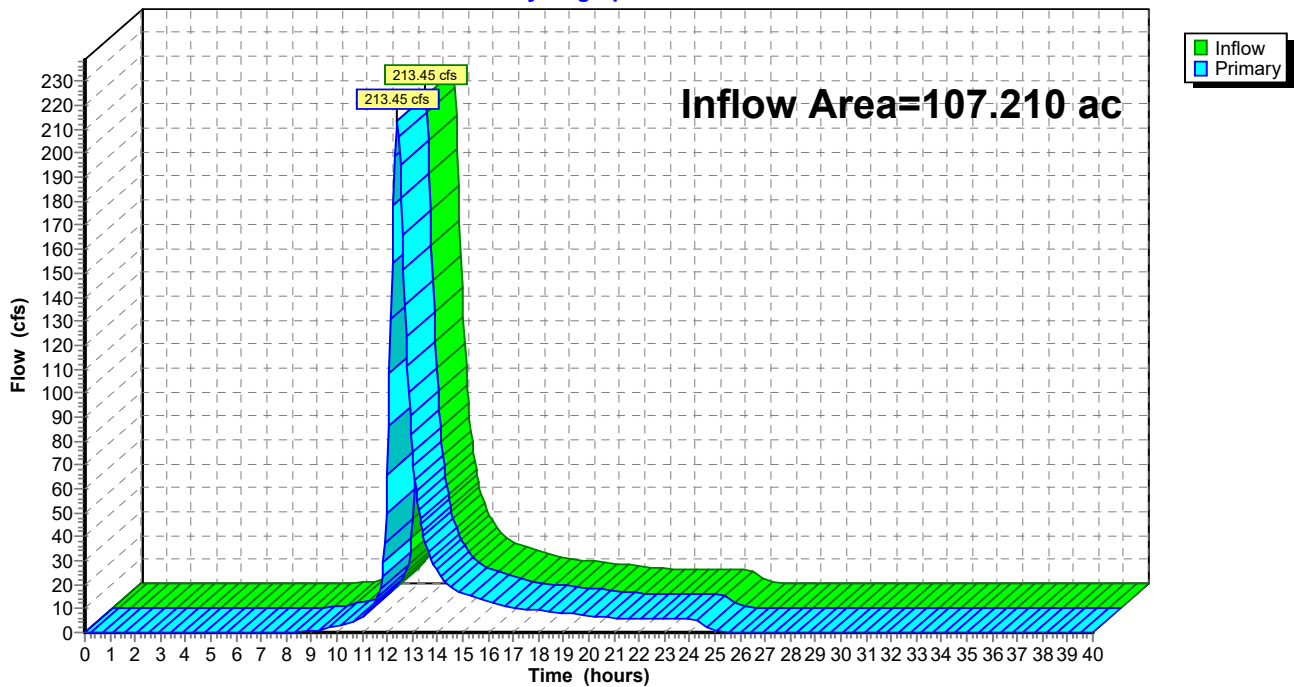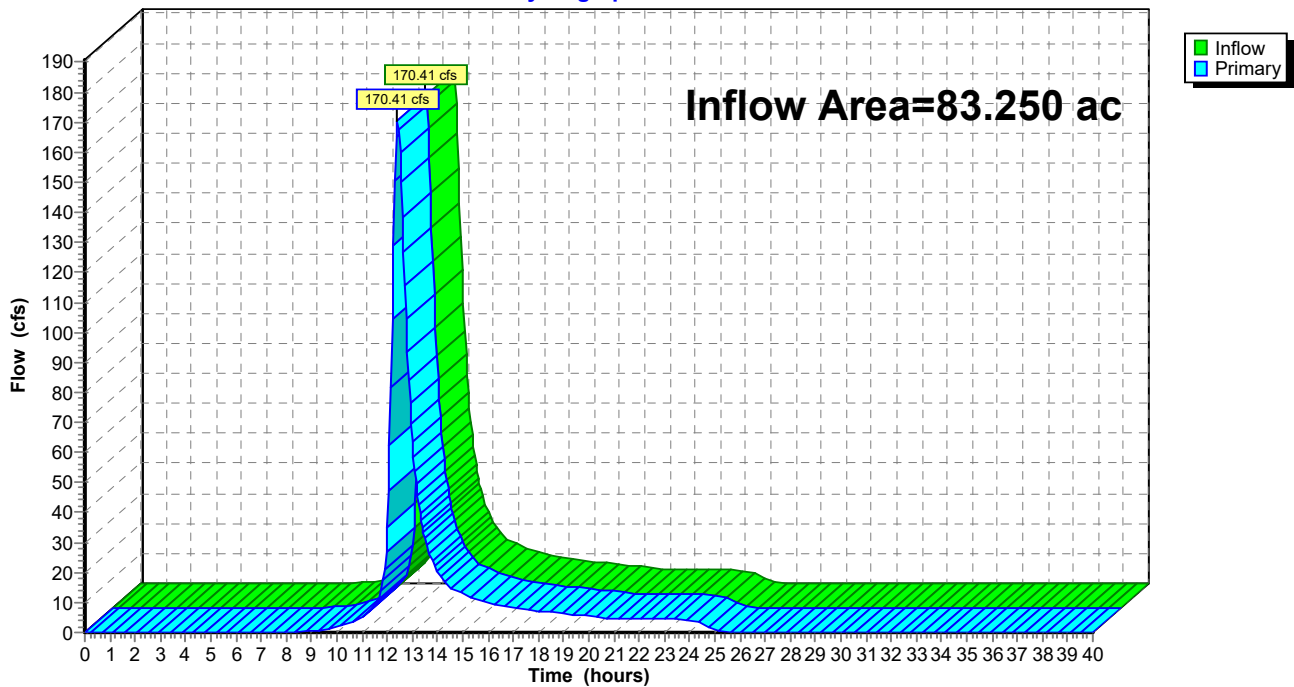*Type II 24-hr 100-Year Rainfall=7.70"*
Printed 4/15/2022
Page 40

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

21-130-HYDRO-EX

Prepared by Schlagel and Assoc.

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped

Type II 24-hr 100-Year Rainfall=7.70"
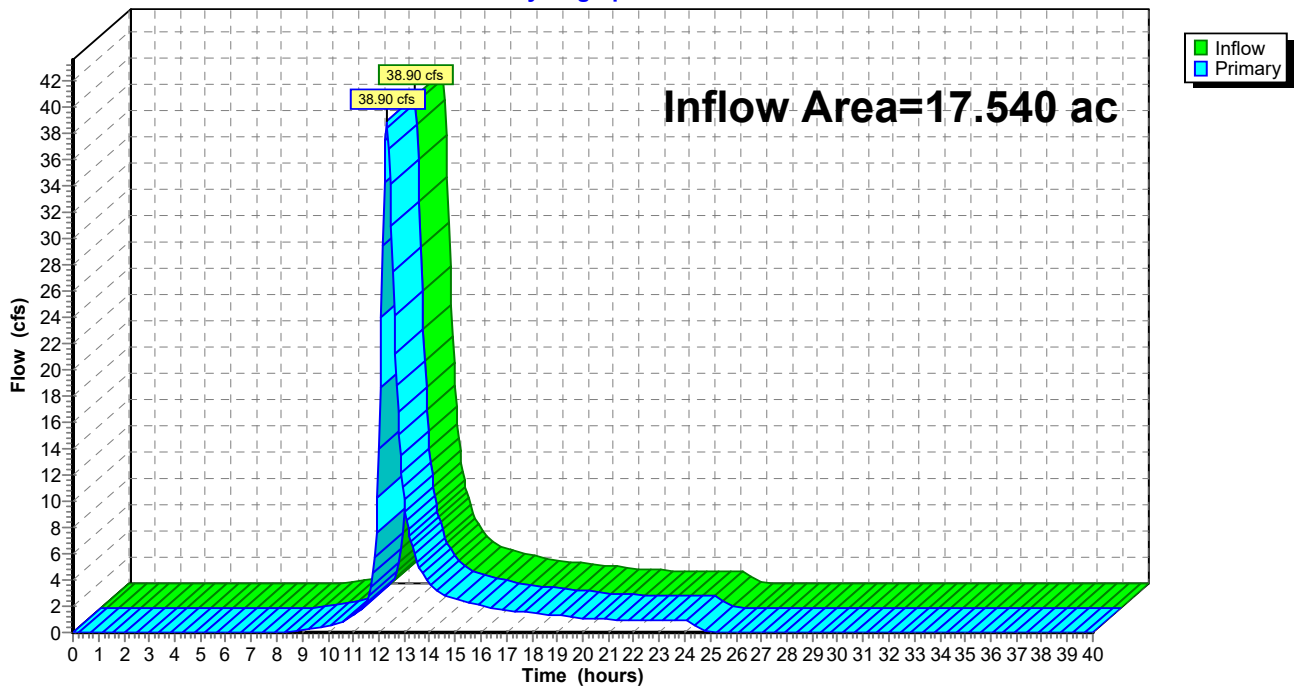
Printed 4/15/2022

Page 41

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

Hydrograph

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/15/2022
Page 42

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/15/2022
Page 43

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

Runoff   =   67.74 cfs @ 12.31 hrs, Volume=   7.308 af, Depth= 5.00"
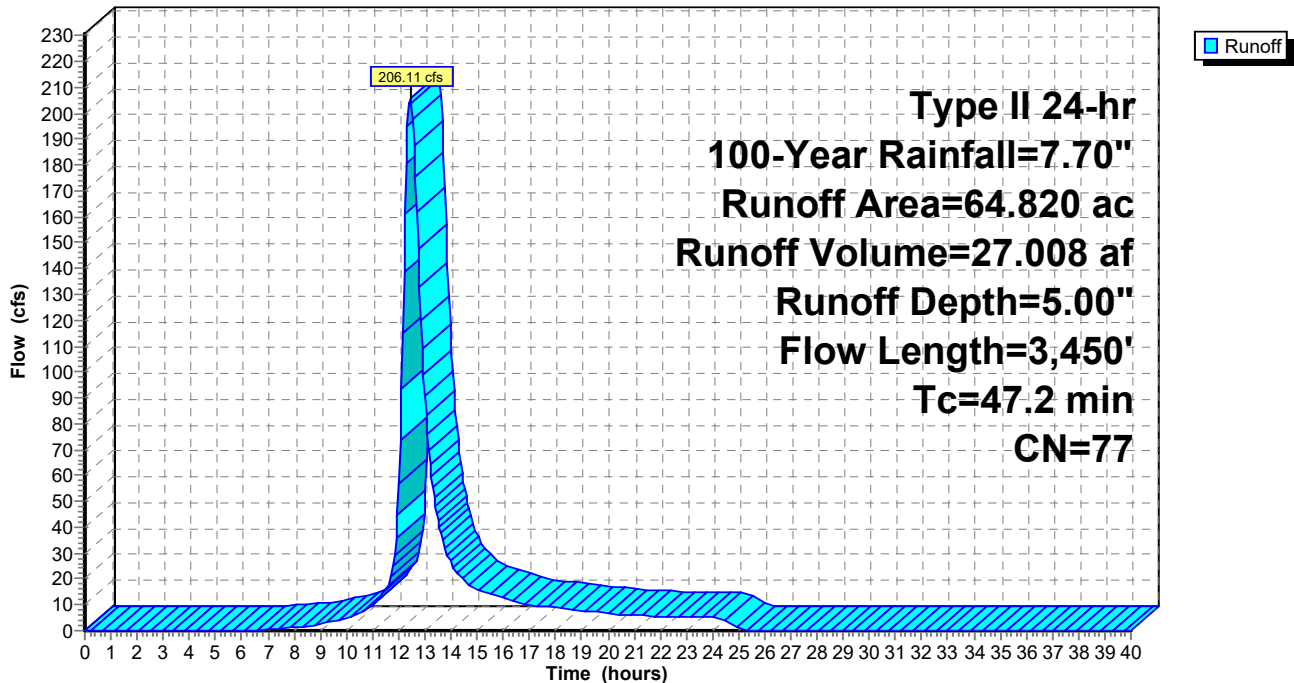
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

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

Hydrograph

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/15/2022
Page 44

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	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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/15/2022
Page 45

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=1.80'
Max Vel=5.10 fps
n=0.030
L=1,041.0'
S=0.0088 '/'
Capacity=2,150.14 cfs

103.03 cfs
98.34 cfs

Inflow
Outflow

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/15/2022
Page 46

Reach 3R: Reach 3

Stage-Discharge

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
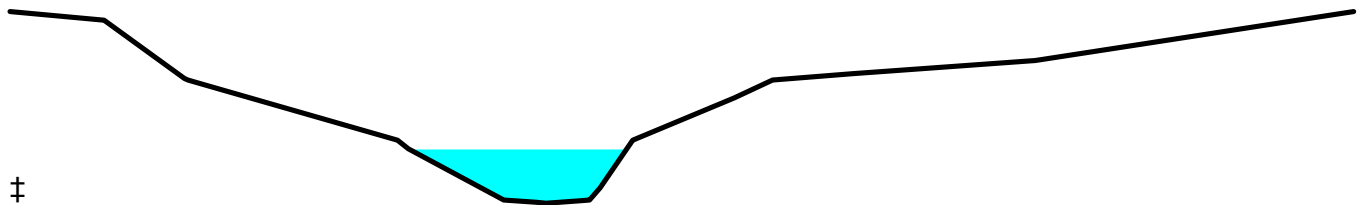*Type II 24-hr 100-Year Rainfall=7.70"*
Printed 4/15/2022
Page 47

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	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

21-130-HYDRO-EX

Bailey Farms - PreDeveloped
Type II 24-hr 100-Year Rainfall=7.70"

Prepared by Schlagel and Assoc.

Printed 4/15/2022

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Page 48

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
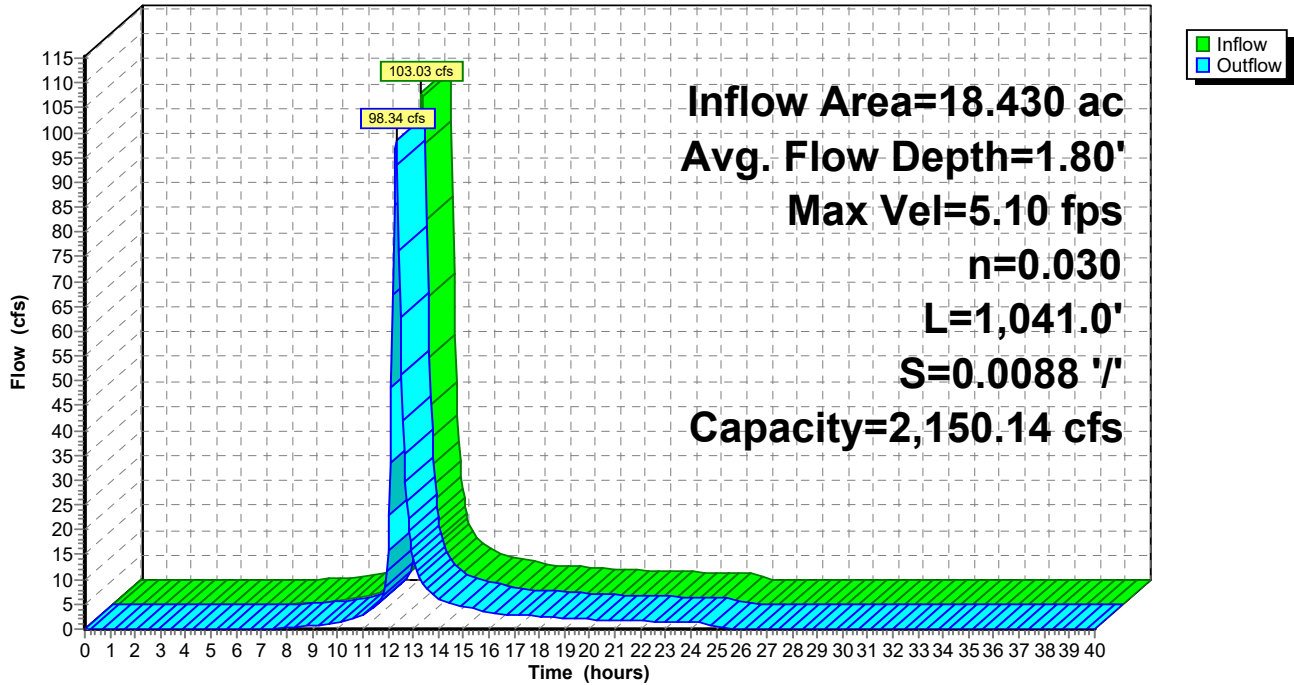*Type II 24-hr 100-Year Rainfall=7.70"*
Printed 4/15/2022
Page 49

Reach 4R: Reach 2

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
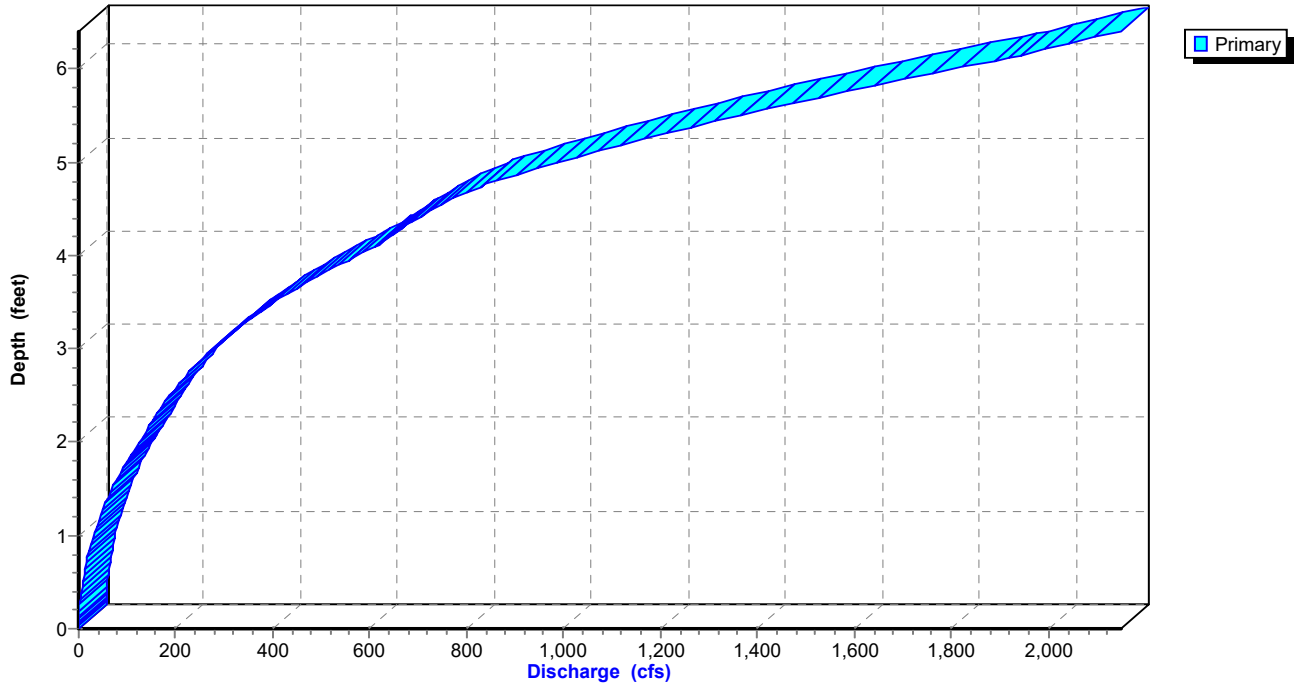HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
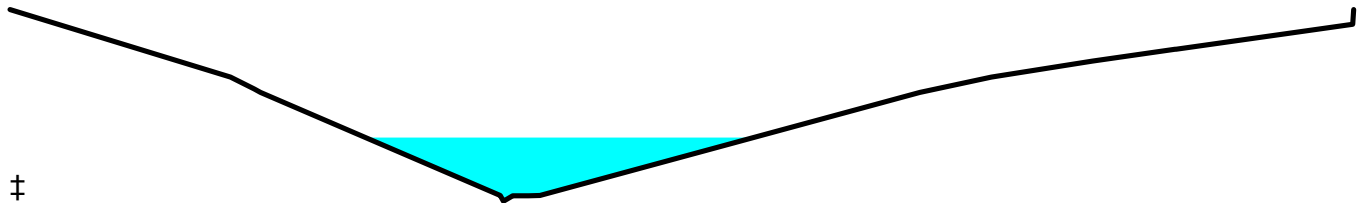*Type II 24-hr 100-Year Rainfall=7.70"*
Printed 4/15/2022
Page 50

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

21-130-HYDRO-EX

Prepared by Schlagel and Assoc.

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
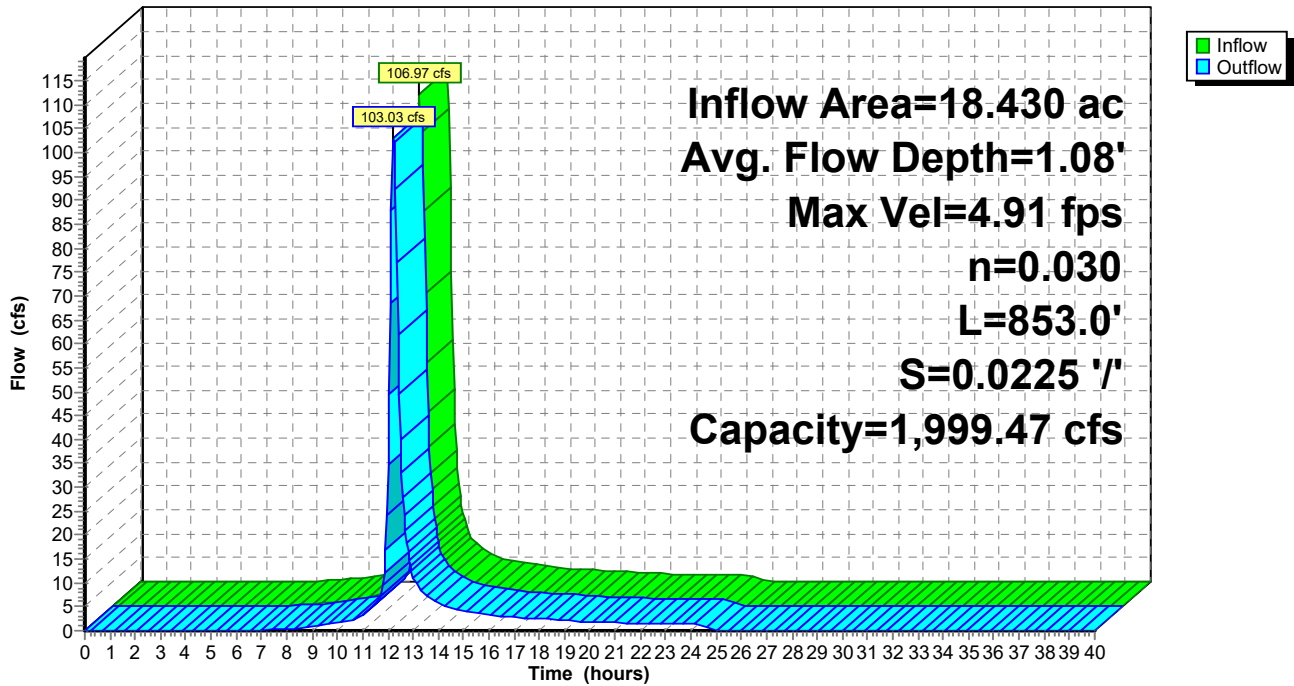
Type II 24-hr 100-Year Rainfall=7.70"

Printed 4/15/2022

Page 51

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

Legend: ■ Inflow ■ Outflow

110.11 cfs

106.97 cfs

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

21-130-HYDRO-EX
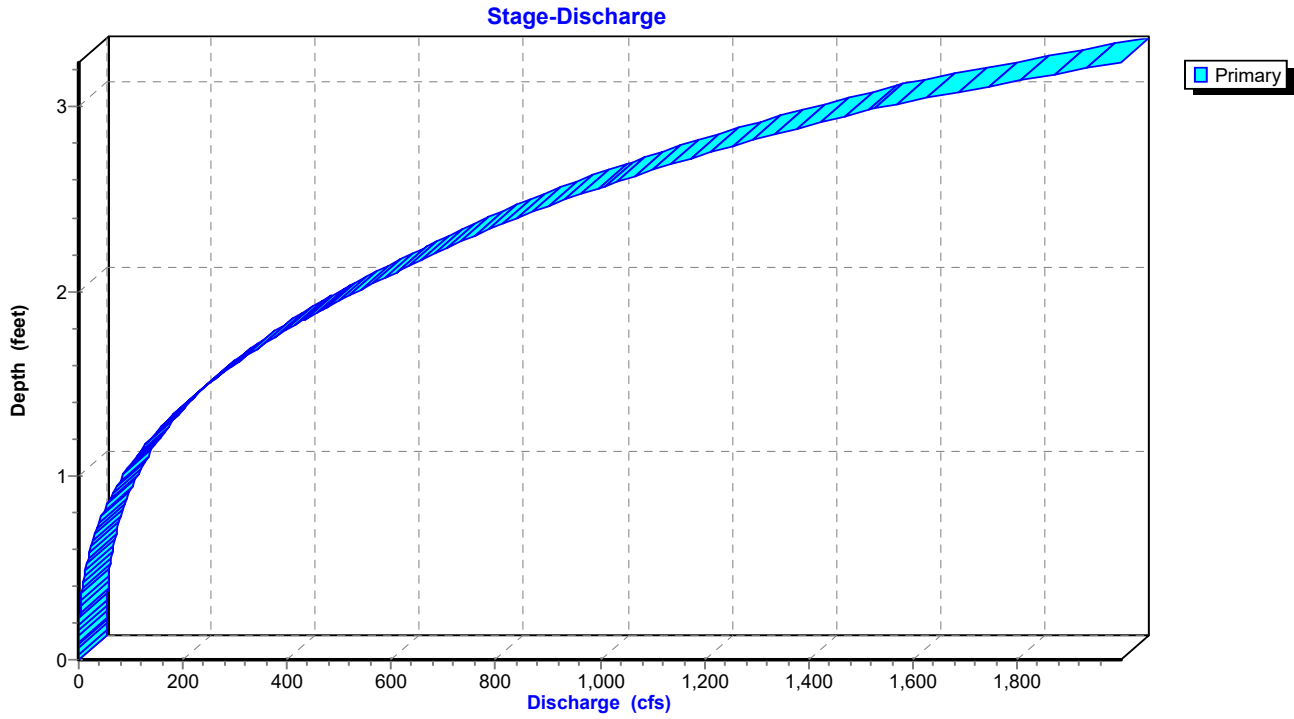Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/15/2022
Page 52

Reach 8R: Reach 1

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/15/2022
Page 53

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/15/2022
Page 54

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

21-130-HYDRO-EX
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - PreDeveloped
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/15/2022
Page 55

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
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

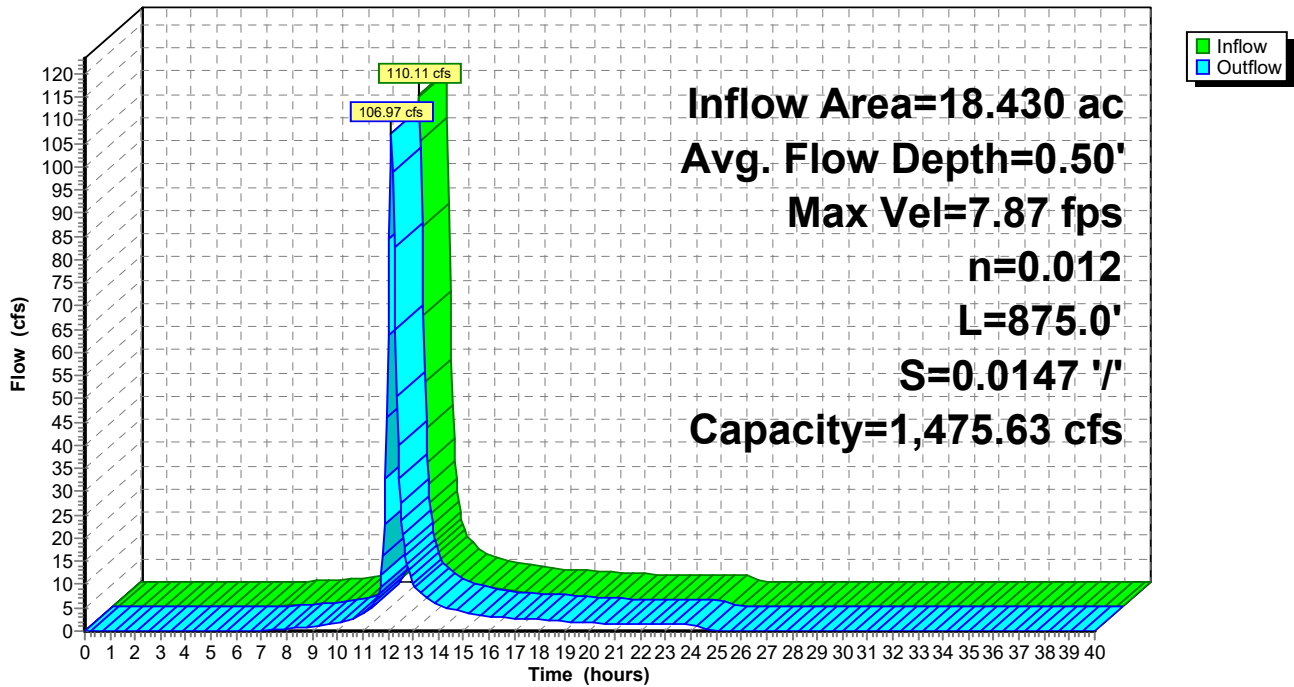Bailey Farms - PreDeveloped
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/15/2022
Page 56

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

HydroCAD - Developed

Proposed Condition

1S ON-SITE #1

5S OFF-SITE #1

4P EDDB #1 Cornerstone

8R REACH 1 (through Pipe System)

7R Reach 2

6R Reach 3

5L RP-4

7S ON-SITE #2

5P EDDB #2 Manor

6S ON-SITE #4 (Bypass)

4L RP-3

3S ON-SITE #3 (Bypass)

3L RP-2

2L RP-1

| Subcat | Reach | Pond | Link |

21-130-HYDRO-PRO orifice plate option

Bailey Farms - Developed

Prepared by Schlagel and Assoc.

Printed 4/18/2022

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Page 2

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
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
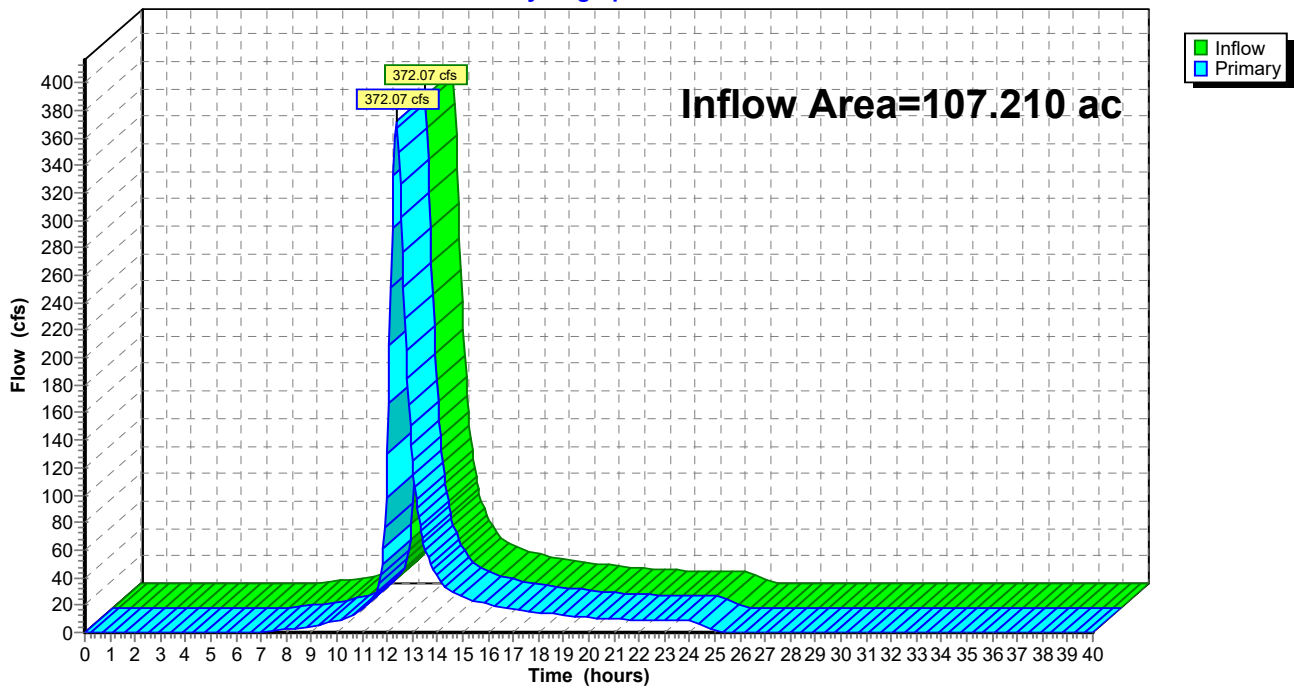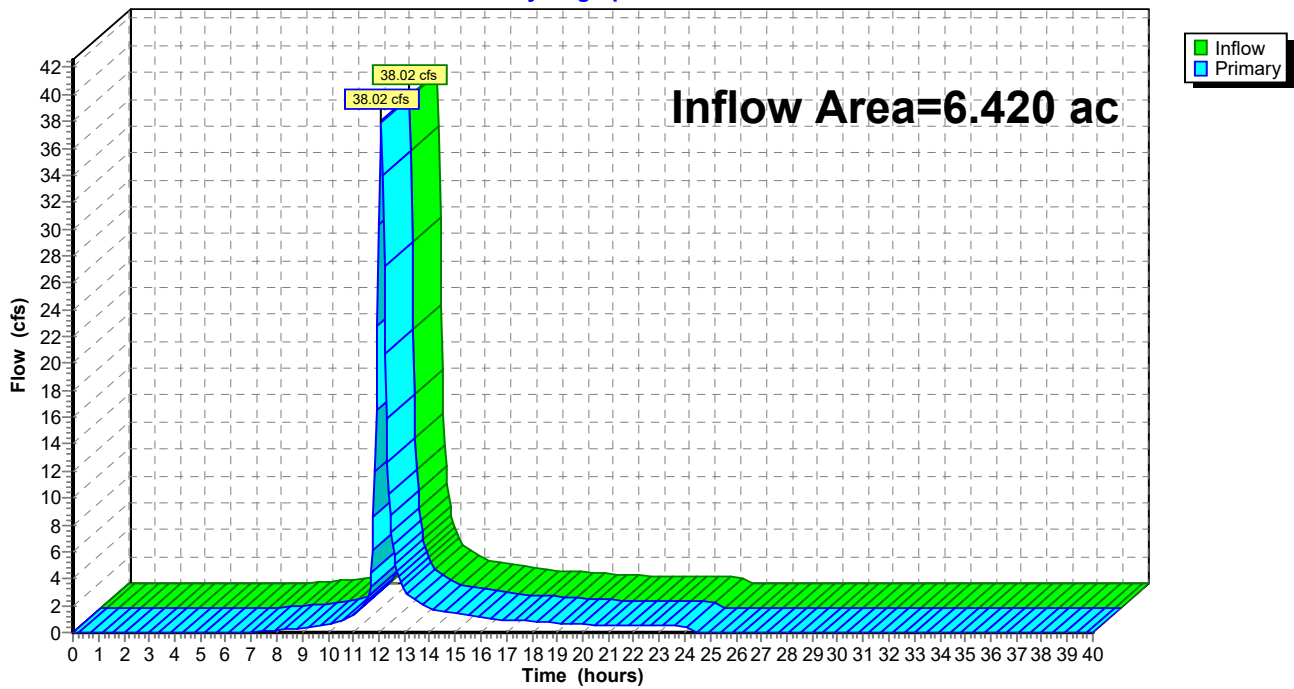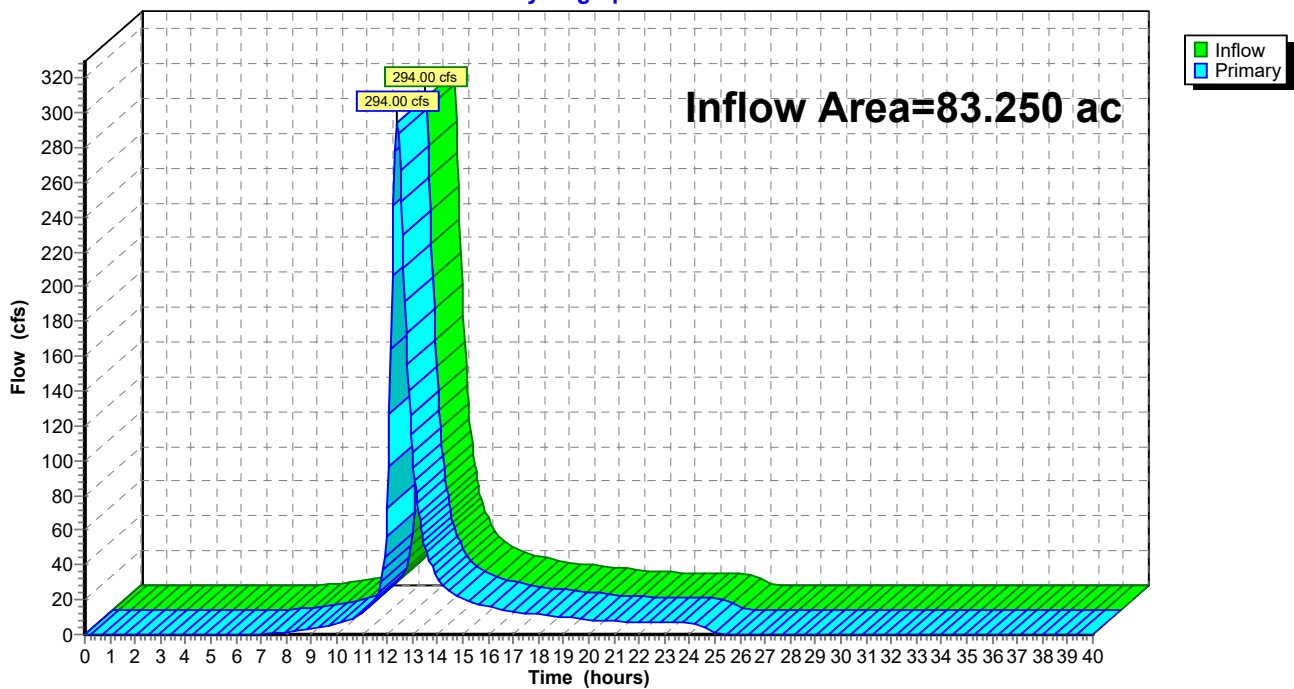*Type II 24-hr 2-Year Rainfall=3.50″*
Printed 4/18/2022
Page 3

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
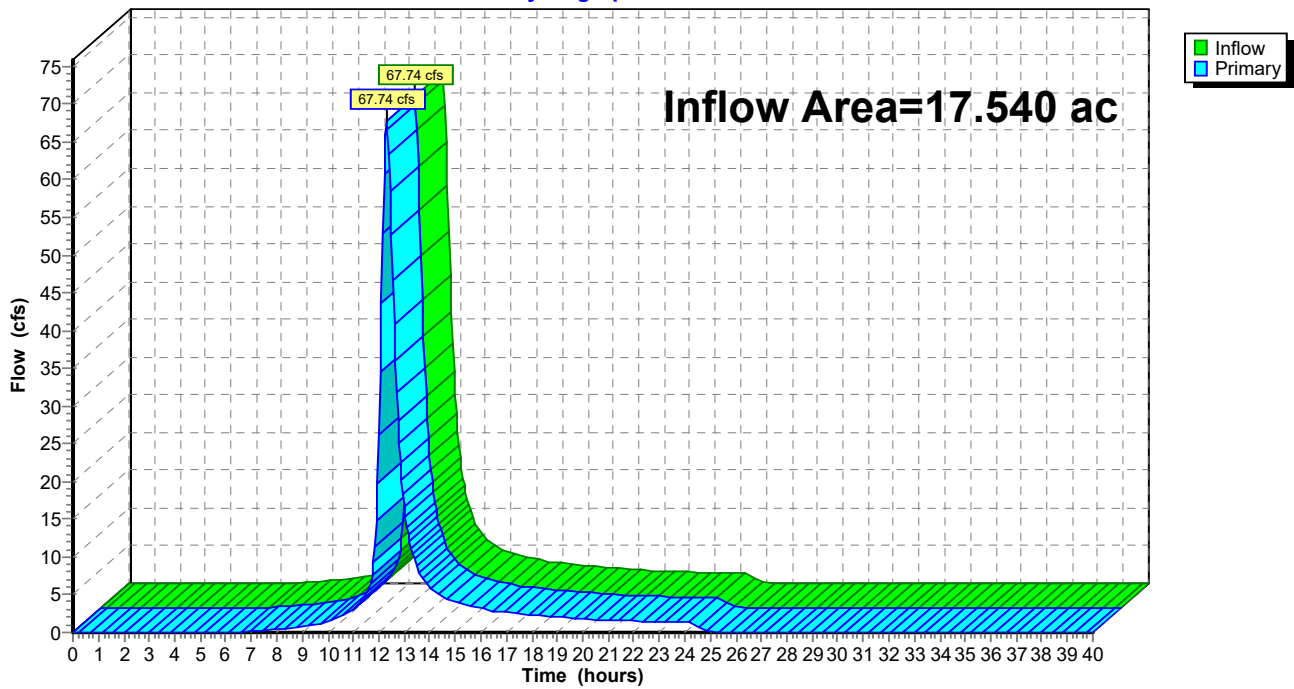*Type II 24-hr 2-Year Rainfall=3.50"*
Printed 4/18/2022
Page 4

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/18/2022
Page 5

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)

Hydrograph

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/18/2022
Page 6

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/18/2022
Page 7

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

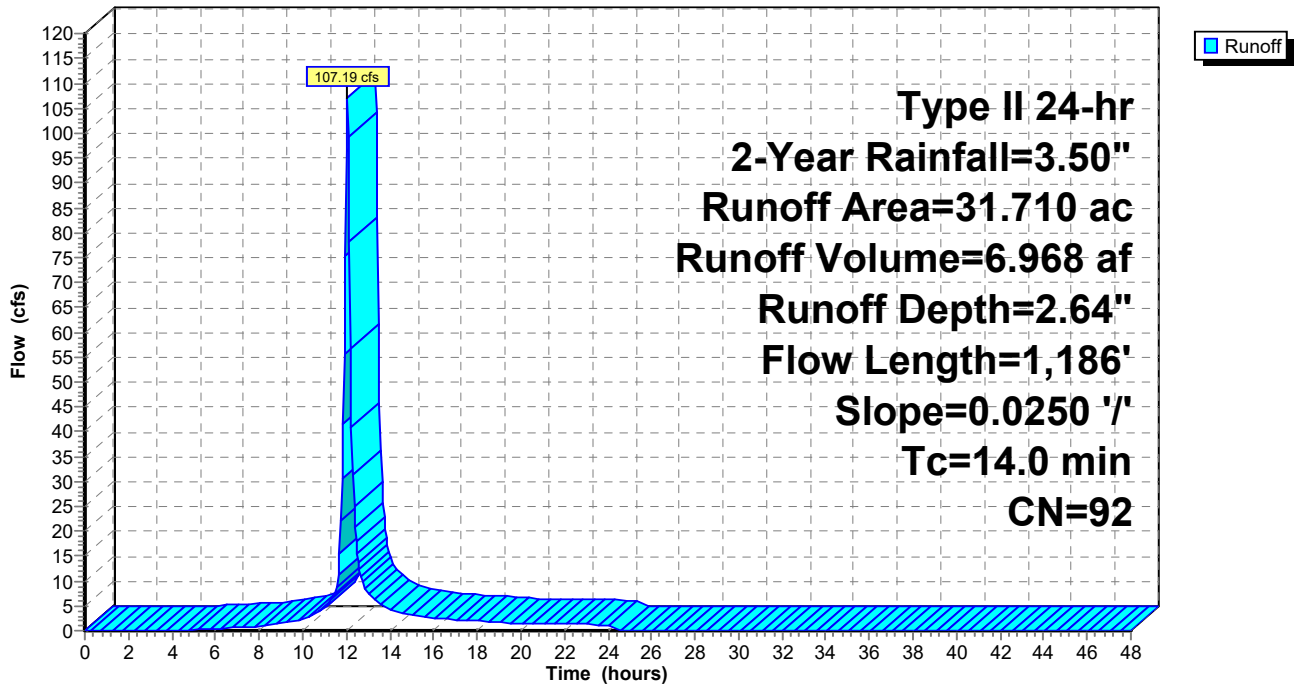Runoff   =   53.19 cfs @ 12.08 hrs, Volume=   3.514 af, Depth= 1.71"

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/18/2022
Page 8

Summary for Subcatchment 7S: ON-SITE #2

Runoff   =   86.05 cfs @ 12.06 hrs, Volume=   5.400 af, Depth= 2.18"
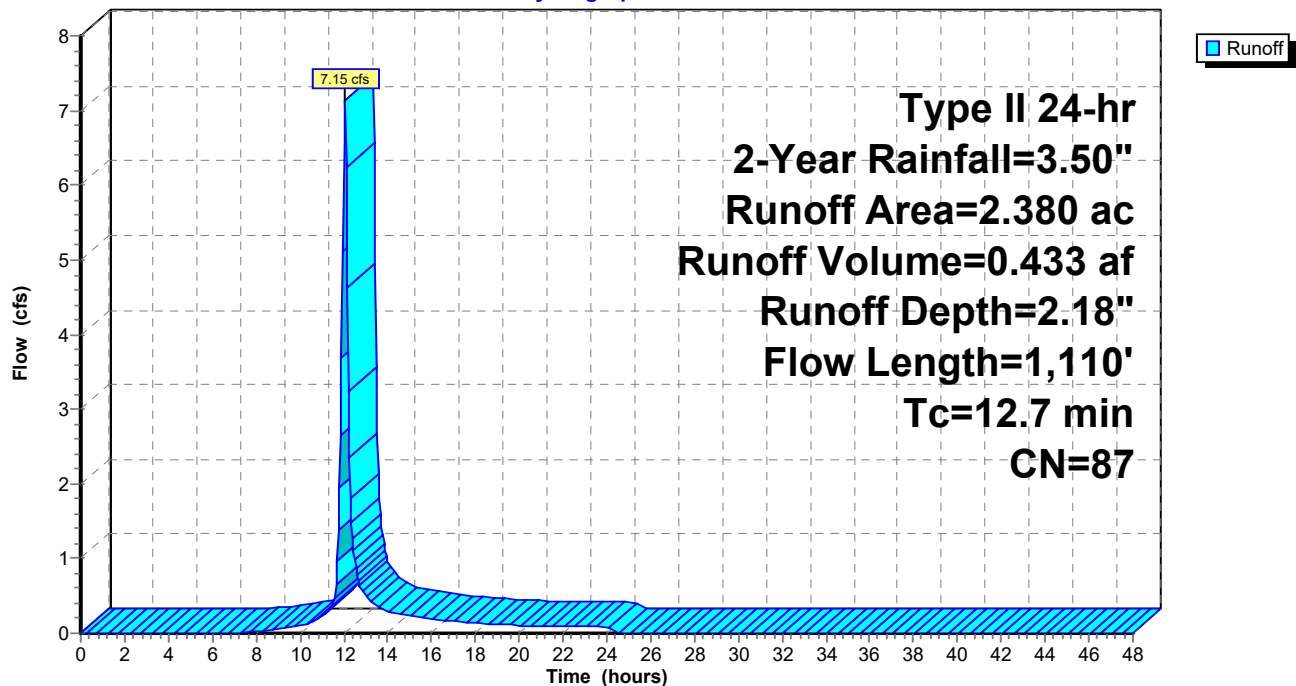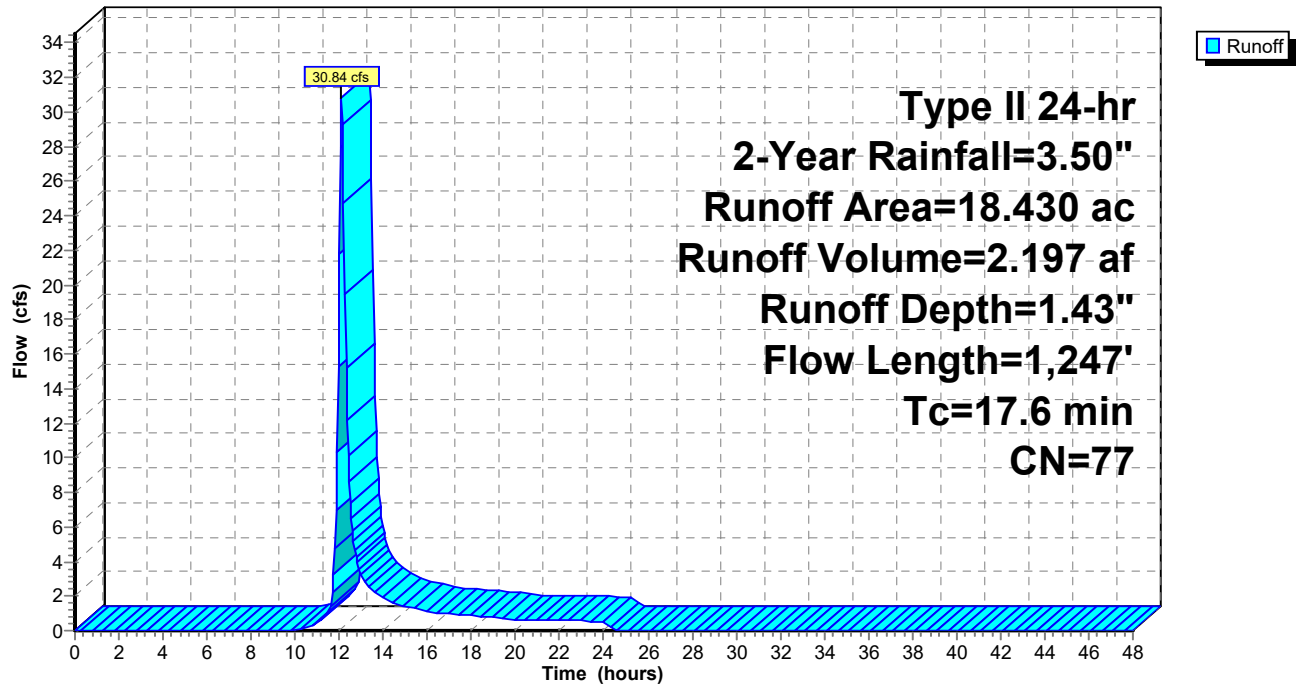
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

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

21-130-HYDRO-PRO orifice plate option

Prepared by Schlagel and Assoc.

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/18/2022
Page 9

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 (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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/18/2022
Page 10

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
Outflow

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

27.77 cfs
25.59 cfs

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/18/2022
Page 11

Reach 6R: Reach 3

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
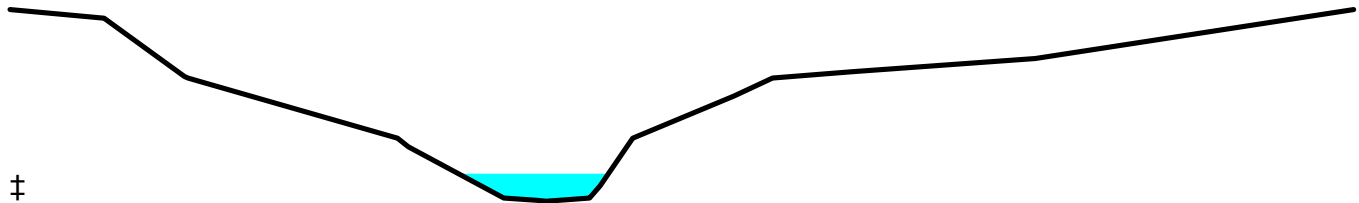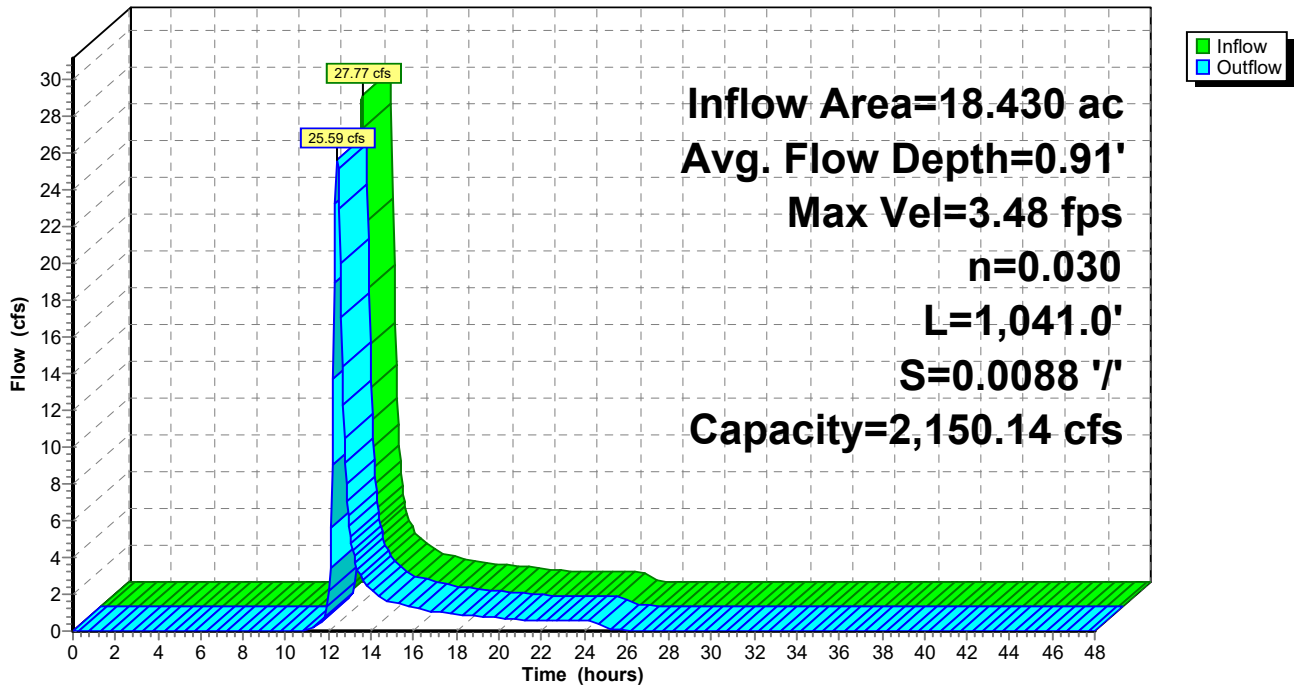Printed 4/18/2022
Page 12

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

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

29.97 cfs
27.77 cfs

21-130-HYDRO-PRO orifice plate option

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"

Prepared by Schlagel and Assoc.

Printed 4/18/2022

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Page 14

Reach 7R: Reach 2

21-130-HYDRO-PRO orifice plate option
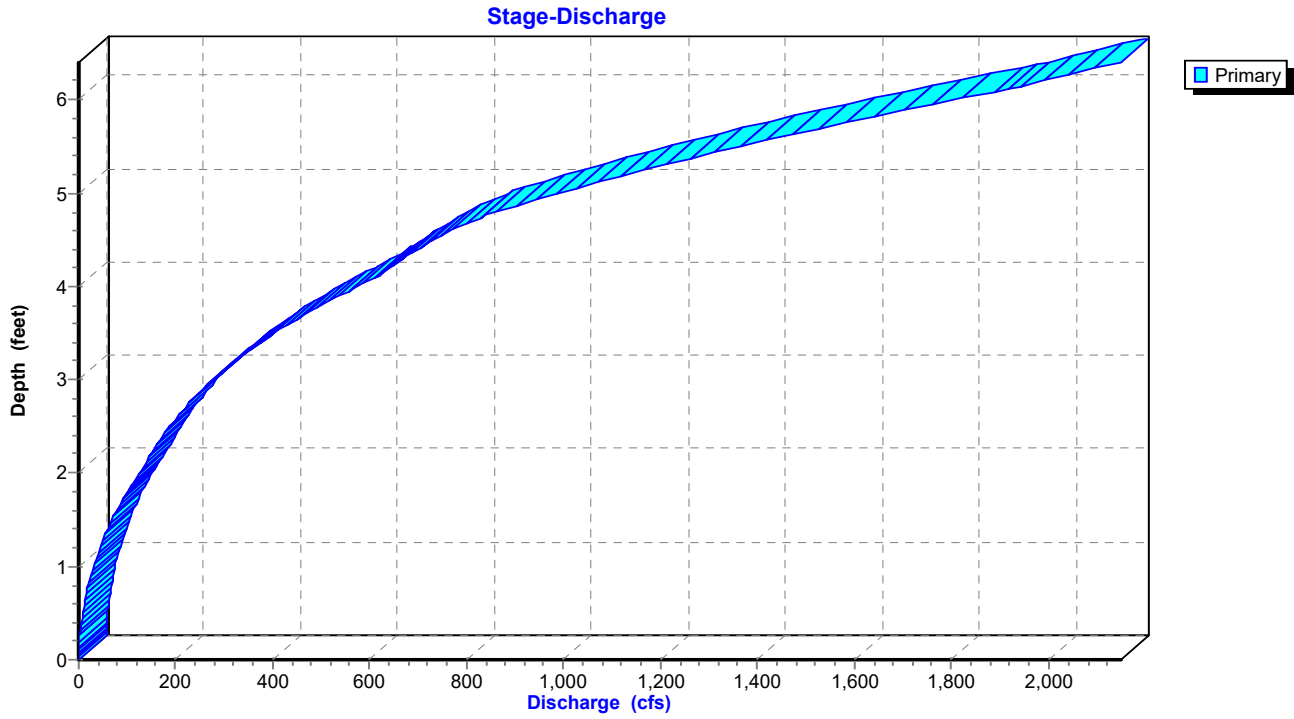Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/18/2022
Page 15

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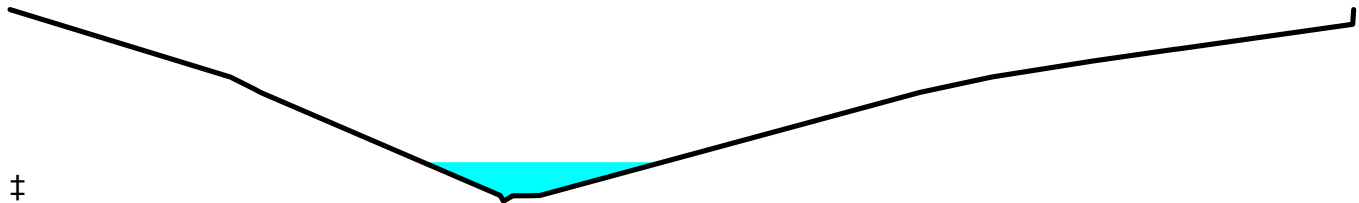
Peak Storage= 2,798 cf @ 12.13 hrs
Average Depth at Peak Storage= 1.19'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 91.10 cfs

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
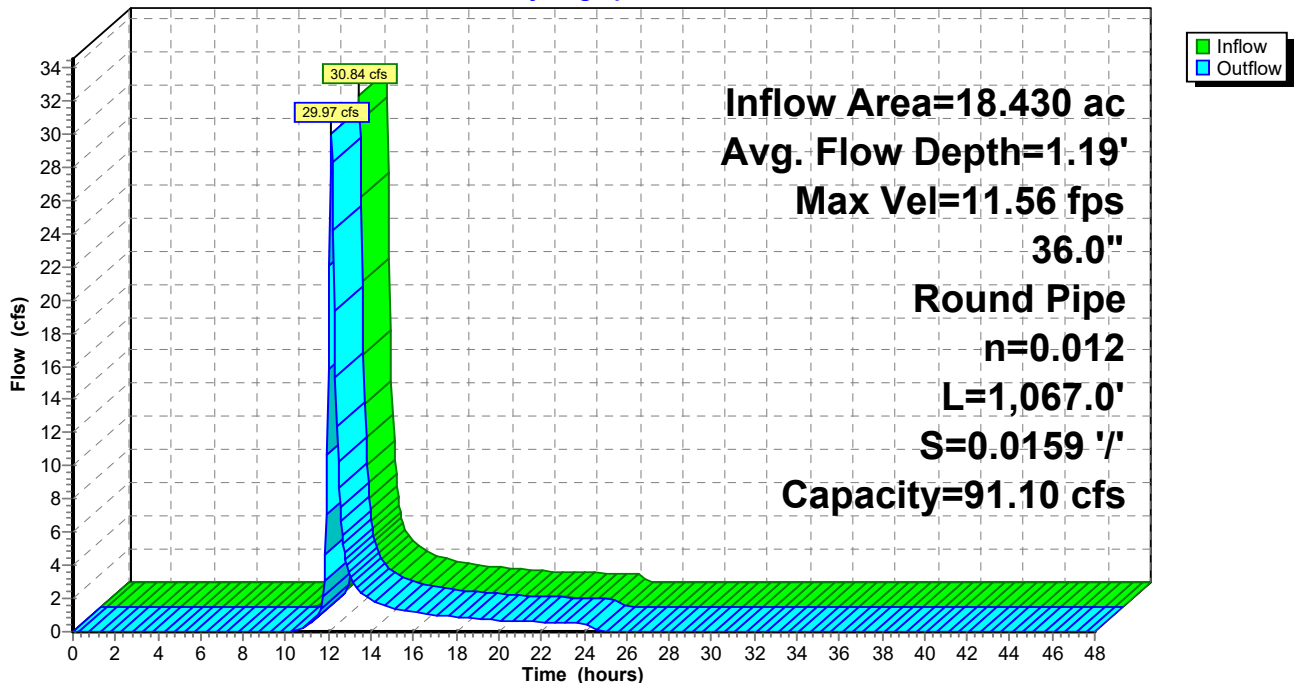
21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/18/2022
Page 16

Reach 8R: REACH 1 (through Pipe System)

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
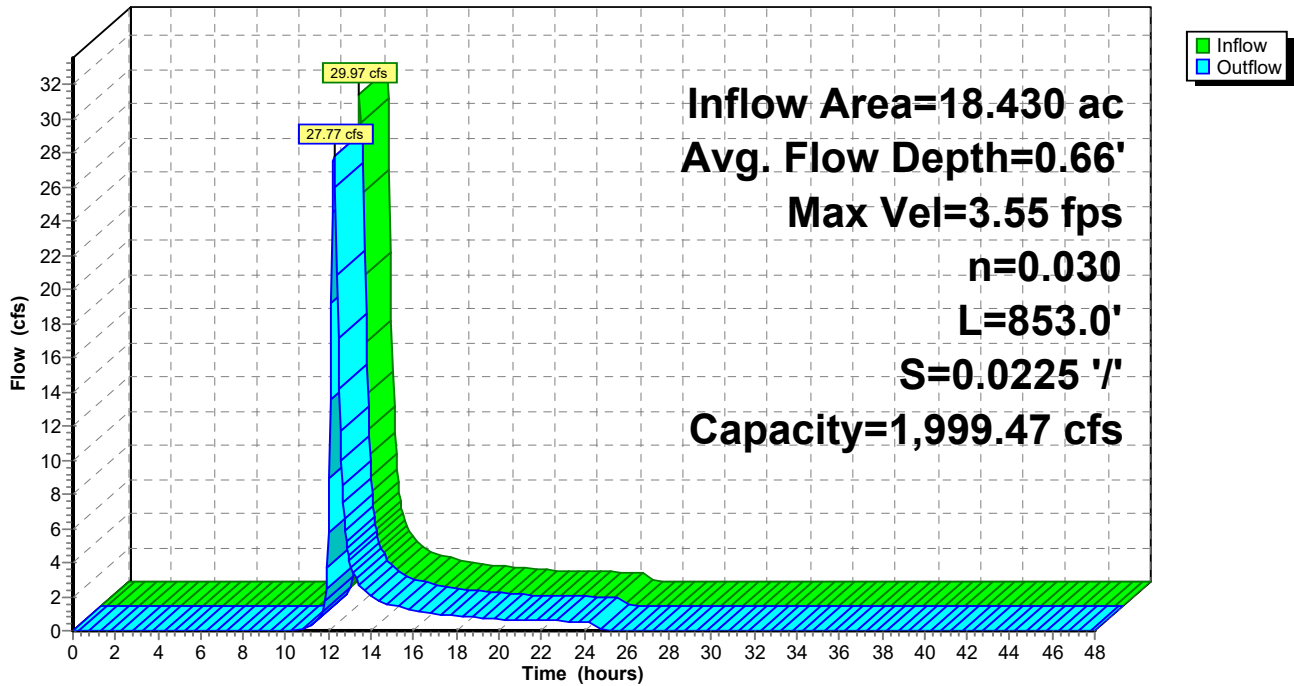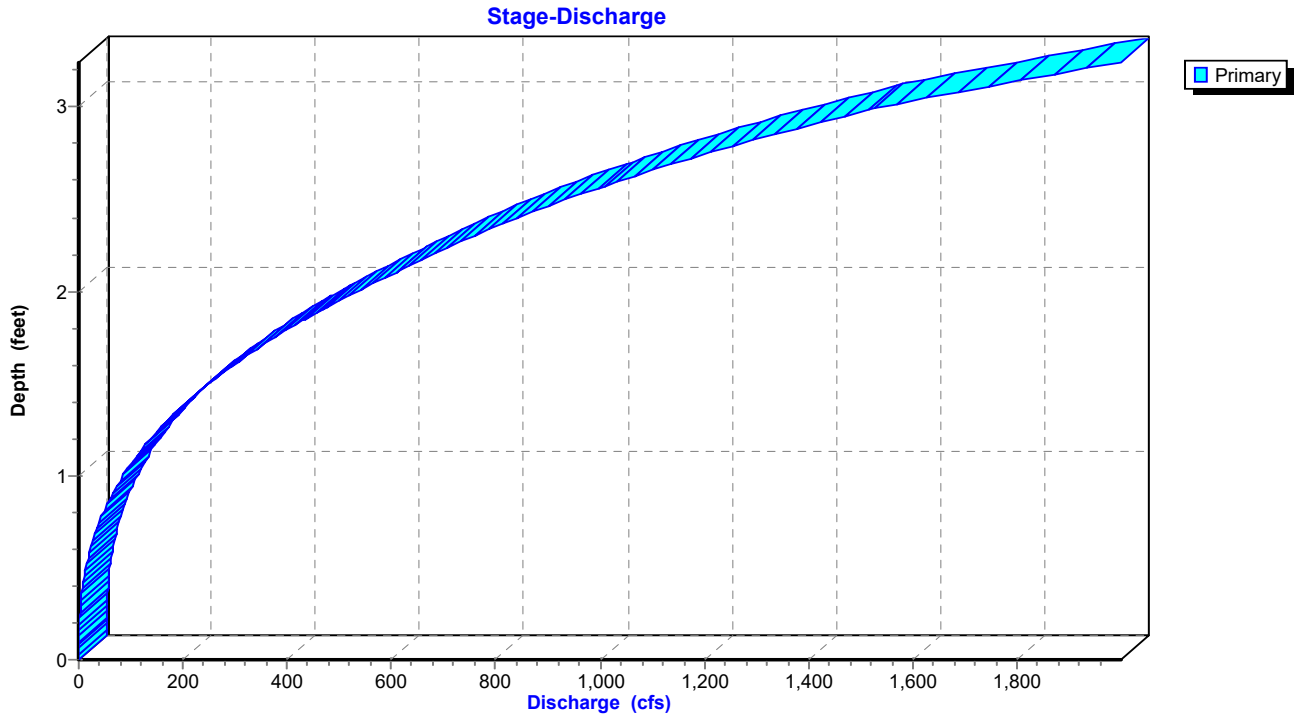*Type II 24-hr 2-Year Rainfall=3.50"*
Printed 4/18/2022
Page 17

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
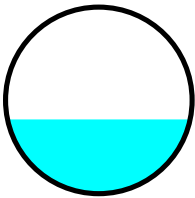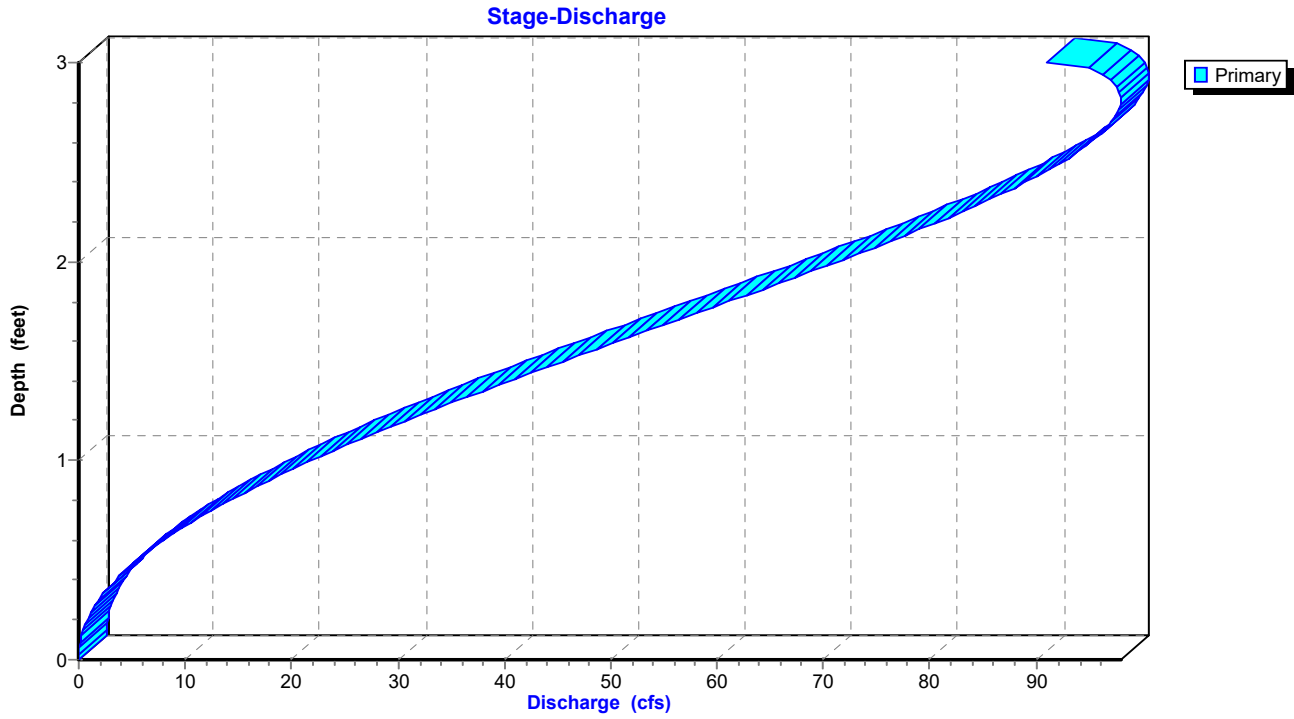Printed 4/18/2022
Page 18

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

Legend: ▉ Inflow ▉ Primary

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/18/2022
Page 19

Pond 4P: EDDB #1 Cornerstone

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/18/2022
Page 20

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

21-130-HYDRO-PRO orifice plate option

Prepared by Schlagel and Assoc.

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed

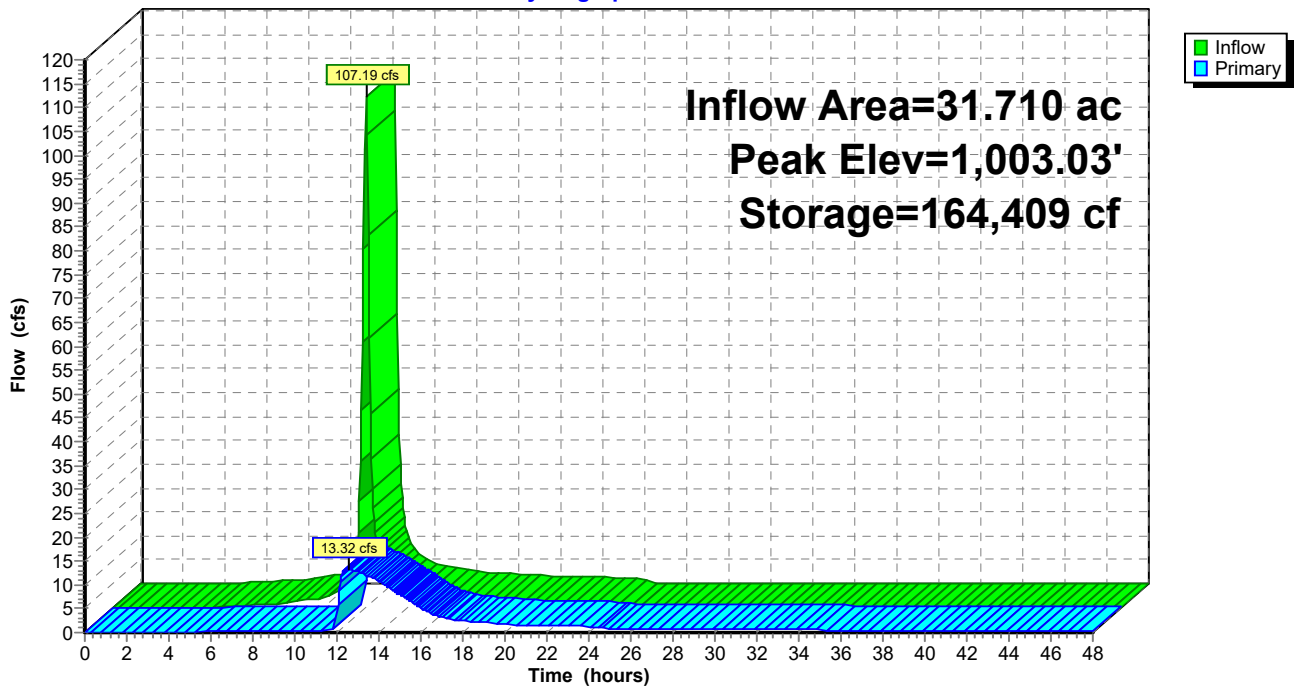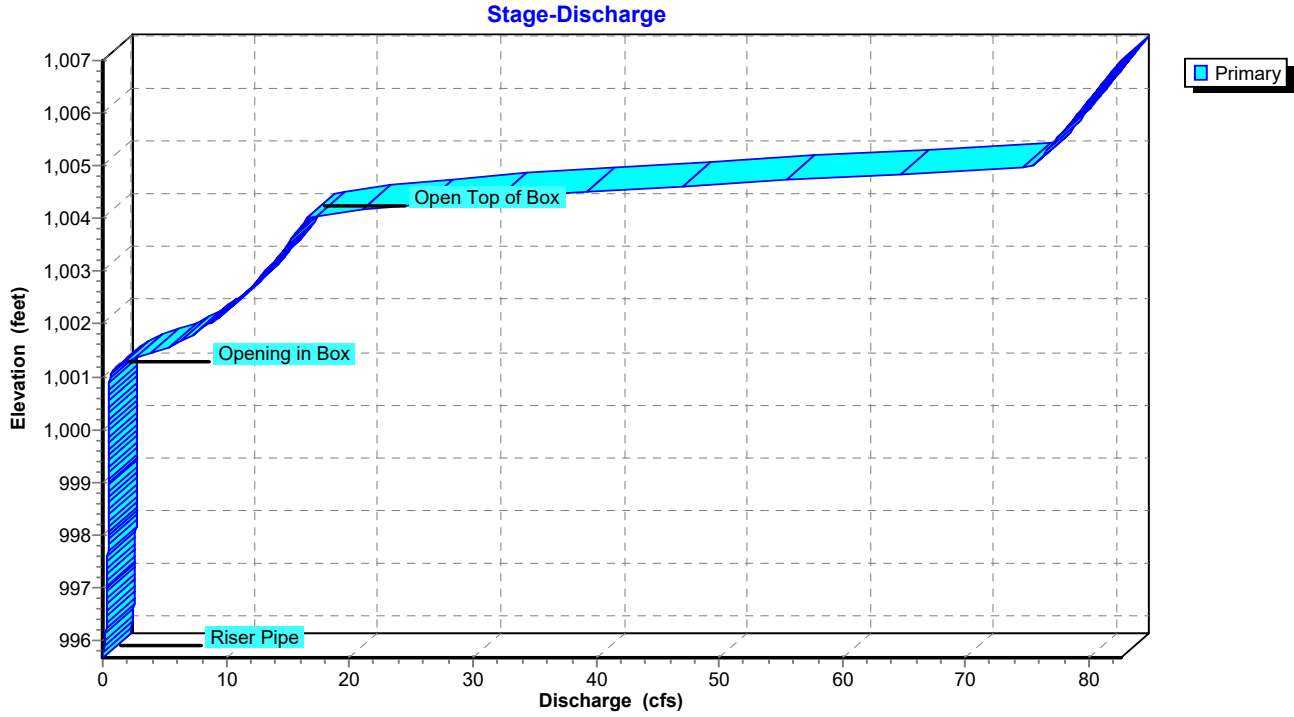*Type II 24-hr 2-Year Rainfall=3.50"*

Printed 4/18/2022

Page 21

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

Hydrograph

Inflow Area=29.690 ac
Peak Elev=994.63'
Storage=122,558 cf

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/18/2022
Page 22

Pond 5P: EDDB #2 Manor

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/18/2022
Page 23

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

Legend:
- Inflow
- Primary

75.14 cfs

75.14 cfs

Inflow Area=106.890 ac

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"
Printed 4/18/2022
Page 24

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

21-130-HYDRO-PRO orifice plate option

Bailey Farms - Developed
Type II 24-hr 2-Year Rainfall=3.50"

Prepared by Schlagel and Assoc.

Printed 4/18/2022

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Page 25

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

Hydrograph

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
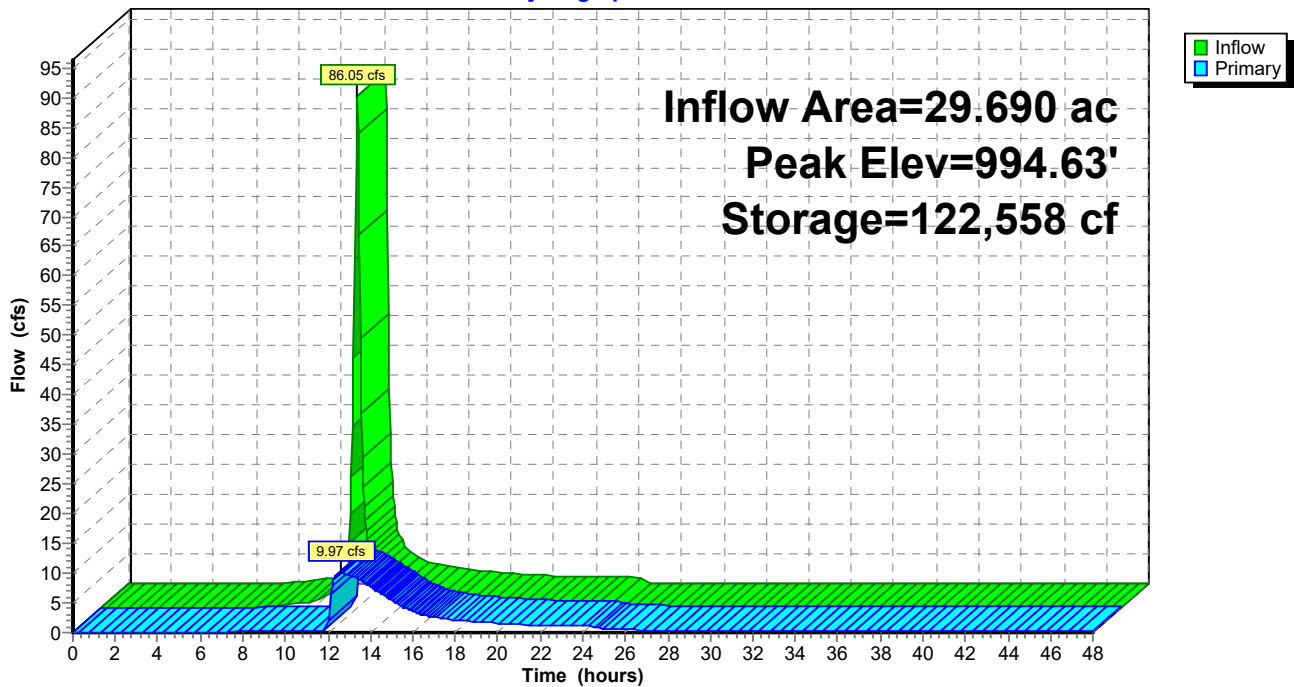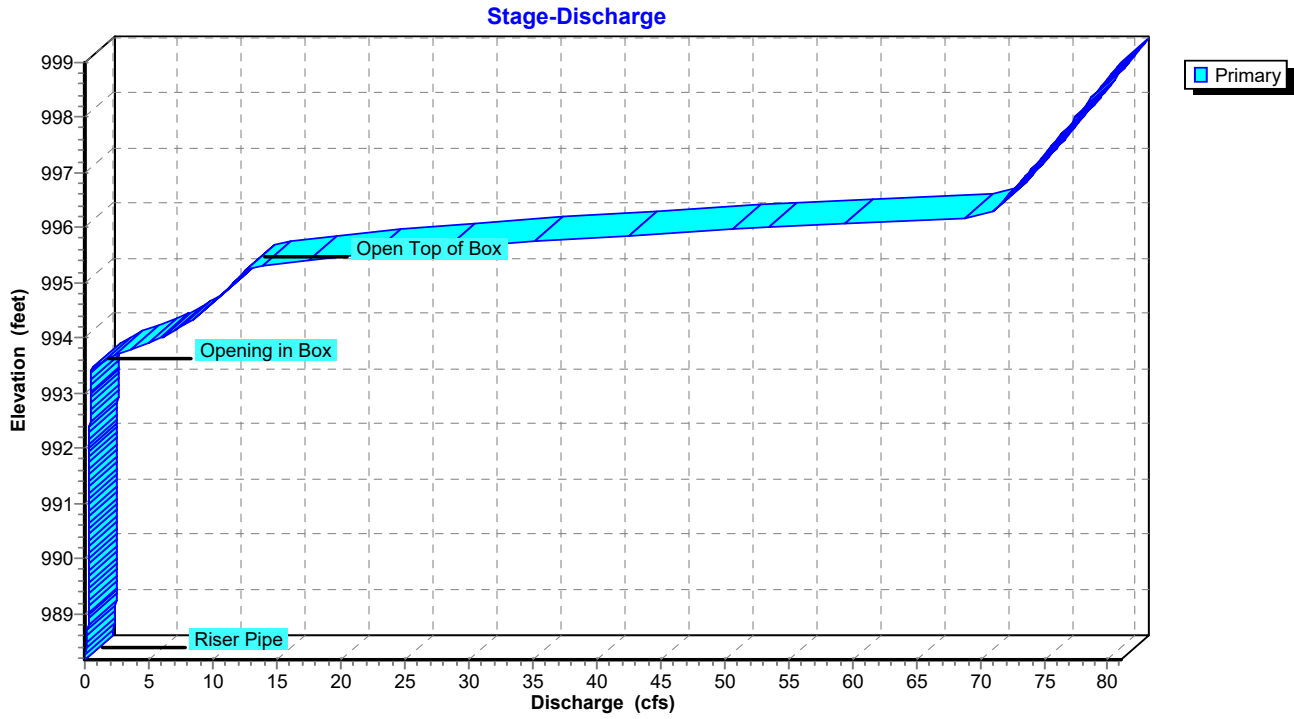*Type II 24-hr 2-Year Rainfall=3.50"*
Printed 4/18/2022
Page 26

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
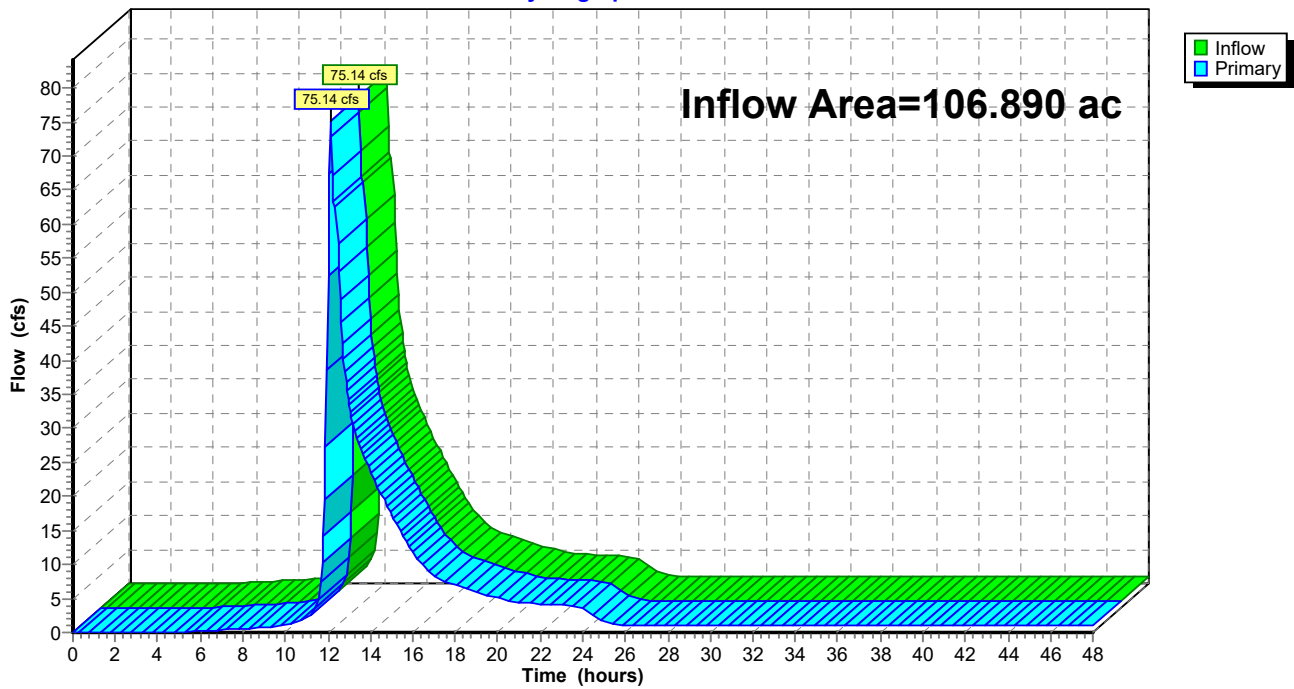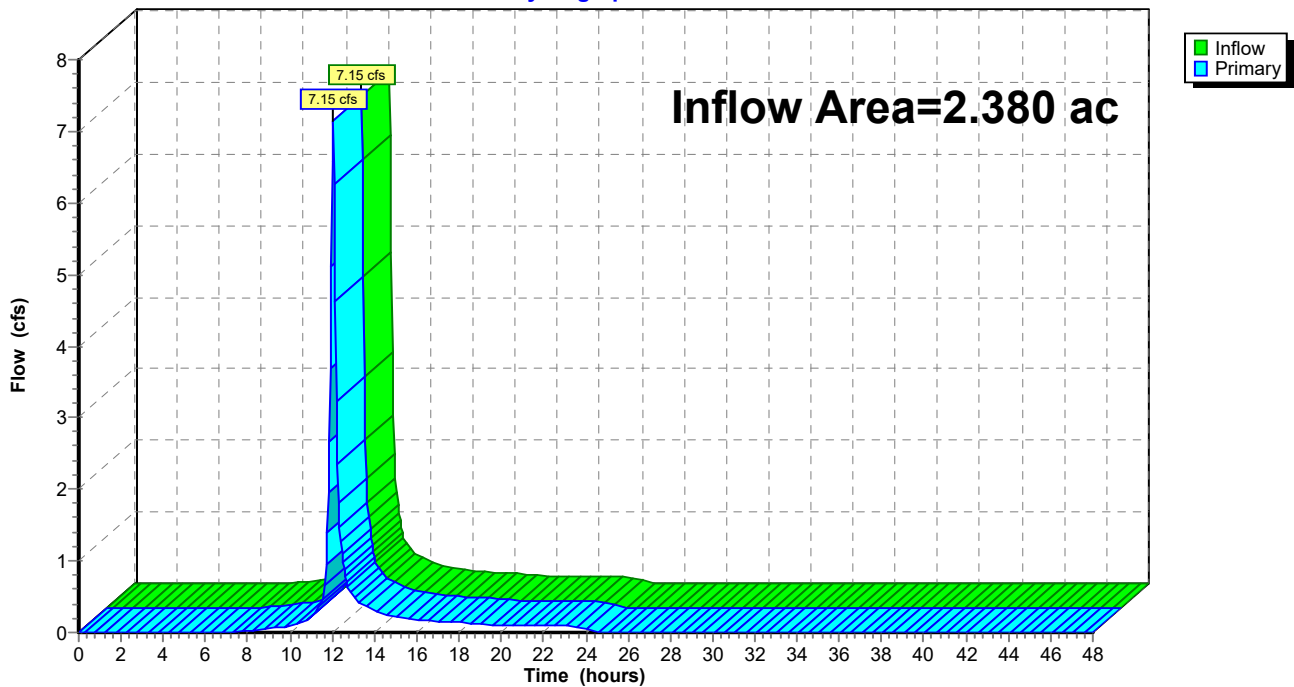Printed 4/18/2022
Page 27

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=4.38"
Flow Length=1,186' Slope=0.0250 '/' Tc=14.0 min CN=92 Runoff=173.27 cfs 11.581 af

Subcatchment 3S: 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

Subcatchment 5S: 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

Subcatchment 6S: 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

Subcatchment 7S: 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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
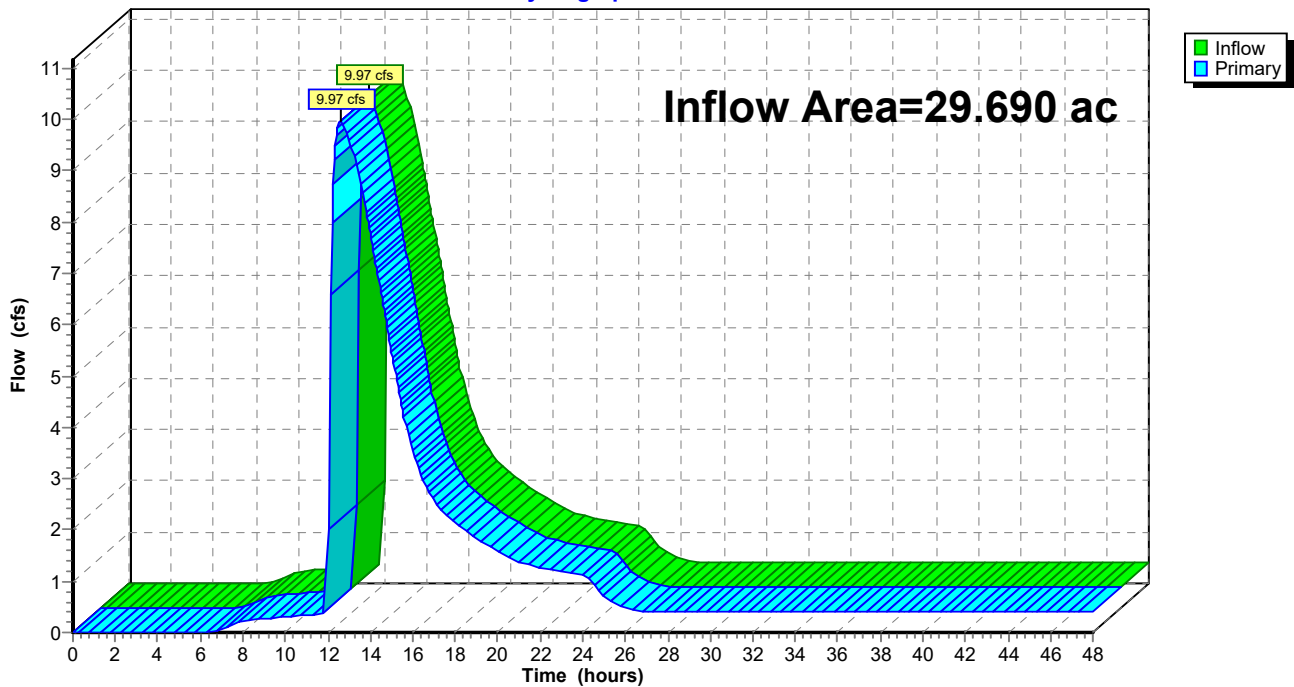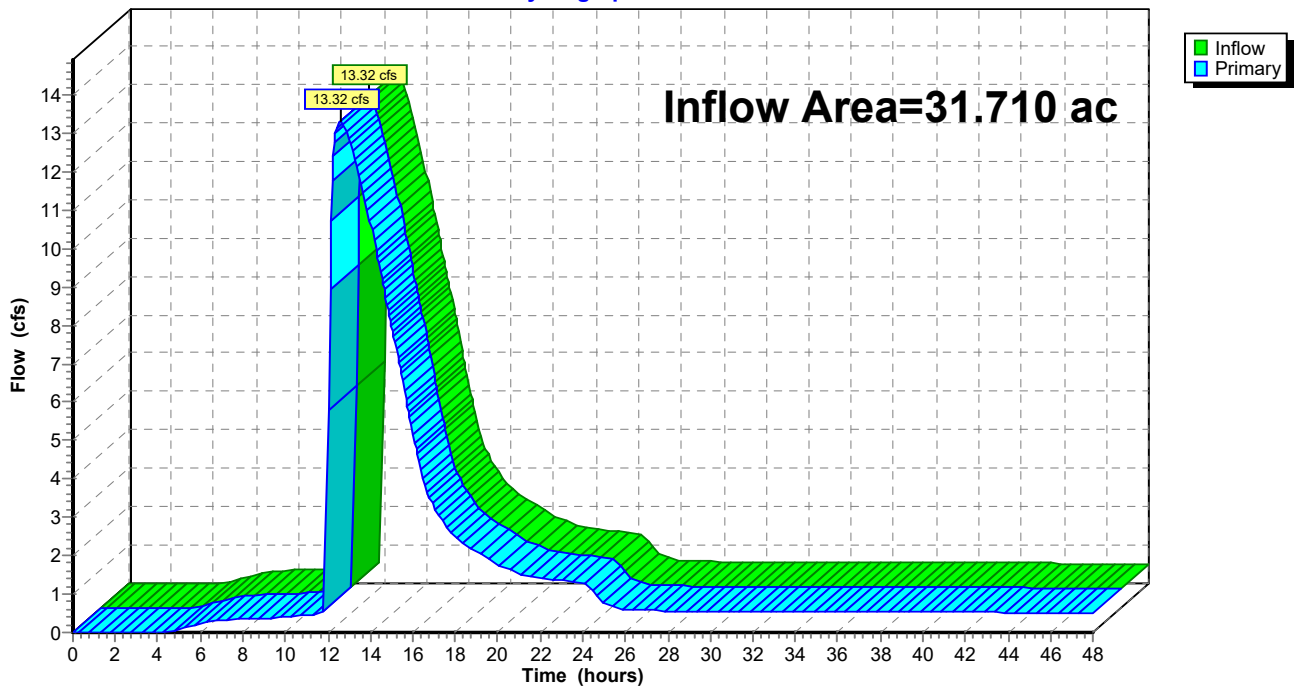*Type II 24-hr 10-Year Rainfall=5.30"*
Printed 4/18/2022
Page 28

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

Hydrograph

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 29

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 30

Summary for Subcatchment 5S: OFF-SITE #1

Runoff   =   62.92 cfs @ 12.10 hrs, Volume=   4.417 af, Depth= 2.88"
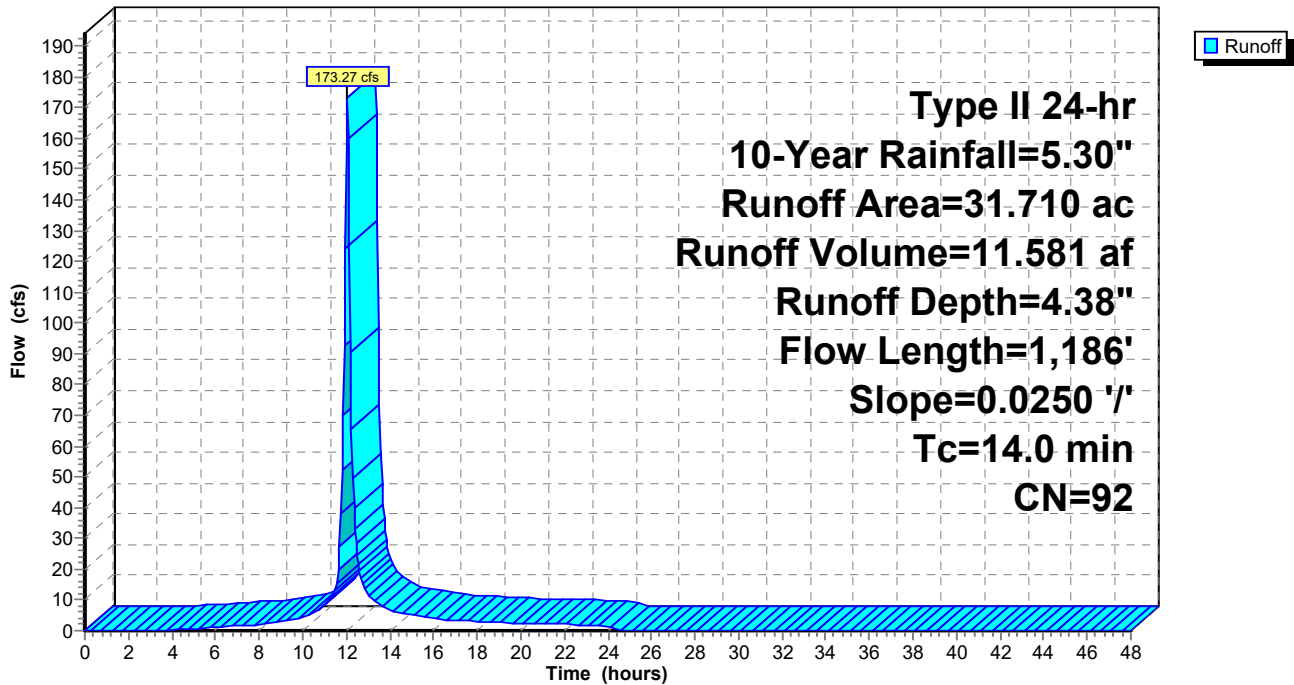
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

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

**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**

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 31

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

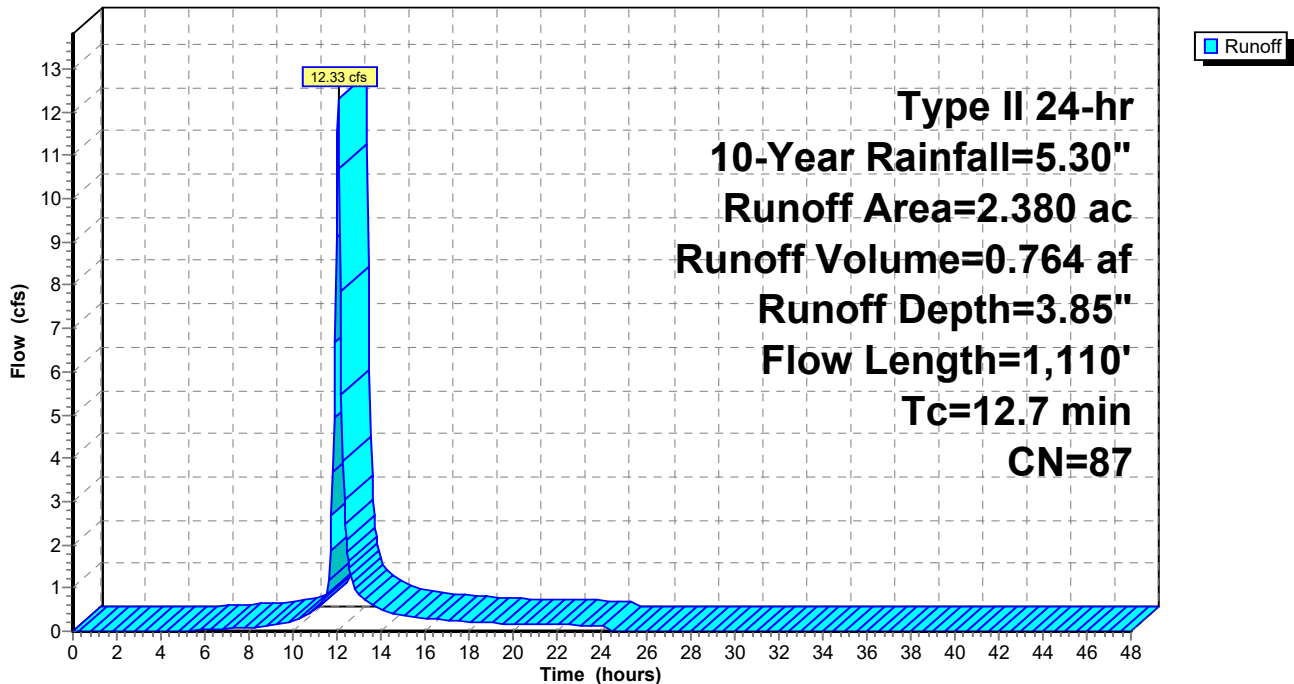Runoff   =   100.98 cfs @ 12.07 hrs, Volume=   6.688 af, Depth= 3.25"

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 32

Summary for Subcatchment 7S: ON-SITE #2

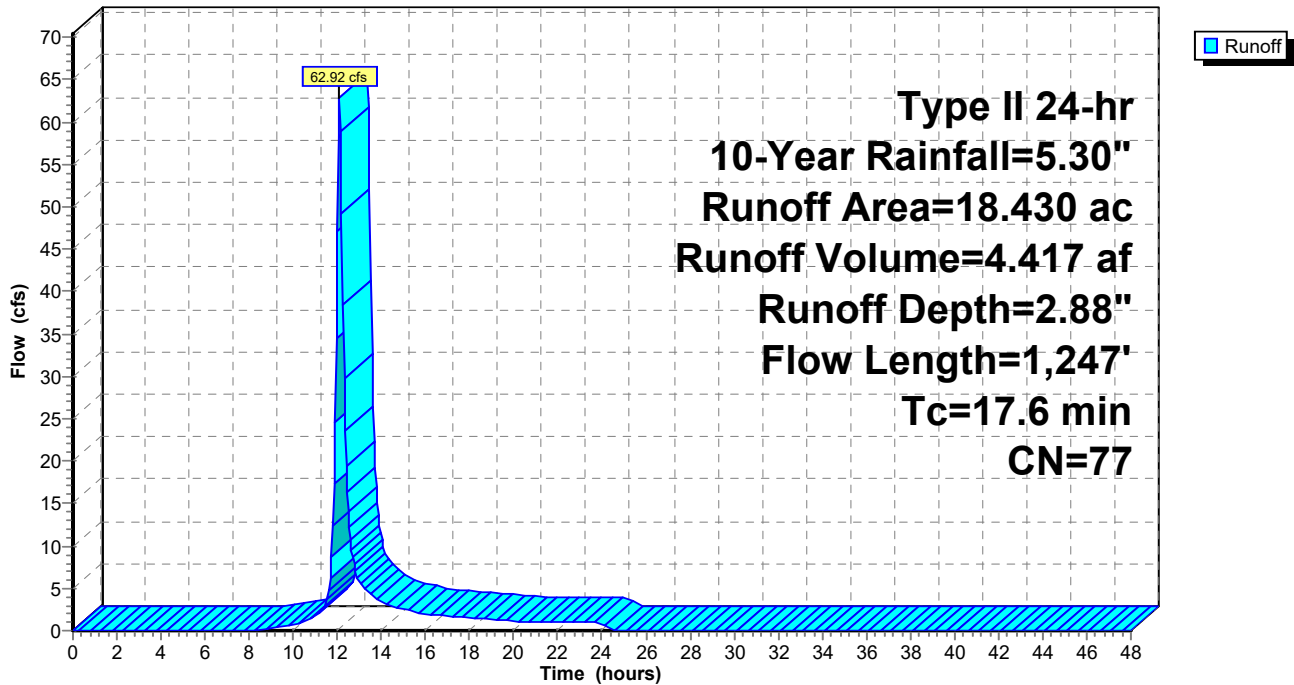Runoff   =   148.68 cfs @ 12.05 hrs, Volume=   9.527 af, Depth= 3.85"

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 33

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	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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 34

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

Legend: Inflow, Outflow

58.33 cfs
54.88 cfs

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 35

Reach 6R: Reach 3

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
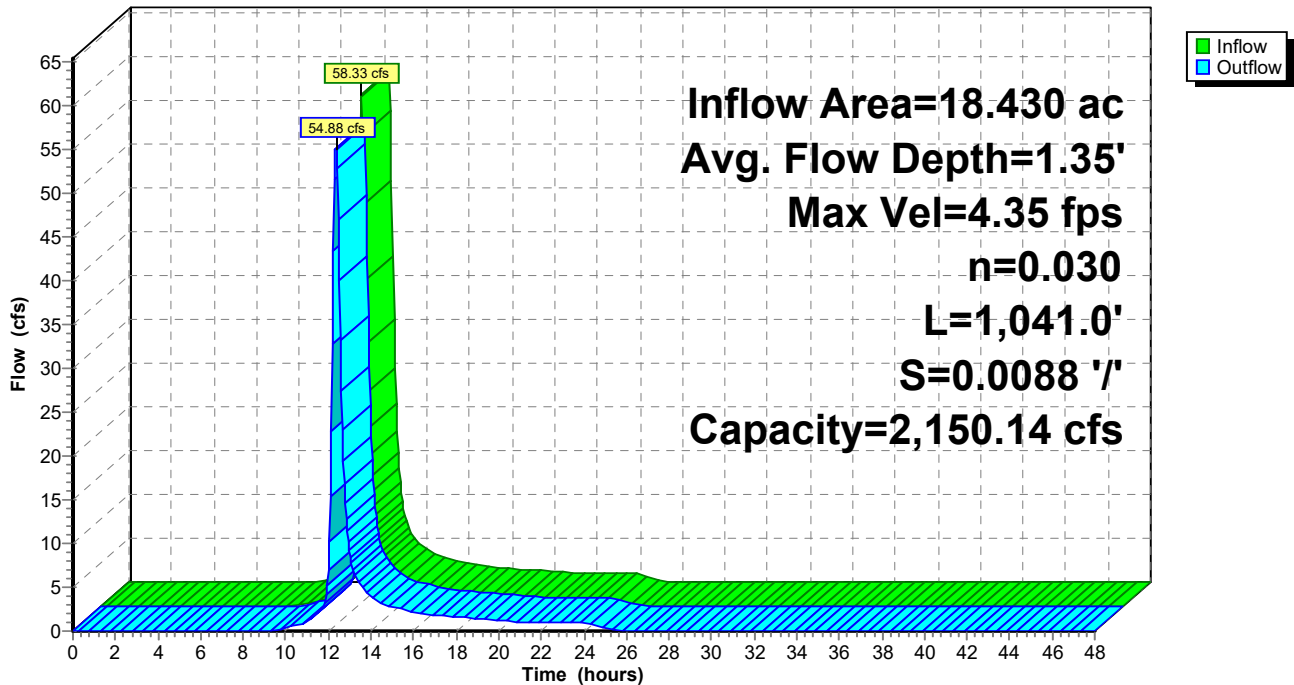*Type II 24-hr 10-Year Rainfall=5.30"*
Printed 4/18/2022
Page 36

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	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

21-130-HYDRO-PRO orifice plate option
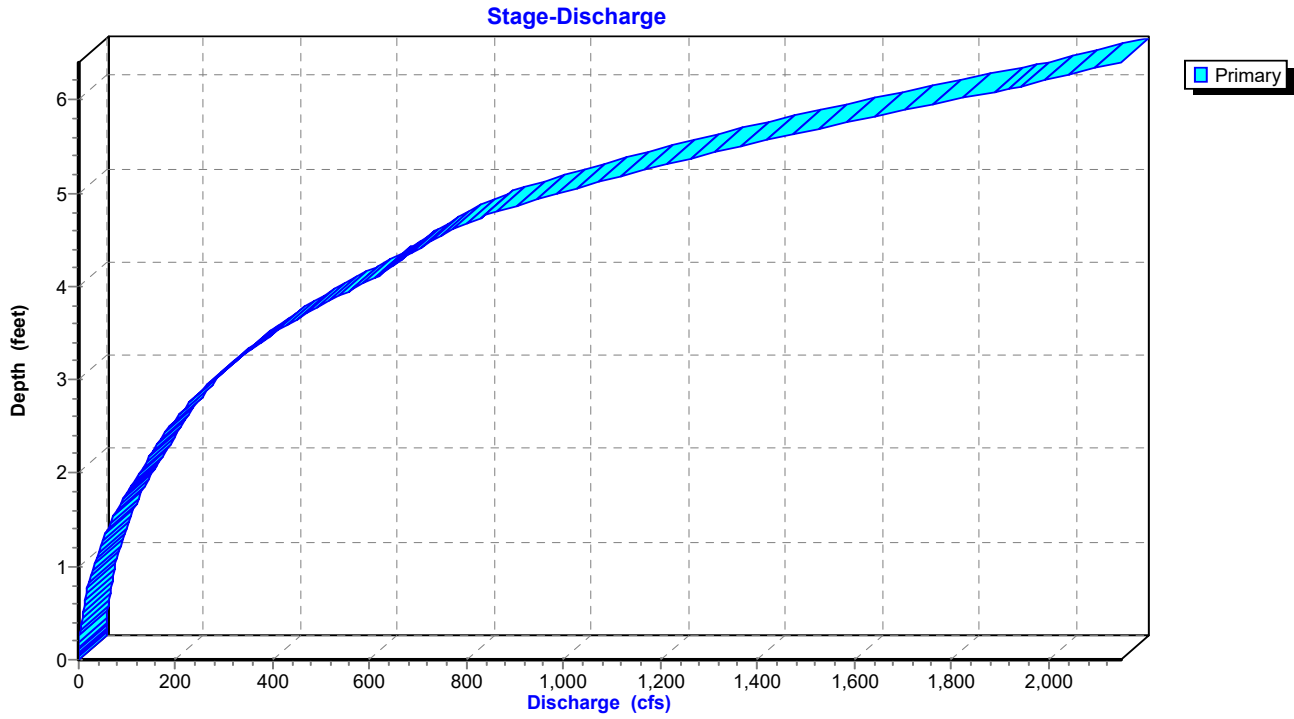Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 37

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

21-130-HYDRO-PRO orifice plate option

Prepared by Schlagel and Assoc.

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed

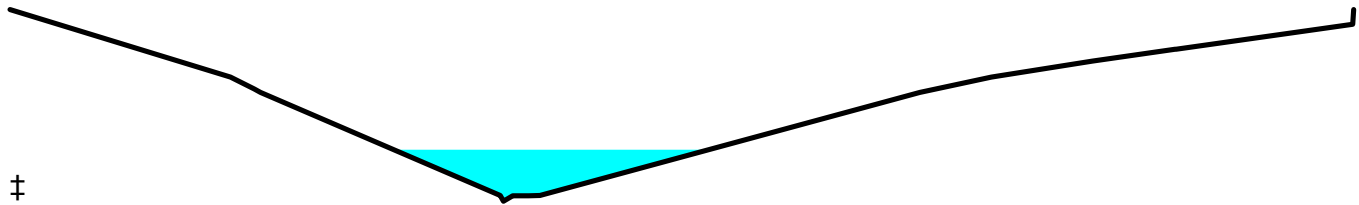*Type II 24-hr 10-Year Rainfall=5.30"*

Printed 4/18/2022

Page 38

Reach 7R: Reach 2

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 39

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
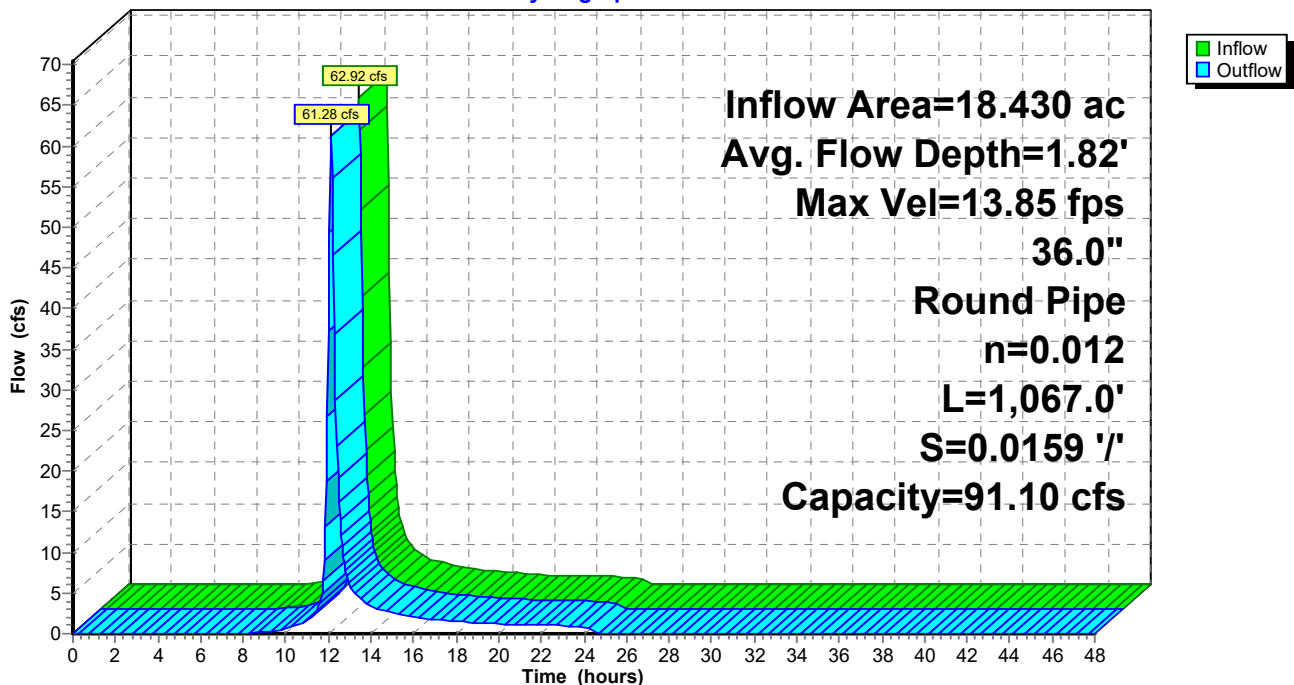
21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

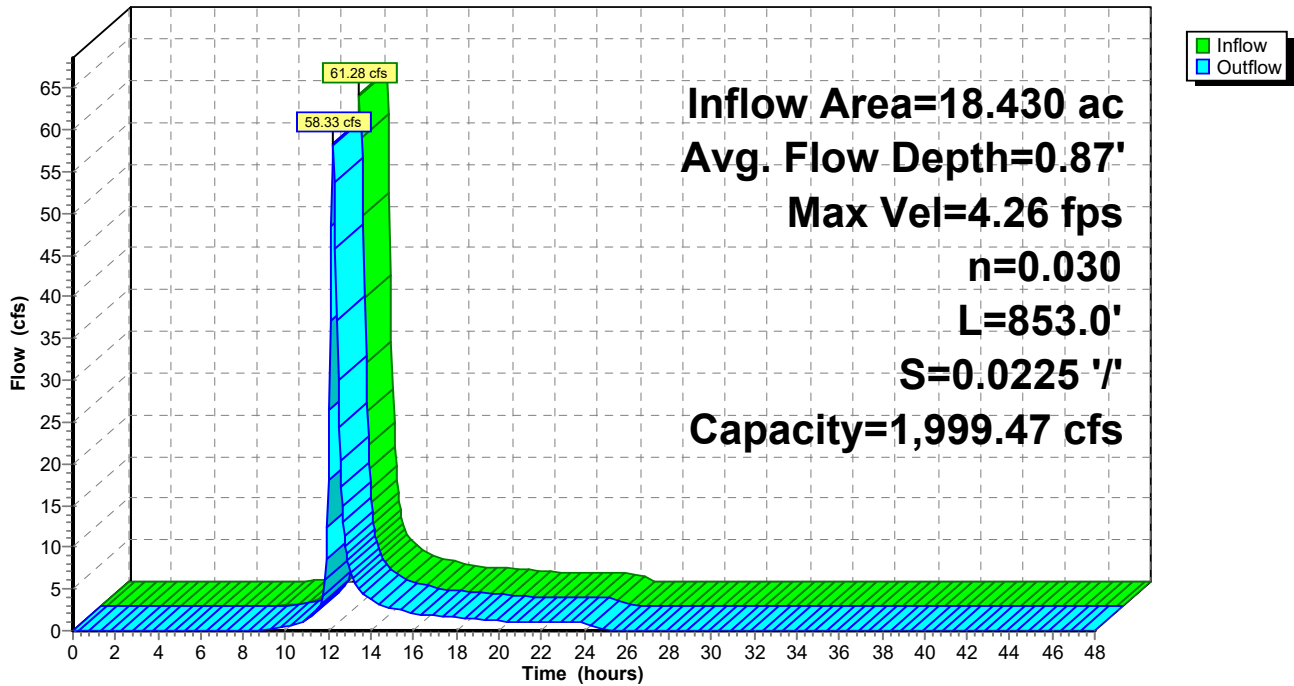Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30″
Printed 4/18/2022
Page 40

Reach 8R: REACH 1 (through Pipe System)

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
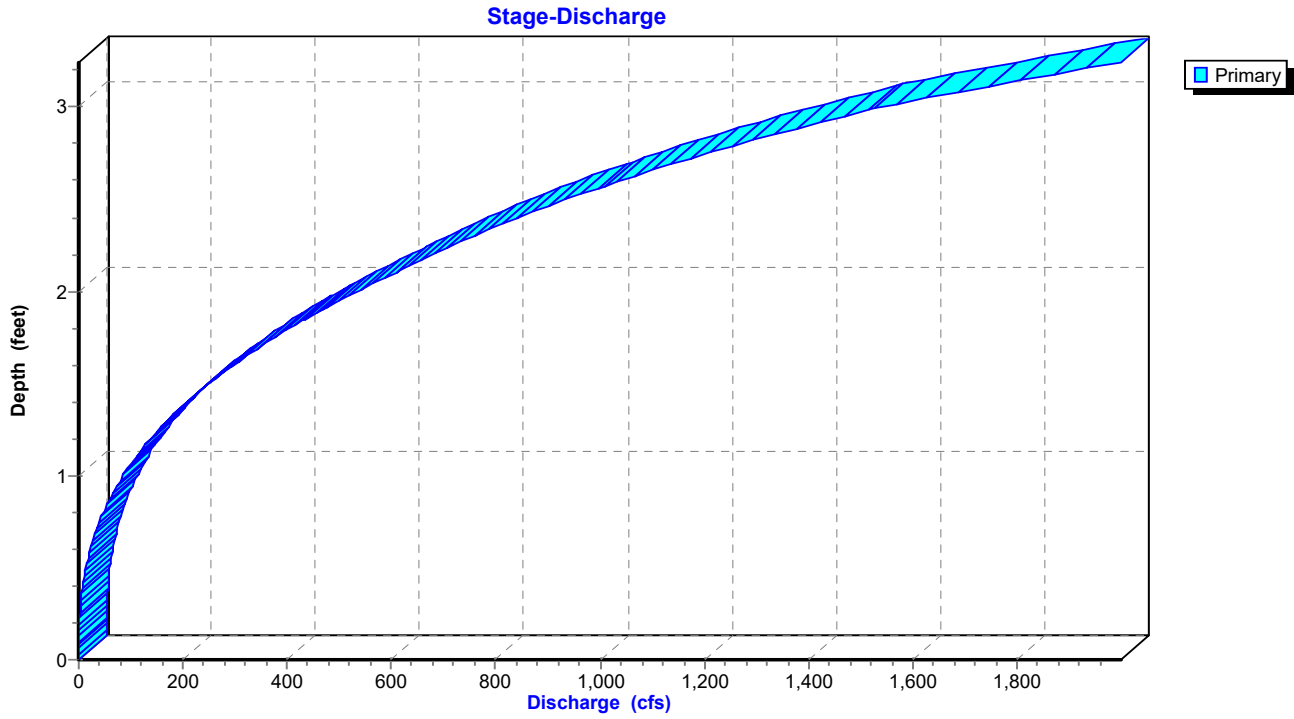Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
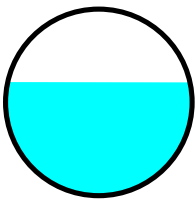Printed 4/18/2022
Page 41

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** 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
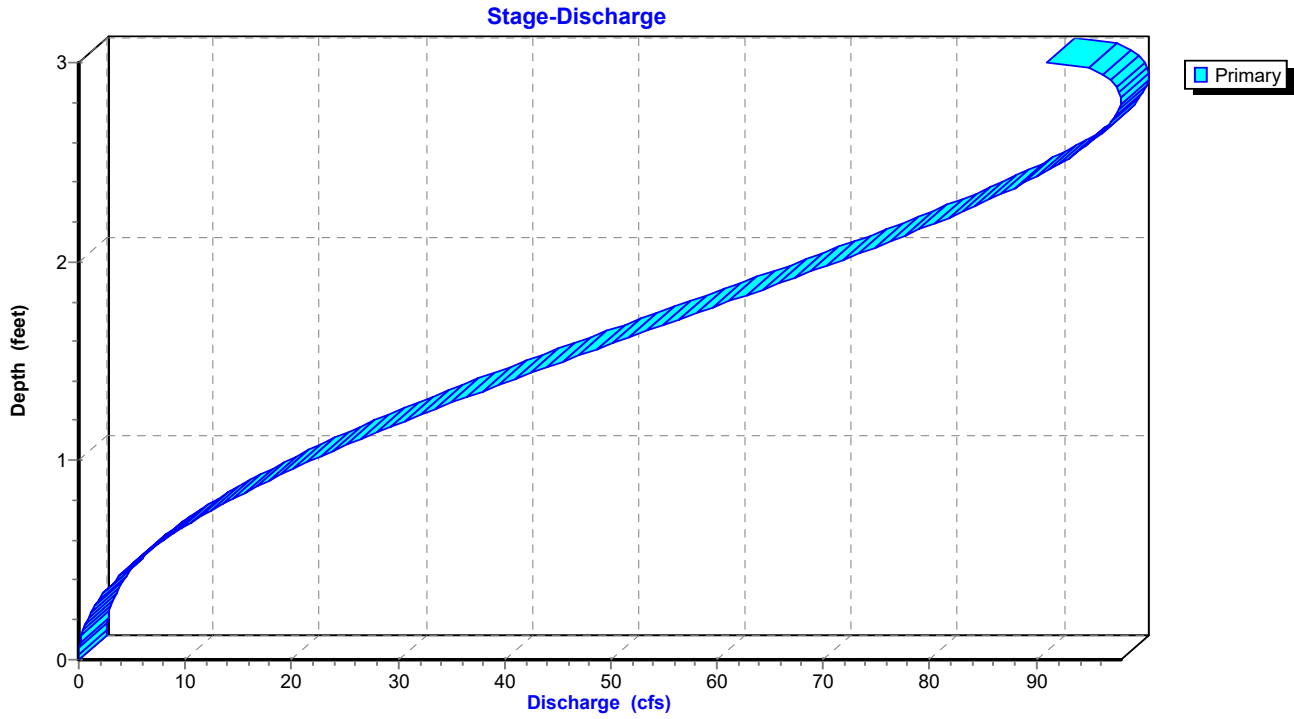Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 42

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

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.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 43

Pond 4P: EDDB #1 Cornerstone

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
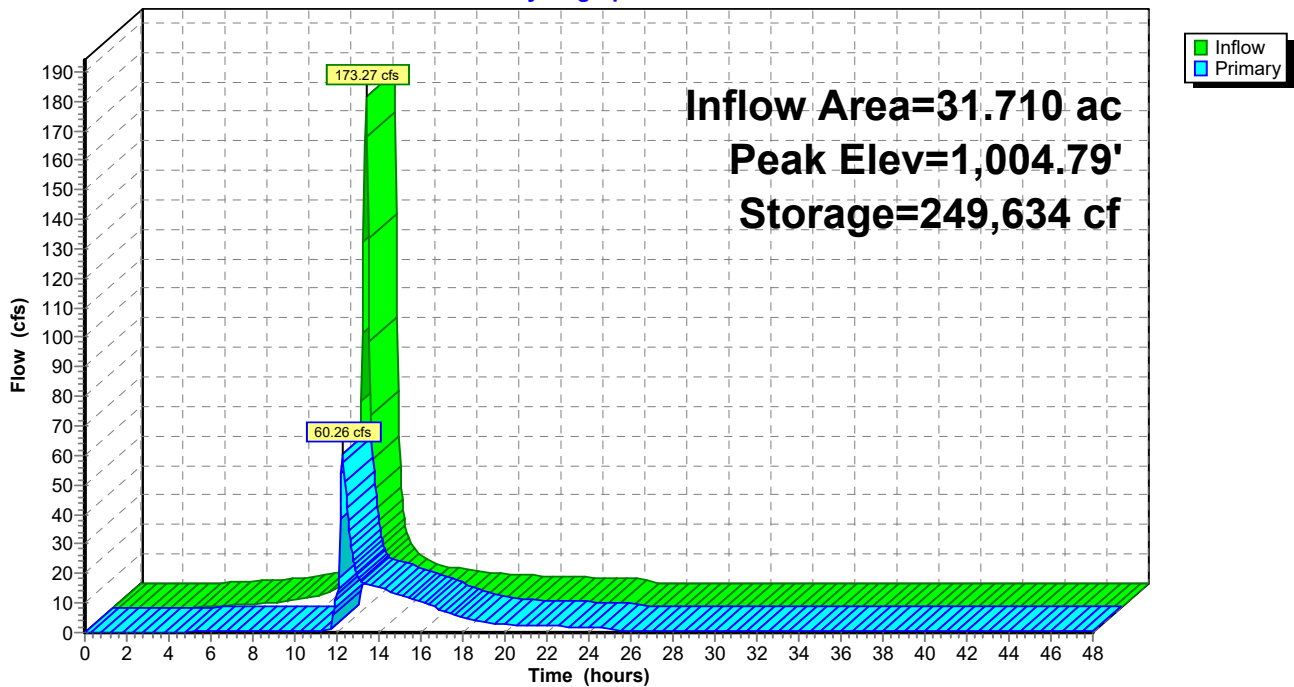*Type II 24-hr 10-Year Rainfall=5.30"*
Printed 4/18/2022
Page 44

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

21-130-HYDRO-PRO orifice plate option
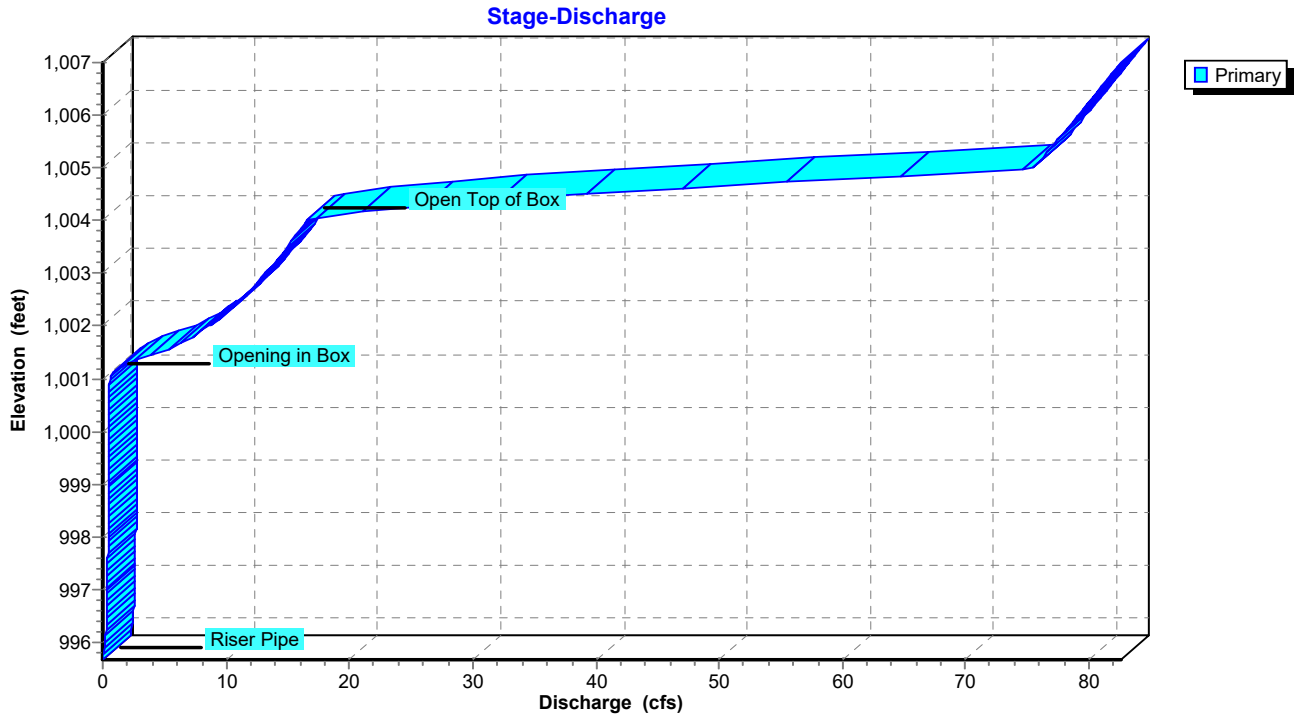Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 45

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 46

Pond 5P: EDDB #2 Manor

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 47

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
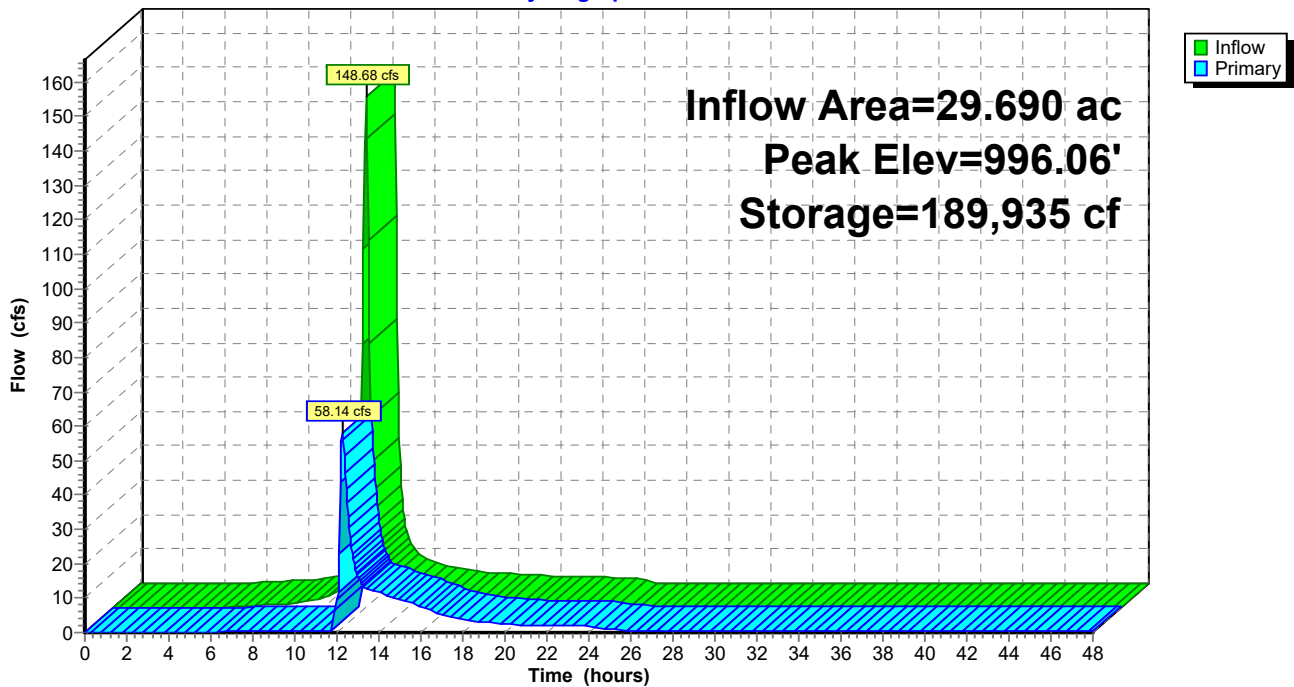*Type II 24-hr 10-Year Rainfall=5.30"*
Printed 4/18/2022
Page 48

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

21-130-HYDRO-PRO orifice plate option
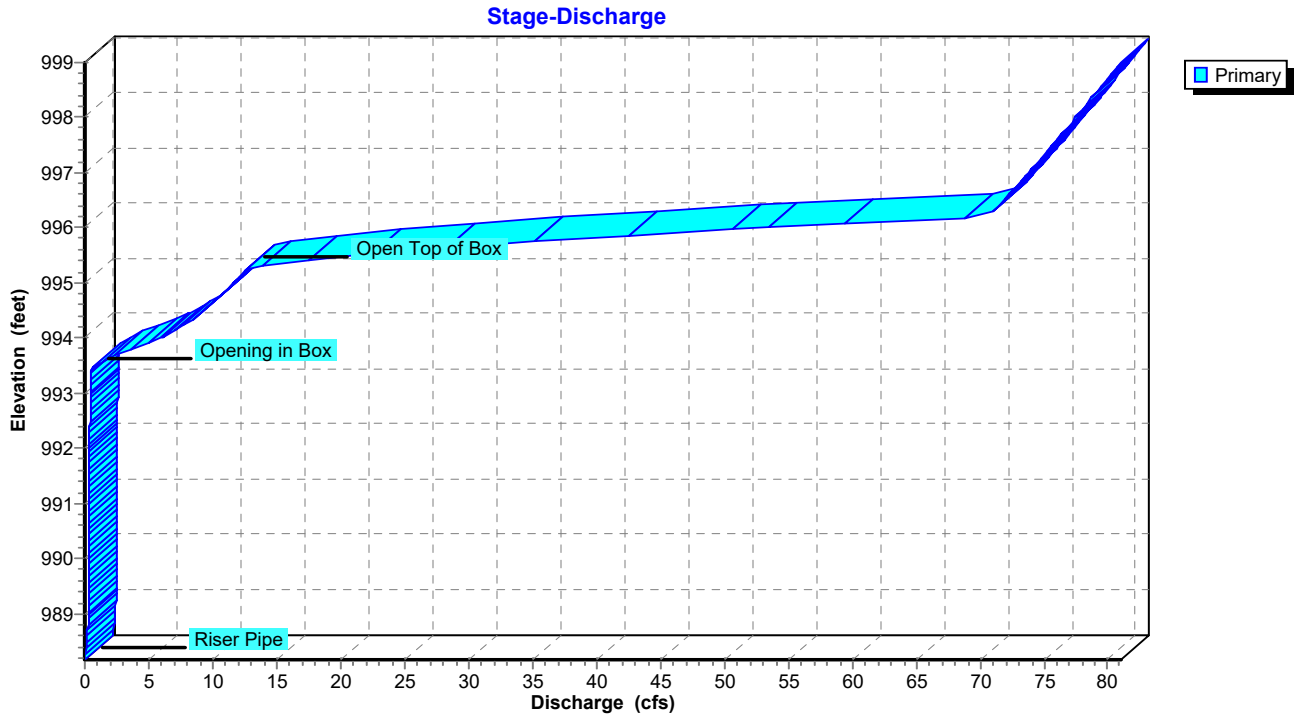Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
Printed 4/18/2022
Page 49

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 10-Year Rainfall=5.30"
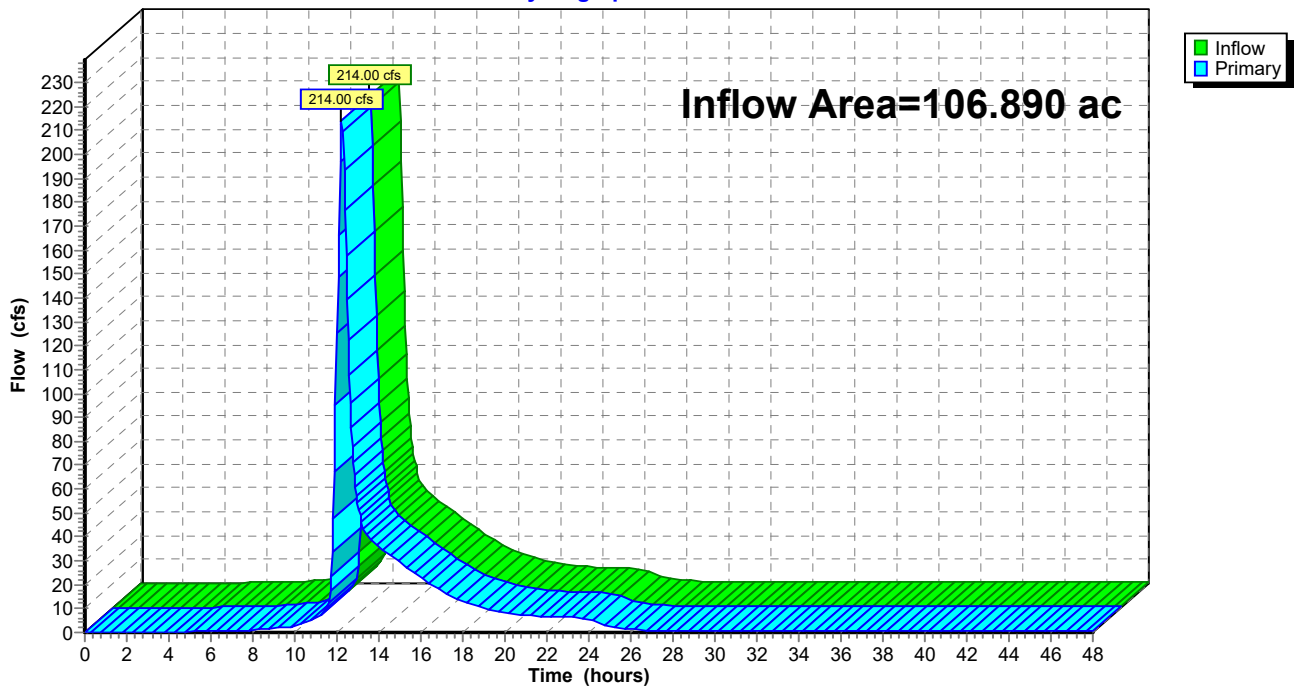Printed 4/18/2022
Page 50

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
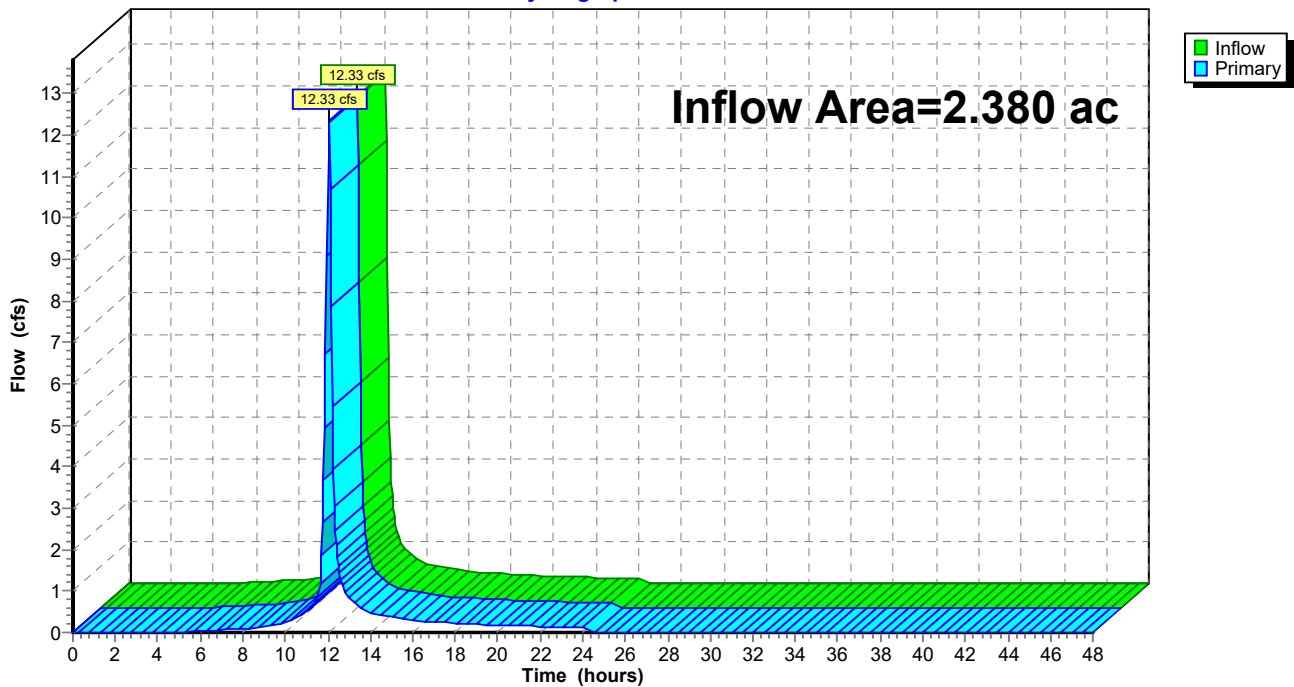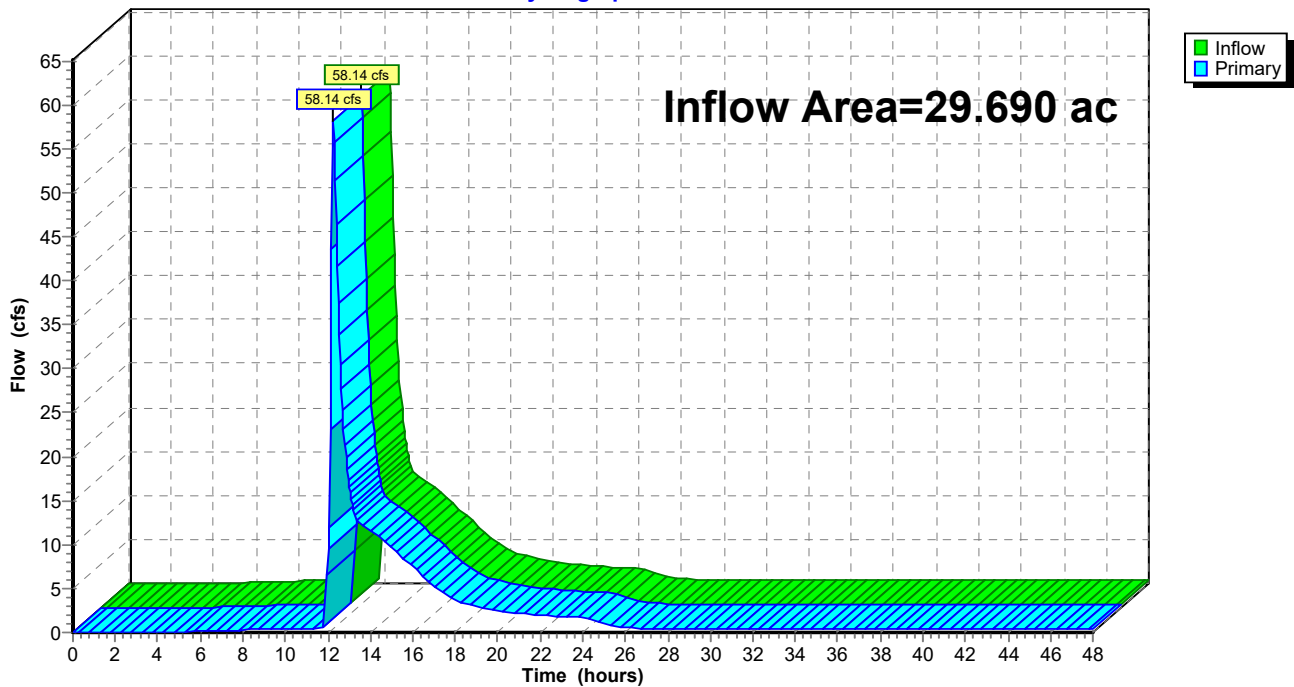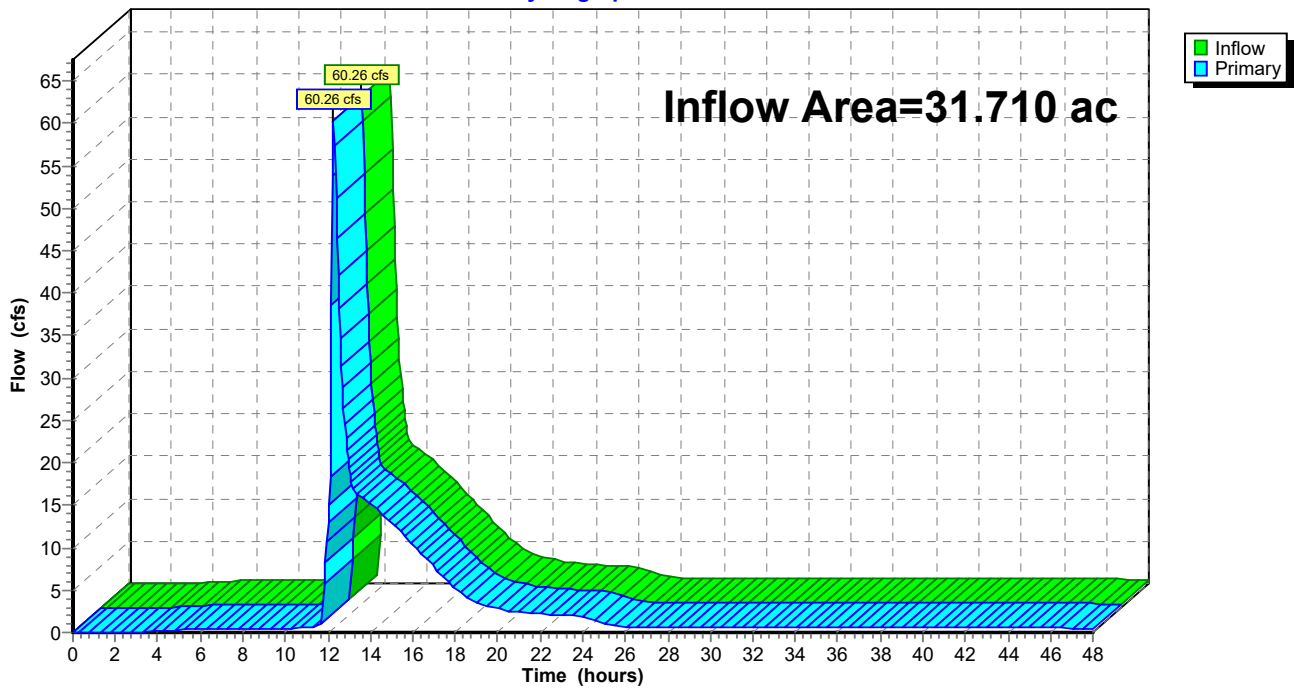Printed 4/18/2022
Page 51

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=6.75"
Flow Length=1,186' Slope=0.0250 '/' Tc=14.0 min CN=92 Runoff=260.19 cfs 17.828 af

Subcatchment3S: 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

Subcatchment5S: 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

Subcatchment6S: 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

Subcatchment7S: 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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 52

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 53

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

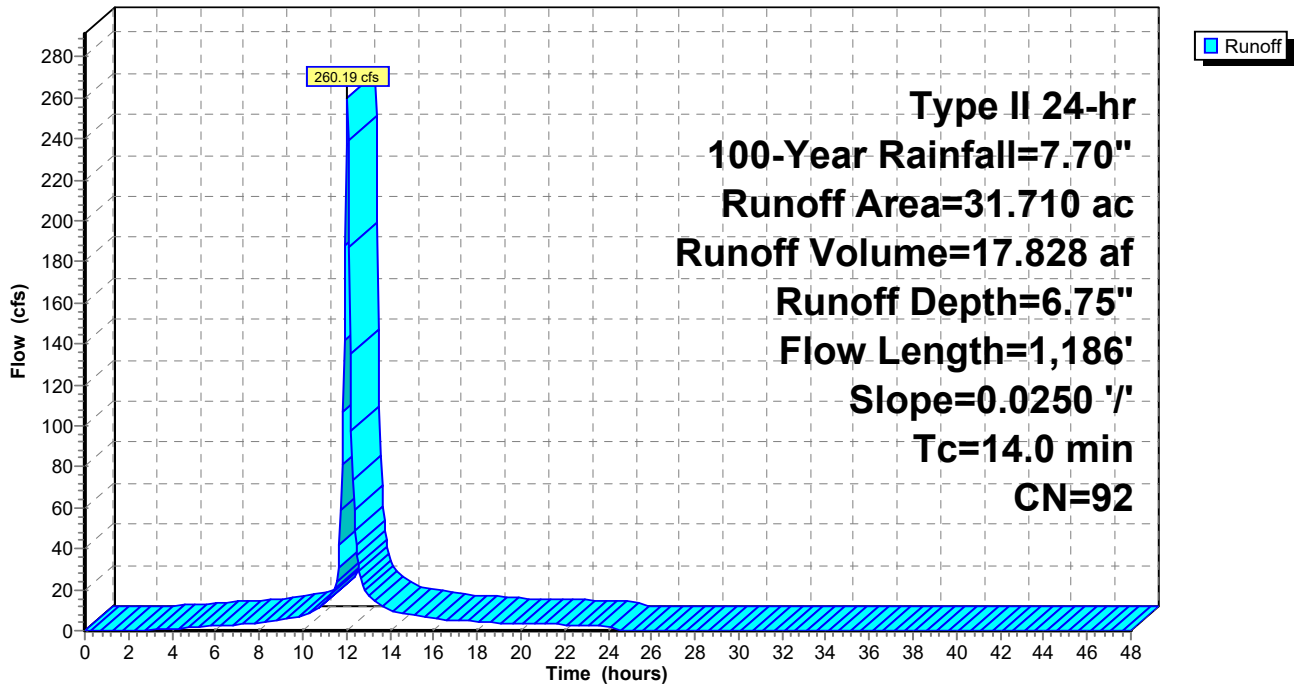Runoff   =   19.23 cfs @ 12.04 hrs, Volume=   1.221 af, Depth= 6.16"

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)

**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**

21-130-HYDRO-PRO orifice plate option

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"

Prepared by Schlagel and Assoc.
Printed 4/18/2022

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC
Page 54

Summary for Subcatchment 5S: OFF-SITE #1

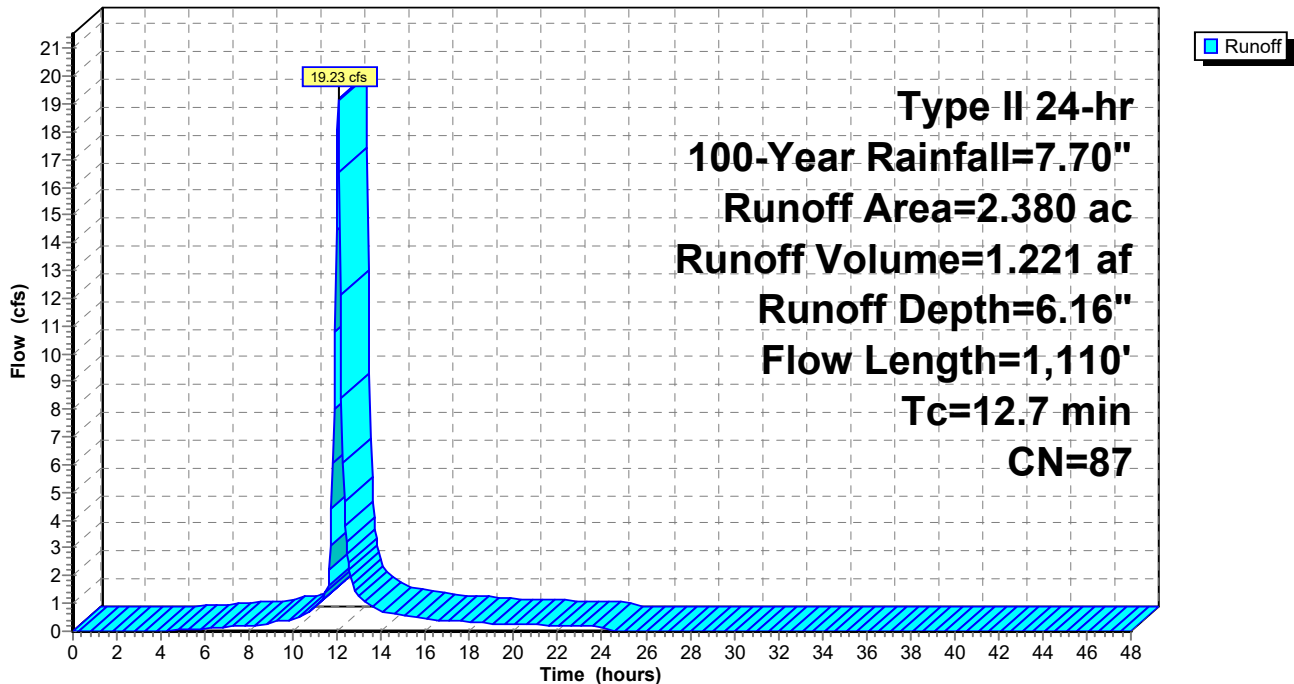Runoff   =   108.57 cfs @ 12.10 hrs, Volume=   7.679 af, Depth= 5.00"

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 55

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

Runoff   =   166.84 cfs @   12.07 hrs, Volume=   11.229 af, Depth= 5.46"
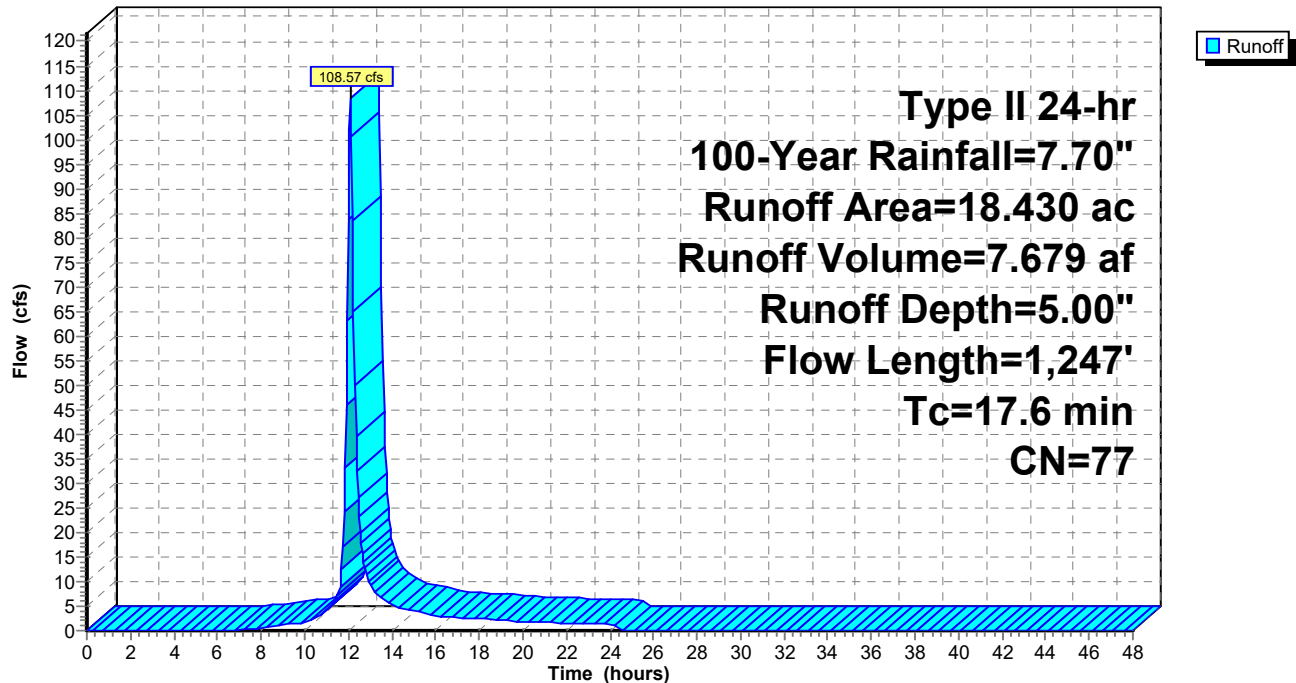
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

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

21-130-HYDRO-PRO orifice plate option

Prepared by Schlagel and Assoc.

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 56

Summary for Subcatchment 7S: ON-SITE #2

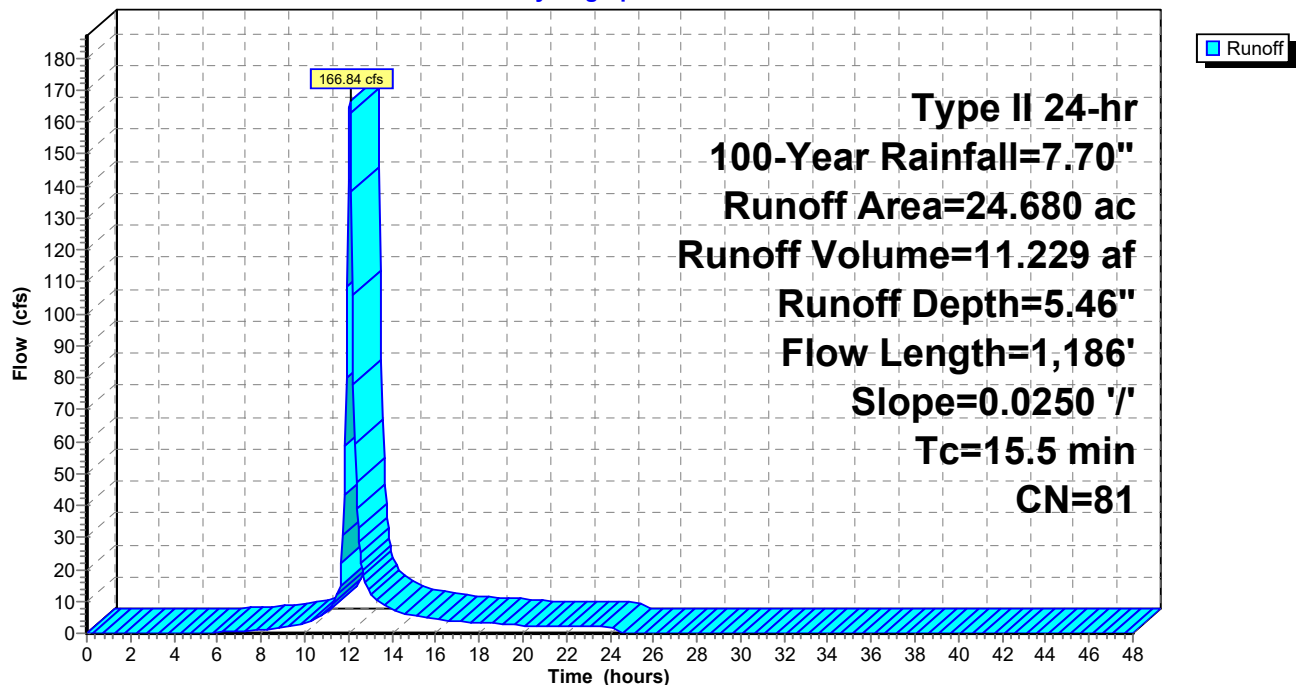Runoff   =   232.03 cfs @ 12.05 hrs, Volume=   15.236 af, Depth= 6.16"

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

21-130-HYDRO-PRO orifice plate option

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"

Prepared by Schlagel and Assoc.

Printed 4/18/2022

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Page 57

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

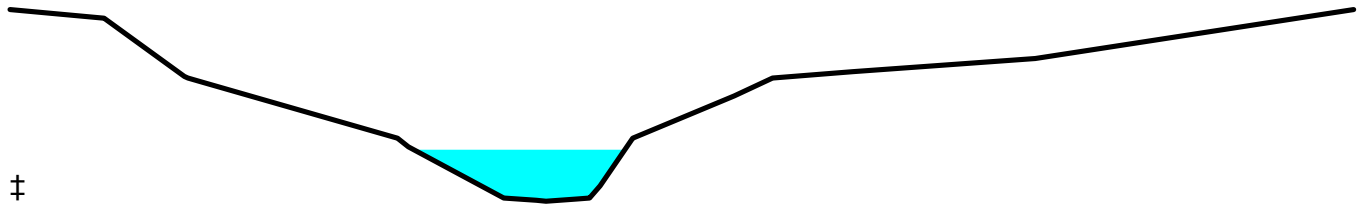Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.99 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 1.24 fps, Avg. Travel Time= 14.0 min

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

21-130-HYDRO-PRO orifice plate option

Prepared by Schlagel and Assoc.

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed

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

Printed 4/18/2022

Page 58

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 59

Reach 6R: Reach 3

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
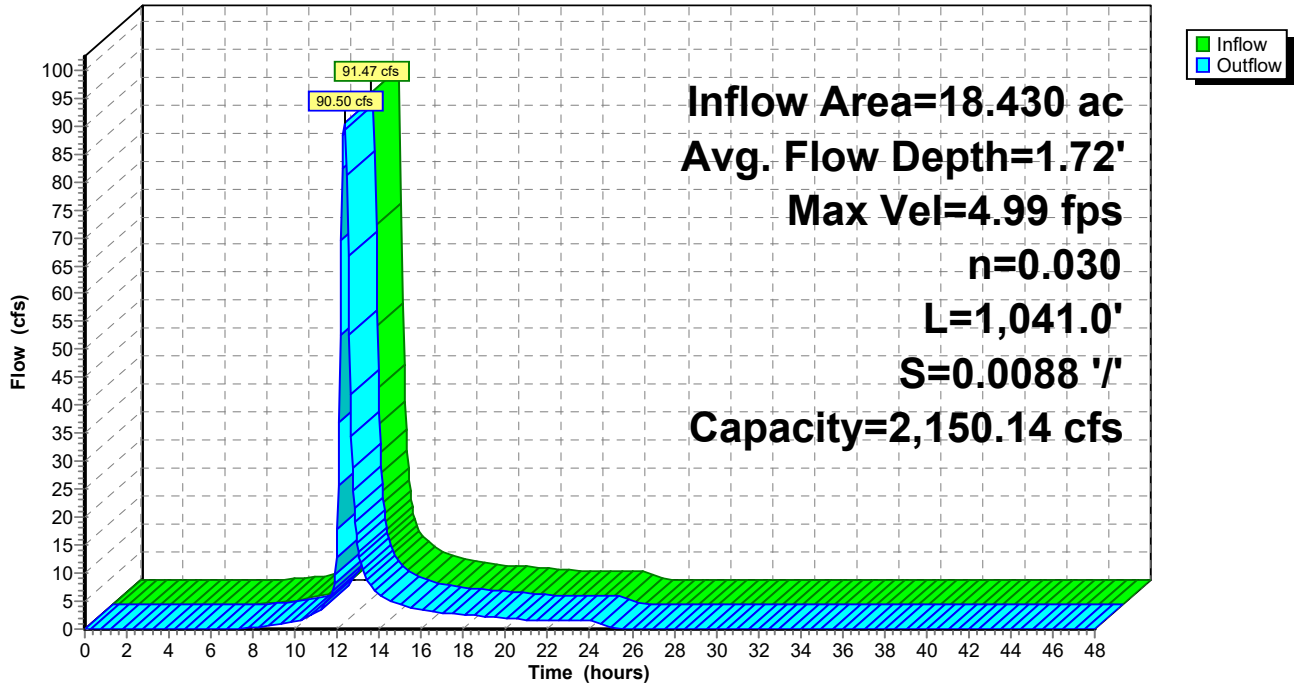*Type II 24-hr 100-Year Rainfall=7.70"*
Printed 4/18/2022
Page 60

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

21-130-HYDRO-PRO orifice plate option
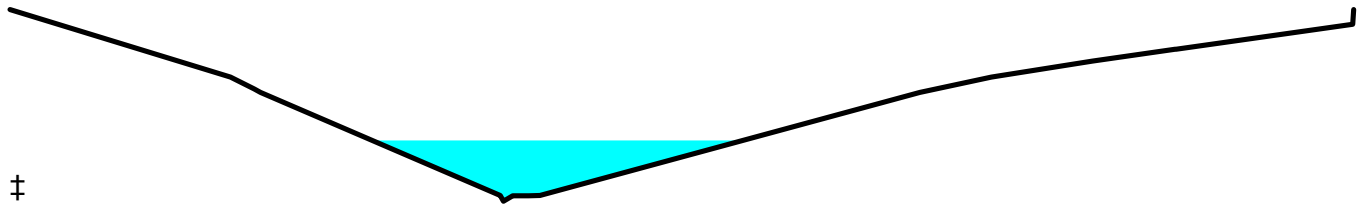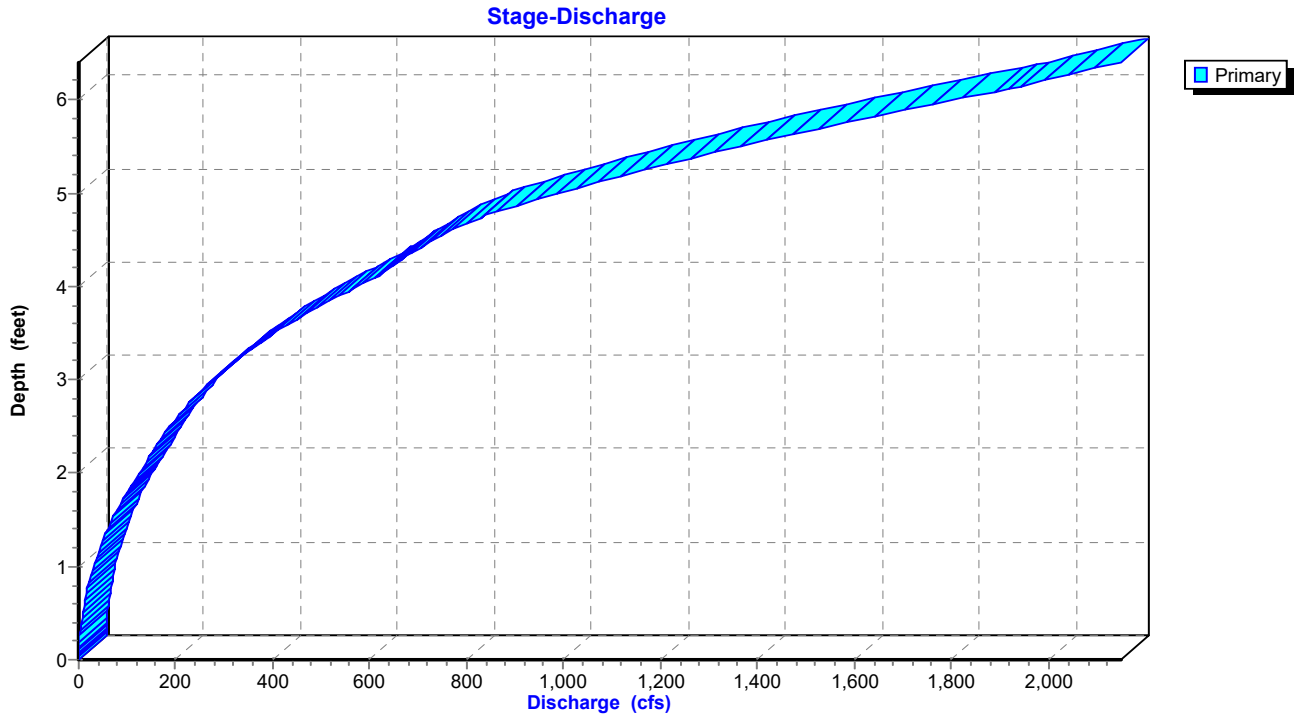Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 61

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

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

21-130-HYDRO-PRO orifice plate option

Bailey Farms - Developed

Prepared by Schlagel and Assoc.

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

Printed 4/18/2022

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Page 62

Reach 7R: Reach 2

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
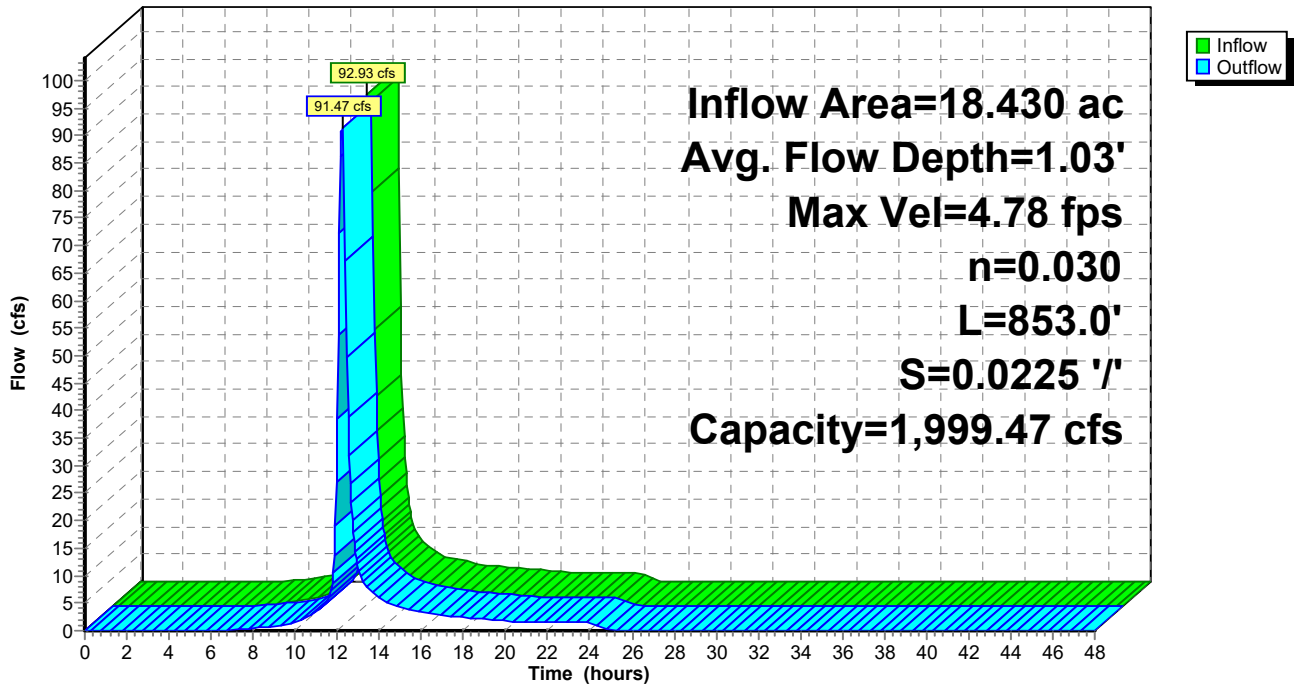*Type II 24-hr 100-Year Rainfall=7.70"*
Printed 4/18/2022
Page 63

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)

**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**
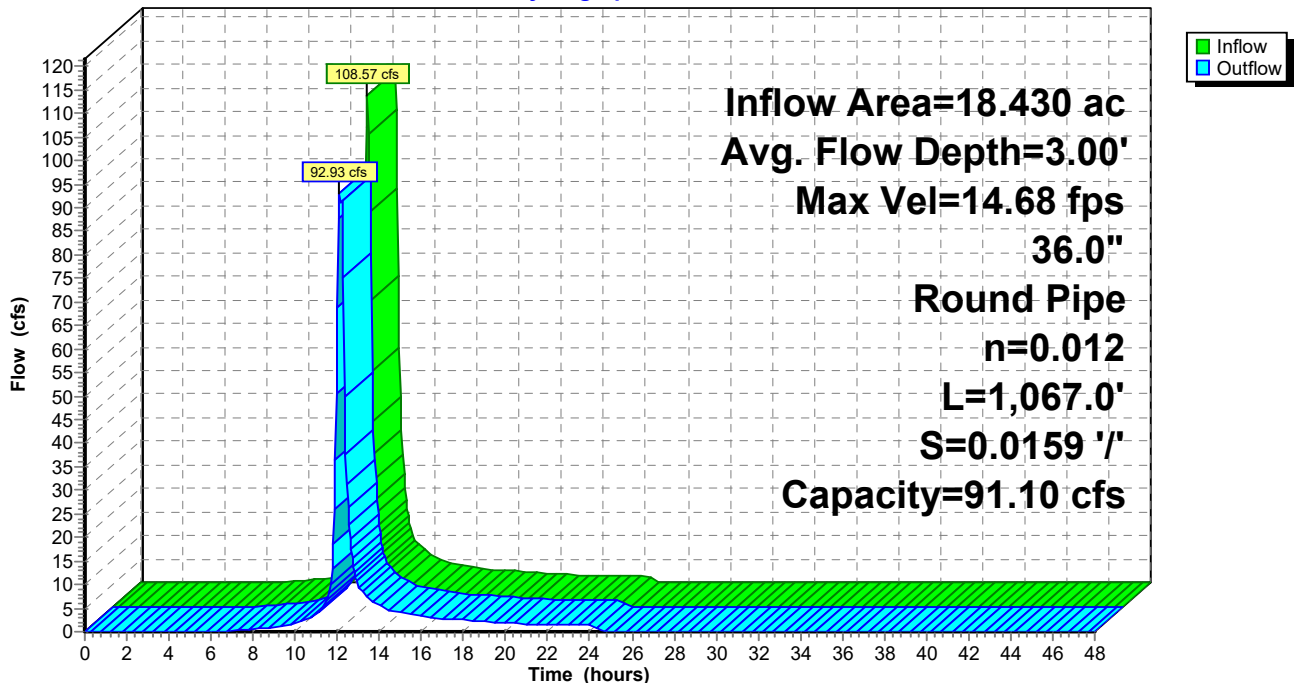
21-130-HYDRO-PRO orifice plate option
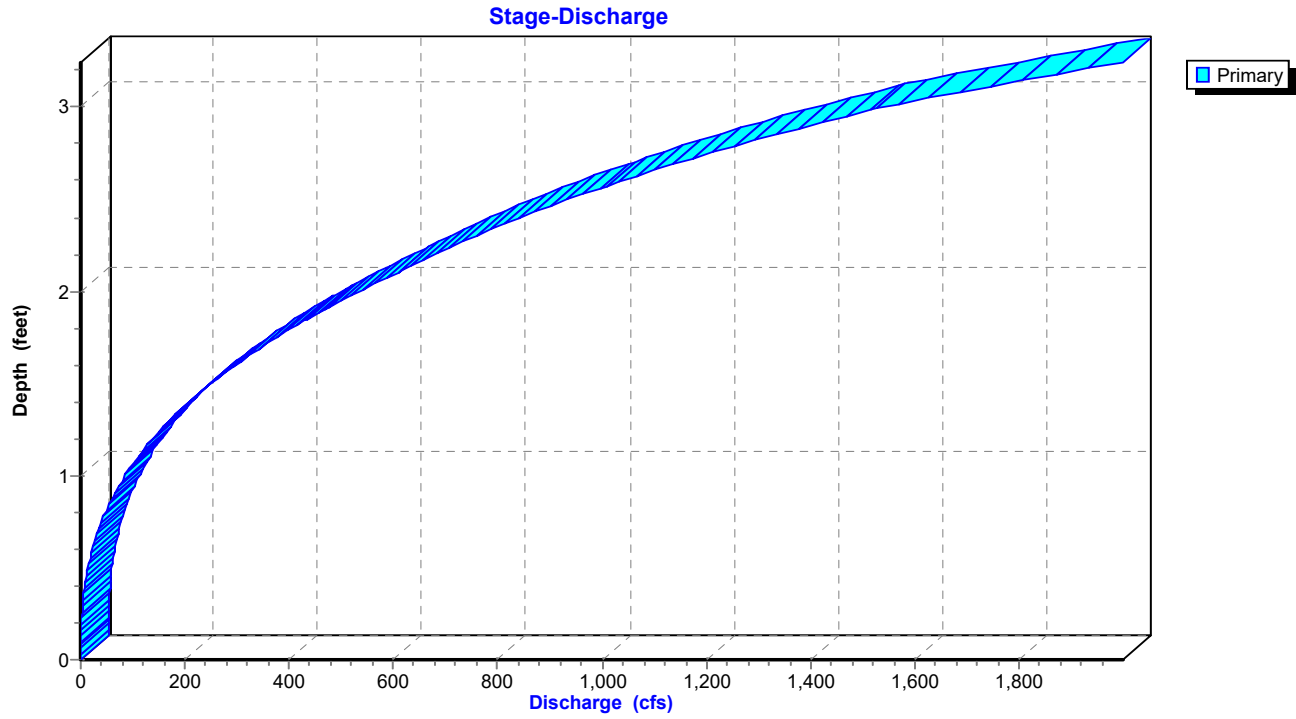Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
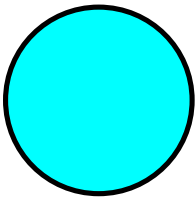Printed 4/18/2022
Page 64

Reach 8R: REACH 1 (through Pipe System)

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 65

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
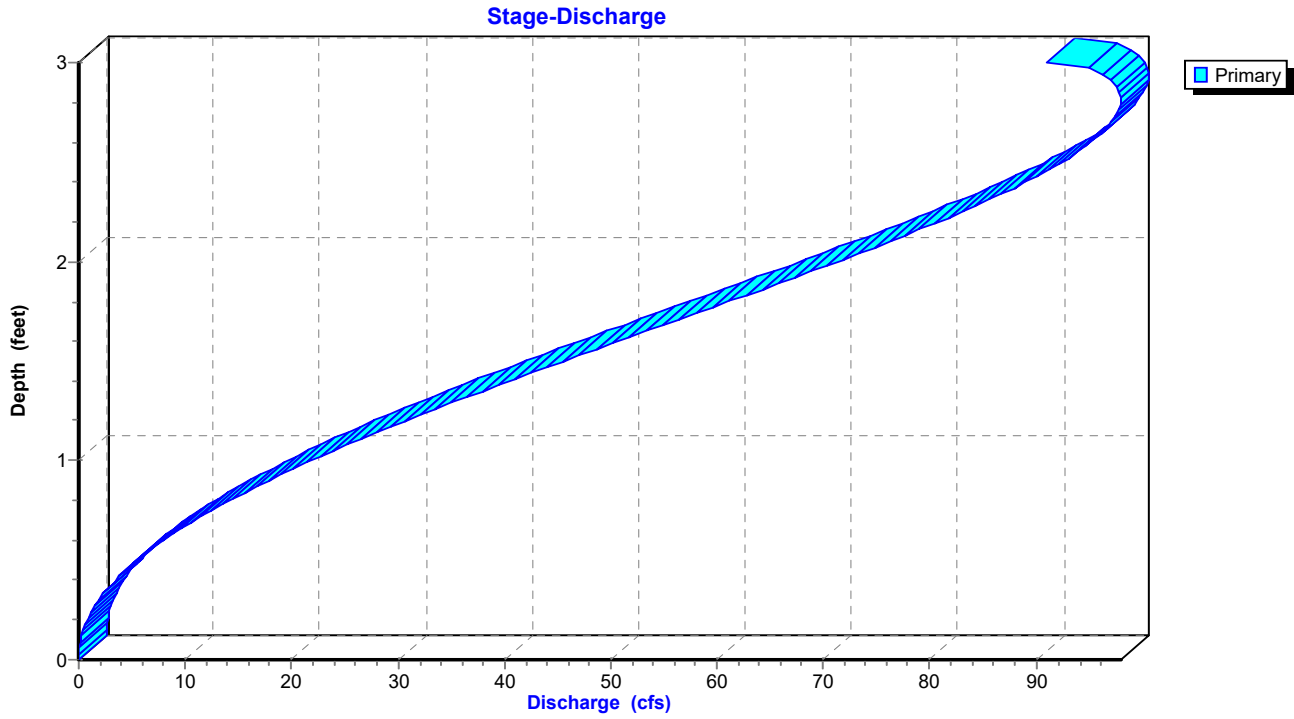Primary   =   81.35 cfs @ 12.29 hrs, Volume=   16.846 af

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

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"

Prepared by Schlagel and Assoc.

Printed 4/18/2022

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Page 66

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

Hydrograph

Inflow Area=31.710 ac
Peak Elev=1,006.64'
Storage=352,702 cf

260.19 cfs

81.35 cfs

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 67

Pond 4P: EDDB #1 Cornerstone

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
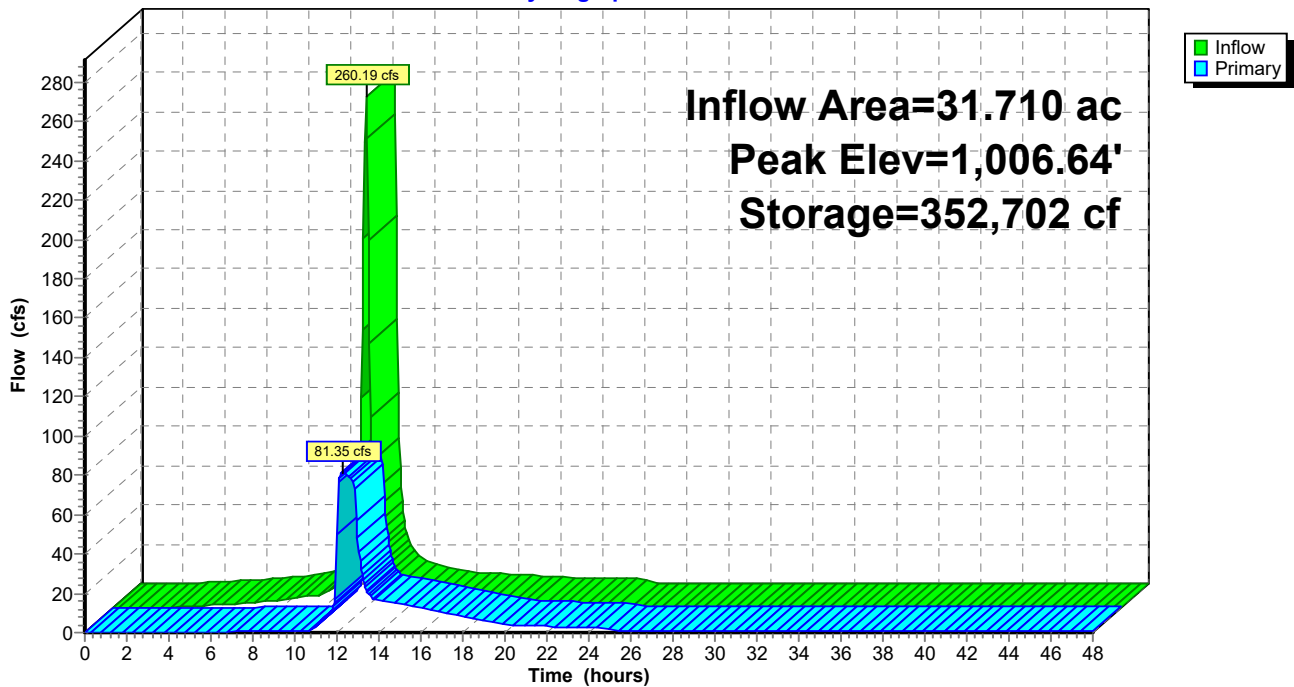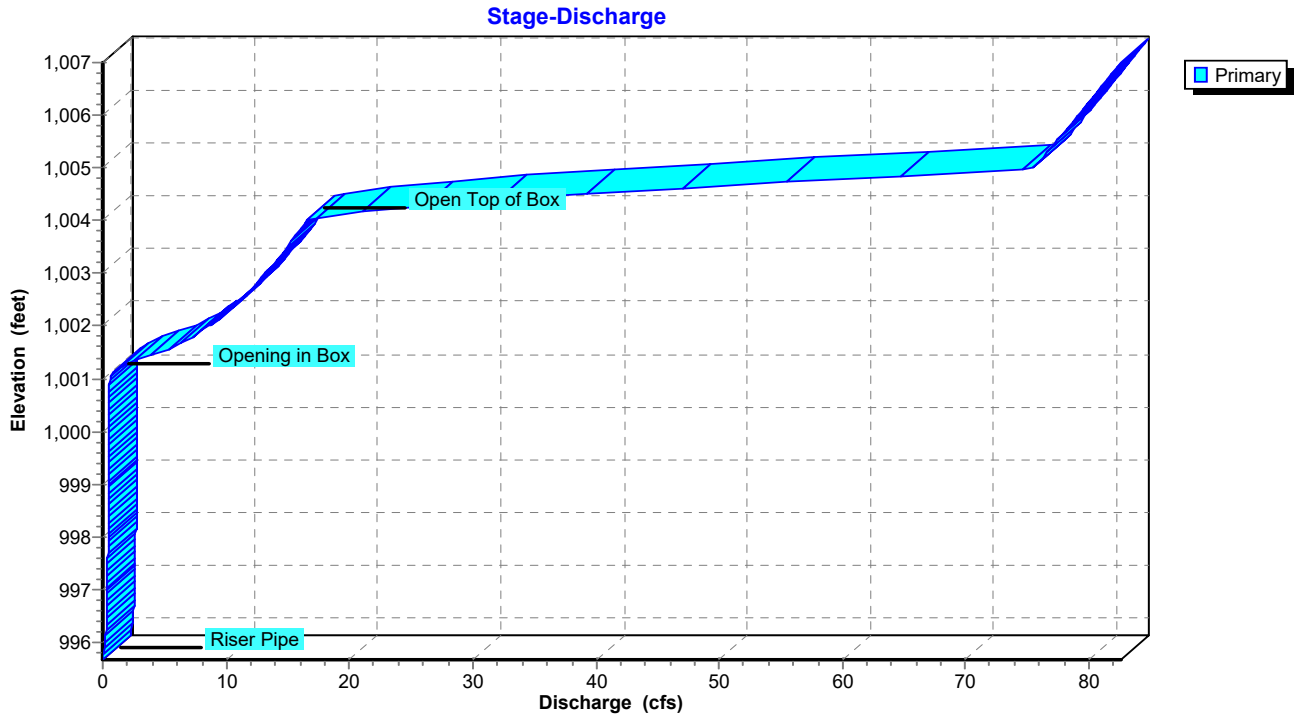*Type II 24-hr 100-Year Rainfall=7.70"*
Printed 4/18/2022
Page 68

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
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 69

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 70

Pond 5P: EDDB #2 Manor

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
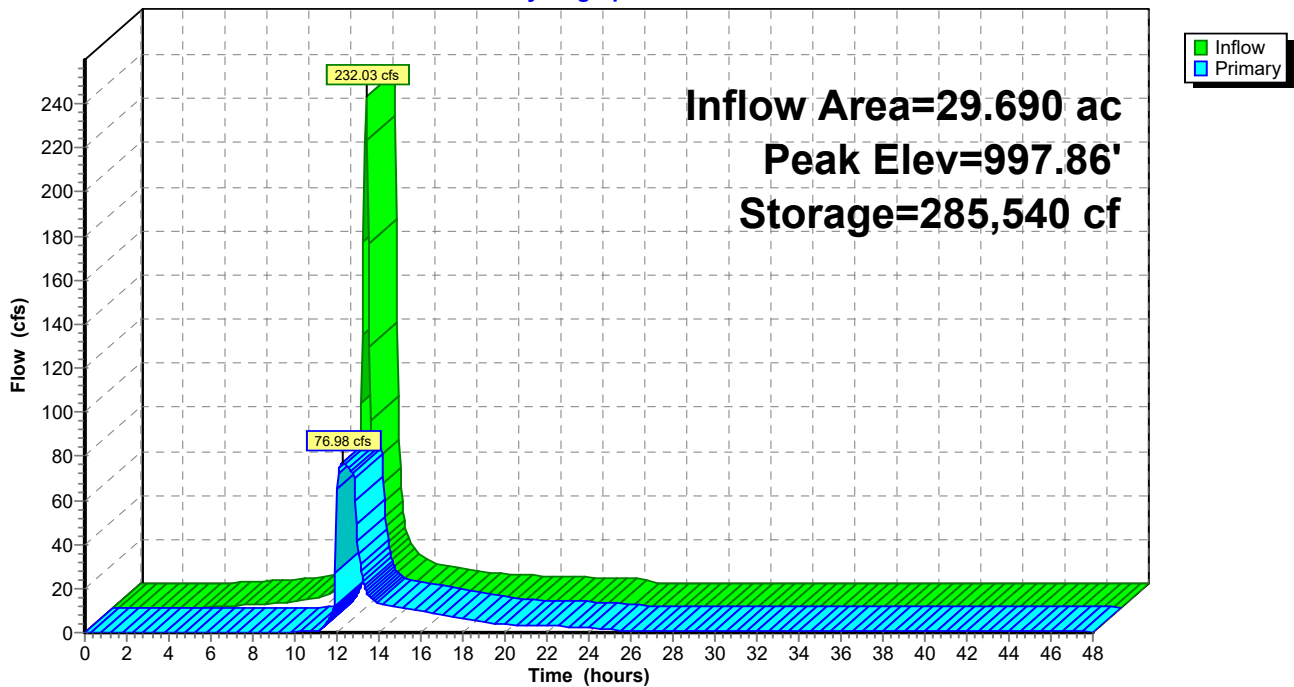*Type II 24-hr 100-Year Rainfall=7.70"*
Printed 4/18/2022
Page 71

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

21-130-HYDRO-PRO orifice plate option
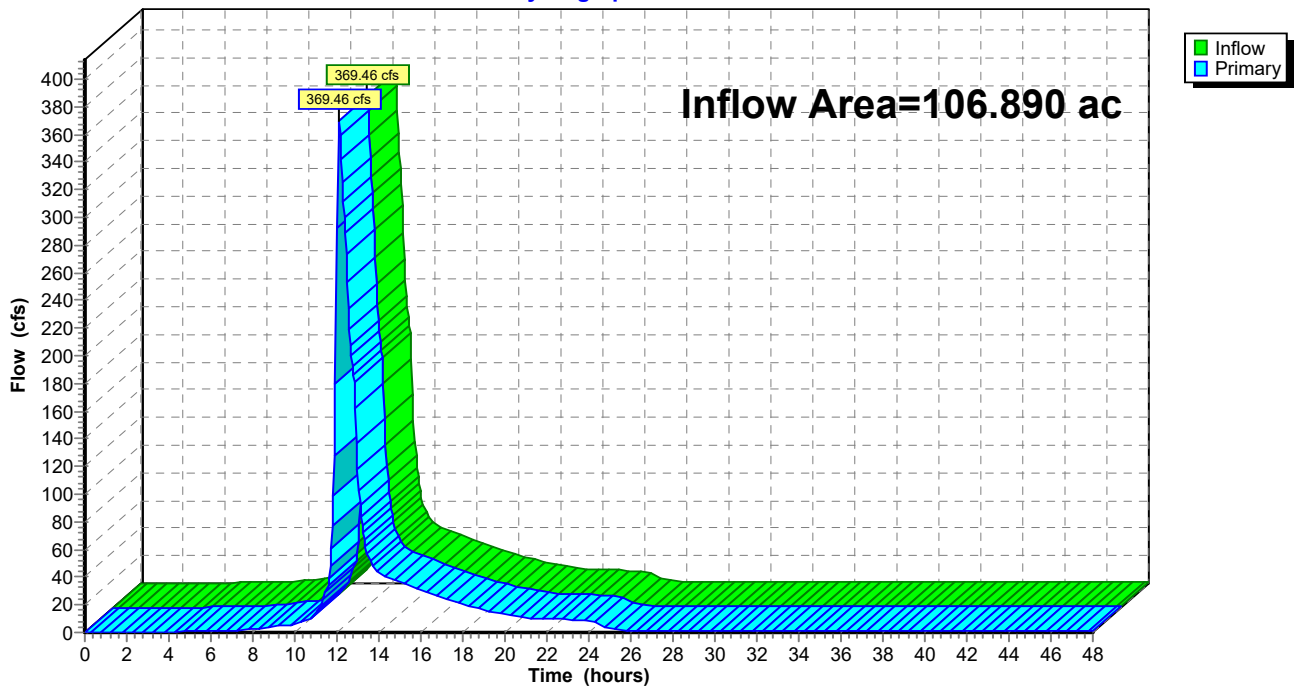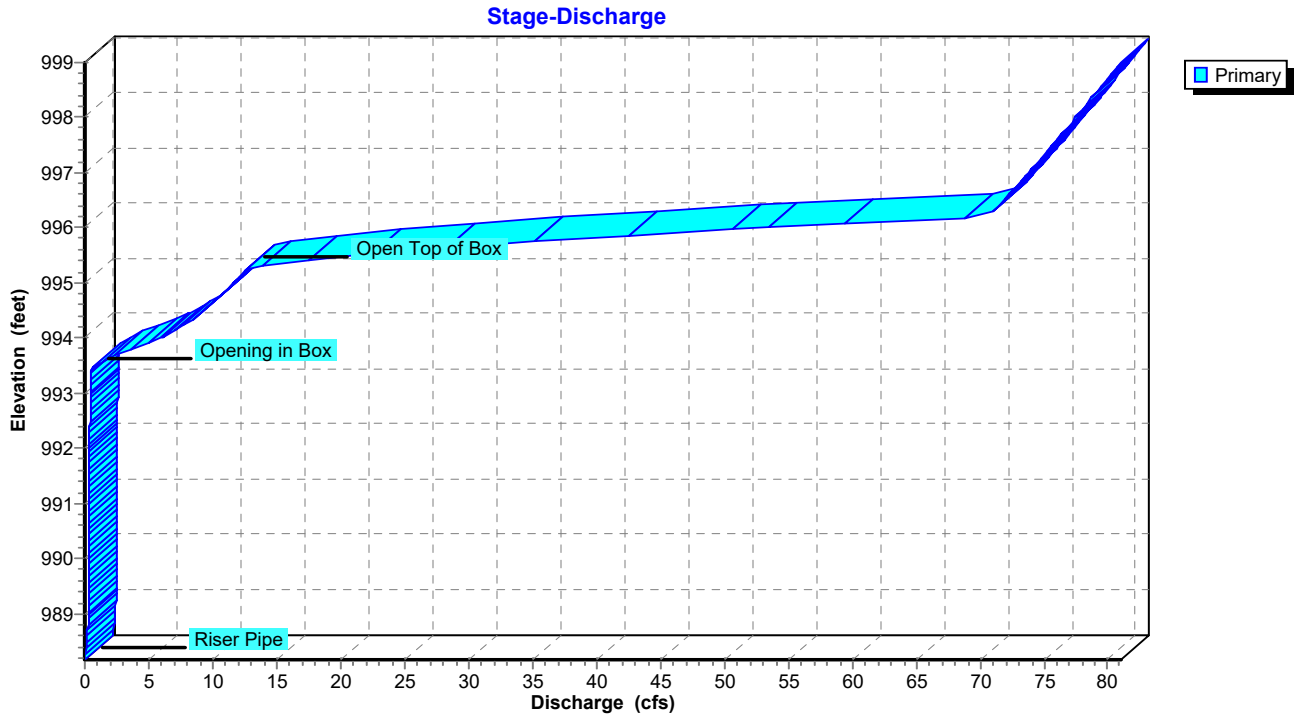Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 72

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.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 73

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
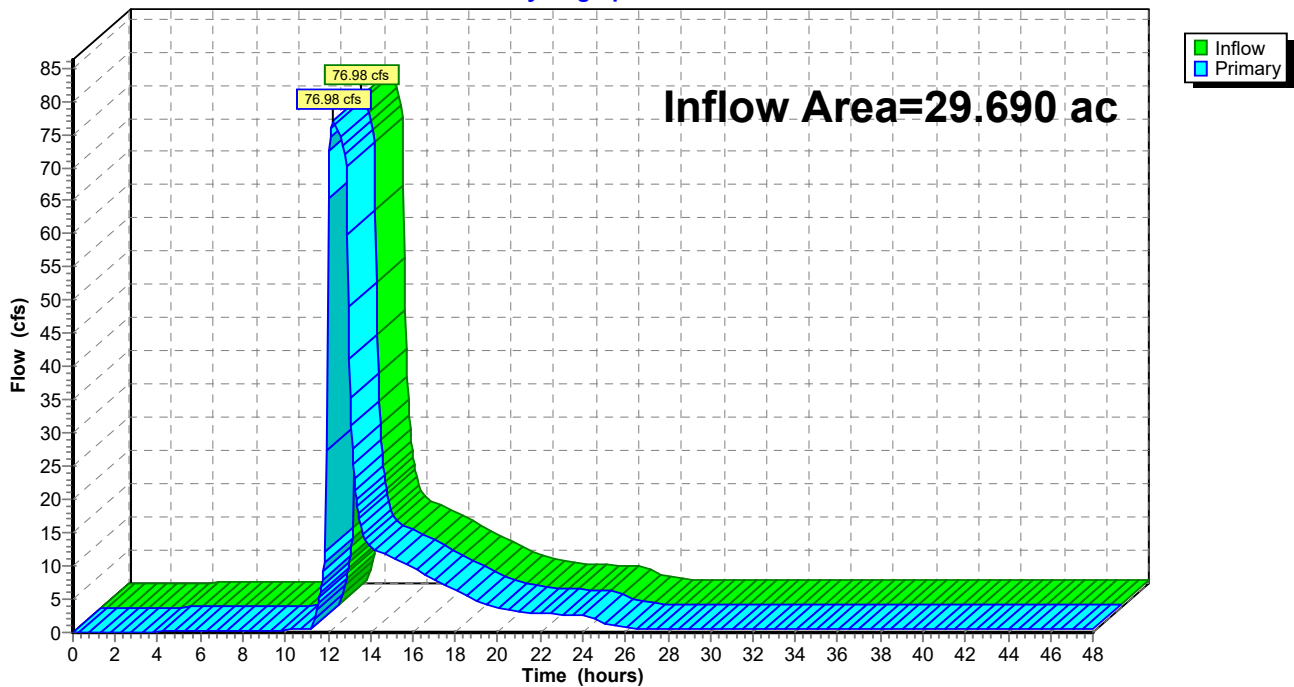
21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr 100-Year Rainfall=7.70"
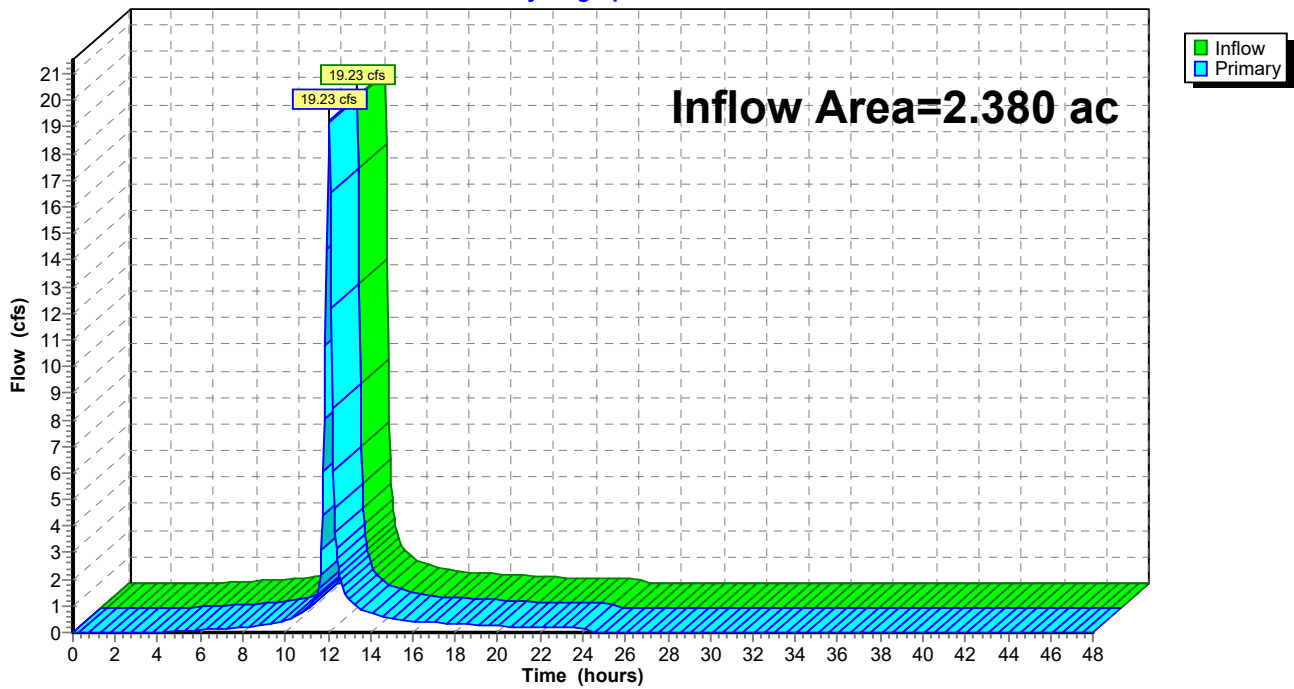Printed 4/18/2022
Page 74

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 75
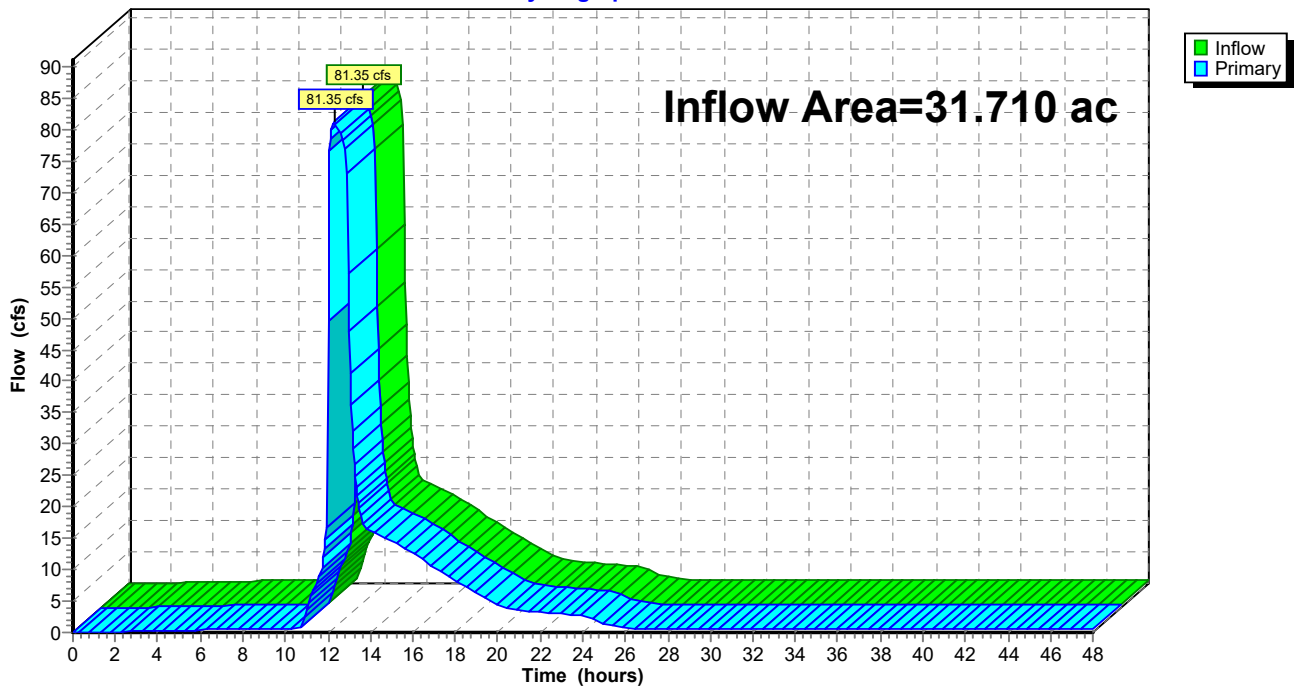
Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: ON-SITE #1   Runoff Area=31.710 ac 26.16% Impervious Runoff Depth=0.69"
                    Flow Length=1,186' Slope=0.0250 '/' Tc=14.0 min CN=92 Runoff=29.17 cfs 1.830 af

Subcatchment3S: 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

Subcatchment5S: 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

Subcatchment6S: 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

Subcatchment7S: 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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 76

Summary for Subcatchment 1S: ON-SITE #1

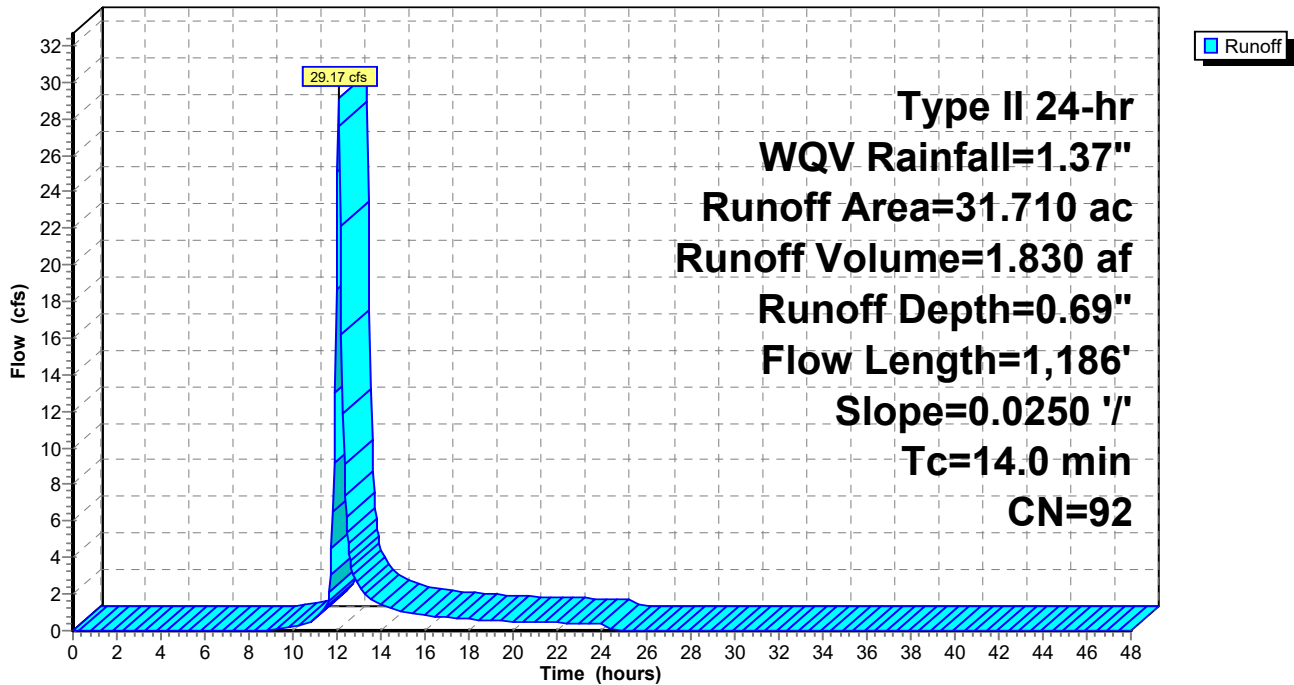Runoff   =   29.17 cfs @ 12.06 hrs, Volume=   1.830 af, Depth= 0.69"

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 77

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

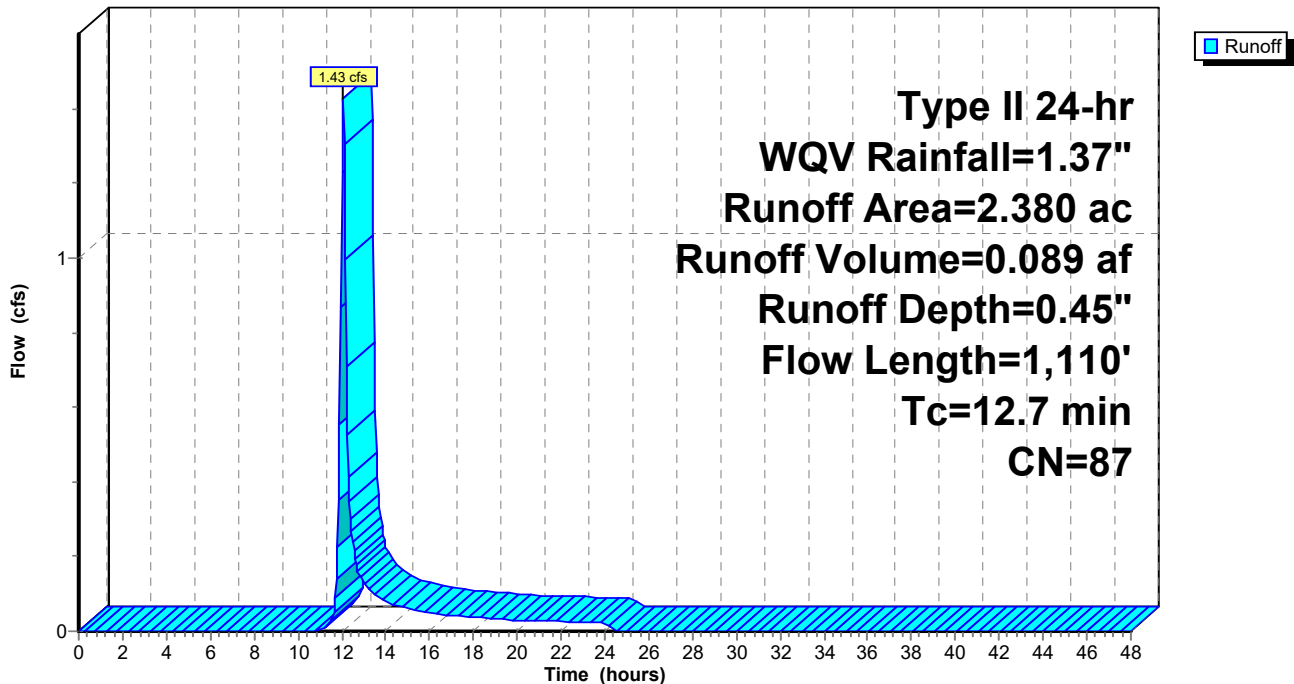Runoff   =   1.43 cfs @   12.06 hrs, Volume=   0.089 af, Depth= 0.45"

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 78

Summary for Subcatchment 5S: OFF-SITE #1

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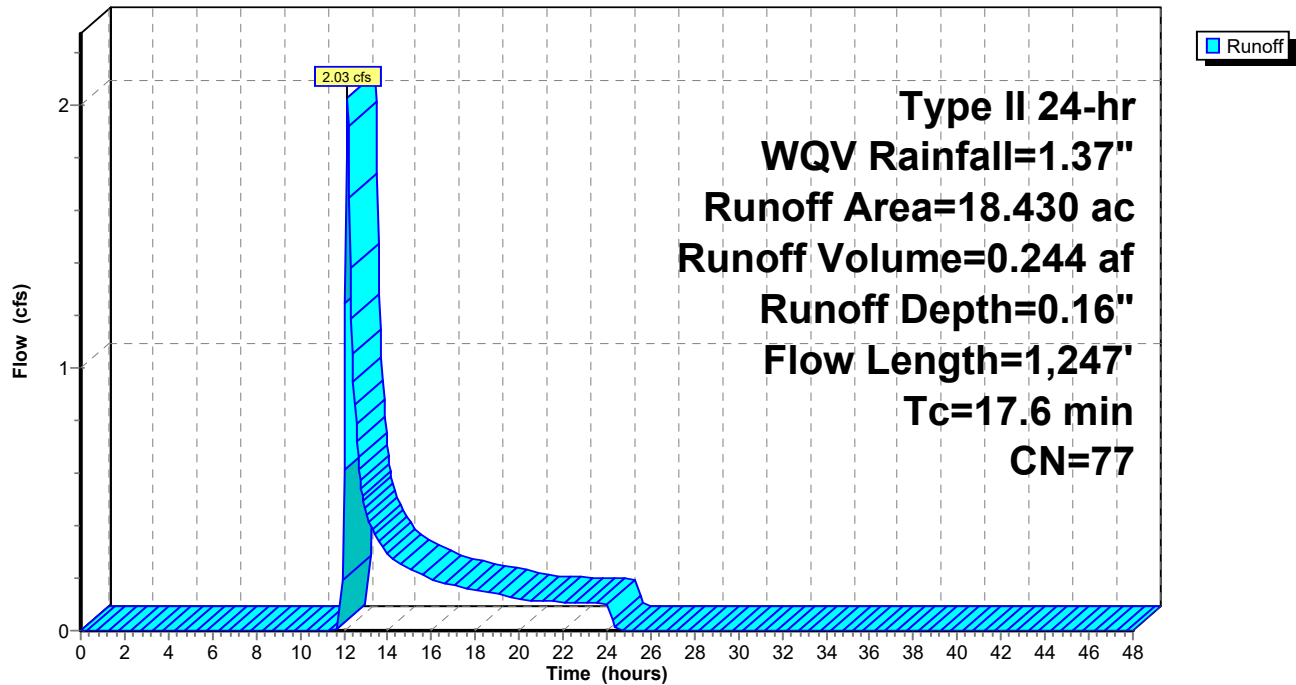
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr WQV Rainfall=1.37"

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 79

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

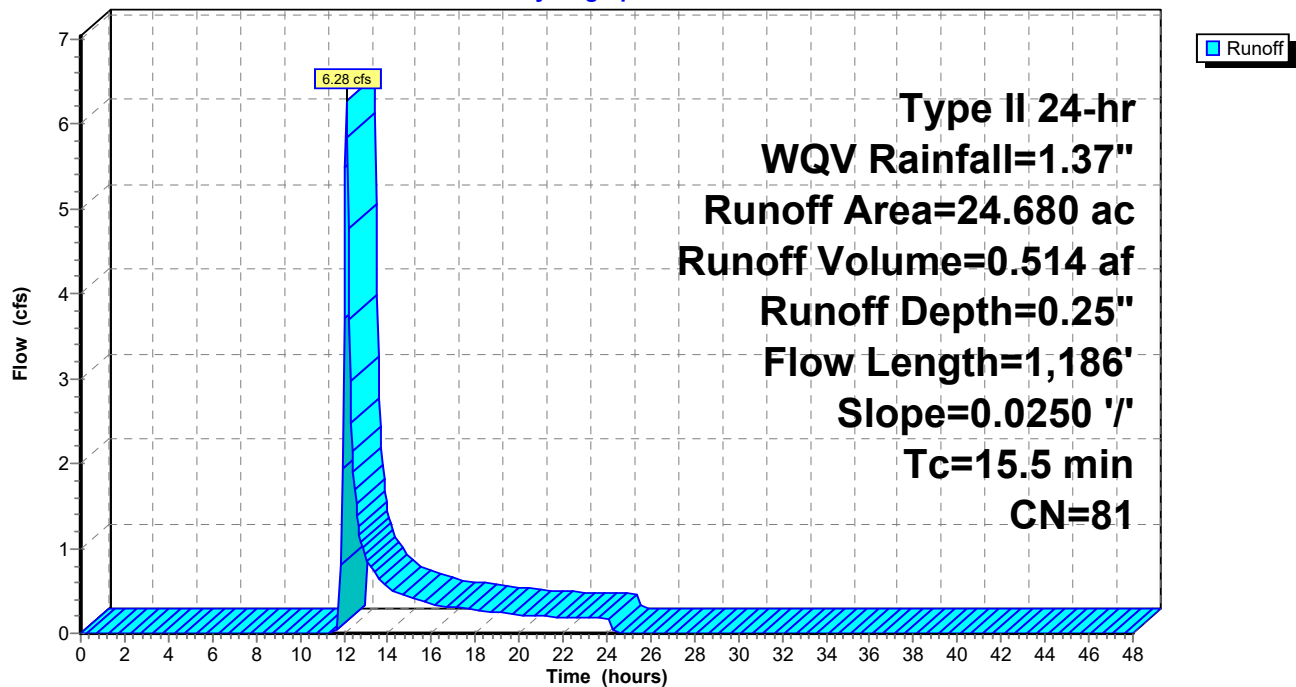Runoff   =   6.28 cfs @ 12.11 hrs, Volume=   0.514 af, Depth= 0.25"

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 80

Summary for Subcatchment 7S: ON-SITE #2

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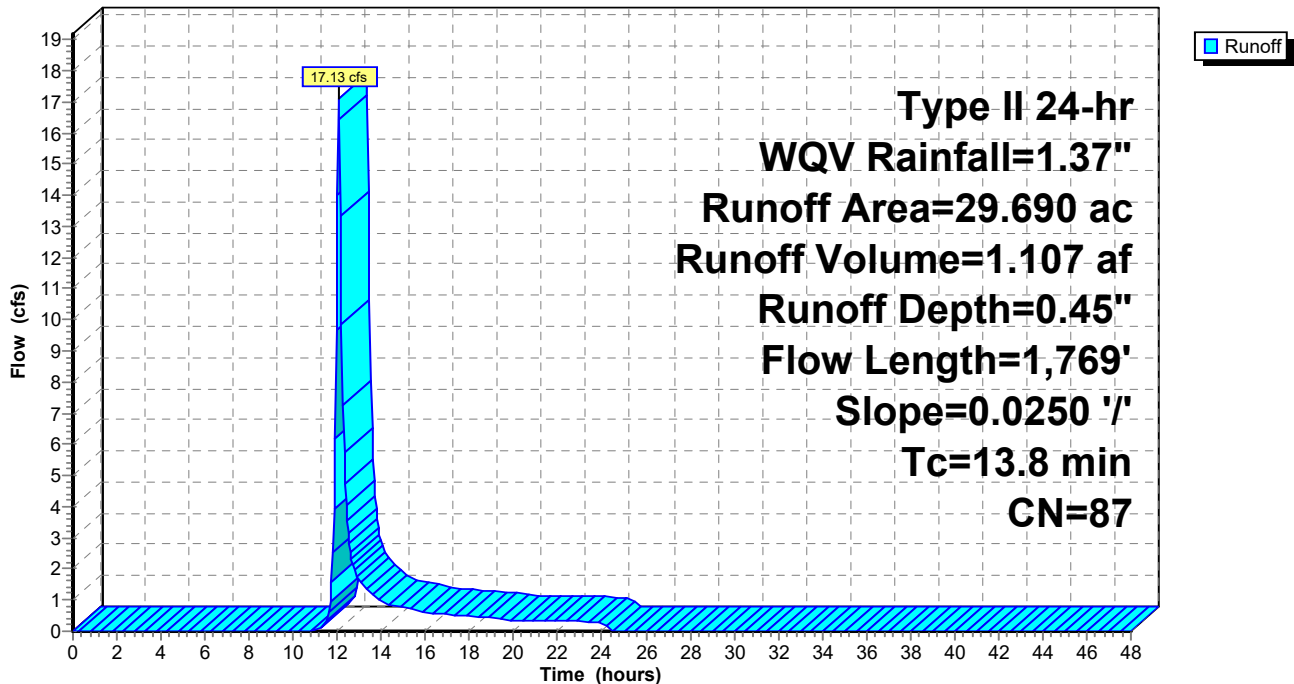
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr WQV Rainfall=1.37"

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

21-130-HYDRO-PRO orifice plate option

Prepared by Schlagel and Assoc.

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed

Type II 24-hr WQV Rainfall=1.37"

Printed 4/18/2022

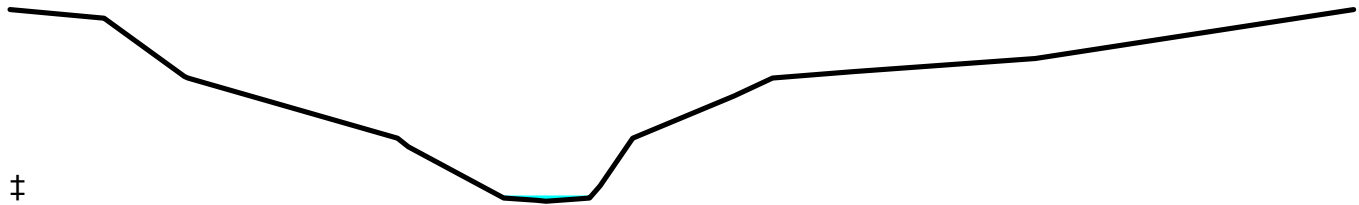Page 81

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 (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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
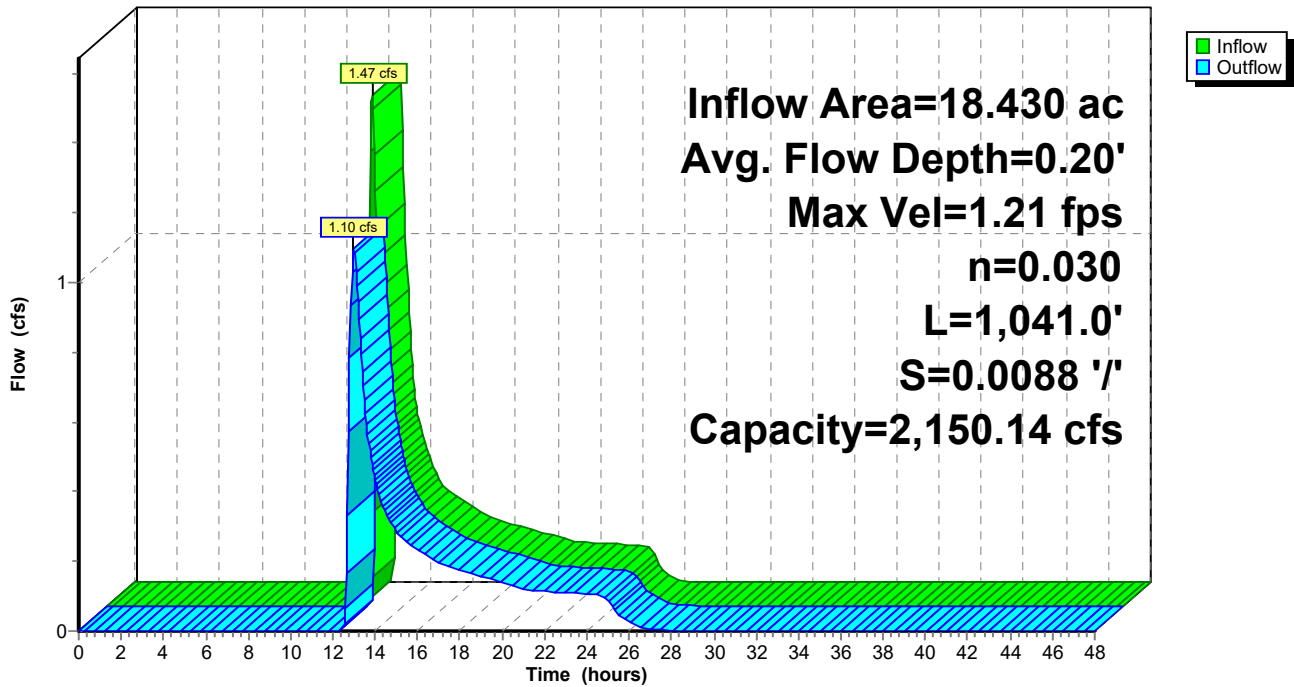*Type II 24-hr WQV Rainfall=1.37"*
Printed 4/18/2022
Page 82

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

21-130-HYDRO-PRO orifice plate option
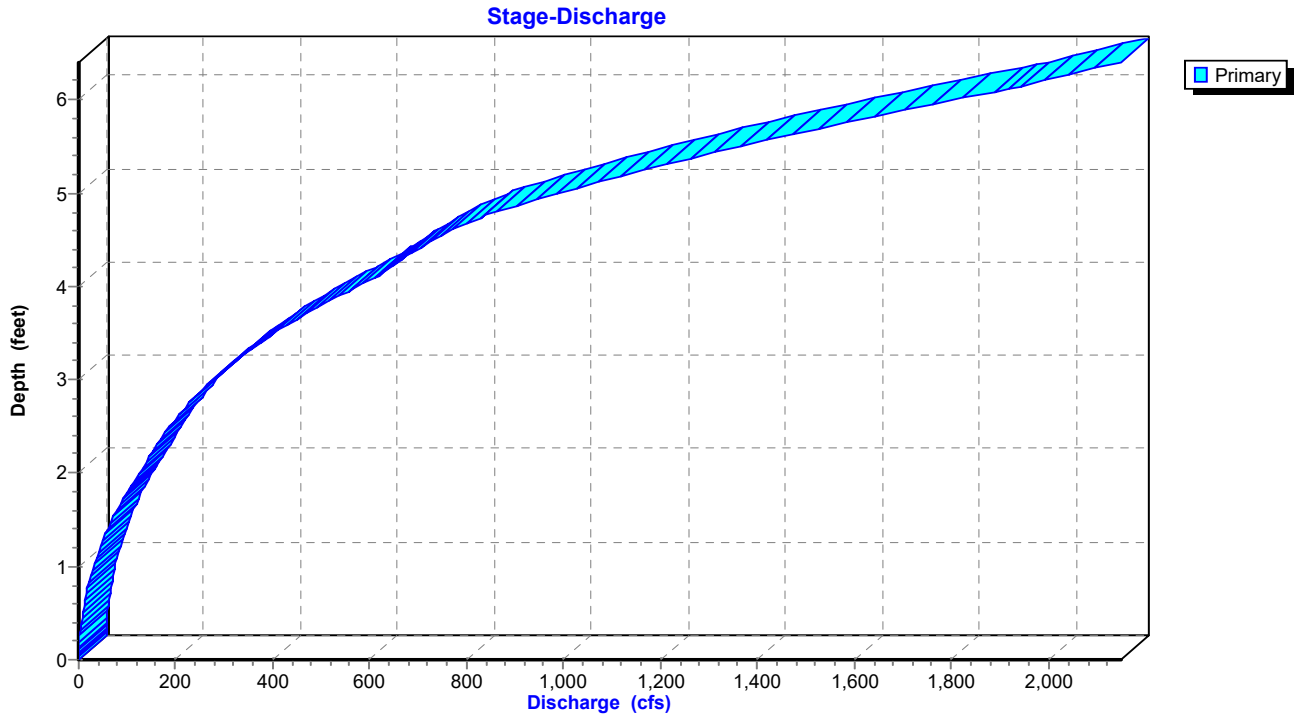Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 83

Reach 6R: Reach 3

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 84
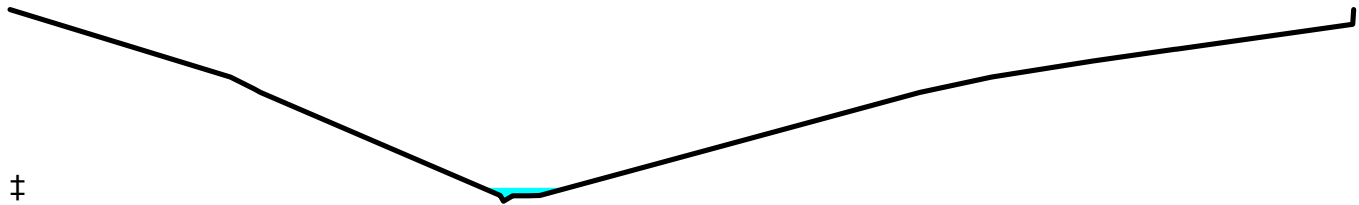
Summary for Reach 7R: Reach 2

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

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
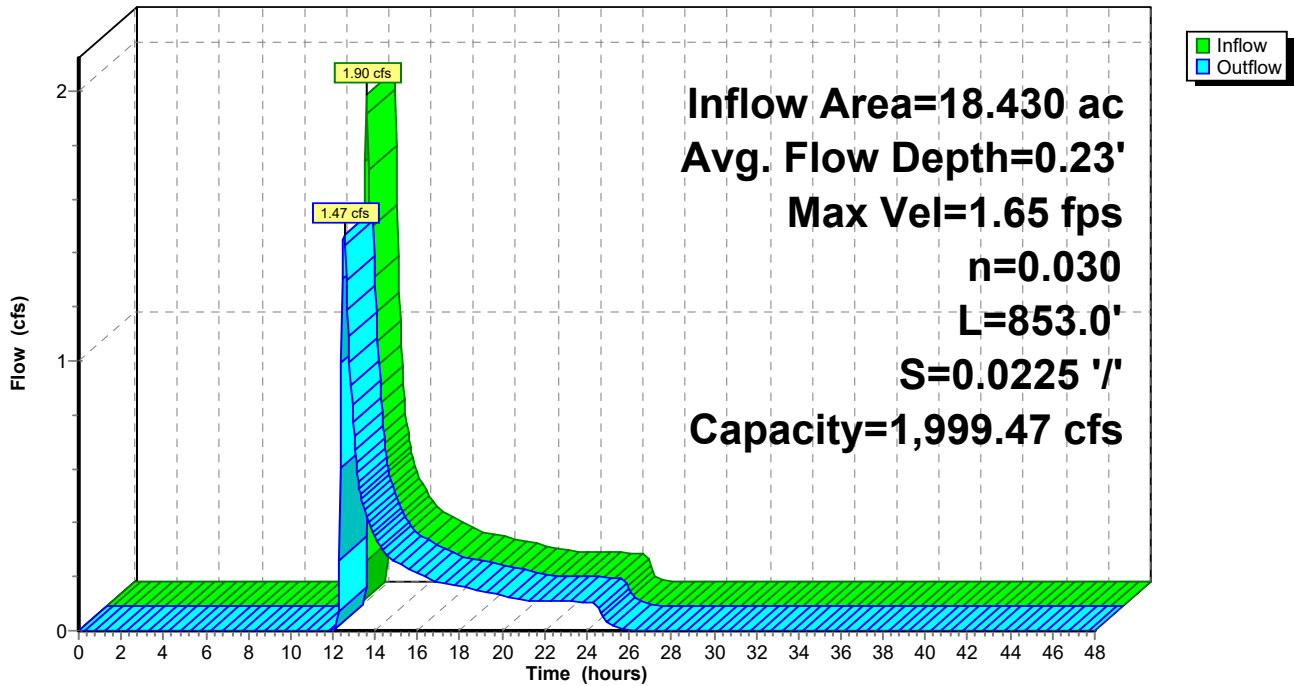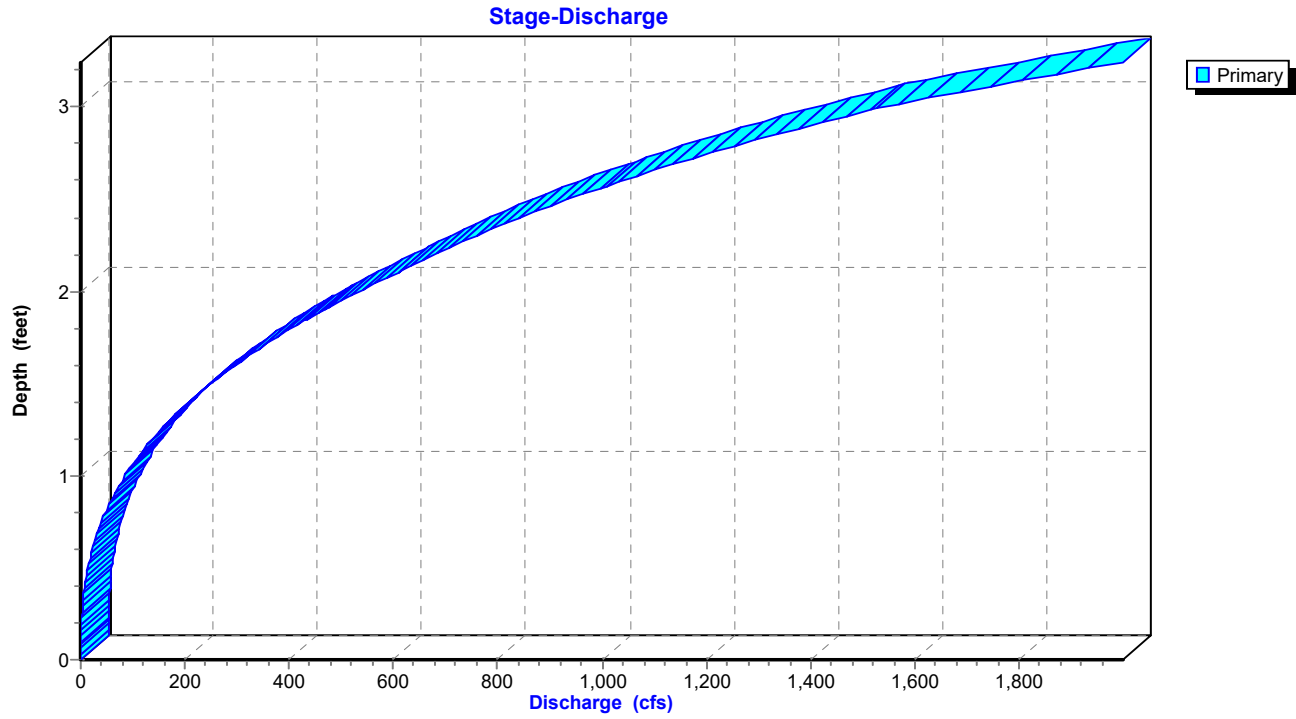*Type II 24-hr WQV Rainfall=1.37"*
Printed 4/18/2022
Page 86

Reach 7R: Reach 2

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
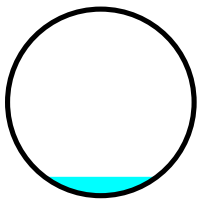Printed 4/18/2022
Page 87

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
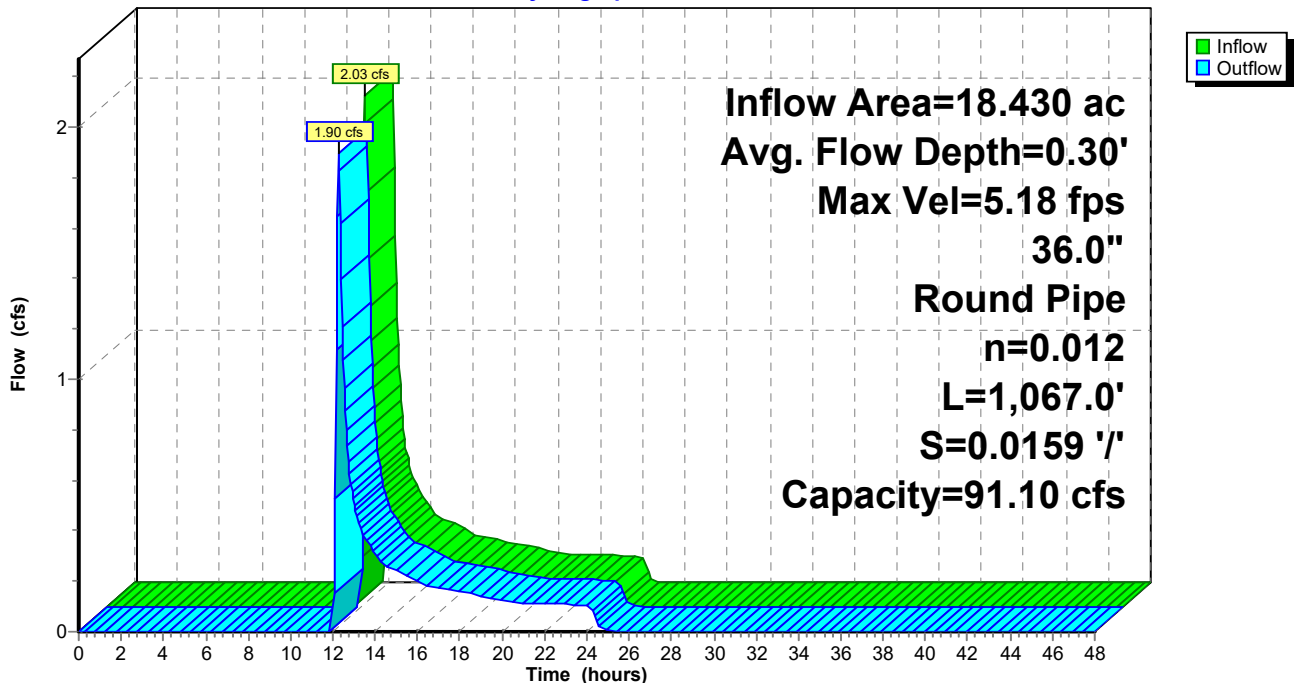
21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 88

Reach 8R: REACH 1 (through Pipe System)

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
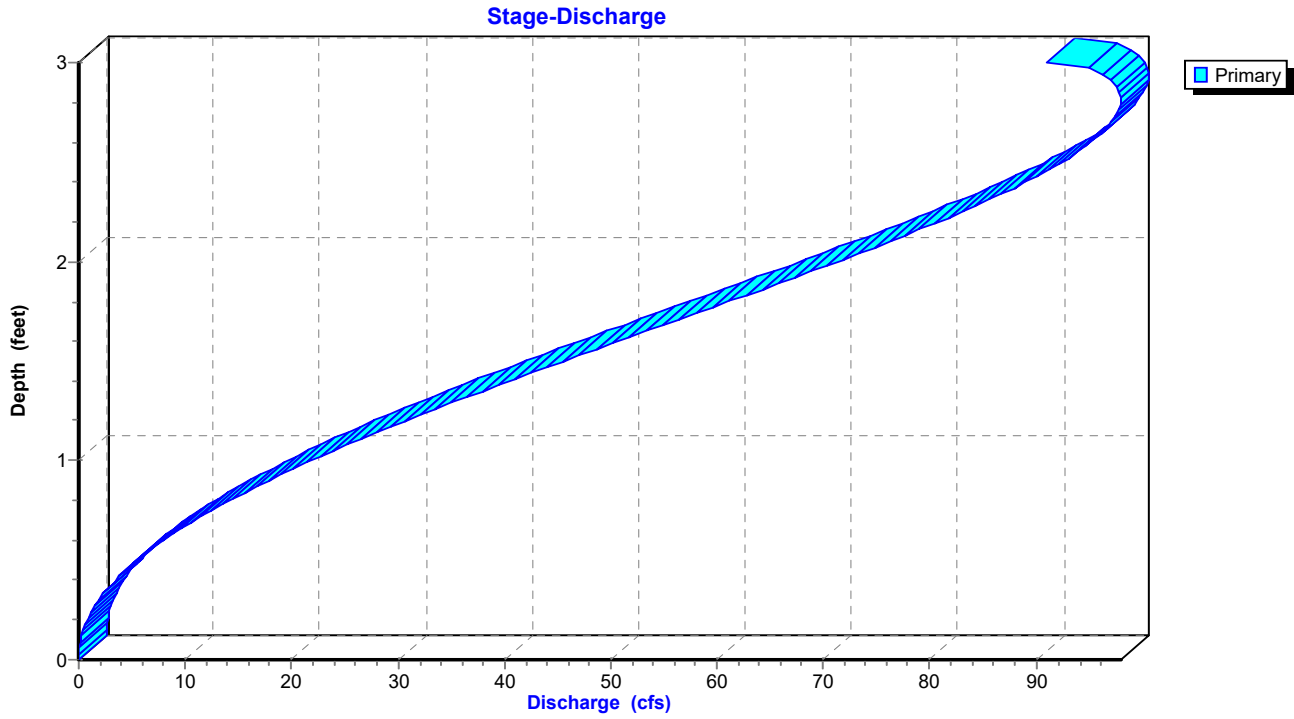Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 89

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
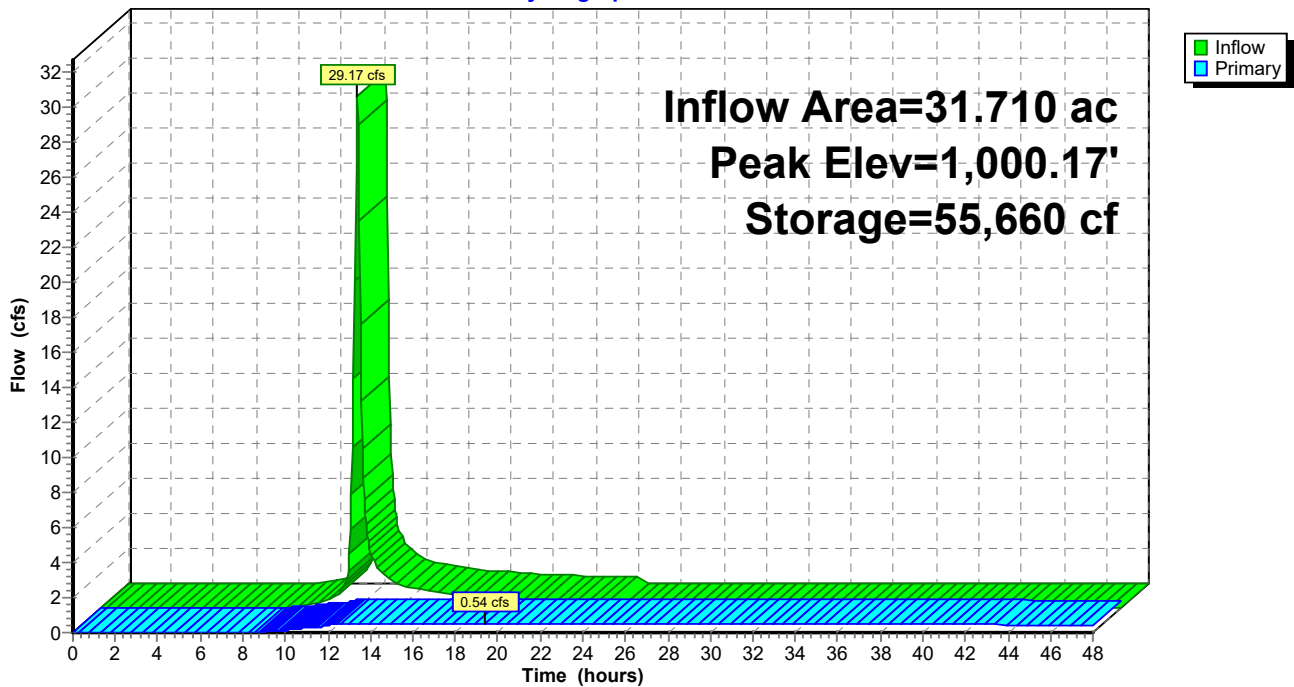*Type II 24-hr WQV Rainfall=1.37"*
Printed 4/18/2022
Page 90

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

21-130-HYDRO-PRO orifice plate option
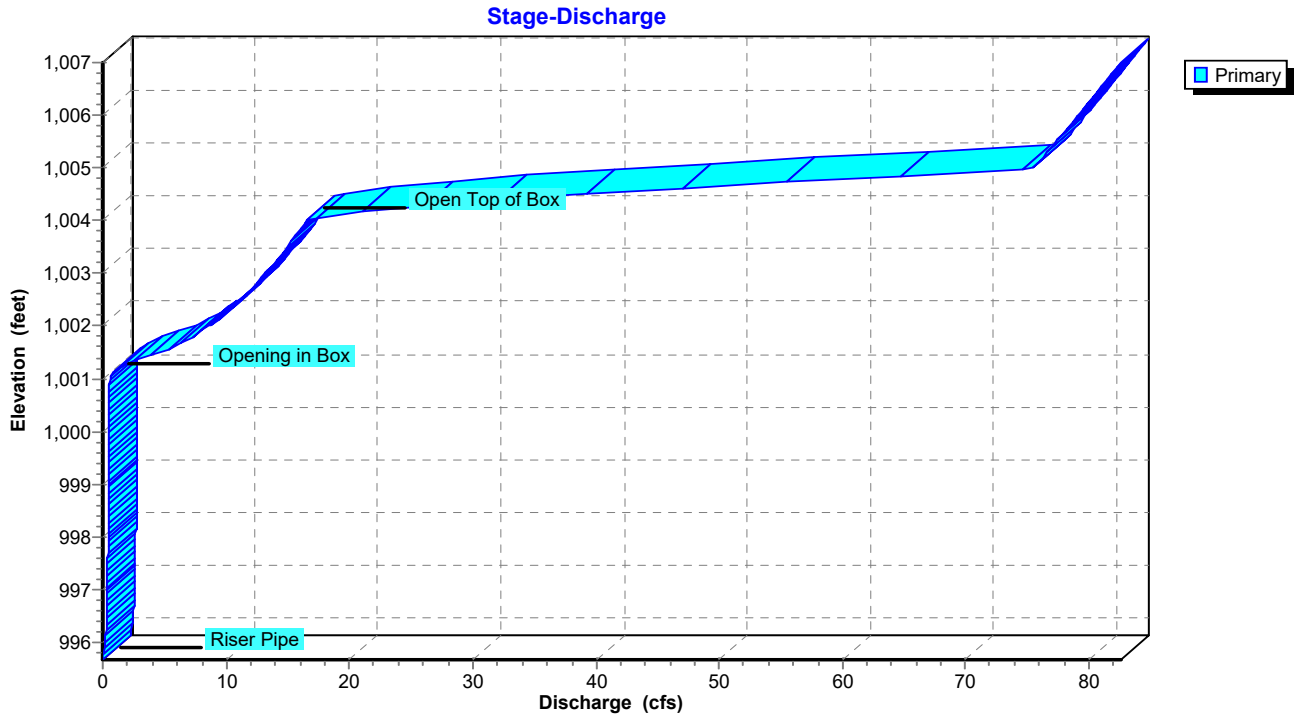Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 91

Pond 4P: EDDB #1 Cornerstone

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 92

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
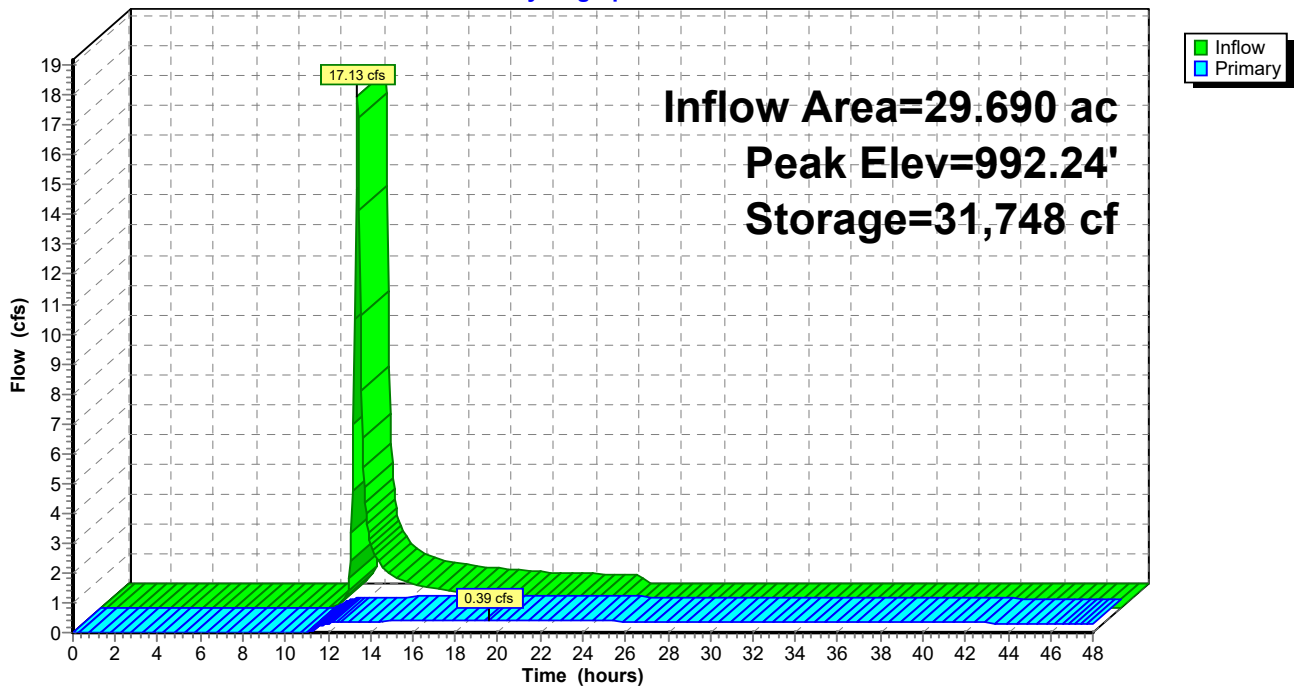*Type II 24-hr WQV Rainfall=1.37"*
Printed 4/18/2022
Page 93

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

21-130-HYDRO-PRO orifice plate option
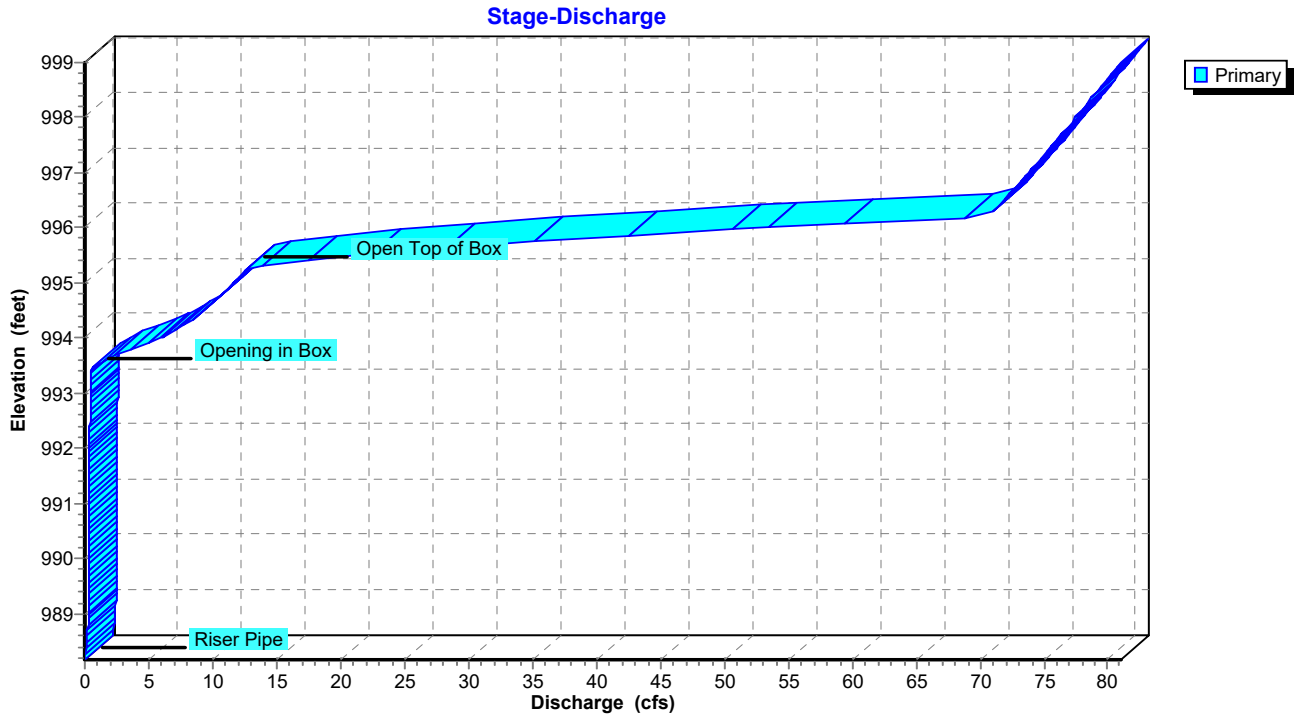Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 94

Pond 5P: EDDB #2 Manor

Stage-Discharge

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 95
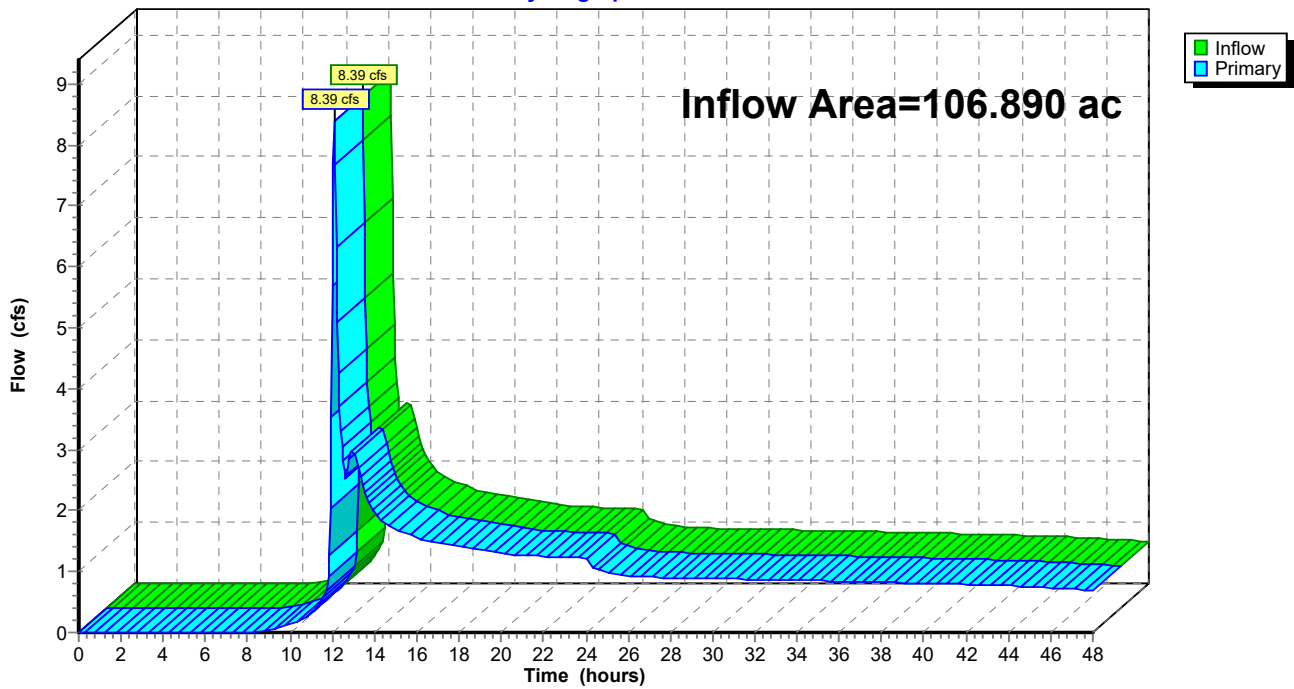
Summary for Link 2L: RP-1

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 96
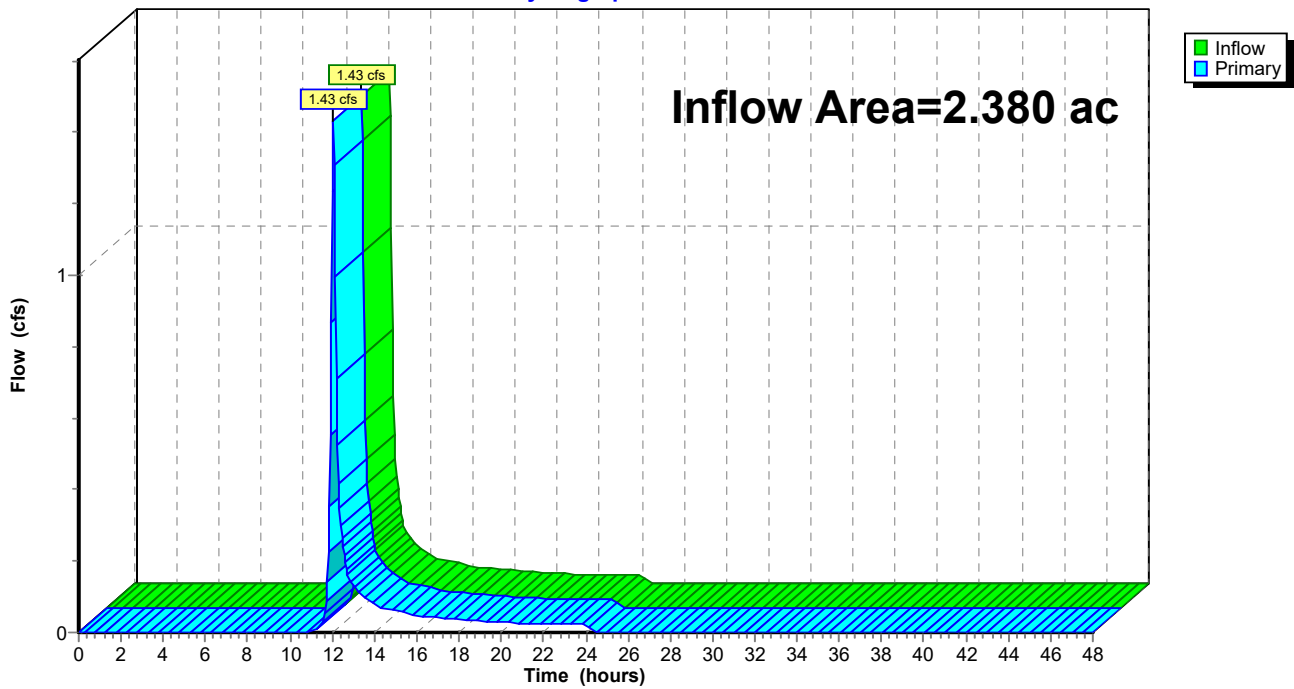
Summary for Link 3L: RP-2

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 97
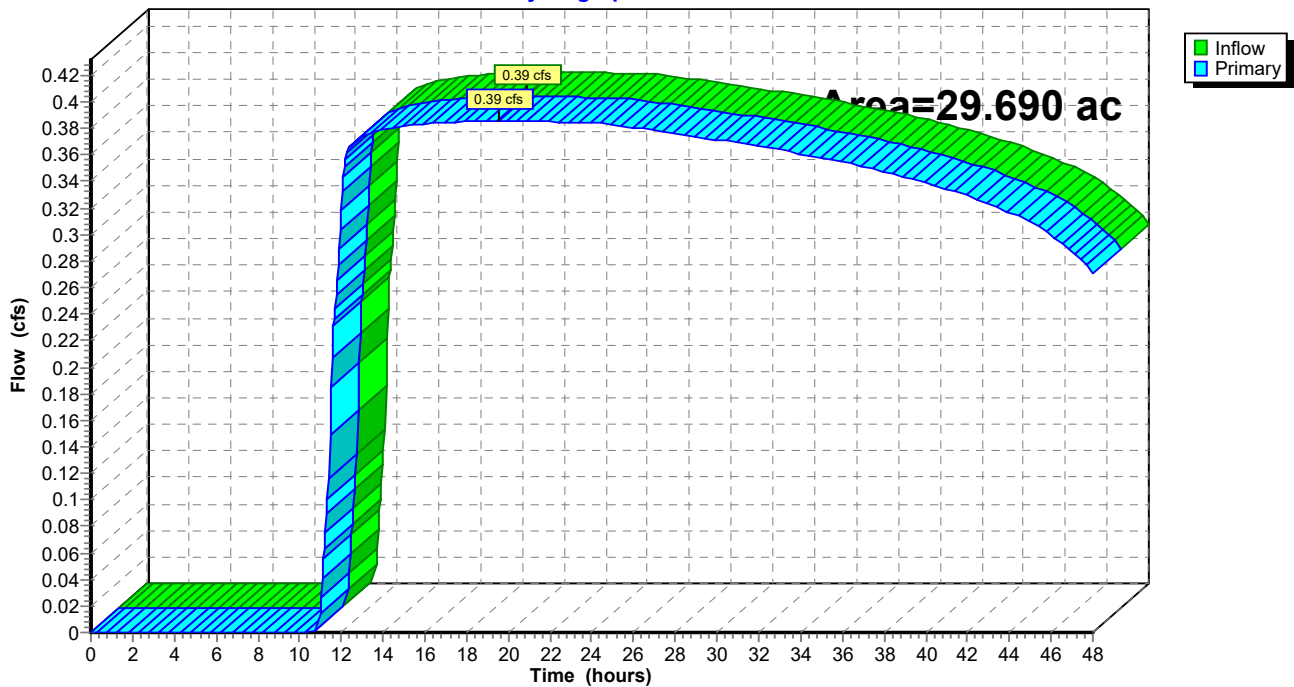
Summary for Link 4L: RP-3

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

21-130-HYDRO-PRO orifice plate option
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - Developed
Type II 24-hr WQV Rainfall=1.37"
Printed 4/18/2022
Page 98
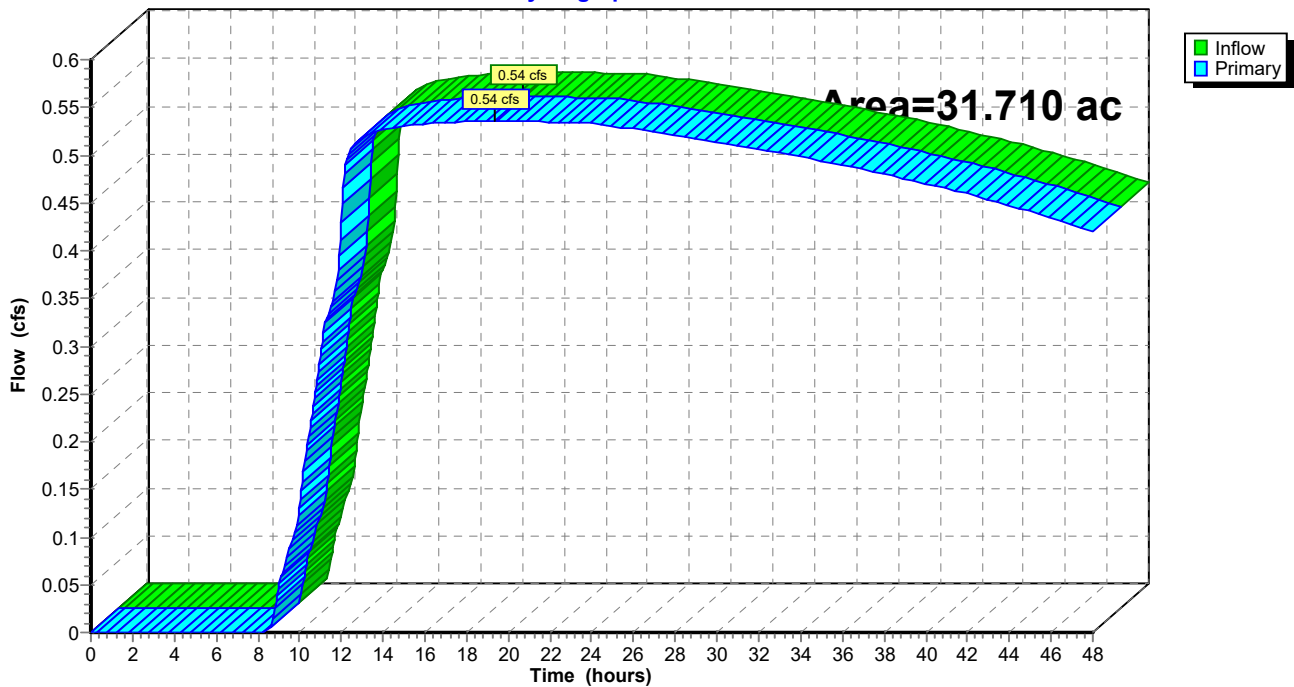
Summary for Link 5L: RP-4

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
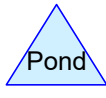
Link 5L: RP-4

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

6S
ON-SITE #4 (Bypass)

EDDB #2 Manor

3S
ON-SITE #3 (Bypass)

4L
RP-3

3L
RP-2

2L
RP-1

Subcat | Reach | Pond | Link
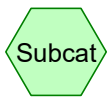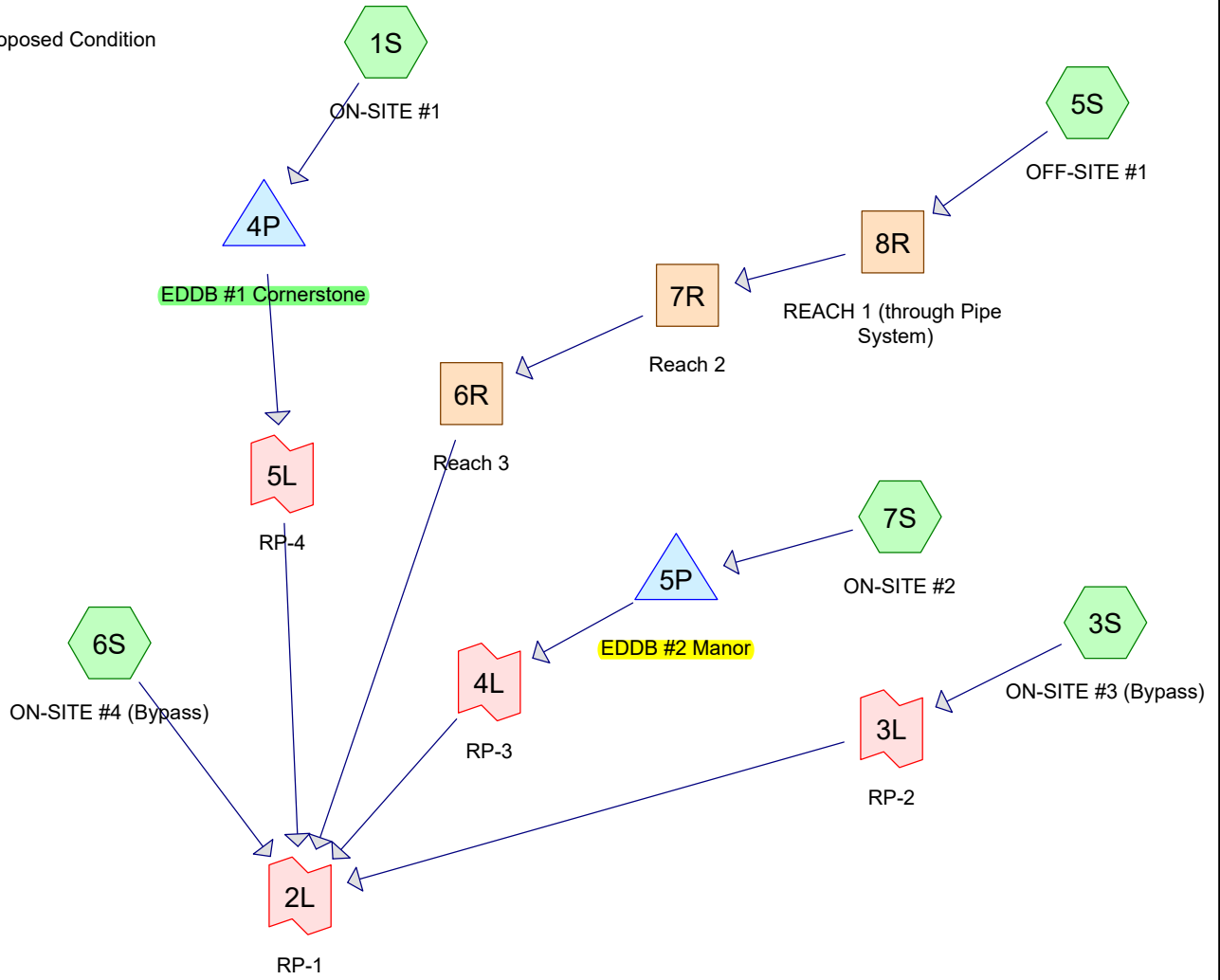
Routing Diagram for 21-130-HYDRO-PRO orifice plate option Clogged
Prepared by Schlagel and Assoc., Printed 4/18/2022
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

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

21-130-HYDRO-PRO orifice plate option Clogged

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
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - 100 yr Clogged
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 5

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
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - 100 yr Clogged
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 6

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** Offset (feet) 0.00 4.50 220.50 225.00 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)

21-130-HYDRO-PRO orifice plate option Clogged

Prepared by Schlagel and Assoc.

HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC
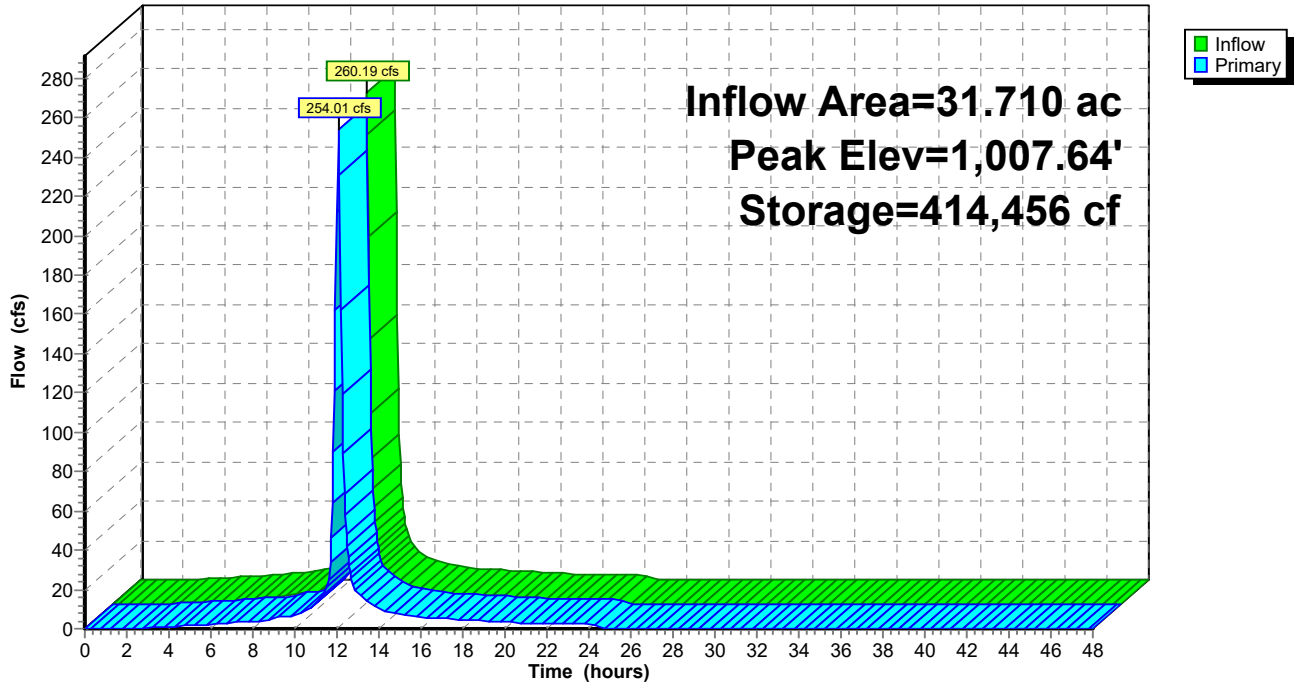
Bailey Farms - 100 yr Clogged
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 7

Pond 4P: EDDB #1 Cornerstone

Hydrograph

Inflow Area=31.710 ac
Peak Elev=1,007.64'
Storage=414,456 cf

260.19 cfs
254.01 cfs

Inflow
Primary

Pond 4P: EDDB #1 Cornerstone

Stage-Discharge

Asymmetrical Weir

Primary

21-130-HYDRO-PRO orifice plate option Clogged
Prepared by Schlagel and Assoc.
HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - 100 yr Clogged
Type II 24-hr 100-Year Rainfall=7.70"
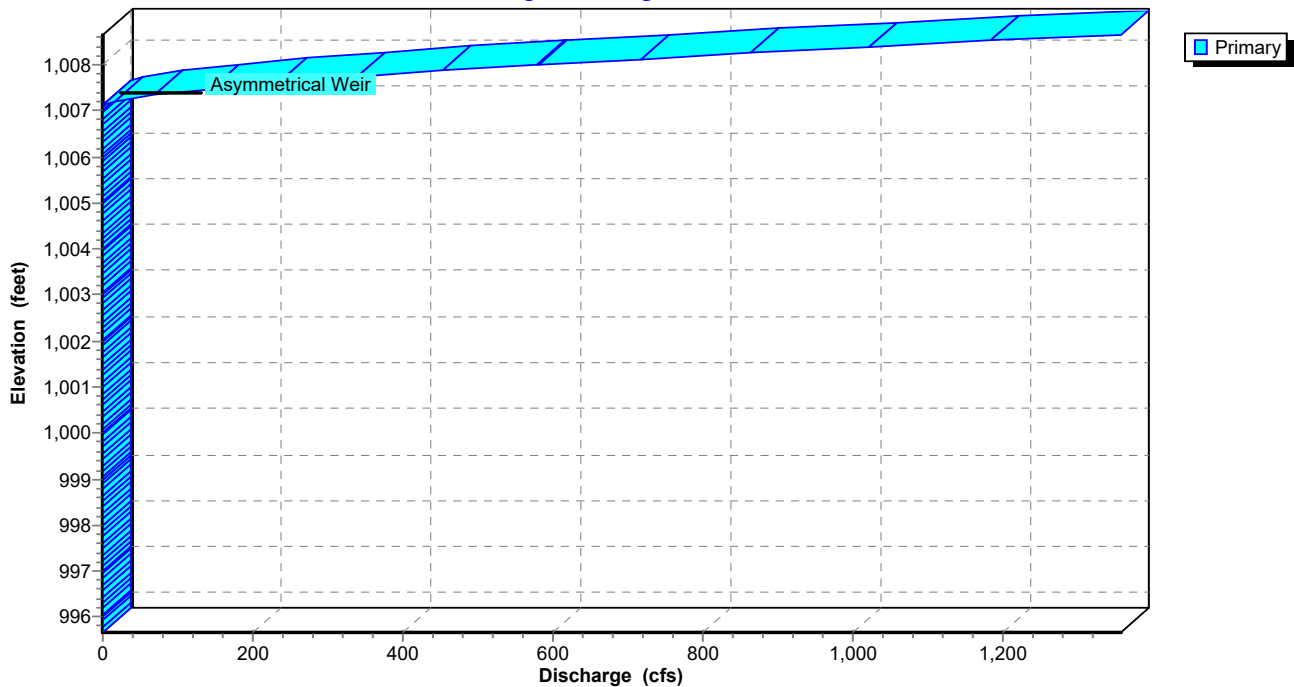Printed 4/18/2022
Page 8

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** Offset (feet) 0.00 4.50 169.50 174.00 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)

21-130-HYDRO-PRO orifice plate option Clogged
Prepared by Schlagel and Assoc.
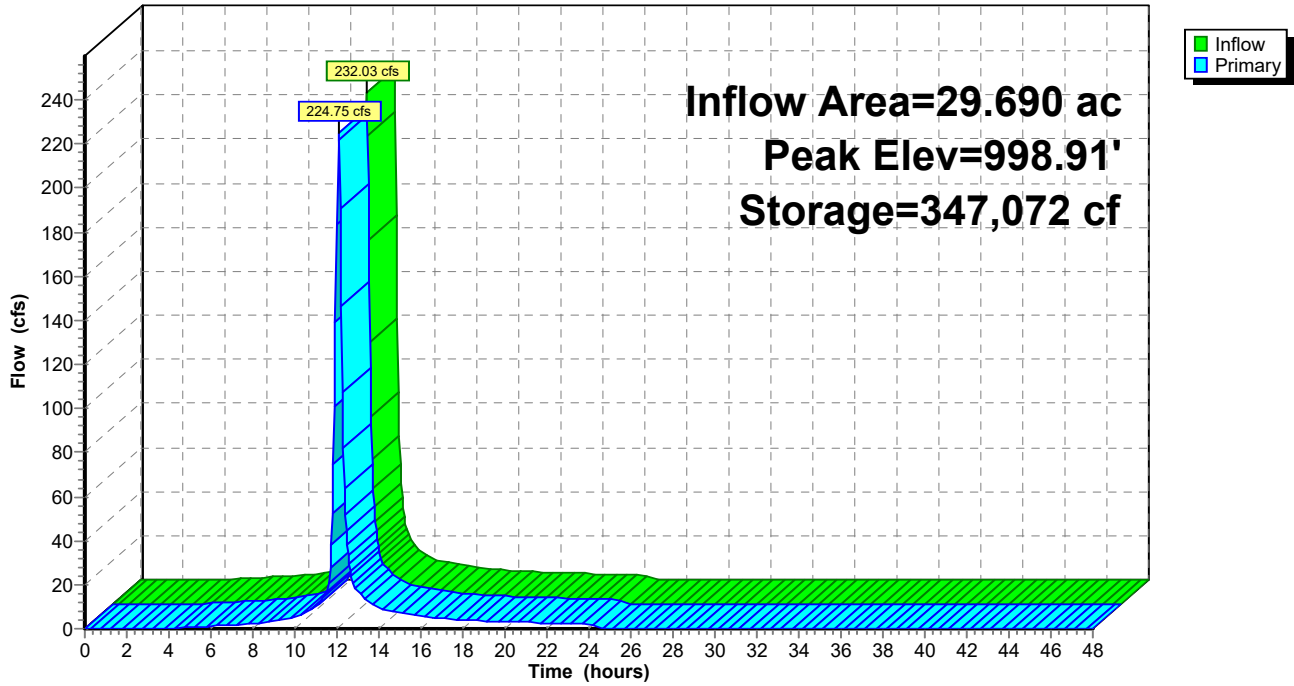HydroCAD® 10.00-13 s/n 08303 © 2014 HydroCAD Software Solutions LLC

Bailey Farms - 100 yr Clogged
Type II 24-hr 100-Year Rainfall=7.70"
Printed 4/18/2022
Page 9

Pond 5P: EDDB #2 Manor

Hydrograph

Inflow Area=29.690 ac
Peak Elev=998.91'
Storage=347,072 cf

Pond 5P: EDDB #2 Manor

Stage-Discharge