STORMWATER MANAGEMENT REPORT

Prepared for:

DUTCH BROS, INC.

DUTCH BROS COFFEE SHOP – STORE NO. IN0703

8032 Calumet Avenue
Town of Munster
Lake County, Indiana

Prepared by:

BOHLER

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Bohler Project No. OHA250022.00

Matthew M. Poindexter, PE
Indiana Professional Engineer License No. 12401163

Dated: October 21, 2025
Revised: N/A

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General Project Description/Stormwater Management

GENERAL PROJECT DESCRIPTION

Dutch Bros, Inc. proposes to develop a Dutch Bros Coffee Shop on an existing 0.86-acre parcel located in the Town of Munster, Lake County, IN. The proposal includes the installation of paving, utilities, landscaping, and stormwater management controls necessary to support the development. Pertinent data characterizing the existing and future site conditions are shown on the accompanying Preliminary/Final Land Development Plans.

STORMWATER MANAGEMENT

The overall property is within the Little Calumet River Watershed. The pre-development and post-development conditions of the site consist of one (1) drainage point (POI #1), indicated on the included Pre-Development and Post-Development Drainage Area Plans. The on-site areas tributary to these drainage points have been delineated and hydrographs have been generated for the 1, 2, 10, 25, 50, and 100-year design storms. The pre-development conditions were analyzed based on existing conditions for all areas tributary to the drainage points. The post-development condition of the site maintains similar drainage points and relative drainage patterns.

The development will not reduce the undeveloped/grass area on site and therefore, will not require detention per the Town of Munster Infrastructure Specifications. Rather, the development proposes a reduction in impervious coverage. For this reason, the peak rates and volume are reduced, and no BMPS are needed. Peak rates for the pre-development and post-development conditions are compared in Table 1 below. Volumes for the pre-development and post-development conditions are compared in Table 2 below.

TABLE 1
PEAK DISCHARGE SUMMARY TO POI #1

Storm Event (year)	Total Pre-Development Peak Discharge (cfs)	Total Post-Development Peak Discharge (cfs)	Difference (cfs)
1	2.31	2.11	-0.20
2	2.98	2.78	-0.20
5	4.04	3.84	-0.20
10	4.91	4.72	-0.19
25	6.19	6.00	-0.19
50	7.25	7.08	-0.17
100	8.40	8.23	-0.17

TABLE 2
VOLUME SUMMARY TO POI #1

Storm Event (year)	Total Pre-Development Volume (cf)	Total Post-Development Volume (cf)	Difference (cf)
1	4,666	4,183	-483
2	6,126	5,592	-534
5	8,486	7,901	-585
10	10,471	9,863	-608
25	13,377	12,749	-628
50	15,831	15,196	-635
100	18,486	17,849	-637

DESIGN METHODOLOGY

The SCS method was utilized for calculating the peak runoff rates and generating hydrographs for the pre- and post-development conditions as defined in the computer watershed software HydroCAD 2022, version 10.20-7a. The hydrographs were generated based on precipitation amounts consistent with the enclosed NOAA rainfall data. The rainfall data is summarized in Table 3 below.

TABLE 3
RAINFALL DATA – SCS TYPE II, 24 HOUR

Storm Event (year)	24-Hour Rainfall Depth (inches)
1	2.40
2	2.93
5	3.77
10	4.47
25	5.49
50	6.35
100	7.28

The storm drainage system has been designed to intercept runoff at topographic low points and areas of significant runoff quantities. The existing infrastructure is to be maintained and shall function per the existing conditions.

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Peak Rate Calculations

NOAA Atlas 14, Volume 2, Version 3
Location name: Munster, Indiana, USA*
Latitude: 41.5672°, Longitude: -87.5093°
Elevation: 600 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.381** (0.342-0.425)	**0.453** (0.407-0.503)	**0.537** (0.482-0.597)	**0.611** (0.548-0.678)	**0.701** (0.625-0.777)	**0.775** (0.687-0.860)	**0.845** (0.745-0.940)	**0.919** (0.803-1.03)	**1.02** (0.883-1.14)	**1.10** (0.944-1.24)
10-min	**0.591** (0.531-0.660)	**0.707** (0.635-0.785)	**0.835** (0.749-0.927)	**0.944** (0.846-1.05)	**1.07** (0.956-1.19)	**1.17** (1.04-1.30)	**1.27** (1.12-1.41)	**1.37** (1.20-1.53)	**1.50** (1.30-1.68)	**1.60** (1.38-1.81)
15-min	**0.725** (0.651-0.809)	**0.864** (0.776-0.960)	**1.02** (0.920-1.14)	**1.16** (1.04-1.29)	**1.32** (1.18-1.47)	**1.45** (1.29-1.61)	**1.58** (1.39-1.76)	**1.71** (1.49-1.90)	**1.87** (1.62-2.10)	**2.00** (1.72-2.26)
30-min	**0.959** (0.862-1.07)	**1.16** (1.04-1.28)	**1.40** (1.26-1.56)	**1.61** (1.45-1.79)	**1.87** (1.67-2.07)	**2.08** (1.84-2.31)	**2.28** (2.01-2.54)	**2.49** (2.18-2.78)	**2.77** (2.40-3.11)	**3.00** (2.58-3.39)
60-min	**1.17** (1.05-1.31)	**1.42** (1.28-1.58)	**1.76** (1.58-1.96)	**2.05** (1.84-2.27)	**2.42** (2.16-2.69)	**2.74** (2.43-3.04)	**3.05** (2.69-3.39)	**3.38** (2.95-3.77)	**3.84** (3.32-4.30)	**4.22** (3.62-4.76)
2-hr	**1.37** (1.23-1.52)	**1.67** (1.50-1.85)	**2.10** (1.88-2.32)	**2.46** (2.20-2.72)	**2.94** (2.61-3.24)	**3.34** (2.96-3.69)	**3.75** (3.30-4.15)	**4.18** (3.64-4.64)	**4.77** (4.11-5.32)	**5.26** (4.49-5.91)
3-hr	**1.48** (1.32-1.66)	**1.80** (1.61-2.01)	**2.28** (2.04-2.55)	**2.69** (2.39-3.00)	**3.22** (2.85-3.59)	**3.68** (3.23-4.10)	**4.14** (3.62-4.62)	**4.63** (4.01-5.18)	**5.30** (4.54-5.97)	**5.87** (4.98-6.63)
6-hr	**1.76** (1.56-2.01)	**2.14** (1.89-2.44)	**2.75** (2.42-3.13)	**3.29** (2.88-3.74)	**4.04** (3.51-4.58)	**4.70** (4.05-5.33)	**5.40** (4.61-6.14)	**6.17** (5.20-7.02)	**7.29** (6.04-8.34)	**8.27** (6.75-9.51)
12-hr	**2.05** (1.82-2.33)	**2.48** (2.20-2.81)	**3.15** (2.79-3.58)	**3.76** (3.31-4.26)	**4.59** (4.01-5.19)	**5.32** (4.61-6.00)	**6.10** (5.23-6.89)	**6.94** (5.88-7.86)	**8.17** (6.80-9.29)	**9.23** (7.58-10.6)
24-hr	**2.40** (2.18-2.66)	**2.93** (2.66-3.24)	**3.77** (3.42-4.17)	**4.47** (4.03-4.92)	**5.49** (4.91-6.04)	**6.35** (5.63-6.98)	**7.28** (6.40-8.00)	**8.30** (7.21-9.13)	**9.79** (8.37-10.8)	**11.1** (9.31-12.2)
2-day	**2.80** (2.54-3.10)	**3.39** (3.08-3.76)	**4.29** (3.89-4.74)	**5.02** (4.54-5.55)	**6.09** (5.46-6.73)	**6.98** (6.21-7.73)	**7.93** (7.00-8.81)	**8.97** (7.83-10.0)	**10.5** (8.98-11.8)	**11.7** (9.91-13.3)
3-day	**2.99** (2.73-3.27)	**3.60** (3.29-3.94)	**4.50** (4.11-4.93)	**5.23** (4.76-5.73)	**6.28** (5.69-6.88)	**7.16** (6.43-7.86)	**8.08** (7.20-8.90)	**9.08** (8.00-10.0)	**10.5** (9.12-11.8)	**11.7** (10.0-13.4)
4-day	**3.17** (2.92-3.44)	**3.80** (3.50-4.13)	**4.70** (4.33-5.11)	**5.44** (4.99-5.91)	**6.48** (5.91-7.04)	**7.33** (6.64-7.98)	**8.24** (7.39-9.00)	**9.20** (8.18-10.1)	**10.6** (9.26-11.9)	**11.7** (10.1-13.4)
7-day	**3.72** (3.45-4.02)	**4.43** (4.11-4.78)	**5.36** (4.97-5.79)	**6.10** (5.65-6.59)	**7.14** (6.58-7.70)	**7.97** (7.30-8.61)	**8.83** (8.04-9.56)	**9.71** (8.78-10.6)	**10.9** (9.76-12.0)	**12.0** (10.6-13.6)
10-day	**4.22** (3.90-4.58)	**5.00** (4.62-5.43)	**6.00** (5.54-6.52)	**6.83** (6.29-7.42)	**7.99** (7.31-8.70)	**8.93** (8.11-9.74)	**9.92** (8.93-10.8)	**10.9** (9.76-12.0)	**12.4** (10.9-13.7)	**13.5** (11.7-15.1)
20-day	**5.68** (5.29-6.11)	**6.71** (6.26-7.21)	**7.90** (7.36-8.49)	**8.84** (8.22-9.49)	**10.1** (9.34-10.8)	**11.0** (10.2-11.9)	**12.0** (11.0-12.9)	**13.0** (11.8-14.0)	**14.2** (12.8-15.5)	**15.2** (13.6-16.6)
30-day	**7.08** (6.66-7.55)	**8.34** (7.85-8.89)	**9.66** (9.08-10.3)	**10.6** (9.99-11.3)	**11.9** (11.1-12.6)	**12.8** (11.9-13.6)	**13.6** (12.7-14.6)	**14.4** (13.4-15.5)	**15.4** (14.2-16.6)	**16.1** (14.8-17.4)
45-day	**8.89** (8.41-9.39)	**10.4** (9.85-11.0)	**11.8** (11.2-12.5)	**12.9** (12.2-13.6)	**14.1** (13.3-15.0)	**15.0** (14.2-15.9)	**15.9** (14.9-16.8)	**16.6** (15.6-17.7)	**17.5** (16.3-18.7)	**18.1** (16.8-19.4)
60-day	**10.6** (10.0-11.2)	**12.4** (11.8-13.2)	**14.2** (13.4-15.0)	**15.4** (14.6-16.3)	**17.0** (16.0-17.9)	**18.1** (17.0-19.2)	**19.1** (17.9-20.3)	**20.0** (18.7-21.3)	**21.1** (19.7-22.6)	**21.9** (20.4-23.5)

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

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

Please refer to NOAA Atlas 14 document for more information.

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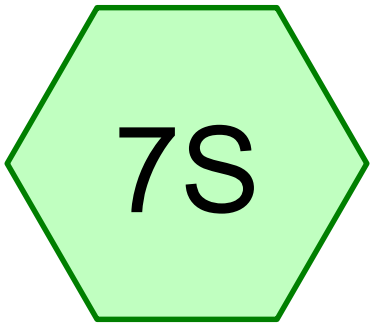
PF graphical

Pre-Dev



POI #1 (Pre-dev)

Subcat Reach Pond Link

Routing Diagram for OHA250022.00_Rev0
Prepared by Bohler Engineering, PC, Printed 10/20/2025

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr	Type II 24-hr		Default	24.00	1	2.40	2
2	2-yr	Type II 24-hr		Default	24.00	1	2.93	2
3	5-yr	Type II 24-hr		Default	24.00	1	3.77	2
4	10-yr	Type II 24-hr		Default	24.00	1	4.47	2
5	25-yr	Type II 24-hr		Default	24.00	1	5.49	2
6	50-yr	Type II 24-hr		Default	24.00	1	6.35	2
7	100-yr	Type II 24-hr		Default	24.00	1	7.28	2

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
8,159	71	Meadow, non-grazed, HSG C (7S)
29,341	98	Paved parking, HSG C (7S)
37,500	**92**	**TOTAL AREA**

Summary for Subcatchment 7S: POI #1 (Pre-dev)

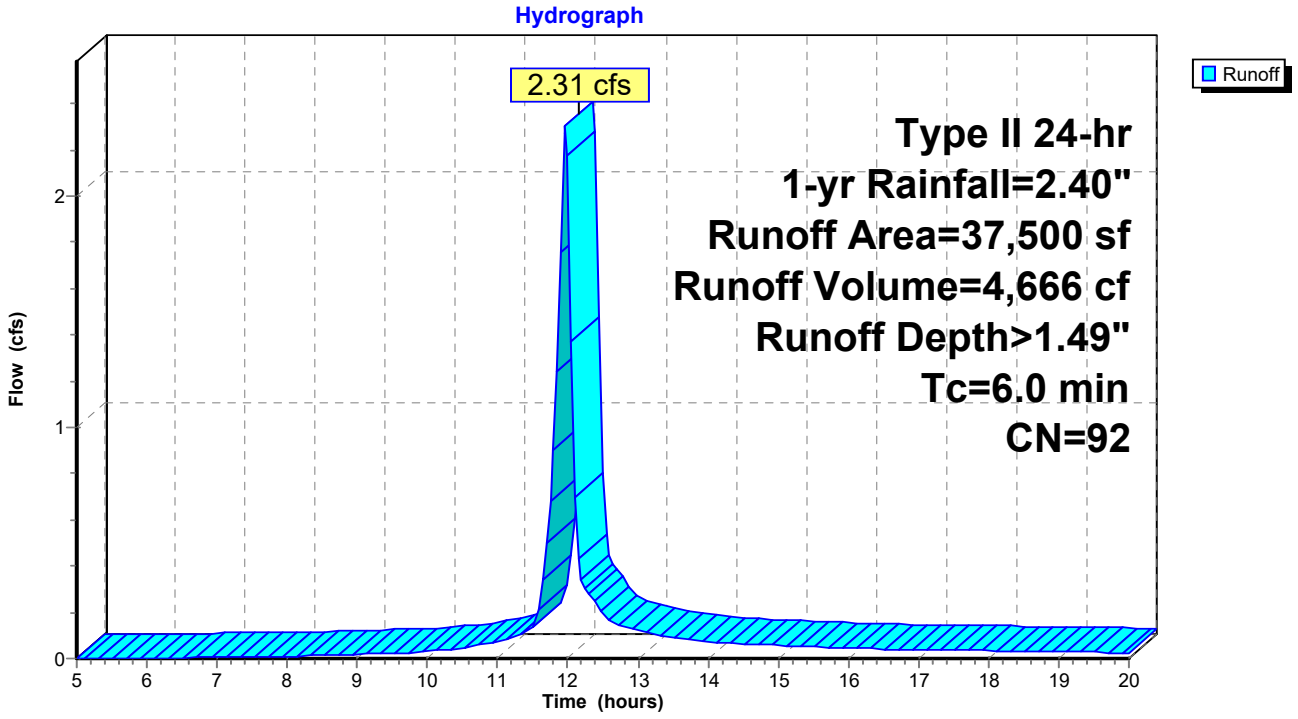
Runoff = 2.31 cfs @ 11.97 hrs, Volume= 4,666 cf, Depth> 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.40"

Area (sf)	CN	Description
8,159	71	Meadow, non-grazed, HSG C
29,341	98	Paved parking, HSG C
37,500	92	Weighted Average
8,159		21.76% Pervious Area
29,341		78.24% Impervious Area

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

Subcatchment 7S: POI #1 (Pre-dev)



Summary for Subcatchment 7S: POI #1 (Pre-dev)

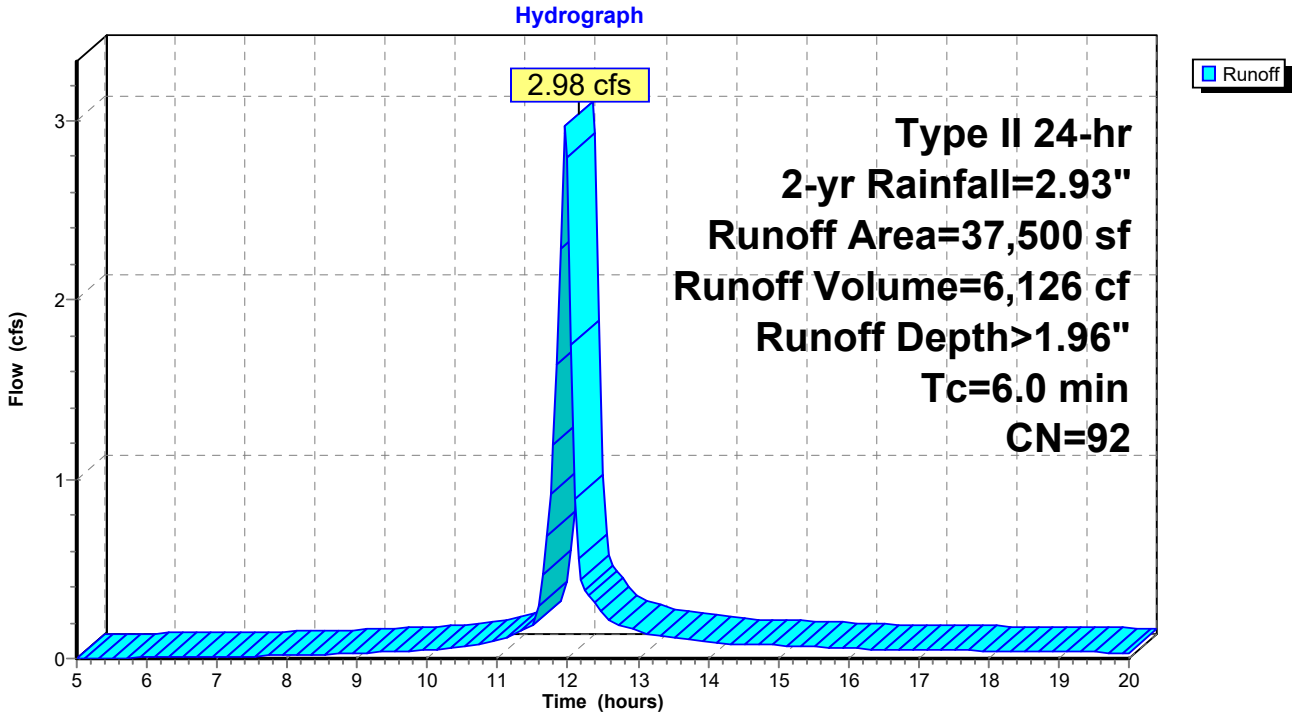
Runoff = 2.98 cfs @ 11.97 hrs, Volume= 6,126 cf, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=2.93"

Area (sf)	CN	Description
8,159	71	Meadow, non-grazed, HSG C
29,341	98	Paved parking, HSG C
37,500	92	Weighted Average
8,159		21.76% Pervious Area
29,341		78.24% Impervious Area

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

Subcatchment 7S: POI #1 (Pre-dev)



Summary for Subcatchment 7S: POI #1 (Pre-dev)

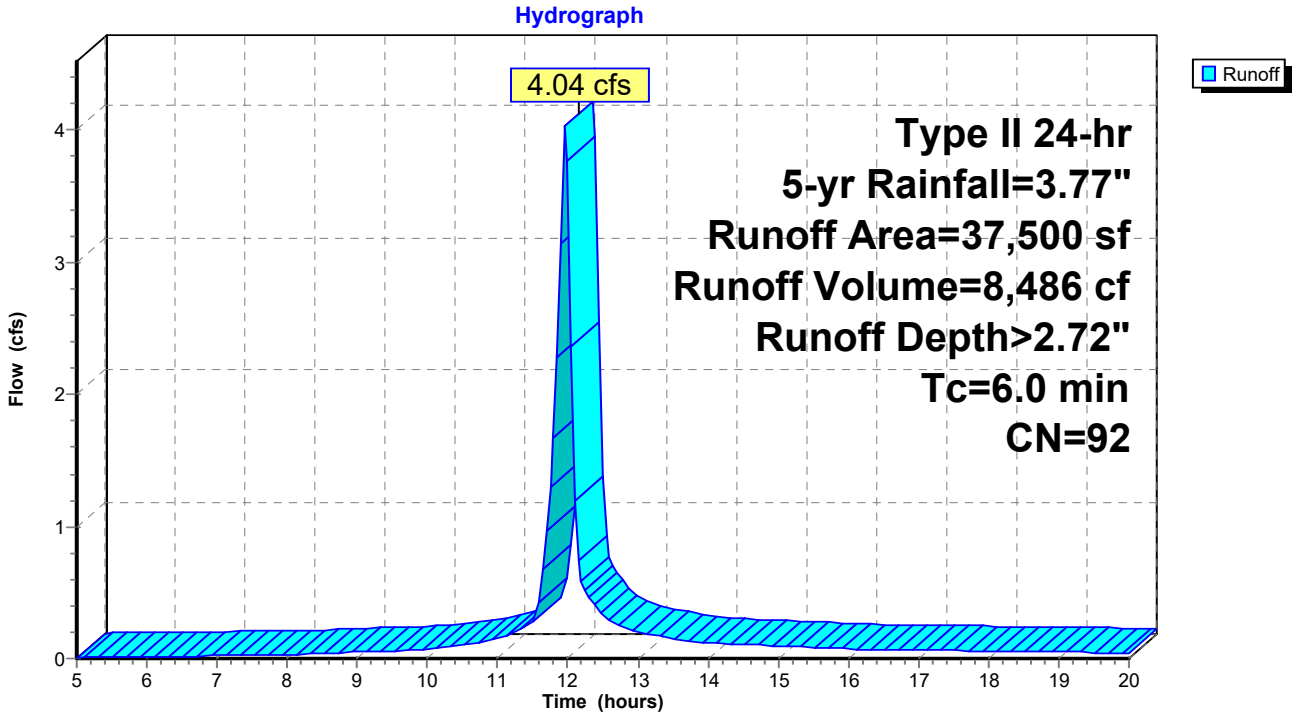
Runoff = 4.04 cfs @ 11.96 hrs, Volume= 8,486 cf, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-yr Rainfall=3.77"

Area (sf)	CN	Description
8,159	71	Meadow, non-grazed, HSG C
29,341	98	Paved parking, HSG C
37,500	92	Weighted Average
8,159		21.76% Pervious Area
29,341		78.24% Impervious Area

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

Subcatchment 7S: POI #1 (Pre-dev)



Summary for Subcatchment 7S: POI #1 (Pre-dev)

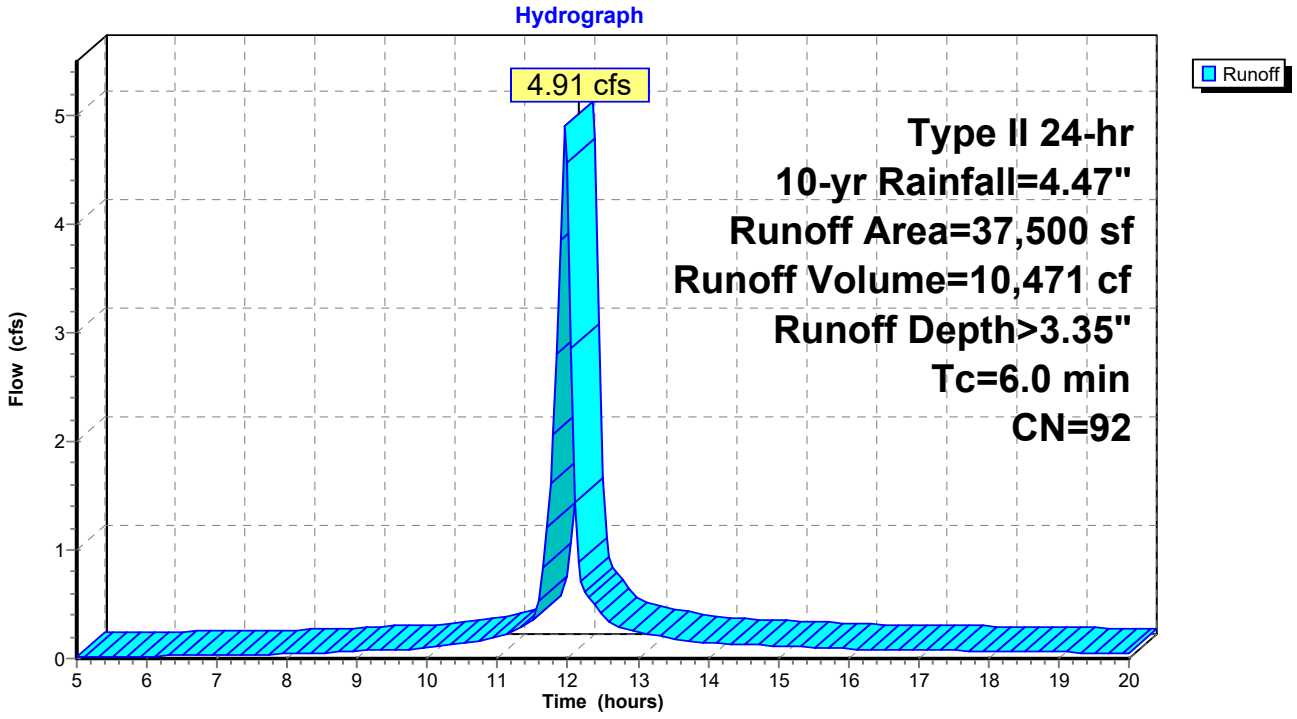
Runoff = 4.91 cfs @ 11.96 hrs, Volume= 10,471 cf, Depth> 3.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.47"

Area (sf)	CN	Description
8,159	71	Meadow, non-grazed, HSG C
29,341	98	Paved parking, HSG C
37,500	92	Weighted Average
8,159		21.76% Pervious Area
29,341		78.24% Impervious Area

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

Subcatchment 7S: POI #1 (Pre-dev)



Summary for Subcatchment 7S: POI #1 (Pre-dev)

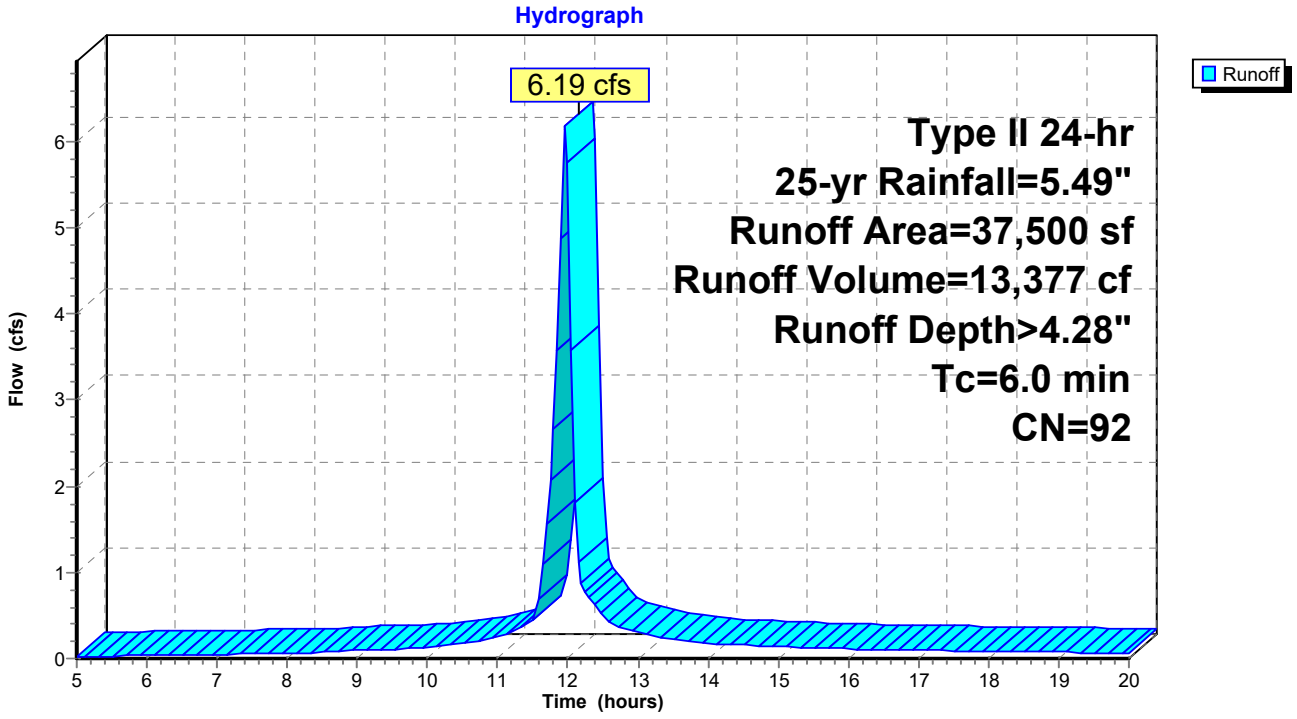
Runoff = 6.19 cfs @ 11.96 hrs, Volume= 13,377 cf, Depth> 4.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=5.49"

Area (sf)	CN	Description
8,159	71	Meadow, non-grazed, HSG C
29,341	98	Paved parking, HSG C
37,500	92	Weighted Average
8,159		21.76% Pervious Area
29,341		78.24% Impervious Area

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

Subcatchment 7S: POI #1 (Pre-dev)



Summary for Subcatchment 7S: POI #1 (Pre-dev)

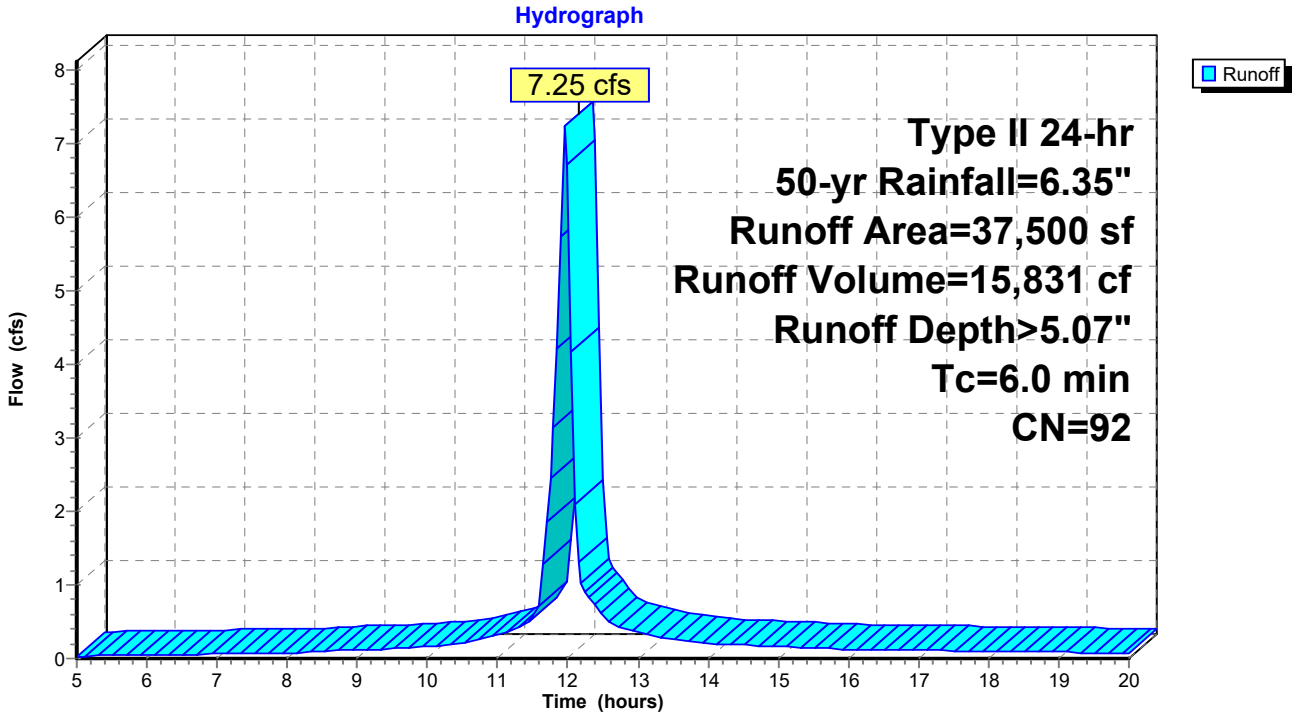
Runoff = 7.25 cfs @ 11.96 hrs, Volume= 15,831 cf, Depth> 5.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=6.35"

Area (sf)	CN	Description
8,159	71	Meadow, non-grazed, HSG C
29,341	98	Paved parking, HSG C
37,500	92	Weighted Average
8,159		21.76% Pervious Area
29,341		78.24% Impervious Area

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

Subcatchment 7S: POI #1 (Pre-dev)



Summary for Subcatchment 7S: POI #1 (Pre-dev)

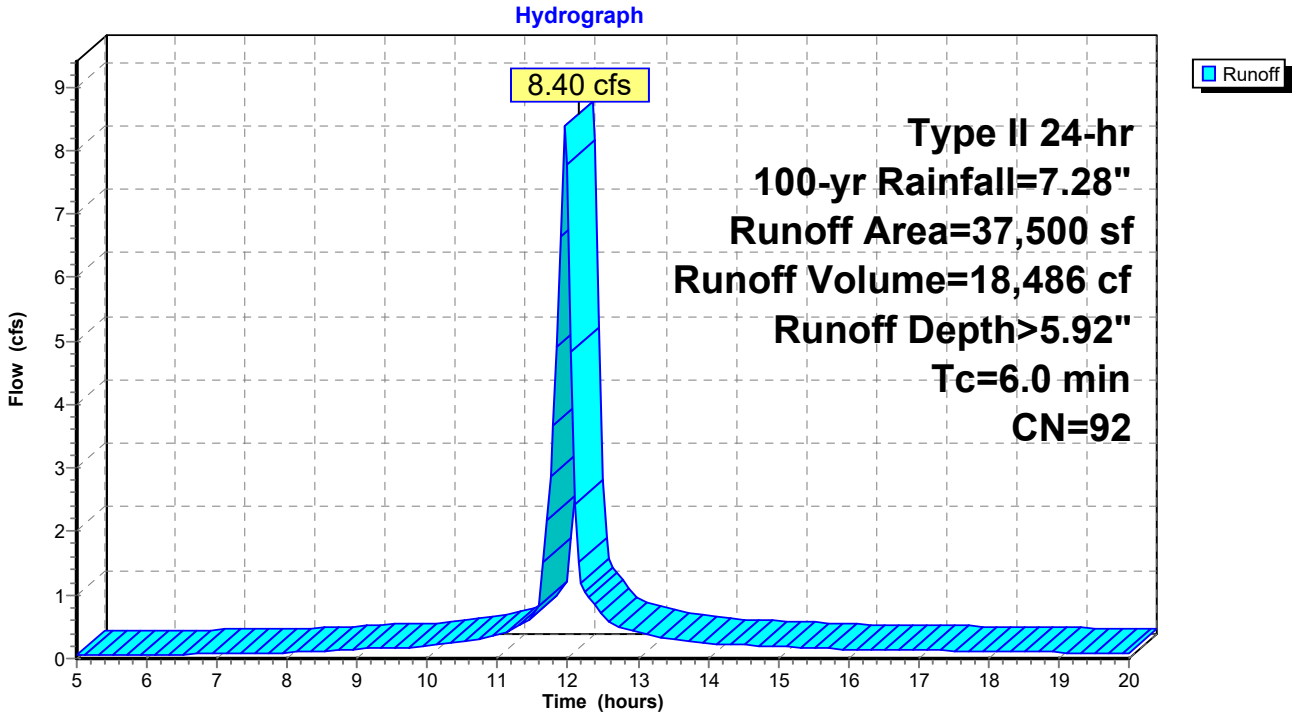
Runoff = 8.40 cfs @ 11.96 hrs, Volume= 18,486 cf, Depth> 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=7.28"

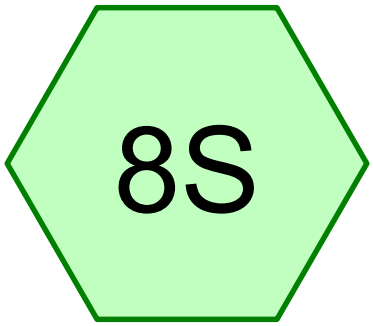
Area (sf)	CN	Description
8,159	71	Meadow, non-grazed, HSG C
29,341	98	Paved parking, HSG C
37,500	92	Weighted Average
8,159		21.76% Pervious Area
29,341		78.24% Impervious Area

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

Subcatchment 7S: POI #1 (Pre-dev)



Post-Dev



POI #1 (Post-dev)

Subcat Reach Pond Link

Routing Diagram for OHA250022.00_Rev0
Prepared by Bohler Engineering, PC, Printed 10/20/2025

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr	Type II 24-hr		Default	24.00	1	2.40	2
2	2-yr	Type II 24-hr		Default	24.00	1	2.93	2
3	5-yr	Type II 24-hr		Default	24.00	1	3.77	2
4	10-yr	Type II 24-hr		Default	24.00	1	4.47	2
5	25-yr	Type II 24-hr		Default	24.00	1	5.49	2
6	50-yr	Type II 24-hr		Default	24.00	1	6.35	2
7	100-yr	Type II 24-hr		Default	24.00	1	7.28	2

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
12,785	74	>75% Grass cover, Good, HSG C (8S)
24,715	98	Paved parking, HSG C (8S)
37,500	**90**	**TOTAL AREA**

Summary for Subcatchment 8S: POI #1 (Post-dev)

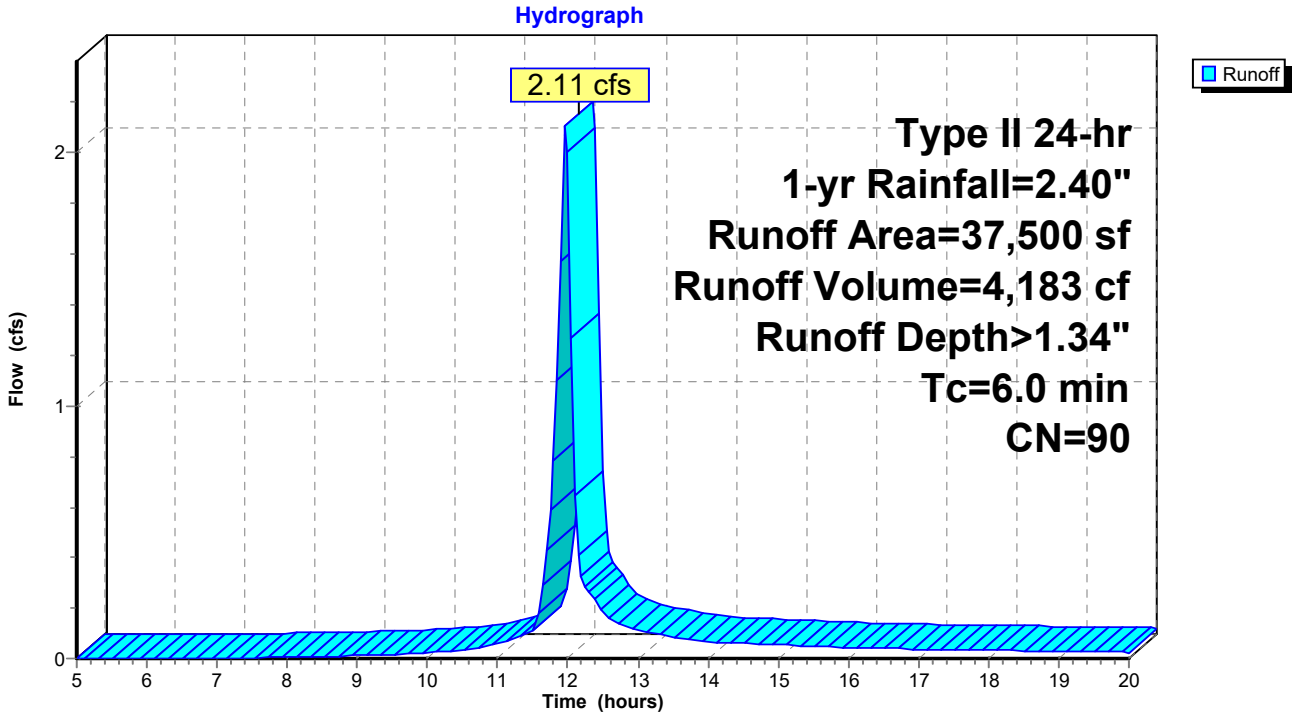
Runoff = 2.11 cfs @ 11.97 hrs, Volume= 4,183 cf, Depth> 1.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.40"

Area (sf)	CN	Description
12,785	74	>75% Grass cover, Good, HSG C
24,715	98	Paved parking, HSG C
37,500	90	Weighted Average
12,785		34.09% Pervious Area
24,715		65.91% Impervious Area

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

Subcatchment 8S: POI #1 (Post-dev)



Summary for Subcatchment 8S: POI #1 (Post-dev)

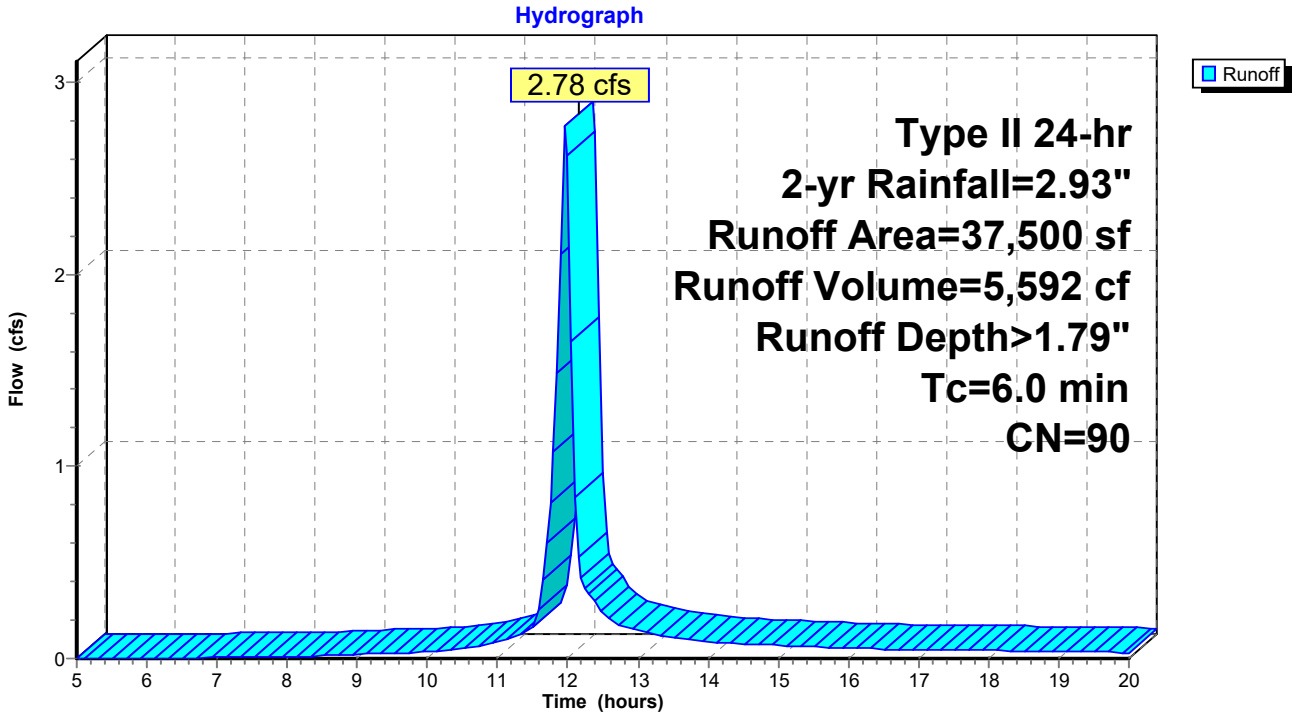
Runoff = 2.78 cfs @ 11.97 hrs, Volume= 5,592 cf, Depth> 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=2.93"

Area (sf)	CN	Description
12,785	74	>75% Grass cover, Good, HSG C
24,715	98	Paved parking, HSG C
37,500	90	Weighted Average
12,785		34.09% Pervious Area
24,715		65.91% Impervious Area

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

Subcatchment 8S: POI #1 (Post-dev)



Summary for Subcatchment 8S: POI #1 (Post-dev)

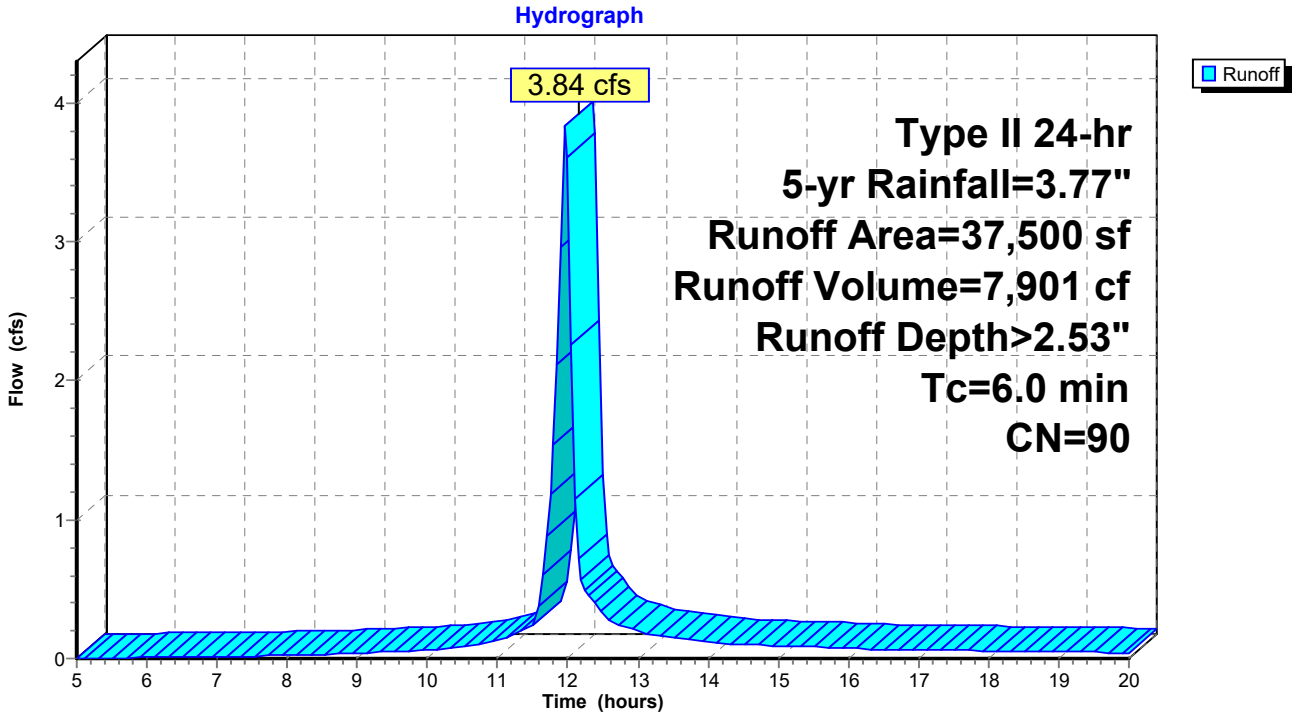
Runoff = 3.84 cfs @ 11.97 hrs, Volume= 7,901 cf, Depth> 2.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 5-yr Rainfall=3.77"

Area (sf)	CN	Description
12,785	74	>75% Grass cover, Good, HSG C
24,715	98	Paved parking, HSG C
37,500	90	Weighted Average
12,785		34.09% Pervious Area
24,715		65.91% Impervious Area

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

Subcatchment 8S: POI #1 (Post-dev)



Summary for Subcatchment 8S: POI #1 (Post-dev)

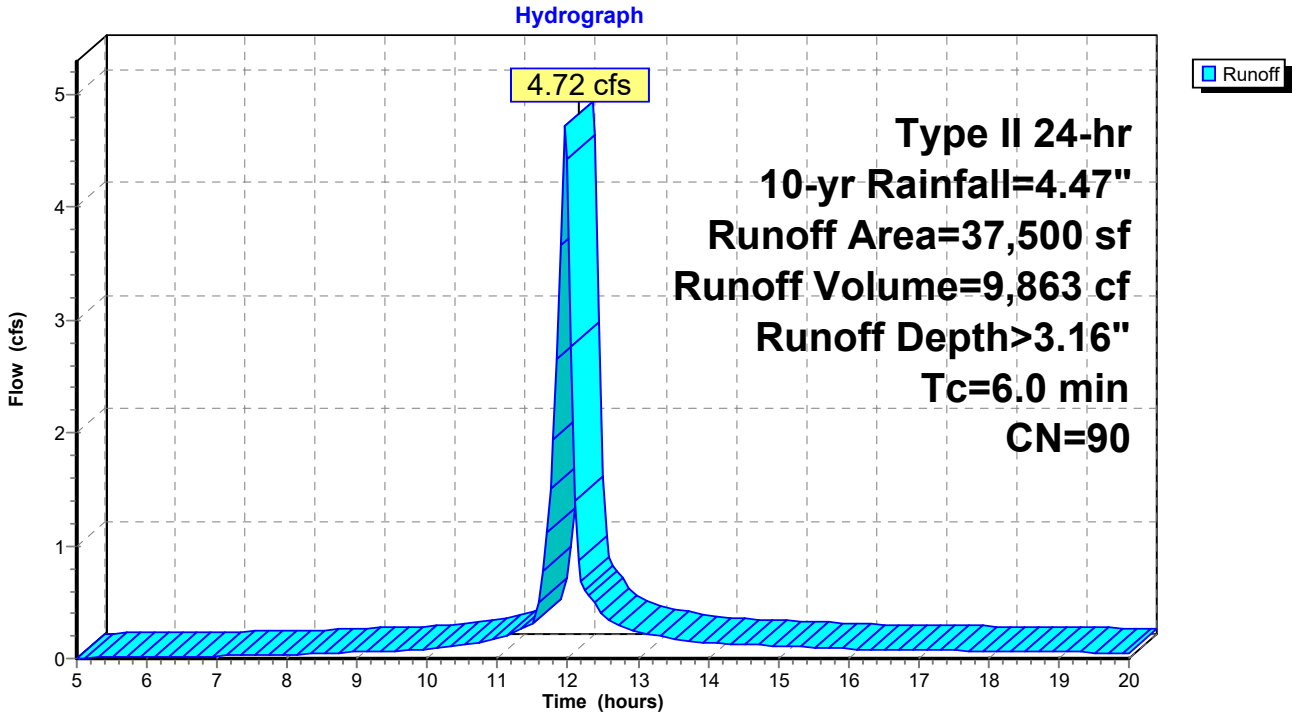
Runoff = 4.72 cfs @ 11.96 hrs, Volume= 9,863 cf, Depth> 3.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.47"

Area (sf)	CN	Description
12,785	74	>75% Grass cover, Good, HSG C
24,715	98	Paved parking, HSG C
37,500	90	Weighted Average
12,785		34.09% Pervious Area
24,715		65.91% Impervious Area

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

Subcatchment 8S: POI #1 (Post-dev)



Summary for Subcatchment 8S: POI #1 (Post-dev)

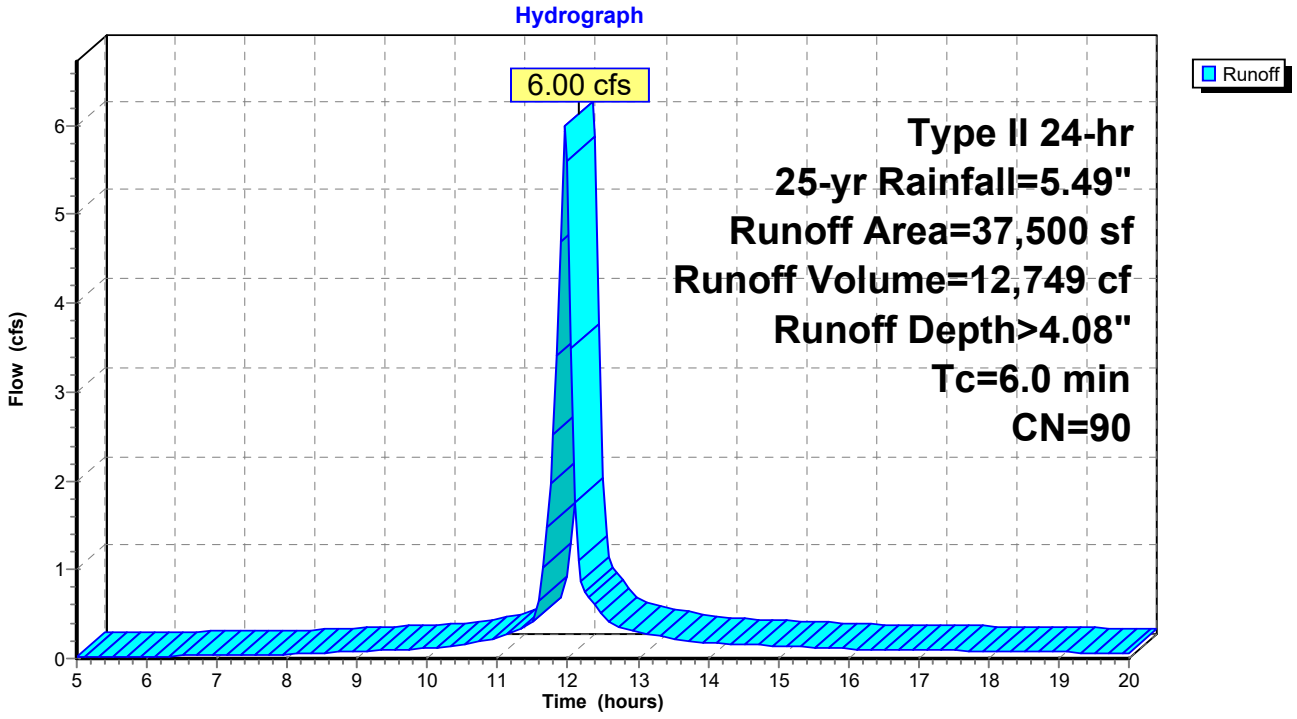
Runoff = 6.00 cfs @ 11.96 hrs, Volume= 12,749 cf, Depth> 4.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=5.49"

Area (sf)	CN	Description
12,785	74	>75% Grass cover, Good, HSG C
24,715	98	Paved parking, HSG C
37,500	90	Weighted Average
12,785		34.09% Pervious Area
24,715		65.91% Impervious Area

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

Subcatchment 8S: POI #1 (Post-dev)



Summary for Subcatchment 8S: POI #1 (Post-dev)

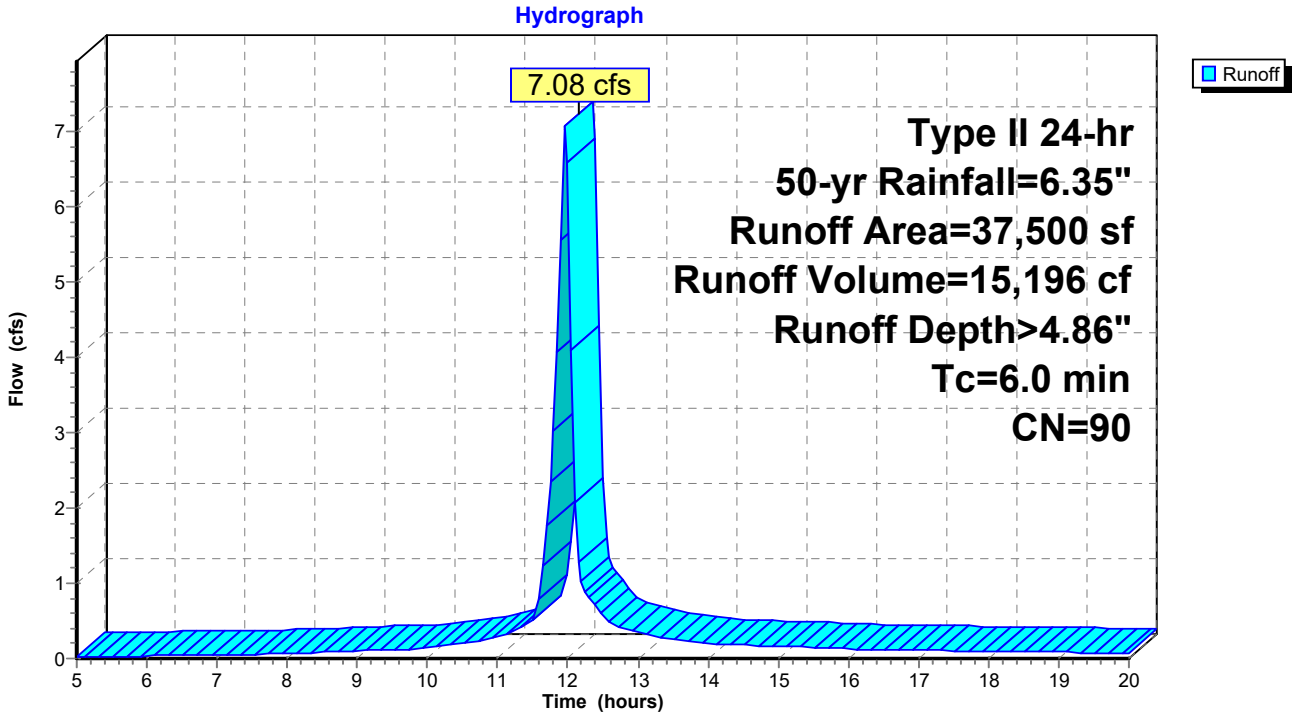
Runoff = 7.08 cfs @ 11.96 hrs, Volume= 15,196 cf, Depth> 4.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=6.35"

Area (sf)	CN	Description
12,785	74	>75% Grass cover, Good, HSG C
24,715	98	Paved parking, HSG C
37,500	90	Weighted Average
12,785		34.09% Pervious Area
24,715		65.91% Impervious Area

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

Subcatchment 8S: POI #1 (Post-dev)



Summary for Subcatchment 8S: POI #1 (Post-dev)

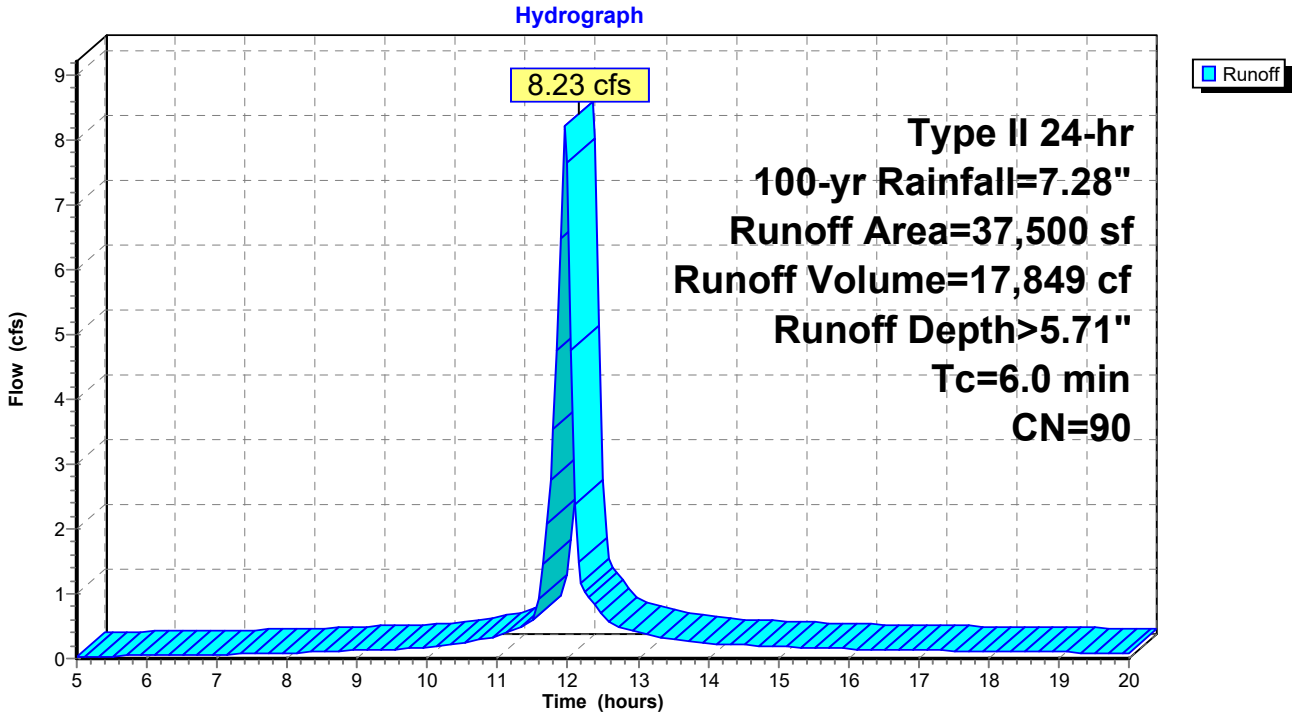
Runoff = 8.23 cfs @ 11.96 hrs, Volume= 17,849 cf, Depth> 5.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=7.28"

Area (sf)	CN	Description
12,785	74	>75% Grass cover, Good, HSG C
24,715	98	Paved parking, HSG C
37,500	90	Weighted Average
12,785		34.09% Pervious Area
24,715		65.91% Impervious Area

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

Subcatchment 8S: POI #1 (Post-dev)



Storm Drainage Calculations

NOAA Atlas 14, Volume 2, Version 3
Location name: Munster, Indiana, USA*
Latitude: 41.5672°, Longitude: -87.5093°
Elevation: 600 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.57** (4.10-5.10)	**5.44** (4.88-6.04)	**6.44** (5.78-7.16)	**7.33** (6.58-8.14)	**8.41** (7.50-9.32)	**9.30** (8.24-10.3)	**10.1** (8.94-11.3)	**11.0** (9.64-12.3)	**12.2** (10.6-13.7)	**13.2** (11.3-14.9)
10-min	**3.55** (3.19-3.96)	**4.24** (3.81-4.71)	**5.01** (4.49-5.56)	**5.66** (5.08-6.28)	**6.43** (5.74-7.13)	**7.04** (6.25-7.82)	**7.63** (6.73-8.48)	**8.23** (7.19-9.19)	**9.00** (7.79-10.1)	**9.62** (8.25-10.8)
15-min	**2.90** (2.60-3.24)	**3.46** (3.10-3.84)	**4.10** (3.68-4.55)	**4.64** (4.16-5.15)	**5.30** (4.72-5.88)	**5.81** (5.16-6.45)	**6.32** (5.57-7.03)	**6.82** (5.97-7.62)	**7.49** (6.48-8.40)	**8.02** (6.88-9.04)
30-min	**1.92** (1.72-2.14)	**2.31** (2.08-2.57)	**2.81** (2.52-3.12)	**3.23** (2.89-3.57)	**3.74** (3.34-4.15)	**4.15** (3.68-4.61)	**4.56** (4.02-5.07)	**4.98** (4.35-5.56)	**5.55** (4.80-6.22)	**6.01** (5.15-6.77)
60-min	**1.17** (1.05-1.31)	**1.42** (1.28-1.58)	**1.76** (1.58-1.96)	**2.05** (1.84-2.27)	**2.42** (2.16-2.69)	**2.74** (2.43-3.04)	**3.05** (2.69-3.39)	**3.38** (2.95-3.77)	**3.84** (3.32-4.30)	**4.22** (3.62-4.76)
2-hr	**0.685** (0.614-0.762)	**0.833** (0.747-0.923)	**1.05** (0.939-1.16)	**1.23** (1.10-1.36)	**1.47** (1.30-1.62)	**1.67** (1.48-1.85)	**1.88** (1.65-2.08)	**2.09** (1.82-2.32)	**2.38** (2.06-2.66)	**2.63** (2.25-2.95)
3-hr	**0.492** (0.440-0.552)	**0.600** (0.537-0.670)	**0.759** (0.677-0.849)	**0.894** (0.796-0.999)	**1.07** (0.950-1.20)	**1.22** (1.08-1.36)	**1.38** (1.20-1.54)	**1.54** (1.34-1.72)	**1.77** (1.51-1.99)	**1.95** (1.66-2.21)
6-hr	**0.294** (0.259-0.335)	**0.357** (0.315-0.407)	**0.458** (0.403-0.522)	**0.548** (0.481-0.624)	**0.674** (0.586-0.765)	**0.784** (0.676-0.889)	**0.901** (0.769-1.02)	**1.03** (0.868-1.17)	**1.22** (1.01-1.39)	**1.38** (1.13-1.59)
12-hr	**0.170** (0.150-0.193)	**0.206** (0.182-0.233)	**0.261** (0.231-0.296)	**0.311** (0.274-0.353)	**0.380** (0.332-0.430)	**0.441** (0.382-0.498)	**0.505** (0.433-0.571)	**0.575** (0.488-0.652)	**0.677** (0.564-0.771)	**0.766** (0.629-0.876)
24-hr	**0.100** (0.090-0.110)	**0.122** (0.110-0.135)	**0.157** (0.142-0.173)	**0.186** (0.168-0.205)	**0.228** (0.204-0.251)	**0.264** (0.234-0.290)	**0.303** (0.266-0.333)	**0.345** (0.300-0.380)	**0.407** (0.348-0.450)	**0.460** (0.388-0.509)
2-day	**0.058** (0.053-0.064)	**0.070** (0.064-0.078)	**0.089** (0.080-0.098)	**0.104** (0.094-0.115)	**0.126** (0.113-0.140)	**0.145** (0.129-0.160)	**0.165** (0.145-0.183)	**0.186** (0.163-0.208)	**0.218** (0.187-0.245)	**0.244** (0.206-0.276)
3-day	**0.041** (0.037-0.045)	**0.049** (0.045-0.054)	**0.062** (0.057-0.068)	**0.072** (0.066-0.079)	**0.087** (0.078-0.095)	**0.099** (0.089-0.109)	**0.112** (0.099-0.123)	**0.126** (0.111-0.139)	**0.146** (0.126-0.164)	**0.162** (0.139-0.185)
4-day	**0.033** (0.030-0.035)	**0.039** (0.036-0.043)	**0.049** (0.045-0.053)	**0.056** (0.051-0.061)	**0.067** (0.061-0.073)	**0.076** (0.069-0.083)	**0.085** (0.077-0.093)	**0.095** (0.085-0.105)	**0.110** (0.096-0.124)	**0.122** (0.105-0.139)
7-day	**0.022** (0.020-0.023)	**0.026** (0.024-0.028)	**0.031** (0.029-0.034)	**0.036** (0.033-0.039)	**0.042** (0.039-0.045)	**0.047** (0.043-0.051)	**0.052** (0.047-0.056)	**0.057** (0.052-0.062)	**0.065** (0.058-0.071)	**0.071** (0.062-0.080)
10-day	**0.017** (0.016-0.019)	**0.020** (0.019-0.022)	**0.025** (0.023-0.027)	**0.028** (0.026-0.030)	**0.033** (0.030-0.036)	**0.037** (0.033-0.040)	**0.041** (0.037-0.045)	**0.045** (0.040-0.050)	**0.051** (0.045-0.057)	**0.056** (0.048-0.062)
20-day	**0.011** (0.011-0.012)	**0.013** (0.013-0.015)	**0.016** (0.015-0.017)	**0.018** (0.017-0.019)	**0.021** (0.019-0.022)	**0.023** (0.021-0.024)	**0.025** (0.022-0.026)	**0.026** (0.024-0.029)	**0.029** (0.026-0.032)	**0.031** (0.028-0.034)
30-day	**0.009** (0.009-0.010)	**0.011** (0.010-0.012)	**0.013** (0.012-0.014)	**0.014** (0.013-0.015)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.018** (0.017-0.020)	**0.020** (0.018-0.021)	**0.021** (0.019-0.023)	**0.022** (0.020-0.024)
45-day	**0.008** (0.007-0.008)	**0.009** (0.009-0.010)	**0.010** (0.010-0.011)	**0.011** (0.011-0.012)	**0.013** (0.012-0.013)	**0.013** (0.013-0.014)	**0.014** (0.013-0.015)	**0.015** (0.014-0.016)	**0.016** (0.015-0.017)	**0.016** (0.015-0.017)
60-day	**0.007** (0.006-0.007)	**0.008** (0.008-0.009)	**0.009** (0.009-0.010)	**0.010** (0.010-0.011)	**0.011** (0.011-0.012)	**0.012** (0.011-0.013)	**0.013** (0.012-0.014)	**0.013** (0.013-0.014)	**0.014** (0.013-0.015)	**0.015** (0.014-0.016)

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

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

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

Appendix A- USDA Soil Resource Report

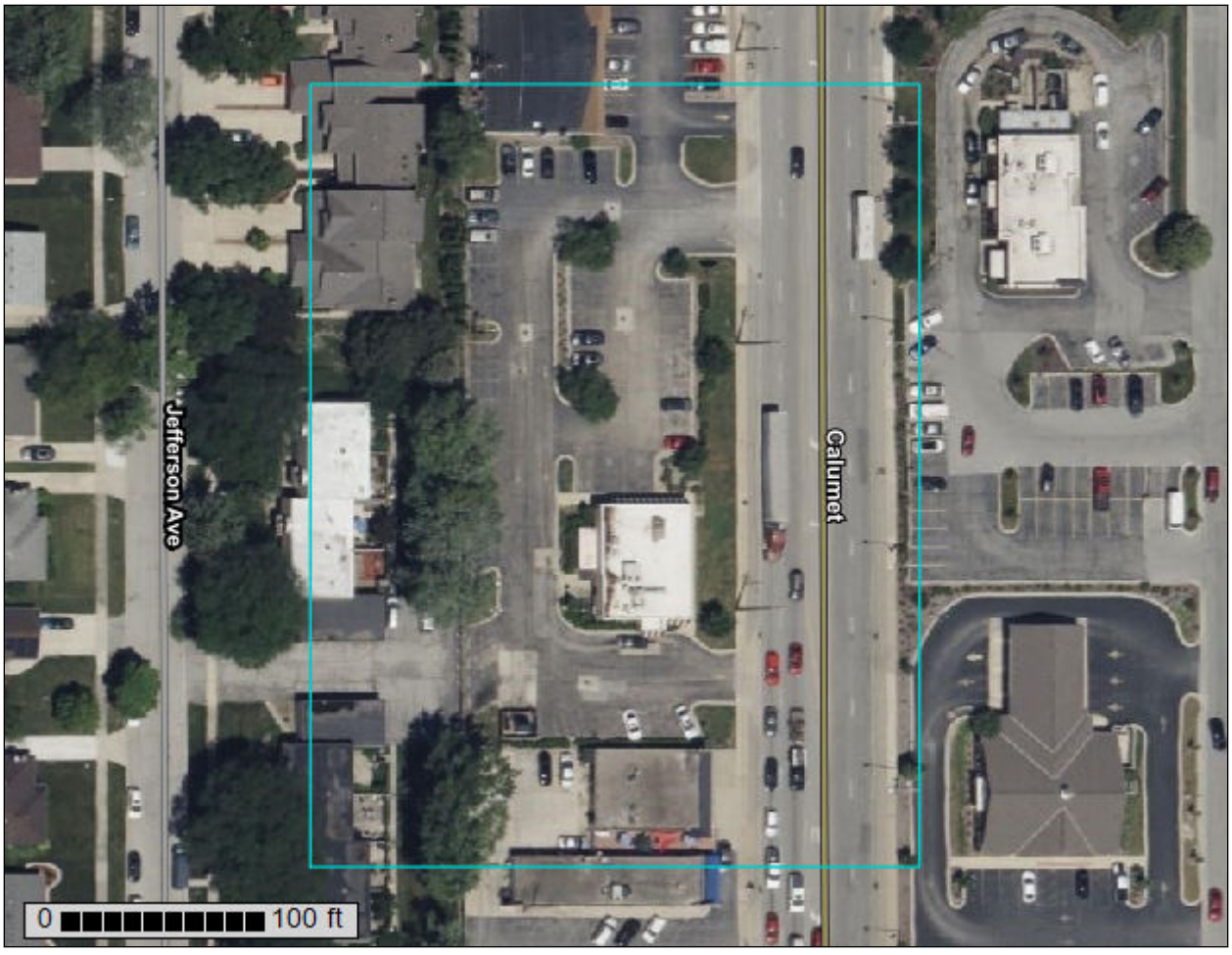
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Lake County, Indiana



October 17, 2025

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

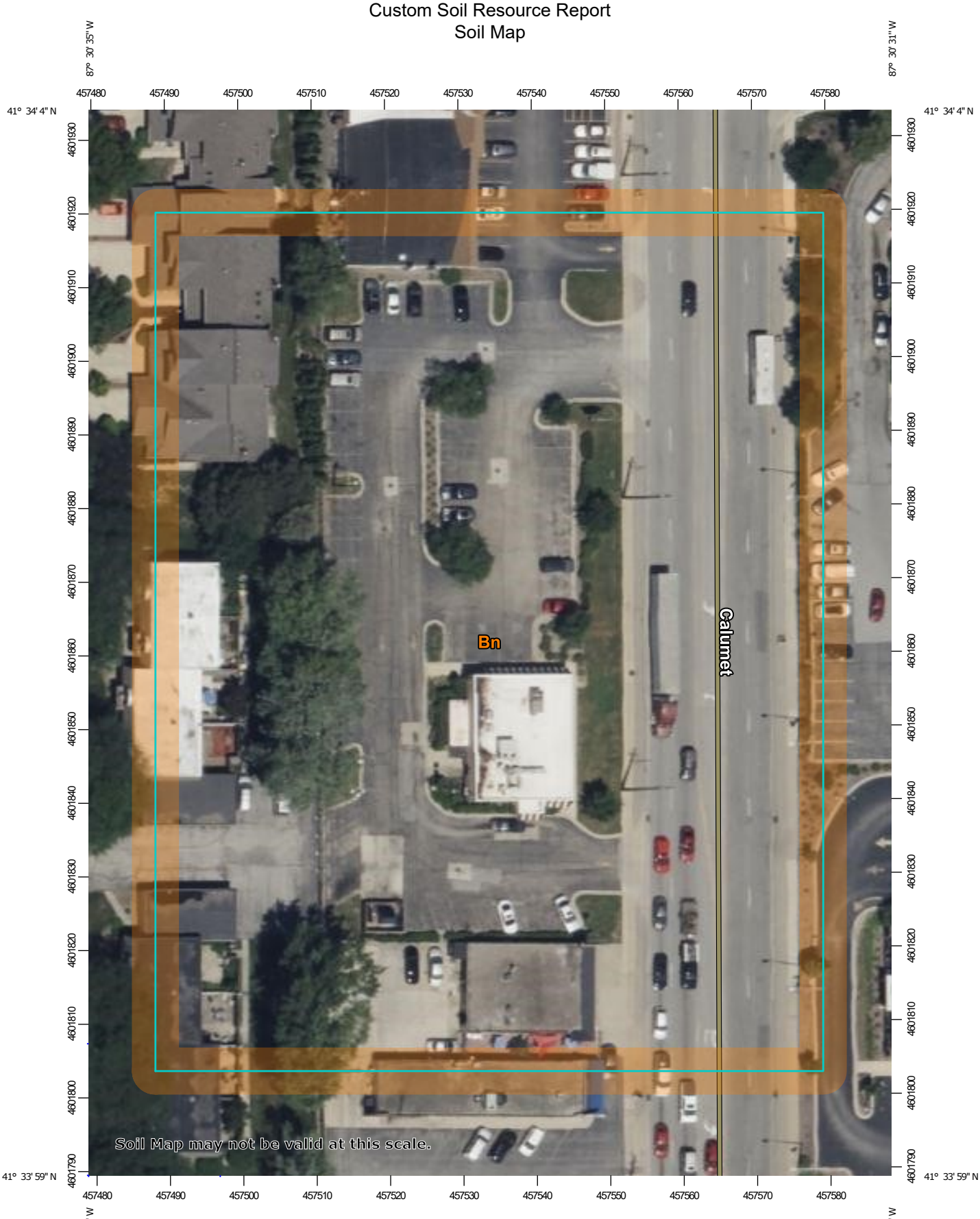
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:705 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 30 60 120 180

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N 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 1:15,800.

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: Lake County, Indiana
Survey Area Data: Version 28, Sep 3, 2025

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

Date(s) aerial images were photographed: Jun 16, 2022—Jun 27, 2022

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
Bn	Bono silty clay	2.6	100.0%
Totals for Area of Interest		**2.6**	**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.

Lake County, Indiana

Bn—Bono silty clay

Map Unit Setting

National map unit symbol: 94hk
Elevation: 570 to 790 feet
Mean annual precipitation: 36 to 40 inches
Mean annual air temperature: 49 to 51 degrees F
Frost-free period: 170 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Bono and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bono

Setting

Landform: Depressions on lake plains
Landform position (two-dimensional): Toeslope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Clayey lacustrine deposits

Typical profile

H1 - 0 to 21 inches: silty clay
H2 - 21 to 39 inches: silty clay
H3 - 39 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
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 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 40 percent
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Ecological site: R097XB047IL - Chicago Wet Clayey Flats
Hydric soil rating: Yes

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

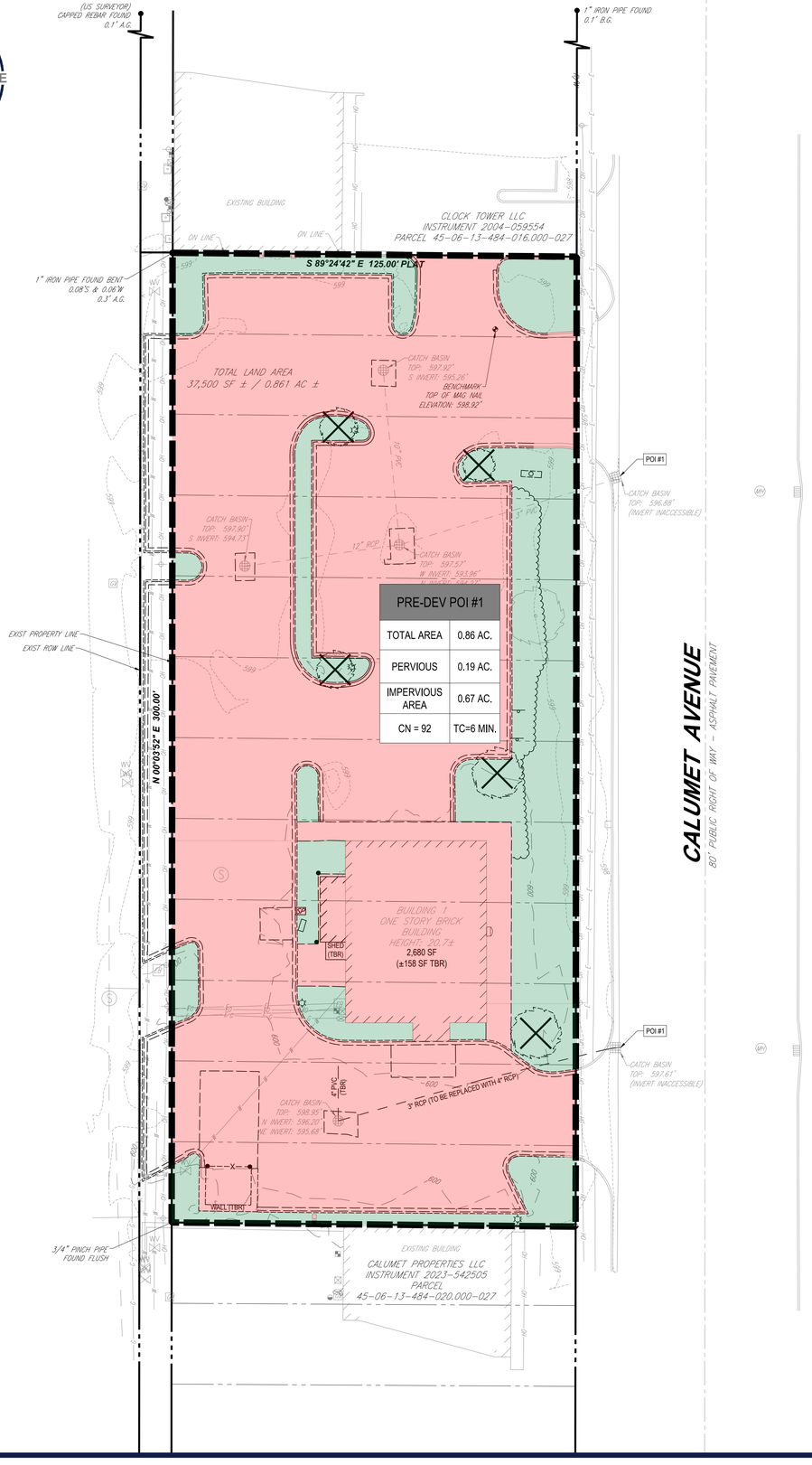
United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

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

Drainage Area Plans



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SCALE: 1" = 20'

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CHECKED BY:	KJB
DATE:	08/21/2025
CAD I.D.:	P-CIVIL-LDVP

PROJECT:

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FOR

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REGISTERED
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STATE OF
INDIANA
PROFESSIONAL ENGINEER

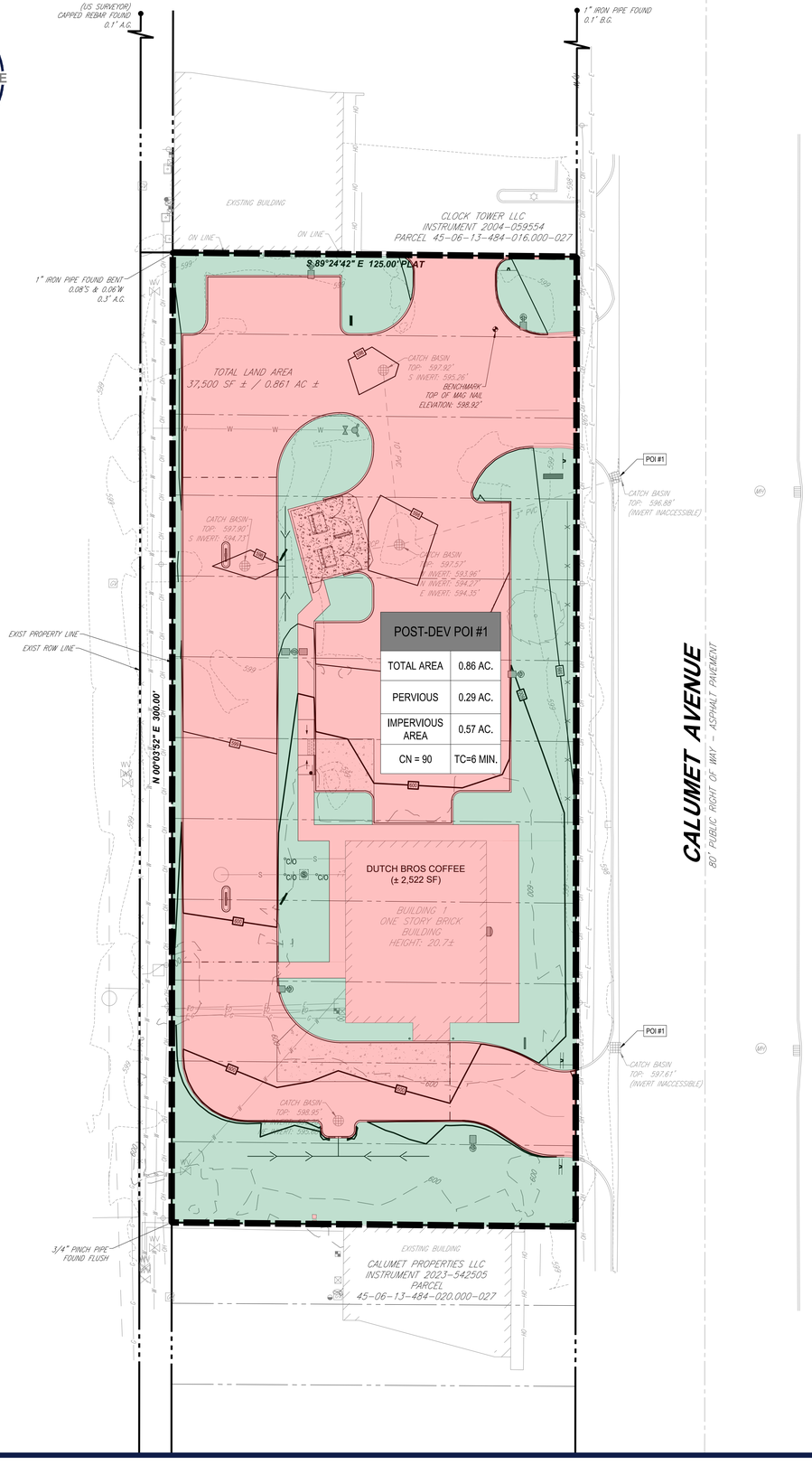
SHEET TITLE:

PRE DEVELOPMENT DRAINAGE AREA MAP

SHEET NUMBER:

C-402

REVISION 1 - 10/21/2025



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SCALE: 1" = 20'

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SHEET TITLE:

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