TOPSS

Drainage Calculations

CITY OF OXFORD, BUTLER COUNTY, OH

FEBRUARY 28, 2025

PREPARED BY:

BAYER BECKER

110 S. COLLEGE AVENUE, SUITE 101

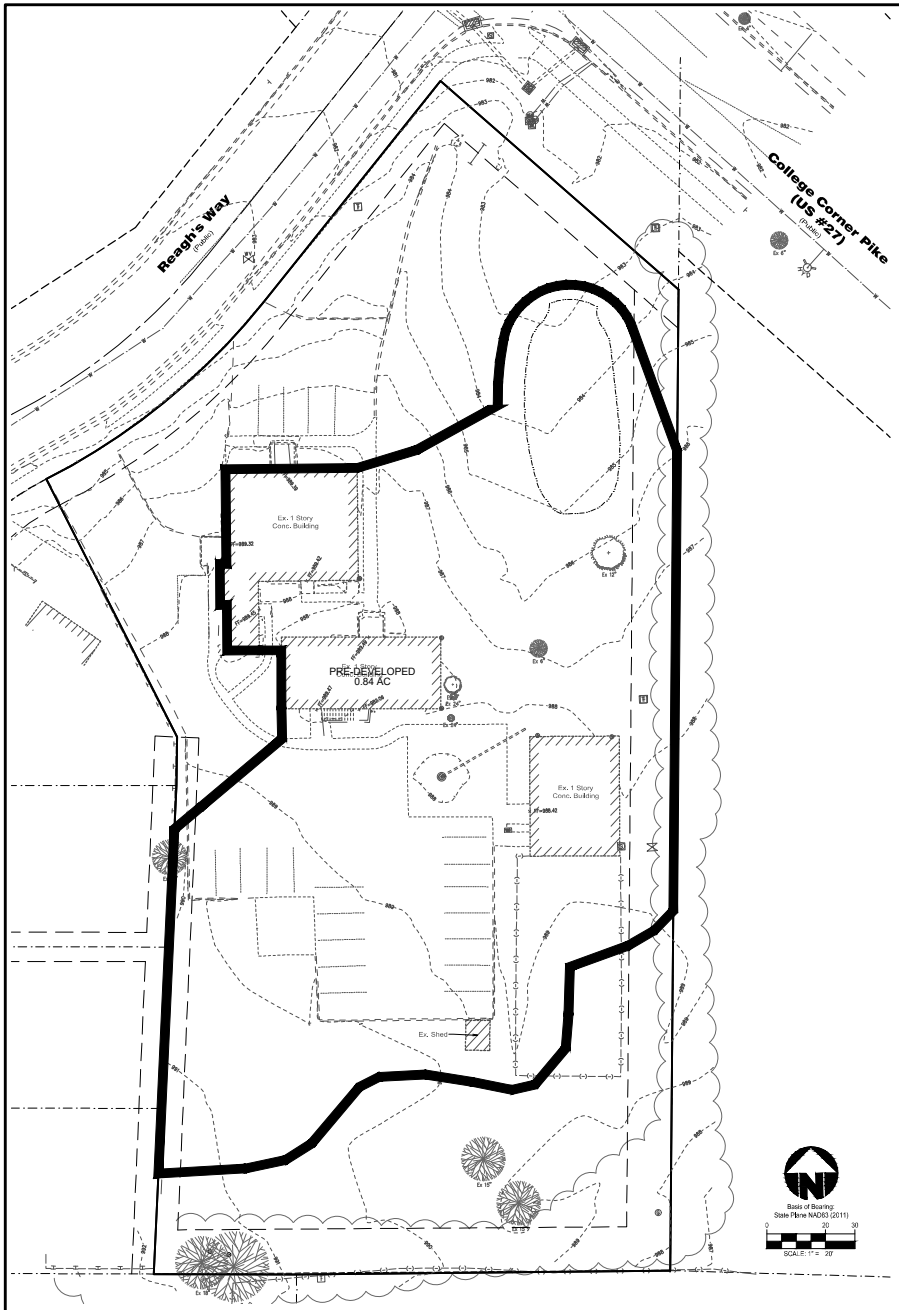
OXFORD, OHIO 45056

P (513) 523-4270

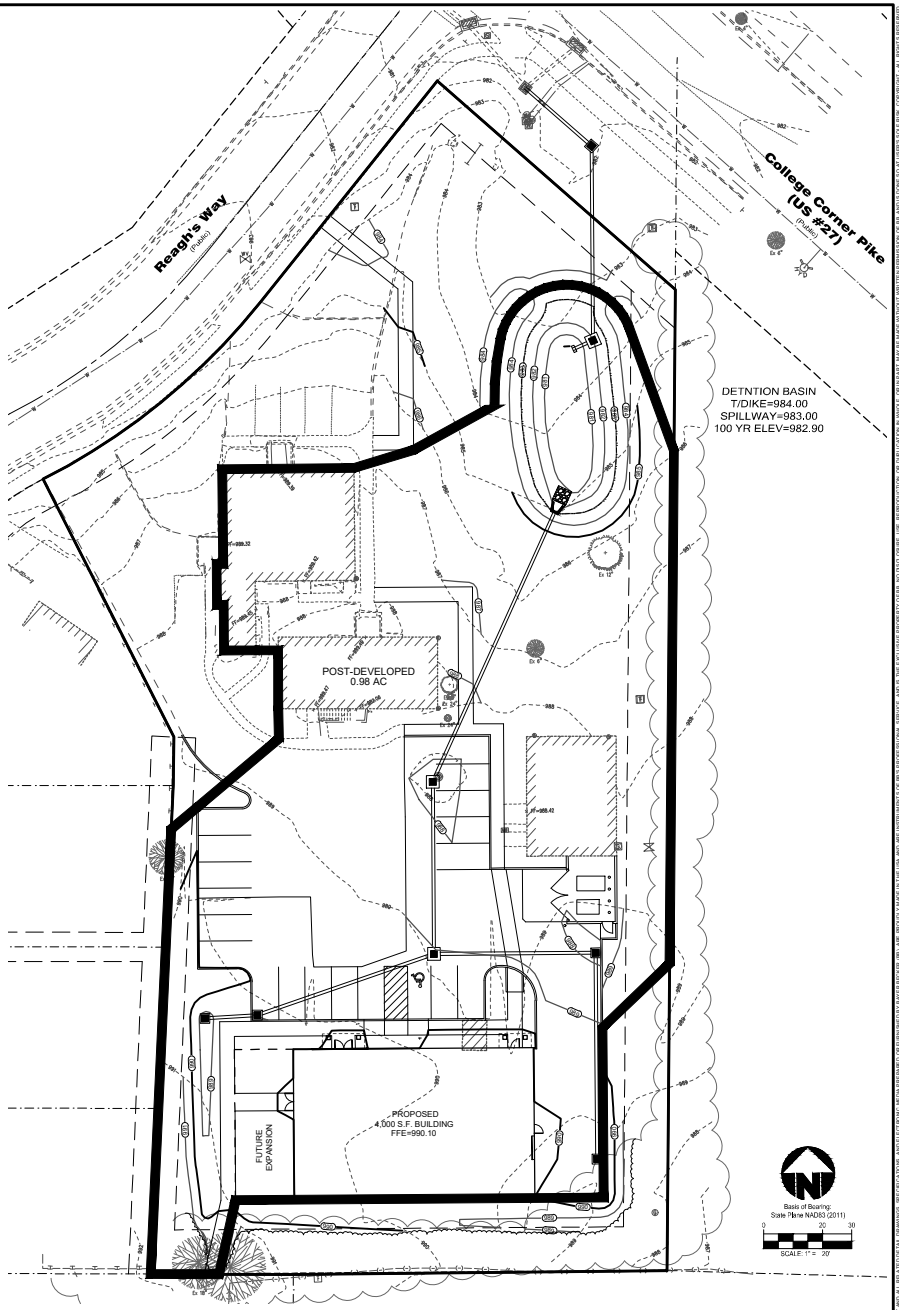
STORM WATER MANAGEMENT

TOPSS

Table of Contents



PRE DEVELOPED DRAINAGE MAP



POST DEVELOPED DRAINAGE MAP

Item | Revision Description | Date | Drawn | Chk

TOPSS: TALAWANDA OXFORD PANTRY & SOCIAL SERVICES
SEC. 16, TOWN 5, RANGE 1, CONGRESS LANDS W. OF THE MIAMI
OXFORD TOWNSHIP
BUTLER COUNTY, OHIO
5445 COLLEGE CORNER PIKE

PRE AND POST DEVELOPED DRAINAGE MAPS

bayer becker
ENGINEERS | SURVEYORS
110 S. College Avenue, Suite 101
Oxford, OH 45056 - 513.523.4270

Drawing: 24-0042 CD
Drawn by: GJK
Checked By:
Issue Date: 02-28-25
Sheet: 1 OF 1

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Plot time: Feb 27, 2025 - 4:05pm
Drawing name: J:\2024\24-0042\CIV\DWG\24-0042 CD.dwg - Layout Tab: Layout1

Map Scale: 1:778 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 35 70 140 210

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 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 1:15,800.

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: Butler County, Ohio
Survey Area Data: Version 24, Aug 27, 2024

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

Date(s) aerial images were photographed: Jun 19, 2022—Jun 21, 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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
RxB	Russell-Urban land complex, gently sloping	C	1.8	100.0%
Totals for Area of Interest			**1.8**	**100.0%**

Description

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.

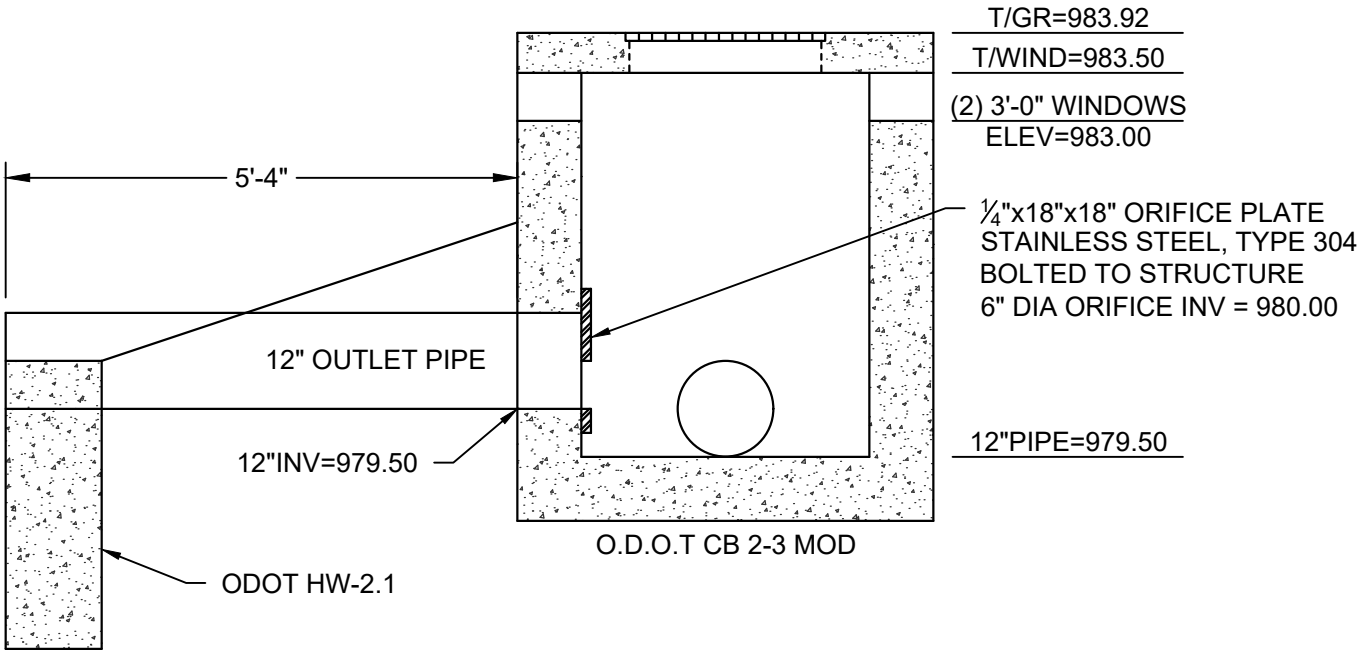
Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

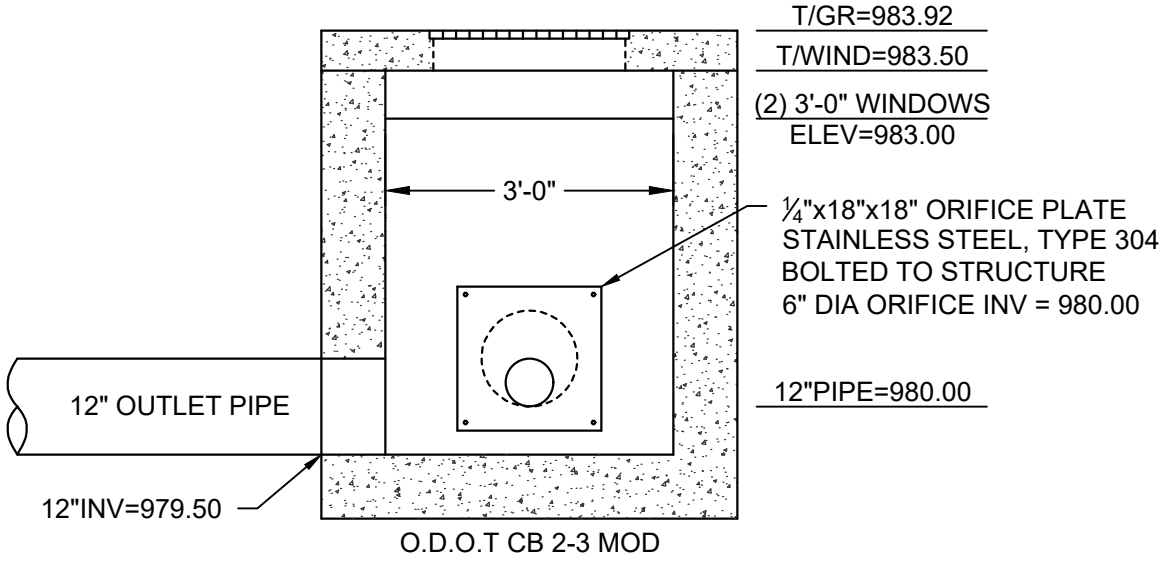
Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over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

Rating Options

Aggregation Method: Dominant Condition





Drawing:	24-0042 CD
Scale	N.T.S
Drawn by:	GJK
Checked By:	
Issue Date:	02-28-25

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SEC. 16, TOWN 5, RANGE 1, CONGRESS LANDS W. OF THE MIAMI
LOT 3285 OXFORD, BUTLER COUNTY, OHIO
5445 COLLEGE CORNER PIKE

OUTLET STRUCTURE DETAIL

bayer becker
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Oxford, OH 45056 - 513.523.4270

DATE: 2-28-25
BY: GJK
CK'D:

BAYER BECKER
CIVIL ENGINEERING - SURVEYING
LANDSCAPE ARCHITECTURE - PLANNING

PROJECT: 24-0042

Storage Equation Method
Stormwater Detention Calculations

Pre Developed:

Description	Area	"c"	A x c
Pervious	0.52	0.30	0.16
Impervious	0.32	0.90	0.29
	0.84		0.44

Weighted "c" = 0.53
Total Area = 0.84 Acres
T_C = 10 Minutes

Post Developed:

Description	Area	"c"	A x c
Pervious	0.43	0.30	0.13
Impervious	0.54	0.90	0.49
	0.98		0.62

Weighted "c" = 0.63
Total Area = 0.97 Acres
T_C = 10 Minutes

Pre-Developed Intensities

(From Exhibit V-1, Page 115 City of Oxford, Stormwater Management Design Manual)

I_1 = 3.07 in/hr
I_2 = 4.08 in/hr
I_5 = 4.85 in/hr
I_{10} = 5.45 in/hr
I_{25} = 6.30 in/hr
I_{50} = 7.02 in/hr
I_{100} = 7.69 in/hr

Post-Developed Intensities

I_1 = 3.07 in/hr
I_2 = 4.08 in/hr
I_5 = 4.85 in/hr
I_{10} = 5.45 in/hr
I_{25} = 6.30 in/hr
I_{50} = 7.02 in/hr
I_{100} = 7.69 in/hr

Pre-Developed Runoff

$\mathbf{Q_x} = CI_xA$

Q_1 = 1.36 cfs
Q_2 = 1.81 cfs
Q_5 = 2.15 cfs
Q_{10} = 2.42 cfs
Q_{25} = 2.80 cfs
Q_{50} = 3.12 cfs
Q_{100} = 3.41 cfs

Post-Developed Runoff

Q_1 = 1.87 cfs
Q_2 = 2.48 cfs
Q_5 = 2.95 cfs
Q_{10} = 3.32 cfs
Q_{25} = 3.83 cfs
Q_{50} = 4.27 cfs
Q_{100} = 4.68 cfs

Required Storage Volume, S_{100}

$\mathbf{S_{100}} = (Q_{100post} - Q_{100pre}) \times 30 \times 60$ sec/min = **2,280 Cu. Ft.**

Required Storage Volume per Frequency Event, S_x

S_1 = 910 Cu. Ft.
S_2 = 1,210 Cu. Ft.
S_5 = 1,438 Cu. Ft.
S_{10} = 1,616 Cu. Ft.
S_{25} = 1,868 Cu. Ft.
S_{50} = 2,081 Cu. Ft.
S_{100} = 2,280 Cu. Ft.

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PROJECT: 24-0042

Storage Equation Method
Stormwater Detention Calculations

Water Quality Volume Required = - Cu. Ft.
(Under 1.0 Acre disturbance - No Water Quanity Required)

Proposed Release Rates: From Hydraflow Pond Report

Storm Event (Year)	Required Storage Volume (Cu. Ft.)	Total Required Volume (Cu. Ft.)	Provided Volume (Cu. Ft.)	Allowable Release Rate (cfs)	Basin Release Rate (cfs)	Total Post Release Rate (cfs)	Storage Elevation (ft)
1	910	910	*1,083*	1.36	1.25	1.25	982.00
2	1,210	1,210	*1,362*	1.81	1.32	1.32	982.20
5	1,438	1,438	*1,642*	2.15	1.39	1.39	982.40
10	1,616	1,616	*1,781*	2.42	1.42	1.42	982.50
25	1,868	1,868	*2,060*	2.80	1.48	1.48	982.70
50	2,081	2,081	*2,339*	3.12	1.54	1.54	982.90
100	2,280	2,280	*2,479*	3.41	1.57	1.57	983.00
Max.			*4,489*		1.83		984.00

Spillway	
Design Discharge (cfs)**	3.41
Spillway Invert	983.00
Spillway Length	20.00
Top of Dike Elevation	984.00
Flow Depth (ft) [C=2.6]	0.16
Freeboard	0.84
Spillway Side Slope	4:1
Velocity	1.05

**Pre-Developed 100yr Discharge

Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 27 / 2025

Pond No. 1 - Detention Basin

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 980.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	980.00	00	0	0
1.00	981.00	641	214	214
2.00	982.00	1,121	870	1,083
3.00	983.00	1,689	1,395	2,479
4.00	984.00	2,350	2,010	4,489

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	6.00	0.00	0.00
Span (in)	= 12.00	6.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 979.50	980.00	0.00	0.00
Length (ft)	= 66.00	0.00	0.00	0.00
Slope (%)	= 2.90	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	980.00	0.00	0.00	---	---	---	---	---	---	---	---	0.000
0.10	21	980.10	0.95 ic	0.03 ic	---	---	---	---	---	---	---	---	0.031
0.20	43	980.20	0.95 ic	0.11 ic	---	---	---	---	---	---	---	---	0.114
0.30	64	980.30	0.95 ic	0.23 ic	---	---	---	---	---	---	---	---	0.230
0.40	85	980.40	0.95 ic	0.36 ic	---	---	---	---	---	---	---	---	0.363
0.50	107	980.50	0.95 ic	0.47 ic	---	---	---	---	---	---	---	---	0.473
0.60	128	980.60	0.95 ic	0.56 ic	---	---	---	---	---	---	---	---	0.559
0.70	150	980.70	0.95 ic	0.63 ic	---	---	---	---	---	---	---	---	0.634
0.80	171	980.80	0.95 ic	0.70 ic	---	---	---	---	---	---	---	---	0.701
0.90	192	980.90	0.95 ic	0.76 ic	---	---	---	---	---	---	---	---	0.762
1.00	214	981.00	0.95 ic	0.82 ic	---	---	---	---	---	---	---	---	0.819
1.10	301	981.10	0.95 ic	0.87 ic	---	---	---	---	---	---	---	---	0.872
1.20	388	981.20	0.95 ic	0.92 ic	---	---	---	---	---	---	---	---	0.921
1.30	475	981.30	0.97 ic	0.97 ic	---	---	---	---	---	---	---	---	0.969
1.40	562	981.40	1.02 ic	1.01 ic	---	---	---	---	---	---	---	---	1.014
1.50	649	981.50	1.07 ic	1.06 ic	---	---	---	---	---	---	---	---	1.057
1.60	736	981.60	1.10 ic	1.10 ic	---	---	---	---	---	---	---	---	1.098
1.70	823	981.70	1.15 ic	1.14 ic	---	---	---	---	---	---	---	---	1.138
1.80	909	981.80	1.18 ic	1.18 ic	---	---	---	---	---	---	---	---	1.177
1.90	996	981.90	1.21 ic	1.21 ic	---	---	---	---	---	---	---	---	1.214
2.00	1,083	982.00	1.27 ic	1.25 ic	---	---	---	---	---	---	---	---	1.251
2.10	1,223	982.10	1.29 ic	1.29 ic	---	---	---	---	---	---	---	---	1.286
2.20	1,362	982.20	1.32 ic	1.32 ic	---	---	---	---	---	---	---	---	1.320
2.30	1,502	982.30	1.35 ic	1.35 ic	---	---	---	---	---	---	---	---	1.353
2.40	1,642	982.40	1.39 ic	1.39 ic	---	---	---	---	---	---	---	---	1.386
2.50	1,781	982.50	1.44 ic	1.42 ic	---	---	---	---	---	---	---	---	1.418
2.60	1,921	982.60	1.46 ic	1.45 ic	---	---	---	---	---	---	---	---	1.449
2.70	2,060	982.70	1.49 ic	1.48 ic	---	---	---	---	---	---	---	---	1.480
2.80	2,200	982.80	1.52 ic	1.51 ic	---	---	---	---	---	---	---	---	1.509
2.90	2,339	982.90	1.55 ic	1.54 ic	---	---	---	---	---	---	---	---	1.539
3.00	2,479	983.00	1.58 ic	1.57 ic	---	---	---	---	---	---	---	---	1.568
3.10	2,680	983.10	1.60 ic	1.60 ic	---	---	---	---	---	---	---	---	1.596
3.20	2,881	983.20	1.63 ic	1.62 ic	---	---	---	---	---	---	---	---	1.624
3.30	3,082	983.30	1.66 ic	1.65 ic	---	---	---	---	---	---	---	---	1.651
3.40	3,283	983.40	1.69 ic	1.68 ic	---	---	---	---	---	---	---	---	1.678
3.50	3,484	983.50	1.71 ic	1.70 ic	---	---	---	---	---	---	---	---	1.704
3.60	3,685	983.60	1.74 ic	1.73 ic	---	---	---	---	---	---	---	---	1.730
3.70	3,886	983.70	1.77 ic	1.76 ic	---	---	---	---	---	---	---	---	1.756

Continues on next page...

Detention Basin

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.80	4,087	983.80	1.79 ic	1.78 ic	---	---	---	---	---	---	---	---	1.781
3.90	4,288	983.90	1.82 ic	1.81 ic	---	---	---	---	---	---	---	---	1.806
4.00	4,489	984.00	1.85 ic	1.83 ic	---	---	---	---	---	---	---	---	1.831

...End

BAYER-BECKER
6900 Tylersville Road, Suite A
Mason, OH 45040
(513) 336-6600

STORM SEWER CALCULATIONS

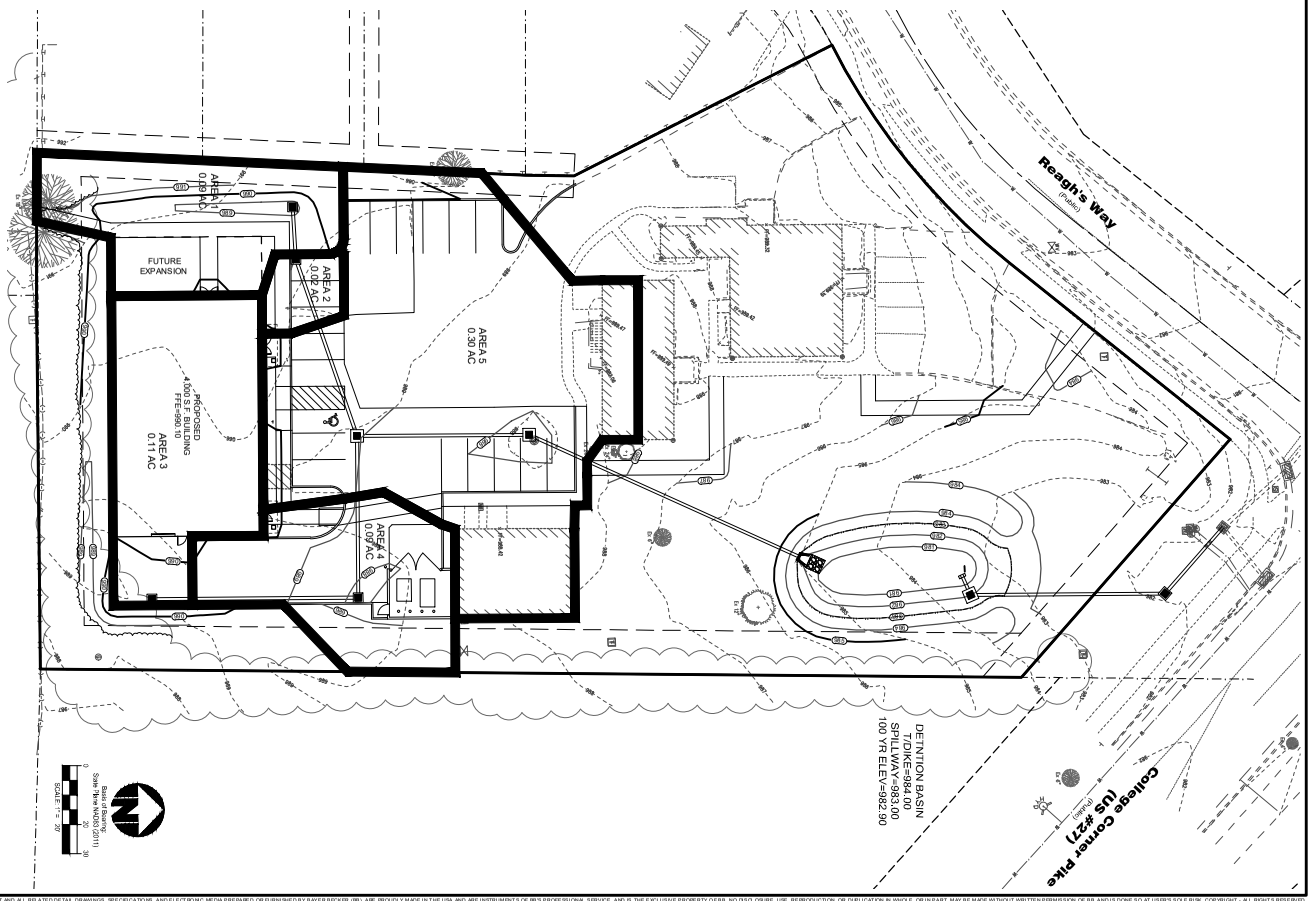
Project Name: **TOPSS Pantry, 5445 College Corner Pike**

FORMULAE USED
$Q_r = AC * I$ (required)
$V_p = (1.486 / n) * R^{2/3} * S^{1/2}$
$Q_p = A_p * V_p$
R = (Pipe Dia. / 4)

Designed By: GJK
Reviewed By:
Date: 2/28/2025
Revised date:
Revised date:
Job # 24-0042

LOCATION		TOPOGRAPHY					TIME					DESIGN					TIME				REMARKS
From	To	Area Number	Acres	"C" Value	"AC" for Area	"AC" Accumulate	Time To Inlet "T" (minutes)	Time In Pipe "Tp" (minutes)	Time of Concentration "Tc" (minutes)	Intensity "I" 10 Year Storm Event	"Q" Required (c.f.s.)	Pipe Size (inches)	"n" Value	Slope in %	Velocity (ft. / sec)	"Q" Provided (c.f.s.)	Length of Pipe (feet)	Time In Pipe "Tp" (minutes)	Inlet Invert Elev.	Outlet Invert Elev.	
1	2	1	0.09	0.60	0.05	0.05	10.0		10.0	5.15	**0.28**	12	0.013	2.00	6.42	**5.04**	18	0.0	986.06	985.70	
2	5	2	0.02	0.80	0.02	0.07	10.0	0.0	10.0	5.14	**0.36**	12	0.013	1.10	4.76	**3.74**	64	0.2	985.70	985.00	
3	4	3	0.11	0.90	0.10	0.10	10.0		10.0	5.15	**0.51**	12	0.013	2.10	6.57	**5.16**	70	0.2	986.00	984.53	
4	5	4	0.09	0.80	0.07	0.17	10.0	0.2	10.2	5.12	**0.88**	12	0.013	0.60	3.51	**2.76**	55	0.3	984.28	983.95	
5	6					0.24	10.2	0.3	10.4	5.08	**1.23**	12	0.013	0.60	3.51	**2.76**	59	0.3	983.95	983.60	
6	7	5	0.30	0.80	0.24	0.48	10.4	0.3	10.7	5.04	**2.43**	12	0.013	1.00	4.54	**3.56**	101	0.4	982.35	981.34	

Plot time: Feb 27, 2025 - 4:05pm
Drawing name: J:\2024\24-0042\CV\DWG\24-0042 CD.dwg - Layout Tab: Layout1



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Sheet: 1 OF 1

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STORM SEWER DRAINAGE MAP

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