STORM WATER MANAGEMENT SUMMARY

OCTOBER 26, 2016

PREPARED FOR:
DAYTON FREIGHT
6450 POE AVENUE, SUITE 311
DAYTON, OHIO

APPROVED
NOV 15 2016
VANDERBURGH COUNTY
DRAINAGE BOARD

RECEIVED BY THE
VANDERBURGH COUNTY
SURVEYOR'S OFFICE
11/2/2016
CA

RECEIVED
NOV 02 2016
SITE REVIEW

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DAYTON FREIGHT-Construction Drawings in Vault-November 15, 2016

C000-Location

C100-Existing Conditions

C101-Demolition

C200 Site Plan

C300 Grading Plan – Revised sheet C301

C500 SWPPP

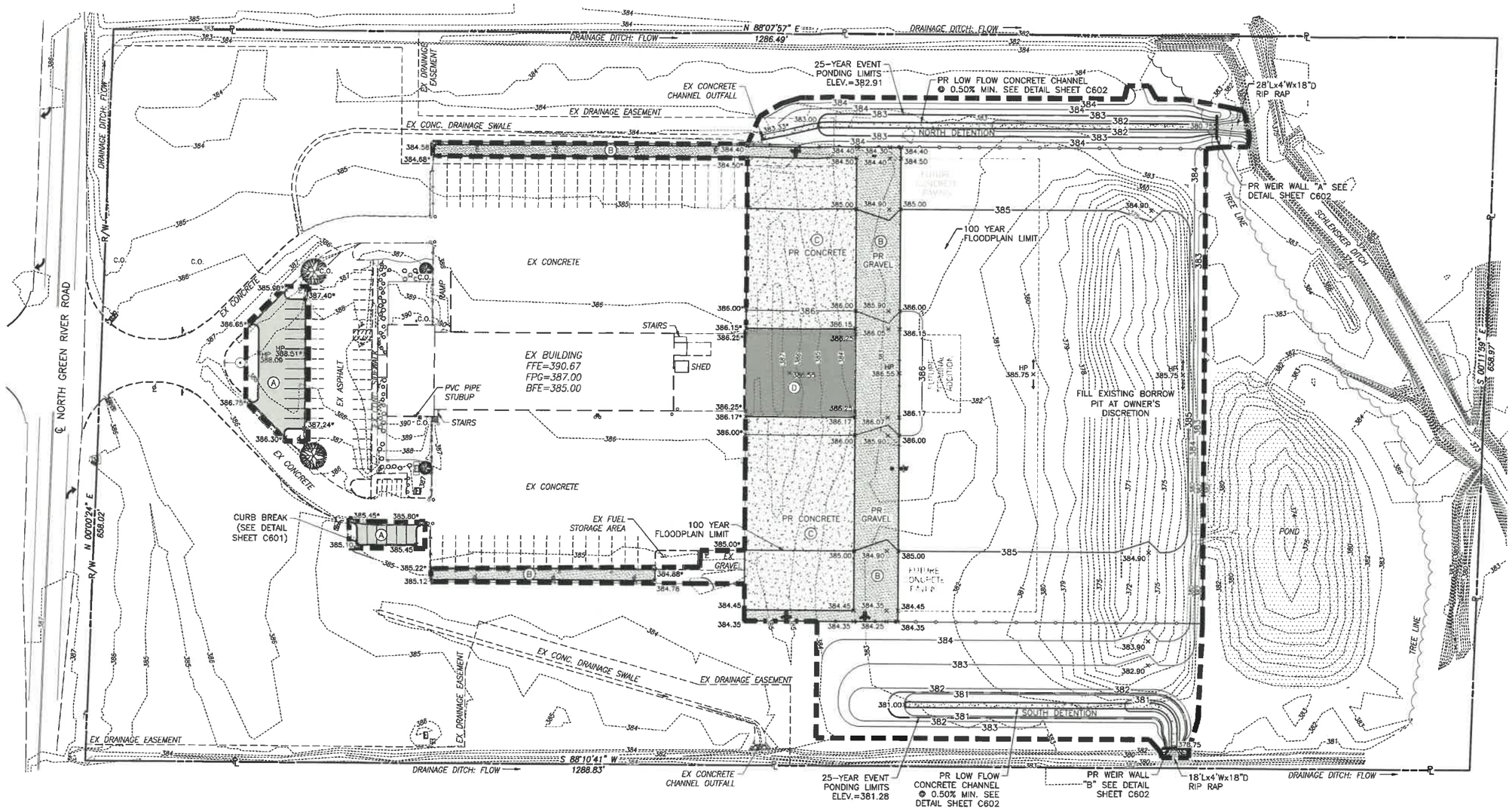
C501 SWPPP Notes

C600 General Notes

C601 Site Details

C602 Site Details

*with conditions – see Nov 15 2016 DB minutes



LEGEND

- PR LD ASPHALT PAVEMENT SEE SHEET C601
- PR GRAVEL PAVEMENT SEE SHEET C601
- PR CONCRETE PAVEMENT SEE SHEET C601
- PR HD ASPHALT PAVEMENT SEE SHEET C601
- EX FENCE
- PR FENCE
- EX GAS LINE
- EX COMMUNICATIONS LINE
- EX ELECTRIC LINE
- EX SANITARY LINE
- EX WATER LINE
- EX LIGHT
- EX SIGN
- EX POWER POLE
- EX LIGHT POLE
- EX ELECTRIC BOX
- EX FIRE HYDRANT
- EX STORM MANHOLE
- EX STORM CATCH BASIN
- EX SANITARY MANHOLE
- EX WATER VALVE
- EX GAS
- PR SPOT ELEVATION

GRADING NOTES

1. ALL SPOTS ARE PAVEMENT ELEVATIONS, UNLESS OTHERWISE NOTED.
2. THE CONTRACTOR SHALL PROVIDE FOR POSITIVE DRAINAGE IN ALL AREAS. PAVEMENT SHALL BE TESTED FOR ANY PONDING CONDITIONS FOLLOWING CONSTRUCTION.
3. CONTRACTOR SHALL EXERCISE EXTREME CAUTION WHEN EXCAVATING AROUND EXISTING UTILITIES. COORDINATE ANY RELOCATION WITH RESPECTIVE UTILITY OWNER.
4. SPOTS NOTED WITH * INDICATE MATCH EXISTING GRADE.
5. ENTIRE SITE LIES WITHIN THE 100 YEAR FLOOD ZONE AE BASED UPON FEMA FLOOD INSURANCE RATE MAP #18163C, PANEL 0128D, DATED MARCH 17, 2011. THE 100 YEAR FLOOD ELEVATION FOR THE SITE IS 385'. THIS NEEDS TO BE VERIFIED WITH THE EVANSVILLE VANDERBURGH BUILDING COMMISSIONER BEFORE ANY CONSTRUCTION IS COMPLETED. NO NEW FLOOD STUDY HAS BEEN COMPLETED IN THIS AREA THAT WOULD HAVE CHANGED THIS ELEVATION. 100 YEAR FLOOD ELEVATION = 385 FPG (FLOOD PROTECTION GRADE). MINIMUM FINISH FLOOR ELEVATION = 387'.
6. BUILDING FINISHED FLOOR ELEVATION TO BE VERIFIED. SURVEYED INFORMATION SHOWED CONSISTENT BASE OF DOCK ELEVATION OF 386.25. DESIGN MATCHES SURVEYED INFORMATION. FFE SHOWN ON THIS PLAN IS FROM ORIGINAL DESIGN PLANS.

ABBREVIATIONS

FFE	FINISH FLOOR ELEVATION
FPG	FLOOD PROTECTION GRADE
BFE	BASE FLOOD ELEVATION

Know what's below. Call before you dig.

GRAPHIC SCALE
0 25 50 100
1 INCH = 50 FEET

Reuse

NO.	DATE	BY	DESCRIPTION

815 GRANDVIEW AVENUE
SUITE 150
COLUMBUS, OH 43215
TEL: 614.441.4222
FAX: 888.488.7340

TECHNICAL SKILL. CREATIVE SPIRIT.

Mannik Smith GROUP
www.MannikSmithGroup.com

PROJECT DATE: 10/31/2016
PROJECT NO.: J13A0008
DRAWN BY: JPB
CHECKED BY: MJM

PREPARED FOR:
JH ARCHITECTS
5120 B. NIKE DRIVE
COLUMBUS, OHIO

CITY OF EVANSVILLE, VANDERBURGH COUNTY, INDIANA

SITE IMPROVEMENT PLAN
DAYTON FREIGHT
11160 GREEN RIVER ROAD

GRADING PLAN

C301

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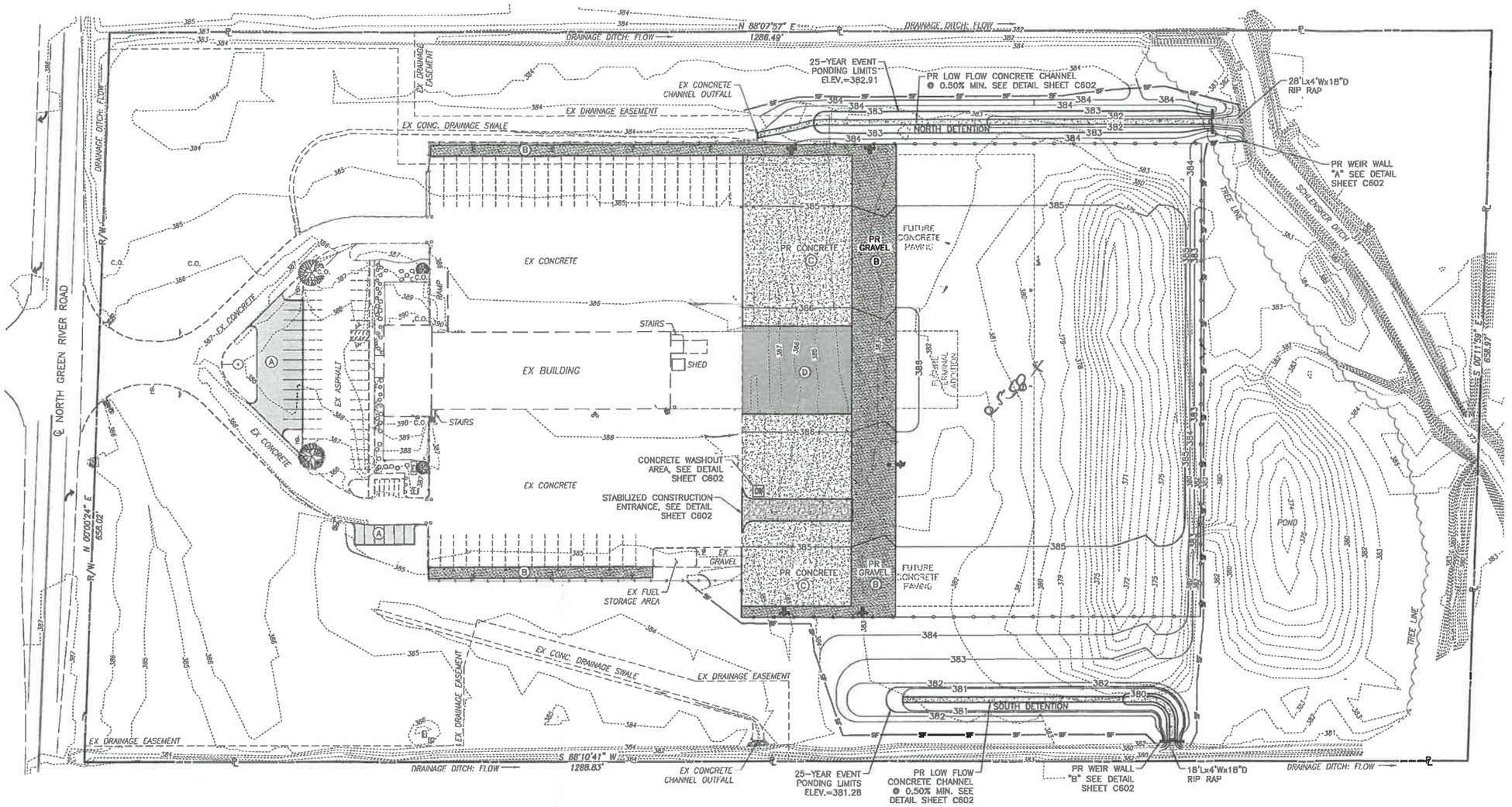

LEGEND

- (A) PR LD ASPHALT PAVEMENT SEE SHEET C601
- (B) PR GRAVEL PAVEMENT SEE SHEET C601
- (C) PR CONCRETE PAVEMENT SEE SHEET C601
- (D) PR HD ASPHALT PAVEMENT SEE SHEET C601
- EX FENCE
- PR FENCE
- EX GAS LINE
- EX COMMUNICATIONS LINE
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- EX ELECTRIC BOX
- EX FIRE HYDRANT
- EX STORM MANHOLE
- EX STORM CATCH BASIN
- EX SANITARY MANHOLE
- EX WATER VALVE
- EX GAS

GRAPHIC SCALE
0 25 50 100
1 INCH = 50 FEET

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PROJECT DATE: 10/31/2016
PROJECT NO.: J1340006
DRAWN BY: JPB
CHECKED BY: MJM

PREPARED FOR:
JH ARCHITECTS
5120 B. NIKE DRIVE
COLUMBUS, OHIO

CITY OF EVANSVILLE, VANDERBURGH COUNTY, INDIANA

SITE IMPROVEMENT PLAN
DAYTON FREIGHT
11160 GREEN RIVER ROAD

SWPPP

C500

STORM WATER MANAGEMENT SUMMARY

11160 GREEN RIVER ROAD
EVANSVILLE, INDIANA

OCTOBER 26, 2016

*PREPARED BY: Mark J. Mathe

MARK J. MATHE, PE

Mannik Smith GROUP

TABLE OF CONTENTS

1.0 INTRODUCTION

Dayton Freight is proposing modifications to their existing site located at 11160 Green River Road, which would include the addition of a concrete pavement area and an additional gravel area. A larger pavement area and additional buildings are planned for the future which this storm design has accounted for. The project site is located in Vanderburgh County, Indiana.

2.0 METHODOLOGY

The Hydrological design for this project was based on controlling the sites post-developed 25 year storm event back to the outflow rate for the pre-developed 10-year storm event. Both Pre-Development and Post-Development runoff and peak discharge amounts were calculated using the rational method as described in the Stormwater Drainage Control section (chapter 13.04) of the Vanderburgh County Code.

3.0 EXISTING CONDITIONS

Currently, the site consists of an existing building, a parking lot area, and drive aisles located primarily in the western portion of the site with the eastern portion of the site consisting primarily of open greenspace. Drainage ditches are located on both the north and south side of the site and a stream runs along the eastern end of the site. The site is bordered by North Green River Road and commercial storage buildings to the west, a residential building and wooded area to the north, farm fields to the east, and commercial buildings and farm fields to the south.

The site hydrology primarily consists of a relatively flat area, which mostly drains into the drainage ditches to the north and south, or towards an existing pond to the east, all of which ultimately outlet into the stream located on the eastern side of the site. An existing runoff coefficient of 0.26 was calculated for the property as shown on the calculation references sheet in the appendix.

3.1 Hydrologic Soil Group

According to the Custom Soil Resource Report, generated by The USDA - Natural Resources Conservation Service (NRCS) Soil Survey, the site is situated on a combination of Birds silt loam (Bd), Evansville silt loam (Ev) and Henshaw silt loam (He). Birds silt loam and Evansville silt loam both have a hydrologic soil group rating of B/D with Henshaw silt loam having a rating of C/D.

4.0 PROPOSED CONDITIONS

The post-developed condition of the site consists of an expansion of the concrete pavement and gravel areas with a further expansion of the pavement areas and the construction of additional buildings planned for the future. Runoff for the developed portions of the site will either be directed into detention basins located on the north or the south side of the site. Both the north and south detention basins will utilize weir walls to control release rates down to allowable values. Runoff from an existing detention basin will route through the proposed north detention basin. The weir wall for the north detention basin has been designed to account for this additional runoff and will allow it to pass through at its existing release rate. A developed runoff coefficient of 0.70 and 0.64, respectively, were calculated for the north and south drainage areas as shown on the calculation references sheet in the appendix.

5.0 PROJECT SUMMARY

Total Site Area: 20.00 Ac.

Drainage Area: 5.583 Ac.

North Drainage Area

	Pre-developed	Post-developed
Pervious Area:	2.434 Ac.	1.175 Ac.
Impervious Area:	0.053 Ac.	1.312 Ac.

South Drainage Area

	Pre-developed	Post-developed
Pervious Area:	3.029 Ac.	1.664 Ac.
Impervious Area:	0.067 Ac.	1.432 Ac.

Detention Type: Dry detention

Design Storm Event: 25 year post-developed storm event controlled to the pre-developed 10 year rate.

	North	South
Allowable Release Rate:	2.84 cfs	3.76 cfs
Pass Through Release Rate:	7.67 cfs	N/A
Total Allowable Release Rate:	10.51 cfs	3.76 cfs
Required Detention Volume:	4,901 cf	5,061 cf
Provided Detention Volume:	14,984 cf	10,834 cf
Detention Time:	18 min	48 min
Peak Storage Elevation:	382.91 ft	381.28 ft
Top of Basin Elevation:	384.00 ft	382.00 ft

Revised

5.0 PROJECT SUMMARY

Total Site Area: 20.00 Ac.

Drainage Area: 4.524 Ac.

North Drainage Area

	Pre-developed	Post-developed
Pervious Area:	1.965 Ac.	0.706 Ac.
Impervious Area:	0.053 Ac.	1.312 Ac.

South Drainage Area

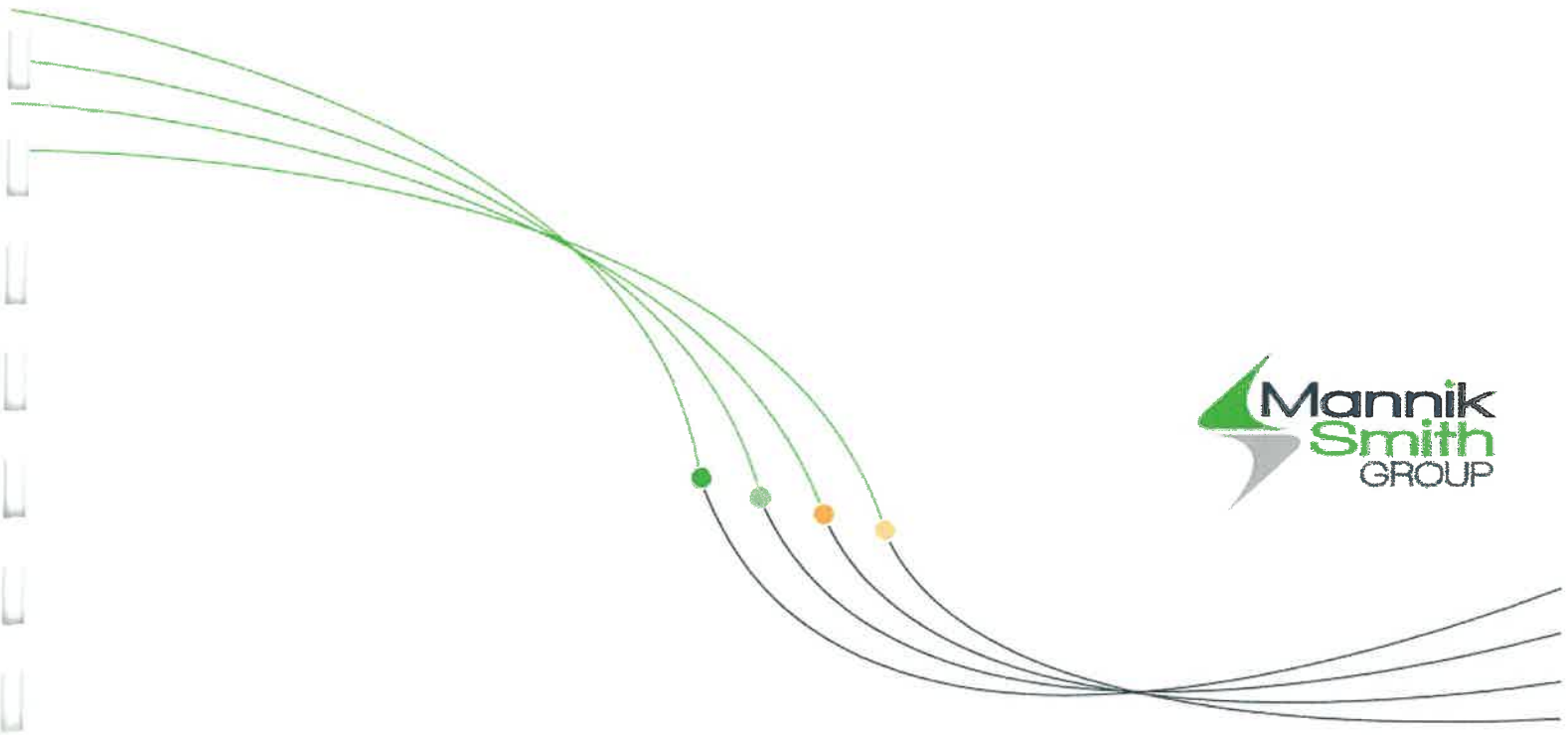
	Pre-developed	Post-developed
Pervious Area:	2.439 Ac.	1.074 Ac.
Impervious Area:	0.067 Ac.	1.432 Ac.

Detention Type: Dry detention

Design Storm Event: 25 year post-developed storm event controlled to the pre-developed 10 year rate.

	North	South
Allowable Release Rate:	2.34 cfs	3.09 cfs
Pass Through Release Rate:	7.67 cfs	N/A
Total Allowable Release Rate:	10.01 cfs	3.09 cfs
Required Detention Volume:	4,999 cf	5,093 cf
Provided Detention Volume:	14,984 cf	10,834 cf
Detention Time:	18 min	48 min
Peak Storage Elevation:	382.93 ft	381.29 ft
Top of Basin Elevation:	384.00 ft	382.00 ft

APPENDIX A
PRE AND POST CONDITIONS DRAINAGE MAPS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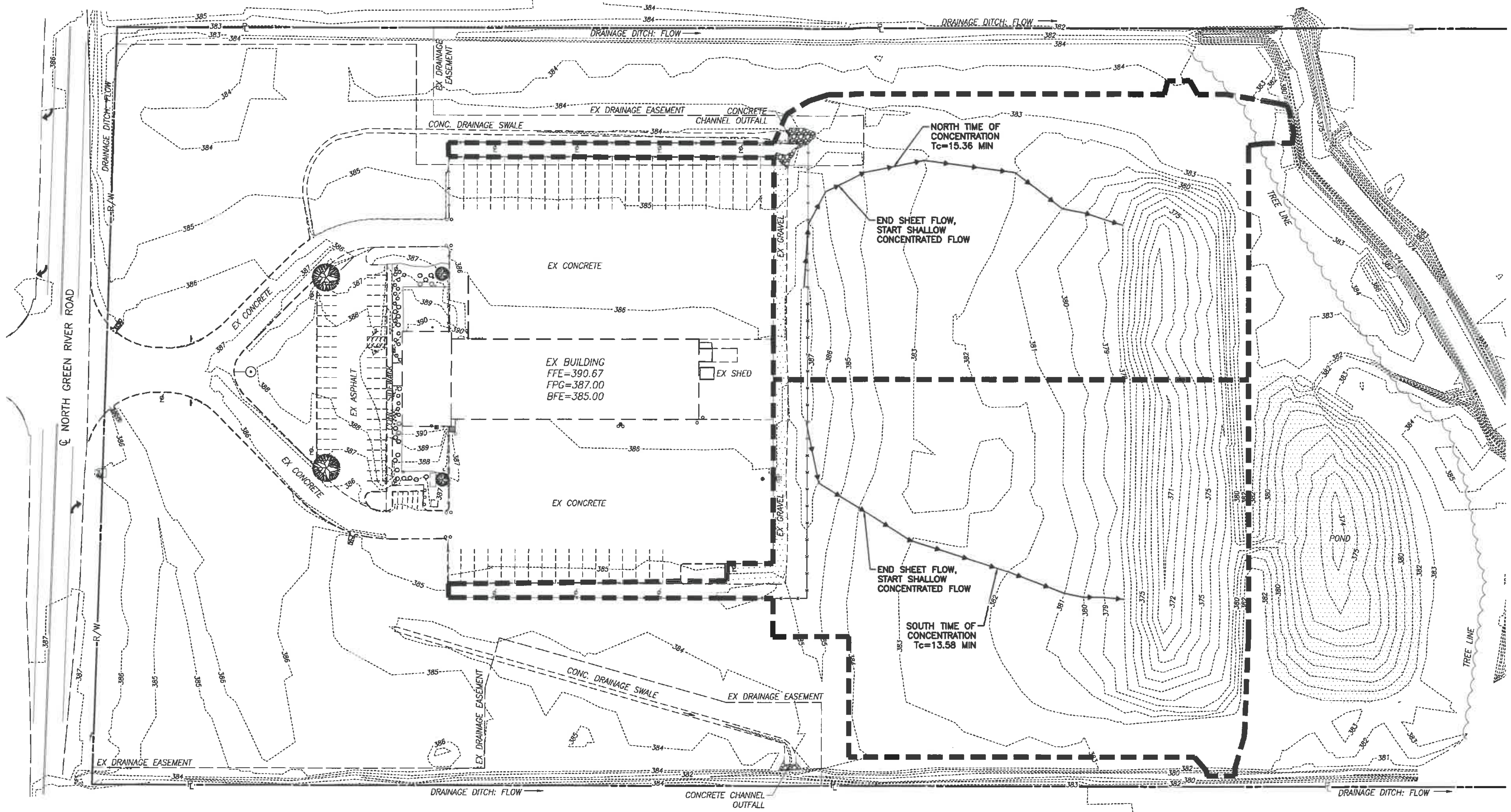

CALCULATED AREAS

NORTH AREA

GREENSPACE (C=0.24):	2.434 AC	97.9%
IMPERVIOUS (C=0.94):	0.053 AC	2.1%
TOTAL	2.487 AC	100.0%

SOUTH AREA

GREENSPACE (C=0.24):	3.029 AC	97.8%
IMPERVIOUS (C=0.94):	0.067 AC	2.2%
TOTAL	3.096 AC	100.0%

LEGEND

- IMPERVIOUS AREA
- Tc FLOW PATH
- DRAINAGE AREA

ABBREVIATIONS

FFE FINISH FLOOR ELEVATION
FPG FLOOD PROTECTION GRADE
BFE BASE FLOOD ELEVATION

GRAPHIC SCALE
0 25 50 100
1 INCH = 50 FEET

815 GRANDVIEW AVENUE
SUITE 650
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TEL: 614.441.4222
FAX: 888.488.7340

PROJECT DATE: 10/31/2016
PROJECT NO.: J1340008
DRAWN BY: JPB
CHECKED BY: MJM

NO. DATE BY DESCRIPTION

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PREPARED FOR:
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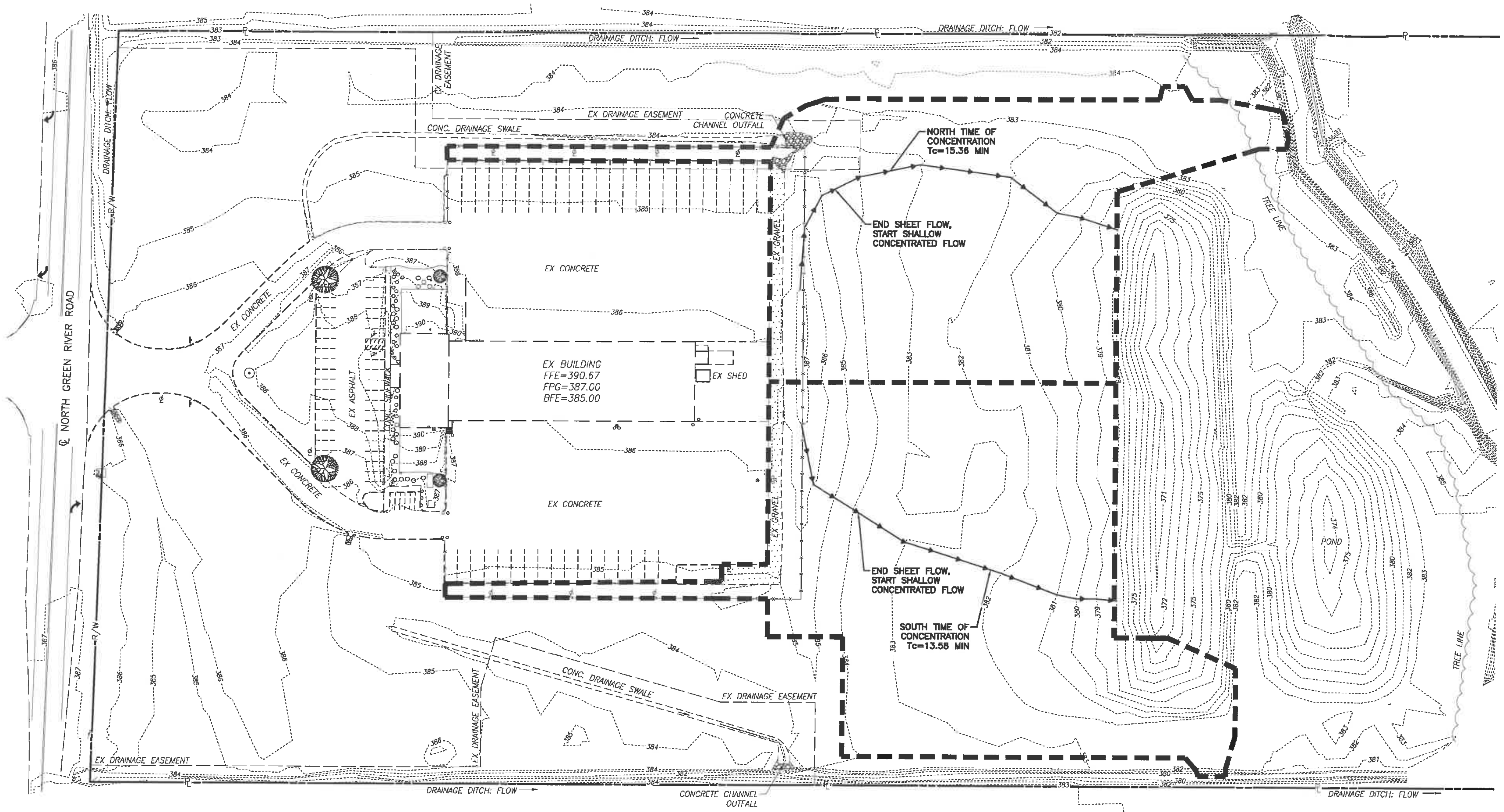
COLUMBUS, OHIO

CITY OF EVANSVILLE, VANDERBURGH COUNTY, INDIANA
SITE IMPROVEMENT PLAN
DAYTON FREIGHT
11160 GREEN RIVER ROAD

PRE DEVELOPED CONDITIONS

1 OF 2

Revised



CALCULATED AREAS

NORTH AREA

GREENSPACE (C=0.24):	1.965 AC	97.4%
IMPERVIOUS (C=0.94):	0.053 AC	2.6%
TOTAL	2.018 AC	100.0%

SOUTH AREA

GREENSPACE (C=0.24):	2.439 AC	97.3%
IMPERVIOUS (C=0.94):	0.067 AC	2.7%
TOTAL	2.506 AC	100.0%

LEGEND

- IMPERVIOUS AREA
- Tc FLOW PATH
- DRAINAGE AREA

ABBREVIATIONS

FFE	FINISH FLOOR ELEVATION
FPG	FLOOD PROTECTION GRADE
BFE	BASE FLOOD ELEVATION

GRAPHIC SCALE

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1 INCH = 50 FEET

PRE DEVELOPED CONDITIONS

CITY OF EVANSVILLE, VANDERBURGH COUNTY, INDIANA

SITE IMPROVEMENT PLAN
DAYTON FREIGHT
11160 GREEN RIVER ROAD

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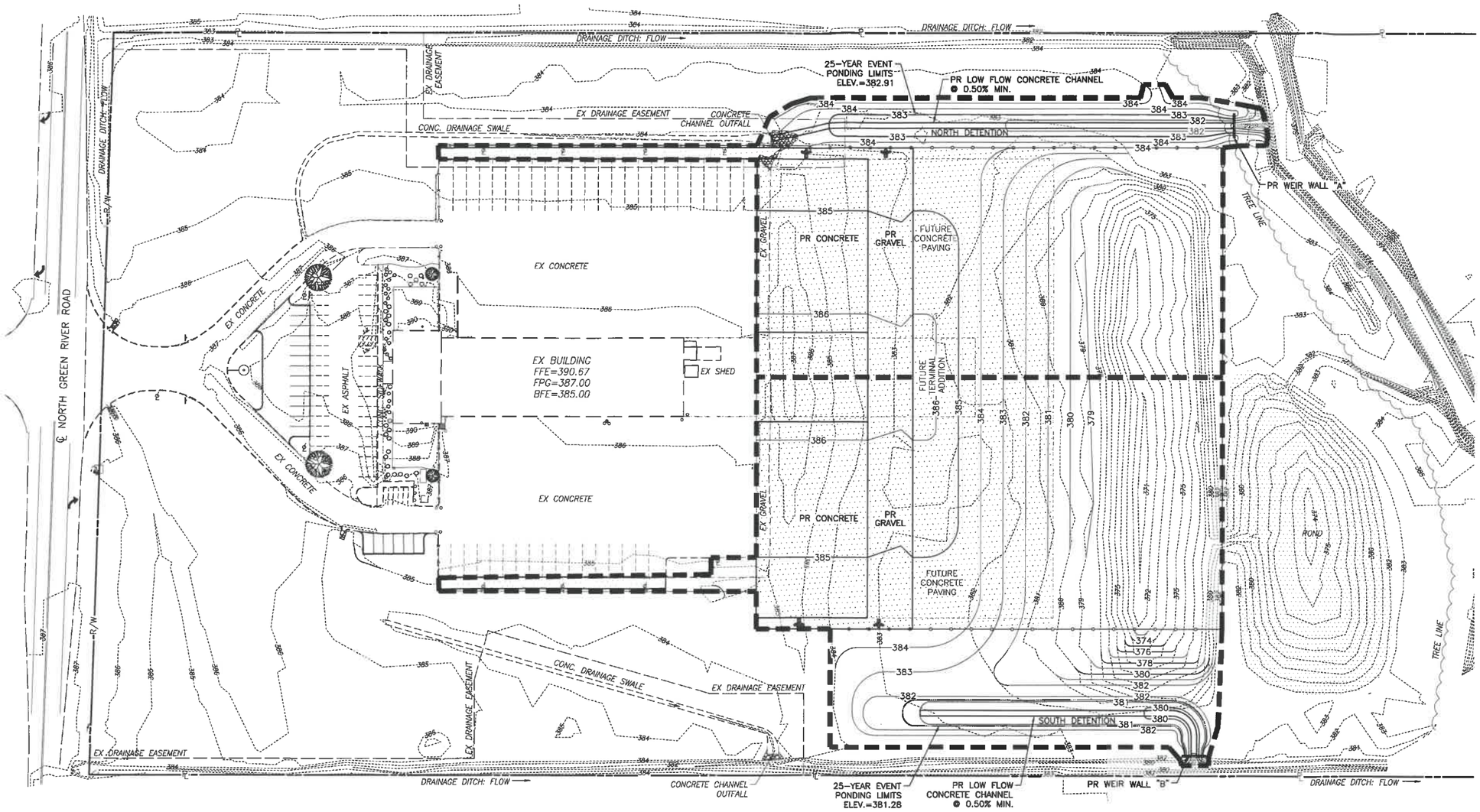

CALCULATED AREAS

NORTH AREA

GREENSPACE (C=0.24):	1.175 AC	52.7%
IMPERVIOUS (C=0.94):	1.312 AC	47.3%
TOTAL	2.487 AC	100.0%

SOUTH AREA

GREENSPACE (C=0.24):	1.664 AC	46.3%
IMPERVIOUS (C=0.94):	1.432 AC	53.7%
TOTAL	3.096 AC	100.0%

LEGEND

IMPERVIOUS AREA

DRAINAGE AREA

ABBREVIATIONS

FFE FINISH FLOOR ELEVATION
FPG FLOOD PROTECTION GRADE
BFE BASE FLOOD ELEVATION

GRAPHIC SCALE
0 25 50 100
1 INCH = 50 FEET

Revised

NO. | DATE | BY | DESCRIPTION

815 GRANDVIEW AVENUE
SUITE 650
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COLUMBUS, OHIO

CITY OF EVANSVILLE, VANDERBURGH COUNTY, INDIANA

SITE IMPROVEMENT PLAN
DAYTON FREIGHT
11160 GREEN RIVER ROAD

POST DEVELOPED CONDITIONS

2 OF 2

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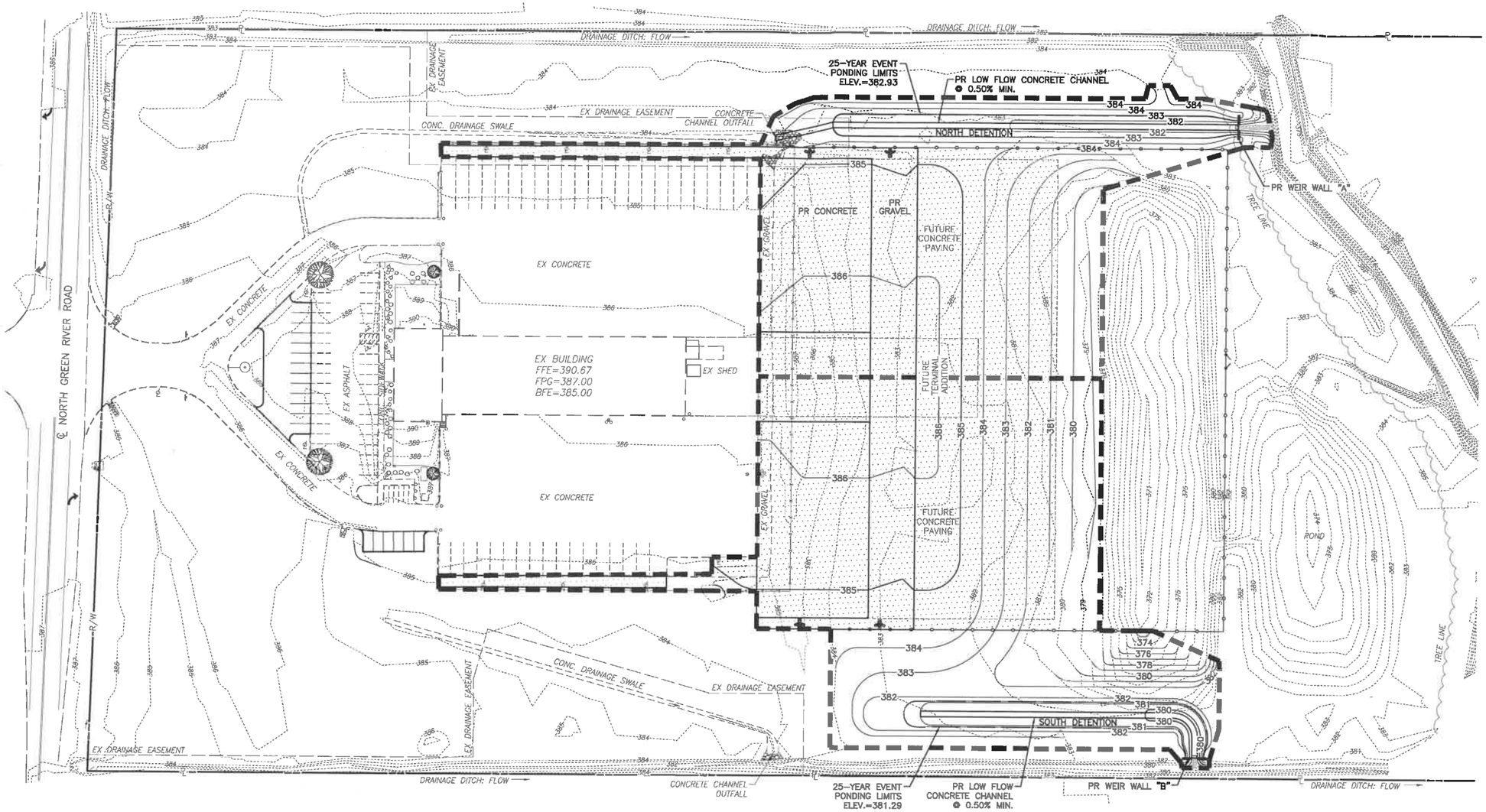

CALCULATED AREAS

NORTH AREA

GREENSPACE (C=0.24):	0.706 AC	35.0%
IMPERVIOUS (C=0.94):	1.312 AC	65.0%
TOTAL	2.018 AC	100.0%

SOUTH AREA

GREENSPACE (C=0.24):	1.074 AC	42.9%
IMPERVIOUS (C=0.94):	1.432 AC	57.1%
TOTAL	2.506 AC	100.0%

LEGEND

IMPERVIOUS AREA

DRAINAGE AREA

ABBREVIATIONS

FFE FINISH FLOOR ELEVATION
FPG FLOOD PROTECTION GRADE
BFE BASE FLOOD ELEVATION

GRAPHIC SCALE

0 25 50 100

1 INCH = 50 FEET

NO.	DATE	BY	DESCRIPTION

815 GRANDVIEW AVENUE
SUITE 659
COLUMBUS, OH 43215
TEL: 614.441.4222
FAX: 888.468.7340

PROJECT DATE: 10/26/2016
PROJECT NO.: J13400038
DRAWN BY: JPB
CHECKED BY: MJM

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COLUMBUS, OHIO

CITY OF EVANSVILLE, VANDERBURGH COUNTY, INDIANA

SITE IMPROVEMENT PLAN
DAYTON FREIGHT
11160 GREEN RIVER ROAD

POST DEVELOPED CONDITIONS

2 OF 2

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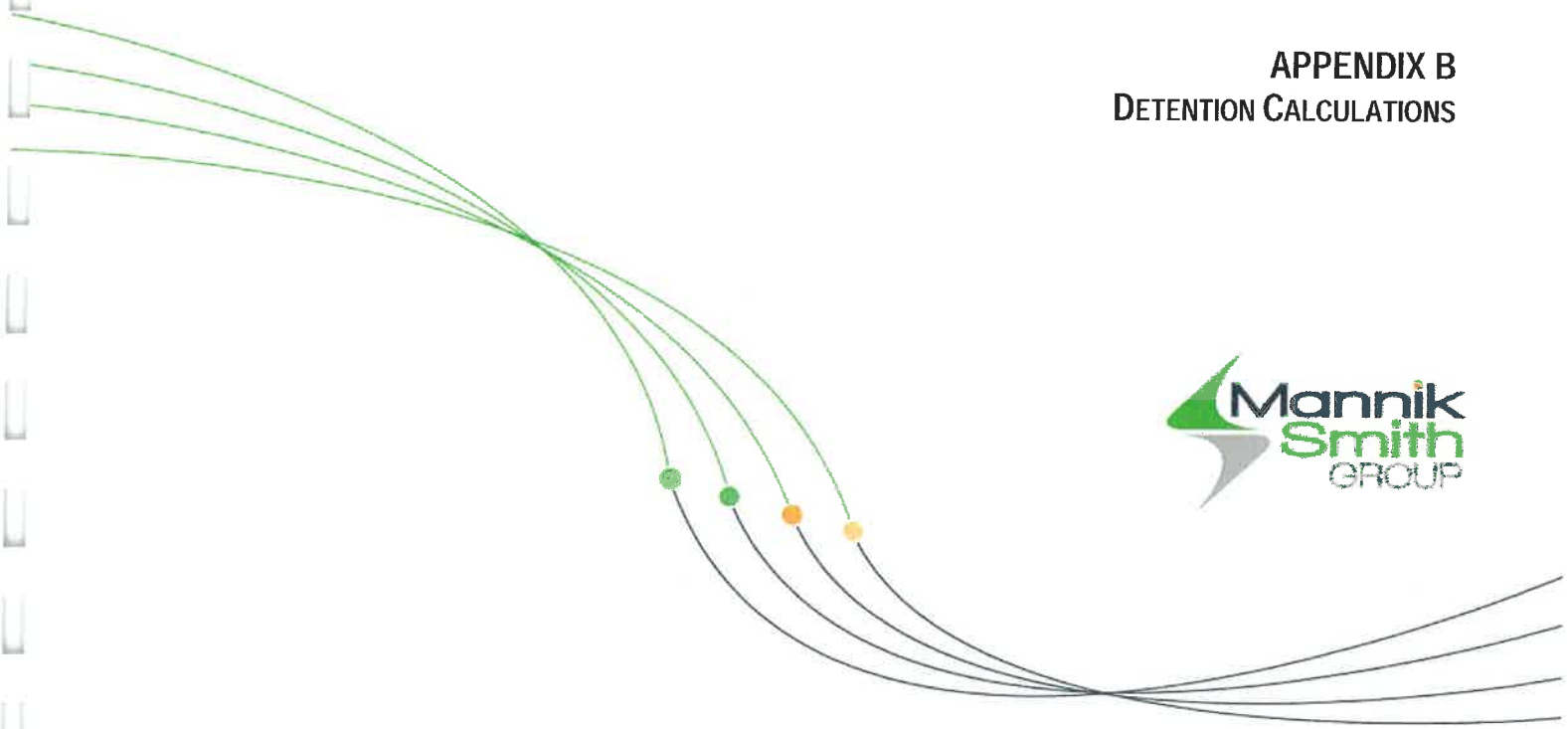
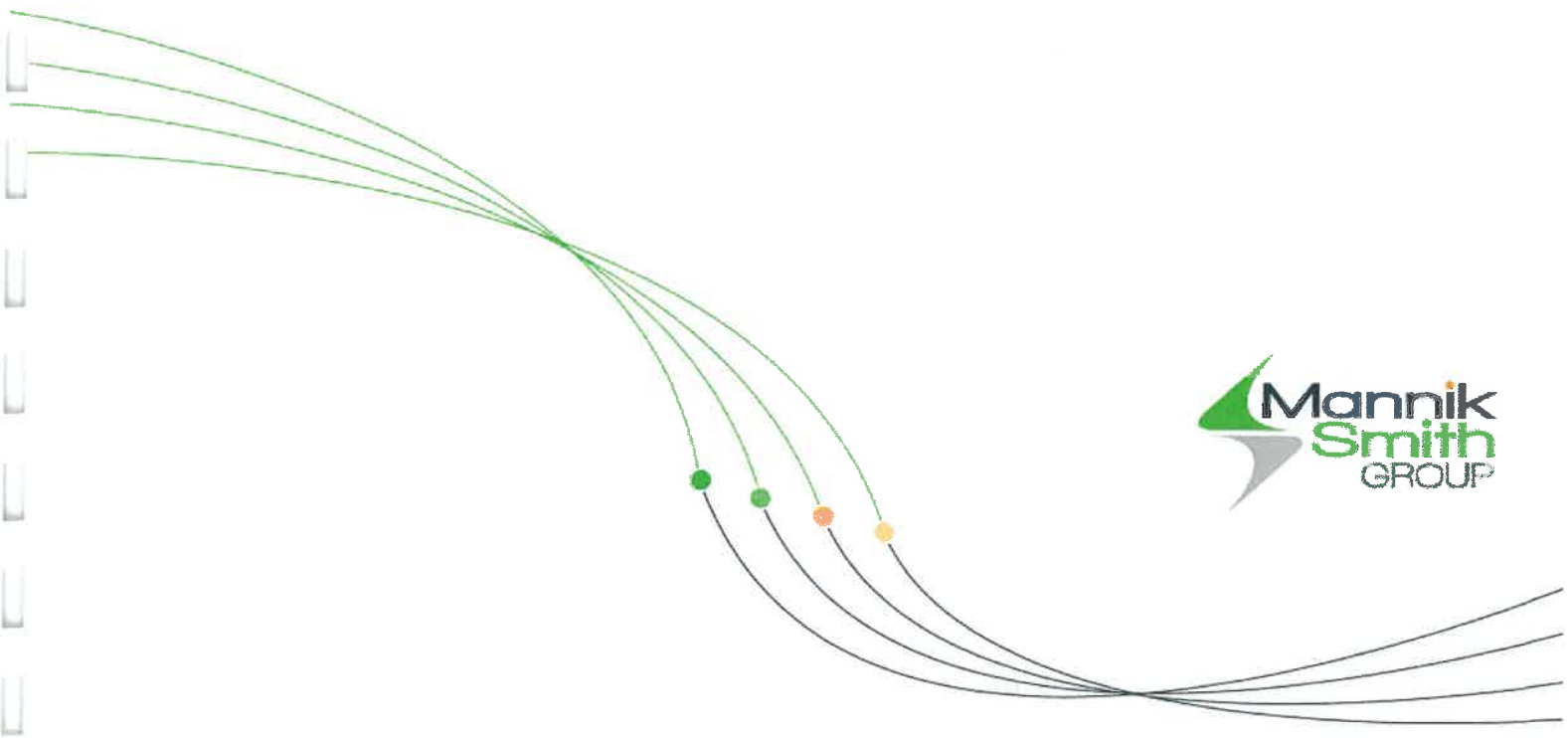
APPENDIX B
DETENTION CALCULATIONS

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Project: Dayton Freight - Evansville, IN
Project Number: J1340008
11601 N. Green River Road, Evansville, IN
North Drainage Area - Calculation References

Allowable Discharge, Q_a = C * i_{10} *A = 0.25 * 4.48 in/hr * 2.487 AC = 2.84 cfs
Allowable Discharge, Q_a = C_{ex}*$i_{10\text{-}Tc}$*A

C = Runoff coefficient dictated by Vanderburgh County
A (AC) = Tributary area
$i_{10\text{-}Tc}$ (in/hr) = Rainfall intensity of a 10 year storm at time Tc

Allowable Discharge, Q_a (cfs) =	2.84
A (AC) =	2.487
Time of Concentration, T_c (min) =	15.36
$i_{10\text{-}Tc}$ (in/hr) =	4.48
Existing Runoff Coefficient, C_{ex} =	0.25
'roposed Runoff Coefficient, C_{pr} =	0.61

C, Runoff Coefficients	
Pavement, Roofs, etc.	0.94
Open Space	0.24

Proposed Conditions	
Impervious Area (AC)	1.312
Pervious Area (AC)	1.175

Existing Conditions	
Impervious Area (AC)	0.053
Pervious Area (AC)	2.434

Jtilized Equations

$Q_{in\text{-}25(t)}$ (cfs) = C_p*$i_{(t)}$*A
$Q_{in\text{-}25(t)}$ (cfs) = Proposed 25-Year inflow rate at time (t)
C_p = PR conditions runoff coefficient
$i_{(t)}$ (in/hr) = Rainfall intensity at time (t)
A (AC) = Drainage area

V_{rs} (ft^3) = ($Q_{in\text{-}25(t)}$ - Q_a)*(T_d*60)
V_{rs} (ft^3) = Required storage volume
$Q_{in\text{-}25(t)}$ (cfs) = Proposed 25-Year inflow rate at time (t)
Q_a (cfs) = Allowable discharge
T_d (min) = Strom duration

Revised

Project: Dayton Freight - Evansville, IN
Project Number: J1340008
11601 N. Green River Road, Evansville, IN
North Drainage Area - Calculation References

Allowable Discharge, Q_a = C * i_{10} *A = 0.26 * 4.48 in/hr * 2.298 AC = 2.67 cfs
Allowable Discharge, Q_a = C_{ex}*$i_{10\text{-}Tc}$*A

C = Runoff coefficient dictated by Vanderburgh County
A (AC) = Tributary area
$i_{10\text{-}Tc}$ (in/hr) = Rainfall intensity of a 10 year storm at time Tc

Allowable Discharge, Q_a (cfs) =	2.34
A (AC) =	2.018
Time of Concentration, T_c (min) =	15.36
$i_{10\text{-}Tc}$ (in/hr) =	4.48
Existing Runoff Coefficient, C_{ex} =	0.26
'roposed Runoff Coefficient, C_{pr} =	0.70

C, Runoff Coefficients	
Pavement, Roofs, etc.	0.94
Open Space	0.24

Proposed Conditions	
Impervious Area (AC)	1.312
Pervious Area (AC)	0.706

Existing Conditions	
Impervious Area (AC)	0.053
Pervious Area (AC)	1.965

Jtilized Equations

$Q_{in\text{-}25(t)}$ (cfs) = C_p*$i_{(t)}$*A
$Q_{in\text{-}25(t)}$ (cfs) = Proposed 25-Year inflow rate at time (t)
C_p = PR conditions runoff coefficient
$i_{(t)}$ (in/hr) = Rainfall intensity at time (t)
A (AC) = Drainage area

V_{rs} (ft^3) = ($Q_{in\text{-}25(t)}$ - Q_a)*(T_d*60)
V_{rs} (ft^3) = Required storage volume
$Q_{in\text{-}25(t)}$ (cfs) = Proposed 25-Year inflow rate at time (t)
Q_a (cfs) = Allowable discharge
T_d (min) = Strom duration

Project: Dayton Freight - Evansville, IN
Project Number: J1340008
11601 N. Green River Road, Evansville, IN
Time of Concentration Calculation

Sheet Flow	
Manning's roughness coefficient, n =	0.24
Flow length, L (ft) =	100
2-year 24-hour rainfall, P_2 (in) =	3.25
Land Slope, s (ft/ft) =	0.0229
Sheet Flow, T_t (min) =	13.41

Shallow Concentrated Flow		
Segment	1st	2nd
Flow length, L (ft) =	210	55
Land Slope, s (ft/ft) =	0.016	0.055
Average velocity, V (ft/s)=	2.055	3.768
ıallow Concentrated Time, T_s (min) =	1.70	0.24

Time of concentration, T_c (min) = 15.36

Utilized Equations

Unpaved, $V = 16.1345*(s)^{0.5}$

Paved, $V = 20.3282*(s)^{0.5}$

$$T_t \text{ (hr)} = \frac{0.007*(n*L)^{0.8}}{P_2^{0.5}*s^{0.4}}$$

T_s (hr) = L / (3600*V)

Project: Dayton Freight - Evansville, IN
Project Number: J1340008
11601 N. Green River Road, Evansville, IN
North Drainage Area - Detention Calculations

Allowable Discharge, $Q_a = C_{ex} * i_{10\text{-}Tc} * A$

Drainage Area, A (AC) =	2.487
Proposed Runoff Coefficient, C_{pr} =	0.61
C_{pr}*A (AC) =	1.52
Existing Tc (min) =	15.36
Proposed Tc (min) =	10.00
10 YR Rainfall Intentsity at time Tc, $i_{10\text{-}Tc}$ (in/hr) =	4.48
Existing Runoff Coefficient, C_{ex} =	0.25
Allowable Discharge, Q_a (CFS) =	2.84

T_d, Storm Duration (min)	$i_{25\text{-}(t)}$, Rainfall Intensity (in/hr)	$Q_{in\text{-}25}$, Inflow Rate (cfs)	$Q_{in\text{-}25} - Q_a$	V_{rs}, Storage Volume Required (ft^3)
5	7.208	10.92	8.08	2,424.11
10	5.925	8.98	6.14	3,681.88
15	5.033	7.63	4.78	4,306.50
20	4.571	6.93	4.08	4,901.41
30	3.646	5.52	2.68	4,830.37
40	3.123	4.73	1.89	4,539.95
50	2.601	3.94	1.10	3,299.25
60	2.078	3.15	0.31	1,108.27
70	1.965	2.98	0.14	573.91
80	1.852	2.81	0.00	0.00
90	1.739	2.63	0.00	0.00
100	1.626	2.46	0.00	0.00
110	1.513	2.29	0.00	0.00
120	1.400	2.12	0.00	0.00
130	1.337	2.02	0.00	0.00
140	1.273	1.93	0.00	0.00
150	1.210	1.83	0.00	0.00
160	1.146	1.74	0.00	0.00
170	1.083	1.64	0.00	0.00
180	1.019	1.54	0.00	0.00

Revised

Project: Dayton Freight - Evansville, IN
Project Number: J1340008
11601 N. Green River Road, Evansville, IN
North Drainage Area - Detention Calculations

Allowable Discharge, $Q_a = C_{ex} * i_{10\text{-}Tc} * A$

Drainage Area, A (AC) =	2.018
Proposed Runoff Coefficient, C_{pr} =	0.70
C_{pr}*A (AC) =	1.40
Existing Tc (min) =	15.36
Proposed Tc (min) =	10.00
10 YR Rainfall Intentsity at time Tc, $i_{10\text{-}Tc}$ (in/hr) =	4.48
Existing Runoff Coefficient, C_{ex} =	0.26
Allowable Discharge, Q_a (CFS) =	2.34

T_d, Storm Duration (min)	$i_{25\text{-}(t)}$, Rainfall Intensity (in/hr)	$Q_{in\text{-}25}$, Inflow Rate (cfs)	$Q_{in\text{-}25} - Q_a$	V_{rs}, Storage Volume Required (ft^3)
5	7.208	10.11	7.77	2,331.99
10	5.925	8.31	5.97	3,584.29
15	5.033	7.06	4.72	4,250.48
20	4.571	6.41	4.07	4,889.17
30	3.646	5.11	2.78	4,999.35
40	3.123	4.38	2.04	4,906.44
50	2.601	3.65	1.31	3,933.86
60	2.078	2.91	0.58	2,081.60
70	1.965	2.76	0.42	1,762.88
80	1.852	2.60	0.26	1,253.98
90	1.739	2.44	0.10	554.89
100	1.626	2.28	0.00	0.00
110	1.513	2.12	0.00	0.00
120	1.400	1.96	0.00	0.00
130	1.337	1.87	0.00	0.00
140	1.273	1.79	0.00	0.00
150	1.210	1.70	0.00	0.00
160	1.146	1.61	0.00	0.00
170	1.083	1.52	0.00	0.00
180	1.019	1.43	0.00	0.00

Weir Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. Wednesday, Oct 26 2016

North Weir

Rectangular Weir

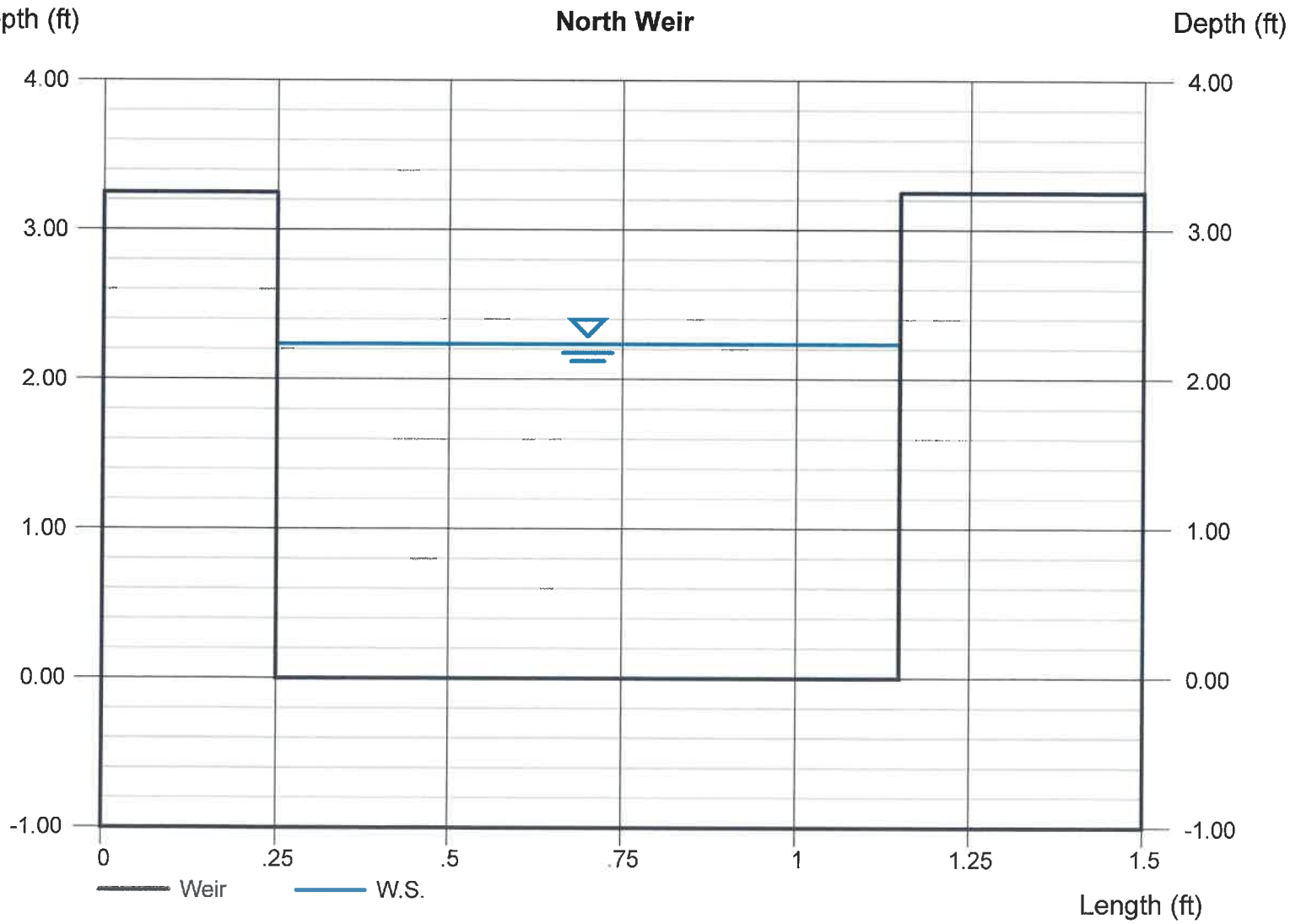
Crest	= Sharp
Bottom Length (ft)	= 0.90
Total Depth (ft)	= 3.25

Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Known Q
Known Q (cfs)	= 10.01

Highlighted

Depth (ft)	= 2.24
Q (cfs)	= 10.01
Area (sqft)	= 2.01
Velocity (ft/s)	= 4.98
Top Width (ft)	= 0.90



Project: Dayton Freight - Evansville, IN
Project Number: J1340008
11601 N. Green River Road, Evansville, IN
South Drainage Area - Calculation References

Allowable Discharge, Q_a = C * i_{10} *A = 0.26 * 4.76 in/hr * 3.096 AC = 3.76 cfs
Allowable Discharge, Q_a = C_{ex}*$i_{10\text{-}Tc}$*A

C = Runoff coefficient dictated by Vanderburgh County
A (AC) = Tributary area
$i_{10\text{-}Tc}$ (in/hr) = Rainfall intensity of a 10 year storm at time Tc

Allowable Discharge, Q_a (cfs) =	3.76
A (AC) =	3.096
Time of Concentration, T_c (min) =	13.58
$i_{10\text{-}Tc}$ (in/hr) =	4.76
Existing Runoff Coefficient, C_{ex} =	0.26
Proposed Runoff Coefficient, C_{pr} =	0.56

C, Runoff Coefficients	
Pavement, Roofs, etc.	0.94
Open Space	0.24

Proposed Conditions	
Impervious Area (AC)	1.432
Pervious Area (AC)	1.664

Existing Conditions	
Impervious Area (AC)	0.067
Pervious Area (AC)	3.029

Utilized Equations

$Q_{in\text{-}25(t)}$ (cfs) = C_p*$i_{(t)}$*A
$Q_{in\text{-}25(t)}$ (cfs) = Proposed 25-Year inflow rate at time (t)
C_p = PR conditions runoff coefficient
$i_{(t)}$ (in/hr) = Rainfall intensity at time (t)
A (AC) = Drainage area

V_{rs} (ft^3) = ($Q_{in\text{-}25(t)}$ - Q_a)*(T_d*60)
V_{rs} (ft^3) = Required storage volume
$Q_{in\text{-}25(t)}$ (cfs) = Proposed 25-Year inflow rate at time (t)
Q_a (cfs) = Allowable discharge
T_d (min) = Strom duration

Revised

Project: Dayton Freight - Evansville, IN
Project Number: J1340008
11601 N. Green River Road, Evansville, IN
South Drainage Area - Calculation References

Allowable Discharge, Q_a = C * i_{10} *A = 0.26 * 4.76 in/hr * 2.174 AC = 2.67 cfs
Allowable Discharge, Q_a = C_{ex}*$i_{10\text{-}Tc}$*A

C = Runoff coefficient dictated by Vanderburgh County
A (AC) = Tributary area
$i_{10\text{-}Tc}$ (in/hr) = Rainfall intensity of a 10 year storm at time Tc

Allowable Discharge, Q_a (cfs) =	3.09
A (AC) =	2.506
Time of Concentration, T_c (min) =	13.58
$i_{10\text{-}Tc}$ (in/hr) =	4.76
Existing Runoff Coefficient, C_{ex} =	0.26
'roposed Runoff Coefficient, C_{pr} =	0.64

C, Runoff Coefficients	
Pavement, Roofs, etc.	0.94
Open Space	0.24

Proposed Conditions	
Impervious Area (AC)	1.432
Pervious Area (AC)	1.074

Existing Conditions	
Impervious Area (AC)	0.067
Pervious Area (AC)	2.439

Jtilized Equations

$Q_{in\text{-}25(t)}$ (cfs) = C_p*$i_{(t)}$*A
$Q_{in\text{-}25(t)}$ (cfs) = Proposed 25-Year inflow rate at time (t)
C_p = PR conditions runoff coefficient
$i_{(t)}$ (in/hr) = Rainfall intensity at time (t)
A (AC) = Drainage area

V_{rs} (ft^3) = ($Q_{in\text{-}25(t)}$ - Q_a)*(T_d*60)
V_{rs} (ft^3) = Required storage volume
$Q_{in\text{-}25(t)}$ (cfs) = Proposed 25-Year inflow rate at time (t)
Q_a (cfs) = Allowable discharge
T_d (min) = Strom duration

Project: Dayton Freight - Evansville, IN
Project Number: J1340008
11601 N. Green River Road, Evansville, IN
Time of Concentration Calculation

Sheet Flow	
Manning's roughness coefficient, n =	0.24
Flow length, L (ft) =	100
2-year 24-hour rainfall, P_2 (in) =	3.25
Land Slope, s (ft/ft) =	0.0317
Sheet Flow, T_t (min) =	11.77

Shallow Concentrated Flow		
Segment	1st	2nd
Flow length, L (ft) =	190	53
Land Slope, s (ft/ft) =	0.015	0.057
Average velocity, V (ft/s)=	2.000	3.839
ıallow Concentrated Time, T_s (min) =	1.58	0.23

Time of concentration, T_c (min) = 13.58

Utilized Equations

Unpaved, $V = 16.1345*(s)^{0.5}$

Paved, $V = 20.3282*(s)^{0.5}$

$$T_t \text{ (hr)} = \frac{0.007*(n*L)^{0.8}}{P_2^{0.5}*s^{0.4}}$$

$$T_s \text{ (hr)} = L / (3600*V)$$

Project: Dayton Freight - Evansville, IN
Project Number: J1340008
11601 N. Green River Road, Evansville, IN
South Drainage Area - Detention Calculations

Allowable Discharge, $Q_a = C_{ex} * i_{10\text{-}Tc} * A$

Drainage Area, A (AC) =	3.096
Proposed Runoff Coefficient, C_{pr} =	0.56
C_{pr}*A (AC) =	1.75
Existing Tc (min) =	13.58
Proposed Tc (min) =	10.00
10 YR Rainfall Intentsity at time Tc, $i_{10\text{-}Tc}$ (in/hr) =	4.76
Existing Runoff Coefficient, C_{ex} =	0.26
Allowable Discharge, Q_a (CFS) =	3.76

T_d, Storm Duration (min)	$i_{25\text{-}(t)}$, Rainfall Intensity (in/hr)	$Q_{in\text{-}25}$, Inflow Rate (cfs)	$Q_{in\text{-}25} - Q_a$	V_{rs}, Storage Volume Required (ft^3)
5	7.208	12.58	8.82	2,646.17
10	5.925	10.34	6.58	3,948.75
15	5.033	8.78	5.02	4,521.93
20	4.571	7.98	4.22	5,060.91
30	3.646	6.36	2.60	4,686.35
40	3.123	5.45	1.69	4,059.07
50	2.601	4.54	0.78	2,337.09
60	2.078	3.63	0.00	0.00
70	1.965	3.43	0.00	0.00
80	1.852	3.23	0.00	0.00
90	1.739	3.04	0.00	0.00
100	1.626	2.84	0.00	0.00
110	1.513	2.64	0.00	0.00
120	1.400	2.44	0.00	0.00
130	1.337	2.33	0.00	0.00
140	1.273	2.22	0.00	0.00
150	1.210	2.11	0.00	0.00
160	1.146	2.00	0.00	0.00
170	1.083	1.89	0.00	0.00
180	1.019	1.78	0.00	0.00

Revised

Project: Dayton Freight - Evansville, IN
Project Number: J1340008
11601 N. Green River Road, Evansville, IN
South Drainage Area - Detention Calculations

Allowable Discharge, $Q_a = C_{ex} * i_{10\text{-}Tc} * A$

Drainage Area, A (AC) =	2.506
Proposed Runoff Coefficient, C_{pr} =	0.64
C_{pr}*A (AC) =	1.60
Existing Tc (min) =	13.58
Proposed Tc (min) =	10.00
10 YR Rainfall Intentsity at time Tc, $i_{10\text{-}Tc}$ (in/hr) =	4.76
Existing Runoff Coefficient, C_{ex} =	0.26
Allowable Discharge, Q_a (CFS) =	3.09

T_d, Storm Duration (min)	$i_{25\text{-}(t)}$, Rainfall Intensity (in/hr)	$Q_{in\text{-}25}$, Inflow Rate (cfs)	$Q_{in\text{-}25} - Q_a$	V_{rs}, Storage Volume Required (ft^3)
5	7.208	11.56	8.47	2,542.18
10	5.925	9.50	6.42	3,849.77
15	5.033	8.07	4.99	4,487.14
20	4.571	7.33	4.24	5,093.08
30	3.646	5.85	2.76	4,970.29
40	3.123	5.01	1.92	4,615.28
50	2.601	4.17	1.08	3,254.37
60	2.078	3.33	0.25	887.58
70	1.965	3.15	0.07	274.36
80	1.852	2.97	0.00	0.00
90	1.739	2.79	0.00	0.00
100	1.626	2.61	0.00	0.00
110	1.513	2.43	0.00	0.00
120	1.400	2.25	0.00	0.00
130	1.337	2.14	0.00	0.00
140	1.273	2.04	0.00	0.00
150	1.210	1.94	0.00	0.00
160	1.146	1.84	0.00	0.00
170	1.083	1.74	0.00	0.00
180	1.019	1.63	0.00	0.00

Weir Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. Wednesday, Oct 26 2016

South Weir

Rectangular Weir

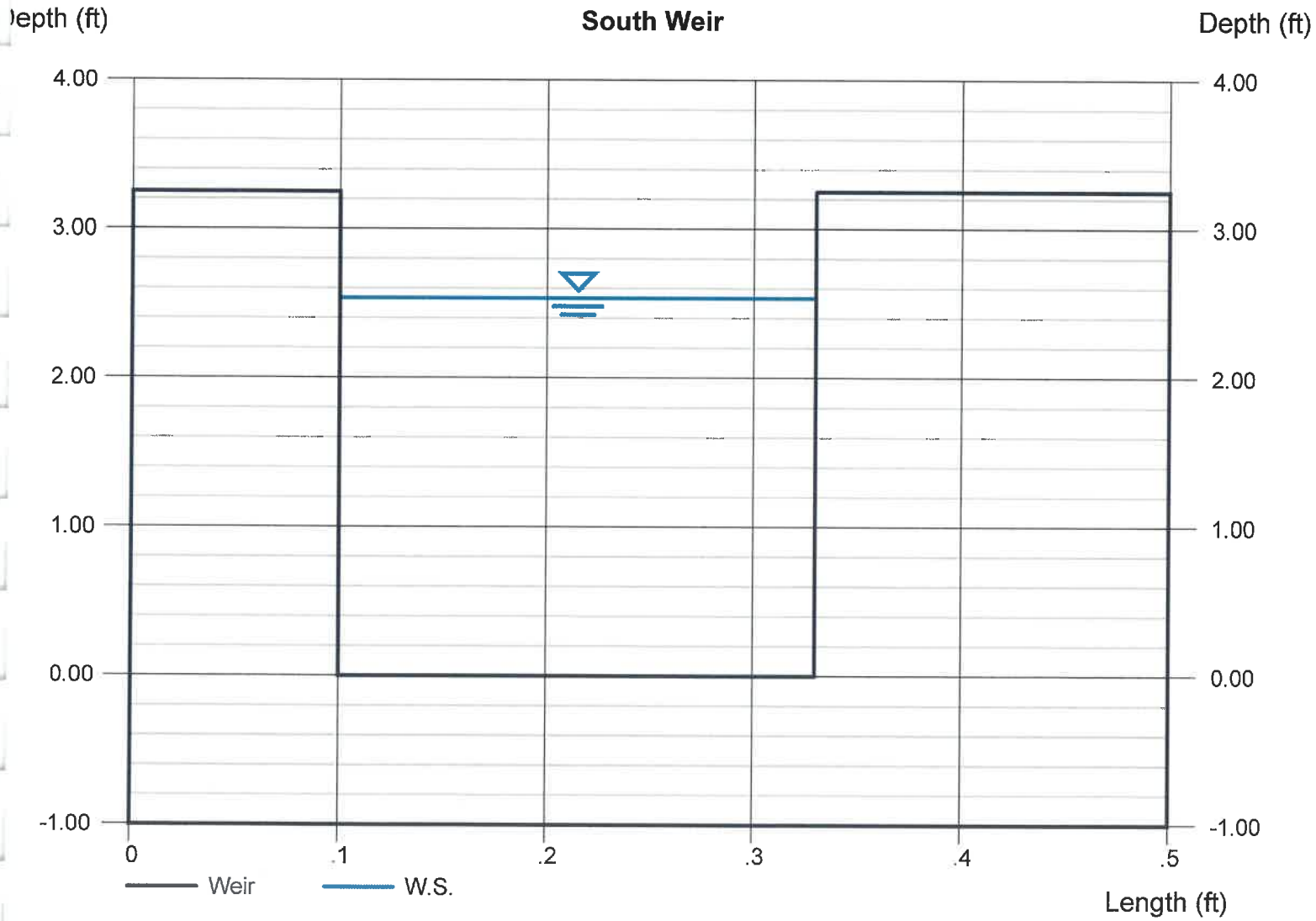
Crest	= Sharp
Bottom Length (ft)	= 0.23
Total Depth (ft)	= 3.25

Calculations

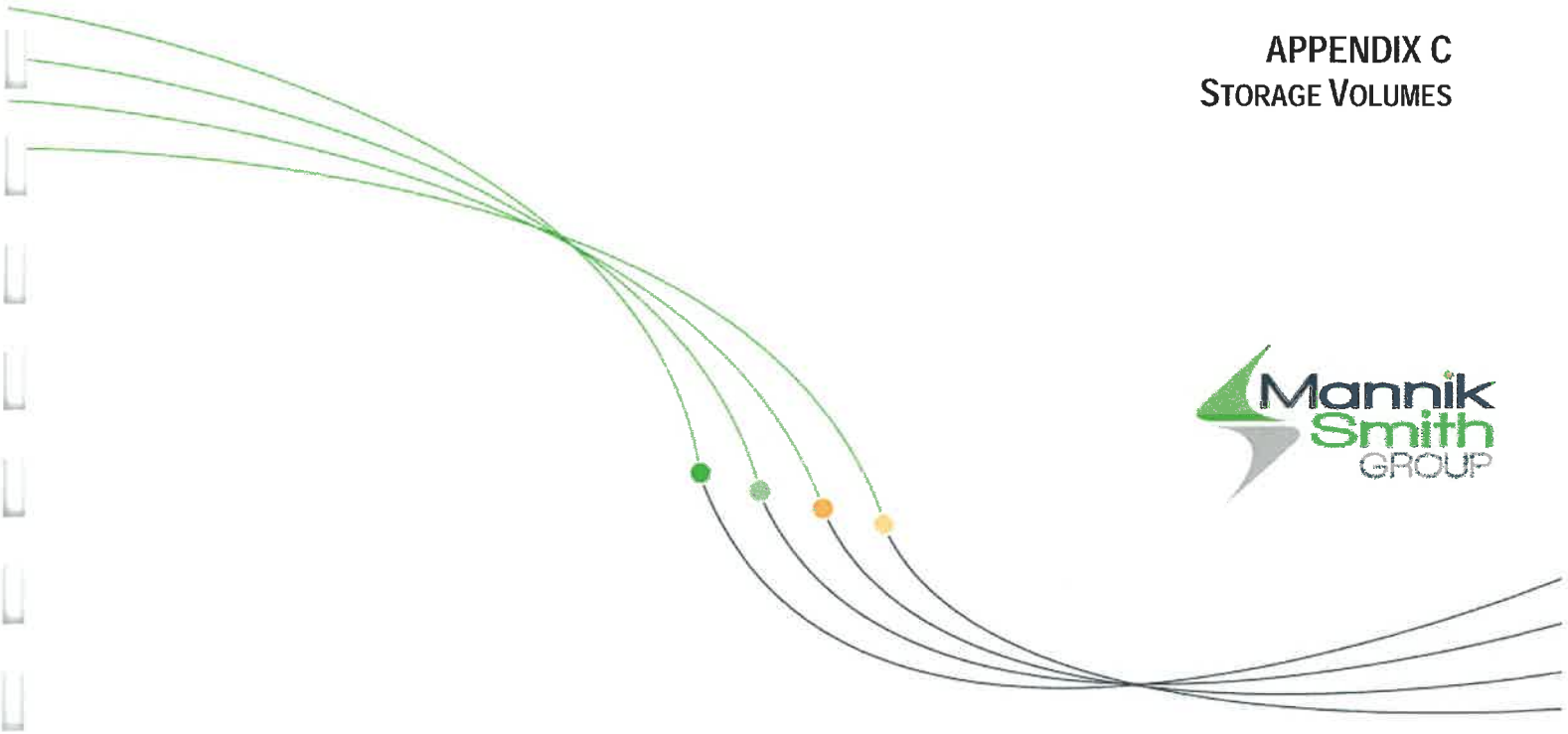
Weir Coeff. Cw	= 3.33
Compute by:	Known Q
Known Q (cfs)	= 3.09

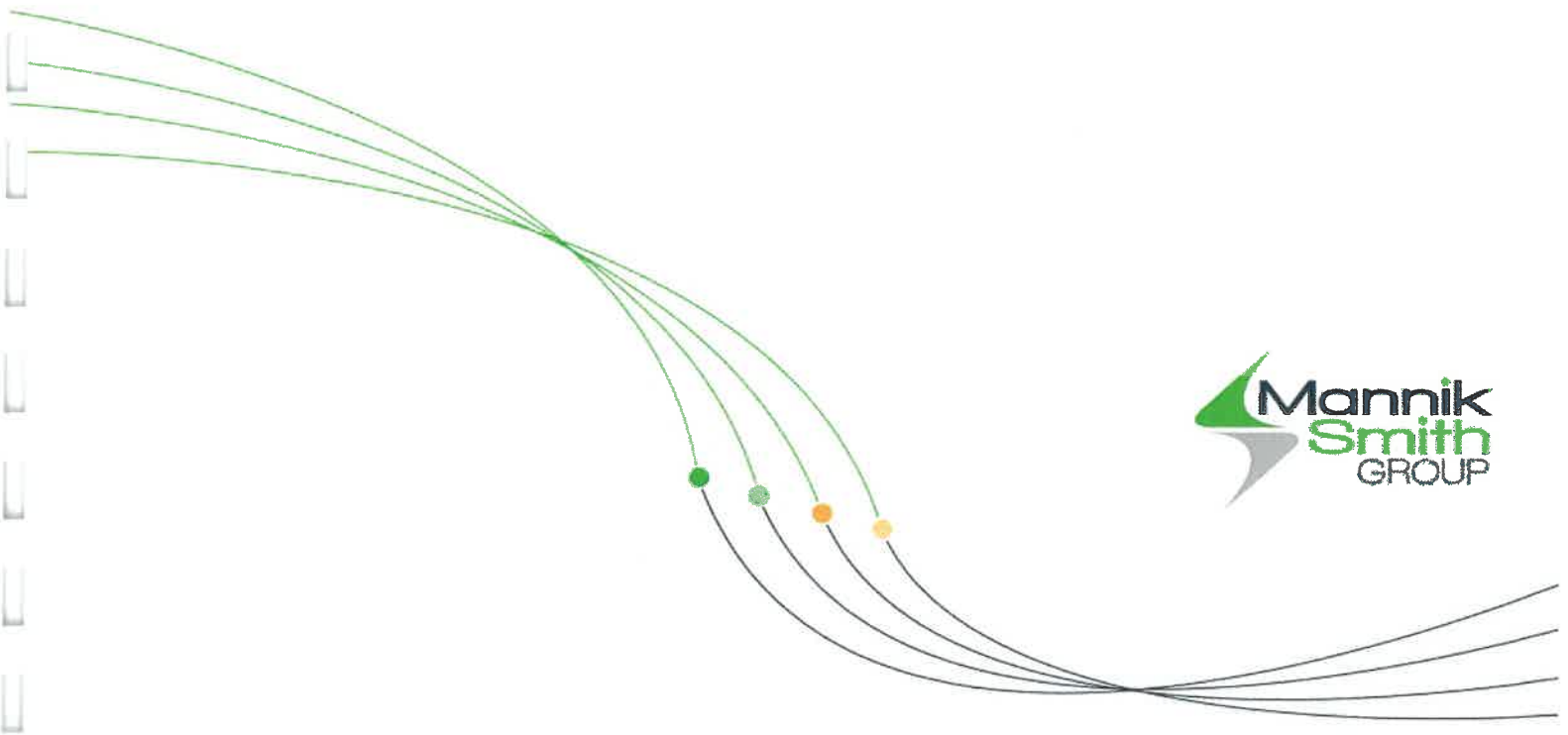
Highlighted

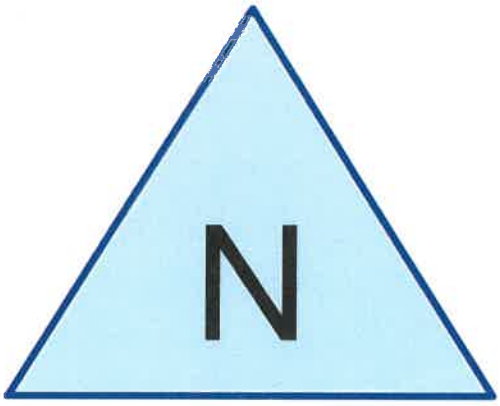
Depth (ft)	= 2.54
Q (cfs)	= 3.090
Area (sqft)	= 0.58
Velocity (ft/s)	= 5.30
Top Width (ft)	= 0.23



APPENDIX C
STORAGE VOLUMES




Mannik
Smith
GROUP



North Basin

Subcat Reach Pond Link

Routing Diagram for J1340008 - Detention Time
Prepared by The Mannik & Smith Group, Printed 10/26/2016

Summary for Pond N: North Basin

Inflow	=	0.00 cfs @	0.00 hrs,	Volume=	0.000 af
Outflow	=	9.49 cfs @	0.00 hrs,	Volume=	0.136 af, Atten= 0%, Lag= 0.0 min
Primary	=	9.49 cfs @	0.00 hrs,	Volume=	0.136 af

Routing by Stor-Ind method, Time Span= 0.00-2.00 hrs, dt= 0.05 hrs
Starting Elev= 382.93' Surf.Area= 6,701 sf Storage= 5,054 cf
Peak Elev= 382.93' @ 0.00 hrs Surf.Area= 6,701 sf Storage= 5,054 cf

Plug-Flow detention time= (not calculated: no plugs found)
Center-of-Mass det. time= (not calculated: no inflow)

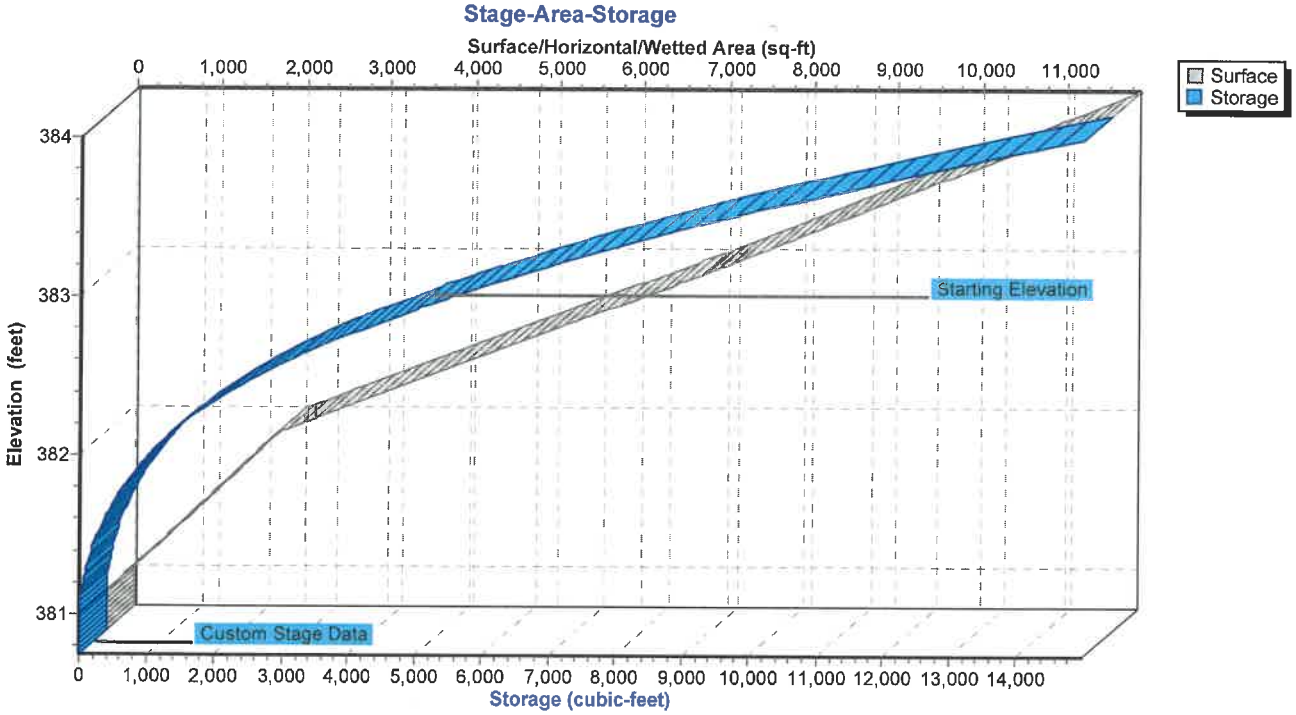
Volume	Invert	Avail.Storage	Storage Description
#1	380.75'	14,984 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
380.75	4	0	0
381.00	8	2	2
382.00	2,002	1,005	1,007
383.00	7,055	4,529	5,535
384.00	11,843	9,449	14,984

Device	Routing	Invert	Outlet Devices
#1	Primary	380.75'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 3.25 Width (feet) 0.90 0.90

Primary OutFlow Max=9.49 cfs @ 0.00 hrs HW=382.93' (Free Discharge)
↑**1=Custom Weir/Orifice** (Weir Controls 9.49 cfs @ 4.84 fps)

Pond N: North Basin



Hydrograph for Pond N: North Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	**0.00**	**5,054**	**382.93**	**9.49**
0.05	0.00	3,493	382.67	7.85
0.10	0.00	2,222	382.40	6.26
0.15	0.00	1,241	382.10	4.64
0.20	0.00	560	381.74	2.92
0.25	0.00	160	381.39	1.53
0.30	0.00	1	380.94	0.24
0.35	0.00	0	380.75	0.00
0.40	0.00	0	380.75	0.00
0.45	0.00	0	380.75	0.00
0.50	0.00	0	380.75	0.00
0.55	0.00	0	380.75	0.00
0.60	0.00	0	380.75	0.00
0.65	0.00	0	380.75	0.00
0.70	0.00	0	380.75	0.00
0.75	0.00	0	380.75	0.00
0.80	0.00	0	380.75	0.00
0.85	0.00	0	380.75	0.00
0.90	0.00	0	380.75	0.00
0.95	0.00	0	380.75	0.00
1.00	0.00	0	380.75	0.00
1.05	0.00	0	380.75	0.00
1.10	0.00	0	380.75	0.00
1.15	0.00	0	380.75	0.00
1.20	0.00	0	380.75	0.00
1.25	0.00	0	380.75	0.00
1.30	0.00	0	380.75	0.00
1.35	0.00	0	380.75	0.00
1.40	0.00	0	380.75	0.00
1.45	0.00	0	380.75	0.00
1.50	0.00	0	380.75	0.00
1.55	0.00	0	380.75	0.00
1.60	0.00	0	380.75	0.00
1.65	0.00	0	380.75	0.00
1.70	0.00	0	380.75	0.00
1.75	0.00	0	380.75	0.00
1.80	0.00	0	380.75	0.00
1.85	0.00	0	380.75	0.00
1.90	0.00	0	380.75	0.00
1.95	0.00	0	380.75	0.00
2.00	0.00	0	380.75	0.00

Stage-Area-Storage for Pond N: North Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
380.75	4	0	381.28	566	82
380.76	4	0	381.29	586	88
380.77	4	0	381.30	606	94
380.78	4	0	381.31	626	100
380.79	5	0	381.32	646	106
380.80	5	0	381.33	666	113
380.81	5	0	381.34	686	119
380.82	5	0	381.35	706	126
380.83	5	0	381.36	726	134
380.84	5	0	381.37	746	141
380.85	6	0	381.38	766	149
380.86	6	1	381.39	786	156
380.87	6	1	381.40	806	164
380.88	6	1	381.41	826	172
380.89	6	1	381.42	845	181
380.90	6	1	381.43	865	189
380.91	7	1	381.44	885	198
380.92	7	1	381.45	905	207
380.93	7	1	381.46	925	216
380.94	7	1	381.47	945	225
380.95	7	1	381.48	965	235
380.96	7	1	381.49	985	245
380.97	8	1	381.50	1,005	255
380.98	8	1	381.51	1,025	265
380.99	8	1	381.52	1,045	275
381.00	8	2	381.53	1,065	286
381.01	28	2	381.54	1,085	297
381.02	48	2	381.55	1,105	307
381.03	68	3	381.56	1,125	319
381.04	88	3	381.57	1,145	330
381.05	108	4	381.58	1,165	342
381.06	128	6	381.59	1,184	353
381.07	148	7	381.60	1,204	365
381.08	168	9	381.61	1,224	377
381.09	187	10	381.62	1,244	390
381.10	207	12	381.63	1,264	402
381.11	227	14	381.64	1,284	415
381.12	247	17	381.65	1,304	428
381.13	267	19	381.66	1,324	441
381.14	287	22	381.67	1,344	454
381.15	307	25	381.68	1,364	468
381.16	327	28	381.69	1,384	482
381.17	347	32	381.70	1,404	496
381.18	367	35	381.71	1,424	510
381.19	387	39	381.72	1,444	524
381.20	407	43	381.73	1,464	539
381.21	427	47	381.74	1,484	553
381.22	447	52	381.75	1,504	568
381.23	467	56	381.76	1,523	583
381.24	487	61	381.77	1,543	599
381.25	507	66	381.78	1,563	614
381.26	526	71	381.79	1,583	630
381.27	546	76	381.80	1,603	646

Stage-Area-Storage for Pond N: North Basin (continued)

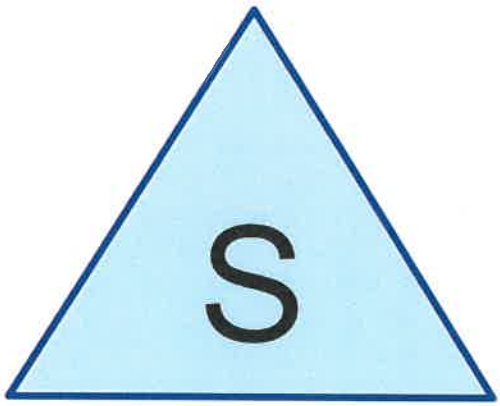
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
381.81	1,623	662	382.34	3,720	1,979
381.82	1,643	678	382.35	3,771	2,017
381.83	1,663	695	382.36	3,821	2,055
381.84	1,683	712	382.37	3,872	2,093
381.85	1,703	729	382.38	3,922	2,132
381.86	1,723	746	382.39	3,973	2,172
381.87	1,743	763	382.40	4,023	2,212
381.88	1,763	781	382.41	4,074	2,252
381.89	1,783	798	382.42	4,124	2,293
381.90	1,803	816	382.43	4,175	2,335
381.91	1,823	834	382.44	4,225	2,377
381.92	1,842	853	382.45	4,276	2,419
381.93	1,862	871	382.46	4,326	2,462
381.94	1,882	890	382.47	4,377	2,506
381.95	1,902	909	382.48	4,427	2,550
381.96	1,922	928	382.49	4,478	2,594
381.97	1,942	947	382.50	4,529	2,639
381.98	1,962	967	382.51	4,579	2,685
381.99	1,982	987	382.52	4,630	2,731
382.00	2,002	1,007	382.53	4,680	2,777
382.01	2,053	1,027	382.54	4,731	2,824
382.02	2,103	1,048	382.55	4,781	2,872
382.03	2,154	1,069	382.56	4,832	2,920
382.04	2,204	1,091	382.57	4,882	2,968
382.05	2,255	1,113	382.58	4,933	3,018
382.06	2,305	1,136	382.59	4,983	3,067
382.07	2,356	1,159	382.60	5,034	3,117
382.08	2,406	1,183	382.61	5,084	3,168
382.09	2,457	1,207	382.62	5,135	3,219
382.10	2,507	1,232	382.63	5,185	3,271
382.11	2,558	1,257	382.64	5,236	3,323
382.12	2,608	1,283	382.65	5,286	3,375
382.13	2,659	1,309	382.66	5,337	3,428
382.14	2,709	1,336	382.67	5,388	3,482
382.15	2,760	1,364	382.68	5,438	3,536
382.16	2,810	1,391	382.69	5,489	3,591
382.17	2,861	1,420	382.70	5,539	3,646
382.18	2,912	1,449	382.71	5,590	3,702
382.19	2,962	1,478	382.72	5,640	3,758
382.20	3,013	1,508	382.73	5,691	3,814
382.21	3,063	1,538	382.74	5,741	3,871
382.22	3,114	1,569	382.75	5,792	3,929
382.23	3,164	1,601	382.76	5,842	3,987
382.24	3,215	1,633	382.77	5,893	4,046
382.25	3,265	1,665	382.78	5,943	4,105
382.26	3,316	1,698	382.79	5,994	4,165
382.27	3,366	1,731	382.80	6,044	4,225
382.28	3,417	1,765	382.81	6,095	4,286
382.29	3,467	1,800	382.82	6,145	4,347
382.30	3,518	1,834	382.83	6,196	4,409
382.31	3,568	1,870	382.84	6,247	4,471
382.32	3,619	1,906	382.85	6,297	4,534
382.33	3,669	1,942	382.86	6,348	4,597

Stage-Area-Storage for Pond N: North Basin (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
382.87	6,398	4,661
382.88	6,449	4,725
382.89	6,499	4,790
382.90	6,550	4,855
382.91	6,600	4,921
382.92	6,651	4,987
382.93	6,701	5,054
382.94	6,752	5,121
382.95	6,802	5,189
382.96	6,853	5,257
382.97	6,903	5,326
382.98	6,954	5,395
382.99	7,004	5,465
383.00	7,055	5,535
383.01	7,103	5,606
383.02	7,151	5,677
383.03	7,199	5,749
383.04	7,247	5,821
383.05	7,294	5,894
383.06	7,342	5,967
383.07	7,390	6,041
383.08	7,438	6,115
383.09	7,486	6,189
383.10	7,534	6,264
383.11	7,582	6,340
383.12	7,630	6,416
383.13	7,677	6,493
383.14	7,725	6,570
383.15	7,773	6,647
383.16	7,821	6,725
383.17	7,869	6,804
383.18	7,917	6,882
383.19	7,965	6,962
383.20	8,013	7,042
383.21	8,060	7,122
383.22	8,108	7,203
383.23	8,156	7,284
383.24	8,204	7,366
383.25	8,252	7,448
383.26	8,300	7,531
383.27	8,348	7,614
383.28	8,396	7,698
383.29	8,444	7,782
383.30	8,491	7,867
383.31	8,539	7,952
383.32	8,587	8,038
383.33	8,635	8,124
383.34	8,683	8,210
383.35	8,731	8,298
383.36	8,779	8,385
383.37	8,827	8,473
383.38	8,874	8,562
383.39	8,922	8,651
383.40	8,970	8,740
383.41	9,018	8,830
383.42	9,066	8,920
383.43	9,114	9,011
383.44	9,162	9,103
383.45	9,210	9,195
383.46	9,257	9,287
383.47	9,305	9,380
383.48	9,353	9,473
383.49	9,401	9,567
383.50	9,449	9,661
383.51	9,497	9,756
383.52	9,545	9,851
383.53	9,593	9,947
383.54	9,641	10,043
383.55	9,688	10,139
383.56	9,736	10,237
383.57	9,784	10,334
383.58	9,832	10,432
383.59	9,880	10,531
383.60	9,928	10,630
383.61	9,976	10,729
383.62	10,024	10,829
383.63	10,071	10,930
383.64	10,119	11,031
383.65	10,167	11,132
383.66	10,215	11,234
383.67	10,263	11,337
383.68	10,311	11,439
383.69	10,359	11,543
383.70	10,407	11,647
383.71	10,454	11,751
383.72	10,502	11,856
383.73	10,550	11,961
383.74	10,598	12,067
383.75	10,646	12,173
383.76	10,694	12,280
383.77	10,742	12,387
383.78	10,790	12,494
383.79	10,838	12,603
383.80	10,885	12,711
383.81	10,933	12,820
383.82	10,981	12,930
383.83	11,029	13,040
383.84	11,077	13,150
383.85	11,125	13,261
383.86	11,173	13,373
383.87	11,221	13,485
383.88	11,268	13,597
383.89	11,316	13,710
383.90	11,364	13,824
383.91	11,412	13,938
383.92	11,460	14,052

Stage-Area-Storage for Pond N: North Basin (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
383.93	11,508	14,167
383.94	11,556	14,282
383.95	11,604	14,398
383.96	11,651	14,514
383.97	11,699	14,631
383.98	11,747	14,748
383.99	11,795	14,866
384.00	**11,843**	**14,984**



South Basin

Subcat Reach Pond Link

Routing Diagram for J1340008 - Detention Time
Prepared by The Mannik & Smith Group, Printed 10/26/2016

Summary for Pond S: South Basin

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	3.05 cfs @	0.00 hrs, Volume=	0.124 af, Atten= 0%, Lag= 0.0 min
Primary	=	3.05 cfs @	0.00 hrs, Volume=	0.124 af

Routing by Stor-Ind method, Time Span= 0.00-2.00 hrs, dt= 0.05 hrs
Starting Elev= 381.29' Surf.Area= 6,563 sf Storage= 5,134 cf
Peak Elev= 381.29' @ 0.00 hrs Surf.Area= 6,563 sf Storage= 5,134 cf

Plug-Flow detention time= (not calculated: no plugs found)
Center-of-Mass det. time= (not calculated: no inflow)

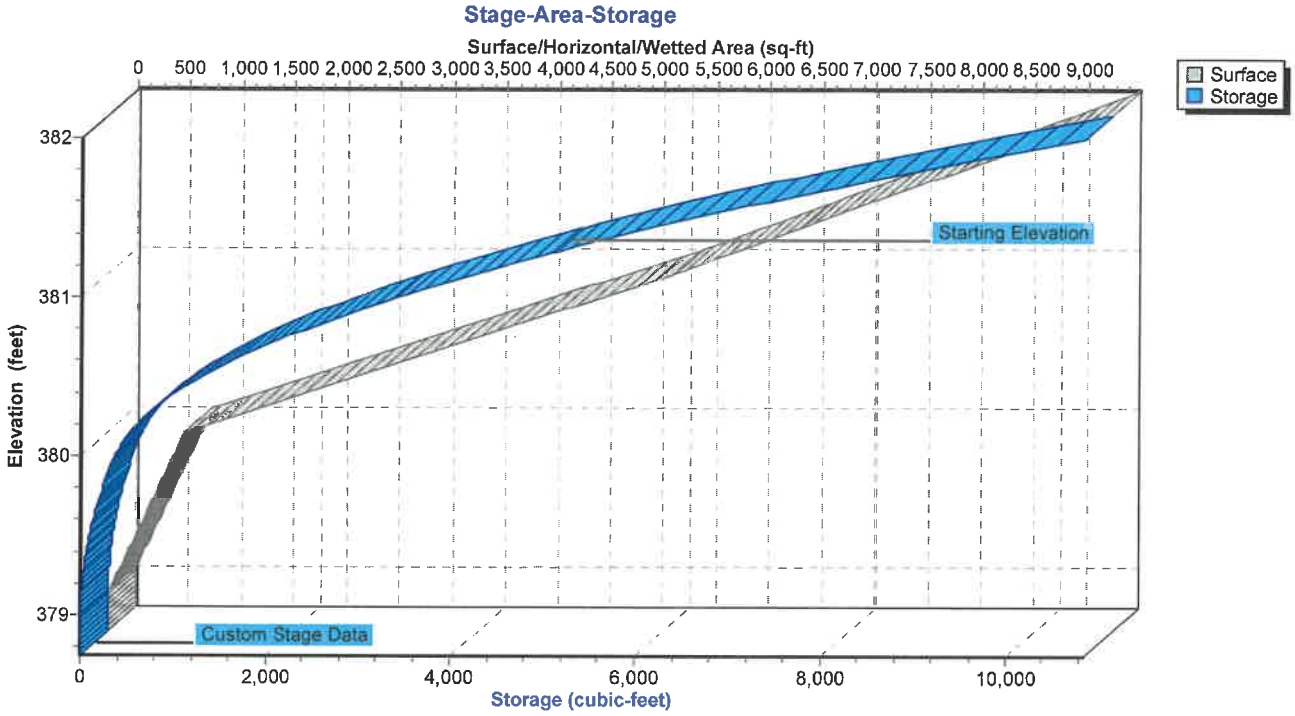
Volume	Invert	Avail.Storage	Storage Description
#1	378.75'	10,834 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
378.75	2	0	0
379.00	5	1	1
380.00	718	362	362
381.00	5,366	3,042	3,404
382.00	9,493	7,430	10,834

Device	Routing	Invert	Outlet Devices
#1	Primary	378.75'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 3.25 Width (feet) 0.23 0.23

Primary OutFlow Max=3.05 cfs @ 0.00 hrs HW=381.29' (Free Discharge)
↑**1=Custom Weir/Orifice** (Weir Controls 3.05 cfs @ 5.22 fps)

Pond S: South Basin



Hydrograph for Pond S: South Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	**0.00**	**5,134**	**381.29**	**3.05**
0.05	0.00	4,599	381.21	2.90
0.10	0.00	4,090	381.12	2.75
0.15	0.00	3,608	381.04	2.61
0.20	0.00	3,152	380.95	2.46
0.25	0.00	2,722	380.86	2.32
0.30	0.00	2,318	380.78	2.17
0.35	0.00	1,940	380.68	2.03
0.40	0.00	1,589	380.59	1.88
0.45	0.00	1,265	380.49	1.72
0.50	0.00	969	380.38	1.57
0.55	0.00	702	380.26	1.39
0.60	0.00	469	380.11	1.19
0.65	0.00	280	379.88	0.90
0.70	0.00	144	379.63	0.62
0.75	0.00	54	379.38	0.38
0.80	0.00	6	379.11	0.16
0.85	0.00	0	378.75	0.00
0.90	0.00	0	378.75	0.00
0.95	0.00	0	378.75	0.00
1.00	0.00	0	378.75	0.00
1.05	0.00	0	378.75	0.00
1.10	0.00	0	378.75	0.00
1.15	0.00	0	378.75	0.00
1.20	0.00	0	378.75	0.00
1.25	0.00	0	378.75	0.00
1.30	0.00	0	378.75	0.00
1.35	0.00	0	378.75	0.00
1.40	0.00	0	378.75	0.00
1.45	0.00	0	378.75	0.00
1.50	0.00	0	378.75	0.00
1.55	0.00	0	378.75	0.00
1.60	0.00	0	378.75	0.00
1.65	0.00	0	378.75	0.00
1.70	0.00	0	378.75	0.00
1.75	0.00	0	378.75	0.00
1.80	0.00	0	378.75	0.00
1.85	0.00	0	378.75	0.00
1.90	0.00	0	378.75	0.00
1.95	0.00	0	378.75	0.00
2.00	0.00	0	378.75	0.00

Stage-Area-Storage for Pond S: South Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
378.75	2	0	379.28	205	30
378.76	2	0	379.29	212	32
378.77	2	0	379.30	219	34
378.78	2	0	379.31	226	37
378.79	2	0	379.32	233	39
378.80	3	0	379.33	240	41
378.81	3	0	379.34	247	44
378.82	3	0	379.35	255	46
378.83	3	0	379.36	262	49
378.84	3	0	379.37	269	52
378.85	3	0	379.38	276	54
378.86	3	0	379.39	283	57
378.87	3	0	379.40	290	60
378.88	4	0	379.41	297	63
378.89	4	0	379.42	304	66
378.90	4	0	379.43	312	69
378.91	4	0	379.44	319	72
378.92	4	1	379.45	326	75
378.93	4	1	379.46	333	79
378.94	4	1	379.47	340	82
378.95	4	1	379.48	347	85
378.96	5	1	379.49	354	89
378.97	5	1	379.50	362	93
378.98	5	1	379.51	369	96
378.99	5	1	379.52	376	100
379.00	5	1	379.53	383	104
379.01	12	1	379.54	390	108
379.02	19	1	379.55	397	111
379.03	26	1	379.56	404	115
379.04	34	2	379.57	411	120
379.05	41	2	379.58	419	124
379.06	48	2	379.59	426	128
379.07	55	3	379.60	433	132
379.08	62	4	379.61	440	137
379.09	69	4	379.62	447	141
379.10	76	5	379.63	454	146
379.11	83	6	379.64	461	150
379.12	91	7	379.65	468	155
379.13	98	8	379.66	476	159
379.14	105	9	379.67	483	164
379.15	112	10	379.68	490	169
379.16	119	11	379.69	497	174
379.17	126	12	379.70	504	179
379.18	133	13	379.71	511	184
379.19	140	15	379.72	518	189
379.20	148	16	379.73	525	195
379.21	155	18	379.74	533	200
379.22	162	19	379.75	540	205
379.23	169	21	379.76	547	211
379.24	176	23	379.77	554	216
379.25	183	24	379.78	561	222
379.26	190	26	379.79	568	227
379.27	198	28	379.80	575	233

Stage-Area-Storage for Pond S: South Basin (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
379.81	583	239	380.34	2,298	875
379.82	590	245	380.35	2,345	898
379.83	597	251	380.36	2,391	922
379.84	604	257	380.37	2,438	946
379.85	611	263	380.38	2,484	971
379.86	618	269	380.39	2,531	996
379.87	625	275	380.40	2,577	1,021
379.88	632	281	380.41	2,624	1,047
379.89	640	288	380.42	2,670	1,074
379.90	647	294	380.43	2,717	1,101
379.91	654	301	380.44	2,763	1,128
379.92	661	307	380.45	2,810	1,156
379.93	668	314	380.46	2,856	1,184
379.94	675	321	380.47	2,903	1,213
379.95	682	327	380.48	2,949	1,242
379.96	689	334	380.49	2,996	1,272
379.97	697	341	380.50	3,042	1,302
379.98	704	348	380.51	3,088	1,333
379.99	711	355	380.52	3,135	1,364
380.00	718	362	380.53	3,181	1,396
380.01	764	370	380.54	3,228	1,428
380.02	811	378	380.55	3,274	1,460
380.03	857	386	380.56	3,321	1,493
380.04	904	395	380.57	3,367	1,527
380.05	950	404	380.58	3,414	1,561
380.06	997	414	380.59	3,460	1,595
380.07	1,043	424	380.60	3,507	1,630
380.08	1,090	435	380.61	3,553	1,665
380.09	1,136	446	380.62	3,600	1,701
380.10	1,183	457	380.63	3,646	1,737
380.11	1,229	469	380.64	3,693	1,774
380.12	1,276	482	380.65	3,739	1,811
380.13	1,322	495	380.66	3,786	1,849
380.14	1,369	508	380.67	3,832	1,887
380.15	1,415	522	380.68	3,879	1,925
380.16	1,462	537	380.69	3,925	1,964
380.17	1,508	552	380.70	3,972	2,004
380.18	1,555	567	380.71	4,018	2,044
380.19	1,601	583	380.72	4,065	2,084
380.20	1,648	599	380.73	4,111	2,125
380.21	1,694	616	380.74	4,158	2,166
380.22	1,741	633	380.75	4,204	2,208
380.23	1,787	650	380.76	4,250	2,250
380.24	1,834	669	380.77	4,297	2,293
380.25	1,880	687	380.78	4,343	2,336
380.26	1,926	706	380.79	4,390	2,380
380.27	1,973	726	380.80	4,436	2,424
380.28	2,019	746	380.81	4,483	2,469
380.29	2,066	766	380.82	4,529	2,514
380.30	2,112	787	380.83	4,576	2,559
380.31	2,159	808	380.84	4,622	2,605
380.32	2,205	830	380.85	4,669	2,652
380.33	2,252	852	380.86	4,715	2,699

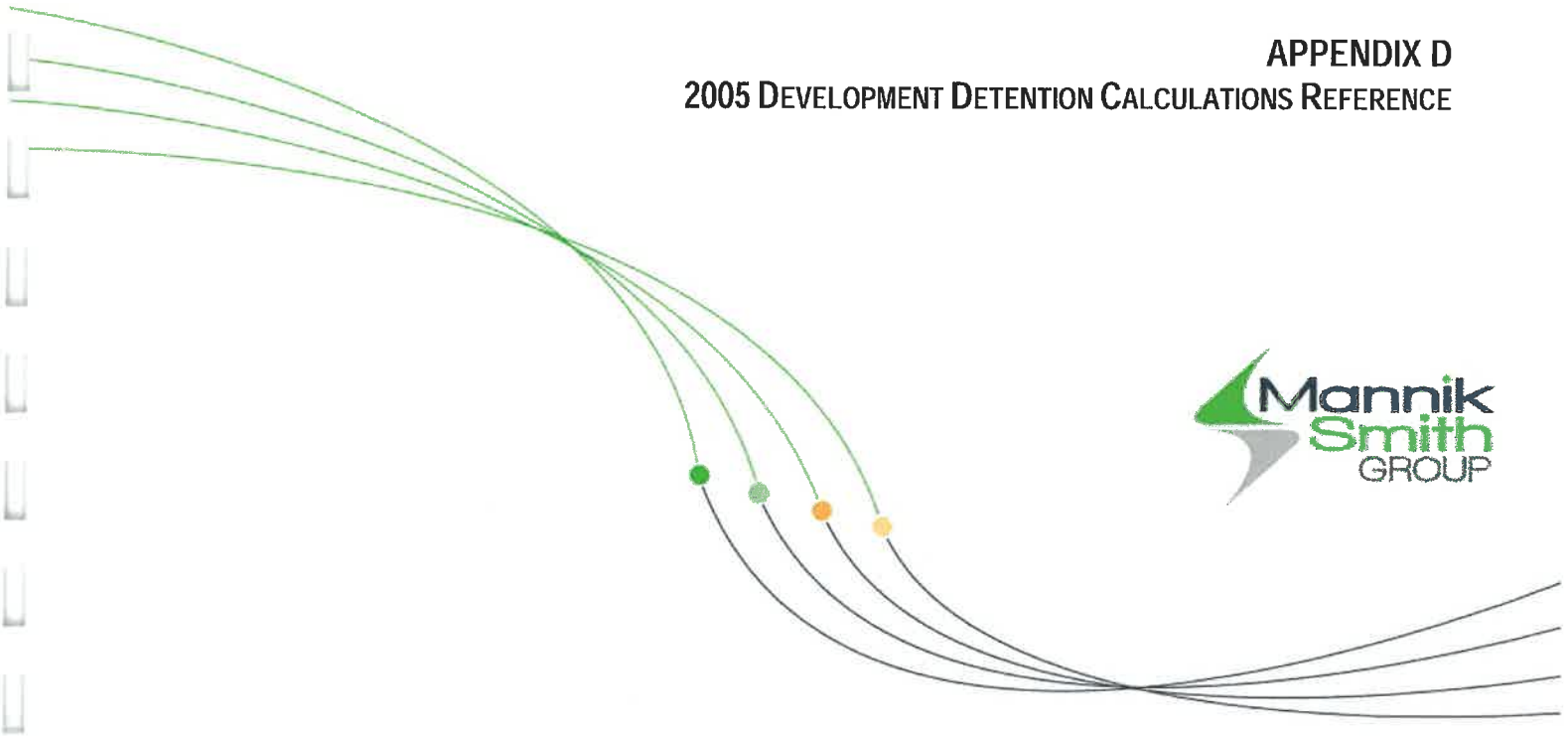
Stage-Area-Storage for Pond S: South Basin (continued)

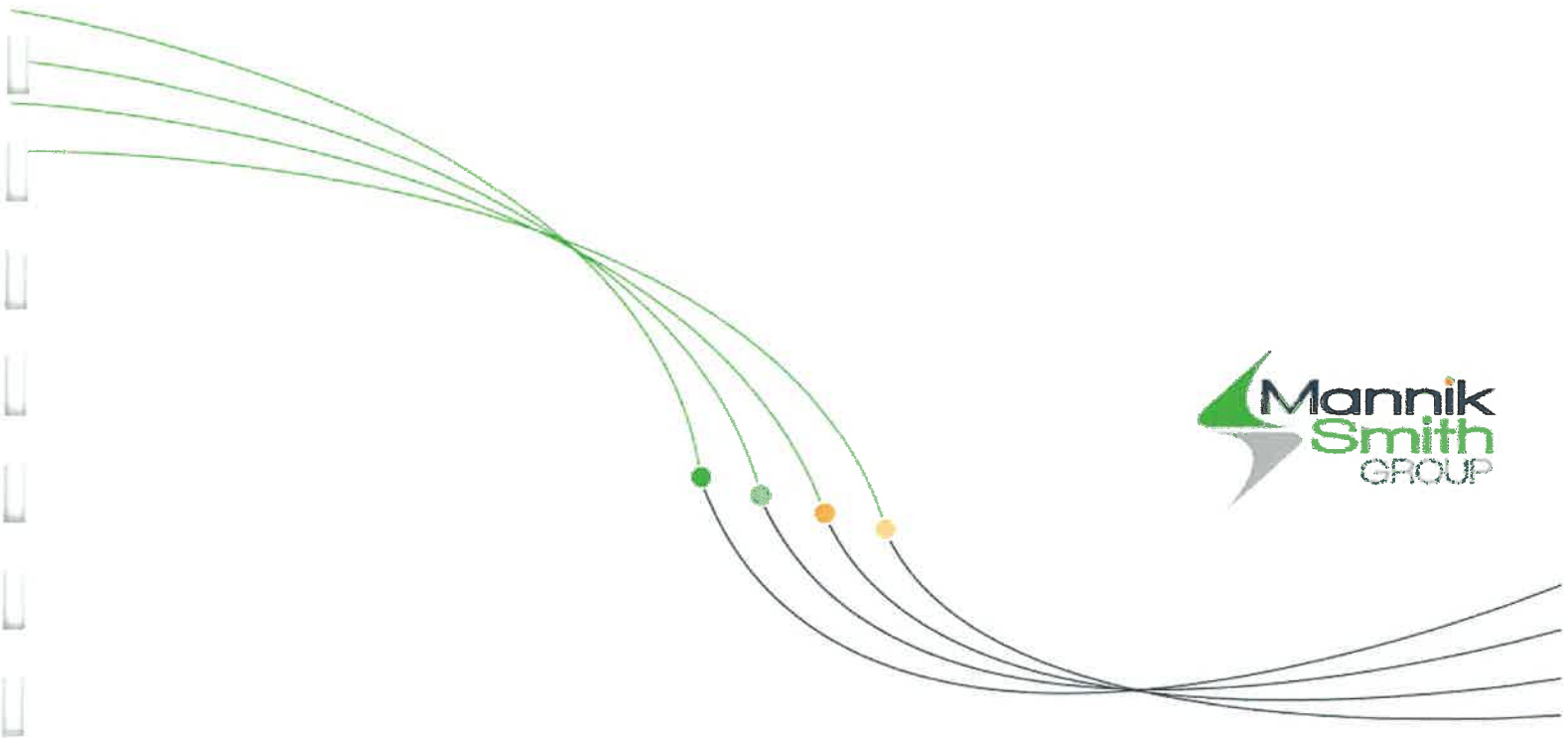
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
380.87	4,762	2,746
380.88	4,808	2,794
380.89	4,855	2,842
380.90	4,901	2,891
380.91	4,948	2,940
380.92	4,994	2,990
380.93	5,041	3,040
380.94	5,087	3,091
380.95	5,134	3,142
380.96	5,180	3,193
380.97	5,227	3,245
380.98	5,273	3,298
380.99	5,320	3,351
381.00	5,366	3,404
381.01	5,407	3,458
381.02	5,449	3,513
381.03	5,490	3,567
381.04	5,531	3,622
381.05	5,572	3,678
381.06	5,614	3,734
381.07	5,655	3,790
381.08	5,696	3,847
381.09	5,737	3,904
381.10	5,779	3,962
381.11	5,820	4,020
381.12	5,861	4,078
381.13	5,903	4,137
381.14	5,944	4,196
381.15	5,985	4,256
381.16	6,026	4,316
381.17	6,068	4,376
381.18	6,109	4,437
381.19	6,150	4,498
381.20	6,191	4,560
381.21	6,233	4,622
381.22	6,274	4,685
381.23	6,315	4,748
381.24	6,356	4,811
381.25	6,398	4,875
381.26	6,439	4,939
381.27	6,480	5,004
381.28	6,522	5,069
381.29	6,563	5,134
381.30	6,604	5,200
381.31	6,645	5,266
381.32	6,687	5,333
381.33	6,728	5,400
381.34	6,769	5,467
381.35	6,810	5,535
381.36	6,852	5,604
381.37	6,893	5,672
381.38	6,934	5,741
381.39	6,976	5,811
381.40	7,017	5,881
381.41	7,058	5,951
381.42	7,099	6,022
381.43	7,141	6,093
381.44	7,182	6,165
381.45	7,223	6,237
381.46	7,264	6,309
381.47	7,306	6,382
381.48	7,347	6,455
381.49	7,388	6,529
381.50	7,430	6,603
381.51	7,471	6,678
381.52	7,512	6,753
381.53	7,553	6,828
381.54	7,595	6,904
381.55	7,636	6,980
381.56	7,677	7,056
381.57	7,718	7,133
381.58	7,760	7,211
381.59	7,801	7,289
381.60	7,842	7,367
381.61	7,883	7,445
381.62	7,925	7,525
381.63	7,966	7,604
381.64	8,007	7,684
381.65	8,049	7,764
381.66	8,090	7,845
381.67	8,131	7,926
381.68	8,172	8,007
381.69	8,214	8,089
381.70	8,255	8,172
381.71	8,296	8,254
381.72	8,337	8,338
381.73	8,379	8,421
381.74	8,420	8,505
381.75	8,461	8,590
381.76	8,503	8,674
381.77	8,544	8,760
381.78	8,585	8,845
381.79	8,626	8,931
381.80	8,668	9,018
381.81	8,709	9,105
381.82	8,750	9,192
381.83	8,791	9,280
381.84	8,833	9,368
381.85	8,874	9,456
381.86	8,915	9,545
381.87	8,956	9,635
381.88	8,998	9,724
381.89	9,039	9,815
381.90	9,080	9,905
381.91	9,122	9,996
381.92	9,163	10,088

Stage-Area-Storage for Pond S: South Basin (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
381.93	9,204	10,179
381.94	9,245	10,272
381.95	9,287	10,364
381.96	9,328	10,457
381.97	9,369	10,551
381.98	9,410	10,645
381.99	9,452	10,739
382.00	**9,493**	**10,834**

APPENDIX D
2005 DEVELOPMENT DETENTION CALCULATIONS REFERENCE

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Copies	Date	No.	Description
3 sets	1-18-05		Final Construction Dwgs for Drain Commission review.
5 shts	1-18-05		Storm Detention Calculations

Remarks:

For your review and approval.

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File

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VANDERBURGH COUNTY
SURVEYOR'S OFFICE
1/20/05 9:30 am ppp

Signature: Steven C. Hermiller

Steven C. Hermiller, PE

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614.476.6000 • Fax 614.476.6225 • www.woolpert.com

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	7.31	1	10	4,385	----	------	----	Pre Developed
2	Rational	12.79	1	10	7,674	----	------	----	Post Developed
3	Reservoir	6.43	1	15	7,672	2	383.89	4,360	Route 25 thru 10 Yr South Pond
5	Rational	8.64	1	10	5,182	----	------	------	Pre Developed
6	Rational	15.55	1	10	9,328	----	------	------	Post Developed
7	Reservoir	7.67	1	15	9,327	6	384.46	4,154	Route 25 thru 10 Yr North Pond

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	Rational	-------	------	------	------	------	6.48	7.31	------	------	Pre Developed
2	Rational	-------	------	------	------	------	11.34	12.79	------	------	Post Developed
3	Reservoir	2	------	------	------	------	5.54	6.43	------	------	Route 25 thru 10 Yr South Pond
5	Rational	-------	------	------	------	------	7.66	8.64	------	------	Pre Developed
6	Rational	-------	------	------	------	------	13.79	15.55	------	------	Post Developed
7	Reservoir	6	------	------	------	------	7.04	7.67	------	------	Route 25 thru 10 Yr North Pond

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 2 - North Pond Storage

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	383.60	100	0	0
0.10	383.70	500	30	30
0.20	383.80	1,000	75	105
0.30	383.90	2,000	150	255
0.40	384.00	2,500	225	480
0.50	384.10	4,000	325	805
0.60	384.20	8,000	600	1,405
0.70	384.30	10,000	900	2,305
0.80	384.40	12,000	1,100	3,405
0.90	384.50	14,000	1,300	4,705

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 2.90	0.00	0.00	0.00
Crest El. ft	= 383.60	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Cipiti	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	383.60	---	---	---	---	0.00	---	---	---	---	0.00
0.10	30	383.70	---	---	---	---	0.31	---	---	---	---	0.31
0.20	105	383.80	---	---	---	---	0.86	---	---	---	---	0.86
0.30	255	383.90	---	---	---	---	1.59	---	---	---	---	1.59
0.40	480	384.00	---	---	---	---	2.44	---	---	---	---	2.44
0.50	805	384.10	---	---	---	---	3.41	---	---	---	---	3.41
0.60	1,405	384.20	---	---	---	---	4.49	---	---	---	---	4.49
0.70	2,305	384.30	---	---	---	---	5.66	---	---	---	---	5.66
0.80	3,405	384.40	---	---	---	---	6.91	---	---	---	---	6.91
0.90	4,705	384.50	---	---	---	---	8.25	---	---	---	---	8.25

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 1 - South Pond Storage

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	383.00	600	0	0
1.00	384.00	9,200	4,900	4,900

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

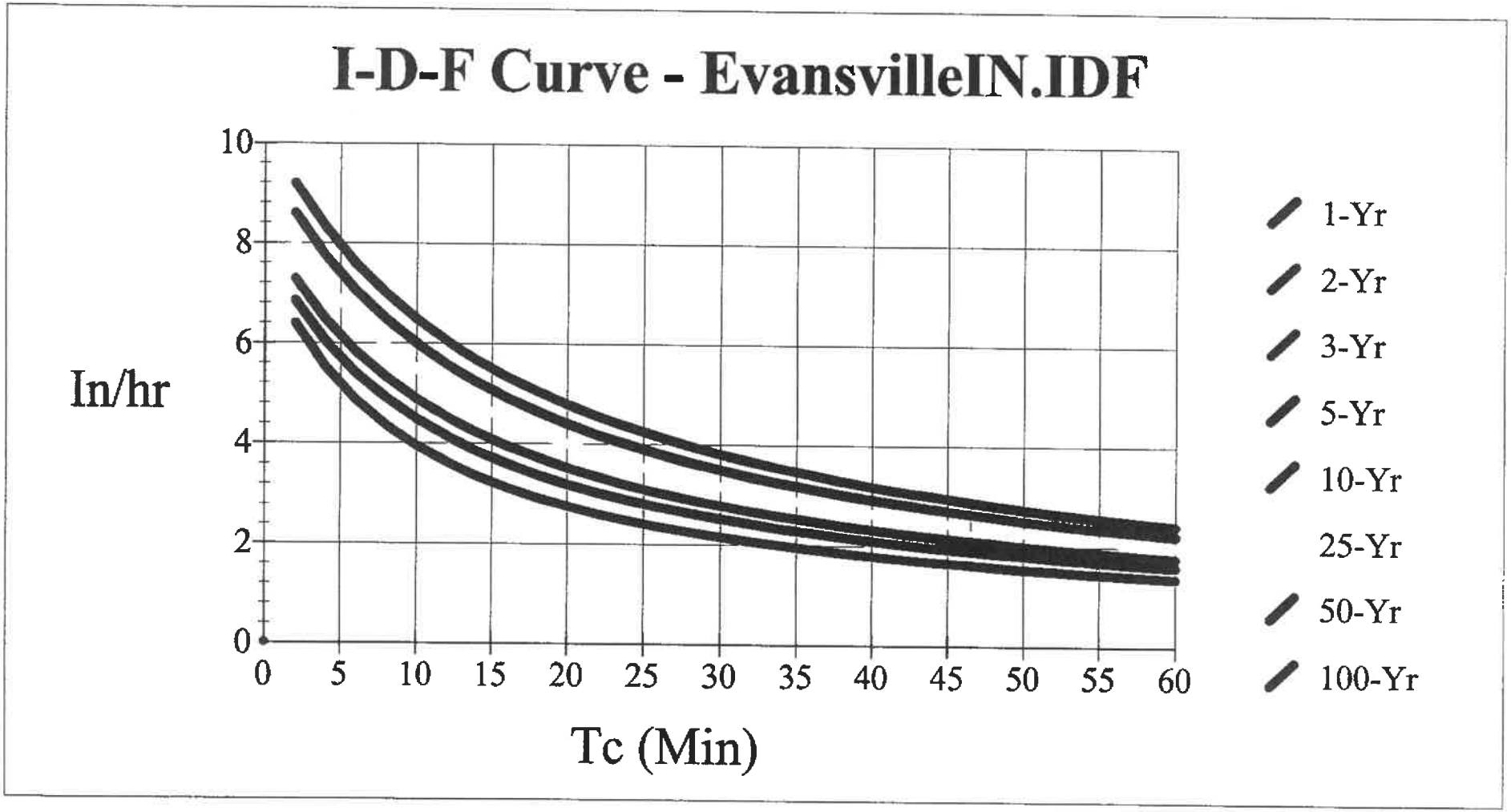
	[A]	[B]	[C]	[D]
Crest Len ft	= 2.30	0.00	0.00	0.00
Crest El. ft	= 383.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Ciplti	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

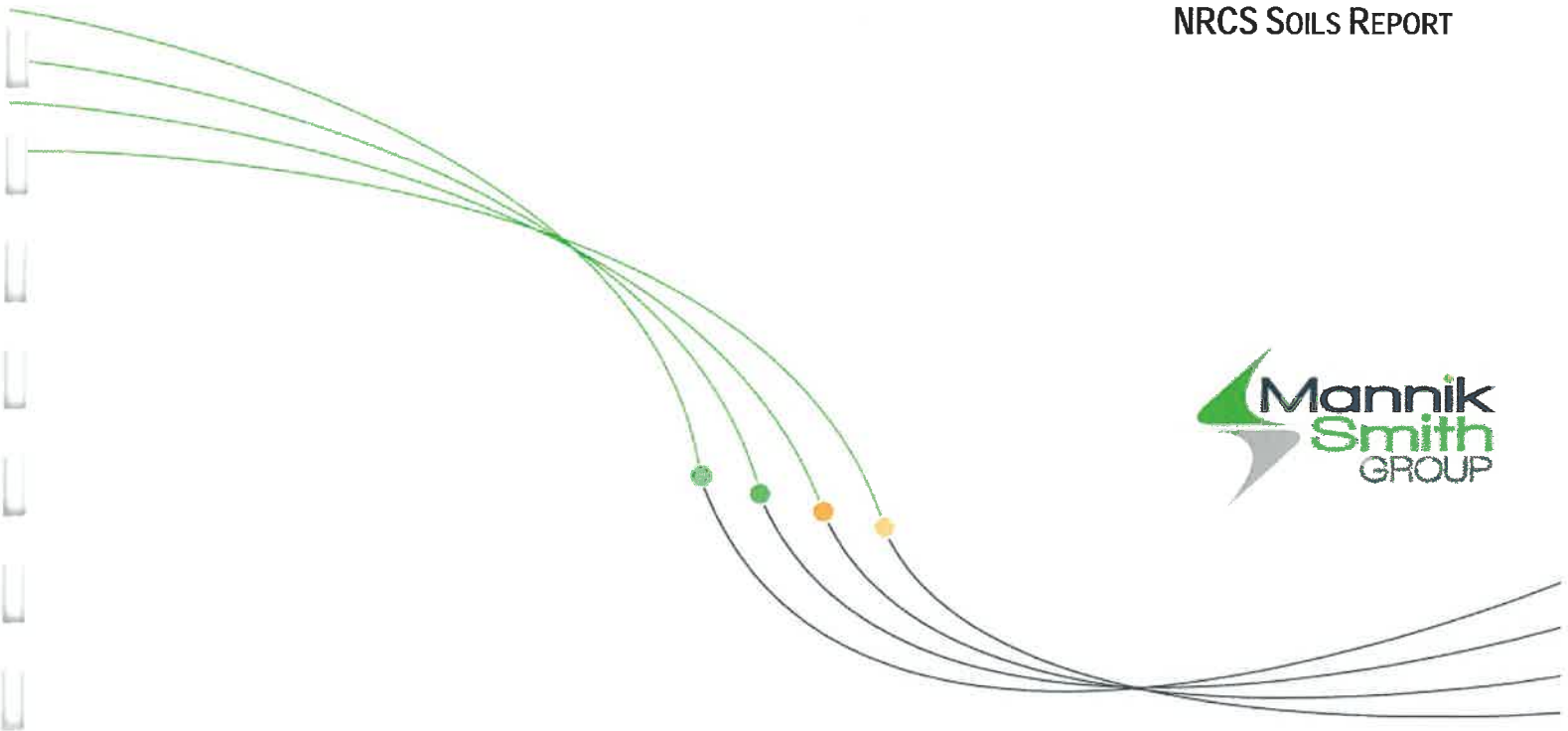
Note: All outflows have been analyzed under inlet and outlet control.

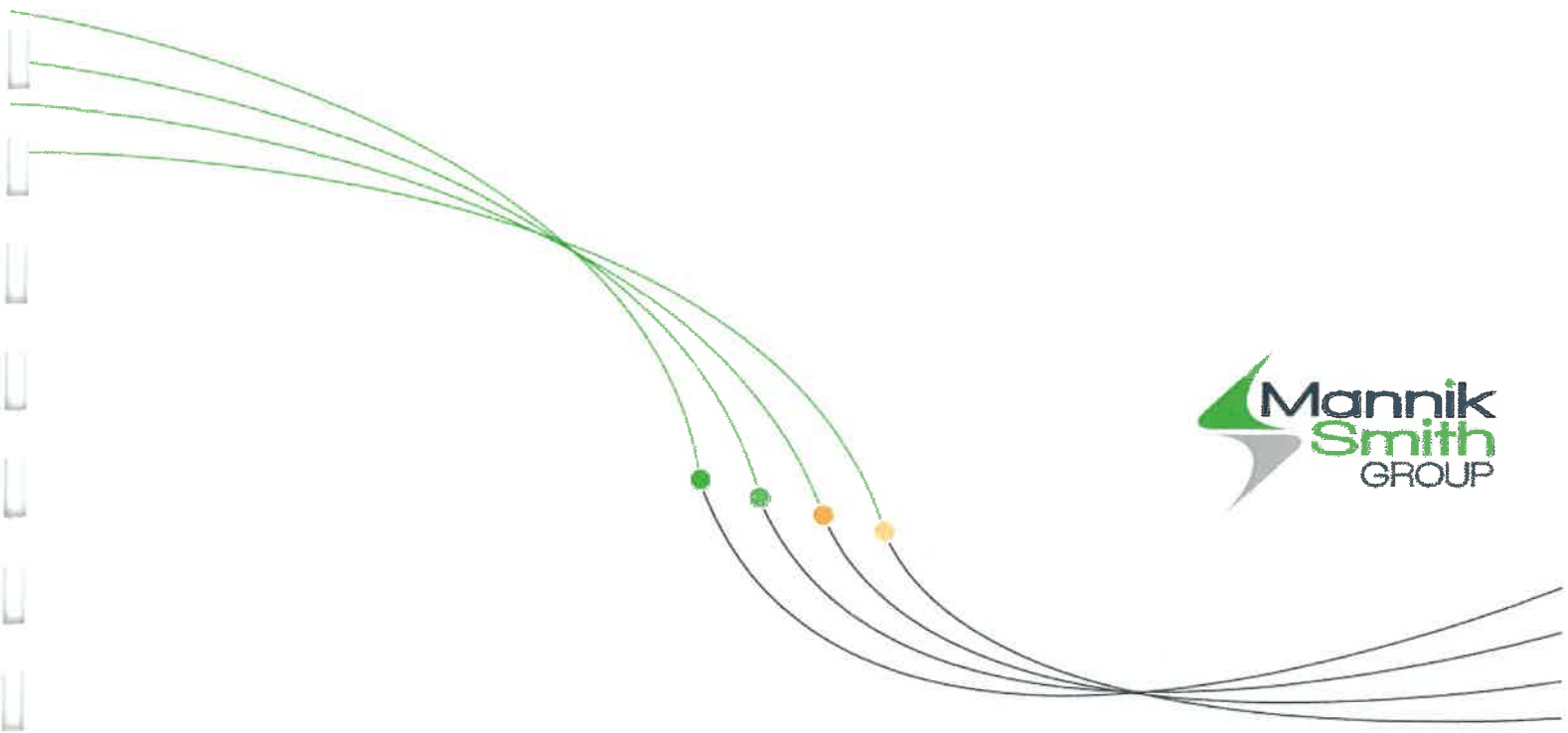
Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	383.00	---	---	---	---	0.00	---	---	---	---	0.00
1.00	4,900	384.00	---	---	---	---	7.66	---	---	---	---	7.66


I-D-F Curve - EvansvilleIN.IDF
In/hr
10
8
6
4
2
0
0
5
10
15
20
25
30
35
40
45
50
55
60
Tc (Min)
1-Yr
2-Yr
3-Yr
5-Yr
10-Yr
25-Yr
50-Yr
100-Yr

APPENDIX F
NRCS SOILS REPORT




Mannik
Smith
GROUP

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 Vanderburgh County, Indiana

August 5, 2016

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 (http://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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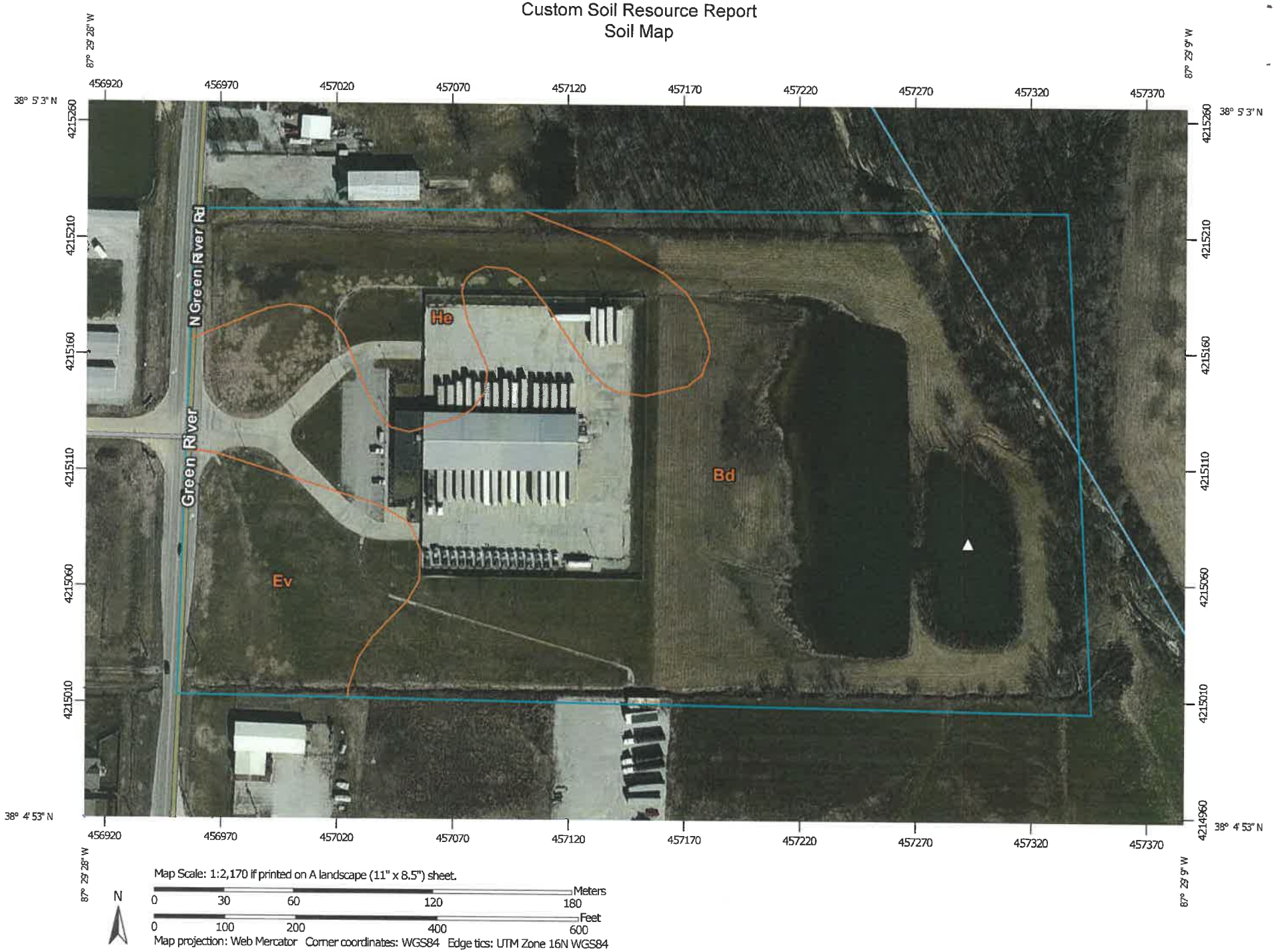
Contents

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 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: http://websoilsurvey.nrcs.usda.gov
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: Vanderburgh County, Indiana
Survey Area Data: Version 15, Sep 11, 2015

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

Date(s) aerial images were photographed: Data not available.

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

Vanderburgh County, Indiana (IN163)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Bd	Birds silt loam	15.2	74.5%
Ev	Evansville silt loam	2.1	10.4%
He	Henshaw silt loam	3.1	15.0%
Totals for Area of Interest		**20.4**	**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.

Vanderburgh County, Indiana

Bd—Birds silt loam

Map Unit Setting

National map unit symbol: 5gbh
Elevation: 340 to 700 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

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

Description of Birds

Setting

Landform: Backswamps on flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Silty alluvium

Typical profile

Ap - 0 to 12 inches: silt loam
Bg - 12 to 52 inches: silt loam
Cg - 52 to 80 inches: stratified silt loam to loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 13.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Other vegetative classification: Trees/Timber (Woody Vegetation)

Ev—Evansville silt loam

Map Unit Setting

National map unit symbol: 5gbl
Elevation: 360 to 600 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Evansville

Setting

Landform: Lake plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

Ap - 0 to 9 inches: silt loam
Bg - 9 to 40 inches: silty clay loam
Cg - 40 to 66 inches: stratified silt loam to silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 20 percent
Available water storage in profile: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Other vegetative classification: Trees/Timber (Woody Vegetation)

He—Henshaw silt loam

Map Unit Setting

National map unit symbol: 5gbp
Elevation: 340 to 700 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Henshaw and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Henshaw

Setting

Landform: Stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy lacustrine deposits

Typical profile

Ap - 0 to 7 inches: silt loam
Bt1 - 7 to 28 inches: silty clay loam
Bt2 - 28 to 43 inches: silty clay loam
C - 43 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 20 percent
Available water storage in profile: High (about 11.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Other vegetative classification: Trees/Timber (Woody Vegetation)

Minor Components

Evansville

Percent of map unit: 3 percent
Landform: Depressions
Other vegetative classification: Trees/Timber (Woody Vegetation)

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DAYTON FREIGHT

13.04.085 Request by applicant for plan review and approval.

A. All requests for drainage plan approval shall be made by the applicant to the drainage board through the county surveyor's office by the presentation to the surveyor of the drainage plan and the supporting data, all in duplicate, by the close of the business day two full weeks prior to the meeting at which approval of the drainage plan shall be sought. **provided on 9/7/2016 Revisions 9/16/2016**

C. Included with the Drainage Plan shall be the following information regarding the applicant that shall be provided on FORM 801.

1. For an individual(s), legal name, current mailing address, email address, name of project and general location of the project. The application must be signed by the individual(s) making such application.

2. For a partnership, corporation or other private entity the legal name of the partnership, corporation or other private entity, mailing address, email address, name of project and general location of the project. For a partnership, the application must be signed by the managing or senior partner or if none exists by all partners. For a Limited Liability Company (LLC), the application must be signed by the manager, or senior member or if one does not exist, by all members. For a corporation, the application must be signed by;

i) the President or Vice-President of the corporation or

ii) by a person whose authority has been delegated to sign such application. If the signature is by a person with a delegation of authority, a copy of such delegation must be included with the application.

D. In all cases the person signing the application will affirm that;

i) the information provided on the application FORM 801 is true and correct and

ii) that the applicant is committing with their signature that an as built plan or record drawing or certification statement will be provided upon completion of the project and that failure to provide an as built plan or record drawing or certification could result in fines under Section 13.04.110 and/or declaring the applicant ineligible for future drainage plan approvals for any project within the County Drainage Board's jurisdiction until such time as an as built drawing or certification is submitted. The County Surveyor or other Technical Advisors to the Board will inform the Drainage Board of any applicants that are not in compliance with submittal of an as built drawing or certification statement prior to any action being taken against such applicant. **Application is for a corporation-signed by Thomas Cronin, President.**

13.04.095 Conditions of drainage plan approval.
In order for an applicant to obtain approval of a final drainage plan, the following requirements must be met:

A. The applicant shall be eligible under the terms of this chapter to apply for and obtain drainage plan approval.

B. The drainage plan and supporting submittals required by this chapter shall have been prepared and submitted in a timely and proper manner in accordance with the provisions of this chapter. **Submitted on 9/7/2016**

C. The drainage plan and supporting submittals shall reflect compliance with the requirements of this chapter, and compliance with any conditions of approval applied to the plan by the drainage board.

D. The submitted data shall be gathered, analyzed, assembled into the drainage plan and supporting submittals; and shall be certified, and presented to the drainage board all by a civil engineer or land surveyor regularly engaged in stormwater drainage design, and registered to practice in the state of Indiana. **Certified**

E. An easement has been dedicated to house any off-site drainage facilities if such facilities are required to serve the project's stormwater drainage system. **No Offsite facilities proposed**

F. The person, persons, partnership, corporation, or other entity to whom approval of the drainage plan is granted must be the person, persons, partnership, corporation, or entity who will be responsible for accomplishing the project for which the drainage plan is developed. **Dayton Freight Lines, Inc, 6450 Poe Avenue Suite 311, Dayton, OH 45414**

13.04.125 Building permits conditioned.
The Vanderburgh County building commissioner shall not allow construction of buildings, or other impervious structures or facilities to commence at the site of a project requiring final drainage plan approval until:

A. Such approval has been expressed by the drainage board;

B. And all storm drainage facilities are constructed.

13.04.130 Phased development of large projects allowed.

Large projects may be divided into phases for the purpose of constructing drainage facilities and obtaining permits in accordance with the requirements of this chapter. **Current proposed project is for paved parking but also designed for additional impervious area for building expansion**

13.04.140 Information submittal and review schedule.

The required drainage plan and supporting data shall be submitted and reviewed by a schedule as follows:

H. For all new major subdivisions as defined in Title 16 of this code, which major subdivisions are shown to discharge an amount of stormwater in addition to that which is discharged prior to new development and all minor subdivisions, C-0 Through M-3, as defined in Title 16 of this code, which minor subdivisions are zoned for commercial use, the applicant shall notify all adjoining landowners and Registered Neighborhood Associations within 1/2 mile of any development of the proposed Drainage Plan. **Single Parcel-not required.**

13.04.165 Contents of the final drainage plan.

A. Soils Map. The soil types based on the most current information available from the SWCD. A soils map indicating soils names and their hydrologic classification must be provided for a proposed project. **Provided-mostly birds silt loam.**

B. Location and Topographic Map. In addition, a location and topographic map must be provided showing the land to be developed, and such adjoining land whose location and topography may affect or be affected by the layout or drainage of the project. **Location map provided along with contour map** The map must also identify all adjoining landowners. **Provided**

C. Contour Intervals.

1. The contour intervals shown on the topographic map shall be two and one-half feet for slopes less than four percent; and five feet for slopes four percent or greater; or best available; **1'**

2. Zone "A" floodplain based on the current FIRM panels. The location of streams and other stormwater conveyance channels, both natural and man-made; and the vertical and horizontal limits of the one hundred (100) year floodplain, according to FIRM panels, and/or the building commissioner; all properly identified; **Per note on drawing C200 entire site is located in 100 year floodplain.**

3. The normal shoreline of lakes, ponds, swamps, and basins, their floodplains, and lines of inflow and outflow; **Dry Basins (two expanded ditches) are the only ponds planned; there is an existing borrow pit on the back of the property**

4. The location of exiting regulated drains, farm drains, inlets and outfalls; **No regulated drains; as to farm drains submitted application states none known**

5. Storm, sanitary, and combined sewers, and outfalls; **Sanitary shown on drawing C100, no combined**

6. Wells, septic tank systems, and outfalls, if any; **submitted application states none known**

7. Seeps, springs, sinkholes, caves, shafts, faults, or other such geological features visible, or of record; **submitted application states none known**

8. The limits of the entire proposed project and the limits of the expected extent of land disturbance required to accomplish the project; **Grading map shows area of construction**

9. The location ~~of the streets~~, lot lines, and easements; **Lot lines shown, no streets.**

10. A scale, preferably one inch equals fifty (50) feet; **Large drawings at 1"= 30' and 1"=50'**

11. An arrow indicating North. **Provided**

D. On-Site Bench Mark Required. A benchmark determined by "Mean Sea Level Datum 1929," is required to be located within the project limits. **Noted on drawing C100**

13.04.170 Final drainage plan layout (Includes information from preliminary).

A. In addition to the requirements listed for a preliminary drainage plan, the final drainage plan shall depict the following:

1. The extent and area of each watershed affecting the design of the drainage facilities for the project; The extent and area of each watershed tributary to the drainage facilities within the project; The existing man-made and natural waterways, ponds, basins, pipes, culverts, and other drainage facilities or features within or affecting the project **Provided**

2. The final layout and design of proposed storm sewers, their inlet and outfall locations and elevations, the receiving streams or channels; all with the basis of their design; **No storm sewers proposed.**

3. The location and design of the proposed street system, including depressed pavements used to convey or detain overflow from storm sewers and over-the-curb runoff resulting from heavier rainstorms, and the outlets for such overflows; all with their designed elevations; **No Streets**

4. The locations, cross sections, and profiles of existing streams, floodways, and floodplains to be maintained, and the same for all new channels to be constructed **No actual streams-storage to be retained in paved channels.**

5. The materials, elevations, waterway openings, size, and basis for design of the proposed culverts and bridges; **no culverts or bridges**

6. Existing ponds and basins to be altered, enlarged, filled, or maintained; and new ponds, basins, swales, to be built, and the basis of their design; **Two lined channels proposed-design provided-Form 800 used different discharges for different storms but calculated volume was correct.**

7. The location and percentage of impervious surfaces existing and expected to be constructed; **Provided**

8. The material types sizes slopes grades and other details of all the stormwater drainage facilities; **Provided**

9. The estimated depth and amount of storage required in the new ponds or basins, the freeboard above the normal pool and highwater pool of wet basins, and details of the emergency overflows from the basins; **Emergency overflow is essentially the lined channel**

10. For all controlled release basins, a plot or tabulation of the storage volumes with corresponding water surface elevations, and a plot or tabulation of the basin outflow rates for those water surface elevations; **Stage storage provided-outflow through weir.**

11. The location of any applicable "impacted drainage areas" or other areas designated to remain totally undisturbed, natural, or for common and/or recreational use. **None shown**

B. Protection of Structures From One Hundred Year Flooding. All structures to be occupied as residences or businesses shall have finished floor elevations two feet above the high water calculated to occur during a one hundred (100) year return period storm for the subject **building** site; and the required floor elevations shall be depicted on the plan drawings for such affected sites. **No buildings at this time but FPG is noted on drawings**

13.04.175 Submittal of a written drainage design report.
The final drainage plan shall be accompanied by a written report containing the following:

A. Any significant stormwater drainage problems existing or anticipated to be associated with the project; **Provided-none noted**

B. The analysis procedure used to identify and evaluate the drainage problems associated with the project; **Rational-10/25**

C. Any assumptions or special conditions associated with the use of the procedures, especially hydrologic or hydraulic methods, used to identify and evaluate drainage problems associated with the project; **All assumptions provided, no special conditions noted**

D. The proposed design of the drainage control system; **Provided**

E. The results of the analysis of the proposed drainage control system showing that it does solve the project's identified and anticipated drainage problems; **Provided**

F. Descriptive data sufficient to support the feasibility of the drainage plan including calculations of the predevelopment and post development runoff rates using rainfall data supplied herein. A detailed

description, depiction, and log of all hydrologic and hydraulic calculations or modeling, and the results obtained thereby; together with the input and output files for all computer runs **Provided**

G. Maps showing individual drainage areas within the project subdivided for use in the analysis thereof. **Provided**

13.04.180 Typical cross sections of the drainage facilities.
One or more typical cross sections must be provided for each existing and proposed channel, basin, pond, or other open drainage facility, which cross sections: **Cross section provided of channel**

13.04.440 General detention/retention basin design requirements.
The following design principles shall be observed for detention and retention basins:

A. Duration of Storage. The maximum volume of water stored and subsequently released at the design release rate shall not result in a storage duration in excess of forty-eight (48) hours, unless additional storms occur within the period. **Not Provided Provided**

B. Depth of Stored Water. The maximum depth of stormwater to be stored, without a permanent pool shall not exceed four feet; and the maximum depth of stormwater to be stored above a permanent pool shall not exceed four feet. **Meets code**

C. Finished Floor Elevations Adjacent to Basins. The lowest floor of any building or structure occupied by humans must be at least two (2) feet above the one-hundred (100) year storm water elevation of detention/retention basins. **No buildings at this time.**

D. Earthen Side Slopes 4:1 Maximum Steepness for Basins. All detention and retention basins with grassed, earthen side slopes shall have side slopes no steeper than four horizontal units of measurement to one vertical unit of measurement (4:1) to the base of dry basins, and to the typical low waterline of wet basins. **4:1 slopes shown**

E. Riprap Side Slopes 2:1 Maximum Steepness for Basins. **Dry Basin**

F. Riprap to Extend Two Vertical Feet Below Waterline. The armored portion of the side slope must extend to a minimum depth below the permanent pool elevation of two vertical feet. **Not Applicable, no rip rap**

G. Underwater Earthen Side Slopes 2:1 Maximum Steepness. **Dry Basin**

H. Minimum Depth of Riprap Application. Riprap side slope armor shall be a minimum twelve (12) inches in depth at all points of application. **rip rap shown at outfall with sufficient depth**

I. Drain Recommended for Maintenance of Wet Basins. **Dry Basin**

J. Safety Ledges and/or Fencing of Wet Basins. **Dry Basin**

K. Outlet Controls to Operate Automatically. Outlet control structures shall be designed to operate as simply as possible, and shall require little or no maintenance for proper operation. **No controls; pipe and open spillway**

L. Designed Water Level Control Required. **Dry Basin**

M. Emergency Spillway Requirements.

1. An emergency overflow spillway shall be provided for the release of storm runoffs exceeding the designed maximum detention volume, or all overflow volumes in emergency conditions, should the normal discharge devices become totally or partially inoperative. **No Spillway as storage is shown as an open channel.**

2. A minimum freeboard of one-half foot above the calculated elevation of the design storm detention high water level to the elevation of the spillway flowline peak is required as a safety factor for all basins. **Meets code**

3. The emergency overflow spillway shall be clearly marked with a defined weir, either grass, rip rap or paved. **No Spillway as storage is shown as an open channel.** The emergency overflow spillway velocities shall be calculated and the necessary erosion control materials shall be specified and utilized in the construction of the overflow spillway and receiving stream. **Both outlets have erosion control measures.** Energy dissipation measures must be employed where required.

N. Automatically Operating Emergency Spillway Required. The emergency overflow spillway shall be designed so that it operates openly, automatically, does not require manual attention, and will pass all the one hundred (100) year return period storm flow with a one-half foot vertical minimum above the one hundred (100) year return storm flow to the lowest dirt elevation in the surrounding earthwork. **No spillway-water is detained in lined channel with weir this should not be an issue.**

O. All Permanent Pools Require Water Quality Provisions. **Dry Basin**

P. Dry Basin Cover and Maintenance. Dry basins shall be planted and maintained in vegetative cover equal to that of residential lawns. **Provided in 2005 plans-is the same mixture to be utilized? Provided on C501 Stormwater notes**

Q. Side Slopes to Remain Stable. All side slopes of a basin shall be constructed stable and shall be maintained in a stable condition by the same criteria as specified herein for open channels. **Side slopes at 4:1**

R. Wet Basin Cover and Maintenance. **Dry Basin**

S. Maintenance Pathway for Basins. A flat pathway with a minimum width of ten (10) feet shall be constructed completely around the top of the embankment of all detention/retention basins. **There is sufficient room to maintain.**

T. Maintenance Easement for Basins. An easement dedicated for the purpose of accessing and maintaining the basin and its appurtenances shall be provided, and the easement shall be configured so that it includes the entire basin, the entire earthwork encompassing the basin, the maintenance pathways into and around the basin, and all inletting and outletting appurtenances of the basin. The basins and maintenance easements shall not be located with the right of way of any county, state or federal road or highway. **Basins serve on site property**

U. Maintenance Report Required for Basin.

1. A brief and concise report shall be prepared, by the design engineer, consisting of a description of the location, intended function of all parts appurtenant to the basin, together with a description of the ways in which the basin and its appurtenances should be maintained, all worded in language easily understood by residential or commercial property owners; and; **Not Provided. Provided on Storm Water Notes**

2. The report shall be attached to the restrictions for the property on which the basin and its parts are located.

3. Such restrictions shall be shown to exist prior to the board's final approval of the drainage plan for a project whose plans include a basin.

V. Copy of Report Must be Submitted With the As-Builts. A copy of the maintenance report described above shall be included with the as-built plans required to be submitted hereinabove. ***It will be recommended to Drainage Board that sign off for proposed improvements will be granted but that the plan should be conditioned that no sign off for any future improvements will be granted until such time as an as built or a engineering certification is submitted.***

W. Elevation of Dry Basin Bottom Marked. A continuous concrete liner at least equal in characteristics to that described in Section 13.04.315F shall be installed in all dry basins from the point of inflow of each channel entering a basin to the point of outflow from the basin. The concrete liner shall be installed at an elevation slightly lower than the earthen floor of the basin, so that it may serve as a trickle trough or low flow liner. **Provided**

X. No tree limbs, trunks, refuse from legally burnt vegetation, nor construction waste, demolition materials, or other man made material may be buried within the area in which an impounding structure will be located. Notice shall be placed on construction drawings noting the prohibition to the burying of any such materials. Certain natural materials such as large rocks may be located in the bottom of wet basins in order to provide fish habitat or habitat breeding areas provided that such materials are not included within the calculations for required storage volumes and will not block outlet structures. **Does not appear to be an issue**

Y. For small sites of less than 5 acres, infiltration trenches may be utilized instead of a wet or dry basin. In utilizing an infiltration trench, the storage volume is equal to the void ratio multiplied by the total volume

of the trench. Information must be provided in advance validating the void ratio as well as testing proposal to validate the void ratio. The infiltration trench must have an outlet that restricts the flow per code provisions. **Dry Basin**

Z. No retention basin shall be allowed within the flowline of a Regulated Drain of Vanderburgh County. The Drainage Board cannot use its rights to discretionary decisions granted under Section 13.04.025 to exempt this restriction. **No Regulated Drain on site**

Other comments:

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DAYTON FREIGHT-Construction Drawings in Vault

Set 1 (Mannik Smith and Renier)

C000-Location

C100-Existing Conditions

C101-Demolition

C200 Site Plan

C300 Grading Plan

C500 SWPPP

C600 General Notes

C601 Site Details

C602 Site Details

Set 2 (Woolpert Smith and Renier)-2005

C000-Location

C100-Existing/Site Demo

C200 Site Plan

C300 Erosion Control

C302 Drainage

C400 Utility

C500, C501 and C502 Details

C600 Landscape

C700 Green River Road Widening

STORM WATER MANAGEMENT SUMMARY

SEPTEMBER 6, 2016

PREPARED FOR:
DAYTON FREIGHT
6450 POE AVENUE, SUITE 311
DAYTON, OHIO

APPROVED
SEP 20 2016
VANDERBURGH COUNTY
DRAINAGE BOARD

See Now 15 | 2016 Approved plans

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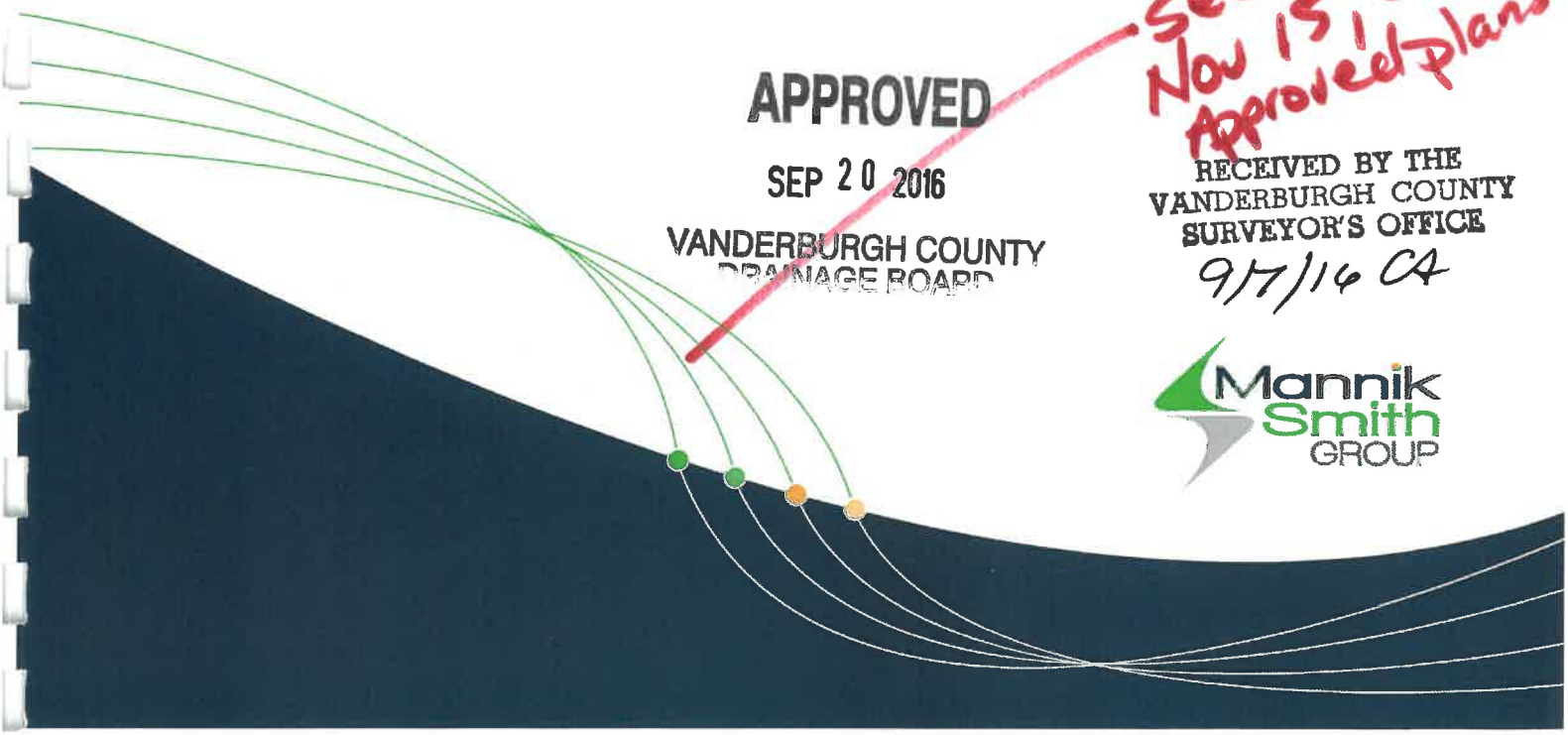

Mannik Smith GROUP