

AGENDA
WORCESTER TOWNSHIP PLANNING COMMISSION
WORCESTER TOWNSHIP COMMUNITY HALL
1031 VALLEY FORGE ROAD, WORCESTER, PA 19490
THURSDAY, MAY 22, 2025 - 7:00 PM

1. CALL TO ORDER

2. ATTENDANCE

3. APPROVAL OF MEETING MINUTES

- a. Motion to approve April 24, 2025 Planning Commission Meeting Minutes

4. LAND DEVELOPMENT

- a. Review LD 2025-01 Westrum/Trooper Ridge
- b. Review LD 2025-04 1038 Windy Hill Road

5. OTHER BUSINESS

- a. Consider recommendation of Accessory Structure Zoning Amendment
- b. Consider recommendation of Childcare Zoning Amendment
- c. Discussion on Internal Review Process Policy

6. NEXT MEETING

- a. June 26, 2025

7. PUBLIC COMMENT

8. ADJOURNMENT

active applications (review period expiration)

- LD 2017-02 Palmer Village, LLC (*Review period waived*)
- LD 2022-01 City View (*Review period waived*)
- LD 2025-01 Westrum (*Review period waived*)
- LD 2025-03 2991 Mohill Road (*Review period waived*)
- LD 2025-04 1038 Windy Hill Road (*Review period waived*)
- LD 2025-05 Meadowood Health Center (*Review period waived*)

WORCESTER TOWNSHIP PLANNING COMMISSION

MEETING MINUTES

Date: April 24, 2025

Time: 7:00 PM

Location: Worcester Township Community Hall

1. Call to Order

The meeting was called to order at 7:00 PM by Chairperson Sherr.

2. Roll Call

Members Present:

All Present

Others Present:

- Dan DeMeno, Township Manager
- Jeff Grosstephen, Woodrow & Associates
- Several members of the public

3. Approval of Minutes

A motion was made by Commissioner Koch and seconded by Commissioner Greenawalt to approve the minutes of the [insert previous date] meeting. The motion passed 4-0 (Commissioner Andorn abstained).

4. Subdivision Presentation – 2991 Mohill Road

Jeff Grosstephen of Woodrow & Associates, along with the property owners, presented a proposal to subdivide the parcel at 2991 Mohill Road. Key points discussed included:

- The proposal is zoning-compliant.
- The applicant seeks to create two additional lots behind the existing three homes currently fronting Mohill.
- Mr. Grosstephen stated they would like to provide a standalone driveway instead of a shared driveway typically required for flag lots.
- Clarification was provided regarding a mistake in the narrative regarding public water; both proposed lots will be served by on-site wells.
- Septic setbacks and well locations were reviewed, with an acknowledgment that a well application has not yet been submitted.

After discussion, the Planning Commission voted unanimously to recommend approval of the subdivision plan as presented.

5. Continued Discussion – Zoning Ordinance Amendments (Accessory Structures and Agricultural Uses)

Manager DeMeno led a detailed conversation on the draft amendments to zoning ordinance provisions related to accessory structures, barns, silos, and non-habitable buildings. The discussion included:

- Concerns about defining barns by use and the implications for non-conforming structures.
- Questions about accessory structures placed on lots with no primary use.
- Debate on the removal of height restrictions for silos and the role of the PA Right to Farm Act.
- Efforts to consolidate and clean up conflicting zoning provisions, especially those affecting height.
- A request for Planning Commission members to send written feedback before the next meeting to streamline future discussions.

6. Update on Childcare Ordinance

Manager DeMeno reported that the Board of Supervisors returned the proposed childcare ordinance amendment for revision. Concerns included unclear definitions and lack of clarity around institutional uses. Manager DeMeno will revise the ordinance with better-defined terms and bring back a new version at a future meeting.

7. General Zoning Concerns – Meadowood and LPD Zoning

Commissioners expressed concern about the lack of unit cap under Land Preservation District (LPD) zoning, particularly for Meadowood. Discussion included the possibility of unlimited expansion through property acquisition, potential impacts on sewer capacity, and a request to explore ordinance revisions to introduce density limitations.

8. Housekeeping and Next Steps

Manager DeMeno reminded the Commission that the next meeting is scheduled for May 22, 2025. He also noted ongoing litigation related to some properties and advised caution during public discussion of those issues.

9. Public Comment

No public comment was made.

10. Adjournment

There being no further business, the meeting was adjourned at 8:01 PM.



January 7, 2025

Mr. Dan DeMeno, Township Manager
Worcester Township
1721 South Valley Forge Road
PO Box 767
Worcester, PA 19490

Re: Preliminary Land Development Plan Submission for
Trooper Ridge - 1035 Trooper Road
Worcester Township, Montgomery County

Dear Mr. DeMeno,

Attached please find the following items comprising the Preliminary Land Development Plan submission for the above referenced project:

1. A completed Subdivision/Land Development Application
2. Completed MCPC Act 247 form
3. A Waiver Request letter
4. Eighteen (18) full size sets of the Preliminary Plans
5. Five (5) copies of the PCSM and E&S Control Report
6. A Letter of Service from Pennsylvania American Water Company
7. A copy of the PNDI receipt
8. A check for the application fee of \$10,950
9. A check for the review escrow of \$24,500

The Traffic Impact Assessment Report and Sewage Facilities Planning Module will be submitted to the Township under separate cover.

This Preliminary Plan is based on the sketch plan for this property previously submitted and reviewed by the Township. It depicts 45 townhouses accessed via private streets with primary access to Trooper Road. An emergency access is proposed onto West Germantown Pike. All open space and private infrastructure within the property will be owned and maintained by a Planned Community Association. The existing house and outbuilding at the northeast corner of the property will remain and a 1.5 acre lot will be subdivided around these structures. Water service will be provided by Pennsylvania American Water Company and sanitary sewer service from Worcester Township.

Please accept this Preliminary Plan submission for review by the Township's professional consultants and Planning Commission. Thank you very much and please contact me with any questions.

Very truly yours,

T&M Associates

Barry G. Stingel, PLA
Supervising Landscape Architect
bstingel@tandmassociates.com | 302-540-1651

Cc: Brian McKenzie, Commerce Pursuit Capital, LLC

ERECTED INTO A TOWNSHIP IN 1733
TOWNSHIP OF WORCESTER
AT THE CENTER POINT OF MONTGOMERY COUNTY
PENNSYLVANIA

1721 Valley Forge Road
P.O. Box 767
Worcester, PA 19490

Phone (610) 584-1410
Fax (610) 584-8901

APPENDIX

SUBDIVISION AND LAND DEVELOPMENT APPLICATION

Date of Application: 01-07-2025 App. fee: \$10,950
Fee Paid: Escrow: \$24,500 W.T.P.C File No. _____

Application for:

Preliminary Review X

Final Review _____

1.) Property: Address 1035 Trooper Road, Norristown, PA 19403

Location/Parcel Number 67-00-01540-004

2.) Owner of record of land: Name James O'Donnell Tel. # _____

Address: 1035 Trooper Road, Norristown, PA 19403 Email _____

3.) Applicant: Name Commerce Pursuit Capital, LP c/o Brian McKenzie Tel. # 215-283-2190

Address 1300 VIRGINIA DR #215, FORT WASHINGTON, PA 19034 Email bmckenzie@westrum.com

4.) Agent or Attorney, (if any): Name Robert Gundlach Tel # 215-918-3636

Address _____ Email rgundlach@foxrothschild.com

5.) Registered Engineer or Surveyor: Name T&M Associates c/o Barry Stingel Tel # 215-282-7839

Address 1018 W 9th Ave, Suite 110, King of Prussia, PA 19406 Email bstingel@tandmassociates.com

6.) Name of Subdivision or Development: Trooper Ridge

7.) Where deed is recorded: Book No. 5085 Page No. 0048

8.) No. of Lots or Dwelling Units: 45

9.) Average Lot Size: N/A

10.) Density (dwelling units per acre): 3.8 units per acre (based on 11.82 developable acres in townhouse lot)

11.) Total Area to be developed or subdivided: _____

*Gross 15.11 acres **Net 13.32 acres

Area in flood plain (if any) N/A

12.) Water Supply: Public system PAWC (public) On lot system _____

13.) Sewage System: Public system Worcester Twp. (public) On lot system _____

14.) List of all Encumbrances:

<u>Amount</u>	<u>Name & Address of Person/Firm</u>	<u>Bk.No.</u>	<u>Pg. No</u>
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<u>N/A</u>			
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15.) Zoning classification of subject land: R-100 and C with MR Multi-residential overlay district

16.) Explanatory statement of plan to be reviewed: _____

Based on the sketch plan reviewed by the Township during the spring of 2024, a Preliminary Land Development Plan for 45 single family attached units (townhouses) is submitted. The plan depicts a proposed Uniform Planned Community with all on-site improvements (streets, sewer, water, stormwater management facilities, open space, etc.) to be owned and maintained by a Planned Community Association.

17.) Linear feet of new streets: 1,630 LF

18.) Copy of all restrictions, covenants, etc. If any, under which lots are to be sold.

Attached ^{To be submitted} under separate cover

None _____

19.) Statement fixing period requested for completion of all items in Paragraph 18 above:

To be determined

20.) Improvements to be made by applicant to subject land with approximate estimate of cost of each:

	<u>Unit Cost</u>	<u>No. of Units</u>	<u>Total</u>
a. Curbs.....			
b. Sidewalks.....			
c. Widening of Existing Streets.....			
d. Park Land.....			
e. Street Lighting.....			
f. Storm Drainage.....			
g. Water Supply & Fire Hydrants....			
h. Sewage Disposal.....			
i. Monuments.....			
j. Landscaping.....			
k. Etc.			

This information to be provided prior to Final Plan Approval

21.) A copy of the description of the land as set forth in the deed shall be attached.

Signature of ^{Applicant} ~~Owner~~ Brian D. McKenzie, VP

Date: 1/6/25

* Gross Area – area calculated to center of street
** Net Area – area calculated to the right of way. Net areas are to be used for density and land area requirements.

ERECTED INTO A TOWNSHIP IN 1733
TOWNSHIP OF WORCESTER
AT THE CENTER POINT OF MONTGOMERY COUNTY
PENNSYLVANIA

1721 Valley Forge Road
P.O. Box 767
Worcester, PA 19490

Phone (610) 584-1410
Fax (610) 584-8901

EXTENSION OF TIME

Date: 01-07-2025

Attn: Township Manager
Worcester Township
1721 Valley Forge Road
P.O. Box 767
Worcester, PA 19490

Dear Township Manager:

RE: SUBDIVISION PLAN/LAND DEVELOPMENT PLAN OF Trooper Ridge

On 01-07-2025, I (we) submitted the referenced plan for official filing.

Please be advised that notwithstanding any contrary provision of the Pennsylvania Municipalities Planning Code or the Worcester Township Subdivision and Land Development Ordinance, this letter will serve as notice to Worcester Township that the requirement that action be taken on this Plan within ninety (90) days, is hereby waived, without limitation as to time.

This waiver is granted to permit us to make such adjustments or revisions to the Plan as may be required during the Plan review process.

If we ever deem it necessary to limit the time of the subdivision or land development review process, we may revoke this extension of time in writing, sent certified mail, return receipt requested, and the Township shall be obligated to render a decision on our plans within sixty (60) days after the date on which the written revocation notice was received.

If the township determines that insufficient progress is being made towards concluding the subdivision or land development review process, the Township may revoke this extension of time in writing, sent regular mail and certified mail, return receipt requested. For purposes of this provision, the Township's written notice shall be deemed received, if sent regular mail and certified mail, on the date of the written receipt on the certified mail return receipt, or, three (3) days after the date indicated on the Township's notification letter in the event the certified mail is return as "refused", "unclaimed", or is otherwise returned without indication of receipt, if addressed as follows (or to a subsequent address specifically provided to the Township by us for the purpose of notice):

At any time sixty (60) days after our receipt of such notice from the Township, we understand that the Township may take (but shall not be obligated to take) such action with regard to our plans as the Township deems necessary and appropriate.

We further understand that nothing herein shall be construed to prevent us from offering, and the Township from accepting, additional extensions of time in the future, but neither party shall be obligated to do so by the terms of the Agreement.

Very truly yours,

By: Brian D. McKenzie, VP
Signature
Brian D. McKenzie, Vice President
Print Name, Title

Accepted by:

Date: _____

Chairman, Board of Supervisors

Attest:

Manager/Secretary



YOUR GOALS. OUR MISSION.

April 4, 2025

Mr. Dan Demeno, Township Manager/Zoning Officer
Worcester Township
1721 South Valley Forge Road
Worcester, PA 19490

RE: **Trooper Ridge Subdivision – Waiver Requests
Preliminary Land Development Plan**

Dear Mr. Demeno:

On behalf of the applicant, Commercial Pursuit Capital, LLC, we respectfully request the following waiver related to the preliminary land development plan design:

Chapter 129: Stormwater Management

§129-18.C.(2): All storm sewer piping shall be Class III reinforced concrete pipe

Waiver Justification: The applicant is requesting a partial waiver from this requirement to allow for HDPE storm pipe for structures S9 to S2 and T12 to T9. These pipes are integrated with the swales along the outer perimeter of the development and HDPE is a more appropriate material to work with in these areas.

§129-18.H.(12): Emergency spillways discharging over fill embankments shall be constructed of reinforced concrete checkerblocks.

Waiver Justification: The applicant is requesting a waiver from this requirement to allow for the basin emergency spillway to be vegetated (grass) with a North American Green C-350 liner. The C-350 liner can withstand velocities of up to 10.5 fps in an unvegetated condition and 20 fps when fully vegetated. The max velocity in each spillway based on the 100-year design storm is less than 2 fps.

§129-18.H.(19): A minimum of 6 inches is required between the emergency spillway elevation and the top of grade elevation of the outlet structure. Six inches is also required between the 100-year water surface elevation and the top of grade of the outlet structure.

Waiver Justification: The proposed stormwater management basin system utilizes an efficient, unique design which minimizes the footprint. There is a vegetated surface component that provides water quality treatment for smaller, more frequent storm events designed per the PADEP MRC protocol. Larger storms are designed to overtop the outlet structure to be collected in a lower underground chamber for rate control. The nature of this efficient-footprint design requires a waiver for the freeboard of 100-year water elevation to top of outlet structure. The additional freeboard to emergency spillway also requires a waiver as the primary spillway is a weir in the lower chamber. However, at the surface, the basin is provided with two (2) earthen emergency spillways. It must lastly be noted that the basin is designed with the TR-55 Method, which is 2.5x more conservative than the Rational Method that the ordinance allows for smaller sites such as this, that the additional freeboard requirements may have been considered for.



§130-16.B.2.a: Horizontal curves for streets shall have a minimum radius of 150 feet

Waiver Justification: Section 130-17.C Driveways for Land Developments, Subsection (1) allows driveways intended for the use of two or more families where the usage by the occupants constitutes essentially a private street. Driveways serving as a private street shall not be dedicated to the municipality. Subsection (2) states that construction of driveways to be used as private streets shall conform to the minimum design standards for public streets, other than those applicable to rights-of-way, width, curbing and shoulder grading; provided, however, that the width of the cartway shall not be in any event less than 20 feet.

The applicant offers that the internal accessway serving the townhouses, which fall within the Township's definition of multifamily units, complies with the definition of private street as defined in Section 130.17.C.

Should it be determined that the internal access drive does not fall within the purview of Section 130.17.C, a waiver is requested from 130-16.B.2.a to allow the internal access street to have radii less than 150' because it is intended to serve only the 45 units and is designed to reduce the amount of roadway otherwise required thus minimizing impervious surface, promote the goal of providing an interesting small community environment that provides for landscaped courts within paved areas, guest parking areas, and locations for community mailboxes. In addition the courts create endpoints at either end of the internal access drive that are more in keeping with a cohesive community than a "J" or "T" turn-around would be.

§130-16.C.1.a.4: A 50 foot wide right of way is required for internal roads.

Waiver Justification: See the description of Section 130-17.C Driveways for Land Developments, above.

A waiver is requested to not provide a 50 foot wide right of way because the internal street will be private and maintained by a Planned Community Association (PCA). In the alternative, a waiver is requested to allow a private right of way that is 40 feet wide.

§130-16.C.1.a.4: A 32, 30, or 28 foot wide cartway is required.

Waiver Justification: See the description of Section 130-17.C Driveways for Land Developments, above.

Should it be determined that the internal access drive does not fall within the purview of Section 130.17.C, a waiver is requested from 130-16.C.1.a.4 to allow the internal access street to have a width of 24 feet because it is intended to serve only the 45 units and is designed to minimize impervious surface, promote the goal of providing an interesting small community environment that provides for landscaped islands within paved areas, guest parking areas, and locations for community mailboxes. In the Fire Marshal's review, it was stated that the 24 foot wide access drive is acceptable with the installation of "No Parking" signs. "No Parking" signs have been provided on the plans.

§130-17.B.2: Driveways shall be a minimum of 40 feet from street intersections.

Waiver Justification: See the description of Section 130-17.C Driveways for Land Developments, above.

Should it be determined that the internal access drive does not fall within the purview of Section 130.17.C, a waiver is requested from 130-17.B.2 to allow less than a 40 feet distance from street intersections to driveways. The closest edge of the paved parking spaces in front of units 1, 10, and 45 are 38 feet from the centerline of the nearest intersecting street which would be a de minimis relief of 2 feet.



§130-17.D.2: Perpendicular parking spaces are prohibited along private roadways unless separated by barrier curbing and at least 7 feet from the cartway

Waiver Justification: See the description of Section 130-17.C Driveways for Land Developments, above.

Should it be determined that the internal access drive does not fall within the purview of Section 130.17.C, a waiver is requested from 130–17.D.2 to allow the proposed guest parking direct access to the internal access way. If a separate driveway is required to provide access to the guest parking spaces, it would reduce the area available to provide guest parking and increase the amount of impervious surface for the development. It would also adversely impact the ability to develop the property for the proposed use given the existing topography at the property and the other ordinance requirements, including the setback and buffer requirements.

§130-18.A.1: Sidewalks shall be provided along all streets.

Waiver Justification: A waiver is requested to not provide a sidewalk along the last 240 feet of Trooper Road frontage at the northern end of the property. There is no sidewalk or significant shoulder beyond the northern end of the property. The property along the final 240 feet for which the waiver is requested has several large trees front of the existing house that would require demolition and change the character of the house. Also there are steep grades that would require significant change in front of the existing house and to the north to accommodate a sidewalk.

§130-18.A.3: Sidewalks shall be 5 feet from the curbline

Waiver Justification: A waiver is requested to allow sidewalks to be 4 feet from the curbline. Montgomery County Planning Commission typically recommends at least a 2-foot verge. The 4-foot verge provided is adequate for tree planting and provides sufficient separate from the sidewalk for pedestrian safety along the internal access driveway.

§130-18.B.1.a: Curbing must be concrete

Waiver Justification: A waiver is requested to provide Belgian Block curb along the internal access drives outside of the public rights-of-way to promote a unique community environment for the development.

Thank you very much for your consideration of the requested waivers and please contact me with any questions you may have.

Sincerely,
T&M Associates

Barry G. Stingel, PLA
Supervising Landscape Architect

PRELIMINARY LAND DEVELOPMENT PLANS FOR TROOPER RIDGE SUBDIVISION WORCESTER TOWNSHIP, MONTGOMERY COUNTY, PENNSYLVANIA

ATTENTION: ALL CONTRACTORS LOCATING OR ALL EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANIES RECORDS AND/OR AERIAL PHOTOGRAPHS. THE USER OF THESE PLANS ASSUMES RESPONSIBILITY FOR THE ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL LOCATION OF ANY UTILITIES SHOWN OR NOT SHOWN. THE USER OF THESE PLANS SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND LEGISLATIVE ACT NUMBER 287 OF 1974 AS AMENDED BY ACT 121 OF 2006. CONTRACTORS MUST VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES AND FACILITIES PRIOR TO START OF WORK. SEE PLAN NO. 20243371817

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR ALL NOTES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR NOTES PRE-SUBMISSION	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER



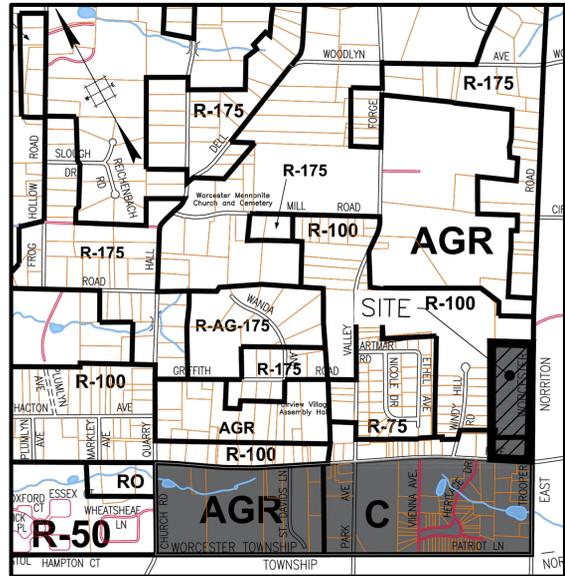
12/19/2024
LICENSED PROFESSIONAL ENGINEER
STATE OF PA LICENSE NO. PE076464

SHEET LIST TABLE		
SHEET NUMBER	SHEET TITLE	
1	COVER SHEET	*
2	LEGEND AND NOTES SHEET	
3	EXISTING CONDITIONS PLAN	
4	EXISTING CONDITIONS PLAN-2	
5	EXISTING RESOURCES PLAN	
6	DEMOLITION PLAN	*
7	SITE PLAN	*
8	SITE PLAN	
9	GRADING PLAN	
10	UTILITY PLAN	
11	DRAINAGE PLAN	
12	LANDSCAPE PLAN	
13	LIGHTING PLAN	
14	EROSION AND SEDIMENT CONTROL PLAN	*
15	NATURAL RESOURCES PROTECTION PLAN	
16	POST CONSTRUCTION STORMWATER MANAGEMENT PLAN	
17	STORM PROFILE-1	
18	STORM PROFILE-2	
19	STORM PROFILE-3	
20	STORM PROFILE-4	
21	SANITARY PROFILE-5	
22	SANITARY PROFILE-6	
23	ROAD PROFILE- CENTERLINE	
24	ROAD PROFILE- NORTH LOOP	
25	ROAD PROFILE- SOUTH LOOP	
26	CONSTRUCTION SITE DETAILS-1	
27	CONSTRUCTION SITE DETAILS-2	
28	STORM SEWER DETAILS-1	
29	STORM SEWER DETAILS-2	
30	UTILITY DETAILS-1	
31	UTILITY DETAILS-2	
32	UTILITY DETAILS-3	
33	LANDSCAPE DETAILS	
34	LANDSCAPE SCHEDULE	
35	LIGHTING DETAILS	
36	EROSION AND SEDIMENT CONTROL DETAILS-1	
37	EROSION AND SEDIMENT CONTROL DETAILS-2	
38	EROSION AND SEDIMENT CONTROL DETAILS-3	*
39	EROSION AND SEDIMENT CONTROL DETAILS-4	
40	POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS-1	*
41	POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS-2	
42	POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS-3	
43	FIRETRUCK TURNING TEMPLATE	
44	FIRETRUCK TURNING TEMPLATE-2	
45	TRASH TRUCK TURNING TEMPLATE	
46	BOX TRUCK TURNING TEMPLATE	

* SHEETS INDICATED TO BE INCLUDED IN RECORD PLAN SET



CONTEXT MAP
SCALE: 1"=1,000'



ZONING MAP
SCALE: 1"=1,000'

SITE & ADJACENT ZONING DISTRICT	
DESIGNATION	ZONING CLASSIFICATION
AGR	AGRICULTURAL
R-175	RESIDENTIAL
R-150	RESIDENTIAL
R-100	RESIDENTIAL
R-75	RESIDENTIAL
R-50	RESIDENTIAL
RO	RESIDENTIAL OFFICE
R-AG-175	RESIDENTIAL AGRICULTURAL
R-AG-200	RESIDENTIAL AGRICULTURAL
C	COMMERCIAL
LI	LIMITED INDUSTRIAL
LPD	LAND PRESERVATION DISTRICT
SC	SHOPPING CENTER
MH	MOBILE HOME DEVELOPMENT
	MULTI-RESIDENTIAL USE OVERLAY DISTRICT
AQRC	AGE QUALIFIED RESIDENTIAL COMMUNITY

WAIVERS REQUESTED
§129-1B - A PARTIAL WAIVER IS REQUESTED FROM THIS SECTION TO ALLOW FOR HDPE STORM PIPE IN LIEU OF CONCRETE

LEGAL OWNER:
JAMES O'DONNELL
1035 TROOPER ROAD
NORRISTON, PA 19403

EQUITABLE OWNER/APPLICANT:
COMMERCIAL PURSUIT CAPITAL, LLC
1300 VIRGINIA DRIVE, SUITE 215
FORT WASHINGTON, PA 19034
(901) 755-4737

APPROVED
APPROVED THIS _____ DAY OF _____, 20____, BY THE BOARD OF SUPERVISORS OF WORCESTER TOWNSHIP, MONTGOMERY COUNTY, PA

ATTEST:
SIGNATURE, CHAIRMAN _____
DATE SIGNED _____
SIGNATURE, SECRETARY _____
DATE SIGNED _____

(TOWNSHIP NOTARY SEAL)
REVIEWED
REVIEWED THIS _____ DAY OF _____, 20____, BY THE PLANNING COMMISSION OF WORCESTER TOWNSHIP, MONTGOMERY COUNTY PA.

ATTEST:
SIGNATURE _____
DATE SIGNED _____

REVIEWED BY THE TOWNSHIP ENGINEER OF WORCESTER TOWNSHIP, MONTGOMERY COUNTY, PA
TOWNSHIP ENGINEER: _____ DATE: _____

COMMONWEALTH OF PENNSYLVANIA, COUNTY OF MONTGOMERY:
ON THIS THE _____ DAY OF _____, 20____, BEFORE ME, THE SUBSCRIBER, PERSONALLY APPEARED **COMMERCIAL PURSUIT CAPITAL, LP**, AND THAT AS MUCH TO DO SO, HE/SHE EXECUTED THE FOREGOING PLAN BY SIGNING THE NAME OF SAID CORPORATION BY HIMSELF/HERSELF AS _____, THAT THE SAID CORPORATION IS THE OWNER OF THE DESIGNATED LAND, THAT ALL NECESSARY APPROVAL OF THE PLAN HAS BEEN OBTAINED AND ENDORSED THEREON AND THAT THE SAID CORPORATION DESIRES THAT THE FOREGOING PLAN MAY BE DULY RECORDED.

BY: _____
OWNER
COMMERCIAL PURSUIT CAPITAL, LP

NOTARY PUBLIC
MY COMMISSION EXPIRES ON THIS ____ DAY OF _____, 20 ____.

CERTIFICATE OF CONFORMANCE - P.E.
I HEREBY CERTIFY THAT, TO THE BEST OF MY KNOWLEDGE, THESE PLANS ARE IN CONFORMITY WITH ENGINEERING, ZONING, BUILDING, SANITATION AND OTHER APPLICABLE TOWNSHIP ORDINANCES AND REGULATIONS.

CHRISTOPHER W. JENSEN, P.E.
LICENSE NO. PE076464

UTILITY USER LIST ACT NUMBER 287 OF 1974 AS AMENDED	
<p>COMCAST 1250 HADDONFIELD-BERLIN RD CHERRY HILL, NJ, 08034 CONTACT: WYATT PARRISH EMAIL: WYATT.PARRISH@CABLE.COMCAST.COM PHONE: 484-368-4391</p> <p>MONTGOMERY COUNTY - PA 1 MONTGOMERY PLZ-ASST & INF-RD & BRG PO BOX 311-SUITE 613 NORRISTOWN, PA, 19404 CONTACT: MORGAN ROUSCHER EMAIL: MORGAN.ROUSCHER@MONTGOMERYPA.GOV PHONE: 610-278-5173</p> <p>PENNSYLVANIA AMERICAN WATER 171 W JOHNSON HIGHWAY NORRISTOWN, PA 19401 CONTACT: SITI YEARWOOD EMAIL: SITI.YEARWOOD@AMWATER.COM PHONE: 610-292-3575</p>	<p>PECO ENERGY C/O USIC LLC 450 S HENDERSON RD SUITE B KING OF PRUSSIA, PA, 19406 CONTACT: NIKKIA SIMPKINS EMAIL: NIKKIASIMPKINS@USICLLC.COM PHONE: 484-681-9720</p> <p>VERIZON BUSINESS FORMERLY MCI 700 WESTON PKWY CARY, NC, 27513 CONTACT: VICTOR WOOD EMAIL: VICTOR.S.WOOD@VERIZON.COM PHONE: 919-414-2782</p> <p>WORCESTER TOWNSHIP 1721 SOUTH VALLEY FORGE ROAD P.O. BOX 767 WORCESTER, PA 19490 CONTACT: ROBERT DILLISTER EMAIL: RDILLISTER@WORCESTER.TWP.PA PHONE: 610-584-1410 EXT. 114</p>

PROJECT INFORMATION: G:\Projects\WDEV\00004A\Plans\...
FILE PATH: G:\Projects\WDEV\00004A\Plans\
FILE NAME: WDEV00004_CVR.dwg
DATE: 28 Mar 2025, 3:11 PM
LAST SAVE BY: CScorze@10
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COMMERCIAL PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
1035 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
COVER SHEET

AND
YOUR GOALS. OUR MISSION.
1700 MARKET STREET, SUITE 3110
PHILADELPHIA, PA 19103
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DESIGNED BY JPK/CKS/CMR/ROP/ZHR	DRAWING CVR
CHECKED BY BGS/ZHR	SHEET 1
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDEV00004	

LEGEND

Table with 2 columns: EX. CONCRETE CURB LINE, EX. EDGE OF PAVEMENT, ZONING DISTRICT BOUNDARY, EX. TREE, EX. WATER VALVE, EX. VENT, EX. TREELINE, PROPERTY LINE, EX. RIGHT-OF-WAY LINE, EX. SANITARY SEWER, EX. WATER LINE, EX. OVERHEAD UTILITY LINES, EX. UNDERGROUND TELEPHONE, EX. STORM SEWER, EX. INLET, EX. MANHOLE, EX. SIGN, EX. LIGHT POLE, EX. FIRE HYDRANT, EX. POLE, EX. CONTOUR, EX. BUILDING, STEEP SLOPES (15%-25%), STEEP SLOPES (>25%), NEW BUILDING, NEW CONCRETE AREA, NEW ASPHALT, NEW REINFORCED TUF, NEW FENCE LINE, NEW TREELINE, NEW SANITARY PIPE, NEW WATER MAIN, NEW SPOT ELEVATION, NEW INDEX CONTOUR, NEW INTERMEDIATE CONTOUR, NEW STORM PIPE, NEW STORM STRUCTURES.

GENERAL NOTES

- 1. TWO HIGHWAY OCCUPANCY PERMITS (PENNDOT AND COUNTY) ARE REQUIRED FOR THIS PROJECT BEFORE ACCESS IS GRANTED TO THE (PENNDOT) STATE ROAD (SR3002) AND THE COUNTY ROAD (WEST GERMANTOWN PIKE)
2. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO REVIEW ALL OF THE DRAWINGS, SPECIFICATIONS, AND REFERENCED DOCUMENTS ASSOCIATED WITH THE PROJECT WORK SCOPE PRIOR TO THE BEGINNING OF CONSTRUCTION. SHOULD THE CONTRACTOR FIND A CONFLICT OR DISCREPANCY WITH THE DRAWINGS RELATIVE TO THE SPECIFICATIONS OR APPLICABLE CODES, IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE PROJECT ENGINEER OF RECORD IN WRITING PRIOR TO THE START OF CONSTRUCTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE CONSTRUCTION MEETS ALL APPLICABLE CODE REQUIREMENTS.
3. ATTENTION ALL CONTRACTORS: LOCATIONS OF ALL EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANY RECORDS AND/OR ABOVEGROUND INSPECTION OF THE SITE. COMPLETENESS OR ACCURACY OF TYPE, SIZE, DEPTH OR HORIZONTAL AND VERTICAL LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES CANNOT BE GUARANTEED. PURSUANT TO REQUIREMENTS OF THE PENNSYLVANIA LEGISLATIVE ACT NUMBER 287 OF 1974, AS AMENDED BY ACT 181 OF 2006, CONTRACTORS MUST VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES AND FACILITIES PRIOR TO ANY CONSTRUCTION. CALL THE PA ONE CALL SYSTEM AT 1-800-242-1776. SERIAL NO. 20243371817 WAS PLACED FOR DESIGN PURPOSES ONLY.
4. PRIOR TO STARTING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE TO ENSURE THAT ALL REQUIRED PERMITS AND APPROVALS HAVE BEEN OBTAINED. NO CONSTRUCTION OR FABRICATION SHALL BEGIN UNTIL THE CONTRACTOR HAS RECEIVED AND THOROUGHLY REVIEWED ALL PLANS AND OTHER DOCUMENTS BY ALL OF THE PERMITTING AUTHORITIES.
5. ALL PROPOSED IMPROVEMENTS SHALL COMPLY WITH "THE AMERICAN DISABILITIES ACT", "ACCESSIBILITY GUIDELINES FOR BUILDINGS AND FACILITIES", AND "THE PENNSYLVANIA UNIVERSAL ACCESSIBILITY ACT".
6. THIS PLAN SHALL NOT BE USED FOR BUILDING TAKEOUT PURPOSES. PROPOSED BUILDING LOCATION AS DEPICTED IS WITHIN ACCEPTABLE TOLERANCES FOR SITE WORK ONLY. PLEASE REFER TO ARCHITECTURAL/STRUCTURAL PLANS FOR EXACT BUILDING PLACEMENT.
7. THE BUILDING FOOTPRINTS DEPICTED HEREON HAVE BEEN TRANSPORTED FROM ARCHITECTURAL PLANS. FINAL BUILDING DIMENSIONS MAY VARY SLIGHTLY FROM THOSE DEPICTED HEREON BUT SHALL ULTIMATELY CONFORM TO ALL APPLICABLE ZONING SETBACKS, IMPERVIOUS SURFACE COVERAGE RATIOS, ETC. CONTRACTOR SHALL NOTIFY PROJECT ENGINEER IF FINAL BUILDING FOOTPRINTS SUBSTANTIALLY VARY FROM THE FOOTPRINTS HEREON.
8. CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH PENNDOT "PUBLICATION 408" LATEST EDITION, MUNICIPAL STANDARDS AND SPECIFICATIONS, AND UTILITY AUTHORITY/CO. STANDARDS AND SPECIFICATIONS, WHICHEVER ARE MORE RESTRICTIVE.
9. SIGNED/SEALED STRUCTURAL DESIGN CALCULATIONS AND CONSTRUCTION DETAILS OF PROPOSED RETAINING WALL(S) SHALL BE SUBMITTED BY THE CONTRACTOR TO THE PROJECT ENGINEER AND MUNICIPALITY FOR APPROVAL PRIOR TO CONSTRUCTION.
10. CONTRACTOR SHALL FURNISH AND INSTALL ALL ITEMS AND COMPLETE ALL WORK INDICATED OR IMPLIED ON THE PROJECT PLANS AND/OR SPECIFICATIONS THAT ARE NOT EXISTING ON THE PROJECT SITE AND THAT ARE NOT SPECIFICALLY NOTED AS "FUTURE" OR "NOT IN CONTRACT (NIC)", "BY OTHERS", "BY OTHER CONTRACTORS", "BY EC", "BY PC", "BY MC".
11. THE CONTRACTOR SHALL BE FAMILIAR WITH AND RESPONSIBLE FOR ANY/ALL CERTIFICATIONS, ETC. REQUIRED BY ALL GOVERNING JURISDICTIONAL AGENCIES DURING AND AFTER CONSTRUCTION FOR SIGN-OFF AND CERTIFICATE OF OCCUPANCY ISSUANCE INCLUDING BUT NOT LIMITED TO PROCUREMENT OF SERVICES, SCHEDULING OF FIELD OBSERVATIONS AND COORDINATION WITH REPRESENTATIVES OF THE APPROPRIATE PARTIES. CONTRACTOR IS RESPONSIBLE TO COORDINATE CERTIFICATIONS, SIGN-OFFS, ETC. NECESSARY FOR JOB CLOSURE AND ISSUANCE OF CERTIFICATE OF OCCUPANCY.
12. THE GEOTECHNICAL REPORT AND RECOMMENDATIONS SET FORTH THEREIN ARE A PART OF THE REQUIRED CONSTRUCTION DOCUMENTS AND IN CASE OF CONFLICT SHALL TAKE PRECEDENCE UNLESS SPECIFICALLY NOTED OTHERWISE ON THE PLANS. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN WRITING OF ANY SUCH DISCREPANCY BETWEEN GEOTECHNICAL REPORT AND PLANS, ETC.
13. THE PROPERTY SURVEY AS CERTIFIED SHALL BE CONSIDERED A PART OF THESE PLANS.
14. THESE PLANS ARE BASED ON INFORMATION PROVIDED TO OUR OFFICE AT THE TIME OF PLAN PREPARATION. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS AND NOTIFY THE ENGINEER IN WRITING IF ACTUAL SITE CONDITIONS DIFFER FROM THOSE SHOWN ON THE PLAN, OR IF THE PROPOSED WORK WOULD BE INHIBITED BY ANY OTHER EXISTING SITE FEATURES.
15. ALL DIMENSIONS SHOWN ON THE PLANS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. CONTRACTOR SHALL NOTIFY ENGINEER IN WRITING IF ANY DISCREPANCIES EXIST PRIOR TO PROCEEDING WITH CONSTRUCTION. NO EXTRA COMPENSATION SHALL BE PAID TO CONTRACTOR FOR WORKING WITH DISCREPANCIES OR CONFLICTS ON THE PLANS IF SUCH NOTIFICATION HAS NOT BEEN GIVEN PRIOR TO THE START OF WORK AND MATERIALS PROCUREMENT.
16. ADA RAMPS ARE SHOWN WITH RAMP TYPE.
17. THE CONTRACTOR SHALL REFER TO THE ARCHITECTURAL/MEPF PLANS FOR EXACT LOCATIONS AND DIMENSIONS OF ENTRY/EXIT POINTS, ELEVATIONS, PRECISE BUILDING DIMENSIONS, EXACT BUILDING UTILITY SERVICE LOCATIONS AND SITE ELECTRICAL DESIGN.
18. DEBRIS SHALL NOT BE BURIED ON THE SUBJECT SITE. ALL EXCAVATED MATERIAL AND DEBRIS (SOLID WASTE) SHALL BE DISPOSED OF IN ACCORDANCE WITH ALL LOCAL, COUNTY, STATE AND FEDERAL LAWS AND APPLICABLE CODES. CONTRACTOR SHALL PROPERLY REMOVE AND ABANDON ALL SUITABLE MATERIAL IN ACCORDANCE WITH ALL APPLICABLE CODES, ORDINANCES AND LAWS.
19. THE CONTRACTOR IS RESPONSIBLE FOR ALL SHORING REQUIRED DURING EXCAVATION AND SHALL BE RESPONSIBLE FOR THE DESIGN, CONSTRUCTION AND MAINTENANCE OF ALL ADDITIONAL PROVISIONS TO ASSURE STABILITY OF CONTIGUOUS STRUCTURES, AS FIELD CONDITIONS DICTATE.
20. THE CONTRACTOR IS TO EXERCISE CARE WHEN PERFORMING WORK ACTIVITIES ADJACENT TO PAVEMENT, STRUCTURES AND FACILITIES THAT ARE TO REMAIN. CONTRACTOR SHALL BE RESPONSIBLE FOR TAKING THE APPROPRIATE MEASURES AS NECESSARY TO ENSURE THE STRUCTURAL STABILITY OF SIDEWALKS AND PAVEMENT TO REMAIN, AND PROVIDE A SAFE WORK AREA.
21. THE CONTRACTOR SHALL BE RESPONSIBLE FOR AND SHALL REPLACE ALL SIGNAL INTERCONNECTION CABLE, CONDUITS, AND ANY UNDERGROUND ACCESSORY EQUIPMENT DAMAGED DURING CONSTRUCTION.
22. THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY DAMAGE DONE TO EXISTING ITEMS DURING CONSTRUCTION SUCH AS BUT NOT LIMITED TO DRAINAGE, UTILITIES, PAVEMENT, STRIPING, CURB, SIDEWALK, ETC. REPAIR SHALL BE EQUAL TO OR BETTER THAN EXISTING CONDITIONS. CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS OF THE CONDITION OF EXISTING ITEMS TO THE OWNER'S DESIGNATED REPRESENTATIVE PRIOR TO CONSTRUCTION START.
23. CONCRETE SHALL HAVE THE MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS AS INDICATED IN SPECIFICATIONS AND REFERENCE DOCUMENTS UNLESS OTHERWISE NOTED ON THE PLANS, DETAILS AND/OR GEOTECHNICAL REPORT.
24. THE ENGINEER IS NOT RESPONSIBLE FOR CONSTRUCTION METHODS/MEANS FOR COMPLETION OF THE WORK DEPICTED ON THESE PLANS NOR ANY CONFLICTS/SCOPE REVISIONS WHICH RESULT FROM THE SAME. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING METHODS/MEANS FOR COMPLETION OF THE WORK PRIOR TO THE COMMENCEMENT OF CONSTRUCTION AND NOTIFICATION OF OWNER AND ENGINEER OF RECORD IN WRITING WHEN A CONFLICT IS IDENTIFIED.
25. NEITHER THE PROFESSIONAL ACTIVITIES OF T&M ASSOCIATES NOR THE PRESENCE OF T&M ASSOCIATES OR ITS EMPLOYEES AND SUB-CONSULTANTS AT A CONSTRUCTION/PROJECT SITE, SHALL RELIEVE THE CONTRACTOR OF ITS OBLIGATIONS, DUTIES AND RESPONSIBILITIES INCLUDING, BUT NOT LIMITED TO, CONSTRUCTION MEANS, METHODS, SEQUENCE, TECHNIQUES OR PROCEDURES NECESSARY FOR PERFORMING, SUPERINTENDING AND COORDINATING THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND ANY HEALTH OR SAFETY PRECAUTIONS REQUIRED BY ANY REGULATORY AGENCIES. T&M ASSOCIATES AND ITS PERSONNEL HAVE NO AUTHORITY TO EXERCISE CONTROL OVER THE CONSTRUCTION CONTRACTOR OR ITS EMPLOYEES IN CONNECTION WITH THEIR WORK OR HEALTH OR SAFETY PRECAUTIONS. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR JOB SITE SAFETY. THE ENGINEER OF RECORD HEREIN IS NOT RESPONSIBLE FOR JOB SITE SAFETY NOR HAS HE BEEN RETAINED FOR SUCH PURPOSES. T&M ASSOCIATES SHALL BE INDEMNIFIED BY THE CONTRACTOR AND SHALL BE MAINTAINED INSURED UNDER THE CONTRACTOR'S POLICIES OF GENERAL LIABILITY INSURANCE.
26. T&M ASSOCIATES SHALL REVIEW AND COMMENT OR TAKE OTHER APPROPRIATE ACTION ON THE CONTRACTOR SUBMITTALS, SUCH AS SHOP DRAWINGS, PRODUCT DATA, SAMPLES AND OTHER DATA, WHICH THE CONTRACTOR IS REQUIRED TO SUBMIT, BUT ONLY FOR THE LIMITED PURPOSE OF CHECKING FOR CONFORMANCE WITH THE DESIGN CONCEPT AND THE INFORMATION SHOWN IN THE CONSTRUCTION MEANS OR METHODS. COORDINATION OF THE WORK WITH OTHER TRADES AND CONSTRUCTION SAFETY PRECAUTIONS ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. T&M ASSOCIATES' REVIEW SHALL BE CONDUCTED WITH REASONABLE EXPEDITIOUSNESS WHILE CONSTRUCTION IS IN PROGRESS. THE REVIEW, REVIEW OF A SPECIFIC ITEM SHALL NOT INDICATE THAT T&M ASSOCIATES HAS REVIEWED THE ENTIRE ASSEMBLY OF WHICH THE ITEM IS A COMPONENT. T&M ASSOCIATES SHALL NOT BE RESPONSIBLE FOR ANY DEVIATIONS FROM THE CONSTRUCTION DOCUMENTS NOT BROUGHT TO THE ATTENTION OF T&M IN WRITING BY THE CONTRACTOR. T&M ASSOCIATES SHALL NOT BE REQUIRED TO REVIEW PARTIAL SUBMISSIONS OR THOSE FOR WHICH SUBMISSIONS OR CORRELATED ITEMS HAVE NOT BEEN RECEIVED.

GENERAL DEMOLITION NOTES

- 1. ALL DEMOLITION ACTIVITIES ARE TO BE PERFORMED IN ACCORDANCE WITH THESE PLANS AND SPECIFICATIONS AS WELL AS ALL FEDERAL, STATE AND LOCAL REGULATIONS. ANY DISCREPANCIES OR DEVIATIONS IDENTIFIED BY THE CONTRACTOR SHALL BE REPORTED TO THE ENGINEER IN WRITING FOR RESOLUTION PRIOR TO INITIATION OF ACTIVITY.
2. THE FIRM OR ENGINEER OF RECORD IS NOT RESPONSIBLE FOR JOB SITE SAFETY OR SUPERVISION. CONTRACTOR IS TO PROCEED WITH THE DEMOLITION IN A SYSTEMATIC AND SAFE MANNER, FOLLOWING ALL THE REQUIREMENTS AND OTHER FEDERAL, STATE, AND LOCAL REGULATIONS, TO ENSURE THE PUBLIC AND CONTRACTOR SAFETY.
3. PRIOR TO STARTING ANY DEMOLITION, CONTRACTOR IS RESPONSIBLE FOR/TO:
A. ENSURE COPIES OF ALL PERMITS AND APPROVALS ARE ON SITE FOR REVIEW.
B. THE REQUIRED SOIL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IN PLACE PRIOR TO SITE DISTURBANCE.
C. ALL EXISTING UTILITIES AND SERVICES, INCLUDING BUT NOT LIMITED TO GAS, WATER, ELECTRIC, SANITARY AND STORM SEWER, TELEPHONE, CABLE, FIBER OPTIC CABLE, ETC. WITHIN THE LIMITS OF DISTURBANCE, SHALL BE VERTICALLY AND HORIZONTALLY LOCATED. THE CONTRACTOR SHALL USE AND COMPLY WITH THE REQUIREMENTS OF THE APPLICABLE UTILITY NOTIFICATION SYSTEM TO LOCATE ALL THE UNDERGROUND UTILITIES.
D. PROTECT AND MAINTAIN IN OPERATION, ALL ACTIVE SYSTEMS THAT ARE NOT BEING REMOVED DURING DEMOLITION ACTIVITIES.
E. FAMILIARIZE THEMSELVES WITH THE APPLICABLE UTILITY SERVICE PROVIDER REQUIREMENTS AND IS RESPONSIBLE FOR ALL COORDINATION REGARDING UTILITY DEMOLITION AND RELOCATION AS IDENTIFIED OR REQUIRED FOR PROJECT. THE CONTRACTOR SHALL PROVIDE THE OWNER WRITTEN NOTIFICATION THAT THE EXISTING UTILITIES AND SERVICES HAVE BEEN TERMINATED AND ABANDONED IN ACCORDANCE WITH JURISDICTION AND UTILITY COMPANY REQUIREMENTS.
F. COORDINATE WITH UTILITY COMPANIES AND TOWNSHIP REGARDING WORKHOURS "PEAK" HOURS OR ON WEEKENDS THAT MAY BE REQUIRED TO MINIMIZE THE IMPACT OF THE AFFECTED PARTIES.
G. ANY AND ALL CONTAMINANTS SHALL BE REMOVED AND DISPOSED OF IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS. DOCUMENTATION OF ANY AND ALL ENVIRONMENTAL WORK INCLUDING HAZARDOUS MATERIAL, SOILS, ASBESTOS, OR OTHER WORK REFERENCED OR IMPLIED HEREIN IS SOLELY THE RESPONSIBILITY OF THE OWNER'S ENVIRONMENTAL CONSULTANT.
4. THE CONTRACTOR SHALL PROVIDE ALL THE "MEANS AND METHODS" NECESSARY TO PREVENT MOVEMENT, SETTLEMENT, OR COLLAPSE OF EXISTING STRUCTURES AND ANY OTHER IMPROVEMENTS TO REMAIN ON OR OFF SITE.
5. IN ABSENCE OF WRITTEN SPECIFICATION, THE CONTRACTOR SHALL PERFORM EARTH MOVING ACTIVITIES, DEMOLITION AND REMOVAL OF ALL FOUNDATION WALLS, FOOTINGS, AND OTHER MATERIALS WITHIN THE LIMITS OF DISTURBANCE IN ACCORDANCE WITH DIRECTION BY OWNER'S GEOTECHNICAL ENGINEER.
6. EXPLOSIVES SHALL NOT BE USED WITHOUT PRIOR WRITTEN CONSENT OF THE OWNER. ALL THE REQUIRED PERMITS AND EXPLOSIVE CONTROL MEASURES THAT ARE REQUIRED BY THE FEDERAL, STATE, AND LOCAL GOVERNMENTS SHALL BE IN PLACE PRIOR TO STARTING AN EXPLOSIVE PROGRAM. THE CONTRACTOR IS ALSO RESPONSIBLE FOR ALL INSPECTION AND SEISMIC VIBRATION TESTING THAT IS REQUIRED TO MONITOR THE EFFECTS ON ALL LOCAL STRUCTURES. APPROVAL FROM WORCESTER TOWNSHIP IS REQUIRED FOR ANY BLASTING.
7. CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL AND GENERALLY ACCEPTED SAFE PRACTICES IN CONFORMANCE WITH THE "MANUAL ON UNIFORM TRAFFIC CONTROL" AS WELL AS FEDERAL, STATE, AND LOCAL REGULATIONS WHEN DEMOLITION RELATED ACTIVITIES IMPACT ROADWAYS OR ROADWAY RIGHT-OF-WAYS.
8. CONDUCT DEMOLITION ACTIVITIES IN SUCH A MANNER TO ENSURE MINIMUM INTERFERENCE WITH ROADS, STREETS, SIDEWALKS, WALKWAYS, AND OTHER ADJACENT FACILITIES. STREET CLOSURE PERMITS MUST BE RECEIVED FROM THE APPROPRIATE GOVERNMENTAL AUTHORITY.
9. DEMOLITION ACTIVITIES AND EQUIPMENT SHALL NOT USE AREAS OUTSIDE THE DEFINED PROPERTY LINES, WITHOUT THE PERMISSION OF THE OWNER, AND/OR APPROPRIATE GOVERNMENT AGENCY.
10. USE DUST CONTROL MEASURES TO LIMIT THE AMOUNT OF AIRBORNE DUST AND DIRT RISING AND SCATTERING IN THE AIR TO WITHIN FEDERAL, STATE, AND/OR LOCAL STANDARDS. AFTER THE DEMOLITION IS COMPLETE, ADJACENT STRUCTURES AND IMPROVEMENTS SHALL BE CLEANED OF ALL DUST AND DEBRIS CAUSED BY THE DEMOLITION OPERATIONS. THE CONTRACTOR IS RESPONSIBLE FOR RETURNING ALL ADJACENT AREAS TO THEIR "PRE-DEMOLITION" CONDITION.
11. CONTRACTOR IS RESPONSIBLE TO SAFEGUARD SITE AS NECESSARY TO PERFORM THE DEMOLITION IN SUCH A MANNER AS TO PREVENT THE UNAUTHORIZED ENTRY OF PERSONS AT ANY TIME.
12. THIS DEMOLITION PLAN IS INTENDED TO IDENTIFY THOSE EXISTING ITEMS/CONDITIONS WHICH ARE TO BE REMOVED. IT IS NOT INTENDED TO PROVIDE DIRECTION OTHER THAN THAT ALL METHODS AND MEANS ARE TO BE IN ACCORDANCE WITH STATE, FEDERAL, LOCAL, AND JURISDICTIONAL REQUIREMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OSHA AND OTHER SAFETY PRECAUTIONS NECESSARY TO PROVIDE A SAFE WORK SITE.
13. THE DEMOLITION CONTRACTOR IS RESPONSIBLE FOR ALL REPAIRS OF DAMAGE TO ALL ITEMS THAT ARE TO REMAIN AS A RESULT OF HIS ACTIVITIES. ALL REPAIRS SHALL USE NEW MATERIAL. THE REPAIRS SHALL RESTORE THE ITEM TO THE PRE-DEMOLITION CONDITION.
14. DEBRIS SHALL NOT BE BURIED ON THE SUBJECT SITE. ALL EXCAVATED MATERIAL AND DEBRIS (SOLID WASTE) SHALL BE DISPOSED OF IN ACCORDANCE WITH ALL LOCAL, COUNTY, STATE, AND FEDERAL LAWS AND APPLICABLE CODES. CONTRACTOR SHALL PROPERLY REMOVE AND DISPOSE OF HAZARDOUS/UNSUITABLE MATERIAL IN ACCORDANCE WITH ALL APPLICABLE CODES, ORDINANCES, AND LAWS.
15. THE CONTRACTOR SHALL COORDINATE SERVICE SHUTOFF AND DISCONNECT/REMOVAL PROCEDURES WITH EACH RESPECTIVE UTILITY COMPANY FOR THE EXISTING UTILITIES SHOWN TO BE REMOVED.
16. THE DEMOLITION PLAN IS NOT INTENDED TO SHOW EROSION CONTROL MEASURES. FOR SUCH GUIDELINES AND DETAILS, SEE THE EROSION AND SEDIMENT CONTROL PLAN AND DETAILS.
17. ALL EXISTING FEATURES WITHIN THE LIMIT OF DISTURBANCE (AS DEFINED ON THE PLAN SET) ARE TO BE REMOVED (UNLESS OTHERWISE NOTED). AT NO ADDITIONAL COST TO THE OWNER WHETHER OR NOT EXPLICITLY DEPICTED ON THIS PLAN. FEATURES TO BE REMOVED INCLUDE BUT ARE NOT LIMITED TO ALL TREES, VEGETATION, STRUCTURES, ABANDONED UTILITIES, AND ABANDONED IRRIGATION PIPE AND SYSTEM COMPONENTS. CONTRACTOR SHALL ABANDON ANY WELLS PRESENT WITHIN THE LIMIT OF DISTURBANCE IN ACCORDANCE WITH APPLICABLE LAWS AND REGULATIONS.

STORM SEWER NOTES

- 1. ROOF LEADERS SHALL BE CONNECTED DIRECTLY TO THE PROPOSED STORMWATER MANAGEMENT SYSTEM OR DIRECTED VIA SURFACE GRADES TO INLETS/STORMWATER MANAGEMENT SYSTEMS. LEAF TRAPS, GUTTER GUARDS, AND/OR CLEANOUTS TO BE PROVIDED TO PREVENT CLOGGING BY UNWANTED DEBRIS.
2. ALL STORM CONVEYANCE PIPE SHALL BE SMOOTH LINED DOUBLE WALLED HIGH DENSITY POLYETHYLENE PIPE (HDPE), UNLESS OTHERWISE SPECIFIED. ALL ROOF LEADERS SHALL BE SCHEDULE 40 PVC.
3. ALL DETENTION AND RETENTION BASIN EMBANKMENTS SHALL BE PLACED IN 8 INCH MAXIMUM LIFTS TO A MINIMUM 95% DRY DENSITY. PRIOR TO PROCEEDING TO THE NEXT LIFT, COMPACTION SHALL BE CHECKED BY THE MUNICIPAL ENGINEER OR AN APPROVED GEOTECHNICAL ENGINEER WHO SHALL PROVIDE THE MUNICIPAL ENGINEER WITH A WRITTEN REPORT. COMPACTION TESTS SHALL BE PERFORMED USING THE MODIFIED PROCTOR METHOD IN ACCORDANCE WITH ASTM D-1577-07. COMPACTION TESTS SHALL BE RUN ON THE LEADING AND TRAILING EDGE AS WELL AS THE TOP OF THE BERM.
4. ANTI-SEEP COLLARS SHALL BE INSTALLED AROUND THE PIPE BARREL WITHIN THE NORMAL SATURATION ZONE OF THE DETENTION BASIN BERMS. THE ANTI-SEEP COLLARS AND THEIR CONNECTIONS TO THE PIPE BARRELS SHALL BE WATER TIGHT. THE ANTI-SEEP COLLARS SHALL EXTEND A MINIMUM OF TWO FEET BEYOND THE OUTSIDE OF THE PRINCIPAL PIPE BARREL. THE MAXIMUM SPACING BETWEEN COLLARS SHALL BE FOURTEEN (14) TIMES THE MINIMUM PROJECTION OF THE COLLAR MEASURED PERPENDICULAR TO THE PIPE. A MINIMUM OF TWO (2) ANTI-SEEP COLLARS SHALL BE INSTALLED ON EACH OUTLET PIPE. ANTI-SEEP COLLAR SHALL BE CAST-IN-PLACE.
5. IF A CONFLICT ARISES DURING THE INSTALLATION OF ANY PART OF THE STORM SEWER SYSTEM THE ENGINEER IS TO BE NOTIFIED IMMEDIATELY IN WRITING.
6. LEAKSCAPING, FENCES AND STRUCTURES SHALL BE PLACED A MINIMUM OF 5 FEET AWAY FROM STORM SEWERS OUTSIDE OF THE RIGHT OF WAY OF STREETS. REFER TO SITE / RECORD PLAN FOR ADDITIONAL NOTES.
7. ALL STORM SEWER INLETS MUST BE IDENTIFIED WITH A STORM DRAIN MARKER. STORM DRAIN MARKERS SHALL BE STAINLESS STEEL AFFIXED TO THE INLET HOOD WITH ADHESIVE, RIVETS, OR BOLTS. (MARKER SHALL BE BOLTED TO THE GRATE IN OFF-ROAD LOCATIONS). MARKER SHALL HAVE A MINIMUM DIAMETER OF 3 & INCHES. "NO DUMPING-DRAINS TO WATERWAY" AND A FISH SYMBOL. ALTERNATE DESIGNS/SIZES MAY BE USED IF APPROVED BY THE TOWNSHIP.

GRADING NOTES

- 1. VERTICAL DATUM IS NAVD 1988 AND ESTABLISHED BY OBSERVATIONS REFERENCED TO THE NGS CORRS NETWORK.
2. THE MINIMUM SLOPE IN GRASSED AREAS SHALL NOT BE LESS THAN 2% AND THE MINIMUM IN PAVED AREAS SHOULD NOT BE LESS THAN 1%.
3. RUNOFF FROM IMPERVIOUS AREAS SHALL NOT BE DIRECTED INTO THE SANITARY SEWER OR INTO ADJACENT PROPERTIES.
4. WALLS IN EXCESS OF 30" IN HEIGHT REQUIRE A SAFETY FENCE A MINIMUM OF 42" IN HEIGHT. REFER TO DETAIL SHEETS.
5. PAVEMENT SHALL BE SAW CUT IN STRAIGHT LINES TO THE FULL DEPTH OF THE EXISTING PAVEMENT. ALL DEBRIS FROM REMOVAL OPERATIONS SHALL BE REMOVED FROM THE SITE AT THE TIME OF EXCAVATION. STOCKPILING OF DEBRIS WILL NOT BE PERMITTED.
6. IN CASE OF DISCREPANCIES BETWEEN PLANS, THE SITE / RECORD PLAN WILL SUPERSEDE IN ALL CASES. THE ENGINEER OF RECORD MUST BE IMMEDIATELY NOTIFIED IN WRITING OF ANY CONFLICTS.
7. THE CONTRACTOR SHALL BE REQUIRED TO SECURE ALL NECESSARY PERMITS (INCLUDING DEP, ETC.) FOR ALL HAUL AND/OR BORROW SITES. CONTRACTOR SHALL SUPPLY A COPY OF APPROVALS TO DESIGN ENGINEER AND OWNER PRIOR TO INITIATING WORK.
8. EXISTING INLETS AND STORM SEWER INDICATED AS FILLED W/DEBRIS SHALL BE CLEANED AND FLUSHED. NEW INLETS AND PIPES SHALL BE CHECKED FOR SILT/DEBRIS AFTER CONSTRUCTION AND FLUSHED/CLEANED IF NECESSARY.
9. DEPTH OF EXISTING UTILITIES IN PORTIONS OF THE SITE ARE UNKNOWN, WHERE EXISTING UTILITIES ARE TO REMAIN AND ARE FOUND TO HAVE INADEQUATE GROUND COVER AFTER FINAL PROPOSED GRADES HAVE BEEN ESTABLISHED, THE CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING AND PRIOR TO FURTHER CONSTRUCTION ACTIVITIES IN THE AREA OF SAID CONFLICT.
10. ALL DESIGNERS AND CONTRACTORS UTILIZING THIS PLAN AND THE INFORMATION CONTAINED THEREON ARE CAUTIONED TO COMPLY WITH THE REQUIREMENTS OF PENNSYLVANIA ACT 287. LOCATION OF EXISTING AND PROPOSED UNDERGROUND UTILITIES AND FACILITIES SHOWN ON THE DRAWINGS HAVE BEEN DEVELOPED FROM INFORMATION MADE AVAILABLE. COMPLETENESS AND ACCURACY OF LOCATION AND DEPTH OF UTILITIES AND FACILITIES CANNOT BE GUARANTEED. THE CONTRACTOR IS TO VERIFY THE DEPTH AND LOCATION OF ALL UTILITIES AND FACILITIES BEFORE THE START OF WORK. UTILIZE HAND EXCAVATION AS REQUIRED. WORK IS ALSO TO BE DONE IN ACCORDANCE WITH THE STANDARDS OF THE UTILITY COMPANIES WHOSE FACILITIES ARE IN THE PROXIMITY OF THE WORK. OTHER UTILITIES MAY BE REQUIRED TO BE IDENTIFIED IN ACCORDANCE WITH PENNSYLVANIA ACT 38 (1970). THE CONTRACTOR SHALL CONTACT THE PENNSYLVANIA ONE CALL SYSTEM AT 1-800-242-1776, AT LEAST 3 DAYS PRIOR TO EXCAVATION.
11. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE FEDERAL, STATE AND LOCAL CODES, AND ALL REGULATIONS APPURTENANT TO THE OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970. ALL WORK SHALL BE DONE IN ACCORDANCE WITH PENNSYLVANIA ACT 38 (1970). THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE STANDARDS AND REQUIREMENTS. WHERE ANY STANDARDS SEEM IN CONFLICT WITH THESE DRAWINGS, NOTIFY THE DESIGN ENGINEER AND CONSTRUCTION MANAGER FOR DIRECTION PRIOR TO PROCEEDING WITH WORK.
12. CONTRACTORS SHALL HAVE ALL REQUIRED SUBMITTAL APPROVALS PRIOR TO BEGINNING WORK OR ORDERING MATERIALS.
13. CONTRACTORS SHALL VERIFY ALL DIMENSIONS, INVERTS, ELEVATIONS, AND EXISTING CONDITIONS PRIOR TO PROCEEDING WITH THE WORK OR PROCUREMENT OF MATERIALS. VARIATIONS BETWEEN DRAWINGS AND ACTUAL FIELD CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER AND RESOLVED PRIOR TO PROCEEDING WITH THE WORK.
14. CONTRACTOR SHALL BE RESPONSIBLE FOR SAFETY, PROCEDURES, MEANS AND METHODS, SEQUENCING, AND COORDINATION.
15. ALL WORK SHALL BE PERFORMED BY QUALIFIED, EXPERIENCED PERSONNEL.
16. CONTRACTOR SHALL NOTIFY THE OWNER OF PREEXISTING CONDITIONS OF DETERIORATION IN AREAS OF WORK THAT ARE UNCOVERED OR EXPOSED DURING THE WORK.
17. FIELD CHANGES REQUIRE PRIOR DESIGN ENGINEERING REVIEW AND WRITTEN CONFIRMATION.
18. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR TO ANY SIDEWALKS, LAWN, TREES, PAVING, AND OTHER IMPROVEMENTS DISTURBED OR DAMAGED BY DEMOLITION ACTIVITIES PROPOSED HEREIN.
19. CONTRACTOR SHALL PROVIDE PROPER TEMPORARY BRACING AND SHORING OF ALL CONSTRUCTION TO REMAIN OR DEMOLITION WORK IN PROGRESS.
20. CONTRACTOR SHALL PROVIDE LAYOUT, LINE AND GRADE UNLESS OTHERWISE NOTED.
21. CONTRACTOR SHALL NOTIFY THE OWNER OF ANY DISCREPANCIES WITHIN THE DRAWINGS, SPECIFICATIONS, CODES OR STANDARDS FOR CORRECTIVE ACTION PRIOR TO START OF WORK.
22. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE AND PROTECTION OF VEHICULAR AND PEDESTRIAN TRAFFIC. ALL TRAFFIC CONTROL MEASURES SHALL BE IN ACCORDANCE WITH LOCAL, PENNDOT & OSHA REGULATIONS.
23. CONTRACTOR SHALL PROVIDE PROTECTION FOR EXISTING UTILITIES UNLESS OTHERWISE NOTED. CONTRACTOR SHALL IMMEDIATELY REPAIR ANY UTILITY LINE INTERRUPTION AT NO ADDITIONAL CONTRACT COST. THE CONTRACTOR SHALL PROVIDE ADEQUATE PROTECTION AND SUPPORT FOR ALL UTILITIES EXPOSED DURING THE WORK TO INSURE AGAINST DAMAGE AT NO ADDITIONAL COST.
24. CONTRACTOR SHALL PROVIDE TEMPORARY DEWATERING OF EXCAVATIONS THROUGHOUT THE DURATION OF CONTRACT AT NO ADDITIONAL COST.
25. EXISTING UTILITIES SHOWN ARE BASED ON AVAILABLE DATA. DUE TO THE POTENTIAL LACK OF COMPLETE OR ACCURATE DATA REGARDING EXISTING ONSITE AND OFFSITE UTILITIES, THE CONTRACTOR SHALL ASSESS AVAILABLE DATA, SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION AND DEPTH OF EXISTING UTILITIES COMPANIES, AND SHALL DIG TEST PITS AT ALL PROPOSED UTILITY CROSSING LOCATIONS SO THAT ELEVATIONS CAN BE TAKEN TO ASSESS POTENTIAL CONFLICTING PIPES/UTILITIES PRIOR TO ANY PROPOSED UTILITY CONSTRUCTION. IF UNEXPECTED UTILITY LOCATIONS OR ELEVATIONS OR PIPE CONFLICTS ARE ENCOUNTERED DURING CONSTRUCTION, OR IF TEST PITS REVEAL POTENTIAL CONFLICT, DESIGN ENGINEER SHALL BE NOTIFIED SO THAT ELEVATIONS AND LOCATIONS (WHERE NECESSARY) OF AFFECTED UTILITIES CAN BE OBTAINED TO FACILITATE NECESSARY DESIGN ADJUSTMENTS.
26. REMOVAL OF EXISTING UTILITIES SHALL BE COORDINATED WITH THE APPROPRIATE UTILITY COMPANIES.
27. REFER TO THE SITE / RECORD PLAN FOR ADDITIONAL NOTES.
28. ALL SIDEWALKS, CROSSWALK, TRAILS, ENTRANCES, AND RAMPS TO BE BUILT IN ACCORDANCE WITH ADA STANDARDS. MAXIMUM LONGITUDINAL SLOPE TO BE 5%. MAXIMUM CROSS SLOPE TO BE 2%. IT IS RECOMMENDED TO CONSTRUCT CROSS SLOPES AT 1.5% AND LONGITUDINAL SLOPES AT 4.9% TO ALLOW FOR CONSTRUCTION TOLERANCE.
29. REFER TO ADA CURB RAMP CONSTRUCTION DETAILS AND ADA ACCESSIBILITY PLAN FOR ADDITIONAL INFORMATION SPECIFIC TO CURB RAMP AND ACCESSIBLE ROUTE GRADING.

ZONING DATA

EXISTING ZONING DISTRICT CLASSIFICATION: R-100 AND C WITH MULTI-RESIDENTIAL USE OVERLAY DISTRICT (MPO)

EXISTING USE: ONE SINGLE-FAMILY DETACHED DWELLING

PROPOSED USE: MULTI-FAMILY RESIDENTIAL

ZONING REQUIREMENTS:

Table with columns: ZONING (BY DISTRICT), MULTI RESIDENTIAL (MPO) TOWNHOMES, REQUIRED, PROPOSED, REQUIRED, PROPOSED. Rows include: MINIMUM LOT AREA, MINIMUM LOT WIDTH, MAXIMUM BUILDING COVERAGE, MAXIMUM IMPERVIOUS COVERAGE, SETBACK BUFFER, MINIMUM FRONT YARD SETBACK, MINIMUM SIDE YARD SETBACK, MINIMUM REAR YARD SETBACK, MAXIMUM BUILDING HEIGHT / STORIES, MAXIMUM BUILDING SIZE (LENGTH), MAXIMUM ACCESSORY STRUCTURE SETBACK, MAXIMUM DENSITY, MINIMUM BUILDING TO BUILDING SEPARATE, MINIMUM PARKING SETBACK FROM BOUNDARY, NUMBER PARKING SPACES PER UNIT, GUEST PARKING SPACES, TRAIL SETBACK, DETENTION BASIN SETBACK, DETENTION BASIN MAX. % OF YARD AREA, SCREEN PLANTING STRIP.

* - UNITS WILL HAVE BASEMENTS WITH A MAJORITY OF BASEMENT WALL AREA BELOW FINISHED GRADE
** - EACH UNIT WILL HAVE A TWO CAR GARAGE AND TWO DRIVEWAY SPACES
*** - EXISTING NON-CONFORMITY

TABLE OF TOTAL EXISTING AND PROPOSED IMPERVIOUS SURFACE AREAS BY LOT

Table with columns: GROSS AREA, AREA WITHIN EX AND ULT R.O.W., 50% OF SLOPES 15% TO 25%, 100% OF SLOPES >25%, NET LOT AREA. Rows for LOT 1 and LOT 2.

SITE STATISTICS

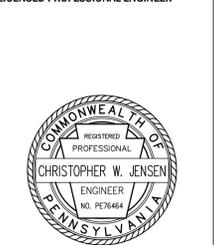
Table with columns: APPLICANT, LEGAL OWNER, EXISTING PROPERTY IDENTIFICATION, DEVELOPABLE AREA SUMMARY, IMPERVIOUS AREAS WITHIN MINIMUM LOT AREA, TABLE OF TOTAL EXISTING AND PROPOSED IMPERVIOUS SURFACE AREAS BY LOT.

TABLE OF EXISTING AND PROPOSED BUILDING AND LOT COVER. Columns: BUILDINGS, PAVING, TOTAL, % BUILDING COVER, % LOT COVER. Rows: LOT 1, LOT 2.



Table with columns: JPK, BOS, JPK, JPK, ZHR, ZHR, BY, CHD. Rows for project milestones and dates.

CHRISTOPHER W. JENSEN, P.E. LICENSED PROFESSIONAL ENGINEER



12/19/2024 LICENSED PROFESSIONAL ENGINEER STATE OF PA LICENSE NO. PD076404

COMMERCIE PURSUIT CAPITAL

TROOPER RIDGE SUBDIVISION 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP, MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA

LEGEND AND NOTES SHEET

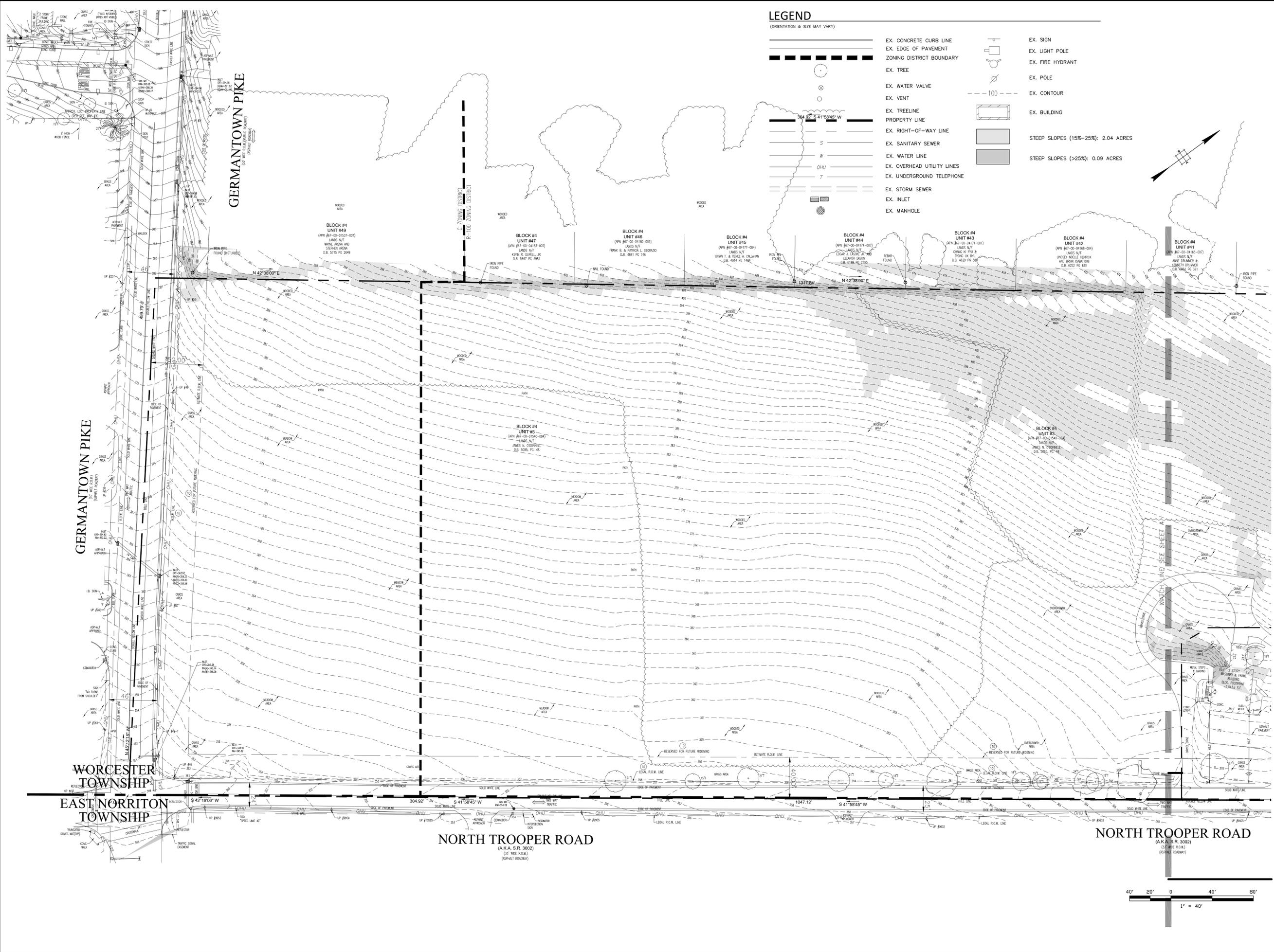


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Table with columns: DESIGNED BY, CHECKED BY, DRAWING, DATE, SCALE, PROJ. NO. Rows: JPK/CKS/RMP/RP/ZHR, BOS/ZHR, SCR/CKS/RAM, 12/19/2024, AS NOTED, WDE00004.

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LEGEND

(ORIENTATION & SIZE MAY VARY)

- EX. CONCRETE CURB LINE
- EX. EDGE OF PAVEMENT
- ZONING DISTRICT BOUNDARY
- EX. TREE
- EX. WATER VALVE
- EX. VENT
- EX. TREELINE
- PROPERTY LINE
- EX. RIGHT-OF-WAY LINE
- EX. SANITARY SEWER
- EX. WATER LINE
- EX. OVERHEAD UTILITY LINES
- EX. UNDERGROUND TELEPHONE
- EX. STORM SEWER
- EX. INLET
- EX. MANHOLE
- EX. SIGN
- EX. LIGHT POLE
- EX. FIRE HYDRANT
- EX. POLE
- EX. CONTOUR
- EX. BUILDING
- STEEP SLOPES (15%-25%): 2.04 ACRES
- STEEP SLOPES (>25%): 0.09 ACRES

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 DATE: 12/19/2024
 TIME: 2:28 PM
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NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 411 PIPES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR 411 PIPES PRE-SUBMISSION MITG	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
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 STATE OF PA LICENSE NO. PE076464

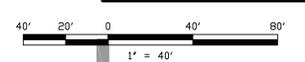
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 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
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EXISTING CONDITIONS PLAN



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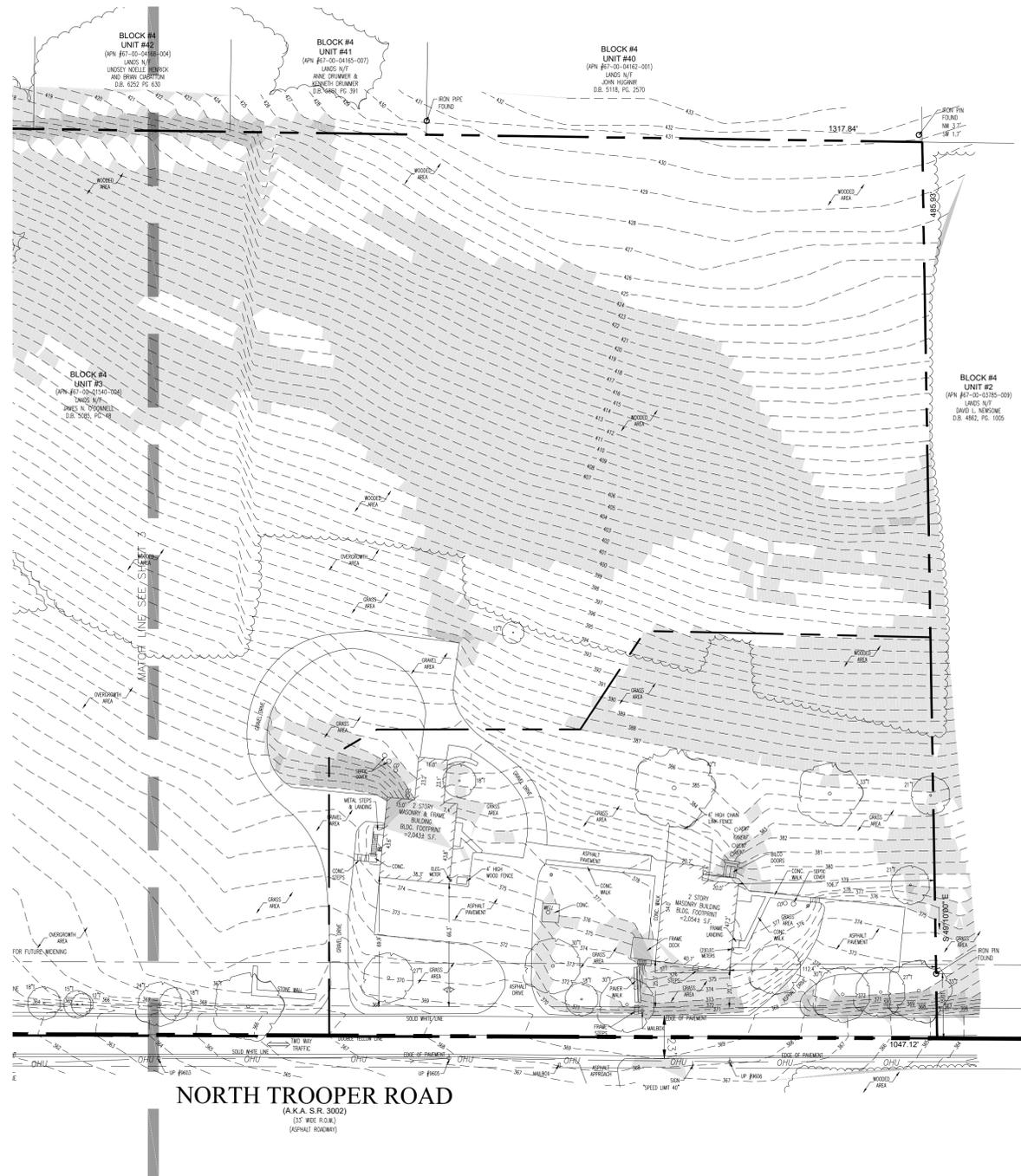
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DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDEV00004	



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LEGEND

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- EX. CONCRETE CURB LINE
- EX. EDGE OF PAVEMENT
- ZONING DISTRICT BOUNDARY
- EX. TREE
- EX. WATER VALVE
- EX. VENT
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- EX. SANITARY SEWER
- EX. WATER LINE
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- EX. UNDERGROUND TELEPHONE
- EX. STORM SEWER
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- EX. SIGN
- EX. LIGHT POLE
- EX. FIRE HYDRANT
- EX. POLE
- EX. CONTOUR
- EX. BUILDING
- STEEP SLOPES (15%-25%): 2.04 ACRES
- STEEP SLOPES (>25%): 0.09 ACRES

ATTENTION: ALL CONTRACTORS LOCATING OR ALL EXISTING UTILITIES
 SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANIES
 RECORDS AND/OR ABOVE-GROUND SURVEYS OF THE SITE.
 COMPLETENESS OR ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL
 LOCATION OF UNDERGROUND FACILITIES OR STRUCTURES CANNOT BE
 GUARANTEED. CONTRACTOR TO REQUIREMENTS OF PENNSYLVANIA
 LEGISLATIVE ACT NUMBER 287 OF 1974 AS AMENDED BY ACT 121 OF
 2004. CONTRACTORS MUST VERIFY LOCATION AND DEPTH OF ALL
 UNDERGROUND UTILITIES AND FACILITIES PRIOR TO START OF WORK.
 20243371817

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 411 PIPES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR 411 PIPES PRE-SUBMISSION MITG	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL

TROOPER RIDGE SUBDIVISION
 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA

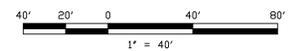
EXISTING CONDITIONS PLAN - 2



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DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDEV00004	



PROJECT INFORMATION:
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 DATE PLOTTED: 03/26/25 10:00 AM
 LAST SAVE BY: J. Kelly

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NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 44 NIPDES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR NIPDES PRE-SUBMISSION MITG	ZHR	ZHR

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL
 TROOPER RIDGE SUBDIVISION
 1035 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
 EXISTING RESOURCES PLAN



DESIGNED BY: JPK/CKS/CMR/ROP/ZHR
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 DRAWN BY: SCR/CKS/RAM
 DATE: 12/19/2024
 SCALE: AS NOTED
 PROJ. NO.: WDEV00004

DRAWING: ER
 SHEET: 5
 OF: 46

PROPERTY INFORMATION	
EQUITABLE OWNER:	COMMERCIAL PURSUIT CAPITAL, LLC
TAX PARCELS:	67-00-01540-00-4
AREA TO TITLE LINE:	15.11 ACRES
AREA TO LEGAL R.O.W. LINE:	14.30 ACRES
SITUATE:	1035 N TROOPER ROAD, NORRISTOWN, PA

- EXISTING DATA SOURCE NOTES:**
- EXISTING FEATURES SHOWN ARE BASED ON A SURVEY PLAN PREPARED BY BLUE MARSH ASSOCIATES, INC., DATED MARCH 10, 2022. BOUNDARY INFORMATION SHOWN IS FROM ACTUAL FIELD SURVEYS PERFORMED BY BLUE MARSH ASSOCIATES, INC.
 - ELEVATIONS ARE BASED UPON (NAV 88) DATUM ESTABLISHED ONSITE UTILIZING GLOBAL POSITIONING SYSTEM DATA COLLECTION.

- GENERAL ERSA NOTES**
- THE PENNSYLVANIA NATURAL DIVERSITY INVENTORY DICTATE A TREE REMOVAL AVOIDANCE MEASURE BETWEEN MAY 15 TO AUGUST 15 TO PRESERVE THE NORTHERN LONG-EARED BAT.
 - THE PROPOSED SITE DOES NOT INCLUDE ANY SCENIC OR VIEW SHED AREAS AS SHOWN IN THE TOWNSHIP MASTER PLAN.
 - THE SITE HAS BEEN FIELD INVESTIGATED FOR WETLANDS AND NONE WERE FOUND TO EXIST.
 - THE PROPOSED SITE IS WITHIN THE FEMA FLOOD ZONE X (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN) OF THE FLOOD INSURANCE RATE MAP, MAP NO. 42091C0261G.

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AbB	Abbotstown silt loam, 3 to 8 percent slopes	15.8	25.9%
Bo	Bowmansville-Knauers silt loams	5.1	8.4%
LaD	Lansdale loam, 15 to 25 percent slopes	0.6	0.9%
PIB	Penn-Lansdale complex, 3 to 8 percent slopes	3.1	5.1%
PIC	Penn-Lansdale complex, 8 to 15 percent slopes	9.5	15.5%
ReB	Readington silt loam, 3 to 8 percent slopes	11.2	18.4%
RhB	Reaville silt loam, 3 to 8 percent slopes	1.5	2.5%
RhC	Reaville silt loam, 8 to 15 percent slopes	13.6	22.2%
UusD	Urban land-Udorthernts, shale and sandstone complex, 8 to 25 percent slopes	0.0	0.0%
W	Water	0.7	1.1%
Totals for Area of Interest		61.1	100.0%

LEGEND
 (ORIENTATION & SIZE MAY VARY)

--- SOIL TYPE BOUNDARY

RhC SOIL TYPE SYMBOL

■ STEEP SLOPES (15%–25%)

■ STEEP SLOPES (>25%)

100' 50' 0 100' 200'
 1" = 100'

TABLE E.1
 LIMITATIONS OF PENNSYLVANIA SOILS PERTAINING TO EARTHMOVING PROJECTS

SOIL NAME	CUTBANKS CAVE	CONCRETE TO CONCRETE/STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
PENN-LANSDALE COMPLEX, 3% TO 8% SLOPES (RhB), 8% TO 15% SLOPES (PIC)	X	C	X				X	X		X	X	X				
ABBOTTSTOWN, 3% TO 6% SLOPES	X	C/S		X		X	X	X	X	X	X	X				X
LANSDALE, 15% TO 25% SLOPES	X	C	X				X	X		X	X	X				
READINGTON SILT LOAM, 3% TO 8% SLOPES	X	C/S		X		X	X	X	X	X	X	X				X
BOWMANVILLE	X	C/S			X	X	X	X	X	X	X	X				X
REAVILLE, 8% TO 15% SLOPES (RhB), 3% TO 8%	X	C/S	X	X		X	X	X	X	X	X	X				X

ATTENTION: ALL CONTRACTORS LOCATIONS OF ALL EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANIES RECORDS AND/OR RECORD DRAWINGS. CONTRACTORS OF THE SITE COMPLETION OR ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES CANNOT BE GUARANTEED. CONTRACTORS ARE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL UTILITIES AND FACILITIES PRIOR TO START OF WORK.

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3	03/26/25	REVISED PER TOWNSHIP COMMENTS	BGS	
2	02/26/25	REVISED FOR 4th FIPDES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR 4th FIPDES SUBMISSION	ZHR	

CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER



12/19/2024
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STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA

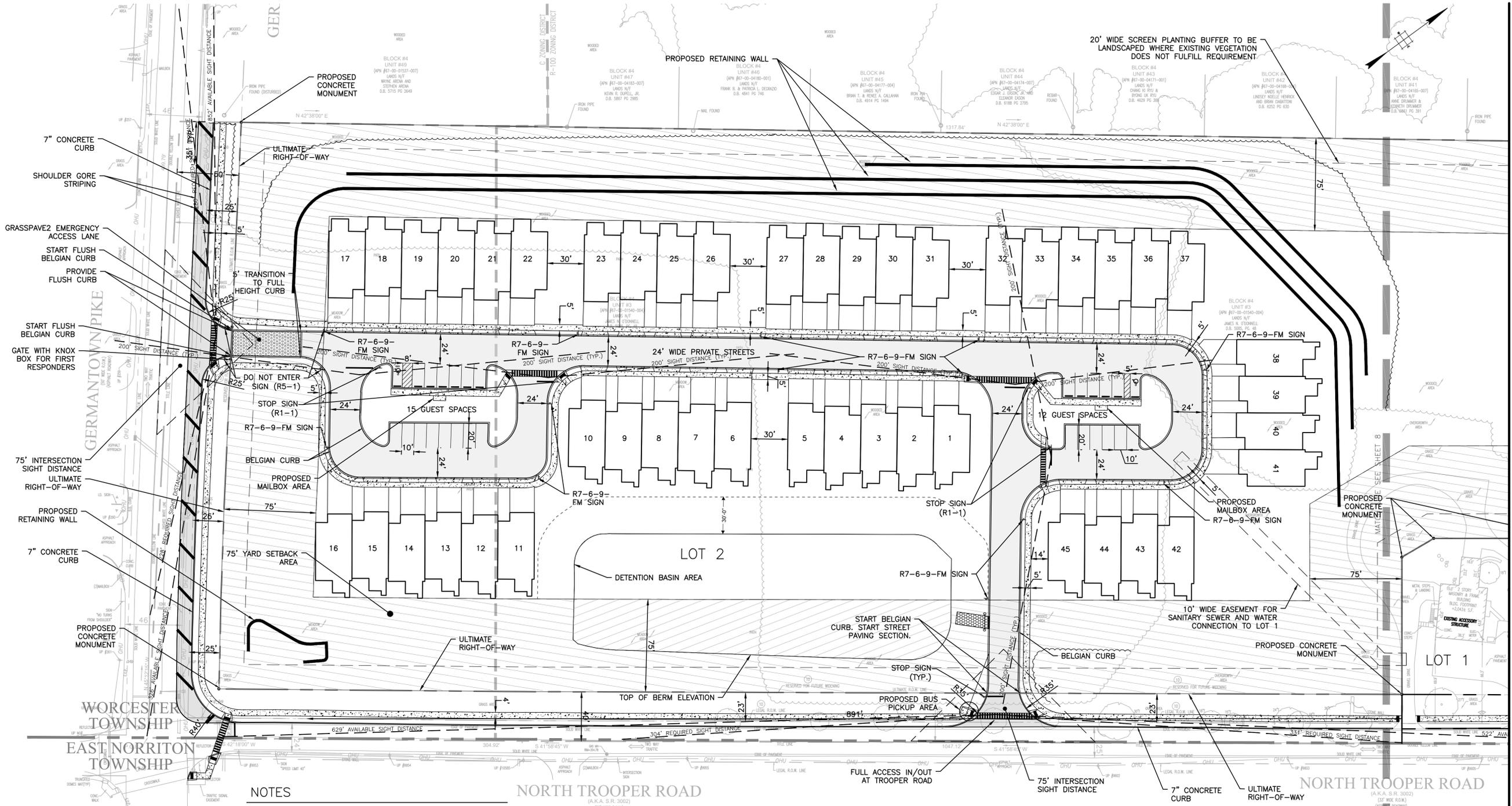
SITE PLAN



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PHILADELPHIA, PA 19103
TEL 215-282-7850
FAX 215-627-3499

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CHECKED BY BGS/ZHR	SHEET 7
DRAWN BY SCR/CKS/RAM	DATE 12/19/2024
DATE 12/19/2024	SCALE AS NOTED
PROJ. NO. WDEV00004	OF 46

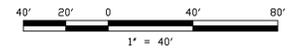


NOTES

- CURBSIDE COLLECTION OF TRASH WILL BE PROVIDED. HOMEOWNERS MUST STORE GARAGE CANS IN THEIR GARAGES.
- THE AREA BETWEEN THE LEGAL AND ULTIMATE ROW ON NORTH TROOPER ROAD IS OFFERED FOR DEDICATION TO PENNDOT. THE AREA BETWEEN THE LEGAL AND ULTIMATE ROW FOR WEST GERMANTOWN PIKE IS OFFERED FOR DEDICATION TO MONTGOMERY COUNTY.
- THE POSTED SPEED LIMIT ON N TROOPER ROAD IS 40 MPH
AVAILABLE SIGHT DISTANCE: 629'R, 522'L REQUIRED: 304'R, 331'L
- THE POSTED SPEED LIMIT ON W GERMANTOWN PIKE IS 35 MPH
AVAILABLE SIGHT DISTANCE: 852'R, 326'L REQUIRED: 280'R, 228'L
- ADDITIONAL ROW ACQUISITION OR AN EASEMENT ON THE CHURCH PROPERTY, PARCEL ID 33-00-03118-00-8, MUST BE OBTAINED BEFORE CONSTRUCTION OF RAMP AND SIDEWALK IMPROVEMENTS SHOWN AT THE NORTHEAST CORNER OF TROOPER ROAD AND WEST GERMANTOWN PIKE.
- PROVIDE 4' WIDE SIDEWALKS ONLY IN FRONT OF UNIT BLOCKS. OTHERWISE, PROVIDE 5' WIDE SIDEWALKS
- ALL STORMWATER FACILITIES (PIPES, INLETS, BASINS, SWALES, AND ALL OTHER STORMWATER MANAGEMENT RELATED STRUCTURES) ON LOT 2 SHALL REMAIN PRIVATE AND OWNED BY THE HOMEOWNERS' ASSOCIATIONS.

LEGEND
(ORIENTATION & SIZE MAY VARY)

	NEW CONCRETE CURB LINE		NEW BUILDING
	NEW BELGIAN BLOCK CURB LINE		NEW CONCRETE AREA
	NEW FENCE LINE		NEW REINFORCED TURF
	NEW TREELINE		
	NEW ASPHALT (OUTSIDE RIGHT-OF-WAY)		
	NEW ASPHALT (WITHIN RIGHT-OF-WAY)		
	REQUIRED YARD AREA 5.4 ACRES		
	AREA OF DETENTION BASIN IN REQUIRED YARD 0.3 ACRES, 6% OF REQUIRED YARD AREA		

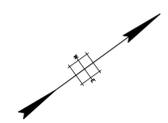
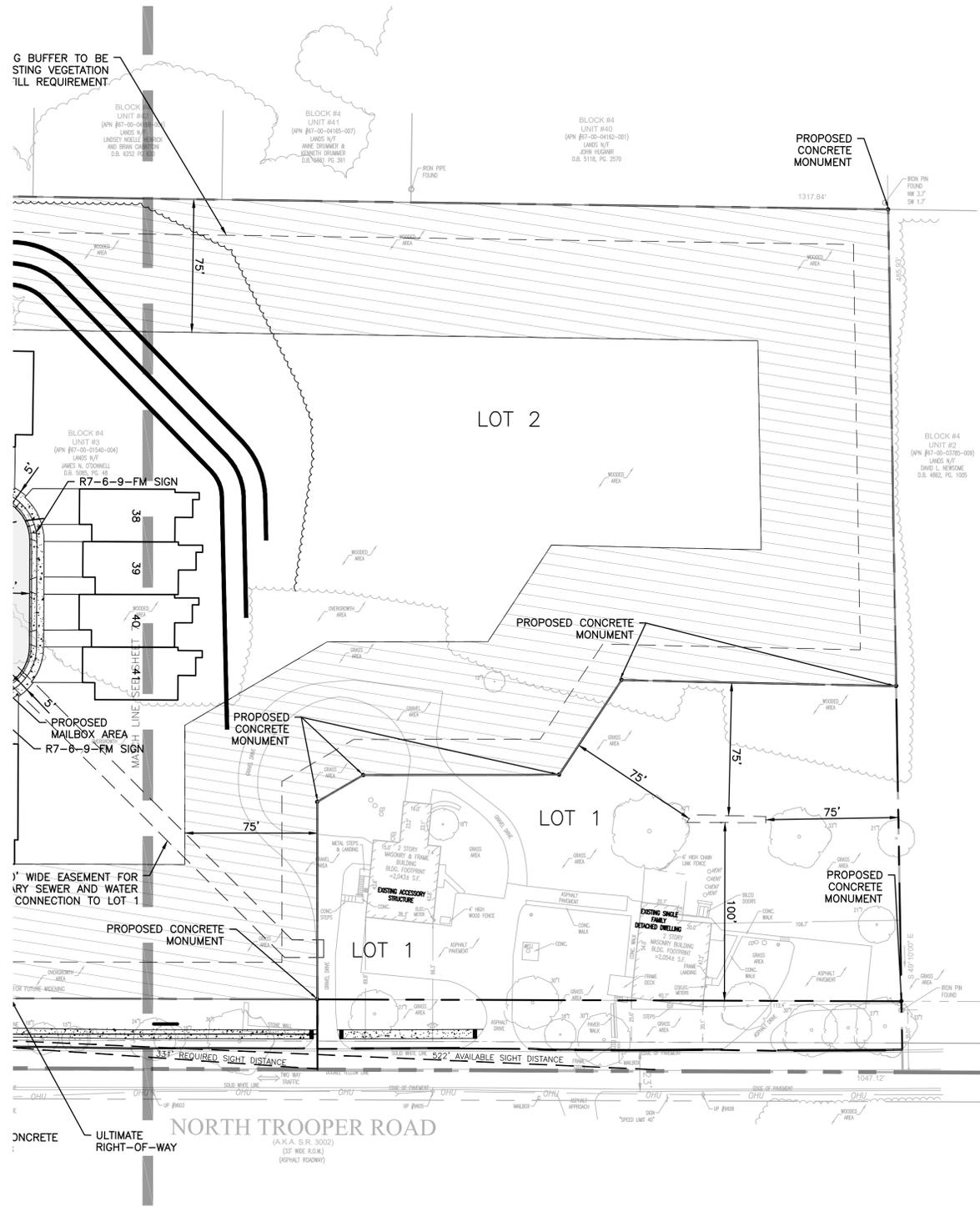


PROJECT INFORMATION:
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FILE NAME: WDEV00004_SITE.dwg
DATE: 03 Apr 2025, 9:23PM
LAST SAVE BY: jpk@cmr

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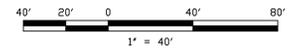
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LEGEND

- INTERNAL ACCESS DRIVE PAVING DETAIL
- PUBLIC PAVING DETAIL
- REQUIRED YARD AREA 5.4 ACRES
- AREA OF DETENTION BASIN IN REQUIRED YARD 0.3 ACRES, 6% OF REQUIRED YARD AREA

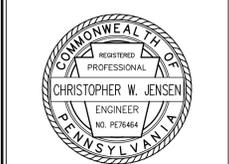


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20243371817

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR MAILBOXES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR MAILBOXES PRE-SUBMISSION MITG	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE No. PE076464

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA

AND
 YOUR GOALS. OUR MISSION.
 1700 MARKET STREET, SUITE 3110
 PHILADELPHIA, PA 19103
 TEL 215-282-7850
 FAX 215-627-3499

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 MASSACHUSETTS, MICHIGAN, NEW JERSEY,
 OHIO AND PENNSYLVANIA

DESIGNED BY JPK/CKS/CMR/ROP/ZHR	DRAWING STE-2
CHECKED BY BGS/ZHR	SHEET 8
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDEV00004	



ATTENTION: ALL CONTRACTORS SHALL LOCATE ALL EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANIES RECORDS AND/OR SURFACE EVIDENCE. THE USER OF THIS DOCUMENT IS RESPONSIBLE FOR VERIFYING THE LOCATION, DEPTH AND HORIZONTAL LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND LICENSES FROM THE APPROPRIATE AGENCIES. THE USER OF THIS DOCUMENT SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND LICENSES FROM THE APPROPRIATE AGENCIES. THE USER OF THIS DOCUMENT SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND LICENSES FROM THE APPROPRIATE AGENCIES.

NO.	DATE	REVISIONS	BY	CHKD
1	01/24/25	REVISED PER TOWNSHIP COMMENTS	JPK	ZHR
2	02/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	ZHR
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER



12/19/2024
LICENSED PROFESSIONAL ENGINEER
STATE OF PA LICENSE NO. PE076464

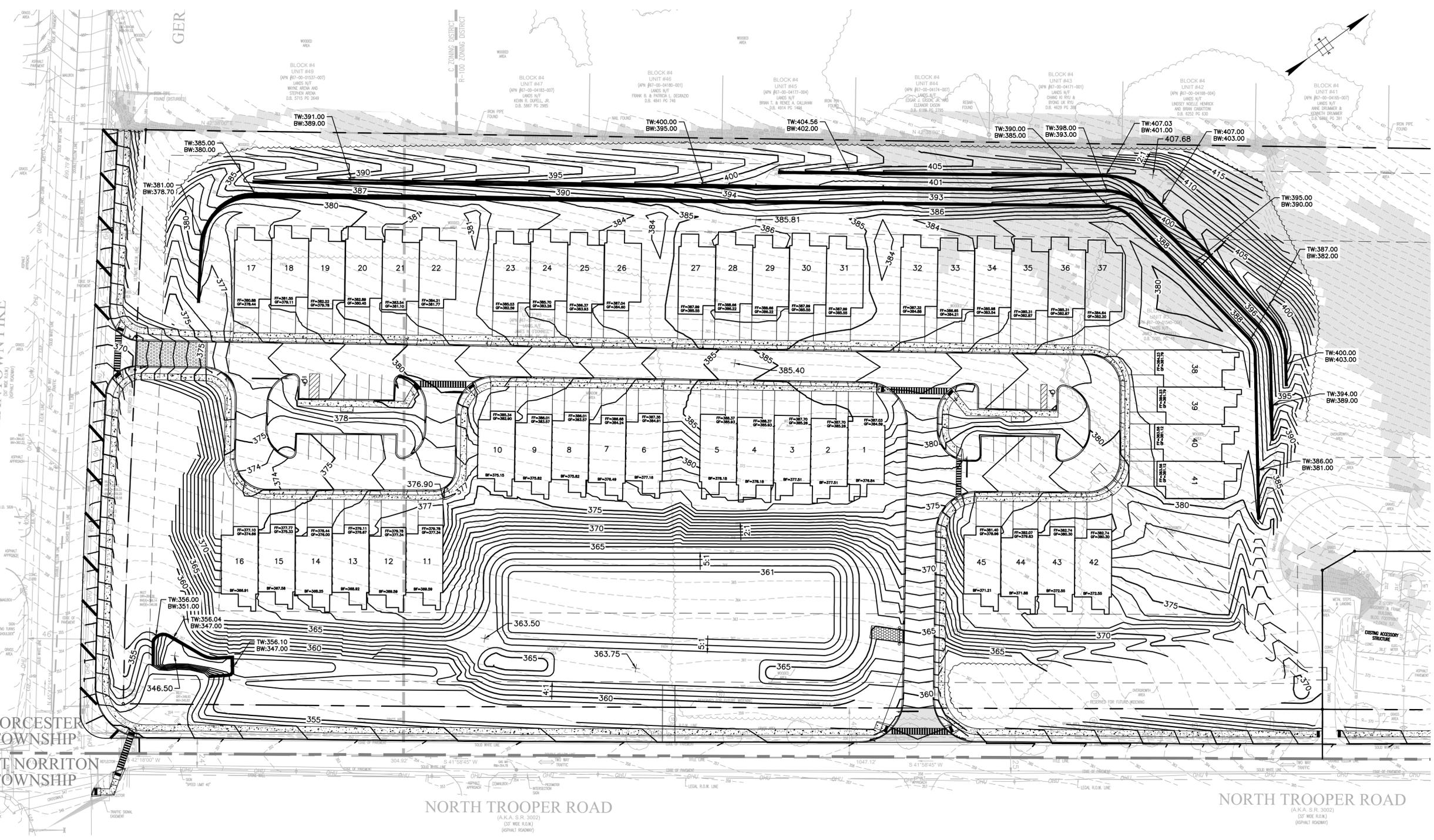
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CHECKED BY BGS/ZHR	SHEET 9
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDE00004	



PROJECT INFORMATION:
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DATE PLOTTED: 12/19/2024 10:34AM
LAST SAVE BY: J.Kelley

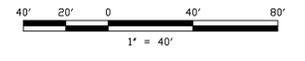
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LEGEND
(ORIENTATION & SIZE MAY VARY)

	NEW SPOT ELEVATION
	NEW INDEX CONTOUR
	NEW INTERMEDIATE CONTOUR
	NEW SLOPE LABEL
	STEEP SLOPES (15%-25%)
	STEEP SLOPES (>25%)

STEEP SLOPE DISTURBANCE

1. DISTURBANCE IN SLOPES 15% TO 25% = 0.74 AC
2. DISTURBANCE IN SLOPES GREATER THAN 25% = 0 AC



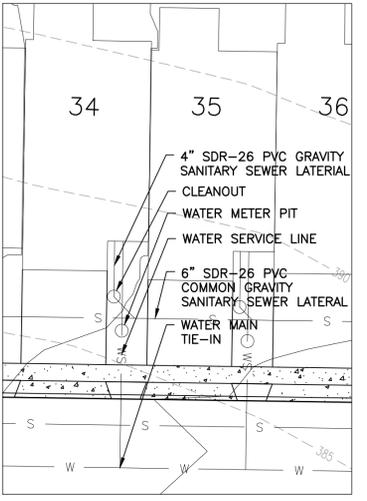
HERITAGE DRIVE

CONNECTION TO HERITAGE DR. TEE WITH 2 GATE VALVES
LOW PRESSURE FORCE MAIN TO CONNECT TO HERITAGE DRIVE MANHOLE. EXISTING MANHOLE MUST BE CORE DRILLED TO ACCEPT LOW PRESSURE FORCE MAIN. EXISTING MANHOLES HD1.1A AND HD1.1 TO BE LINED WITH AN EPOXY COATING

WATER LINE CONSTRUCTION NOTES

- 1. PIPE SHALL BE CLASS 52 DUCTILE IRON PIPE WITH CEMENT LINING AND POLY WRAP.
2. 2A STONE IS REQUIRED FOR BACKFILL OF THE PIPE TRENCH. NATIVE MATERIALS WILL NOT BE ACCEPTED.
3. IF CONDITIONS WARRANT IT (STREAMS, WETLAND AREAS, SINKHOLE PRONE AREAS) A GRIPPING GASKET WILL BE REQUIRED FOR THE PIPE.
4. GRIPPING GASKETS ARE REQUIRED FOR 2 JOINTS IN ALL DIRECTIONS FROM ANY FITTING INSTALLED REGARDLESS OF SITE CONDITIONS.
5. PIPE DEPTH OF COVER SHALL BE 4 FT AT ALL TIMES
6. ONLY PAWC PERSONNEL SHALL OPERATE MAIN LINE VALVES FOR THE CONTRACTOR.
7. EASEMENTS, IN A FORM SATISFACTORY TO PAWC, SHALL BE REQUIRED FOR ALL WATER FACILITIES LOCATED OUTSIDE THE PUBLIC RIGHT OF WAY.
8. TYPE K COPPER SERVICE LINES ARE REQUIRED UP TO EACH METER PIT
9. MUELLER THERMAL-COIL METER PITS OR EQUIVALENT (18" DIAMETER) ARE REQUIRED FOR EACH RESIDENTIAL SERVICE. PREFERRED PLACEMENT IS JUST BEYOND THE CURB. METER PITS MAY NOT BE PLACED WITHIN PAVED AREAS AND MUST BE EQUIPPED WITH A COMPOSITE LID.
10. HYDRANTS MUST BE FACTORY PAINTED IN THE COLOR SCHEME DESIRED BY THE LOCAL FIRE OFFICIAL HAVING JURISDICTION OVER YOUR SITE. FIELD ADJUSTMENT OF HYDRANT COLORS IS NOT PERMITTED.
11. HYDRANT LOCATION IS SUBJECT TO THE APPROVAL OF THE FIRE OFFICIALS CLAIMING JURISDICTION OVER THE PROJECT LOCATION. THE PARTY RESPONSIBLE FOR PAYING THE MONTHLY HYDRANT FEES MUST COMPLETE AN APPLICATION FOR

- SERVICE TO THE HYDRANTS PRIOR TO ACTIVATION OF THE WATER FACILITIES ASSOCIATED WITH THIS PROJECT.
12. DISINFECTION OF THE MAINS SHALL BE BY LIQUID INJECTION ONLY - NO TABLETS/POWDERS SHALL BE USED. ADDITIONAL TAPS MAY BE REQUIRED FOR DISINFECTION AND SUBSEQUENT FLUSHING OF THE MAINS FOR TESTING.
13. BACTERIOLOGICAL SAMPLES MUST BE COLLECTED BY A CERTIFIED LAB TECHNICIAN AND ANALYZED BY A PADEP CERTIFIED LAB.
14. FLUSHING OF MAINS WILL NOT BE ALLOWED UNTIL THE SITE IS ADEQUATELY STABILIZED AGAINST EROSION.
15. FLUSHED WATER MUST BE DECHLORINATED COMPLETELY PRIOR TO BEING DISCHARGED INTO THE ENVIRONMENT.
16. VALVE CLUSTERS ARE REQUIRED AT EACH INTERSECTION.
17. VALVE BOXES SHALL BE SCREW ADJUSTABLE TYPE WITH LIDS MARKED "WATER"
18. VALVES MUST BE OPEN RIGHT
19. ALL PIPING INDICATED IN THE AGREEMENT MUST BE INSTALLED AND FULLY TESTED BEFORE ANYTHING WILL BE PLACED IN SERVICE.
20. LOCATION OF EXISTING WATER FACILITIES SHOWN ARE APPROXIMATE. ANY UTILITIES NOT SHOWN, OR NOT LOCATED AS SHOWN, SHALL NOT BE THE CAUSE OF THE CONTRACTOR TO DENY RESPONSIBILITY FOR PROTECTION AND/OR REPAIR DURING CONSTRUCTION. EXACT LOCATION SHALL BE VERIFIED IN THE FIELD.
21. DEVELOPER SHALL OBTAIN ALL NECESSARY ROAD OPENING PERMITS FOR THE INSTALLATION OF THE WATER FACILITIES AND SHALL BE RESPONSIBLE FOR THE PAYMENT OF ALL APPLICATION FEES AND INSPECTION COSTS ASSOCIATED WITH THESE PERMITS.



ATTENTION: ALL CONSTRUCTION ACTIVITIES OF ALL EXISTING UTILITIES SHOWN HEREON HAVE BEEN EVALUATED FROM UTILITY COMPANY RECORDS AND BY VISUAL OBSERVATION OF THE SITE. THE COMPLETENESS OR ACCURACY OF THIS DATA, DEPTH OR HORIZONTAL LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES CANNOT BE LEGISLATIVE ACT NUMBER 287 OF 1974 AS AMENDED BY ACT 121 OF 2008. CONTRACTOR MUST VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES AND FACILITIES PRIOR TO START OF WORK. DATE: 2024/3/17/1817

Table with columns: NO., DATE, REVISIONS, BY, CHD. Includes entries for updates for water submission and revisions.

CHRISTOPHER W. JENSEN, P.E. LICENSED PROFESSIONAL ENGINEER



12/19/2024 LICENSED PROFESSIONAL ENGINEER STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL TROOPER RIDGE SUBDIVISION 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP, MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA

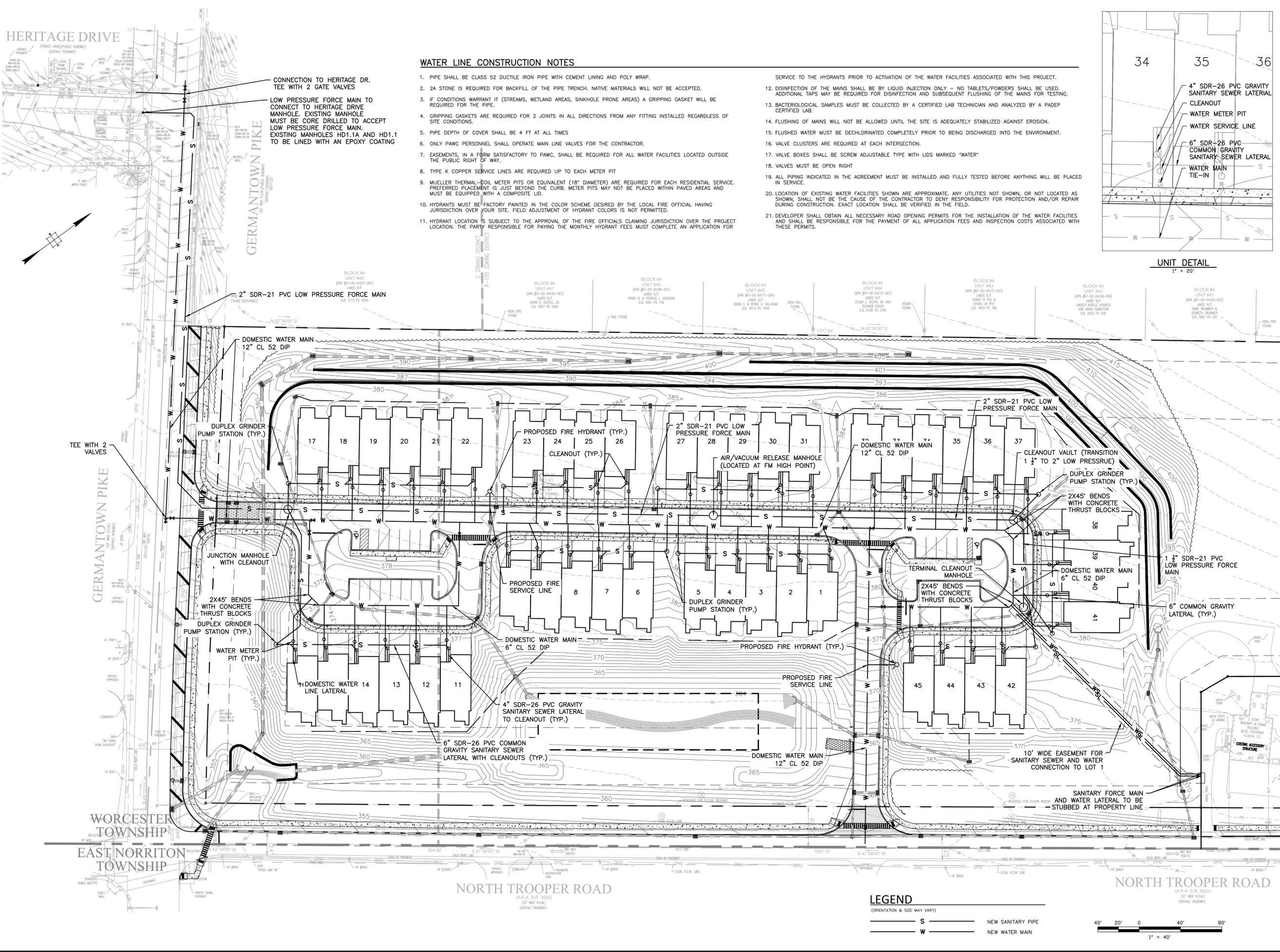
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DESIGNED BY JPK/CKS/CMR/RP/ZHR CHECKED BY BGS/ZHR DRAWN BY SCR/CKS/RAM DATE 12/19/2024 SCALE AS NOTED PROJ. NO. WDE00004 DRAWING UTL SHEET 10 OF 46

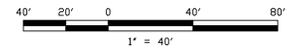
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LEGEND

- (ORIENTATION & SIZE MAY VARY) S - NEW SANITARY PIPE W - NEW WATER MAIN



UNIT DETAIL 1' = 20'

ATTENTION: ALL CONSTRUCTION LOCATIONS OF ALL EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANY RECORDS AND/OR FIELD SURVEY. THE USER OF THIS PLAN ASSUMES ALL RESPONSIBILITY FOR THE ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL LOCATION OF ANY UTILITIES SHOWN ON THIS PLAN. THE USER OF THIS PLAN ASSUMES ALL RESPONSIBILITY FOR THE ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL LOCATION OF ANY UTILITIES SHOWN ON THIS PLAN. THE USER OF THIS PLAN ASSUMES ALL RESPONSIBILITY FOR THE ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL LOCATION OF ANY UTILITIES SHOWN ON THIS PLAN.

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BBS
2	02/26/25	UPDATES FOR ALL PIPES SUBMISSION	JPK	JPK
1	01/24/25	UPDATES FOR PIPES PRE-SUBMISSION MITG	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
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12/19/2024
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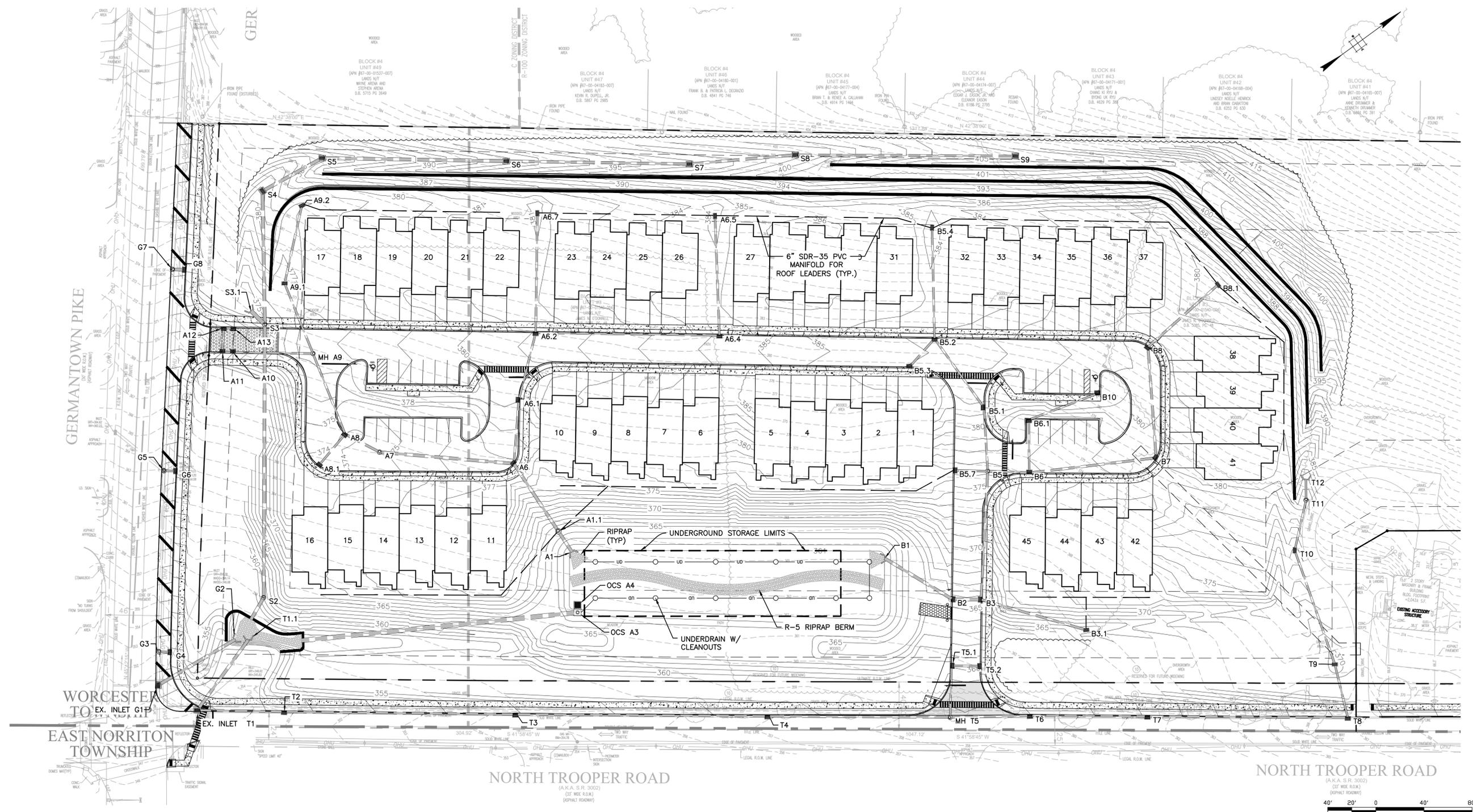
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CHECKED BY: BBS/ZHR
DRAWN BY: SCR/CMS/RAM
DATE: 12/19/2024
SCALE: AS NOTED
PROJ. NO.: WDEV00004

DRAWING: **DRN**
SHEET: **11**
OF: **46**



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NAME	STRUCTURE DETAILS	TG/RIM	INVERT
A1	D-W EW	363.25	361.00
A1.1	MH	365.03	361.10
A6	TYPE C	376.89	366.54
A6.1	TYPE C	379.03	375.78
A6.2	TYPE C	381.06	377.41
A6.4	TYPE C	384.11	379.91
A6.5	TYPE M	383.65	381.15
A6.7	TYPE M	380.65	378.15
A7	MH	374.73	367.35
A8	TYPE C	373.81	367.61
A8.1	TYPE S	373.58	370.83
A9.1	TYPE M	376.57	372.75
A9.2	TYPE M	377.92	375.60
A10	TYPE C	371.91	368.50
A11	TYPE C	371.10	368.64
A12	TYPE C	371.10	368.84
A13	TYPE C	371.84	368.95
B1	D-W EW	363.25	361.00
B2	TYPE C, 2'X6' BOX	365.65	361.33
B3	TYPE C, 2'X6' BOX	365.66	361.90

NAME	STRUCTURE DETAILS	TG/RIM	INVERT
B3.1	TYPE M	365.80	363.10
B5	MH	376.30	373.05
B5.1	TYPE C	381.52	378.52
B5.2	TYPE C	383.71	379.12
B5.3	TYPE C	384.00	381.00
B5.4	TYPE M	383.50	380.75
B5.7	TYPE C	376.32	373.32
B6	TYPE S	377.79	374.23
B6.1	TYPE C	377.38	374.69
B7	TYPE S	379.34	375.55
B8	TYPE C	380.61	376.26
B8.1	TYPE M	379.15	376.90
B10	TYPE C	380.96	378.50
EX. INLET T1	TYPE M, TYPE 4 BOX	349.00	345.82
EX. INLET G1	TYPE M, TYPE 4 BOX	351.00	346.08
G2	D-W EW	348.75	346.50
G3	MH	352.21	348.15
G4	TYPE C	352.69	348.25
G5	MH	362.88	359.25
G6	TYPE C	363.00	359.35

NAME	STRUCTURE DETAILS	TG/RIM	INVERT
G7	MH	373.59	370.34
G8	TYPE C	359.98	356.37
MH A9	MH	377.43	368.07
MH T5	MH	358.00	354.75
OCS A3	6X6 BOX W/ MH TOP	362.70	351.00
OCS A4	6X6 BOX W/ TRASH RACK	362.70	352.70
S2	MH	360.00	346.70
S3	MH	374.69	367.58
S3.1	D-W EW	377.10	374.00
S4	TYPE M, TYPE 4 BOX	380.85	376.26
S5	TYPE M, TYPE 4 BOX	385.89	379.20
S6	TYPE M, TYPE 4 BOX	391.95	386.34
S7	TYPE M, TYPE 4 BOX	395.95	391.22
S8	TYPE M, TYPE 4 BOX	398.92	394.12
S9	TYPE M, TYPE 4 BOX	404.97	399.86
T1.1	D-W EW	348.75	346.50
T2	TYPE C	351.44	346.97
T3	TYPE C	354.28	349.50
T4	TYPE C	356.92	353.25
T5.1	TYPE C	360.14	356.89

NAME	STRUCTURE DETAILS	TG/RIM	INVERT
T5.2	TYPE C	360.64	357.26
T6	TYPE C	359.98	356.37
T7	TYPE C	362.12	357.60
T8	TYPE C	366.64	363.64
T9	TYPE M	370.00	364.34
T10	TYPE M	375.98	372.21
T11	TYPE M	380.03	376.50
T12	D-W EW	382.05	378.50

NAME	SIZE	LENGTH	SLOPE	MATL	INV UP	INV DN
A1.1 TO A1	24"	20.5'	0.49%	RCP	361.10	361.00
A2 TO WALL	36"	230.5'	1.95%	RCP	351.00	346.50
A6 TO A1.1	24"	67.2'	6.31%	RCP	366.54	362.30
A6.1 TO A6	15"	52.9'	3.57%	RCP	375.78	373.89
A6.2 TO A6.1	15"	57.3'	2.41%	RCP	377.41	376.03
A6.3 TO A6.2	15"	152.7'	1.21%	RCP	379.91	378.06
A6.5 TO A6.4	15"	98.8'	1.00%	RCP	381.15	380.16
A7 TO A6.2	15"	98.9'	0.50%	RCP	378.15	377.66
A7 TO A6	24"	112.0'	0.50%	RCP	367.35	366.79
A8 TO A7	18"	32.2'	0.50%	RCP	367.61	367.45
A8.1 TO A8	15"	34.0'	5.55%	RCP	370.83	368.95
A9.1 TO A8	15"	71.9'	0.50%	RCP	368.07	367.71
A9.2 TO A9.1	15"	62.7'	6.90%	RCP	372.75	368.42
A10 TO A9.1	15"	66.0'	3.94%	RCP	375.60	373.00
A11 TO A9	15"	66.6'	0.50%	RCP	368.50	368.17
A11 TO A10	15"	8.7'	0.50%	RCP	368.64	368.60
A12 TO A11	15"	20.0'	0.50%	RCP	368.84	368.74
A13 TO A12	15"	7.9'	1.40%	RCP	368.95	368.84

NAME	SIZE	LENGTH	SLOPE	MATL	INV UP	INV DN
B2 TO B1	24"	65.9'	0.50%	RCP	361.33	361.00
B3 TO B2	24"	23.9'	1.68%	RCP	361.90	361.50
B3.1 TO B3	18"	91.0'	0.55%	RCP	363.10	362.60
B5 TO B4.1	18"	106.3'	9.54%	RCP	373.05	362.91
B5.1 TO B5	15"	52.9'	9.77%	RCP	378.52	373.35
B5.2 TO B5.1	15"	70.2'	0.50%	RCP	379.12	378.77
B5.3 TO B5.2	15"	31.5'	3.17%	RCP	381.00	380.00
B5.4 TO B5.2	15"	91.8'	1.08%	RCP	380.75	379.76
B5.7 TO B5	15"	27.8'	0.50%	RCP	373.32	373.18
B6 TO B5	18"	34.5'	2.98%	RCP	374.23	373.20
B6.1 TO B6	15"	43.9'	0.48%	RCP	374.69	374.48
B7 TO B6	18"	108.2'	0.72%	RCP	375.55	374.79
B8 TO B7	18"	92.0'	0.50%	RCP	376.26	375.80
B8.1 TO B8	18"	209.6'	1.67%	RCP	376.90	376.51
B10 TO B9	15"	60.9'	8.85%	RCP	378.50	374.94
G2 TO G1	24"	74.1'	0.57%	RCP	346.50	346.08
G4 TO G3	15"	9.8'	1.00%	RCP	348.25	348.15
G6 TO G5	15"	10.2'	1.00%	RCP	359.35	359.25

NAME	SIZE	LENGTH	SLOPE	MATL	INV UP	INV DN
G8 TO G7	24"	10.5'	0.50%	RCP	370.39	370.34
S2 TO WALL	30"	20.9'	0.96%	HDPE	346.70	346.50
S3 TO S2	30"	225.9'	5.24%	HDPE	367.58	355.73
S3.1 TO S3	36"	16.4'	36.68%	HDPE	374.00	368.00
S4 TO S3	30"	110.5'	7.48%	HDPE	376.26	368.00
S5 TO S4	30"	56.6'	4.75%	HDPE	379.20	376.51
S6 TO S5	30"	153.1'	4.50%	HDPE	386.34	379.45
S7 TO S6	24"	152.3'	2.88%	HDPE	391.22	386.84
S8 TO S7	24"	88.3'	3.00%	HDPE	394.12	391.47
S9 TO S8	18"	182.8'	3.00%	HDPE	399.86	394.37
T1.1 TO T1	24"	72.4'	0.94%	RCP	346.50	345.82
T2 TO T1	18"	72.2'	1.25%	RCP	346.97	346.07
T3 TO T2	18"	192.1'	1.32%	RCP	349.50	346.97
T4 TO T3	18"	209.6'	1.67%	RCP	353.25	349.75
T5 TO T4	18"	151.8'	0.82%	RCP	354.75	353.50
T5.1 TO T5	15"	42.6'	4.43%	RCP	356.89	355.00
T5.2 TO T5.1	15"	24.1'	0.50%	RCP	357.26	357.14
T6 TO T5	18"	66.2'	2.06%	RCP	356.37	355.00

NAME	SIZE	LENGTH	SLOPE	MATL	INV UP	INV DN
T7 TO T6	18"	97.7'	1.00%	RCP	357.60	356.62
T8 TO T7	18"	166.5'	3.48%	RCP	363.64	357.85
T9 TO T8	18"	45.3'	1.00%	HDPE	364.34	363.89
T10 TO T9	18"	100.0'	6.49%	HDPE	372.21	365.72
T11 TO T10	18"	42.7'	9.47%	HDPE	376.50	372.46
T12 TO T11	18"	17.4'	10.03%	HDPE	378.50	376.75

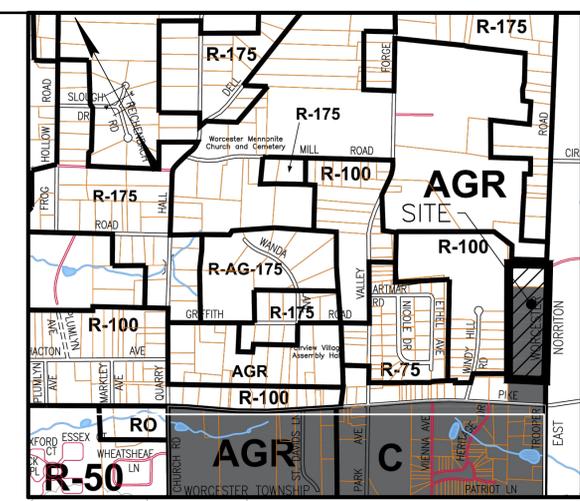
LEGEND



1" = 40'

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LOCATION/ZONING MAP
 SCALE: 1"=1,000'

ATTENTION: ALL CONSTRUCTION LOCATIONS OF ALL EXISTING UTILITIES
 SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANIES
 RECORDS AND/OR AERIAL PHOTOGRAPHS OF THE SITE.
 THE LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES CANNOT BE
 GUARANTEED. THE USER OF THIS INFORMATION SHALL BE RESPONSIBLE FOR
 OBTAINING THE NECESSARY PERMITS AND LEGISLATIVE ACT NUMBER 287 OF 1974 AS AMENDED BY ACT 121 OF
 2004. CONTRACTORS MUST VERIFY LOCATION AND DEPTH OF ALL
 UNDERGROUND UTILITIES AND FACILITIES PRIOR TO START OF WORK.
 DATE: 03/26/25

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 44 PIPES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR PIPES PRE-SUBMISSION MITG	JPK	ZHR

BARRY G. STINGEL
 REGISTERED LANDSCAPE ARCHITECT



12/19/2024
 REGISTERED LANDSCAPE ARCHITECT
 STATE OF PA LICENSE NO. LA001345R

COMMERCE PURSUIT CAPITAL
 TROOPER RIDGE SUBDIVISION
 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA

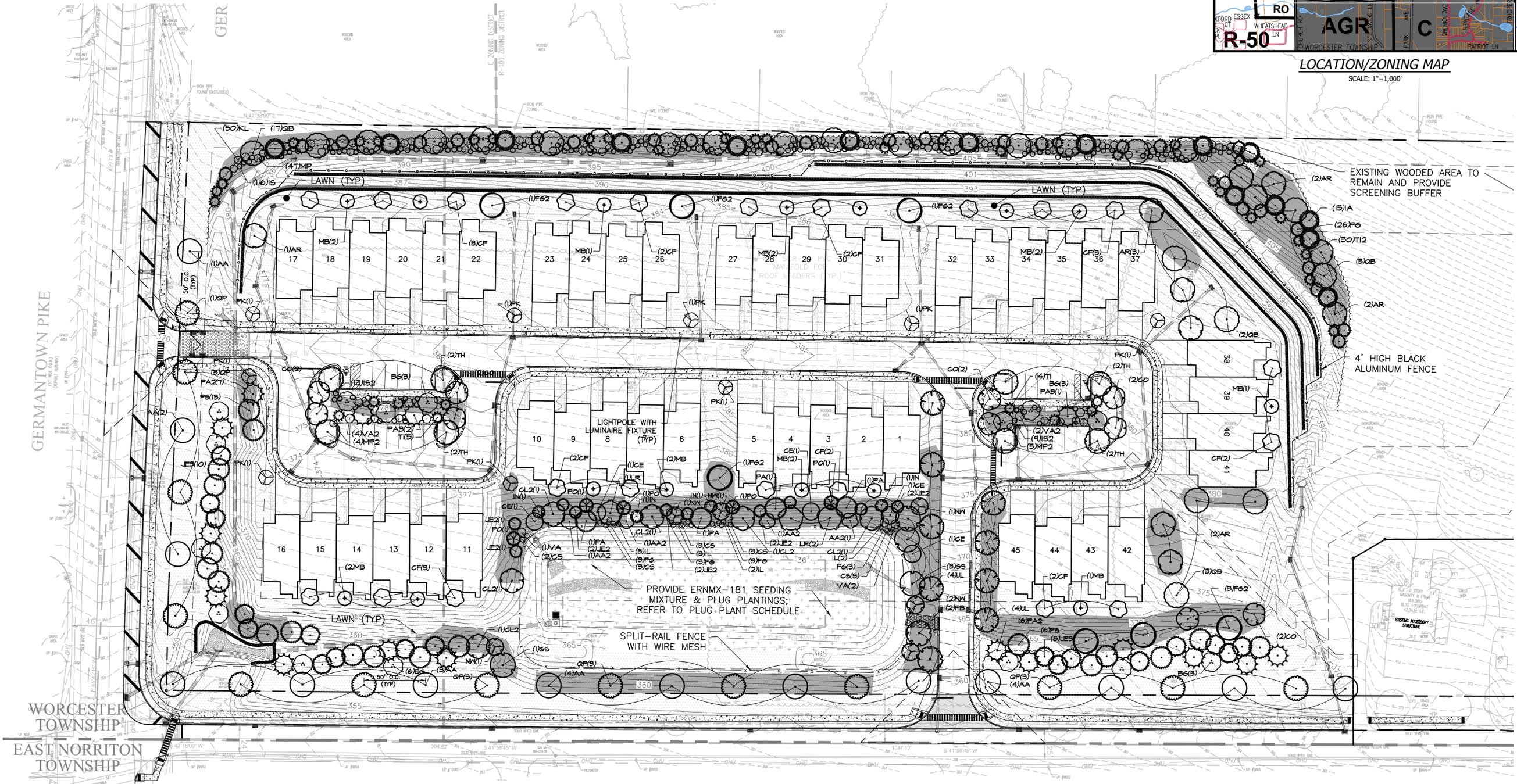
LANDSCAPE PLAN



1700 MARKET STREET, SUITE 3110
 PHILADELPHIA, PA 19103
 TEL 215-282-7850
 FAX 215-627-3459
 www.landmassociates.com

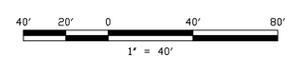
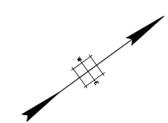
OFFICES LOCATED IN:
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 OHIO AND PENNSYLVANIA

DESIGNED BY JPK/CKS/CMR/ROP/ZHR	DRAWING LSP
CHECKED BY BGS/ZHR	SHEET 12
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDEV00004	



LEGEND
 (ORIENTATION & SIZE MAY VARY. REFER TO LANDSCAPE DETAIL SHEETS FOR PLANT SCHEDULE)
 [Symbol] SLOPES >10% (WHERE NEW TREES/SHRUBS ARE SHOWN)

GENERAL LANDSCAPING NOTES:
 1. REFER TO LANDSCAPE DETAILS SHEET (30 OF 39) FOR PLANT SCHEDULE AND LANDSCAPE PLANTING DETAILS, NOTES, AND SPECIFICATIONS.
 2. SHRUBS PROPOSED IN CLOSE PROXIMITY SHALL BE INSTALLED WITHIN CONTINUOUS MULCH BEDS.



GERMANTOWN PIKE

WORCESTER TOWNSHIP
 EAST NORRITON TOWNSHIP

NORTH TROOPER ROAD



ATTENTION: ALL CONTRACTORS LOCATING OR EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANIES RECORDS AND/OR FIELD SURVEY. THE USER OF THIS DRAWING ACCEPTS THE ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES SHOWN HEREON. THE USER OF THIS DRAWING ACCEPTS THE ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES SHOWN HEREON. LEGISLATIVE ACT NUMBER 281 OF 1974 AS AMENDED BY ACT 121 OF 2004. CONTRACTORS MUST VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES AND FACILITIES PRIOR TO START OF WORK. DATE: 12/19/2024

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR ALL NOTES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR NOTES PRE-SUBMISSION	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER



12/19/2024
LICENSED PROFESSIONAL ENGINEER
STATE OF PA LICENSE NO. PE076464

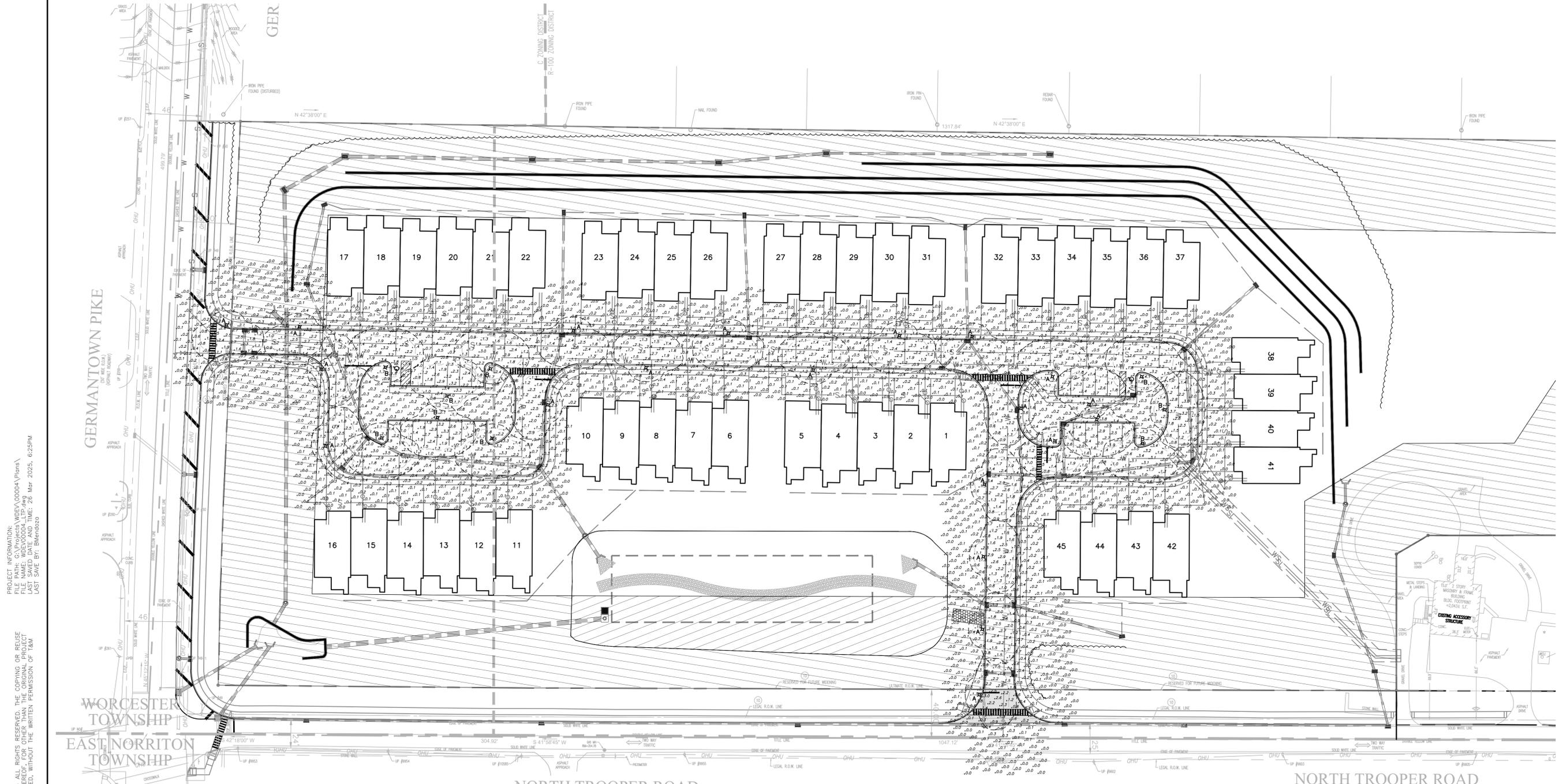
COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
LIGHTING PLAN



1700 MARKET STREET, SUITE 3110
PHILADELPHIA, PA 19103
TEL 215-282-7850
FAX 215-627-3499

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CHECKED BY BGS/ZHR	SHEET 13
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	SCALE AS NOTED
PROJ. NO. WDE00004	

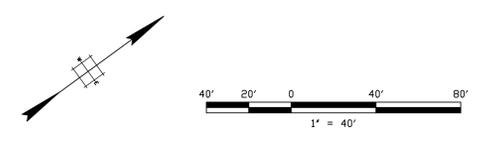


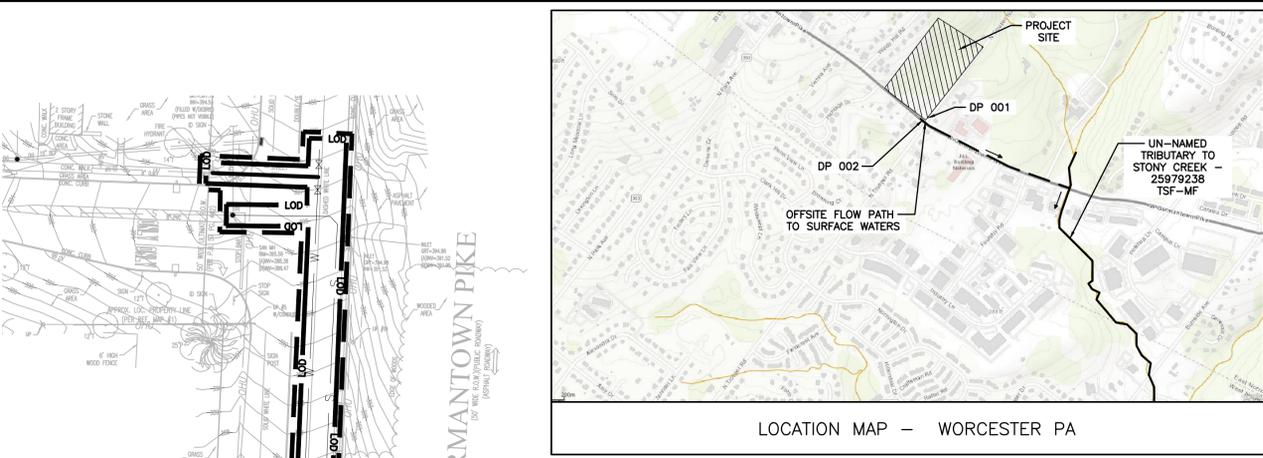
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FILE NAME: WDE00004_LTP.dwg
DATE: 12/19/2024 6:25PM
LAST SAVE BY: BMarozzo

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LIGHTING SUMMARY				
CALC. ZONE	MINIMUM	MAXIMUM	AVERAGE	
ROADWAY & PARKING AREAS WITHIN PROPERTY LINE	ROADWAY	0.2 FC	3.6 FC	1.5 FC
	PARKING AREAS	0.4 FC	3.8 FC	

LIGHTING FIXTURE								
LIGHT SYMBOL	LIGHT TPE	PRODUCT NO.	MOUNTING HEIGHT	FIXTURE HEIGHT	LLF	WATTS	QUANTITY	
A	POLE MOUNTED	CE21T4C-FGC-T4HS-P30-30K	12 FT	15 FT	0.9	43.8	20	
B	POLE MOUNTED	CE21T4C-FGC-T4HS-P40-30K	12 FT	15 FT	0.9	55.1	9	



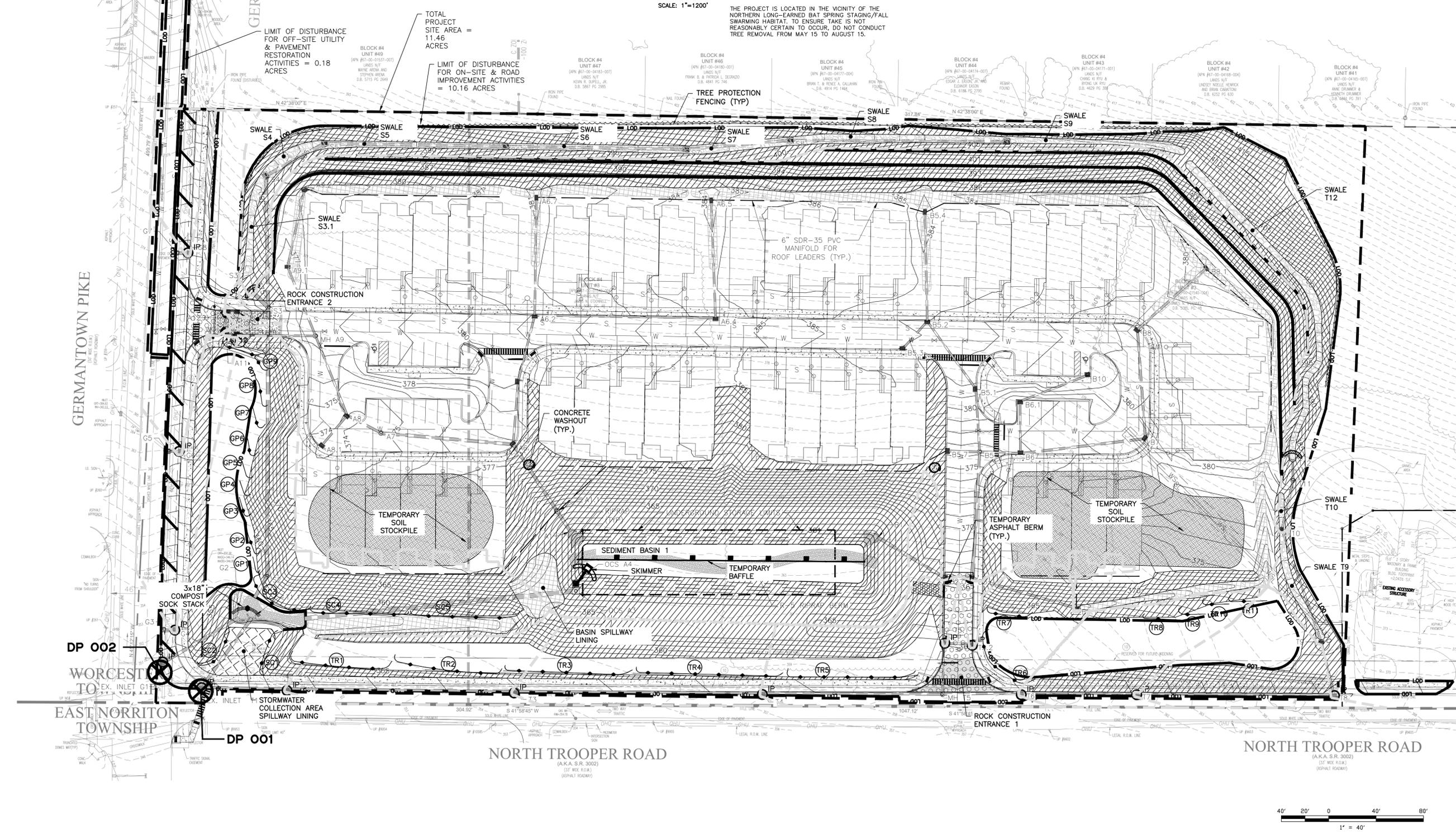


LEGEND
(ORIENTATION & SIZE MAY VARY)

- TOTAL PROJECT SITE BOUNDARY
- LIMIT OF DISTURBANCE
- COMPOST FILTER SOCK
- TEMPORARY GRADING
- BMP DRAINAGE AREA
- SOIL TYPE BOUNDARY
- STOCKPILE
- TEMPORARY ASPHALT BERM
- STONE FILTER BERM
- ROCK CONSTRUCTION ENTRANCE
- INLET PROTECTION
- CONCRETE WASHOUT
- EROSION CONTROL BLANKET NAG-75 SLOPE PROTECTION
- EROSION CONTROL BLANKET SC-150 SWALE LINING / BASIN SPILLWAY LINING
- EROSION CONTROL BLANKET STORMWATER COLLECTION AREA SPILLWAY LINING
- RIP RAP SWALE LINING
- TREE PROTECTION FENCING

USFWS AVOIDANCE MEASURE

PRIOR TO THE START OF EARTH DISTURBANCE ACTIVITIES, PLEASE NOTE THE FOLLOWING AVOIDANCE MEASURE:
THE PROJECT IS LOCATED IN THE VICINITY OF THE NORTHERN LONG-EARED BAT SPRING STAGING/FALL SWARMING HABITAT. TO ENSURE TAKE IS NOT REASONABLY CERTAIN TO OCCUR, DO NOT CONDUCT TREE REMOVAL FROM MAY 15 TO AUGUST 15.



PROJECT INFORMATION:
FILE PATH: G:\Projects\WDEV\00004A\Plans\
FILE NAME: WDEV00004_ENS.dwg
DATE: 12/19/2024 3:24PM
LAST SAVE BY: SRobert

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NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 441 APPROPRIATIONS	JPK	ZHR
1	01/24/25	UPDATES FOR VICES PRE-SUBMISSION MITG	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER



12/19/2024
LICENSED PROFESSIONAL ENGINEER
STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
EROSION AND SEDIMENT CONTROL PLAN



OFFICES LOCATED IN:
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OHIO AND PENNSYLVANIA

DESIGNED BY JPK/CKS/CMR/ROP/ZHR	DRAWING ENS
CHECKED BY BGS/ZHR	SHEET 14
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	PROJ. NO. WDEV00004
SCALE AS NOTED	



ATTENTION: ALL CONTRACTORS LOCATIONS OF ALL EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANY RECORDS AND/OR AERIAL PHOTOGRAPHS OF THE SITE. THE COMPLETENESS OR ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL LOCATION OF INDIVIDUAL UTILITIES OR UTILITIES CANNOT BE GUARANTEED. CONTRACTOR TO VERIFY THE LOCATION OF UTILITIES. LEGISLATIVE ACT NUMBER 287 OF 1974 AS AMENDED BY ACT 121 OF 2008. CONTRACTOR MUST VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES AND FACILITIES PRIOR TO START OF WORK. SEE PLAN NO.

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR ALL NOTES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR NOTES PRE-SUBMISSION MITG	ZHR	ZHR

CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER



12/19/2024
LICENSED PROFESSIONAL ENGINEER
STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
NATURAL RESOURCES PROTECTION PLAN



1700 MARKET STREET, SUITE 3110
PHILADELPHIA, PA 19103
TEL 215-282-7850
FAX 215-627-3499

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OHIO AND PENNSYLVANIA

DESIGNED BY JPK/CKS/CMR/ROP/ZHR	DRAWING NR
CHECKED BY BGS/ZHR	SHEET 15
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDEV00004	



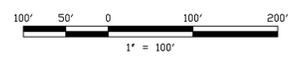
LEGEND

- (ORIENTATION & SIZE MAY VARY)
- SOIL TYPE BOUNDARY
 - SOIL TYPE SYMBOL
 - STEEP SLOPES (15%-25%)
 - STEEP SLOPES (>25%)

EXISTING WOODED AREA GROWTH COMMUNITIES

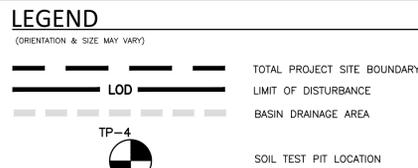
- MEADOW GROWTH**
NO EXISTING TREES OVER 6" DBH.
- YOUNG GROWTH**
WOODED AREA IS PRIMARILY DECIDUOUS VEGETATION WITH HEAVY, INVASIVE UNDERSTORY GROWTH AND MANY DEAD, DYING, DISEASED, AND/OR FALLEN TREES.
1.0 ACRE SAMPLE AREA YIELDED 17 TREES GREATER THAN OR EQUAL TO 6" DBH.
3.9 ACRE AREA YIELDS 67 TOTAL TREES GREATER THAN OR EQUAL TO 6" DBH.
- MEDIUM GROWTH**
WOODED AREA IS PRIMARILY DECIDUOUS VEGETATION WITH HEAVY, INVASIVE UNDERSTORY GROWTH AND MANY DEAD, DYING, DISEASED, AND/OR FALLEN TREES.
0.9 ACRE SAMPLE AREA (TOTAL AREA TO BE DISTURBED WITHIN MEDIUM GROWTH AREA) YIELDED 21 TREES GREATER THAN OR EQUAL TO 6" DBH.
3.21 ACRE AREA YIELDS 75 TOTAL TREES GREATER THAN OR EQUAL TO 6" DBH.

CALCULATED TOTAL NO. OF EXISTING TREES AND TREES TO BE REMOVED
A TOTAL OF 142 TREES GREATER THAN OR EQUAL TO 6" DBH EXIST ON THE SUBJECT PARCEL.
88 EXISTING TREES GREATER THAN OR EQUAL TO 6" DBH ARE TO BE REMOVED AS PART OF THE PROPOSED DEVELOPMENT AND ASSOCIATED IMPROVEMENTS



PROJECT INFORMATION:
FILE PATH: G:\Projects\WDEV00004\Plans\
FILE NAME: WDEV00004_NR.dwg
DATE PLOTTED: 12/19/2024 10:43AM
LAST SAVE BY: J.Kelly

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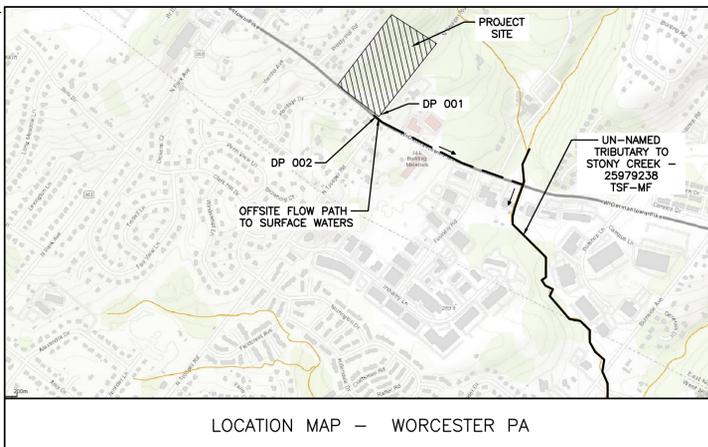
USFWS AVOIDANCE MEASURE

PRIOR TO THE START OF EARTH DISTURBANCE ACTIVITIES, PLEASE NOTE THE FOLLOWING AVOIDANCE MEASURE:

THE PROJECT IS LOCATED IN THE VICINITY OF THE NORTHERN LONG-EARED BAT SPRING STAGING/FALL SWARMING HABITAT. TO ENSURE TAKE IS NOT REASONABLY CERTAIN TO OCCUR, DO NOT CONDUCT TREE REMOVAL FROM MAY 15 TO AUGUST 15.

NOTE

ALL PROPOSED UTILITIES ARE TO BE INSTALLED UNDERGROUND.

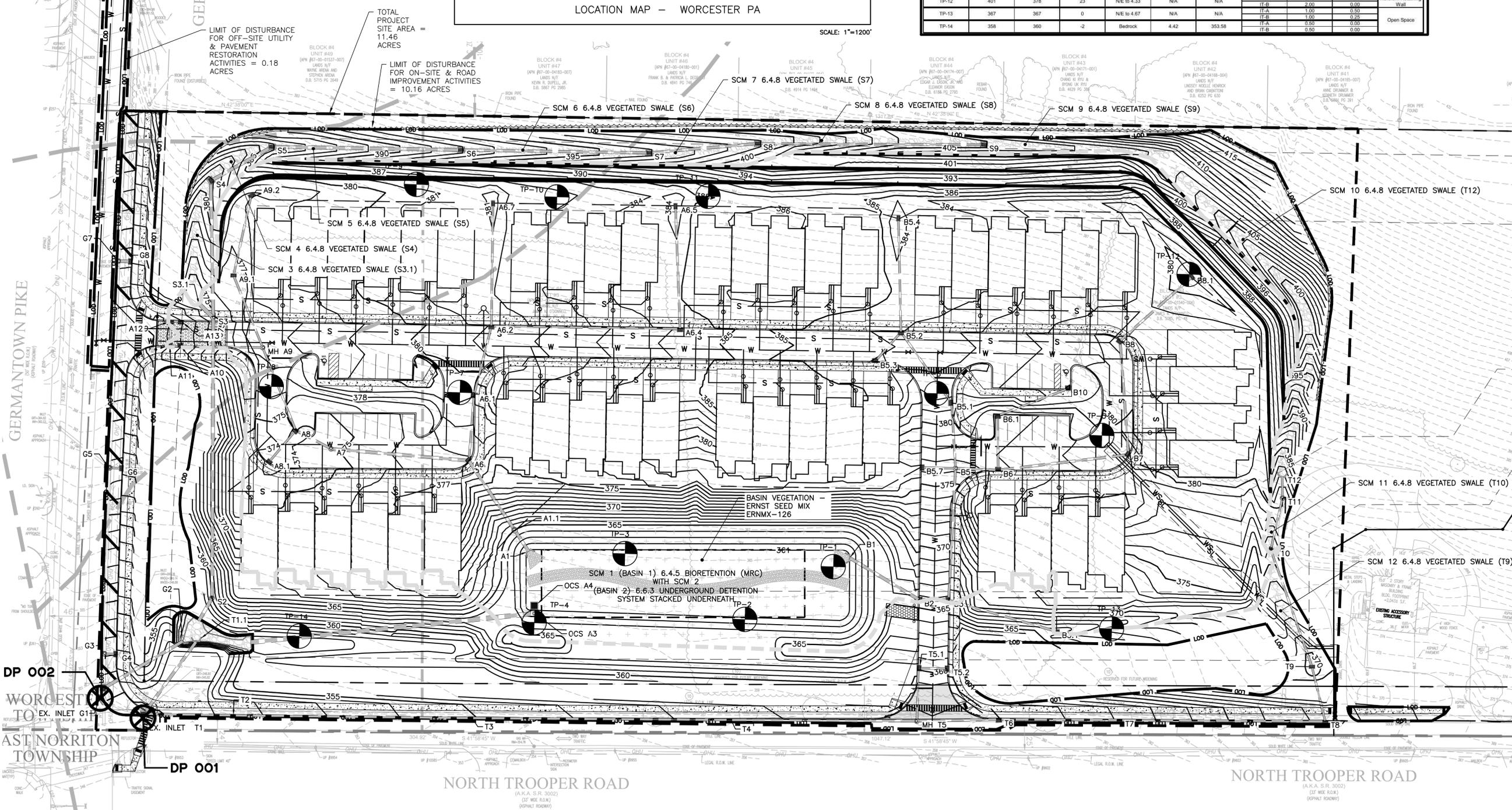


GTA GEO-TECHNOLOGY ASSOCIATES, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Project: Trooper Ridge
Project Number: 31241616
Project Location: Worcester Township, Montgomery County, Pennsylvania
Client: Pulse Homes

Legend
N/A = Not Encountered
N/A = Not Applicable
EGS = Existing Ground Surface Elevation
SHOHTW = Seasonal High Groundwater Table

Test Pit Location	Existing Ground Surface Elevation (ft)	Proposed Elevation (ft)	Cut/Fill (ft)	Limiting Zone Type / Encountered	Limiting Zone Depth (ft)	Limiting Zone Elevation (ft)	Infiltration Test Location	Infiltration Test Depth (ft)	Final Raw Infiltration Rate (in/hr)	Stormwater Facility Location
TP-1	365	361	4	N/E to 5.17	N/A	N/A	IT-A	1.00	0.00	Proposed Infiltration Basin
TP-2	362	361	1	Bedrock	4.58	357.42	IT-B	3.00	0.00	
TP-3	365	361	4	Bedrock	5.08	359.92	IT-B	3.00	0.50	Northeastern Parking Lot
TP-4	361	361	0	N/E to 5.0	N/A	N/A	IT-A	1.00	0.00	
TP-5	379	375	4	Bedrock	5.33	373.67	IT-A	2.00	0.00	Southeastern Parking Lot
TP-6	378	377	1	Bedrock	5.17	372.83	IT-B	1.75	0.00	
TP-7	374	376	-2	Bedrock	4.17	369.83	IT-A	1.00	0.50	Northwestern Retaining Wall
TP-8	372	374	-2	Bedrock	5.00	367.00	IT-B	2.00	0.00	
TP-9	387	377	10	Bedrock	3.33	383.67	IT-B	0.50	0.00	Northern Retaining Wall
TP-10	393	381	12	Bedrock	4.00	389.00	IT-B	2.00	0.00	
TP-11	397	379	18	Bedrock	3.42	393.58	IT-B	2.00	0.25	Open Space
TP-12	401	378	23	N/E to 4.33	N/A	N/A	IT-A	2.00	0.00	
TP-13	367	367	0	N/E to 4.67	N/A	N/A	IT-A	1.00	0.50	
TP-14	358	360	-2	Bedrock	4.42	353.58	IT-B	0.50	0.00	



PROJECT INFORMATION:
 FILE PATH: G:\Projects\WDEVE\0000A\Plans\
 FILE NAME: WDEVE0000A_PCSM.dwg
 DATE: 28 Mar 2025, 3:22PM
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3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	REVISED FOR ALL PIPES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR PIPES PRE-SUBMISSION MITG	ZHR	

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER

12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA

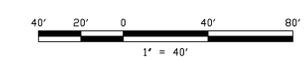
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

AND
 YOUR GOALS. OUR MISSION.

1700 MARKET STREET, SUITE 3110
 PHILADELPHIA, PA 19103
 TEL 215-282-7850
 FAX 215-627-3499

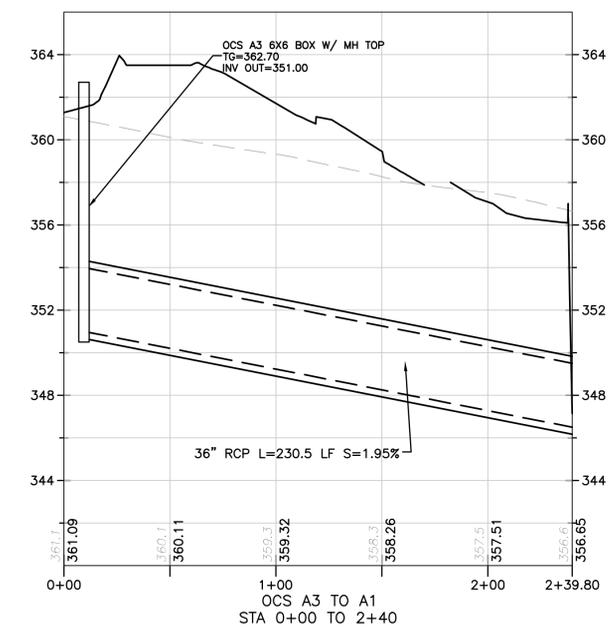
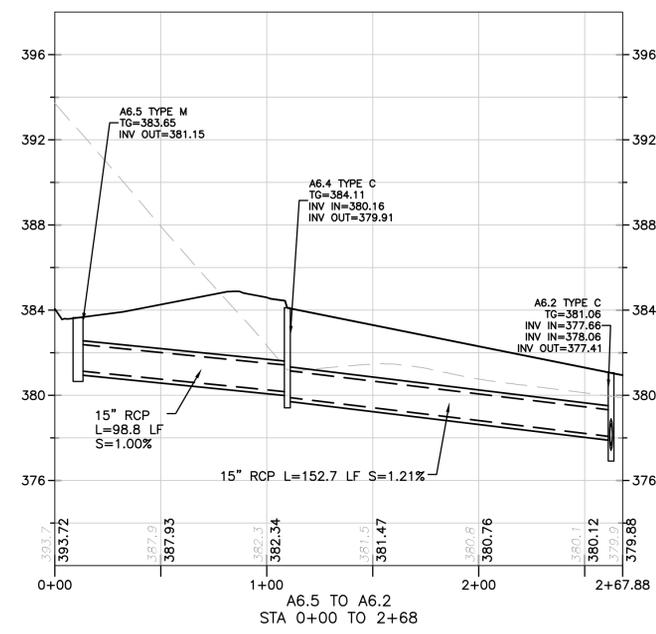
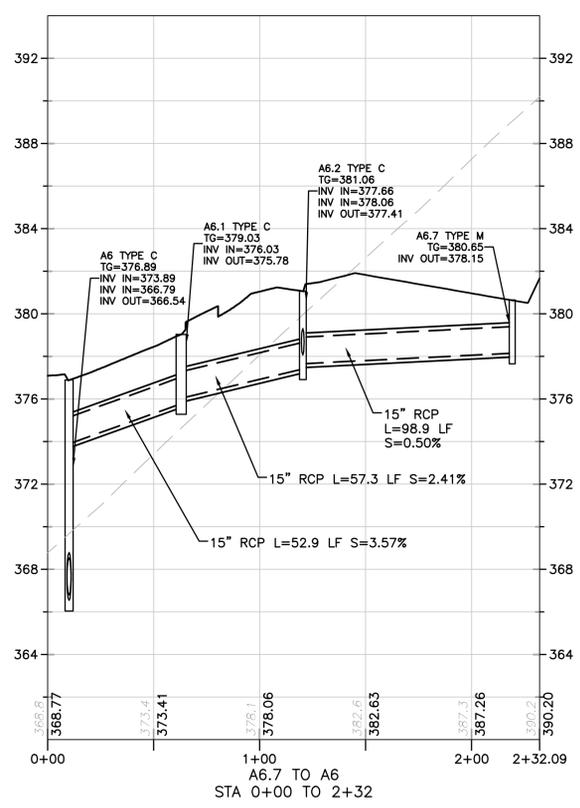
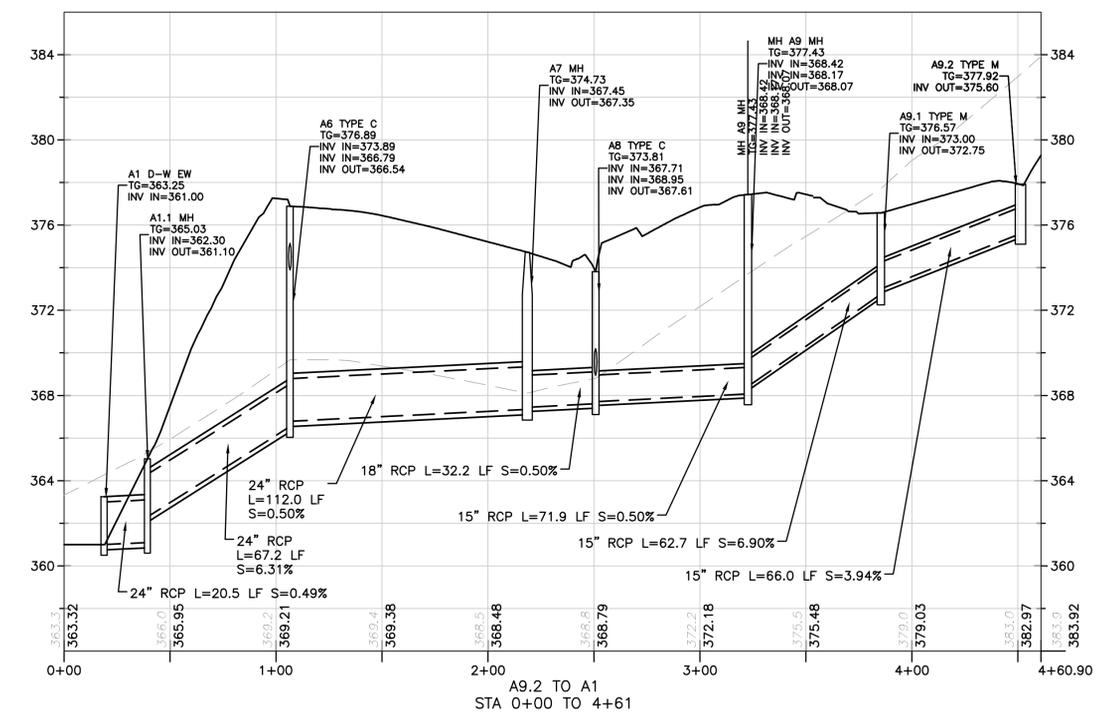
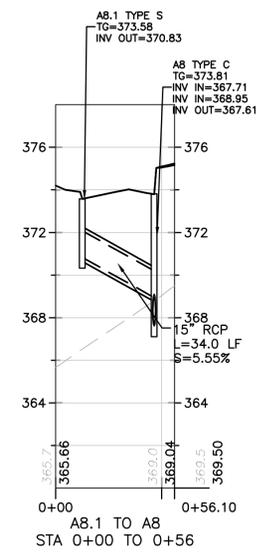
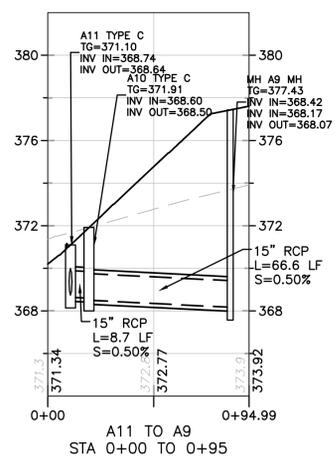
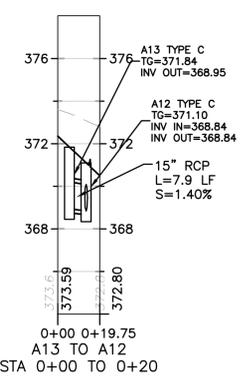
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DESIGNED BY JPK/CKS/CMR/ROP/ZHR	DRAWING PCSM
CHECKED BY BGS/ZHR	SHEET 16
DRAWN BY SCR/CKS/RAM	DATE 12/19/2024
SCALE AS NOTED	PROJ. NO. WDEVE00004
	OF 46

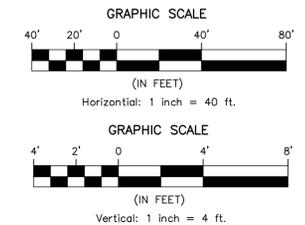


PROJECT INFORMATION:
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 DATE PLOTTED: 12/19/2024 10:00 AM
 LAST SAVE BY: J.Kelley

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LEGEND
 - - - - - EXISTING GRADE
 _____ FINISHED GRADE



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 LOCATION OF ALL UNDERGROUND FACILITIES OR STRUCTURES SHOWN. THE
 CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL
 UNDERGROUND UTILITIES AND FACILITIES PRIOR TO START OF WORK.
 2024-371817

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 14\"/>		
1	01/24/25	UPDATES FOR 14\"/>		

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE NO. PE076484

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
 1035 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
STORM PROFILE - 1

AND
 YOUR GOALS. OUR MISSION.
 1700 MARKET STREET, SUITE 3110
 PHILADELPHIA, PA 19103
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OFFICES LOCATED IN:
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 OHIO AND PENNSYLVANIA

DESIGNED BY: JPK/CKS/CMR/ROP/ZHR
 CHECKED BY: BGS/ZHR
 DRAWN BY: SCR/CKS/RAM
 DATE: 12/19/2024
 SCALE: AS NOTED
 PROJ. NO.: WDEVA0000A

DRAWING: **PRF-1**
 SHEET: **17**
 OF **46**



ATTENTION: ALL CONTRACTORS LOCATIONS OF ALL EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANIES RECORDS AND/OR ABOVE-GROUND EXPOSURES OF THE SITE. COMPLETENESS OR ACCURACY OF TYPE, SIZE, DEPTH OR HORIZONTAL LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES CANNOT BE GUARANTEED. CONTRACTOR TO REQUIREMENTS OF PENNSYLVANIA LEGISLATIVE ACT NUMBER 287 OF 1974 AS AMENDED BY ACT 121 OF 2004. CONTRACTOR MUST VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES AND FACILITIES PRIOR TO START OF WORK.

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 14" RCP SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR 14" RCP SUBMISSION MITG	ZHR	ZHR

CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER



12/19/2024
LICENSED PROFESSIONAL ENGINEER
STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
1035 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA

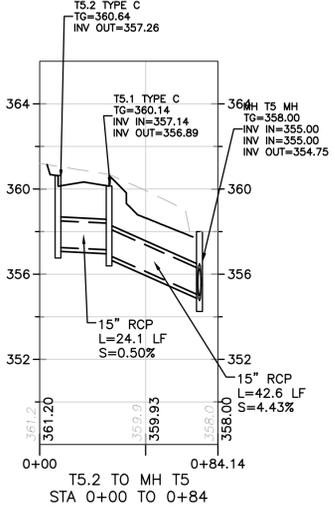
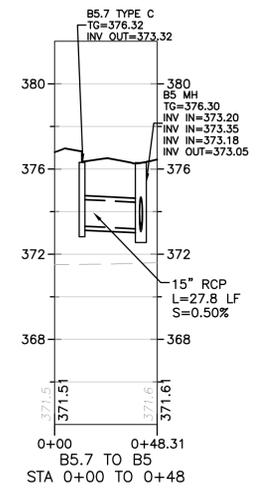
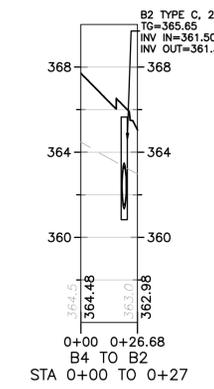
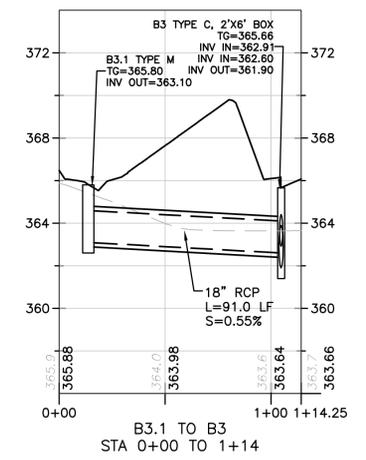
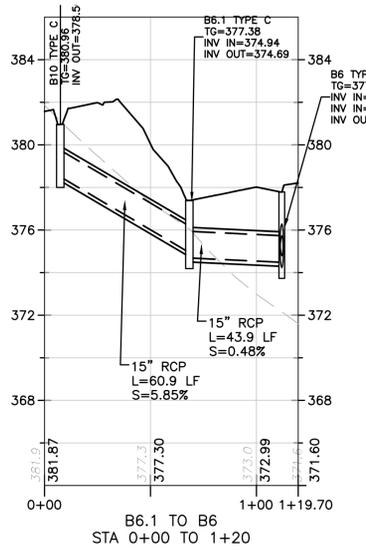
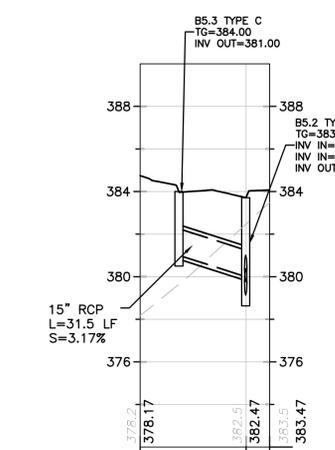
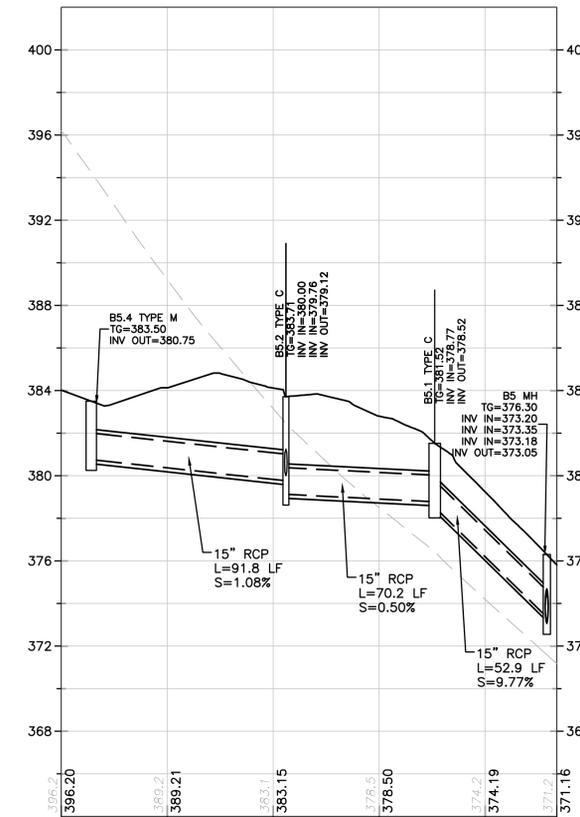
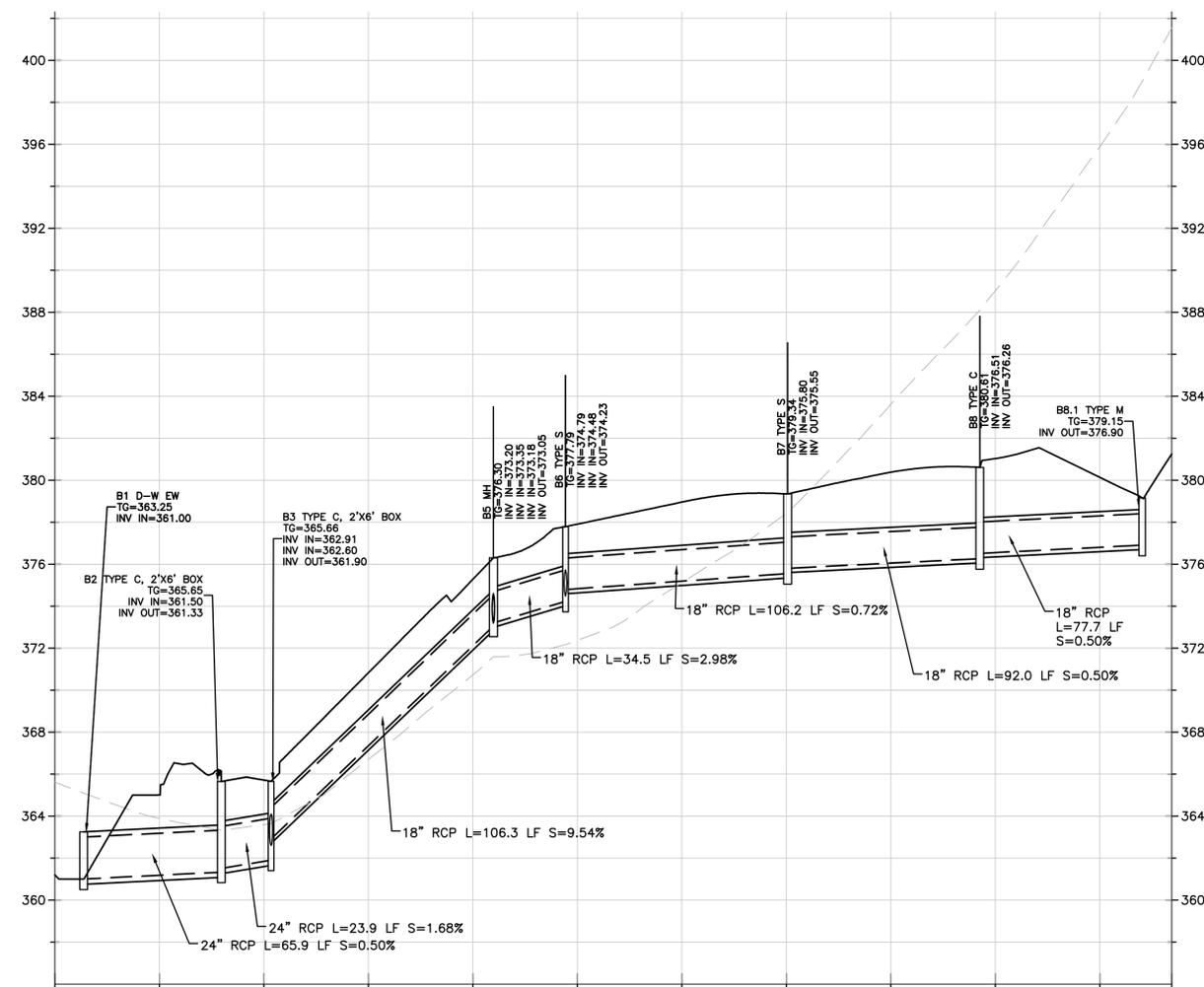
STORM PROFILE - 2



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DESIGNED BY JPK/CKS/CMR/ROP/ZHR	DRAWING PRF-2
CHECKED BY BGS/ZHR	SHEET 18
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDE00004	

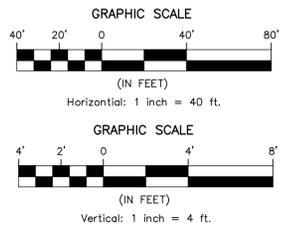


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DATE: 12/19/2024 2:03PM
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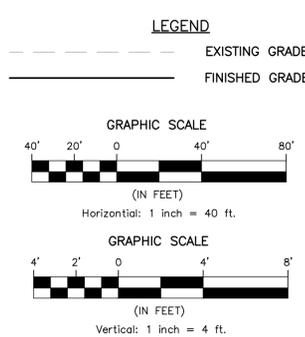
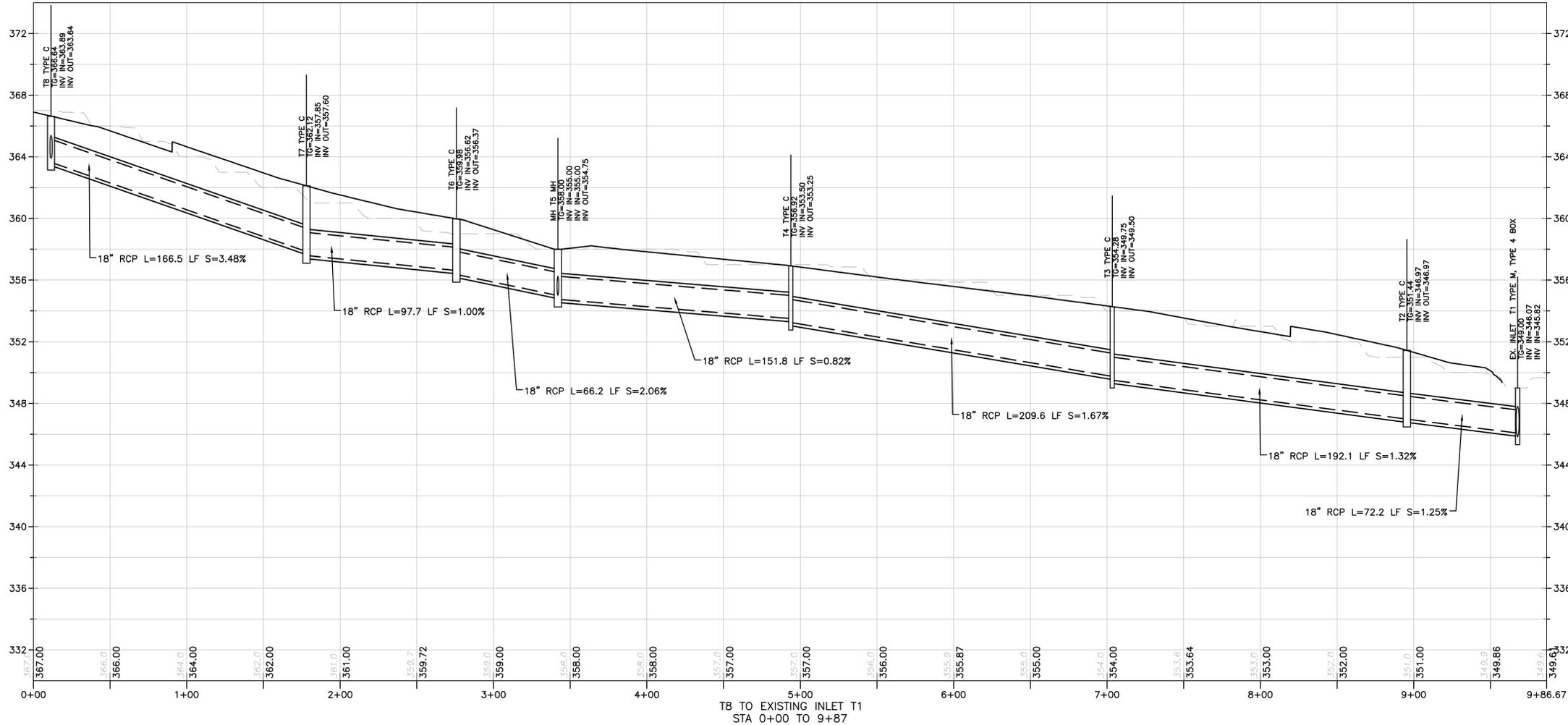
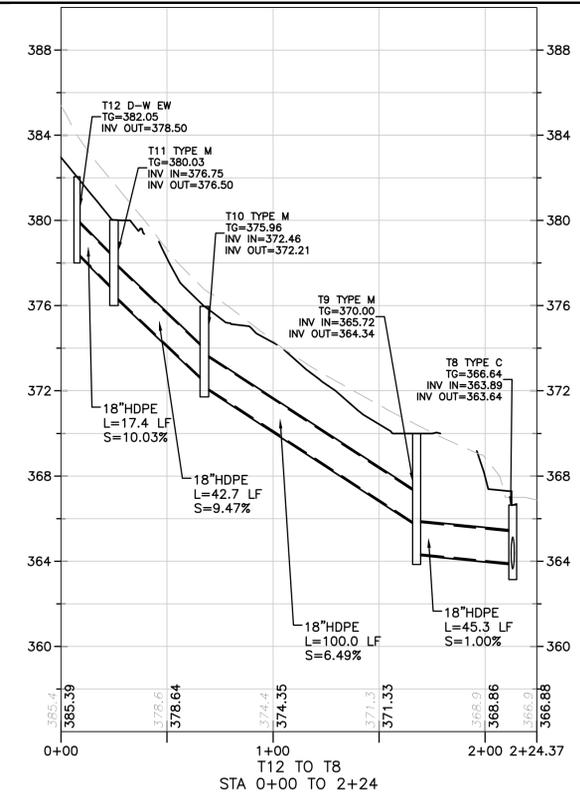
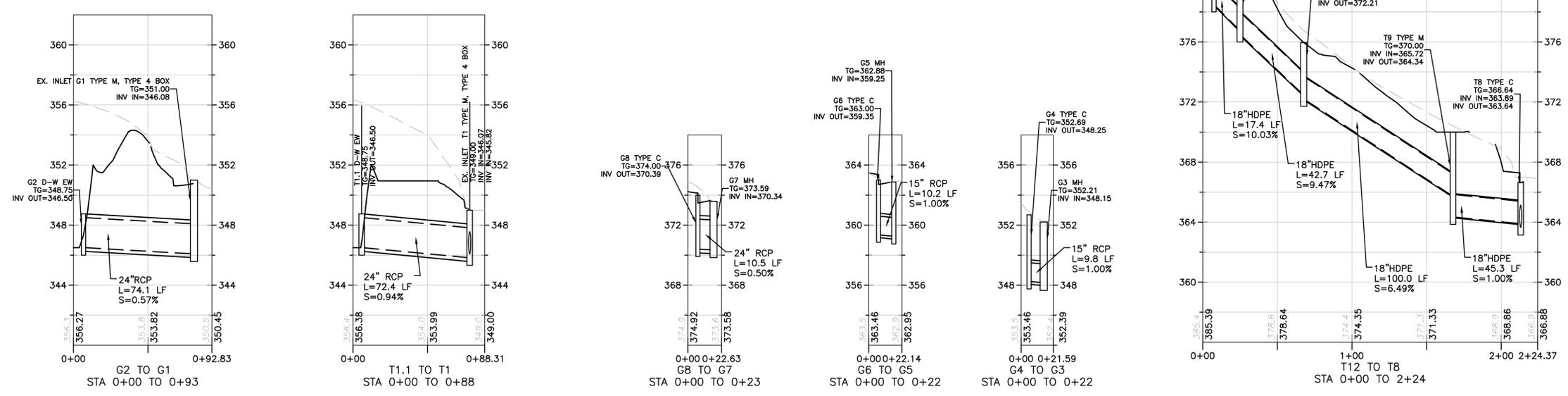
LEGEND

---	EXISTING GRADE
—	FINISHED GRADE



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 FILE NAME: WDEV0000A_PRF.dwg
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20243371817

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	BGS	
2	02/26/25	UPDATES FOR 18" RCP SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR 18" RCP SUBMISSION MITG	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE No. PE076464

COMMERCE PURSUIT CAPITAL
 TROOPER RIDGE SUBDIVISION
 1035 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA

STORM PROFILE - 3



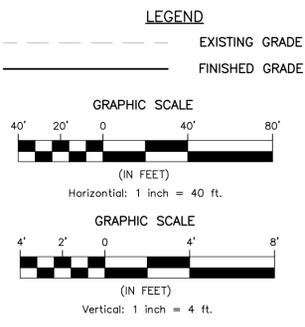
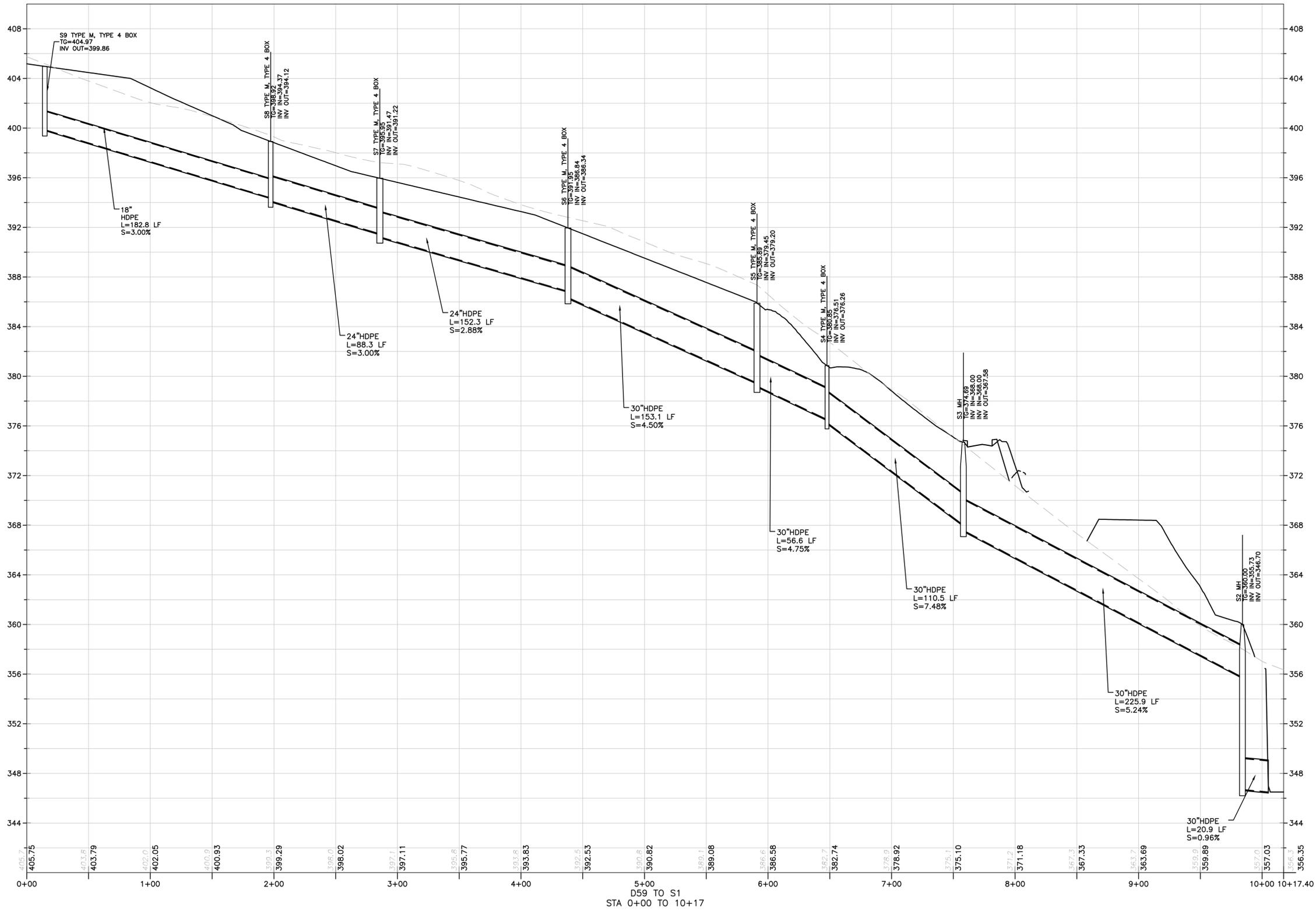
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DESIGNED BY: JPK/CKS/CMR/RDP/ZHR
 CHECKED BY: BGS/ZHR
 DRAWN BY: SCR/CKS/RAM
 DATE: 12/19/2024
 SCALE: AS NOTED
 PROJ. NO.: WDEV00004

DRAWING: PRF-3
 SHEET: 19
 OF 46

PROJECT INFORMATION:
 FILE PATH: G:\Projects\WDEV\00004\Plans\
 FILE NAME: WDEV00004_PRF.dwg
 DATE: 12/19/2024 2:05PM
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NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	ZHR
2	02/26/25	UPDATES FOR 18" PIPES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR 18" PIPES SUBMISSION	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
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TROOPER RIDGE SUBDIVISION
 1035 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
STORM PROFILE - 4

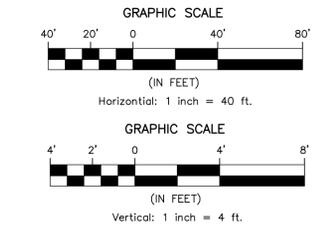
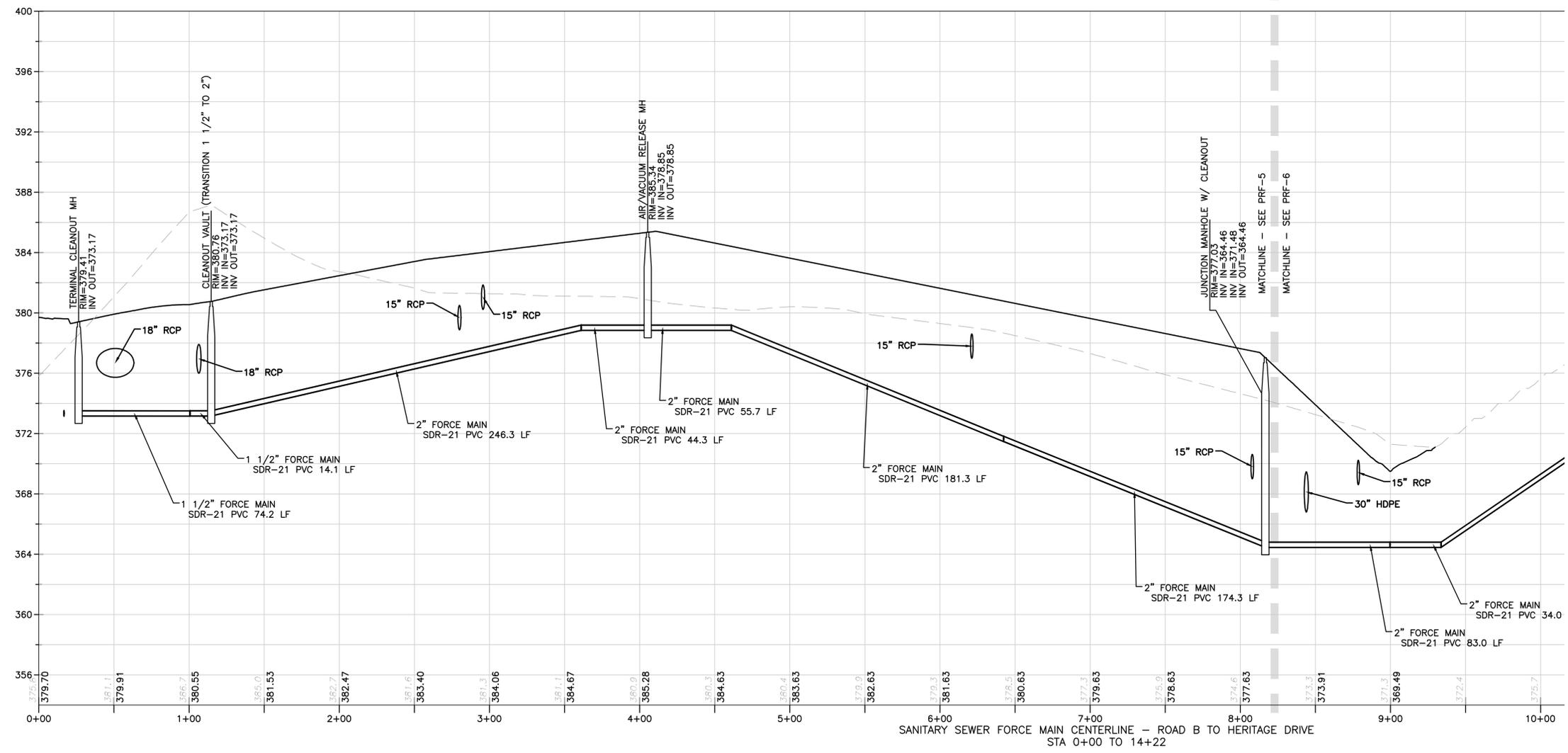


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DRAWING PRF-4			SHEET 20		
			OF 46		

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 FILE NAME: WDEV0000A_PRF.dwg
 DATE: 12/19/2024 2:05PM
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LEGEND
 --- EXISTING GRADE
 ——— FINISHED GRADE

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 20243371817

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR ALL PIPES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR PIPES PRE-SUBMISSION MITG	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
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 STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL
 TROOPER RIDGE SUBDIVISION
 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
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 SANITARY PROFILE-5

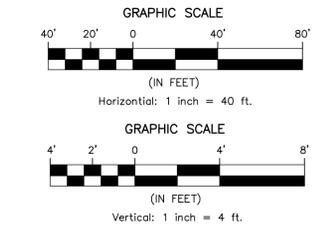
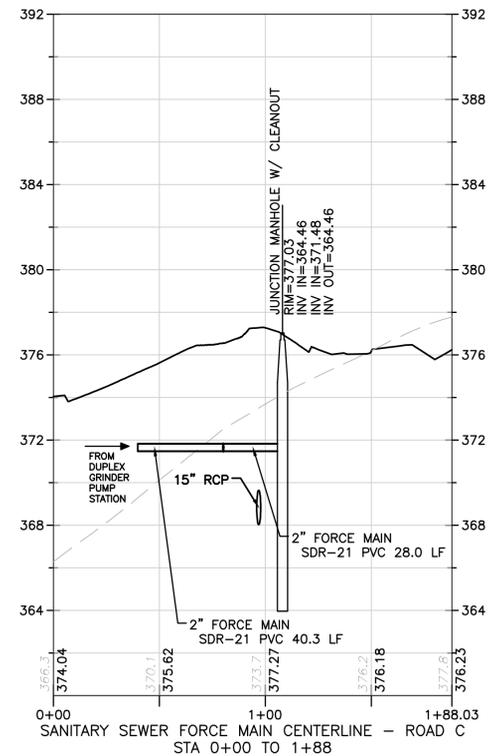
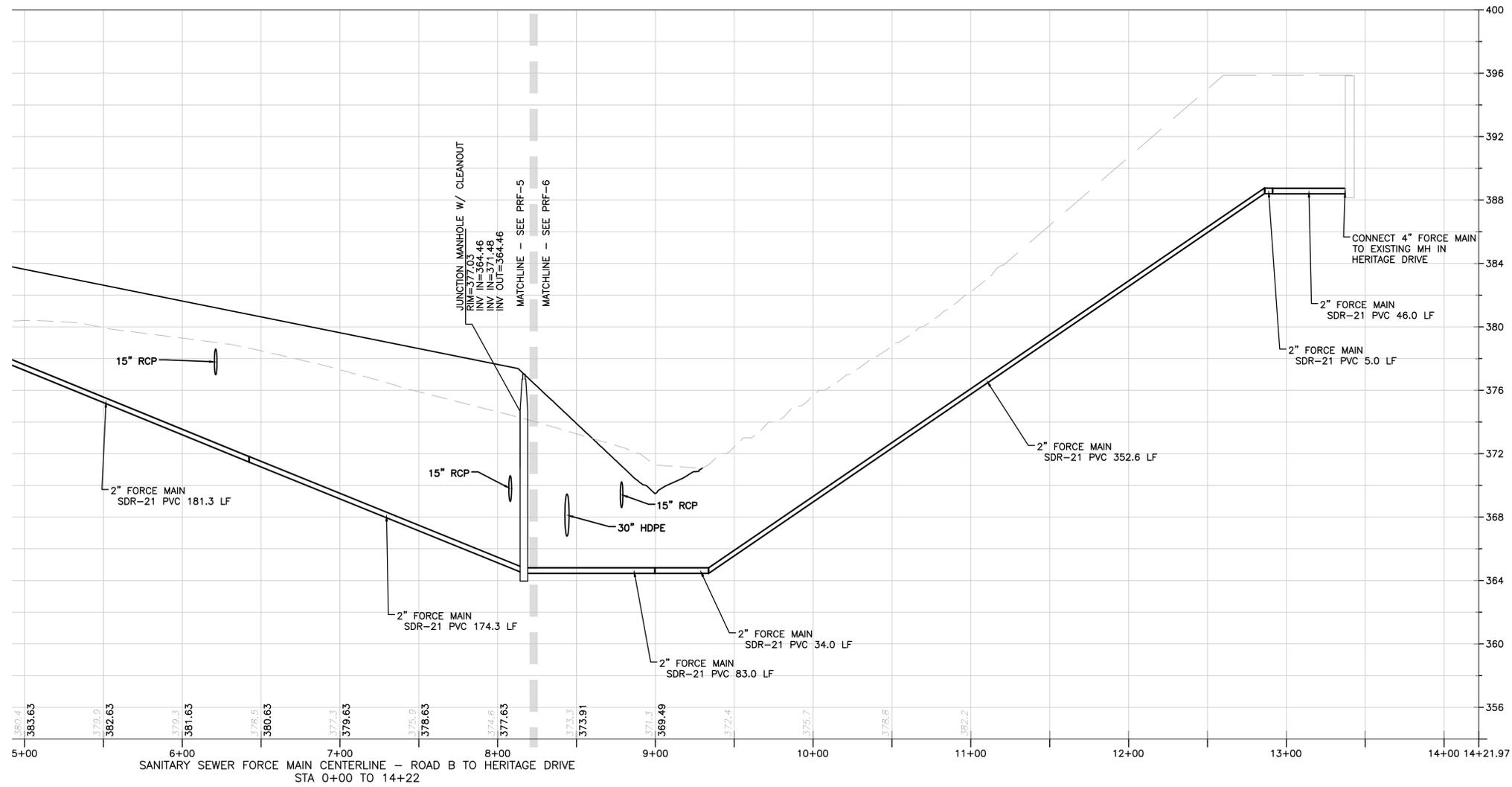


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DESIGNED BY JPK/CKS/CMR/ROP/ZHR	DRAWING PRF-5
CHECKED BY BGS/ZHR	SHEET 21
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDEV00004	

PROJECT INFORMATION:
 FILE PATH: G:\Projects\WDEV\0000A\Plans\
 FILE NAME: WDEV0000A_PRF.dwg
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LEGEND
 --- EXISTING GRADE
 ——— FINISHED GRADE

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 SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANIES
 RECORDS AND/OR NON-DESTRUCTIVE TESTING OF THE SITE.
 COMPLETENESS OR ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL
 LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES CANNOT BE
 GUARANTEED. CONTRACTOR TO RECONSTRUCT OR REPAIR UNDERGROUND
 UTILITIES ACT NUMBER 287 OF 1974 AS AMENDED BY ACT 121 OF
 2008. CONTRACTOR MUST VERIFY LOCATION AND DEPTH OF ALL
 UNDERGROUND UTILITIES AND FACILITIES PRIOR TO START OF WORK.
 DATE: 12/19/2024

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 15" RCP SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR 15" RCP SUBMISSION MITG	ZHR	ZHR

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE No. PE76464

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 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
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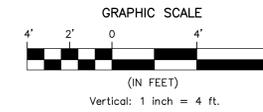
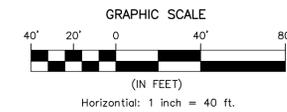
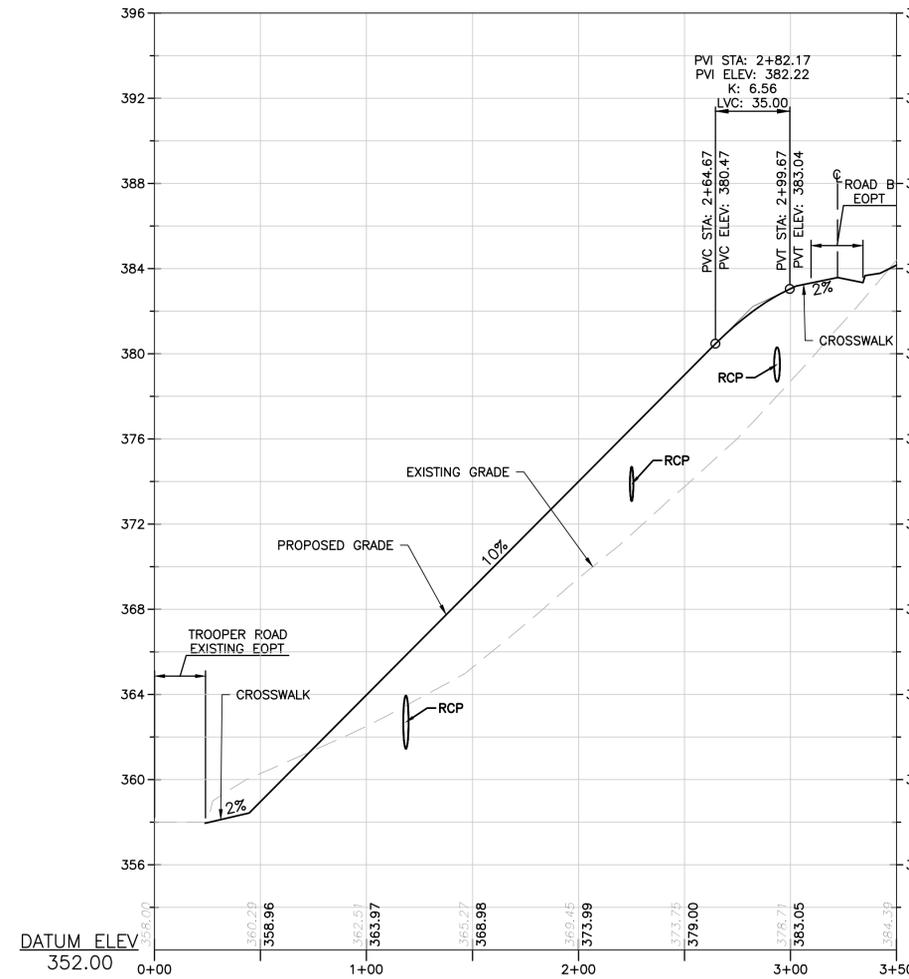
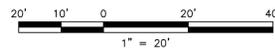
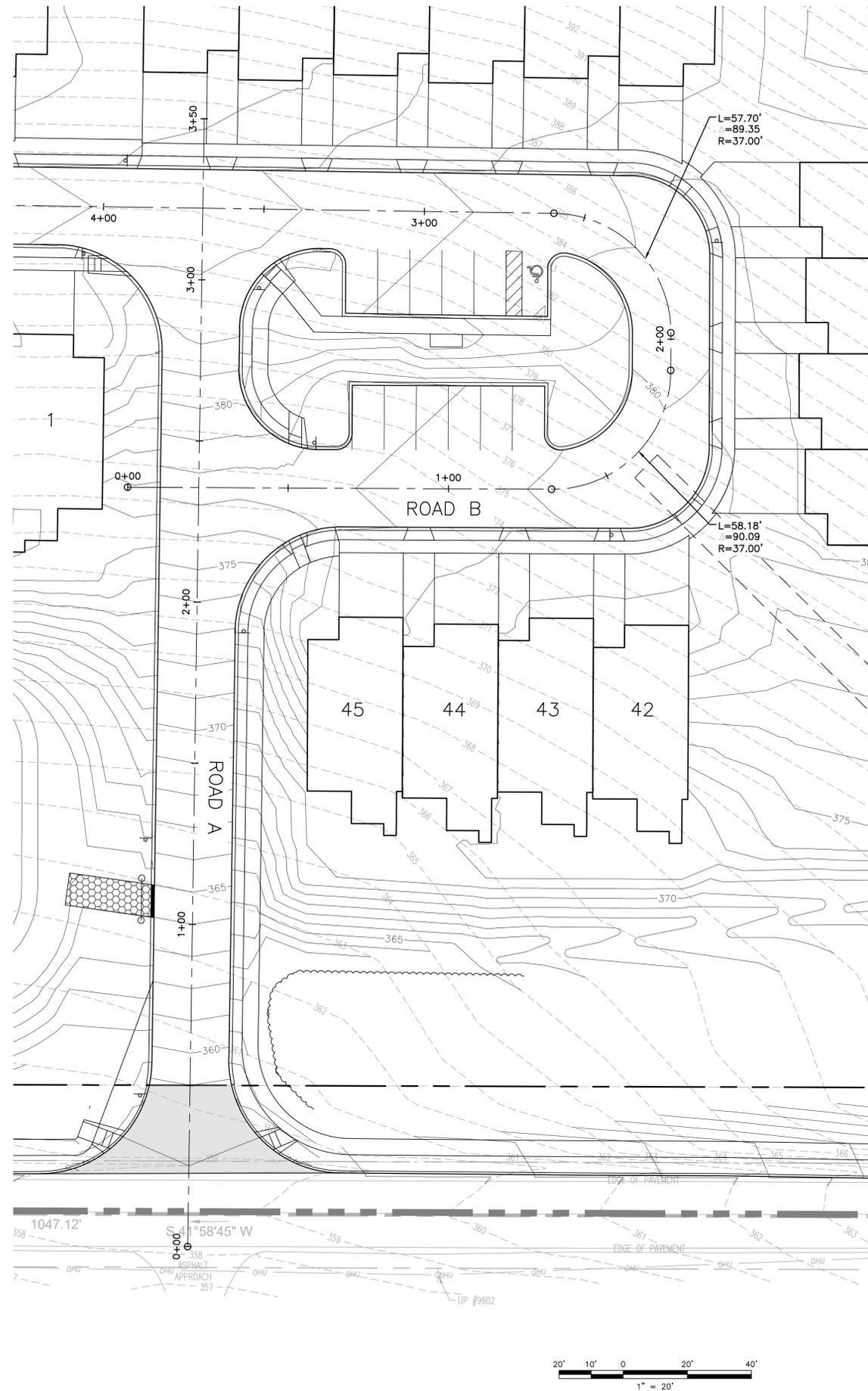
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 DATE: 12/19/2024
 SCALE: AS NOTED
 PROJ. NO.: WDEV00004

DRAWING: PRF-6
 SHEET: 22
 OF 46

PROJECT INFORMATION:
 FILE PATH: G:\Projects\WDEV\00004\Plans\1
 FILE NAME: WDEV00004_PRF -ROAD.dwg
 DATE PLOTTED: 12/19/2024 10:00 AM
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NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 44 NIPDES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR NIPDES PRE-SUBMISSION MITG	ZHR	ZHR

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



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 STATE OF PA LICENSE No. PE076464

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 1035 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
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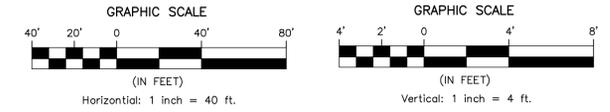
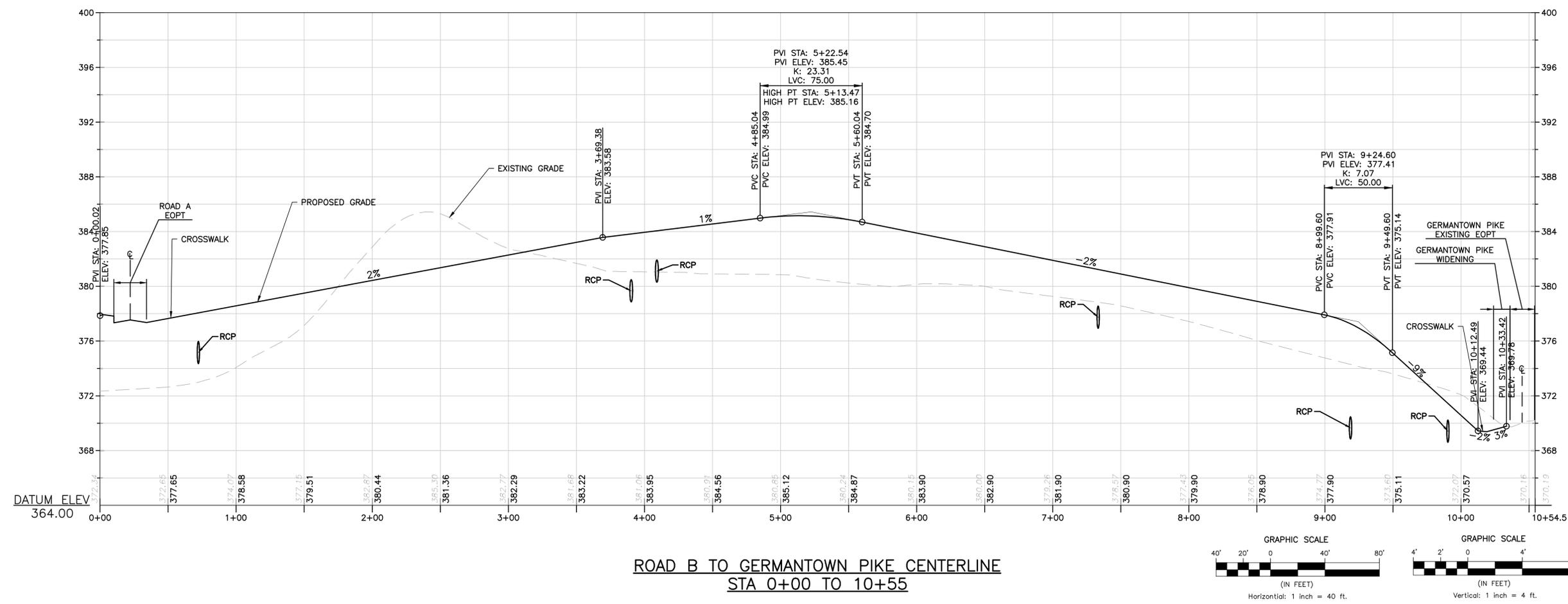
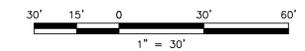
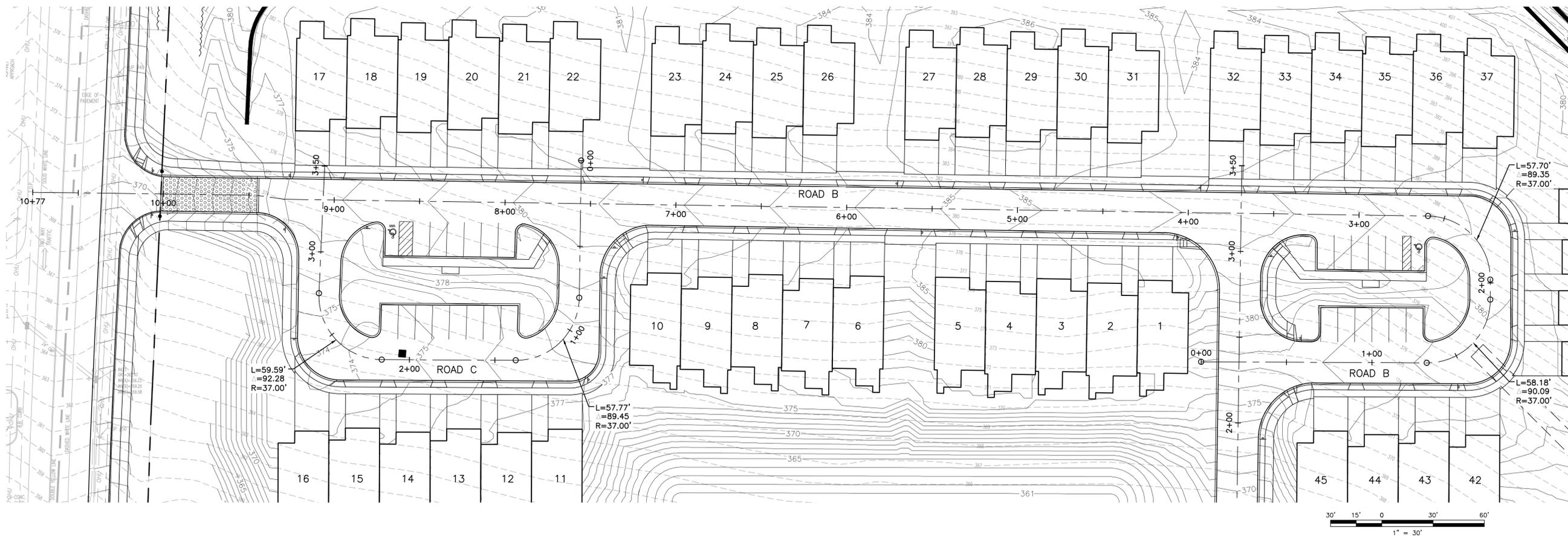
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CHECKED BY BGS/ZHR	SHEET 23
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDEV00004	



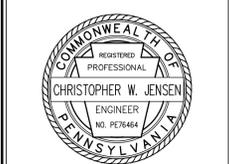
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 20243371817

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR ALIPIPES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR VPIES PRE-SUBMISSION MITG	ZHR	ZHR

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12/19/2024
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 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
 ROAD PROFILE - NORTH LOOP



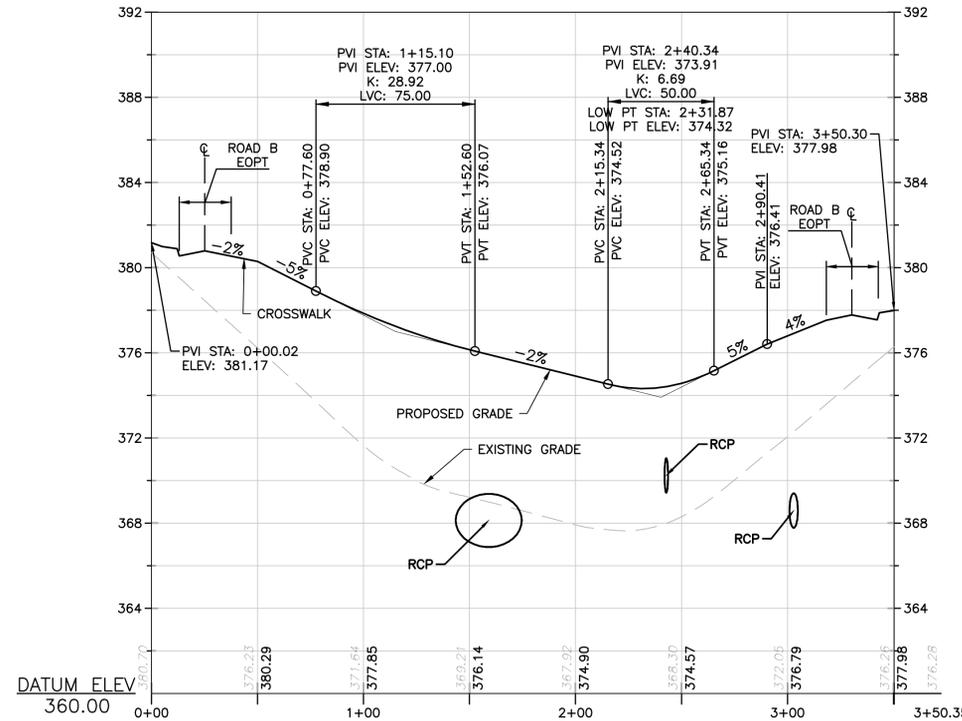
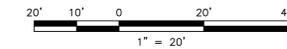
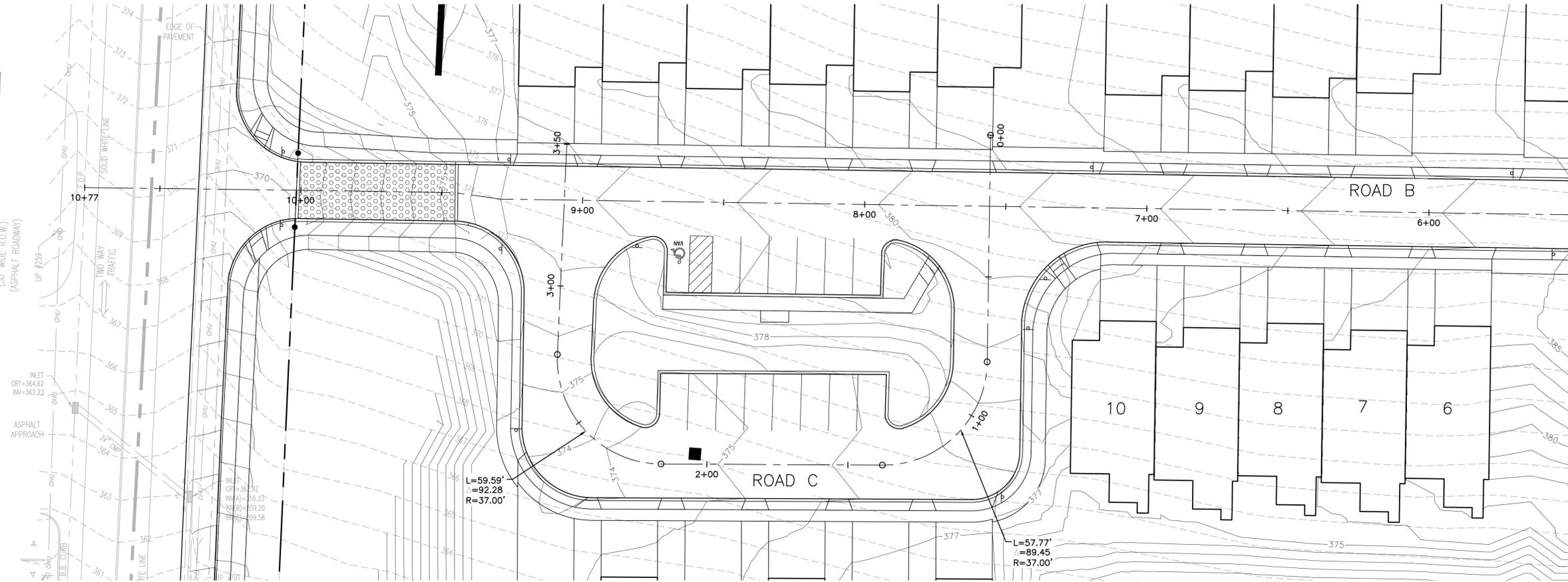
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 DRAWN BY: SCR/CKS/RAM
 DATE: 12/19/2024
 SCALE: AS NOTED
 PROJ. NO.: WDEV00004

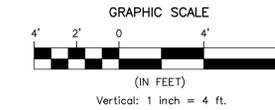
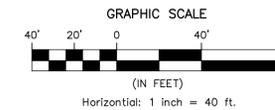
DRAWING: PRF-8
 SHEET: 24
 OF 46

GERMANTOWN PIKE

(50' WIDE R.O.W.)
(ASPHALT ROADWAY)



ROAD C CENTERLINE
STA 0+00 TO 3+50



PROJECT INFORMATION:
FILE PATH: G:\Projects\WDEV\0000A\Plans\
FILE NAME: WDEV0000A_PRF -ROAD.dwg
DRAWN BY: JPK
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DATE: 12/19/2024
LAST SAVE BY: J.Kelley

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20243371817

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 341 PIPES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR 341 PIPES PRE-SUBMISSION	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER



12/19/2024
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STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL

TROOPER RIDGE SUBDIVISION
1035 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
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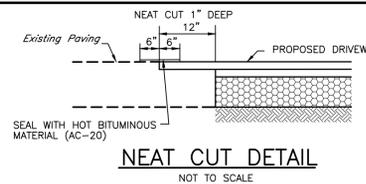
ROAD PROFILE - SOUTH LOOP



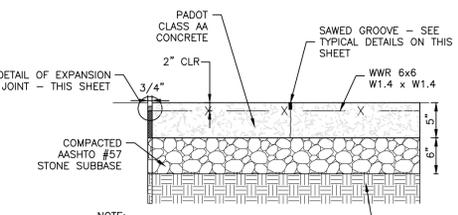
1700 MARKET STREET, SUITE 3110
PHILADELPHIA, PA 19103
TEL 215-282-7850
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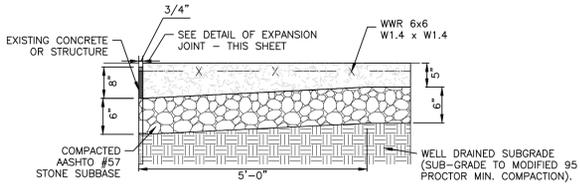
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CHECKED BY BGS/ZHR	SHEET 25
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
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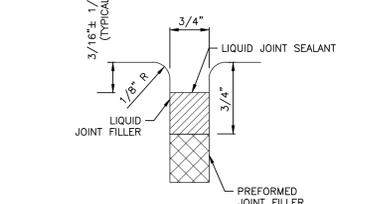
NEAT CUT DETAIL
NOT TO SCALE



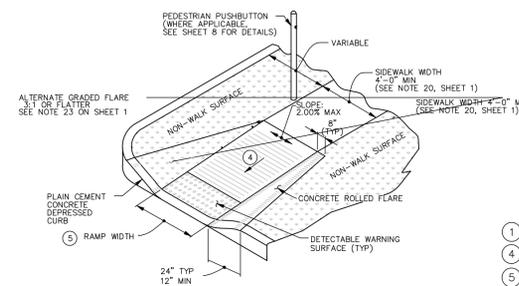
CONSTRUCTION JOINT (CRJ)
NOT TO SCALE



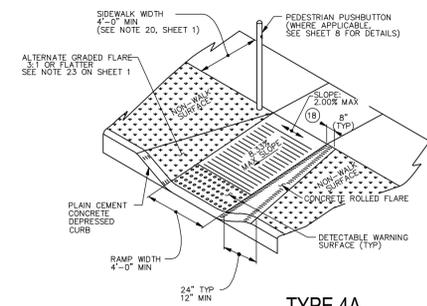
TYPICAL CONCRETE SECTION AT ISOLATION JOINT
NOT TO SCALE



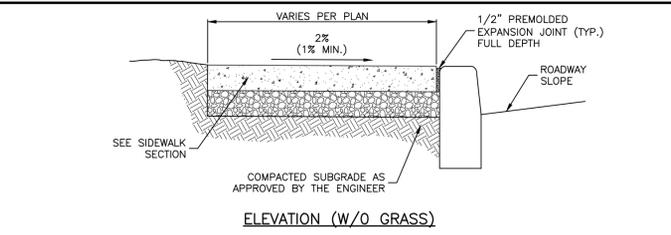
TYPICAL DETAIL OF EXPANSION JOINTS
NOT TO SCALE



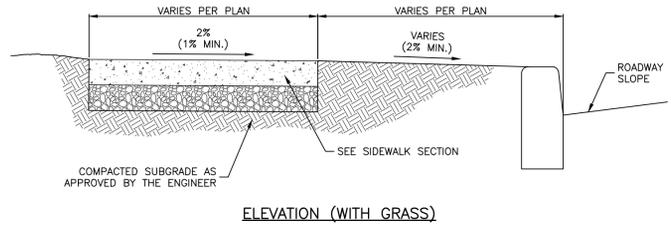
TYPE 4A CURB RAMP



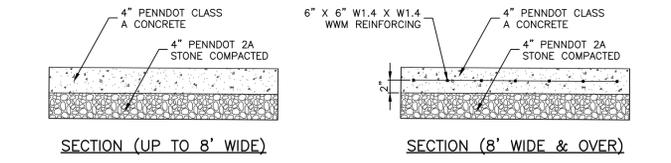
TYPE 4A CURB RAMP (PERPENDICULAR)



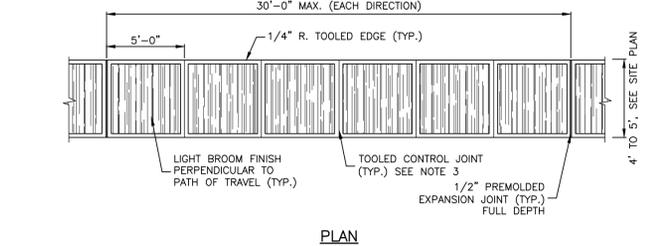
ELEVATION (W/O GRASS)



ELEVATION (WITH GRASS)



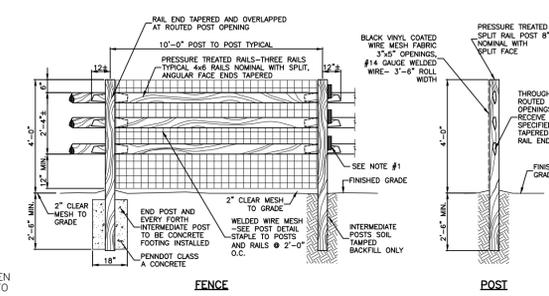
SECTION (UP TO 8' WIDE) SECTION (8' WIDE & OVER)



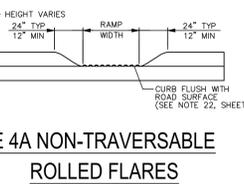
PLAN

- NOTES:**
1. ALL CONSTRUCTION, MATERIALS, METHODS OF CONSTRUCTION AND CONTROL OF WORK TO BE GOVERNED BY THE CURRENT EDITION OF PENNDOT SPECIFICATIONS, PUBLICATION 408.
 2. PLACE 1/2" PREMOLED EXPANSION JOINT MATERIAL FOR THE FULL DEPTH OF THE SIDEWALK AT 30' INTERVALS OPPOSITE EXPANSION JOINTS IN ADJACENT CURB, BETWEEN THE SIDEWALK AND CURB AND BETWEEN THE SIDEWALK AND ANY RIGID STRUCTURES.
 3. FORM TRANSVERSE TOoled CONTROL JOINTS AT 5 FOOT INTERVALS, APPROXIMATELY 1/8" DEEP AND AT LEAST 1" DEEP OR PER SCORING DETAIL PLANS WHEN PROVIDED.
 4. ALL EXPOSED CONCRETE SHALL BE SEALED WITH AQUORON CPT-2000 OR APPROVED EQUAL.
 5. EXISTING CONCRETE TO BE REMOVED, ADJACENT TO EXISTING CONCRETE TO REMAIN, SHALL BE SAW CUT FULL DEPTH AT AN EXISTING CONTROL JOINT.
 6. FOR USE WITHIN PEDESTRIAN TRAVEL AREAS.
 7. CONCRETE USED IN CURBING WORK SHALL BE AT LEAST 3,000 POUNDS PER SQUARE INCH AT 28 DAYS WITH CERTIFICATION OF THE MIX FURNISHED TO THE TOWNSHIP ENGINEER. CONCRETE SHALL BE PLACED IN FORMS THAT ARE STRAIGHT AND SECURELY BRACED. CARE SHALL BE TAKEN TO CONTROL THE WATER CONTENT TO PREVENT SEPARATION OF THE AGGREGATES. THE CONCRETE SHALL HAVE A BROOM FINISH AND THE EDGES SHALL BE FINISHED WITH AN APPROVED EDGING TOOL.

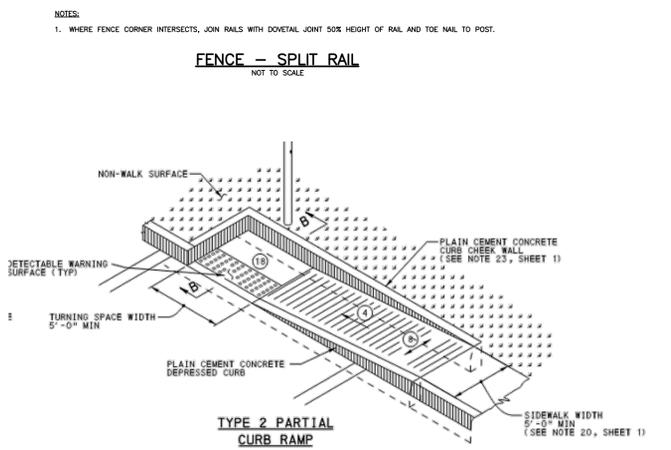
SIDEWALK - CONCRETE
NOT TO SCALE



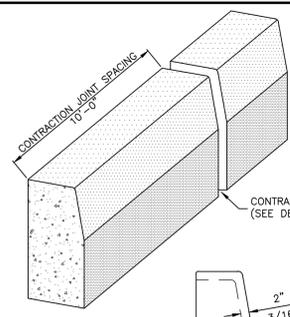
FENCE - SPLIT RAIL
NOT TO SCALE



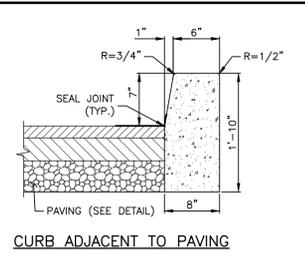
TYPE 4A NON-TRAVERSABLE ROLLED FLARES



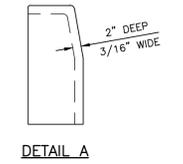
TYPE 2 PARTIAL CURB RAMP



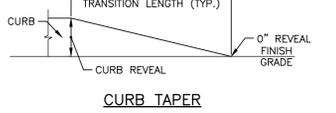
CONTRACTION JOINT (SEE DETAIL A)



CURB ADJACENT TO PAVING



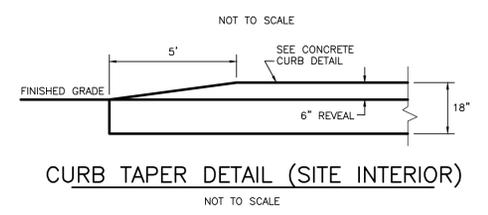
DETAIL A



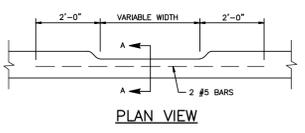
CURB TAPER

- NOTES:**
1. CONCRETE SHALL BE PENNDOT CLASS A - MINIMUM.
 2. 3/4" PREMOLED EXPANSION JOINTS SHALL BE PLACED AT STRUCTURES AND AT THE END OF THE WORK DAY.
 3. FLEXIBLE FORMS SHALL BE REQUIRED FOR ALL CURB RADI WITH A RADIUS OF LESS THAN 150 FEET.
 4. WHERE THE SUBGRADE IS SOFT OR SPONGY, AS DETERMINED BY THE MUNICIPAL ENGINEER, A LAYER OF CRUSHED STONE NOT LESS THAN 4" THICKNESS SHALL BE PLACED UNDER THE CURB.
 5. SEAL JOINT WITH 1" WIDE P664-22 SEALANT OR APPROVED EQUAL (2" UP FACE OF CURB, 10" AWAY FROM CURB).
 6. ALL EXPOSED CONCRETE SHALL BE SEALED WITH AQUORON CPT-2000 OR APPROVED EQUAL.
 7. ALL CONCRETE USED IN THE CONSTRUCTION OF IMPROVEMENTS SHALL BE CERTIFIED TO DEVELOP A COMPRESSIVE STRESS OF AT LEAST 3,000 POUNDS PER SQUARE INCH AT 28 DAYS WITH CERTIFICATION OF THE MIX FURNISHED TO THE TOWNSHIP ENGINEER.

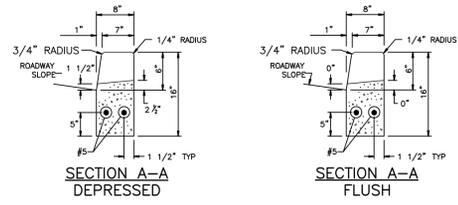
CURB - CONCRETE PUBLIC STREETS



CURB TAPER DETAIL (SITE INTERIOR)
NOT TO SCALE



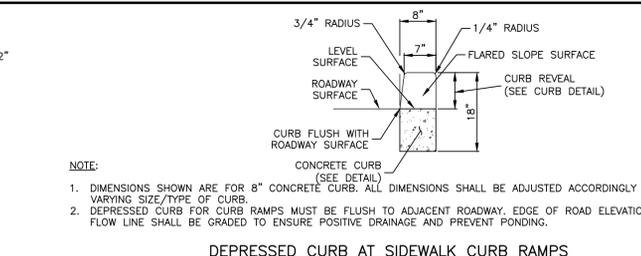
PLAN VIEW



SECTION A-A DEPRESSED SECTION A-A FLUSH

- NOTES:**
1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 630 FOR PLAN CEMENT CONCRETE CURB AND DEPRESSED CURB.
 2. SPACE CONTRACTION JOINTS IN UNIFORM LENGTHS OR SECTIONS.
 3. PLACE 3/4" THICK PREMOLED EXPANSION JOINT FILLER MATERIAL AT STRUCTURES AND AT THE END OF THE WORK DAY. CUT MATERIAL TO CONFORM TO AREA ADJACENT TO CURB OR TO CONFORM TO CROSS SECTIONAL AREA OF CURB.
 4. SEE RC-67M FOR PLAN CEMENT CONCRETE CURB SLOPED TOP TREATMENT AT END OF STRUCTURES.
 5. ALL DIMENSIONS ARE IN U.S. CUSTOMARY UNITS.

DEPRESSED AND FLUSH CURB
NOT TO SCALE

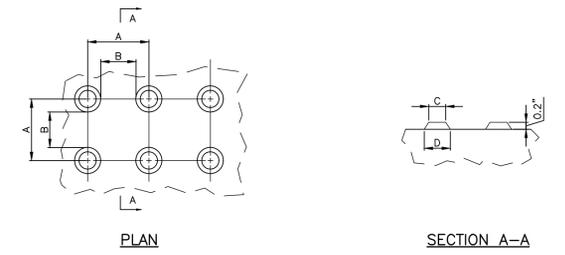


DEPRESSED CURB AT SIDEWALK CURB RAMPS

- NOTE:**
1. DIMENSIONS SHOWN ARE FOR 8" CONCRETE CURB. ALL DIMENSIONS SHALL BE ADJUSTED ACCORDINGLY FOR VARYING SIZE TYPE OF CURB.
 2. DEPRESSED CURB FOR CURB RAMPS MUST BE FLUSH TO ADJACENT ROADWAY. EDGE OF ROAD ELEVATIONS AT THE FLOW LINE SHALL BE GRADED TO ENSURE POSITIVE DRAINAGE AND PREVENT PONDING.

- NOTES:**
1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PENNDOT PUBLICATION 408, SECTIONS 350, 409, 630, 676, AND 694.
 2. PROVIDE EXPANSION JOINT MATERIAL 1/2" THICK WHERE CURB RAMP ADJOINS ANY RIGID PAVEMENT, SIDEWALK OR STRUCTURE WITH THE TOP OF JOINT FILLER FLUSH WITH ADJACENT CONCRETE SURFACE.
 3. IF PEDESTRIAN CROSSWALKS ARE NOT WIDE ENOUGH TO PROVIDE MINIMUM 4'-0" X 4'-0" WIDE WHEELCHAIR OVERRUN ZONE AT THE BOTTOM OF THE RAMP, POSITION CROSSWALKS AS INDICATED IN PENNDOT PUBLICATION 72M - RC-67M - DETAIL A ON SHEET 7.
 4. SEAL JOINTS WITH AN APPROVED SEALING MATERIAL.
 5. PROVIDE SLIP RESISTANT TEXTURE ON CURB RAMP BY COARSE BROOMING TRANSVERSE TO THE SLOPE OF THE RAMP. EXTEND TEXTURE THE FULL WIDTH AND LENGTH OF CURB RAMP INCLUDING FLARED SIDE RAMPS.
 6. MODIFY CONSTRUCTION DETAILS TO ADAPT DIMENSIONS TO EXISTING CURB ALTERATIONS WHERE THE CURB IS LESS THAN THE STANDARD 8" HEIGHT.
 7. CURB RAMP AND SIDE FLARE LENGTHS ARE VARIABLE AND BASED ON CURB HEIGHT AND THE SIDEWALK SLOPE.
 8. IT MAY BE NECESSARY TO LIMIT THE RUN OF A PARALLEL OR PERPENDICULAR CURB RAMP IN ORDER TO AVOID CHASING GRADE INDEFINITELY WHEN TRAVERSING THE HEIGHT OF CURB. RAMP LENGTH NOT TO EXCEED 15'-0". ADJUST RAMP SLOPE AS NEEDED TO PROVIDE ACCESS TO THE MAXIMUM EXTENT POSSIBLE.
 9. WHENEVER POSSIBLE, CONSTRUCT THE TRANSITION SLOPE FROM THE CURB RAMP AND FLARE SIDES TO ADJOINING SURFACES WITH A GRADUAL ROUNDED SHAPE RATHER THAN AN ABRUPT ANGLE. ENSURE CONSTRUCTION IS WITHIN MAXIMUM SLOPE.
 10. ALIGN DETECTABLE WARNING DOMES ON A SQUARE GRID IN THE PREDOMINANT DIRECTION OF THE RAMP AND PERPENDICULAR TO CURB.
 11. PROVIDE DETECTABLE WARNING SURFACES (DWS) 24" MINIMUM (IN THE DIRECTION OF PEDESTRIAN TRAVEL) ACROSS FULL WIDTH OF RAMP AT THE GRADE BREAK NEAR STREET EDGE. PROVIDE DWS THAT CONTRAST VISUALLY WITH ADJACENT WALKWAY SURFACES, EITHER LIGHT-ON-DARK OR DARK-ON-LIGHT FOR THE FULL WIDTH OF RAMP. DETECTABLE WARNING SURFACES SHALL COMPLY WITH THE REQUIREMENTS OF PENNDOT PUBLICATION 72M - RC-67M AND ADA REQUIREMENTS.
 12. FOR NEW CONSTRUCTION, DO NOT EXCEED 2.0% CROSS SLOPE ON THE CURB RAMP OR ACCESSIBLE ROUTE.
 13. CONSTRUCT RAMP AND FLARE SLOPES WITH THE FLATTEST SLOPE POSSIBLE. THE SLOPES INDICATED IN THE DETAILS SHOW THE MAX SLOPE ALLOWABLE. IT IS STRONGLY RECOMMENDED TO USE THE SLOPES LISTED ABOVE TO ALLOW FOR CONSTRUCTION TOLERANCES.

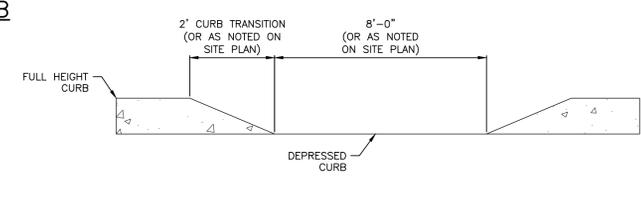
CURB RAMP - GENERAL INFORMATION
NOT TO SCALE



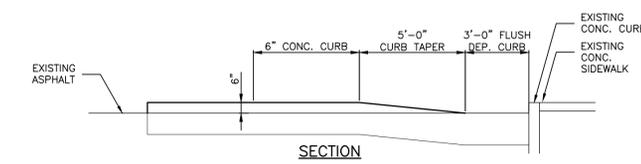
TRUNCATED DOME DIMENSIONS			
DIM	MIN (INCH)	MAX (INCH)	
A	1.6	2.4	
B	0.65	1.5	
C	SEE NOTE 1	SEE NOTE 1	
D	0.9	1.4	

- NOTES:**
1. THE C DIMENSION SHALL BE 50% TO 65% OF THE D DIMENSION.
 2. DETECTABLE WARNING SURFACES SHALL COMPLY WITH ALL REQUIREMENTS OF THE AMERICANS WITH DISABILITIES ACT AND PENNDOT PUBLICATION 72M - RC67M.
 3. DETECTABLE WARNINGS SHALL BE PROVIDED AT ALL LOCATIONS WHERE A PEDESTRIAN WALK CROSSES OR ADJOINS A VEHICULAR WAY AND THE WALKING SURFACES ARE NOT SEPARATED BY CURBS, RAILINGS, OR OTHER ELEMENTS.
 4. DETECTABLE WARNINGS SHALL EXTEND THE FULL WIDTH OF THE WALKING PATH AND BE A MINIMUM OF TWO FEET (2') IN DEPTH.
 5. DETECTABLE WARNINGS SHALL BE ARMOR-TILE (TM) TACTILE SYSTEM - CAST IN PLACE SYSTEM, OR APPROVED EQUAL (WWW.ARMOR-TILE.COM).
 6. COLOR SHALL BE DARK GRAY (FEDERAL COLOR NO. 36118). COLORS SHALL BE SUBMITTED FOR OWNER'S APPROVAL PRIOR TO ORDERING MATERIAL.

DETECTABLE WARNING SURFACE
NOT TO SCALE



CURB CUT DETAIL
NOT TO SCALE



CURB ISLAND DETAIL
NOT TO SCALE



TYPICAL DETAIL OF SAWED GROOVE
NOT TO SCALE

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NO.	DATE	REVISIONS	BY	CHKD
1	01/24/25	UPDATES FOR VICES PRE-SUBMISSION MITG	JPK	ZHR
2	02/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	ZHR
3	03/26/25	REVISED FOR PLAN UPDATES SUBMISSION	JPK	BGS

CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER



12/19/2024
LICENSED PROFESSIONAL ENGINEER
STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA

CONSTRUCTION SITE DETAILS - 1



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DESIGNED BY JPK/CKS/CMR/ROP/ZHR	DRAWING CSD-1
CHECKED BY BGS/ZHR	SHEET 26
DRAWN BY SCR/CKS/RAM	SCALE AS NOTED
DATE 12/19/2024	PROJ. NO. WDE00004
NO.	OF 46

GENERAL NOTES:

- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESES.
- METRIC UNITS INDICATED ARE SOFT CONVERTED FROM U.S. CUSTOMARY UNITS.
- DESIGN SPECIFICATIONS: ASHITO LIFE BRIDGE DESIGN SPECIFICATIONS AND AS SUPPLEMENTED BY THE DESIGN MANUAL, PART 4, STRUCTURES.
- CONSTRUCTION SPECIFICATIONS: PROVIDE MATERIALS AND PERFORM WORK IN ACCORDANCE WITH THE CURRENT VERSION OF THE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION PUBLICATION 408, ASHITO BRIDGE WELDING CODE AND THE CONTRACT SPECIAL PROVISIONS.
- SHOP DRAWINGS FOR INLET TOPS, GRATES, FRAMES, AND GRADE ADJUSTMENT RINGS ARE NOT REQUIRED IF THE ITEM IS CONSTRUCTED/FABRICATED IN ACCORDANCE WITH THIS STANDARD.
- IF A REQUIRED DETAIL IS NOT FOUND IN THIS STANDARD OR ON THE CONTRACT DRAWINGS, A SPECIAL SUBMISSION REQUESTING ACCEPTANCE FOR SPECIFIC DETAILS MUST BE MADE TO THE BUREAU OF DESIGN HIGHWAY QUALITY ASSURANCE DIVISION, CHIEF.
- FOR INLET BOX DETAILS REFER TO RC-45M.

PLACEMENT NOTES:

- EACH TYPE OF CONCRETE TOP UNIT OR FRAME IS SUITED FOR A PARTICULAR SITUATION AS FOLLOWS:
 - TYPE C CONCRETE TOP UNIT AND TYPE C ALTERNATE CONCRETE TOP UNIT WITH A TYPE C FRAME ARE DESIGNATED FOR INSTALLATION WITH NON-MOUNTABLE CURBS.
 - TYPE M CONCRETE TOP UNIT AND TYPE M FRAME ARE DESIGNATED FOR INSTALLATION IN AREAS ADJACENT TO MEDIANS AND MOUNTABLE CURBS.
 - TYPE H CONCRETE TOP UNIT IS DESIGNATED FOR INSTALLATION IN SHOULDER AREAS WITH A TYPE D INLET BOX.
 - TYPE H LEVEL CONCRETE TOP UNIT IS DESIGNATED FOR INSTALLATION IN AREAS ADJACENT TO MEDIANS WITH A TYPE D INLET BOX.
- PLACEMENT OF CONCRETE TOP UNITS:
 - TYPE C AND TYPE C ALTERNATE: DO NOT PLACE THE TOP UNIT ADJACENT TO CURBS WITH TYPE D INLET BOXES. PROVIDE A MINIMUM CLEARANCE OF 150 mm (6") FROM THE CURB TO THE TOP UNIT.
 - TYPE M: PLACE THE TOP UNIT OR FRAME ADJACENT TO THE BACK EDGE OF THE CURB FLUSH WITH THE INVERTED SURFACE, WHEN REQUIRED WITH A CONCRETE MOUNTABLE CURB SECTION.
 - TYPE S: THE PLACEMENT OF THE TOP UNIT IS DEPENDENT ON THE GUTTER ELEVATION AND THE RATE OF THE BACK SLOPE. FOR BACK SLOPES GREATER THAN 12 (1) LOCATE THE INLET TOP WHERE THE BACK SLOPE LINE INTERSECTS THE BACK, TOP, OR OUTSIDE CORNER OF THE INLET TOP. FOR BACK SLOPES LESS THAN 12 (1) LOCATE THE INLET TOP WHERE THE BACK SLOPE LINE INTERSECTS THE EDGE OF THE INLET GRATE.
- PLACE THE TOP UNIT IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
- THE SELECTION OF COMPONENTS TO ACHIEVE A SPECIFIED INLET ASSEMBLY IS THE CONTRACTOR'S RESPONSIBILITY, UNLESS OTHERWISE INDICATED ON THE CONTRACT DOCUMENTS.
- SET THE PRECAST CONCRETE TOP UNITS ON A NON-SHRINK GROUT AND PROVIDE FULL BEARING ON THE SUPPORTING SURFACE. NON-SHRINK GROUT IS ALSO PERMITTED FOR CROSS SLOPE AND LONGITUDINAL GRADE ADJUSTMENTS. PROVIDE NON-SHRINK GROUT IN ACCORDANCE WITH PUBLICATION 408, SECTION 100.205. MINIMUM GROUT DEPTH = 13 mm (1/2"). MAXIMUM GROUT DEPTH = 13 mm (1/2"). FOR ALTERNATE GRADE ADJUSTMENT SYSTEMS, WHICH DO NOT REQUIRE NON-SHRINK GROUT, REFER TO NOTE 5 UNDER THE GRADE ADJUSTMENT RINGS GENERAL NOTES ON SHEET 12.
- BRICK OR BRICK AND MORTAR ARE NOT ALLOWED FOR GRADE ADJUSTMENTS FOR NEW OR REHABILITATION PROJECTS.

GENERAL GRATE NOTES:

- THE FOLLOWING TWO DIFFERENT GRATE DEPTHS ARE SPECIFIED ON THIS STANDARD:
 - STRUCTURAL STEEL GRATES - 38 mm (3/4") DEPTH WITH 64 mm (2 1/2") PERIMETER DEPTH
 - CAST IRON GRATES - 64 mm (2 1/2") DEPTH (MINIMUM)
- THE SELECTION OF THE TYPE OF GRATE MATERIAL IS THE CONTRACTOR'S RESPONSIBILITY, UNLESS OTHERWISE INDICATED ON THE CONTRACT DOCUMENTS.

CONCRETE TOP UNIT NOTES:

- SHEETS 2 THRU 4 AND 18 THRU 20 SPECIFY THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. IT DOES NOT INCLUDE DETAILS REQUIRED FOR FABRICATION OR MANUFACTURING. FOR MORE INFORMATION, REFER TO THE STANDARD, SUBMIT SHOP DRAWINGS TO THE BUREAU OF DESIGN HIGHWAY QUALITY ASSURANCE DIVISION, CHIEF FOR REVIEW AND ACCEPTANCE.
- PROVIDE PRECAST CONCRETE TOP UNITS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15.
- PROVIDE WELDED INLET ANGLE ASSEMBLIES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15.
- CAST-IN-PLACE TOP UNITS MAY BE MOUNTING WITH THE INLET BOX.
- CONCRETE TOP UNITS - TYPE D-H
- CONCRETE TOP UNITS - TYPE D-H LEVEL
- STRUCTURAL STEEL GRATE
- STRUCTURAL STEEL GRATE - BICYCLE SAFE
- CAST IRON GRATES - 1
- CAST IRON GRATES - 2
- CAST IRON WARE GRATE
- GRADE ADJUSTMENT RINGS - 1
- GRADE ADJUSTMENT RINGS - 2
- TYPE C FRAME
- TYPE M FRAME
- TYPE M PLACEMENT AT MEDIAN - 1
- TYPE M PLACEMENT AT MEDIAN - 2
- CONCRETE TOP UNITS - TYPE M AND TYPE S FOR REHABILITATION PROJECTS
- CONCRETE TOP UNITS - TYPE C ALTERNATE FOR REHABILITATION PROJECTS
- A HIGHER STRENGTH OF CONCRETE MAY BE SUBSTITUTED FOR A LOWER STRENGTH OF CONCRETE AT NO ADDITIONAL COST TO THE DEPARTMENT, SUBJECT TO REVIEW AND ACCEPTANCE.
- GRADE 40 (GRADE 60) DEFORMED REINFORCEMENT BARS THAT MEET THE REQUIREMENTS OF ASTM A618 (OR ASTM A706) ARE PERMITTED. DO NOT WELD REINFORCEMENT BARS WITHOUT A PENNDOT APPROVED WELDING PROCEDURE.
- CLEAR COVER FOR STEEL:
 - PRECAST: 25 mm (1")
 - CAST-IN-PLACE: 50 mm (2")
- REINFORCEMENT PROJECTS: PROVIDE CONCRETE TOP UNITS IN ACCORDANCE WITH THE DETAILS SHOWN ON SHEETS 18 THRU 20 IF THE AVAILABLE DEPTH IS LESS THAN THE DEPTHS DETAILED ON SHEETS 2 THRU 4.
- CONTRACTOR TO REMOVE THE EXISTING TOP UNIT AND ANY GRADE ADJUSTMENT DEVICES, INCLUDING BRICK AND MORTAR AND GRADE ADJUSTMENT RINGS, DOWN TO THE TOP OF THE EXISTING INLET BOX. THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE REQUIRED DEPTH OF THE NEW CONCRETE TOP UNIT BASED ON THE AVAILABLE DEPTH. COST OF THIS WORK IS INCIDENTAL TO THE COST OF THE CONCRETE TOP UNIT. THE DEPTH OF THE CONCRETE TOP UNIT MUST ALWAYS BE MAINTAINED. FOR PRECAST CONCRETE TOP UNITS, THE CONTRACTOR MUST PROVIDE THE AVAILABLE DEPTH TO THE FABRICATOR FOR FABRICATION IN ACCORDANCE WITH THIS STANDARD. FOR CAST-IN-PLACE CONCRETE TOP UNITS, THE CONTRACTOR IS TO CONSTRUCT THE NEW TOP IN ACCORDANCE WITH THIS STANDARD.
- GALVANIZED PLATES, ANGLES AND STUDS OR BENT BAR ANCHORS (AFTER FABRICATION AND BEFORE INSTALLATION IN FORMS) IN ACCORDANCE WITH PUBLICATION 408, SECTION 110.010.
- CHAMFER EXPOSED CONCRETE EDGES 12 mm x 12 mm (1/2" x 1/2"), EXCEPT AS NOTED (CHAMFERS ARE NOT SHOWN ON THE DETAILS).
- PRECAST TOP UNITS: TAPERS MAY BE PROVIDED ON THE INSIDE AND/OR OUTSIDE VERTICAL FACES OF THE INLET TOPS TO FACILITATE FORM STRIPPING. TAPERS MAY RESULT IN BOTTOM DIMENSIONS THAT VARY BY A MAXIMUM 50 mm (2").
- REHABILITATION PROJECTS: PROVIDE CONCRETE TOP UNITS IN ACCORDANCE WITH THE DETAILS SHOWN ON SHEETS 18 THRU 20 IF THE AVAILABLE DEPTH IS LESS THAN THE DEPTHS DETAILED ON SHEETS 2 THRU 4.
- CONTRACTOR TO REMOVE THE EXISTING TOP UNIT AND ANY GRADE ADJUSTMENT DEVICES, INCLUDING BRICK AND MORTAR AND GRADE ADJUSTMENT RINGS, DOWN TO THE TOP OF THE EXISTING INLET BOX. THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE REQUIRED DEPTH OF THE NEW CONCRETE TOP UNIT BASED ON THE AVAILABLE DEPTH. COST OF THIS WORK IS INCIDENTAL TO THE COST OF THE CONCRETE TOP UNIT. THE DEPTH OF THE CONCRETE TOP UNIT MUST ALWAYS BE MAINTAINED. FOR PRECAST CONCRETE TOP UNITS, THE CONTRACTOR MUST PROVIDE THE AVAILABLE DEPTH TO THE FABRICATOR FOR FABRICATION IN ACCORDANCE WITH THIS STANDARD. FOR CAST-IN-PLACE CONCRETE TOP UNITS, THE CONTRACTOR IS TO CONSTRUCT THE NEW TOP IN ACCORDANCE WITH THIS STANDARD.

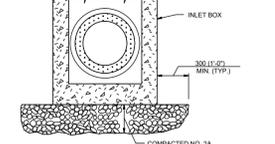
INDEX OF SHEETS	
SHEET NO.	SHEET TITLE
1	GENERAL NOTES
2	CONCRETE TOP UNITS - TYPE M AND TYPE S
3	CONCRETE TOP UNITS - TYPE C
4	CONCRETE TOP UNITS - TYPE C ALTERNATE
5	CONCRETE TOP UNITS - TYPE D-H
6	CONCRETE TOP UNITS - TYPE D-H LEVEL
7	STRUCTURAL STEEL GRATE
8	STRUCTURAL STEEL GRATE - BICYCLE SAFE
9	CAST IRON GRATES - 1
10	CAST IRON GRATES - 2
11	CAST IRON WARE GRATE
12	GRADE ADJUSTMENT RINGS - 1
13	GRADE ADJUSTMENT RINGS - 2
14	TYPE C FRAME
15	TYPE M FRAME
16	TYPE M PLACEMENT AT MEDIAN - 1
17	TYPE M PLACEMENT AT MEDIAN - 2
18	CONCRETE TOP UNITS - TYPE M AND TYPE S FOR REHABILITATION PROJECTS
19	CONCRETE TOP UNITS - TYPE C ALTERNATE FOR REHABILITATION PROJECTS
20	CONCRETE TOP UNITS - TYPE C ALTERNATE FOR REHABILITATION PROJECTS

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

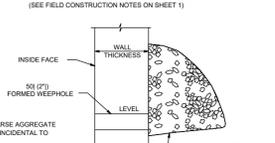
COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN

INLET TOPS, GRATES, AND FRAMES GENERAL NOTES		
RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT. 1 OF 20
CHIEF, HWY. QA DIVISION		DIRECTOR, BUREAU OF DESIGN
		RC-45M

- NOTES:**
- FOR ADDITIONAL NOTES, SEE SHEETS 1-3.
 - STANDARD INLET BOXES SHOWN, PROVIDE TOP SLABS FOR OTHER INLET BOX TYPES.
 - SEE RC-45M FOR DETAILS FOR THE CONCRETE TOP UNITS, FRAMES, AND GRATES.
 - PROVIDE GRADE ADJUSTMENT RINGS WHEN REQUIRED. SEE RC-45M FOR DETAILS.



INLET BOX SUBBASE PREPARATION DETAIL
(SEE FIELD CONSTRUCTION NOTES ON SHEET 1)

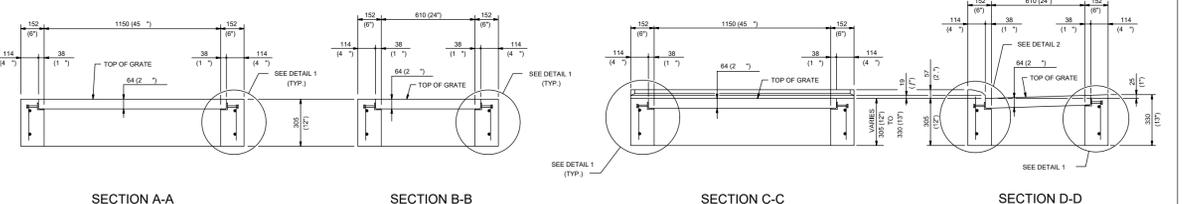
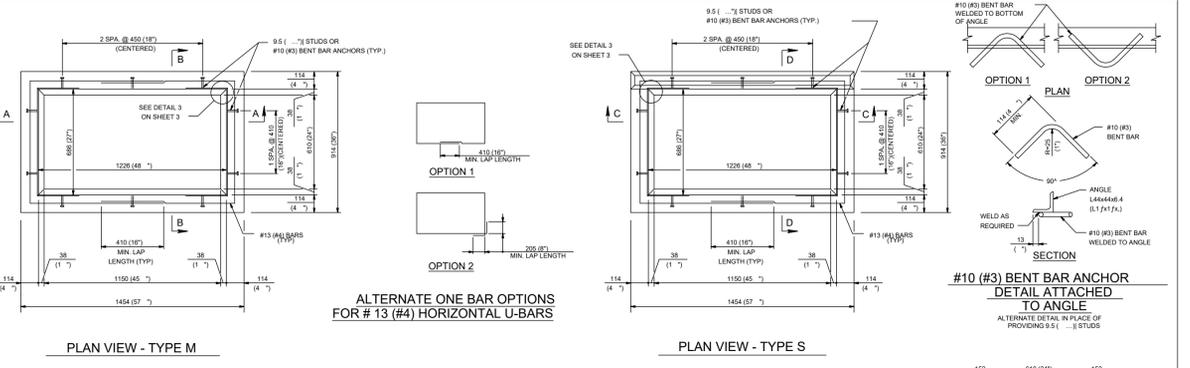


WEEP HOLE DETAIL
(SEE GENERAL NOTE 15 ON SHEET 1)

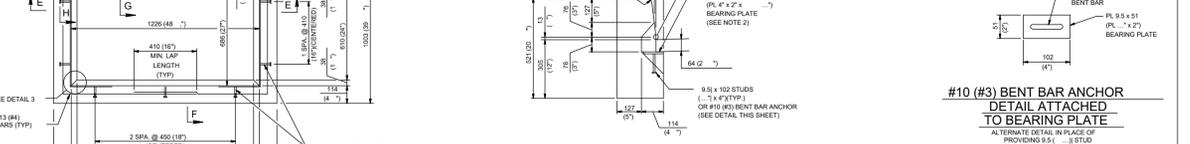
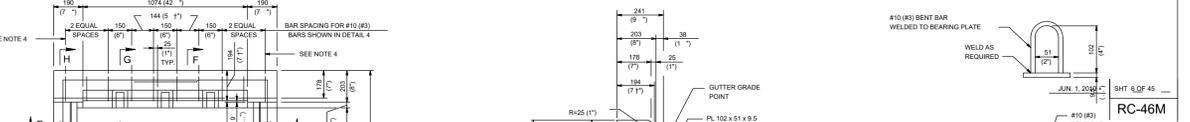
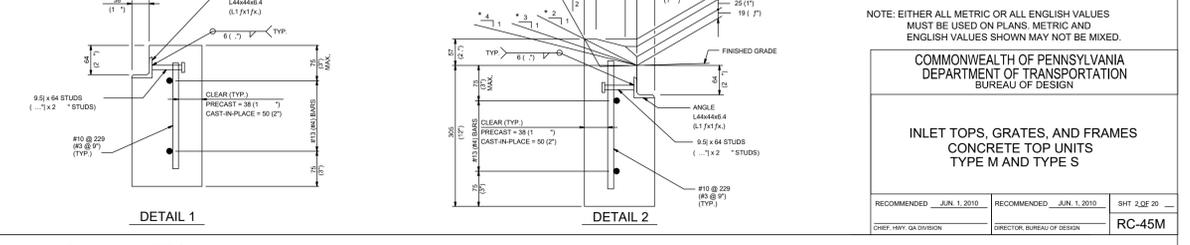
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN

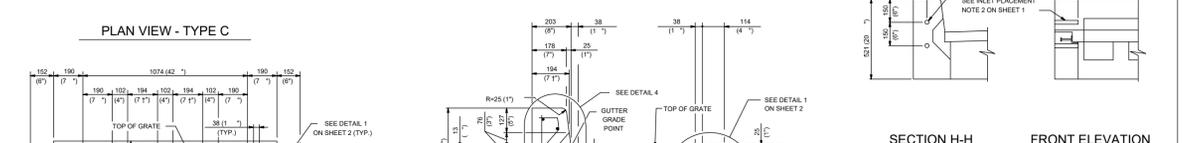
INLET BOXES INLET ASSEMBLY - 1		
RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT. 4 OF 45
CHIEF, HWY. QA DIVISION		DIRECTOR, BUREAU OF DESIGN
		RC-46M



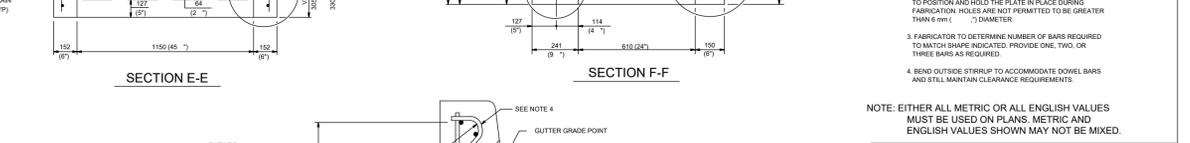
ALTERNATE ONE BAR OPTIONS FOR #13 (#4) HORIZONTAL U-BARS



SECTION E-E and **SECTION F-F**



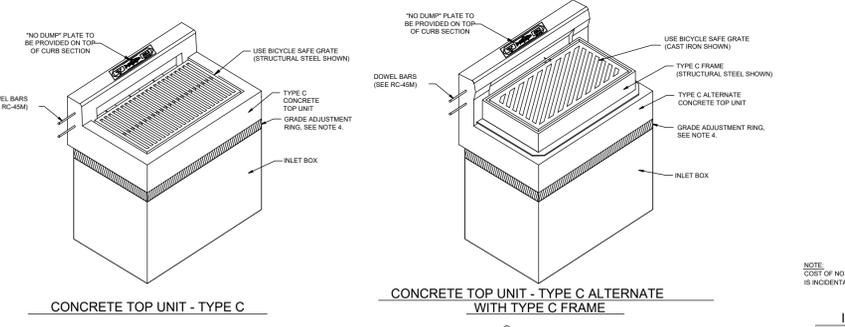
SECTION G-G



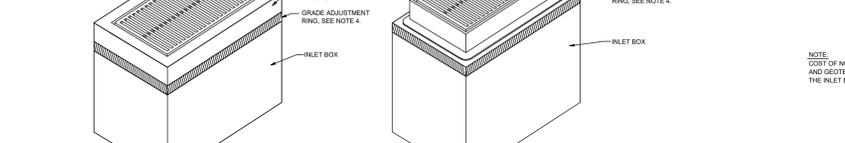
SECTION H-H and **FRONT ELEVATION**



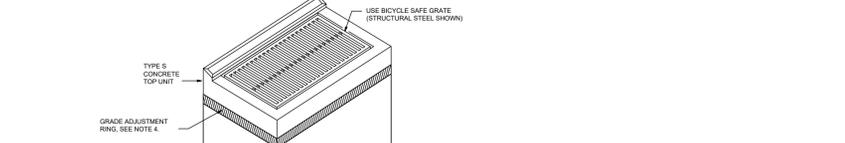
DETAIL 3 and **DETAIL 4**



CONCRETE TOP UNIT - TYPE C



CONCRETE TOP UNIT - TYPE C ALTERNATE WITH TYPE C FRAME



CONCRETE TOP UNIT - TYPE M



INLET BOX WITH TYPE M FRAME

CONCRETE TOP UNIT - TYPE S		
RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT. 1 OF 20
CHIEF, HWY. QA DIVISION		DIRECTOR, BUREAU OF DESIGN
		RC-45M

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ATTENTION: ALL CONTRACTORS, SUBMITTERS OF ALL EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANY RECORDS AND NO ASSURANCE IS GIVEN AS TO THE ACCURACY OF THE LOCATION, DEPTH OR HORIZONTAL LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES. CONTRACTOR SHALL VERIFY THE LOCATION, DEPTH AND HORIZONTAL LOCATION OF ALL UTILITIES AND STRUCTURES PRIOR TO START OF WORK. SEE SPEC. 202.01.

2024.0317187

NO.	DATE	REVISIONS	BY	CHKD
3	02/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 3/4" RIBS SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR RIBS PRESUBMISSION	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN

REGISTERED PROFESSIONAL ENGINEER
CHRISTOPHER W. JENSEN
ENGINEER NO. PC78464

12/19/2024
LICENSED PROFESSIONAL ENGINEER
STATE OF PA LICENSE NO. PED76404

COMMERCE PURSUIT CAPITAL

TROOPER RIDGE SUBDIVISION
1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA

STORM SEWER DETAILS - 2

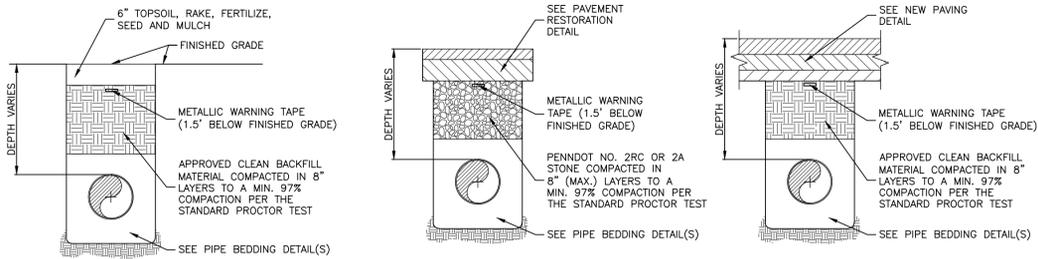
AND

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1700 MARKET STREET, SUITE 3110
PHILADELPHIA, PA 19103
TEL 215-282-7850
FAX 215-627-3459

OFFICES LOCATED IN:
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DESIGNED BY	DRAWING
JPK/CKS/CMR/ROP/ZHR	STRMD-2
CHECKED BY	BGS/ZHR
DRAWN BY	SCR/CKS/RAM
DATE	12/19/2024
SCALE	AS NOTED
PROJ. NO.	WDEW0004
	OF 46



UNPAVED AREAS

EXISTING PAVED AREAS

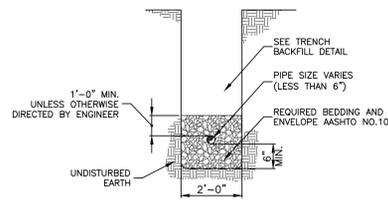
NEW ROADWAYS & PARKING AREAS

NOTES:

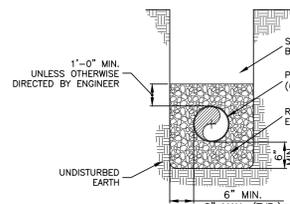
- TRENCH COMPACTION TO BE TESTED, AT THE DEVELOPER'S EXPENSE, IN ACCORDANCE WITH PENNDOT PUB 408, LATEST REVISION, AS REQUIRED BY THE MUNICIPALITY/AUTHORITY HAVING JURISDICTION.
- CLEAN FILL MUST BE APPROVED BY THE MUNICIPALITY/AUTHORITY HAVING JURISDICTION PRIOR TO PLACEMENT IN THE TRENCH.
- AREAS AROUND MANHOLES, INLETS, AND OTHER APPURTENANCES SHALL BE HAND COMPACTED AS DIRECTED BY THE MUNICIPALITY/AUTHORITY HAVING JURISDICTION.
- NO SLAG MATERIAL PERMITTED.
- IF WATER IS ENCOUNTERED IN THE EXCAVATION TRENCH, ASHTO #57 AGGREGATE MUST BE USED.
- ALL MATERIALS AND CONSTRUCTION METHODS SHALL COMPLY WITH PENNDOT SPECIFICATIONS, PUBLICATION 408 AND 67 PA CODE SECTION 459.
- UNDER NO CIRCUMSTANCES SHALL WATER BE ALLOWED TO COLLECT IN EXCAVATED TRENCHES. ANY WATER IN THE TRENCHES SHALL BE REMOVED THROUGH A PUMPED WATER FILTER BAG.

BACKFILL (TRENCH)

NOT TO SCALE



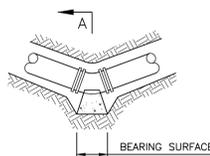
WATER SERVICE



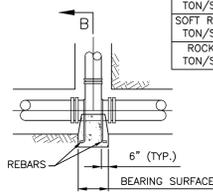
WATER MAIN

PIPE BEDDING (WATER MAIN AND SERVICE)

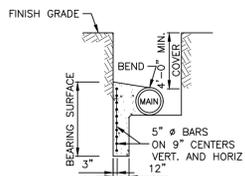
NOT TO SCALE



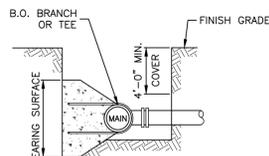
PLAN



PLAN



SECTION A-A



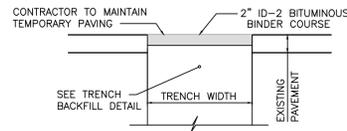
SECTION B-B

NOTES:

- ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI.
- ALL REINFORCING STEEL SHALL BE DEFORMED BARS (ASTM GRADE 60).
- ALL FITTINGS AND JOINTS SHALL BE COVERED WITH POLYETHYLENE FILM BEFORE PLACING OF CONCRETE.
- PAINT ALL EXPOSED STEEL WITH TWO COATS OF BITUMASTIC PAINT OR EPOXY COATING.
- FOR THE REQUIRED BEARING SURFACE SEE STANDARD THRUST BLOCKING DETAIL.
- BEARING SURFACE MUST BE UNDISTURBED EARTH.

WATER-HORIZONTAL THRUST BLOCKING

NOT TO SCALE



TEMPORARY TRENCH RESTORATION

NOT TO SCALE

BEARING SURFACE REQUIRED - SQ.FT. HORIZONTAL THRUST BLOCKING & VERTICAL THRUST DOWNWARD 125 P.S.I. WORKING PRESSURE

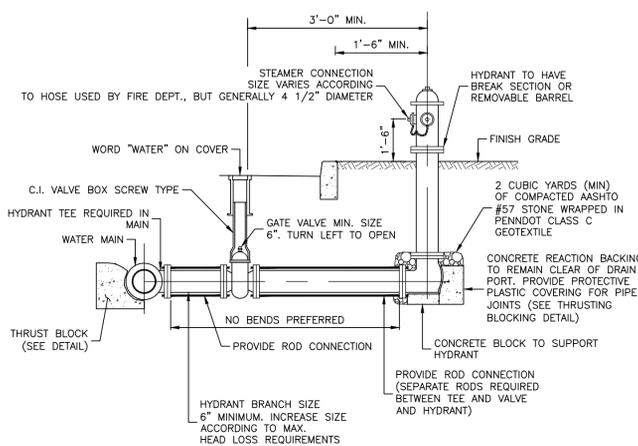
PIPE SIZE	6" & 8"				10" & 12"				16" 18" 20"				24"			
	22.5'	45'	90'	D.E.	22.5'	45'	90'	D.E.	22.5'	45'	90'	D.E.	22.5'	45'	90'	D.E.
SAND 0.75 TON/SQ.FT.	3.4	6.0	11.0	6.4	6.7	12.8	23.4	14.2	14.8	28.8	52.9	34.4	26.1	48.3	89.7	64.0
SOFT CLAY 1 TON/SQ.FT.	2.6	4.6	8.2	4.8	5.0	9.6	17.5	10.7	11.2	21.7	39.7	28.2	19.6	36.3	67.3	48.0
SAND AND GRAVEL 2 TON/SQ.FT.	1.3	2.3	4.1	2.4	2.5	4.8	8.8	5.3	5.6	10.8	20.0	14.1	9.8	13.1	33.6	24.0
CLAY 4 TON/SQ.FT.	1.0	1.2	2.1	1.3	1.3	2.4	4.4	2.7	2.8	5.4	10.0	7.2	4.9	9.1	16.8	12.0
SOFT ROCK 5 TON/SQ.FT.	1.0	1.0	1.6	1.0	1.0	1.9	3.5	2.2	1.6	4.4	8.0	5.7	3.9	7.3	13.5	9.6
ROCK 15 TON/SQ.FT.	-	-	1.0	0.4	-	1.0	1.2	0.8	1.0	1.4	2.6	1.9	1.3	2.4	4.5	3.2
PIPE SIZE	30"				36"				42"				48"			
TYPE OF BEARING MATERIAL AND ALLOWABLE LOADS	DEGREE OF BEND OR DEFLECTION															
	22.5'	45'	90'	D.E.	22.5'	45'	90'	D.E.	22.5'	45'	90'	D.E.	22.5'	45'	90'	D.E.
SAND 0.75 TON/SQ.FT.	40.3	76.5	139.0	99.1	55.5	107.5	197.5	140.0	74.3	144.7	266.5	188.7	83.2	182.3	336.2	238.0
SOFT CLAY 1 TON/SQ.FT.	30.2	57.4	104.3	74.3	41.6	80.6	148.0	105.0	55.7	108.5	200.0	141.6	70.0	136.7	252.2	178.0
SAND AND GRAVEL 2 TON/SQ.FT.	15.1	28.7	52.1	37.2	20.8	40.3	74.0	52.5	27.9	54.3	100.0	70.8	35.0	68.3	126.1	89.2
CLAY 4 TON/SQ.FT.	7.6	14.6	26	18.6	10.4	20.2	37.0	26.3	14.0	27.0	50.0	35.3	17.5	34.2	63.0	44.6
SOFT ROCK 5 TON/SQ.FT.	6.0	11.5	20.9	14.9	8.3	16.1	29.6	21.0	11.2	21.7	40.0	28.3	14.0	27.3	50.4	35.7
ROCK 15 TON/SQ.FT.	2.0	3.8	7.0	5.0	1.4	2.8	5.4	7.0	3.7	7.2	13.3	9.4	4.7	9.1	16.8	12.0

NOTES:

- D.E. DENOTES DEAD END.

WATER-THRUST BLOCKING TABLE

NOT TO SCALE

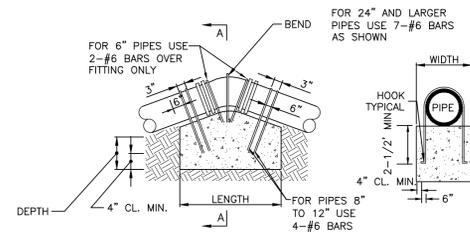


NOTES:

- MAXIMUM HEAD LOSS 5 PSI BETWEEN MAIN AND HYDRANT OUTLET FOR 750 GPM FLOW.
- HYDRANT TO BE PLACED WITH STEAMER CONNECTION FACING STREET @ 1'-6" BEHIND FACE OF CURB OR E.O.P. (TYP.)
- MEGA-LUG REQUIRED AT VALVE (ON HYDRANT SIDE ONLY IF HYDRANT TEE IS UTILIZED) AND AT HYDRANT.
- ALL PROPOSED PLUMBING TO BE INSTALLED IN STRICT ACCORDANCE WITH SPECIFICATIONS OF AUTHORITY HAVING JURISDICTION.
- MINIMUM OF 4'-0" OF COVER OVER ALL PIPES.
- HYDRANT TO HAVE 5' SEAT OPENING.

FIRE HYDRANT

NOT TO SCALE



TYPICAL SECTION - VERTICAL THRUST UPWARD

SECTION A-A

CONCRETE BLOCKING DIMENSIONS, VERTICAL THRUST UPWARD 150 P.S.I. WORKING PRESSURE

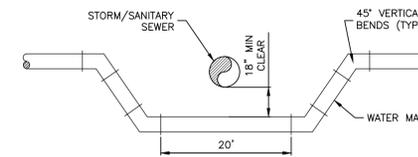
PIPE SIZES	LENGTH			WIDTH			DEPTH		
	11 1/2"	22 1/2"	45"	11 1/2"	22 1/2"	45"	11 1/2"	22 1/2"	45"
6" & 8"	3'	4'	6'	3'	3'	3'	2'	3'	4'
10" & 12"	3.5'	4'	7'	4'	4'	4'	2.5'	3'	4'
14" & 16"	4'	6'	9'	4.5'	4.5'	4.5'	3.5'	4'	5'
18" & 20"	5'	6.5'	11.5'	5'	5'	5'	4'	5'	5.5'
24"	5'	9'	12.5'	5'	5'	6'	4.5'	5'	6'
30"	5.5'	9'	13.5'	5.5'	6'	7'	5.5'	6'	7'
36"	6.5'	11'	14'	5.5'	6.5'	7'	6'	6.5'	7'
42"	9'	13.5'	15'	6'	7'	7'	6'	7'	7'
48"	10'	14'	16'	6'	7'	7'	6'	7'	7'

NOTES:

- ALL CONC. SHALL HAVE MIN. COMPRESSIVE STRENGTH OF 3000 PSI AT THE END OF 28 DAYS.
- ALL REINFORCING STEEL SHALL BE DEFORMED BARS (ASTM GRADE 60)
- ALL FITTINGS AND JOINTS SHALL BE COVERED WITH POLYETHYLENE FILM BEFORE PLACING CONC.
- PAINT ALL EXPOSED STEEL WITH TWO COATS OF VALUURA PAINT OR APPROVED EQUAL.
- REINFORCING BARS SHALL BE U-SHAPE AROUND THE PIPE.

THRUST BLOCKING TABLE-VERTICAL-UPWARD

NOT TO SCALE

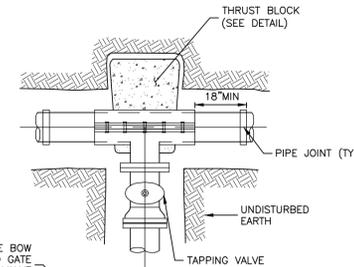


NOTES:

- ALL PIPE AND FITTINGS SHALL BE RESTRAINED PER AUTHORITY SPECIFICATIONS AND BY DIRECTION OF THE ENGINEER.
- THE USE OF CONCRETE THRUST BLOCK SHALL BE PER THE DIRECTION OF THE AUTHORITY AND ENGINEER.

STORM SEWER - SANITARY SEWER WATER CROSSING

NOT TO SCALE



STANDARD VALVE BOX

SEE STANDARD GATE VALVE AND VALVE BOX DETAIL

TAPPING VALVE

SEE STANDARD GATE VALVE AND VALVE BOX DETAIL

NOTES:

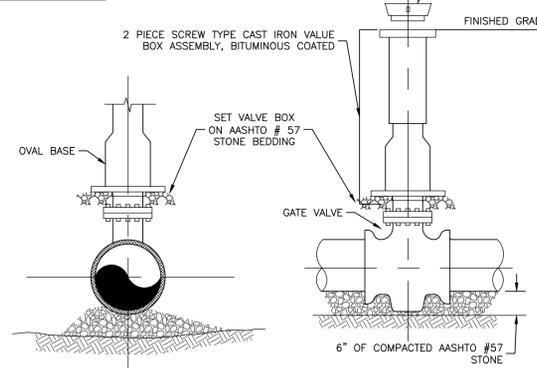
- TAPPING SLEEVE SHALL BE AIR-TESTED PRIOR TO THE LIVE MAIN BEING TAPPED.

TAPPING SLEEVE AND VALVE

NOT TO SCALE



COVER DETAIL



END

ELEVATION

NOTES:

- VALVE SHALL NOT COME INTO CONTACT WITH VALVE.

STANDARD GATE VALVE AND VALVE BOX

NOT TO SCALE

ATTENTION: ALL CONSTRUCTION, LOCATION OF ALL EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANIES RECORDS AND/OR FIELD SURVEY. THE ENGINEER HAS NOT VERIFIED THE COMPLETENESS OR ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES. OWNER IS RESPONSIBLE FOR OBTAINING NECESSARY PERMITS AND FOR VERIFYING THE LOCATION OF ALL UTILITIES AND STRUCTURES PRIOR TO START OF WORK. SEE PLAN SHEET NO. 2024337187

NO.	DATE	REVISIONS	BY	CHKD
1	01/24/25	UPDATES FOR RFP'S PRE-SUBMISSION MITG	ZHR	
2	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BBS
3	02/26/25	REVISED PER ALL RFP'S SUBMISSION	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER



12/19/2024
LICENSED PROFESSIONAL ENGINEER
STATE OF PA LICENSE NO. PED76464

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
UTILITY DETAILS-1

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DESIGNED BY: JPK/CKS/CMR/RDP/ZHR
CHECKED BY: BGS/ZHR
DRAWN BY: SCR/CKS/RAM
DATE: 12/19/2024
SCALE: AS NOTED
PROJ. NO.: WDE00004

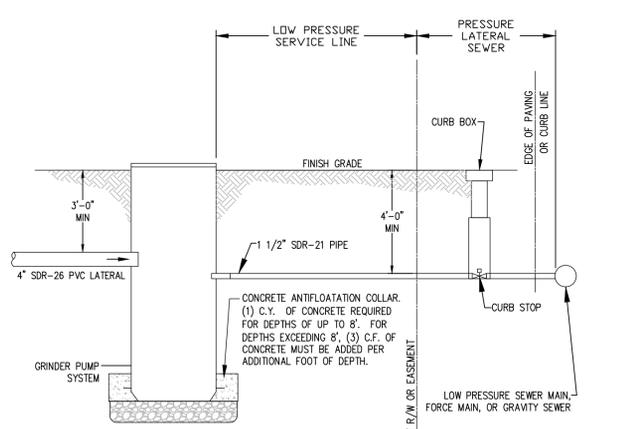
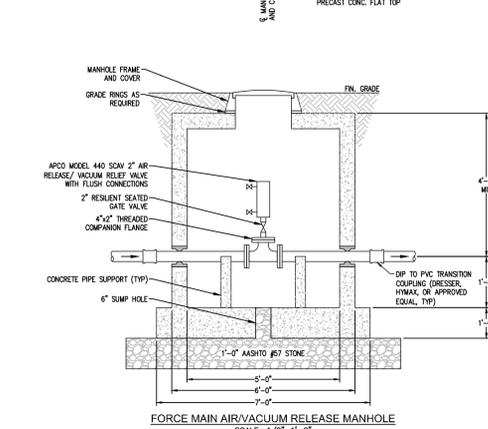
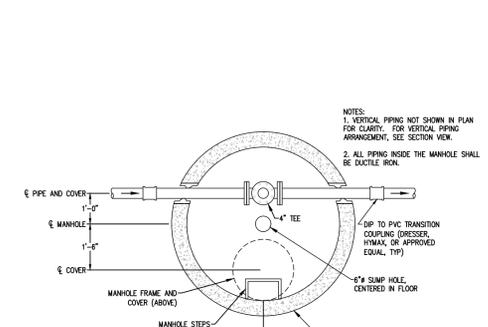
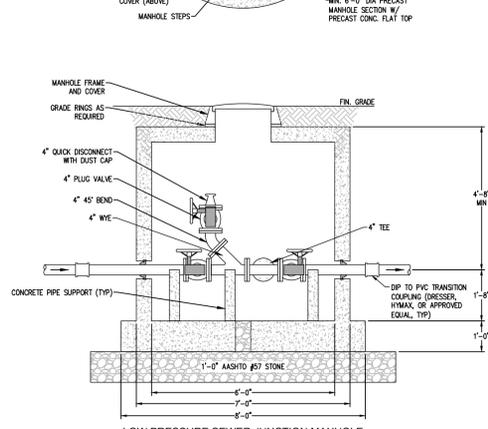
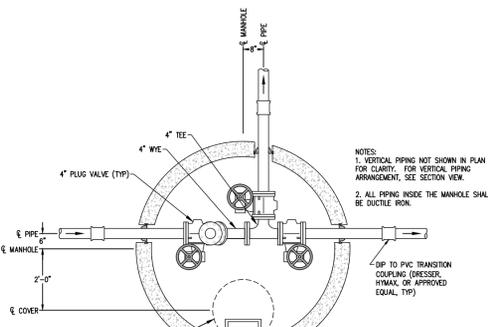
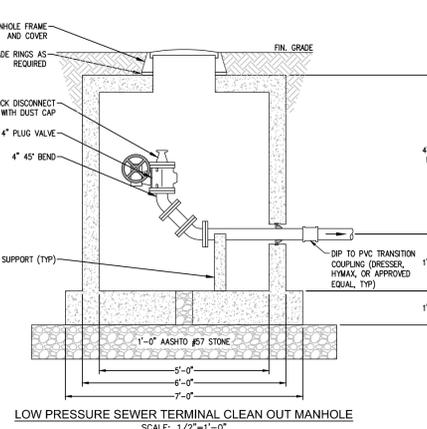
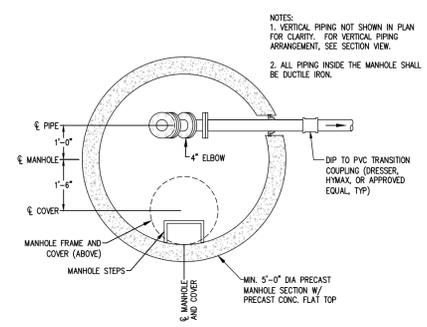
DRAWING: UTLD-1
SHEET: 30
OF 46

PROJECT INFORMATION:
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FILE NAME: WDEV0004_DTL.dwg
DATE: 03 Apr 2025, 5:03PM
LAST SAVE BY: C5602640

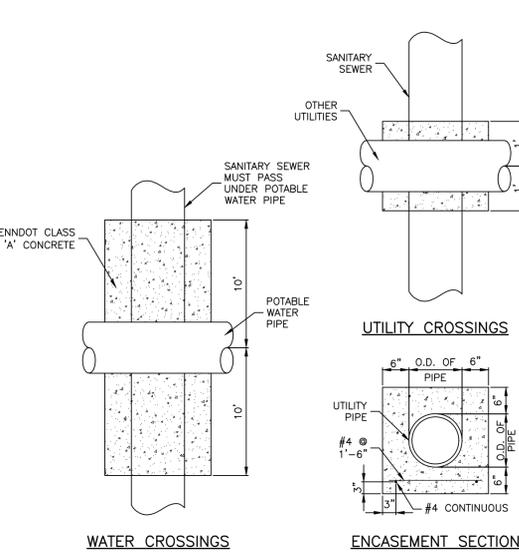
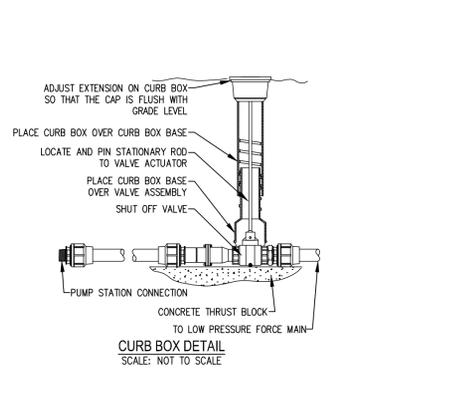
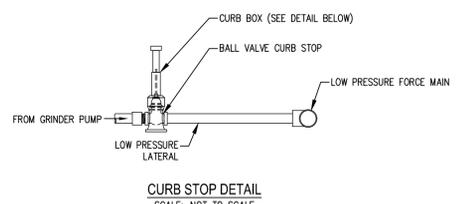
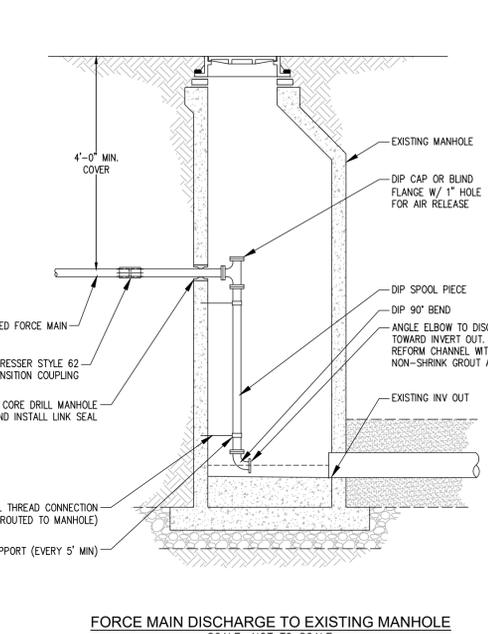
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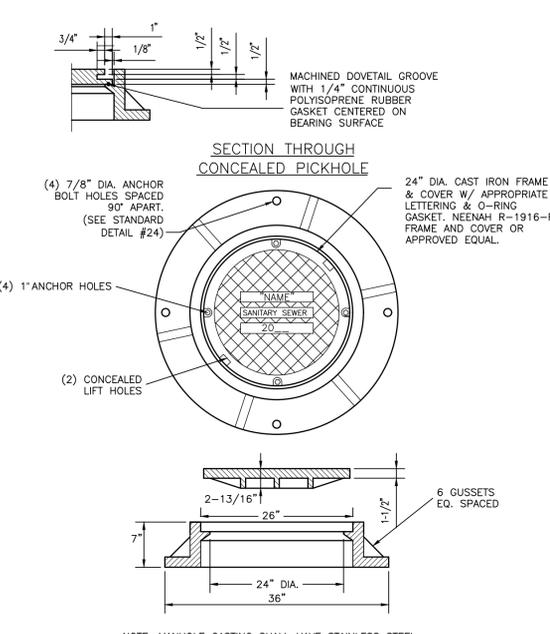
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SIMPLEX GRINDER PUMP PLUMBING DETAIL
 SCALE: NOT TO SCALE



UTILITY CROSSING (CONCRETE ENCASEMENT)
 NOT TO SCALE



HEAVY DUTY CAST IRON MANHOLE FRAME AND SELF-SEALING COVER
 NOT TO SCALE

ATTENTION: ALL CONTRACTORS LOCATING OR EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANIES RECORDS AND/OR ABOVE-GROUND SURVEYS OF THE SITE. COMPLETENESS OR ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES CANNOT BE GUARANTEED. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES AND FACILITIES PRIOR TO START OF WORK. SEE ALSO: 20243371817

NO.	DATE	REVISIONS	BY	CHKD
1	01/24/25	UPDATES FOR NIPES PRE-SUBMISSION MITG	ZHR	
2	02/26/25	UPDATES FOR 44 NIPES SUBMISSION	JPK	
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	BGS	

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL
 TROOPER RIDGE SUBDIVISION
 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
 UTILITY DETAILS - 2

AND
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 1700 MARKET STREET, SUITE 3110
 PHILADELPHIA, PA 19103
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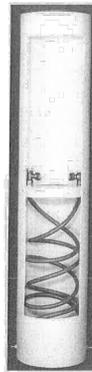
OFFICES LOCATED IN:
 CALIFORNIA, INDIANA, KENTUCKY,
 MASSACHUSETTS, MICHIGAN, NEW JERSEY,
 OHIO AND PENNSYLVANIA

DESIGNED BY
 JPK/CKS/CMR/ROP/ZHR
 CHECKED BY
 BGS/ZHR
 DRAWN BY
 SCR/CKS/RAM
 DATE
 12/19/2024
 SCALE
 AS NOTED
 PROJ. NO.
 WDEV0004A

DRAWING
 UTLD-2
 SHEET
 31
 OF 46

**MUELLER® / HUNT
THERMAL-COIL® METER BOX**

Mueller Co. 8F.1



The MUELLER / Hunt THERMAL-COIL Meter Box provides a means to allow a meter to be read and maintained even though it is set deep in the ground to resist freezing. The THERMAL-COIL Meter Box is designed with the meter installed on a platform that normally sets near the bottom of the box where the ground temperature keeps it warmer. The meter and platform are connected to the service line by coils of polybutylene tubing which allow the meter and platform to be raised to the surface.

The body of the meter box is made from rigid PVC which has a high insulating "R" value to resist frost bridging* inside the box. For extremely cold climates, an optional insulating pad is available which traps the relatively warm air rising from the earth inside the box.

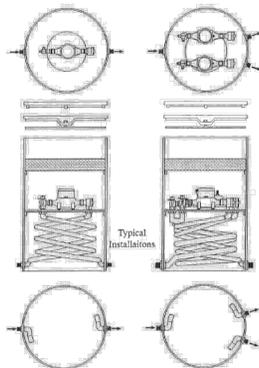
MUELLER / Hunt THERMAL-COIL Meter Boxes are shipped fully assembled, ready for meter installation. Their light weight saves shipping costs and makes installation a one man job in most cases. Every box is factory tested and has a 150 psig maximum working pressure rating.

MUELLER / Hunt THERMAL-COIL Meter Boxes are available for 5/8" to 1" meters. A wide variety of end connections, control valves, box depths, lids and other options provide you with the meter set you need. Due to the almost endless combination of features available, each box is custom built to your specifications. See page 8F.2 for options and ordering instructions.

Manufactured under one or more of the following: U.S. Patent No. 4,614,113; 4,813,281

MUELLER / Hunt THERMAL-COIL Meter Box Features

- Rigid .300 minimum wall PVC material holds shape and resists frost bridging
- Optional insulation pad traps earth's heat to prevent freezing in extremely cold climates
- White interior aids visibility
- Meter set is anchored to moveable platform to maintain alignment and stability
- Platform support and reinforcing ring add rigidity to box
- Poly coil tubing provides low friction loss equivalent to a typical conventional meter set of the same size and depth
- Male I.P. thread inlet and outlet connections accept a variety of MUELLER Service Fittings—see section 6
- Optional aluminum bottom available
- Large selection of optional lids



REF: 10/20/2018

MUELLER Valves and Couplings used in these meter box assemblies are manufactured and tested in accordance with ANSI/AWWA C800.

8F.2 Mueller Co.

**MUELLER® / HUNT
THERMAL-COIL® METER BOX**

Rev. 4-99

MUELLER / Hunt THERMAL-COIL Meter Box ordering instructions

To order a MUELLER / Hunt THERMAL-COIL Meter Box, simply choose the options you require from the eight categories listed below and place the option code on the appropriate line of the catalog number shown below.

If the box you need is a tandem type, please fill out the tandem information box shown below the options listing and contact the factory for price and delivery information. Phone 1-800-821-3553 or fax 1-615-895-7686.

Catalog Number PIT MUST HAVE COMPOSITE LID. CANNOT BE LOCATED IN TRAFFIC AREA.

(1) _____ (2) _____ (3) _____ (4) _____ (5) _____ (6) _____ (7) _____ (8) _____

Options

1 Meter size NOTE: Meter is not furnished. Order meter separately.	<table border="1"> <thead> <tr> <th>Meter size</th> <th>Code number</th> </tr> </thead> <tbody> <tr> <td>5/8"</td> <td>200</td> </tr> <tr> <td>3/4"</td> <td>250</td> </tr> <tr> <td>1"</td> <td>300</td> </tr> </tbody> </table>	Meter size	Code number	5/8"	200	3/4"	250	1"	300	5 Meter inlet type	<table border="1"> <thead> <tr> <th>Meter inlet</th> <th>Code number</th> </tr> </thead> <tbody> <tr> <td>Locking angle meter stop</td> <td>L</td> </tr> <tr> <td>Locking angle ball valve (full port)</td> <td>FB</td> </tr> <tr> <td>Locking angle ball valve (reduced port)</td> <td>FR</td> </tr> </tbody> </table>	Meter inlet	Code number	Locking angle meter stop	L	Locking angle ball valve (full port)	FB	Locking angle ball valve (reduced port)	FR																				
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Tandem box order information N/A

Type of tandem device (regulator, backflow preventer etc) _____

Size _____ and length _____ of tandem device

Tandem device manufacturer's name _____ Tandem device model number _____

* NOTE: Tandem device is not included and must be purchased separately. ALSO, 3/4" tandems systems when used with certain regulators may need to be placed within a 18" box; list the regulator model when specifying this system. If an ASSE check valve or ball valve is being used in a 3/4" setting then an 18" meter box will be required.

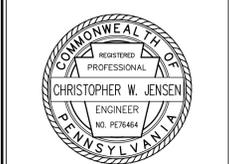
MUELLER Valves and Couplings used in these meter box assemblies are manufactured and tested in accordance with ANSI/AWWA C800.

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2024371817

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 3/4" PIPES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR METERS PRE-SUBMISSION	ZHR	ZHR

CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER



12/19/2024
LICENSED PROFESSIONAL ENGINEER
STATE OF PA LICENSE No. PED76464

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
1035 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA

UTILITY DETAILS-3

AND
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1700 MARKET STREET, SUITE 3110
PHILADELPHIA, PA 19103
TEL 215-282-7850
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OFFICES LOCATED IN:
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DESIGNED BY JPK/CKS/CMR/ROP/ZHR	DRAWING UTLD-3
CHECKED BY BGS/ZHR	SHEET 32
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDEV00004	

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LANDSCAPE PLANTING NOTES AND SPECIFICATIONS:

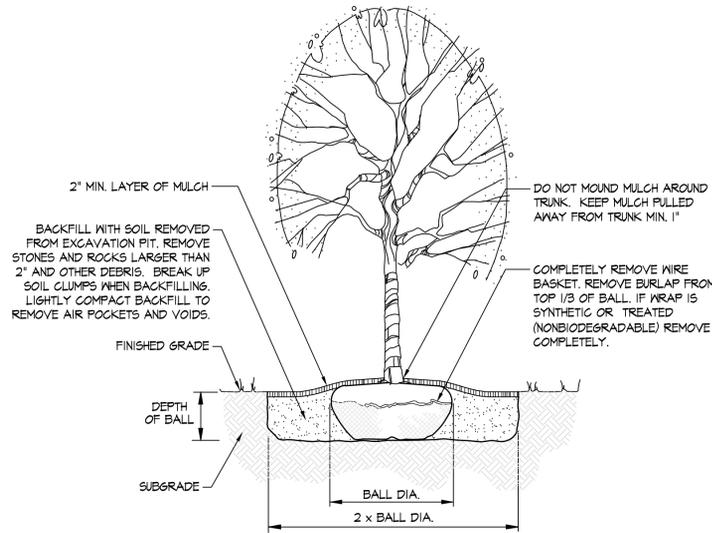
- ALL PLANT MATERIAL SHALL BE PROVIDED AND INSTALLED IN STRICT CONFORMANCE WITH USDA STANDARDS FOR NURSERY STOCK AND THE "AMERICAN NURSERY AND LANDSCAPE ASSOCIATION" STANDARDS LATEST EDITIONS.
- THE CONTRACTOR SHALL VERIFY ALL UTILITIES WITHIN WORK AREA PRIOR TO COMMENCING WITH ANY EXCAVATIONS AND SHALL BE RESPONSIBLE FOR THEIR PROTECTION.
- THE CONTRACTOR SHALL FURNISH AND PLANT ALL PLANTS SHOWN ON THE DRAWINGS, AS SPECIFIED, AND IN QUANTITIES INDICATED ON THE PLANT LIST. IF A DISCREPANCY SHOULD ARISE BETWEEN THE AMOUNT OF PLANTS SHOWN ON THE PLAN VS. THE PLANT SCHEDULE, THE PLAN SHALL GOVERN.
- ALL PLANTS SHALL BE NURSERY GROWN.
- ALL PLANTS SHALL BE HARDY UNDER CLIMATIC CONDITIONS SIMILAR TO THOSE IN THE LOCALITY OF THE PROJECT.
- ALL PLANTS SHALL BE TYPICAL OF THEIR SPECIES OR VARIETY AND SHALL HAVE A NORMAL HABIT OR GROWTH. THEY SHALL BE SOUND, HEALTHY AND VIGOROUS WELL BRANCHED AND DENSELY FOLIATED WHEN IN LEAF THEY SHALL BE FREE OF DISEASE AND INSECT PESTS, EGGS OR LARVAE. THEY SHALL HAVE HEALTHY WELL-DEVELOPED ROOT SYSTEMS.
- SUBSTITUTIONS: WHEN PLANTS OF A SPECIFIED KIND OR SIZE ARE NOT AVAILABLE WITHIN A REASONABLE DISTANCE, SUBSTITUTIONS MAY BE MADE UPON REQUEST BY THE CONTRACTOR IF APPROVED BY THE LANDSCAPE ARCHITECT AND THE TOWNSHIP ENGINEER.
- ALL AREAS TO BE SHOWN AS LAWN SHALL BE SEEDED, AS SPECIFIED, AND WATERED UNTIL A HEALTHY STAND OF GRASS IS OBTAINED WITH A MINIMUM OF 90% COVER PER 5 SQUARE FEET OF LAWN AREA AVERAGE.
- TREE LOCATIONS MAY NEED TO BE ADJUSTED BASED ON LOCATIONS OF UTILITIES, FIELD CONDITIONS, OR FINAL GRADING. THE CONTRACTOR SHALL NOTIFY THE OWNER AND/OR THEIR REPRESENTATIVE IF ADJUSTMENTS ARE NECESSARY.
- ALL SHRUBS TO BE PLANTED IN CONTINUOUS MULCH BEDS UNLESS OTHERWISE NOTED. ALL PLANTING BEDS TO RECEIVE 3" SHREDDED HARDWOOD MULCH.
- ALL PLANTS DELIVERED TO THE SITE MUST BE INSTALLED WITHIN 24 HOURS. IF PLANTS MUST BE STORED LONGER THAN 24 HOURS THEY ARE TO BE HEeled IN WITH MULCH AND SUFFICIENTLY WATERED TO PREVENT DRYNESS AND DESICCATION. IN NO CASE SHALL PLANTS BE STORED MORE THAN 12 HOURS WITHOUT APPROVAL FROM THE OWNERS REPRESENTATIVE.
- ROOT BALLS OF ALL PLANTS SHALL BE ADEQUATELY PROTECTED AT ALL TIMES FROM SUN AND DRYING WINDS OR FROST. PLANTS WITH BROKEN ROOT BALLS, TRUNK AND BARK DAMAGE OR EXCESSIVE DAMAGE TO THE CROWN SHALL BE REPLACED PRIOR TO PLANTING.
- ROPES AT TOP OF BALL SHALL BE CUT. REMOVE TOP 1/3 OF BURLAP MINIMUM. ALL NON-BIODEGRADABLE MATERIAL SHALL BE TOTALLY REMOVED. WIRE BASKETS SHALL BE CAREFULLY REMOVED ENTIRELY AT THE TIME OF PLANTING, PREFERABLY AFTER THE ROOT BALL HAS BEEN INSTALLED IN THE PLANTING PIT.
- PREPARATION OF PLANTING: CLEAN SOIL EXCAVATED FROM PLANTING PIT OF ROOTS, PLANTS, STONES LARGER THAN 2", CLAY LUMPS, AND OTHER EXTRANEOUS MATERIALS HARMFUL OR TOXIC TO PLANT GROWTH.
- DO NOT ALLOW AIR POCKETS TO FORM WHEN BACKFILLING.
- NO PLANT SHALL BE PLACED IN THE GROUND BEFORE ROUGH GRADING HAS BEEN COMPLETED AND APPROVED BY THE PROJECT LANDSCAPE ARCHITECT OR HIS/HER EQUAL.

- INSTALL ALL PLANTS SO THAT THE TOP OF THE ROOTBALL IS SLIGHTLY ABOVE FINISHED GRADE. IN NO CASE SHALL THE PLAN BE INSTALLED WITH NO LESS THAN THE SAME RELATIONSHIP TO FINISHED GRADE AS THE PLANT'S ORIGINAL ROOT CROWN. EXCESS SOIL MAY EXIST AROUND THE ROOT CROWN FROM NURSERY OPERATIONS. THIS EXCESS MATERIAL SHALL BE REMOVED PRIOR TO PLANTING TO DETERMINE THE PROPER BALL INSTALLATION DEPTH.
- ALL EXISTING TREES THAT ARE TO BE SAVED AS DETERMINED BY LANDSCAPE ARCHITECT SHALL BE PROTECTED UNTIL CONSTRUCTION HAS BEEN COMPLETED. AREA WITHIN DRIPLINE SHALL NOT BE TRAVELED ACROSS BY CONSTRUCTION TRAFFIC.
- TREES PLANTED ALONG STREETS SHALL HAVE A SINGLE STRAIGHT TRUNK THAT DOES NOT FORK BELOW 6'.
- ALL PLANTS SHALL BE BALLED AND WRAPPED OR CONTAINER GROWN AS SPECIFIED. NO CONTAINER GROWN STOCK WILL BE ACCEPTED IF IT IS ROOT BOUND. ALL NON-BIODEGRADABLE ROOT WRAPPING MATERIAL SHALL BE REMOVED AT TIME OF PLANTING.
- WITH CONTAINER GROWN STOCK, THE CONTAINER SHALL BE REMOVED AND THE CONTAINER BALL CUT THROUGH THE SURFACE IN TWO VERTICAL LOCATIONS MINIMUM.
- THE CONTRACTOR SHALL LAYOUT WITH IDENTIFIABLE STAKES INDIVIDUAL TREE AND SHRUB LOCATIONS AND AREAS FOR MULTIPLE PLANTING ALONG WITH THE ARRANGEMENTS AND OUTLINE OF PLANTING BEDS AS INDICATED ON DRAWING. THE LAYOUT OF PLANTING WILL THEN BE APPROVED BY LANDSCAPE ARCHITECT PRIOR TO ANY EXCAVATION OF PLANT PITS OR PLANT BEDS.
- AT PLANTING TIME, ALL PLANT MATERIAL SHALL TRIMMED TO REMOVE BROKEN AND/OR DEAD VEGETATIVE MATERIAL.
- ALL PLANTS SHALL BE INSTALLED AS PER THE PLANTING DETAILS AND THE CONTRACT SPECIFICATIONS, WHERE APPLICABLE.
- ALL PLANTS SHALL BE INSTALLED PLUMB UNLESS OTHERWISE SPECIFIED.
- ALL PLANTS SHALL BE THOROUGHLY WATERED TWICE DURING THE FIRST 24 HOUR PERIOD AFTER PLANTING. ALL PLANTS SHALL THEN BE WATERED WEEKLY OR MORE OFTEN, IF NECESSARY, DURING THE FIRST GROWING SEASON.
- CONDITIONS DETRIMENTAL TO PLANTS: THE CONTRACTOR SHALL NOTIFY THE PROJECT REPRESENTATIVE IN WRITING OF ALL SOIL OR DRAINAGE CONDITIONS WHICH THE CONTRACTOR CONSIDERS DETRIMENTAL TO THE GROWTH OF PLANTS. HE SHALL STATE THE CONDITIONS AND SUBMIT A PROPOSAL FOR CORRECTING THE CONDITIONS INCLUDING ANY CHANGE IN COST FOR REVIEW AND ACCEPTANCE BY THE PROJECT REPRESENTATIVE.
- WARRANT TREES AND SHRUBS FOR A MINIMUM PERIOD OF EIGHTEEN (18) MONTHS AFTER DATE OF WRITTEN FINAL ACCEPTANCE BY THE LANDSCAPE ARCHITECT AND/OR THE OWNERS AUTHORIZED REPRESENTATIVE AGAINST DEFECTS INCLUDING DEATH AND UNSATISFACTORY GROWTH. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO MONITOR THE PROJECT PLANTINGS DURING THE WARRANTY PERIOD AND NOTIFY THE OWNER IF PROBLEMS DEVELOP. PLANTS THAT DIE DURING THE WARRANTY PERIOD SHALL BE REMOVED IMMEDIATELY AND REPLACED.
- ANY TREE OR SHRUB WHICH DIES WITHIN 18 MONTHS OF PLANTING SHALL BE REPLACED IN KIND. ANY TREE OR SHRUB WHICH WITHIN 18 MONTHS OF PLANTING OR REPLANTING IS DEEMED BY THE TOWNSHIP NOT TO BE HEALTHY AND VIGOROUS SHALL BE REPLACED IN KIND. REPLACEMENTS MAY BE OF A SUBSTITUTE SPECIES ONLY WHEN APPROVED BY THE TOWNSHIP.
- THE TOWNSHIP RESERVES THE RIGHT TO REQUIRE ADDITIONAL LANDSCAPE BUFFER PLANTINGS, FOLLOWING SUBSTANTIAL COMPLETION OF CONSTRUCTION, SHOULD VEGETATION TO BE PRESERVED OR NOT OTHERWISE BE AS REPRESENTED ON THE FINAL LANDSCAPE PLAN(S).

EMERGENCY SEEDING RECOMMENDATIONS TOWNSHIP OF WORCESTER

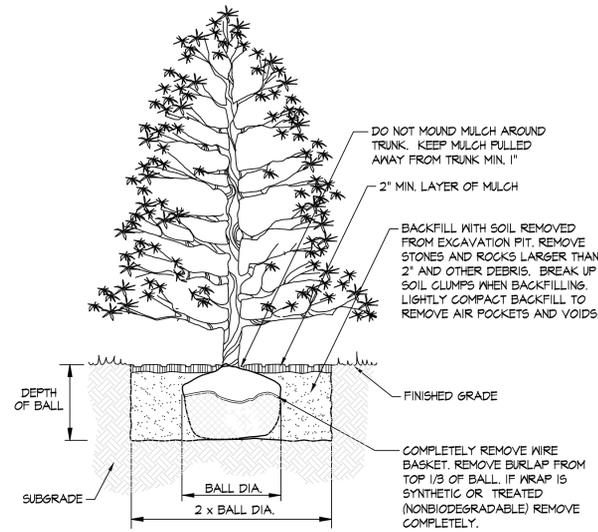
DURING CONSTRUCTION, ALL DISTURBED AREAS SHOULD BE SEEDED ACCORDING TO THE FOLLOWING INSTRUCTIONS: SEEDING RECOMMENDATION FOR SIX TO TWELVE-MONTH PERIODS.

- INSTALL NEEDED WATER-CONTROL MEASURES.
 - PERFORM ALL CULTURAL OPERATIONS AT RIGHT ANGLES TO THE SLOPE.
 - LIME ACCORDING TO SOIL TEST OR KNOWLEDGE OF THE SITE OR APPLY TWO TONS OF GROUND LIMESTONE PER ACRE.
 - FERTILIZE ACCORDING TO SOIL TEST OR KNOWLEDGE OF THE SITE OR APPLY 40-40-40 PER ACRE.
 - INCORPORATE LIME AND FERTILIZER INTO THE TOP FOUR INCHES OF SURFACE SOIL BY DISCING OR OTHER SUITABLE MEANS.
 - SEED ONE OF THE FOLLOWING MIXTURES AT THE MOST SUITABLE DATE. APPLY UNIFORMLY WITH A DRILL OR BY BROADCASTING:
 - MARCH 1 TO OCTOBER 1: 20 POUNDS OF ANNUAL RYE GRASS OR FIELD BROMEGRASS PER ACRE.
 - MARCH 1 TO MAY 30: 20 POUNDS OF ANNUAL RYE GRASS OR FIELD BROMEGRASS AND 64 POUNDS OF SPRING OATS PER ACRE.
 - AUGUST 1 TO NOVEMBER 1: 20 POUNDS OF ANNUAL RYE GRASS OR FIELD BROMEGRASS AND 112 POUNDS OF WINTER RYE PER ACRE.
 - COVER GRASS AND LEGUME SEEDS ONE-FOURTH-INCH DEEP WITH CULTIPACKER OR HARROW. COVER RYE OR OATS ABOUT TWO INCHES DEEP.
 - MOW RYE OR OATS JUST BEFORE THEY HEAD OUT IF SLOPE PERMITS.
- SECTION 130-6 SHALL PREVAIL IN CASES OF CONFLICT WITH THE ABOVE PROVISIONS.



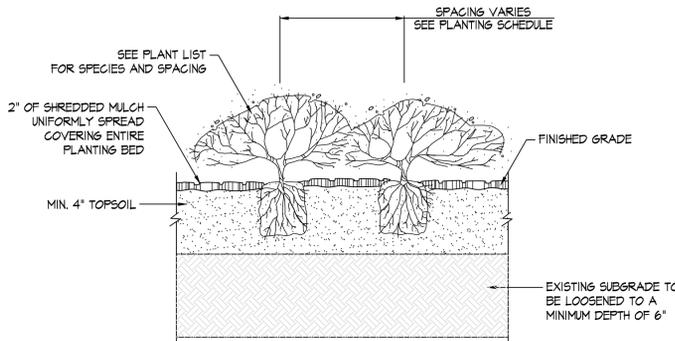
DECIDUOUS TREE PLANTING

NOT TO SCALE



EVERGREEN TREE PLANTING

NOT TO SCALE

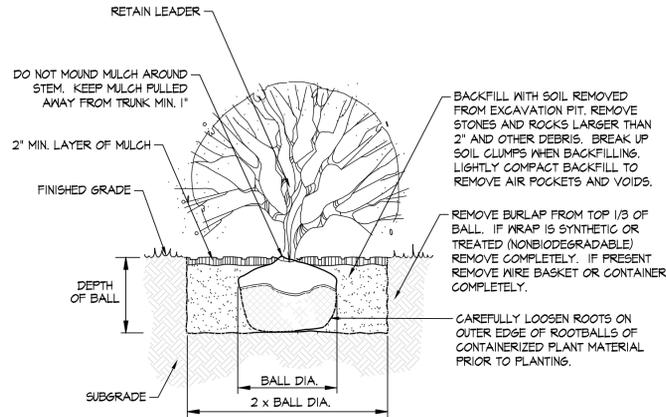


NOTES:

- GROUND COVER MATERIAL SHALL BEAR SAME RELATION TO FINISHED GRADE AS IT BORE TO PREVIOUS GRADE IN THE NURSERY.

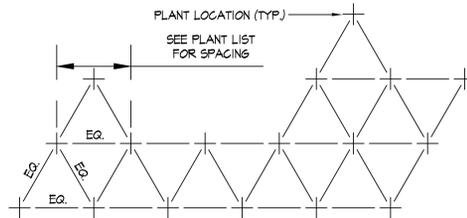
PLUG AND PERENNIAL PLANTING

NOT TO SCALE



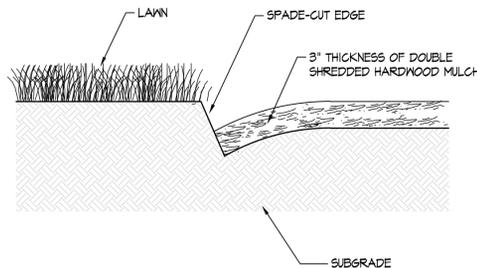
SHRUB PLANTING

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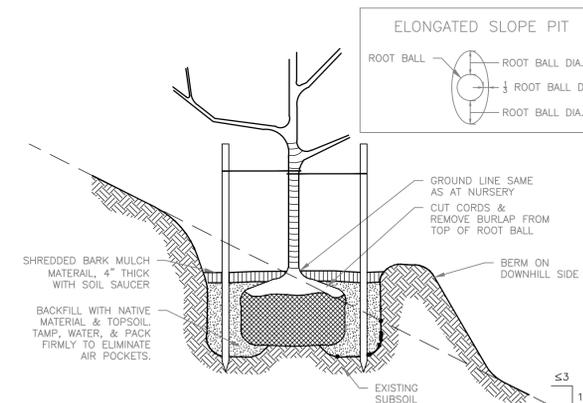
PLANT SPACING DIAGRAM

NOT TO SCALE



EDGING AT MULCH BED

NOT TO SCALE



NOTES:

- REFER TO TREE PLANTING DETAIL.
- ALL PLANTS TO BE SET VERTICAL, NOT PERPENDICULAR TO SLOPE.
- FOR PLANTING A TREE ON A SLOPE, THE ROOT BALL SHALL NOT BE EXPANDED ON THE DOWNHILL SIDE. A BERM SHALL BE BUILT WITH THE NURSERY EXCAVATED FROM THE TREE PIT TO COVER THE DOWNHILL.

SLOPE PLANTING DETAIL

NOT TO SCALE

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NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 341 NPDES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR NPDES PRE-SUBMISSION MITG.	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE NO. PD76464

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
LANDSCAPE DETAILS

T&M AND ASSOCIATES
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 TEL 215-282-7850
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OFFICES LOCATED IN:
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DESIGNED BY JPK/CKS/CMR/ROP/ZHR	CHECKED BY BGS/ZHR	DRAWING LSPD
DRAWN BY SCR/CKS/RAM	DATE 12/19/2024	SHEET 33
PROJ. NO. WDE00004	SCALE AS NOTED	OF 46

PLANT SCHEDULE

SYMBOL	CODE	QTY	BOTANICAL NAME	COMMON NAME	ROOT	CALIPER	HEIGHT	SPREAD	REMARKS
EVERGREEN TREES									
	JES	10	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	B & B		10'-12'	6' MIN	
	PA2	13	PICEA ABIES	NORWAY SPRUCE	B & B		10'-12'	6' MIN	
	PS	14	PINUS STROBUS	WHITE PINE	B & B		10'-12'	6' MIN	
FLOWERING TREES									
	GF	21	CORNUS FLORIDA	FLOWERING DOGWOOD	B & B	1.5"-2" CAL.	8' MIN	4'-6'	
	MB	15	MALUS X 'RED BARRON'	RED BARRON CRABAPPLE	B & B	1.5"-2" CAL.	8' MIN	4'-6'	
	PK	9	PRUNUS SERRULATA 'KWANZAN'	FLOWERING CHERRY	B & B	1.5"-2" CAL.	8' MIN	4'-6'	
PARKING AREA TREES									
	PA3	3	PICEA ABIES	NORWAY SPRUCE	B & B		10'-12'	6' MIN	
	TI	9	THUJA X 'GREEN GIANT'	GREEN GIANT ARBORVITAE	B & B		8' MIN	6' MIN	
	TH	8	TILIA CORDATA 'HALKA'	SUMMER SPRITE LINDEN	B & B	2 1/2" - 3" CAL.	10'-12'	6' MIN	STRAIGHT SINGLE LEADER
REPLACEMENT TREES									
	AR	10	ACER RUBRUM	RED MAPLE	B & B	2 1/2" - 3" CAL.	10'-12'	6' MIN	
	B6	15	BETULA NIGRA 'CULLY IMPROVED'	HERITAGE IMPROVED RIVER BIRCH	B & B		10'-12'	6' MIN	MULTI-TRUNK
	CO	10	CELTIS OCCIDENTALIS	COMMON HACKBERRY	B & B	1.5"-2" CAL.	8'-10'	6' MIN	
	F62	7	FAGUS GRANDIFOLIA	AMERICAN BEECH	B & B	2" - 2 1/2" CAL.	8'-10'	6' MIN	STRAIGHT SINGLE LEADER
	QB	25	QUERCUS BICOLOR	SWAMP WHITE OAK	B & B	3" - 3 1/2" CAL.	11'-13'	6'-10'	
SCREENING BUFFER EVERGREEN TREES									
	IA	15	ILEX OPACA	AMERICAN HOLLY	B & B		6'-7'	6' MIN	FULL FORM TO GROUND
	P6	26	PICEA GLAUCA	WHITE SPRUCE	B & B		6'-7'	6' MIN	FULL FORM TO GROUND
	TI2	30	THUJA X 'GREEN GIANT'	GREEN GIANT ARBORVITAE	B & B		8' MIN	6' MIN	
STORMWATER BASIN TREES									
	AA2	4	AMELANCHIER X GRANDIFLORA	APPLE SERVICEBERRY	B & B	1.5"-2" CAL.	8' MIN	4'-6'	
	CE	5	CERCIS CANADENSIS	EASTERN REDBUD	B & B		8' MIN	4'-6'	MULTI-TRUNK
	CL2	6	CLADRASTIS LUTEA	AMERICAN YELLOWWOOD	B & B	2 1/2" - 3" CAL.	10'-12'	6' MIN	STRAIGHT SINGLE LEADER
	GS	4	GLEDITSIA TRIACANTHOS 'SKYLINE'	SKYLINE HONEY LOCUST	B & B	2 1/2" - 3" CAL.	10'-12'	6' MIN	STRAIGHT SINGLE LEADER
	IN	4	ILEX X 'NELLIE R STEVENS'	NELLIE STEVENS HOLLY	B & B		8' MIN	6' MIN	FULL FORM TO GROUND
	JE2	10	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	B & B		8' MIN	6' MIN	
	LR	3	LIQUIDAMBAR STYRACIFLUA 'ROTUNDILOBA' TM	ROUND-LOBED SWEET GUM	B & B	2 1/2" - 3" CAL.	10'-12'	6' MIN	STRAIGHT SINGLE LEADER
	NA	6	NYSSA SYLVATICA 'WILDFIRE'	WILDFIRE TUPELO	B & B	1.5"-2" CAL.	8' MIN	4'-6'	
	PA	4	PICEA ABIES	NORWAY SPRUCE	B & B		10'-12'	6' MIN	
	PO	5	PICEA OMORICA	SERBIAN SPRUCE	B & B		10'-12'	6' MIN	
	PB	2	PLATANUS X ACERIFOLIA 'BLOODGOOD'	LONDON PLANE TREE	B & B	2 1/2" - 3" CAL.	10'-12'	6' MIN	STRAIGHT SINGLE LEADER
STREET TREES									
	AA	14	ACER RUBRUM 'AUTUMN FLAME'	AUTUMN FLAME MAPLE	B & B	2 1/2" - 3" CAL.	10'-12'	6' MIN	STRAIGHT SINGLE LEADER
	QP	13	QUERCUS PALUSTRIS	PIN OAK	B & B	2 1/2" - 3" CAL.	10'-12'	6' MIN	
	UL	8	ULMUS AMERICANA 'LIBERTY'	LIBERTY AMERICAN ELM	B & B	2 1/2" - 3" CAL.	10'-12'	6' MIN	

SYMBOL	CODE	QTY	BOTANICAL NAME	COMMON NAME	CONT	HEIGHT	SPREAD	REMARKS
SHRUBS								
	CS	14	CORNUS SERICEA 'BAILEY'	RED TWIG DOGWOOD	5 GAL	4' O.C. SPACING	24"-36"	MIN. 3 CANES
	FG	12	FOTHERGILLA GARDENII	DWARF FOTHERGILLA	3 GAL	3' O.C. SPACING	18"-24"	MIN. 3 CANES
	IL	10	ITEA VIRGINICA 'LITTLE HENRY' TM	VIRGINIA SWEETSPICE	5 GAL	3' O.C. SPACING	18"-24"	MIN. 3 CANES
	VA	3	VIBURNUM RHYTIDOPHYLLUM 'ALLEGHANY'	ALLEGHANY VIBURNUM	B & B	6' O.C. SPACING	36" HT MIN	MIN. 3 CANES
PARKING SCREENING SHRUBS								
	IS2	22	ILEX GLABRA 'SHAMROCK'	INKBERRY	7 GAL	3' O.C. SPACING	36" HT MIN	MIN. 3 CANES
	MP2	9	MYRICA PENNSYLVANICA	NORTHERN BAYBERRY	7 GAL	6' O.C. SPACING	36" HT MIN	MIN. 3 CANES; 1 MALE PER
	VA2	6	VIBURNUM RHYTIDOPHYLLUM 'ALLEGHANY'	ALLEGHANY VIBURNUM	B & B	6' O.C. SPACING	36" HT MIN	MIN. 3 CANES
SCREENING BUFFER SHRUBS								
	IS	116	ILEX GLABRA 'SHAMROCK'	INKBERRY	7 GAL	3' O.C. SPACING	36" HT MIN	MIN. 3 CANES
	KL	50	KALMIA LATIFOLIA	MOUNTAIN LAUREL	7 GAL	6' O.C. SPACING	36" HT MIN	MIN. 5 CANES
	MP	47	MYRICA PENNSYLVANICA	NORTHERN BAYBERRY	7 GAL	6' O.C. SPACING	36" HT MIN	MIN. 3 CANES; 1 MALE PER

Plug Plant Schedule

Botanical Name	Common Name	Minimum Plant Spacing (FT)	Size Specifications	Plant Count
Plugs*				
Carex pensylvanica	Pennsylvania Sedge	12" - 18" O.C.	LP50	1000
Carex vulpinoidea	Fox Sedge	12" - 18" O.C.	LP50	1000
Schizachyrium scoparium	Little Bluestem	12" - 18" O.C.	LP50	1000
Elymus hystrix	Bottlebrush Grass	12" - 18" O.C.	LP50	1000
Sorghastrum nutans	Indiangrass	12" - 18" O.C.	LP50	1000
* Plug species to be evenly distributed throughout basin bottom				

LANDSCAPE REQUIREMENTS

No.	Section	Requirement	Proposed	Variance/Waiver	
1	130-28G (4) (b)	Street Trees: Along primary streets, street trees are to be placed 50 feet O.C. Germantown Pike: 439 LF / 50 = 9 Street trees N Trooper Road: 938 LF / 50 = 19 Street trees Lot 2 Main Access Driveway: 185 LF / 50 = 4 x 2 (both sides) = 8 Street trees (LF excludes access drive widths)	Germantown Pike: 7 Street trees + Ex. Wooded Area to remain N Trooper Road: 19 Street trees Lot 2 Main Access Driveway: 8 Street trees	NO	
2	130-28G (5) (f)	Screening Buffer: Where under applicable sections of Chapter 150 (\$150-89E (6)), zoning, screen buffers are required for the entire length of all common boundaries abutting adjacent districts, such sections are hereby amended, and the following landscape requirements shall be adhered to: \$130-28G (5) (f) [1] \$130-28G (5) (f) [2] \$130-28G (5) (f) [3]	Screening buffer along rear and side yards where existing vegetation is insufficient At minimum, 1 Evergreen tree and 3 shrubs per 12 LF 850 LF / 12 = 71 evergreen trees and 213 shrubs	850 LF Screening buffer in accordance with 130-28G(5)(f)(3) provided along side yard to Northwest 71 Evergreen Trees 213 Shrubs Existing woods along rear and side yards to the North to remain and provide sufficient softening buffer to adjacent properties	NO
3	130-28G (7) (f)	Basin Perimeter Plantings: Plantings shall be at least 10 feet from the toe of berm. 1 shade tree for every 50 LF of basin perimeter	770 LF basin perimeter / 50 = 15 shade trees.	15 shade trees around basin perimeters	NO
4	129-18 (24) (c) [1]	Drainage area and detention basin landscaping: The perimeter of the retention/detention basin shall be landscaped with a mixture of deciduous trees, evergreens, and shrubs arranged in an informal manner. Retention basin (wet ponds) and artificial wetland basin landscaping shall be designed to create a "natural" appearance. Minimum plant material shall include the following per 100 linear feet of basin perimeter measured at the 100-year water surface elevation: [a] Three evergreen trees (minimum height five feet) [b] Two deciduous trees (minimum caliper 2 1/2 inches) [c] Five shrubs (minimum height three feet)	770 LF basin perimeter / 100 = 7.70 7.70 x 3 = 23 evergreen trees 7.70 x 2 = 15 deciduous trees 7.70 x 5 = 39 shrubs	23 evergreen trees 15 deciduous trees 39 shrubs	NO
5	130-28F (7) (b)	Tree Replacement: If greater than 25% of the existing trees on a site with a trunk diameter of six inches DBH or greater are destroyed because of street alignment, building placement, parking area location, grading or otherwise, then replacement of those trees over the twenty-five-percent threshold shall be required as follows:	142 total existing trees on site 25% threshold = 36 trees 100 existing trees proposed to be removed 100-36 = 64 trees to be replaced	64 replacement trees refer to Replacement Tree Schedule for species and size	NO
6	130-28G (9) (b)	Individual Lot Landscaping: Each multifamily dwelling unit shall have one deciduous or evergreen tree as listed in Subsection H.	45 dwelling units = 45 trees	45 trees (flowering trees)	NO
7	130-28G (6) (a)	Off-Street parking perimeter Landscaping: The perimeters of off-street parking lots in all districts shall be buffered in accordance with the above regulations by means of screening buffers	Western parking lot: 82LF / 12 = 7 evergreen trees and 21 shrubs Eastern parking lot: 62 LF / 12 = 5 evergreen trees and 16 shrubs	Western parking lot: 7 evergreen trees and 21 shrubs Eastern parking lot: 5 evergreen trees and 16 shrubs	NO
8	130-28G (6) (c)	Off-Street parking interior Landscaping: A minimum of 10% of the parking area shall be devoted to landscaping; Landscaping shall include a minimum of one tree per 15 parking spaces	15,112 parking lot area x 10% = 1,511 interior landscape area 27 parking spaces / 15 = 2 trees	7,505 SF of parking lot landscaping area 8 parking lot trees	NO

BASIN SEEDING MIXTURE

Ernst Conservation Seeds
8884 Mercer Pike
Meadville, PA 16335
(800) 873-3321 Fax (814) 336-5191
www.ernstseed.com

Date: December 17, 2024

Retention Basin Floor Mix - Low Maintenance - ERNMX-126

Botanical Name	Common Name	Price/Lb
20.00 % <i>Panicum clandestinum</i> , Tioga	Deertongue, Tioga	22.27
20.00 % <i>Puccinellia distans</i> , Fuels	Alkalgrass, Fuels	3.84
18.00 % <i>Elymus virginicus</i> , Madison-NY Ecotype	Virginia Wildrye, Madison-NY Ecotype	10.46
15.00 % <i>Agrostis stolonifera</i> , 'PC 2.0'	Creeping Bentgrass, 'PC 2.0'	14.40
15.00 % <i>Poa palustris</i>	Fowl Bluegrass	21.60
10.00 % <i>Carex vulpinoidea</i> , PA Ecotype	Fox Sedge, PA Ecotype	31.20
1.00 % <i>Carex scaparia</i> , PA Ecotype	Blunt Broom Sedge, PA Ecotype	96.00
1.00 % <i>Juncus effusus</i>	Soft Rush	48.00

100.00 % Mix Price/Lb Bulk: \$17.07

Seeding Rate: 20-40 lbs per acre, or 0.5-1 lb/1,000 sq ft with a cover crop. For a cover crop use one of the following: grain rye (1 Sep to 30 Apr; 30 lbs/acre), Japanese millet (1 May to 31 Aug; 10 lbs/acre), or barnyard grass (1 May to 31 Aug; 10 lbs/acre).

Grasses & Grass-like Species - Herbaceous Perennial; Stormwater Management

The hardy inexpensive grass and grass-like species are ideal for retention basins that may have high salt inflows and where mowing may be required. Mix formulations are subject to change without notice depending on the availability of existing and new products. While the formula may change, the guiding philosophy and function of the mix will not.

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3	03/26/25	REVISED PER TOWNSHIP COMMENTS	BGS
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CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER



12/19/2024
LICENSED PROFESSIONAL ENGINEER
STATE OF PA LICENSE NO. PE076464

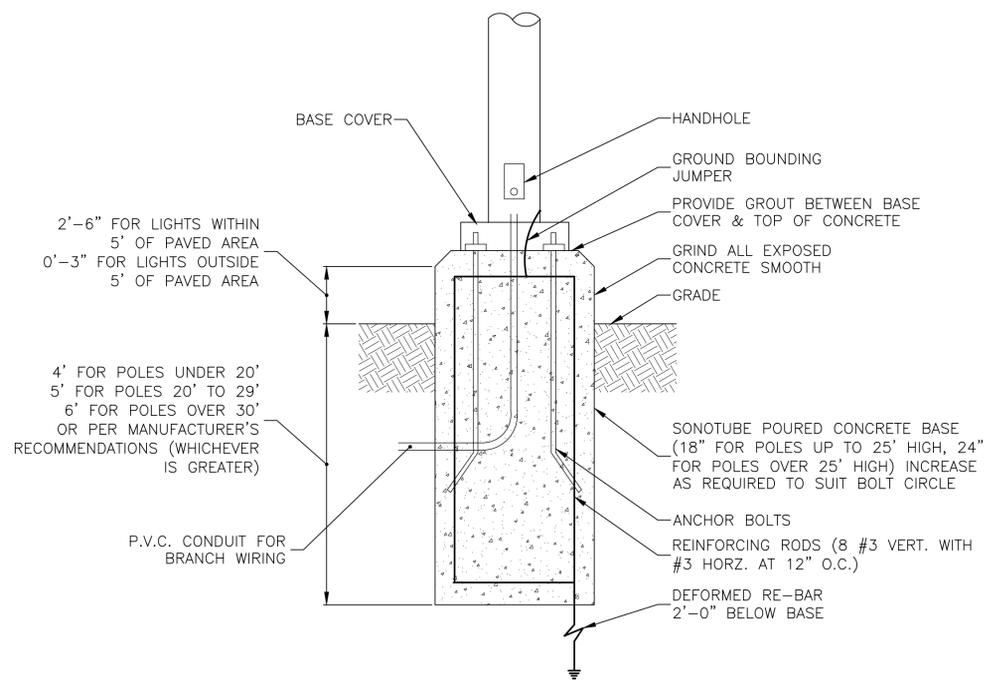
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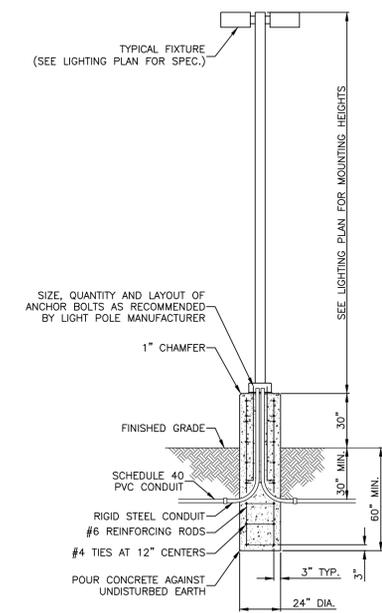
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 CHECKED BY: BGS/ZHR
 DRAWN BY: SCR/CKS/RAM
 DATE: 12/19/2024
 SCALE: AS NOTED
 PROJ. NO.: WDEV0004A
 SHEET: **34**
 OF 46

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LIGHT BASE
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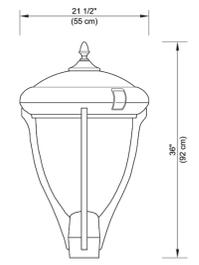
- NOTES:
 1. INSTALL ALL ELECTRICAL WORK PER LOCAL REGULATIONS.
 2. POLE SELECTION PER FIXTURE MANUFACTURER RECOMMENDATIONS AND LOCAL WIND LOAD REQUIREMENTS.
 3. SEE LIGHTING PLAN FOR POLE/FIXTURE SPECIFICATIONS.

LIGHT POLE
 NOT TO SCALE



Paseo CE21T4C
 Approval - Specification

Project: _____ Order: _____
 Qty: _____ Luminaire: _____ Type: _____



EPA: 0.89 ft² Weight: 41.2 lbs / 18.7 kg

Base module: Cast A356 round aluminum shape. The pole-top fitter is self-leveling and retained using set screws. Fits on a 4" (10cm) outside diameter x 3" (7cm) long tenon. Four cast aluminum arms are welded to the base module. The lower section of the cast aluminum ring is welded to the upper end of the arms to support the optical module.

Roof module: Round molded A356 aluminum mechanically assembled to the top section of the ring. The roof is adorned with a decorative spun aluminum dome and a cast aluminum finial. Features a latch for tool-less opening, providing light compression when closed, and allowing access to the driver. Everything is assembled mechanically.

Optical module: The molded A384 aluminum heat sink is designed to minimize the temperature of the LEDs, increasing their longevity and efficiency. The optical module is mechanically assembled to the heat-sink for easy replacement. The luminaire is available without a lens or with a flat lens attached to a cast aluminum frame. The optical module is IP66 rated thanks to a molded silicone gasket. The high efficiency Orion LED optical engine is mechanically assembled on the heat sink. The lifetime of the LEDs is 100,000 hours. It is based on the LM-80 test and extrapolated with TM-21. This data is calculated when 50% of the LEDs produce 70% of their initial luminous flux (L70). The minimum color rendering index (CRI) is 70. The optical acrylic lens are designed to illuminate only where needed while achieving excellent uniformity with maximum spacing. The optical acrylic lens are sealed on the LED board. The available light distribution types are T1, T1A, T1AHS, T2, T2HS, T2M, T2MHS, T3, T3HS, T3M, T3MHS, T4, T4HS, T5. A white decorative acrylic protection plate is mechanically assembled under the optical module. The crosswalk optic (TCW) for pedestrian crossing is also available.

Driver module: Class 2 (P10 to P60). Primary tension is of 120 to 480VAC Volts, 50/60Hz, THD max 20% with a high-power factor of 90%. Operating temperature is -40°F (-40°C) to 113°F (45°C). The regulator offers an output of 0-10 Volts and is ROHS compliant. Assembled with pull-out connectors. Complete with 10kV/5kA or 20kV/10kA tri-polar surge protection for live-MALT, live-neutral and neutral-MALT lines according to IEEE/ANSI C62.41 2002 C.

Wiring / Hardware: Type TEWT 14-7 AWG, 12' (3.05m) minimum exceeding luminaire. All electrical connections between the modules are provided with quick-disconnect connectors for easy maintenance. All outside accessible hardware is made of 304 stainless steel.

Color: All Cyclone colors are available in textured (TX) or smooth (SM) finish. A durable polyester powder coating is applied and meets the AAMA 2604 requirements (5 years exposure to all weather conditions). The finish meets the ASTM G7, B117, D1654 and D2247 requirements relative to salt spray and humidity resistance. **Cyclone recommends a textured finish for this product.**

Warranty: 5-year limited warranty. Complete warranty terms located at: <https://www.cyclonelighting.com/assets/Legal/Cyclone-Sales-TermsConditions-en.pdf>

Stamp/Approval: _____ Name: _____ Page 1 of 2
 Date: _____

Cyclone Lighting: 2175 Des Entreprises Blvd, Terrebonne (QC) Canada J6Y 1W9 www.cyclonelighting.com Rev. 2024/06
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CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



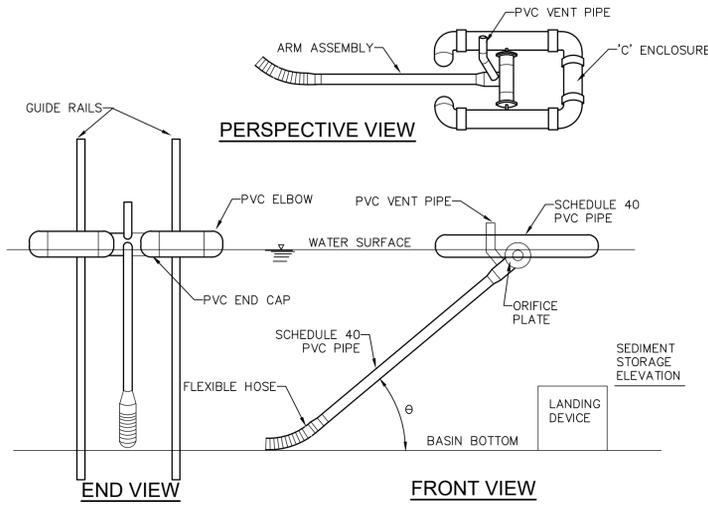
12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL
 TROOPER RIDGE SUBDIVISION
 1035 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
 LIGHTING DETAILS

AND
 YOUR GOALS. OUR MISSION.
 1700 MARKET STREET, SUITE 3110
 PHILADELPHIA, PA 19103
 TEL 215-282-7850
 FAX 215-627-3499

OFFICES LOCATED IN:
 CALIFORNIA, INDIANA, KENTUCKY,
 MASSACHUSETTS, MICHIGAN, NEW JERSEY,
 OHIO AND PENNSYLVANIA

DESIGNED BY JPK/CKS/CMR/ROP/ZHR	DRAWING LTPD
CHECKED BY BGS/ZHR	SHEET 35
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDEV00004	



BASIN NO.	WATER SURFACE ELEVATION (FT)	ARM LENGTH (FT)	ARM DIA. (IN)	ORIFICE DIA. (IN)	TOP OF LANDING DEVICE ELEVATION (FT)	FLEXIBLE HOSE LENGTH (IN)	FLEXIBLE HOSE ATTACHMENT ELEVATION (FT)
A	360.80	10	3.0	2.40	357.90	48	357.00

NOTES:

ORIFICE DIAMETER MUST BE EQUAL TO OR LESS THAN ARM DIAMETER

A ROPE SHALL BE ATTACHED TO THE SKIMMER ARM TO FACILITATE ACCESS TO THE SKIMMER ONCE INSTALLED.

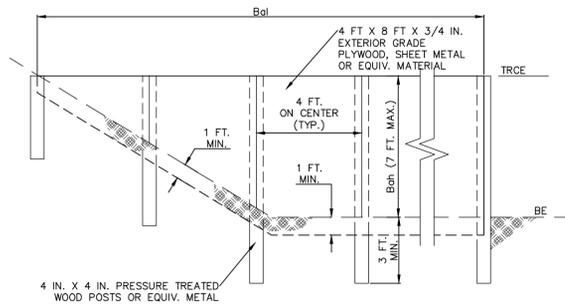
SKIMMER SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. ANY MALFUNCTIONING SKIMMER SHALL BE REPAIRED OR REPLACED WITHIN 24 HOURS OF INSPECTION.

ICE OR SEDIMENT BUILDUP AROUND THE PRINCIPAL SPILLWAY SHALL BE REMOVED SO AS TO ALLOW THE SKIMMER TO RESPOND TO FLUCTUATING WATER ELEVATIONS.

SEDIMENT SHALL BE REMOVED FROM THE BASIN WHEN IT REACHES THE LEVEL MARKED ON THE SEDIMENT CLEAN-OUT STAKE OR THE TOP OF THE LANDING DEVICE.

A SEMI-CIRCULAR LANDING ZONE MAY BE SUBSTITUTED FOR THE GUIDE RAILS (STANDARD CONSTRUCTION DETAIL # 7-3).

STANDARD CONSTRUCTION DETAIL #7-1
SKIMMER
NOT TO SCALE



BASIN OR TRAP NO.	BAFFLE LENGTH (FT)	BAFFLE HEIGHT (FT)	TEMPORARY RISER CREST ELEV. (FT)	BOTTOM ELEV. (FT)
1	200	3.80	360.80	357.00

NOTES:

SEE APPROPRIATE BASIN DETAIL FOR PROPER LOCATION AND ORIENTATION.

AN ACCEPTABLE ALTERNATIVE IS TO INSTALL A SUPER SILT FENCE AT THE BAFFLE LOCATION IN POOLS WITH DEPTHS EXCEEDING 7'. THE TOP OF THE PLYWOOD BAFFLE DOES NOT NEED TO EXTEND TO THE TEMPORARY RISER CREST. SUPER SILT FENCE BAFFLES NEED NOT EXTEND TO TRCE ELEVATION.

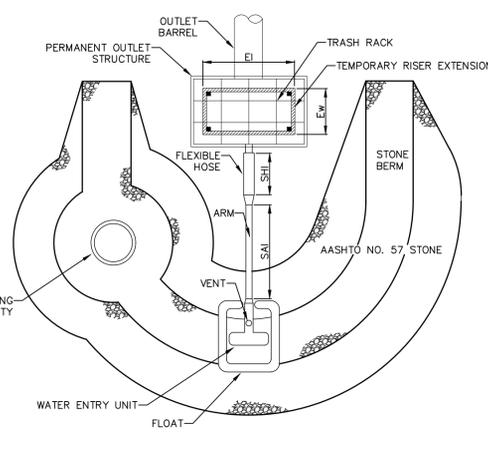
BAFFLES SHALL BE TIED INTO ONE SIDE OF THE BASIN UNLESS OTHERWISE SHOWN ON THE PLAN DRAWINGS.

SUBSTITUTION OF MATERIALS NOT SPECIFIED IN THIS DETAIL SHALL BE APPROVED BY THE DEPARTMENT OR THE LOCAL CONSERVATION DISTRICT BEFORE INSTALLATION.

DAMAGED OR WARPED BAFFLES SHALL BE REPLACED WITHIN 7 DAYS OF INSPECTION.

BAFFLES REQUIRING SUPPORT POSTS SHALL NOT BE INSTALLED IN BASINS REQUIRING IMPERVIOUS LINERS.

STANDARD CONSTRUCTION DETAIL #7-14
BAFFLE
NOT TO SCALE

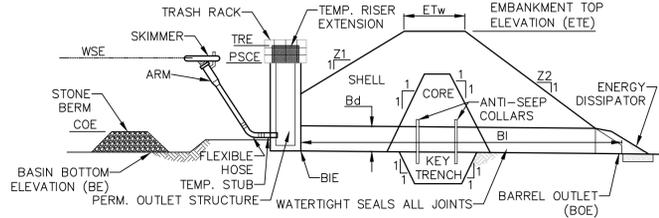


NOTES:

NO GUIDE RAILS SHALL BE REQUIRED FOR THIS INSTALLATION.

THIS DETAIL SHALL BE USED IN CONJUNCTION WITH STANDARD CONSTRUCTION DETAILS #7-2 AND #7-4.

STANDARD CONSTRUCTION DETAIL #7-3
SKIMMER WITH STONE LANDING BERM
NOT TO SCALE



BASIN NO.	Z1 (FT)	Z2 (FT)	TEMP RISER EXT. ELEV. (FT)	EMBANKMENT			CLEAN OUT ELEV. (FT)	BOTTOM ELEV. (FT)
				TOP ELEV. (FT)	TOP WIDTH (FT)	KEY TRENCH DEPTH (FT)		
1	4	4	360.80	365.00	10	2	357.90	357.00

SKIMMER			OUTLET BARREL			
DIA SAd (IN)	LENGTH SAl (FT)	MAT'L	DIA Bd (IN)	INLET ELEV BIE (FT)	LENGTH BI (FT)	OUTLET ELEV BOE (FT)
3	10	PVC	24	351	RCP	346.50

NOTES:

SEDIMENT BASINS, INCLUDING ALL APPURTENANT WORKS, SHALL BE CONSTRUCTED TO THE DETAIL AND DIMENSIONS SHOWN ON THE E&S PLAN DRAWINGS.

AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO A DEPTH OF TWO FEET PRIOR TO ANY PLACEMENT AND COMPACTION OF EARTHEN FILL. IN ORDER TO FACILITATE MAINTENANCE AND RESTORATION, THE POOL AREA SHALL BE CLEARED OF ALL BRUSH, TREES, AND OBJECTIONABLE MATERIAL. FILL MATERIAL FOR THE EMBANKMENTS SHALL BE FREE OF ROOTS, OR OTHER WOODY VEGETATION, ORGANIC MATERIAL, LARGE STONES, AND OTHER OBJECTIONABLE MATERIALS. THE EMBANKMENT SHALL BE COMPACTED IN LAYERED LIFTS OF NOT MORE THAN 6 TO 9 IN. THE MAXIMUM ROCK SIZE SHALL BE NO GREATER THAN 2/3 THE LIFT THICKNESS.

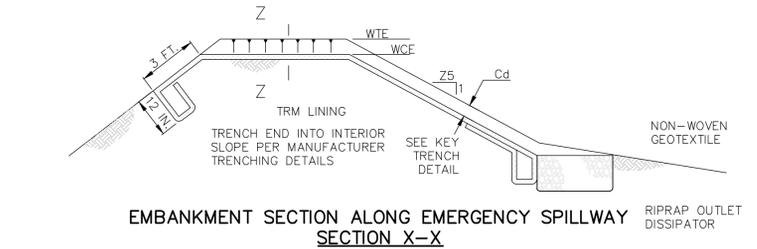
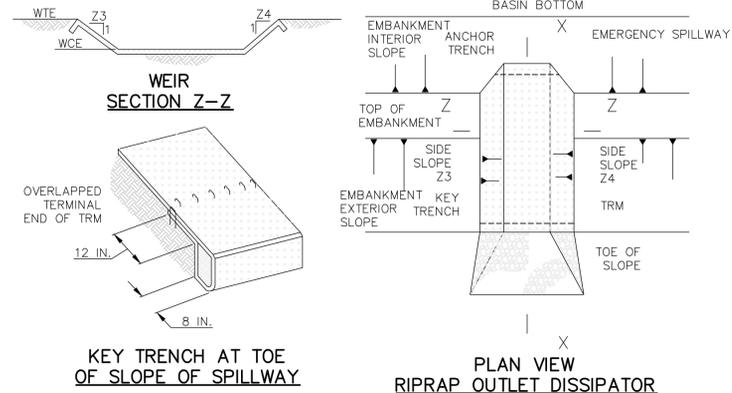
UPON COMPLETION, THE EMBANKMENT SHALL BE SEED, MULCHED, BLANKETED OR OTHERWISE STABILIZED ACCORDING TO THE SPECIFICATIONS OF THE E&S PLAN DRAWINGS. TREES SHALL NOT BE PLANTED ON THE EMBANKMENT.

INSPECT ALL SEDIMENT BASINS ON AT LEAST A WEEKLY BASIS AND AFTER EACH RUNOFF EVENT. PROVIDE ACCESS FOR SEDIMENT REMOVAL AND OTHER REQUIRED MAINTENANCE ACTIVITIES. A CLEAN OUT STAKE SHALL BE PLACED NEAR THE CENTER OF EACH BASIN. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT HAS REACHED THE CLEAN OUT ELEVATION ON THE STAKE AND THE BASIN RESTORED TO ITS ORIGINAL DIMENSIONS. DISPOSE OF MATERIALS REMOVED FROM THE BASIN IN THE MANNER DESCRIBED IN THE E&S PLAN.

BASIN EMBANKMENTS, SPILLWAYS, AND OUTLETS SHALL BE INSPECTED FOR EROSION, PIPING AND SETTLEMENT. NECESSARY REPAIRS SHALL BE IMMEDIATELY. DISPLACED RIPRAP WITHIN THE OUTLET ENERGY DISSIPATER SHALL BE REPLACED IMMEDIATELY.

ACCUMULATED SEDIMENT SHALL BE REMOVED AND DISTURBED AREAS SHALL BE STABILIZED INSIDE THE BASIN BEFORE CONVERSION TO A STORMWATER MANAGEMENT FACILITY. THE DEVICE SHOWN IN STANDARD CONSTRUCTION DETAIL #7-16 MAY BE USED TO DEWATER SATURATED SEDIMENT PRIOR TO ITS REMOVAL. ROCK FILTERS SHALL BE ADDED AS NECESSARY.

STANDARD CONSTRUCTION DETAIL #7-4
SEDIMENT BASIN EMBANKMENT AND SPILLWAY DETAILS - SKIMMER
NOT TO SCALE



BASIN NO.	Z3 (FT)	Z4 (FT)	WEIR		WIDTH Ww (FT)	LINING TRM TYPE	STAPLE PATTERN	Z5 (FT)	DEPTH Cd (FT)	LENGTH DI (FT)	DISSIPATOR	
			TOP ELEV WTE (FT)	CREST ELEV WCE (FT)							WIDTH Dw (FT)	RIPRAP SIZE (R-...)
1	4	4	365.00	363.75	155	C350	E	4	N/A	N/A	N/A	N/A
1	4	4	365.00	363.50	20	C350	E	4	N/A	N/A	N/A	N/A

NOTES:

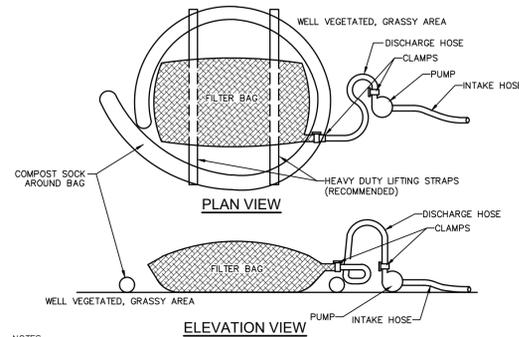
HEAVY EQUIPMENT SHALL NOT CROSS OVER SPILLWAY WITHOUT PRECAUTIONS TAKEN TO PROTECT TRM LINING.

DISPLACED LINER WITHIN THE SPILLWAY AND/OR OUTLET CHANNEL SHALL BE REPLACED IMMEDIATELY.

RIPRAP AT TOE OF EMBANKMENT SHALL BE EXTENDED A SUFFICIENT LENGTH IN BOTH DIRECTIONS TO PREVENT SCOUR.

THE USE OF BAFFLES THAT REQUIRE SUPPORT POSTS ARE RESTRICTED FROM USE IN BASINS REQUIRING IMPERVIOUS LINERS.

STANDARD CONSTRUCTION DETAIL #7-13
SEDIMENT BASIN EMERGENCY SPILLWAY WITH TRM LINING
NOT TO SCALE



NOTES:

LOW VOLUME FILTER BAGS SHALL BE MADE FROM NON-WOVEN GEOTEXTILE MATERIAL SEWN WITH HIGH STRENGTH, DOUBLE STITCHED "T" TYPE SEAMS. THEY SHALL BE CAPABLE OF TRAPPING PARTICLES LARGER THAN 150 MICRONS. HIGH VOLUME FILTER BAGS SHALL BE MADE FROM WOVEN GEOTEXTILES THAT MEET THE FOLLOWING STANDARDS:

PROPERTY	TEST METHOD	MINIMUM STANDARD
AVG. WIDE WIDTH STRENGTH	ASTM D-4896	60 LB/IN
GRAB TENSILE	ASTM D-4632	205 LB
PUNCTURE	ASTM D-4833	110 LB
MULLEN BURST	ASTM D-3786	350 PSI
UV RESISTANCE	ASTM D-4355	70%
ASS % RETAINED	ASTM D-4751	80 SIEVE

A SUITABLE MEANS OF ACCESSING THE BAG WITH MACHINERY REQUIRED FOR DISPOSAL PURPOSES SHALL BE PROVIDED. FILTER BAGS SHALL BE REPLACED WHEN THEY BECOME 1/2 FULL OF SEDIMENT. SPARE BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT OF THOSE THAT HAVE FAILED OR ARE FILLED. BAGS SHALL BE PLACED ON STRAPS TO FACILITATE REMOVAL UNLESS BAGS COME WITH LIFTING STRAPS ALREADY ATTACHED.

BAGS SHALL BE LOCATED IN WELL-VEGETATED (GRASSY) AREA, AND DISCHARGE ONTO STABLE, EROSION RESISTANT AREAS. WHERE THIS IS NOT POSSIBLE, A GEOTEXTILE UNDERLAYMENT AND FLOW PATH SHALL BE PROVIDED. BAGS MAY BE PLACED ON FILTER STONE TO INCREASE DISCHARGE CAPACITY. BAGS SHALL NOT BE PLACED ON SLOPES GREATER THAN 5% FOR SLOPES EXCEEDING 5%. CLEAN ROCK OR OTHER NON-ERODIBLE AND NON-POLLUTING MATERIAL MAY BE PLACED UNDER THE BAG TO REDUCE SLOPE STEEPNESS.

NO DOWNSLOPE SEDIMENT BARRIER IS REQUIRED FOR MOST INSTALLATIONS. COMPOST BERM OR COMPOST FILTER SOCK SHALL BE INSTALLED BELOW BAGS LOCATED IN HO OR EV WATERSHEDS, WITHIN 50 FEET OF ANY RECEIVING SURFACE WATER OR WHERE GRASSY AREA IS NOT AVAILABLE.

THE PUMP DISCHARGE HOSE SHALL BE INSERTED INTO THE BAGS IN THE MANNER SPECIFIED BY THE MANUFACTURER AND SECURELY CLAMPED. A PIECE OF PVC PIPE IS RECOMMENDED FOR THIS PURPOSE.

THE PUMPING RATE SHALL BE NO GREATER THAN 750 GPM OR 1/2 THE MAXIMUM SPECIFIED BY THE MANUFACTURER, WHICHEVER IS LESS. PUMP INTAKES SHALL BE FLOATING AND SCREENED.

FILTER BAGS SHALL BE INSPECTED DAILY. IF ANY PROBLEM IS DETECTED, PUMPING SHALL CEASE IMMEDIATELY AND NOT RESUME UNTIL THE PROBLEM IS CORRECTED.

STANDARD CONSTRUCTION DETAIL #3-16
PUMPED WATER FILTER BAG W/ COMPOST SOCK
NOT TO SCALE

PROJECT INFORMATION:
FILE PATH: G:\Projects\WDEV\0000A\Plans\
FILE NAME: WDEV0000A_DTL.dwg
DATE: 03 Apr 2025, 5:03PM
LAST SAVE BY: CScorozo

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NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 341 RIPRAP SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR 341 RIPRAP SUBMISSION MITG	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER



12/19/2024
LICENSED PROFESSIONAL ENGINEER
STATE OF PA LICENSE NO. PE076404

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
EROSION AND SEDIMENT CONTROL DETAILS - 1



1700 MARKET STREET, SUITE 3110
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OFFICES LOCATED IN:
CALIFORNIA, INDIANA, KENTUCKY,
MASSACHUSETTS, MICHIGAN, NEW JERSEY,
OHIO AND PENNSYLVANIA

DESIGNED BY JPK/CKS/CMR/ROP/ZHR	DRAWN BY SCR/CKS/RAM	DRAWING ENSD-1
CHECKED BY BGS/ZHR	DATE 12/19/2024	SHEET 36
SCALE AS NOTED	PROJ. NO. WDEV00004	OF 46

NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	REVISED FOR 4" RIPPES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR RIPPES PRE-SUBMISSION MITG	ZHR	JPK

CHRISTOPHER W. JENSEN, P.E.
LICENSED PROFESSIONAL ENGINEER



12/19/2024
LICENSED PROFESSIONAL ENGINEER
STATE OF PA LICENSE NO. PE076464

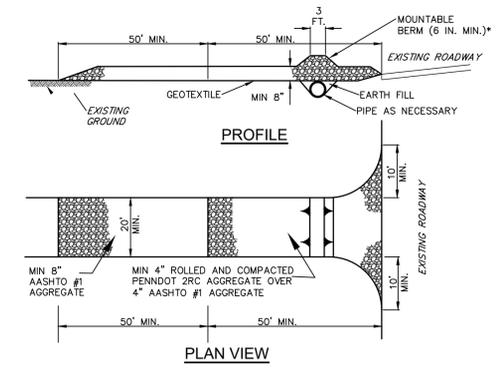
COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
EROSION AND SEDIMENT CONTROL DETAILS-2



1700 MARKET STREET, SUITE 3110
PHILADELPHIA, PA 19103
TEL 215-282-7850
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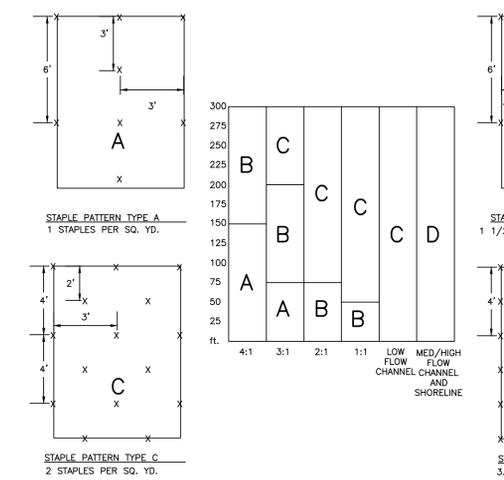
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DESIGNED BY JPK/CKS/CMR/ROP/ZHR	DRAWING ENSD-2
CHECKED BY BGS/ZHR	SHEET
DRAWN BY SCR/CKS/RAM	37
DATE 12/19/2024	OF 46
SCALE AS NOTED	
PROJ. NO. WDEV00004	

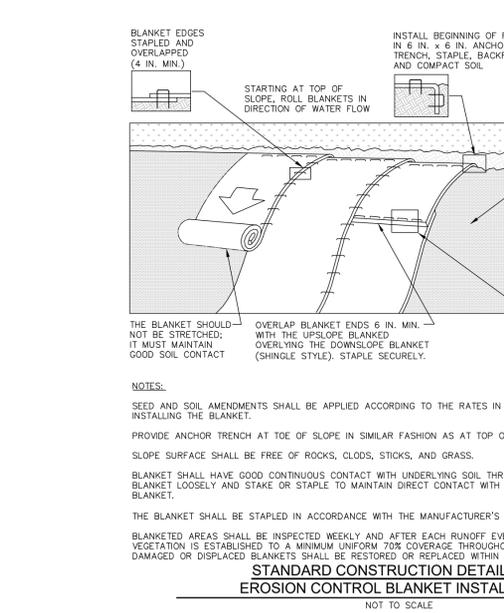


NOTES:
REMOVE TOPSOIL PRIOR TO INSTALLATION OF ROCK CONSTRUCTION ENTRANCE. EXTEND ROCK OVER FULL WIDTH OF ENTRANCE.
RUNOFF SHALL BE DIVERTED FROM ROADWAY TO A SUITABLE SEDIMENT REMOVAL BMP PRIOR TO ENTERING ROCK CONSTRUCTION ENTRANCE.
MOUNTABLE BERM SHALL BE INSTALLED WHEREVER OPTIONAL CULVERT PIPE IS USED AND PROPER PIPE COVER AS SPECIFIED BY MANUFACTURER IS NOT OTHERWISE PROVIDED. PIPE SHALL BE SIZED APPROPRIATELY FOR SIZE OF DITCH BEING CROSSED.
MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. IF EXCESSIVE AMOUNTS OF SEDIMENT ARE BEING DEPOSITED ON ROADWAY, EXTEND LENGTH OF ROCK CONSTRUCTION ENTRANCE BY 50 FOOT INCREMENTS UNTIL CONDITION IS ALLEVIATED OR INSTALL WASH RACK, WASHING THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.

**ALTERNATE CONSTRUCTION DETAIL #3-1
ROCK CONSTRUCTION ENTRANCE**
NOT TO SCALE



NORTH AMERICAN GREEN STAPLE PATTERNS
NOT TO SCALE

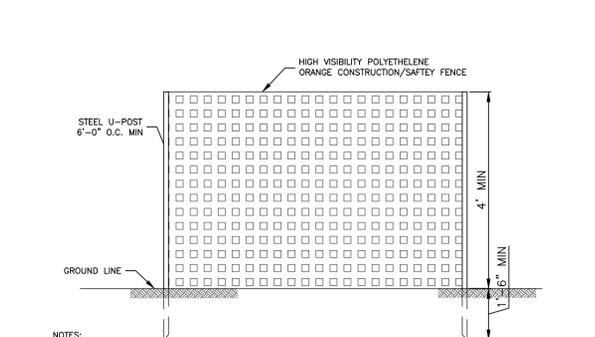


**STANDARD CONSTRUCTION DETAIL #11-1
EROSION CONTROL BLANKET INSTALLATION**
NOT TO SCALE

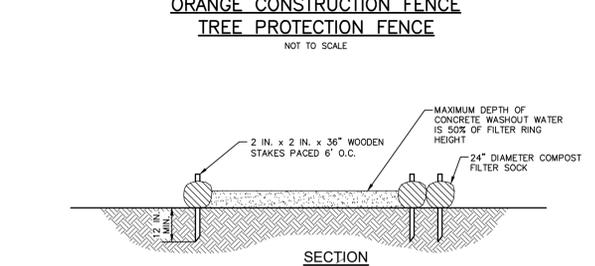
	TEMPORARY SEEDING		PERMANENT SEEDING
	PennDOT Formula D	PennDOT Formula E	General Seeding / Sod
Species	70% Kentucky 31 Fescue 20% Pennlawn Red Fescue 10% Weeping Alkali Grass	100% Annual Ryegrass	20% turf type perennial ryegrass 30% fine red or chewings fescue 50% Kentucky bluegrass mixture (poa pratensis)
Application Rate/1000 SY	21 lbs.	10 lbs.	8 lbs. (min.)
Where Applied	Anywhere	Anywhere	Anywhere
Seeding Dates	March 5 - June 1 August 1 - October 1	March 5-Oct.1	March 5 - October 1
Fert. and Rate/1000 SY	Commercial Fert. (10-20-20) 20 lbs. Pulverized Agricultural Limestone 90 lbs.	Comm. Fert. (10-20-20) 192 lbs. Urea Form (38-0-0) 50 lbs.	Min. 1lb. Nitrogen Per 1000 Sq. Ft. and 4% Phosph. Acid and 2% Potassium (50% of Nitrogen To Be Organic)
Mulch: @ Min. 3 ton/ac.	Hay or Straw Mulch *	Hay (As directed)	* Hay (As directed)

**SOIL, SEEDING, FERTILIZATION
SCHEDULE AND SPECIFICATIONS**

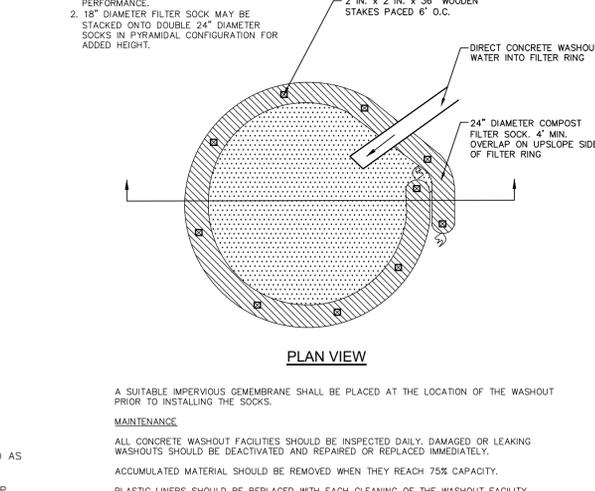
* OR WOOD CELLULOSE (ON SLOPES 4:1 OR FLATTER), EXCEPT USE HAY



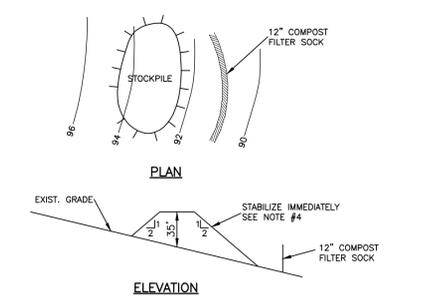
**ORANGE CONSTRUCTION FENCE
TREE PROTECTION FENCE**
NOT TO SCALE



**TYPICAL COMPOST SOCK
CONCRETE WASHOUT INSTALLATION**
NOT TO SCALE

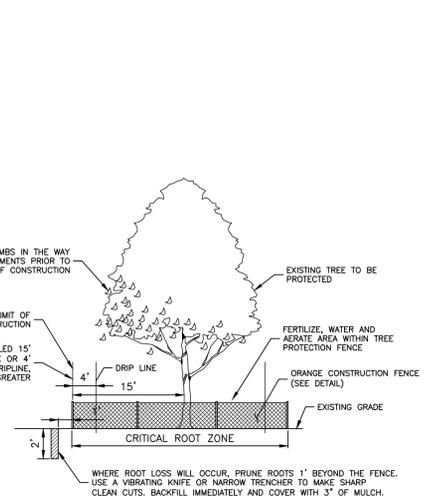


**STANDARD CONSTRUCTION DETAIL #9-1
RIPRAP APRON AT PIPE OUTLET
WITH FLARED END SECTION OR ENDWALL**
NOT TO SCALE

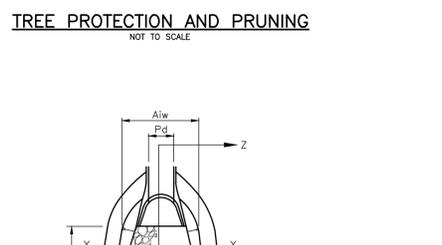


NOTES:
1. INSTALL 12\"/>

MATERIAL STOCKPILE AND MAINTENANCE
NOT TO SCALE



TREE PROTECTION AND PRUNING
NOT TO SCALE

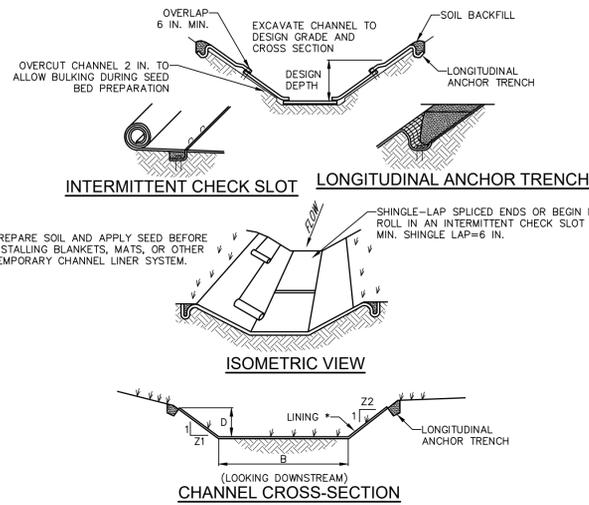


**STANDARD CONSTRUCTION DETAIL #9-1
RIPRAP APRON AT PIPE OUTLET
WITH FLARED END SECTION OR ENDWALL**
NOT TO SCALE

OUTLET NO.	PIPE DIA Pd (IN)	RIPRAP		APRON		
		SIZE R-	THICK. Rt (IN)	LENGTH Al (FT)	INITIAL WIDTH Atw (FT)	TERMINAL WIDTH Atf (FT)
A1	24	R-5	27	16	6	13
B1	24	R-5	27	8	6	10
S2	30	R-5	27	12	8	13
A2	24	R-5	27	8	6	10

**STANDARD CONSTRUCTION DETAIL #9-1
RIPRAP APRON AT PIPE OUTLET
WITH FLARED END SECTION OR ENDWALL**
NOT TO SCALE

NOTES:
ALL APRONS SHALL BE CONSTRUCTED TO THE DIMENSIONS SHOWN. TERMINAL WIDTHS SHALL BE ADJUSTED AS NECESSARY TO MATCH RECEIVING CHANNELS.
ALL APRONS SHALL BE INSPECTED AT LEAST WEEKLY AND AFTER EACH RUNOFF EVENT. DISPLACED RIPRAP WITHIN THE APRON SHALL BE REPLACED IMMEDIATELY.

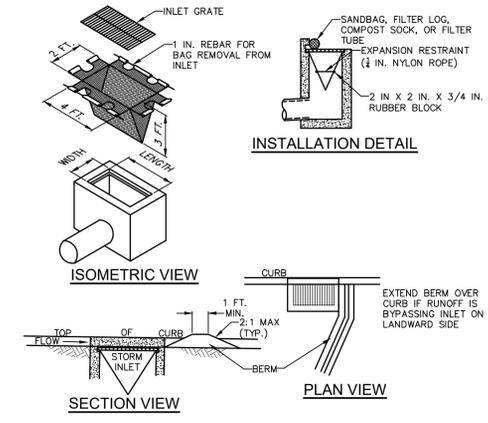


* SEE MANUFACTURER'S LINING INSTALLATION DETAIL FOR STAPLE PATTERNS, VEGETATIVE STABILIZATION FOR SOIL AMENDMENTS, SEED MIXTURES AND MULCHING INFORMATION

CHANNEL NO.	STATIONS	BOTTOM WIDTH B (FT)	DEPTH D (FT)	TOP WIDTH W (FT)	Z1 (FT)	Z2 (FT)	LINING *
S3.1	ALL	5	1.00	11.0	3	3	R-5 RIP-RAP
S4	ALL	5	1.00	11.0	3	3	R-5 RIP-RAP
S5	ALL	5	1.00	11.0	3	3	R-5 RIP-RAP
S6	ALL	5	1.00	11.0	3	3	R-5 RIP-RAP
S7	ALL	5	1.00	11.0	3	3	R-5 RIP-RAP
S8	ALL	5	1.00	11.0	3	3	R-5 RIP-RAP
S9	ALL	5	1.25	12.5	3	3	R-5 RIP-RAP

NOTES:
 ANCHOR TRENCHES SHALL BE INSTALLED AT BEGINNING AND END OF CHANNEL IN THE SAME MANNER AS LONGITUDINAL ANCHOR TRENCHES.
 CHANNEL DIMENSIONS SHALL BE CONSTANTLY MAINTAINED. CHANNEL SHALL BE CLEANED WHENEVER TOTAL CHANNEL DEPTH IS REDUCED BY 25% AT ANY LOCATION.
 SEDIMENT DEPOSITS SHALL BE REMOVED WITHIN 24 HOURS OF DISCOVERY OR AS SOON AS SOIL CONDITIONS PERMIT ACCESS TO CHANNEL WITHOUT FURTHER DAMAGE. DAMAGED LINING SHALL BE REPAIRED OR REPLACED WITHIN 48 HOURS OF DISCOVERY.
 NO MORE THAN ONE THIRD OF THE SHOOT (GRASS LEAF) SHALL BE REMOVED IN ANY MOWING. GRASS HEIGHT SHALL BE MAINTAINED BETWEEN 2 AND 3 INCHES UNLESS OTHERWISE SPECIFIED. EXCESS VEGETATION SHALL BE REMOVED FROM PERMANENT CHANNELS TO ENSURE SUFFICIENT CHANNEL CAPACITY.

STANDARD CONSTRUCTION DETAIL #6-1
VEGETATED CHANNEL
 NOT TO SCALE

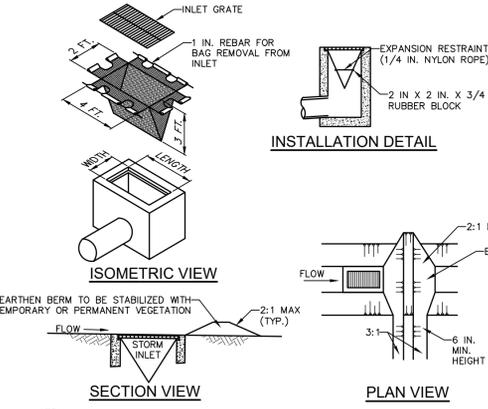


NOTES:
 MAXIMUM DRAINAGE AREA = 1/2 ACRE.
 INLET PROTECTION SHALL NOT BE REQUIRED FOR INLET TRIBUTARY TO SEDIMENT BASIN OR TRAP. BERMS SHALL BE REQUIRED FOR ALL INSTALLATIONS.

ROLLED EARTHEN BERM SHALL BE MAINTAINED UNTIL ROADWAY IS STONED. ROAD SUBBASE BERM SHALL BE MAINTAINED UNTIL ROADWAY IS PAVED. SIX INCH MINIMUM HEIGHT ASPHALT BERM SHALL BE MAINTAINED UNTIL ROADWAY SURFACE RECEIVES FINAL COAT.
 AT A MINIMUM, THE FABRIC SHALL HAVE A MINIMUM GRAB TENSILE STRENGTH OF 120 LBS., A MINIMUM BURST STRENGTH OF 200 PSI, AND A MINIMUM TRAPEZOIDAL TEAR STRENGTH OF 50 LBS. FILTER BAGS SHALL BE CAPABLE OF TRAPPING ALL PARTICLES NOT PASSING A NO. 40 SIEVE.

INLET FILTER BAGS SHALL BE INSPECTED ON A WEEKLY BASIS AND AFTER EACH RUNOFF EVENT. BAGS SHALL BE EMPTIED AND RINSED OR REPLACED WHEN HALF FULL OR WHEN FLOW CAPACITY HAS BEEN REDUCED SO AS TO CAUSE FLOODING OR BYPASSING OF THE INLET. DAMAGED OR CLOGGED BAGS SHALL BE REPLACED. A SUPPLY SHALL BE MAINTAINED ON SITE FOR REPLACEMENT OF BAGS. ALL NEEDED REPAIRS SHALL BE INITIATED IMMEDIATELY AFTER THE INSPECTION. DISPOSE OF ACCUMULATED SEDIMENT AS WELL AS ALL USED BAGS ACCORDING TO THE PLAN NOTES.

DO NOT USE ON MAJOR PAVED ROADWAYS WHERE PONDING MAY CAUSE TRAFFIC HAZARDS.
STANDARD CONSTRUCTION DETAIL #4-15
FILTER BAG INLET PROTECTION - TYPE C INLET
 NOT TO SCALE



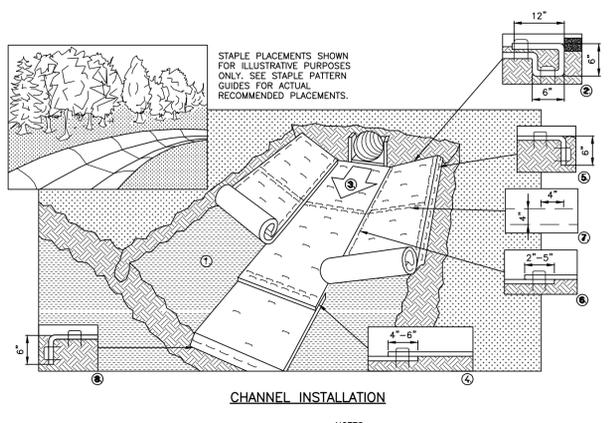
NOTES:
 MAXIMUM DRAINAGE AREA = 1/2 ACRE.
 INLET PROTECTION SHALL NOT BE REQUIRED FOR INLET TRIBUTARY TO SEDIMENT BASIN OR TRAP. BERMS SHALL BE REQUIRED FOR ALL INSTALLATIONS.

ROLLED EARTHEN BERM IN ROADWAY SHALL BE MAINTAINED UNTIL ROADWAY IS STONED. ROAD SUBBASE BERM ON ROADWAY SHALL BE MAINTAINED UNTIL ROADWAY IS PAVED. EARTHEN BERM IN CHANNEL SHALL BE MAINTAINED UNTIL PERMANENT STABILIZATION IS COMPLETED OR REMAIN PERMANENTLY.

AT A MINIMUM, THE FABRIC SHALL HAVE A MINIMUM GRAB TENSILE STRENGTH OF 120 LBS., A MINIMUM BURST STRENGTH OF 200 PSI, AND A MINIMUM TRAPEZOIDAL TEAR STRENGTH OF 50 LBS. FILTER BAGS SHALL BE CAPABLE OF TRAPPING ALL PARTICLES NOT PASSING A NO. 40 SIEVE.

INLET FILTER BAGS SHALL BE INSPECTED ON A WEEKLY BASIS AND AFTER EACH RUNOFF EVENT. BAGS SHALL BE EMPTIED AND RINSED OR REPLACED WHEN HALF FULL OR WHEN FLOW CAPACITY HAS BEEN REDUCED SO AS TO CAUSE FLOODING OR BYPASSING OF THE INLET. DAMAGED OR CLOGGED BAGS SHALL BE REPLACED. A SUPPLY SHALL BE MAINTAINED ON SITE FOR REPLACEMENT OF BAGS. ALL NEEDED REPAIRS SHALL BE INITIATED IMMEDIATELY AFTER THE INSPECTION. DISPOSE ACCUMULATED SEDIMENT AS WELL AS ALL USED BAGS ACCORDING TO THE PLAN NOTES.

DO NOT USE ON MAJOR PAVED ROADWAYS WHERE PONDING MAY CAUSE TRAFFIC HAZARDS.
STANDARD CONSTRUCTION DETAIL #4-16
FILTER BAG INLET PROTECTION - TYPE M INLET
 NOT TO SCALE



NOTES:
 CRITICAL POINTS
 A. OVERLAPS AND SEAMS
 B. PROJECTED WATER LINE
 C. CHANNEL BOTTOM/SIDE SLOPE VERTICES

- NORTH AMERICAN GREEN OR APPROVED EQUAL.
- PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECP's), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
- BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE RECP'S IN A 6" DEEP X 6" WIDE TRENCH WITH APPROXIMATELY 12" OF RECP'S EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE RECP'S WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" PORTION OF RECP'S BACK OVER SEED AND COMPACTED SOIL. SECURE RECP'S OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" APART ACROSS THE WIDTH OF THE RECP'S.
- ROLL THE RECP'S IN DIRECTION OF WATER FLOW IN BOTTOM OF CHANNEL. RECP'S WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL RECP'S MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING THE DOT SYSTEM, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
- PLACE CONSECUTIVE RECP'S END OVER END (SHINGLE STYLE) WITH A 4" - 6" OVERLAP. USE A DOUBLE ROW OF STAPLES STAGGERED 4" APART AND 4" ON CENTER TO SECURE RECP'S.
- FULL LENGTH EDGE OF RECP'S AT TOP OF SIDE SLOPES MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN A 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
- ADJACENT RECP'S MUST BE OVERLAPPED APPROXIMATELY 2" - 5" (DEPENDING ON RECP'S TYPE) AND STAPLED.
- IN HIGH FLOW CHANNEL APPLICATIONS, A STAPLE CHECK SLOT IS RECOMMENDED AT 30 TO 40 FOOT INTERVALS. USE A DOUBLE ROW OF STAPLES STAGGERED 4" APART AND 4" ON CENTER OVER ENTIRE WIDTH OF THE CHANNEL.
- THE TERMINAL END OF THE RECP'S MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN A 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
- IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY SECURE THE RECP'S.
- NORTH AMERICAN GREEN, 14649 HIGHWAY 41 NORTH, EVANSVILLE, INDIANA 47735. USA 1-800-772-2040, CANADA 1-800-448-2040. WWW.NAGREEN.COM

CHANNEL STABILIZATION/INSTALLATION GUIDELINES
 NOT TO SCALE

PROJECT INFORMATION:
 FILE PATH: G:\Projects\WDE\00004\Plans\
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 LAST SAVE BY: C5602610
 DATE: 03 Apr 2025, 5:03PM

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 20243371817

NO.	DATE	BY	REVISIONS
3	03/26/25	BGS	REVISED PER TOWNSHIP COMMENTS
2	02/26/25	JPK	REVISED FOR ALL TYPES SUBMISSION
1	01/24/25	ZHR	UPDATES FOR NIDES PRE-SUBMISSION MITG

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE No. PE076404

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
EROSION AND SEDIMENT CONTROL DETAILS-3

AND
 YOUR GOALS. OUR MISSION.
 1700 MARKET STREET, SUITE 3110
 PHILADELPHIA, PA 19103
 TEL 215-282-7850
 FAX 215-627-3499

OFFICES LOCATED IN:
 CALIFORNIA, INDIANA, KENTUCKY,
 MASSACHUSETTS, MICHIGAN, NEW JERSEY,
 OHIO AND PENNSYLVANIA

DESIGNED BY JPK/CKS/CMR/ROP/ZHR	CHECKED BY BGS/ZHR	DRAWN BY SCR/CKS/RAM	DATE 12/19/2024	SCALE AS NOTED	PROJ. NO. WDE\00004
DRAWING ENSD-3			SHEET 38		OF 46

GENERAL EROSION & SEDIMENT CONTROL PROCEDURES

- 1. ALL EARTH DISTURBANCES, INCLUDING CLEARING AND GRUBBING AS WELL AS CUTS AND FILLS SHALL BE DONE IN ACCORDANCE WITH THE APPROVED E&S PLAN PREPARED BY THE REVIEWING AGENCY...
2. AT LEAST SEVEN (7) DAYS PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, INCLUDING CLEARING AND GRUBBING, THE OWNER AND/OR OPERATOR SHALL INVITE ALL CONTRACTORS INVOLVED IN THOSE ACTIVITIES...
3. AT LEAST THREE (3) DAYS PRIOR TO THE START OF ANY EARTH DISTURBANCE ACTIVITIES, OR EXPANDING INTO AN AREA PREVIOUSLY UNMARKED...
4. ALL EARTH DISTURBANCE ACTIVITIES SHALL PROCEED IN ACCORDANCE WITH THE SEQUENCE PROVIDED ON THE PLAN DRAWINGS...
5. AREAS TO BE FILLED ARE TO BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO REMOVE TREES, VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL...
6. CLEARING, GRUBBING, AND TOPSOIL STRIPPING SHALL BE LIMITED TO THOSE AREAS DESCRIBED IN EACH STAGE OF THE CONSTRUCTION SEQUENCE...
7. AT NO TIME SHALL CONSTRUCTION VEHICLES BE ALLOWED TO ENTER AREAS OUTSIDE THE LIMIT OF DISTURBANCE BOUNDARIES SHOWN ON THE PLAN MAPS...
8. TOPSOIL REQUIRED FOR THE ESTABLISHMENT OF VEGETATION SHALL BE STOCKPILED AT THE LOCATION(S) SHOWN ON THE PLAN IN THE AMOUNTS NECESSARY TO COMPLETE THE FINISH GRADING OF ALL EXPOSED AREAS...
9. IMMEDIATELY UPON DISCOVERING UNFORESEEN CIRCUMSTANCES POSING THE POTENTIAL FOR ACCELERATED EROSION AND/OR SEDIMENT POLLUTION, THE OPERATOR SHALL IMPLEMENT APPROPRIATE BEST MANAGEMENT PRACTICES...
10. ALL BUILDING MATERIALS AND WASTES SHALL BE REMOVED FROM THE SITE BY THE CONTRACTOR AND RECYCLED OR DISPOSED IN ACCORDANCE WITH THE DEPARTMENT'S SOLID WASTE MANAGEMENT REGULATIONS...
11. ALL OFF-SITE WASTE AND BORROW AREAS MUST HAVE AN E&S PLAN APPROVED BY THE LOCAL CONSERVATION DISTRICT OR THE DEPARTMENT FULLY IMPLEMENTED PRIOR TO BEING ACTIVATED...
12. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ANY MATERIAL BROUGHT ON SITE IS CERTIFIED CLEAN FILL...
13. ALL PUMPING OF WATER FROM ANY WORK AREA SHALL BE DONE ACCORDING TO THE APPROVED PLAN...
14. VEHICLES AND EQUIPMENT MAY NEITHER ENTER DIRECTLY NOR EXIT DIRECTLY FROM THE CONSTRUCTION SITE ONTO ANY PUBLIC ROAD...
15. UNTIL THE SITE IS STABILIZED, ALL EROSION AND SEDIMENT BMPs SHALL BE MAINTAINED PROPERLY...
16. A LOG SHOWING DATES THAT E&S BMPs WERE INSPECTED AS WELL AS ANY DEFICIENCIES FOUND AND THE DATE THEY WERE CORRECTED SHALL BE MAINTAINED ON THE SITE...
17. SEDIMENT TRACKED ONTO ANY ROADWAY OR SIDEWALK SHALL BE RETURNED TO THE CONSTRUCTION SITE BY THE END OF EACH WORK DAY...
18. ALL SEDIMENT REMOVED FROM BMPs SHALL BE DISPOSED OF IN A MANNER DESCRIBED ON PLAN DRAWINGS...
19. UPON FINAL GRADING, AREAS WHICH ARE TO BE TOPSOILED SHALL BE SCARIFIED TO A MINIMUM DEPTH OF 3 TO 5 INCHES...
20. ALL FILLS SHALL BE COMPACTED AS REQUIRED TO REDUCE EROSION, SLIPPAGE, SETTLEMENT, SUBSIDENCE OR OTHER RELATED PROBLEMS...
21. ALL EARTHEN FILLS SHALL BE PLACED IN COMPACTED LAYERS NOT TO EXCEED 9 INCHES IN THICKNESS...
22. FILL MATERIALS SHALL BE FREE OF FROZEN PARTICLES, BRUSH, ROOTS, SOIL, OR OTHER FOREIGN OR OBJECTIONABLE MATERIALS...
23. FILL SHALL NOT BE PLACED ON SATURATED OR FROZEN SURFACES...
24. SEEPS OR SPRINGS ENCOUNTERED DURING CONSTRUCTION SHALL BE HANDLED IN ACCORDANCE WITH THE STANDARD AND SPECIFICATION FOR SUBSURFACE DRAIN OR OTHER APPROVED METHOD...
25. ALL GRADED AREAS SHALL BE PERMANENTLY STABILIZED IMMEDIATELY UPON REACHING FINISHED GRADE...
26. IMMEDIATELY AFTER EARTH DISTURBANCE ACTIVITIES CEASE IN ANY AREA OR SUBAREA OF THE PROJECT AND UPON RECEIPT OF CLEAN TEST SAMPLES...

MONITORING, INSPECTION, AND REPORTING REQUIREMENTS

- 1. THE PERMITTEE AND CO-PERMITTEE(S) MUST ENSURE THAT VISUAL SITE INSPECTIONS ARE CONDUCTED WEEKLY, AND WITHIN 24 HOURS AFTER EACH MEASURABLE RAINFALL EVENT THROUGHOUT THE DURATION OF CONSTRUCTION...
2. EROSION AND SEDIMENTATION POLLUTION CONTROL SPECIALISTS' CONTACTS: MONTGOMERY COUNTY CONSERVATION DISTRICT: (610) 925-4920 PADEP SOUTHEAST REGIONAL OFFICE (484) 250-5900
3. ALL EROSION AND SEDIMENTATION POLLUTION CONTROL MEASURES MUST REMAIN IN PLACE UNTIL THE SITE IS STABILIZED...
4. UNTIL THE SITE IS STABILIZED, ALL EROSION AND SEDIMENT POLLUTION CONTROLS (BMPs) MUST BE PROPERLY MAINTAINED...
5. SEDIMENT REMOVED FROM BMPs SHALL BE DISPOSED OF IN LANDSCAPED AREAS OUTSIDE OF STEEP SLOPES, WETLANDS, FLOODPLAINS OR DRAINAGE SWALES...
6. REFER TO THE SITE / RECORD PLAN FOR ADDITIONAL NOTES.

RECYCLING OR DISPOSAL METHODS

- 1. THE OPERATOR SHALL REMOVE FROM THE SITE, RECYCLE, OR DISPOSE OF ALL DEBRIS, RUBBISH AND WASTE...
2. EXCEPT FOR ITEMS OR MATERIALS INDICATED TO BE REUSED, SALVAGED, REINSTALLED, OR OTHERWISE INDICATED TO REMAIN ON THE PROPERTY...
3. DEBRIS SHALL NOT BE PERMITTED TO ACCUMULATE ON THE JOB-SITE...
4. RECYCLING OR DISPOSAL OF MATERIALS ASSOCIATED WITH OR FROM THIS PROJECT SITE SHALL BE UNDERTAKEN IN ACCORDANCE WITH REGULATIONS...
5. SEDIMENT REMOVED FROM CONTROL FACILITIES AS A PART OF REGULAR MAINTENANCE SHALL BE DISPOSED OF UPSLOPE OF CONTROL FACILITIES...
6. REFER TO THE SITE / RECORD PLAN FOR ADDITIONAL NOTES.

MAINTENANCE OF EROSION CONTROL FACILITIES

- 1. THE OPERATOR SHALL BE RESPONSIBLE FOR THE PROPER CONSTRUCTION, STABILIZATION AND MAINTENANCE OF ALL EROSION AND SEDIMENTATION CONTROLS AND RELATED ITEMS...
2. EROSION AND SEDIMENTATION POLLUTION CONTROL SPECIALISTS' CONTACTS: MONTGOMERY COUNTY CONSERVATION DISTRICT: (610) 925-4920 PADEP SOUTHEAST REGIONAL OFFICE (484) 250-5900
3. ALL EROSION AND SEDIMENTATION POLLUTION CONTROL MEASURES MUST REMAIN IN PLACE UNTIL THE SITE IS STABILIZED...
4. UNTIL THE SITE IS STABILIZED, ALL EROSION AND SEDIMENT POLLUTION CONTROLS (BMPs) MUST BE PROPERLY MAINTAINED...
5. SEDIMENT REMOVED FROM BMPs SHALL BE DISPOSED OF IN LANDSCAPED AREAS OUTSIDE OF STEEP SLOPES, WETLANDS, FLOODPLAINS OR DRAINAGE SWALES...
6. REFER TO THE SITE / RECORD PLAN FOR ADDITIONAL NOTES.

SEQUENCE OF CONSTRUCTION

- 1. INSTALL GP AND TR SERIES PERIMETER COMPOST FILTER SOCK SEGMENTS. CRITICAL STAGE - INSPECT PERIMETER COMPOST SOCK
2. INSTALL ROCK CONSTRUCTION ENTRANCES 1 AND 2. CUT IN CONSTRUCTION ENTRANCES AT PROPOSED GRADE, STOCKPILE EXCAVATION AT LOCATIONS INDICATED.
3. CONSTRUCT TROOPER ROAD CURBING AND STORM SEWER FROM EXISTING INLET T1 UP TO PROPOSED INLET T9. DISTURB NO MORE EARTH IN A DAY WHICH CAN BE STABILIZED AT END OF EACH DAY WITH TOPSOIL, SEED AND EROSION BLANKETS...
4. CONSTRUCT STORMWATER COLLECTION AREA AT G2-T11-S1-AT NEXUS. MAKE STORM SEWER CONNECTION TO AND T1 EXCAVATE AREA INSTALLED RETAINING WALL AND PIPE STUBS THROUGH WALL AT S1 AND A1, AND HEADWALLS T1.1 AND G2. STABILIZE SURROUNDING SURFACES EXTERNAL TO THE COLLECTION AREA...
5. INSTALL STORM SEWER FROM S1 UP TO S3 AND HEADWALL S3.1.
6. CRITICAL STAGE - INSPECT STORM SEWER RUN FROM S3.1 TO S1 THAT IT IS ONLINE AND CAN RECEIVE RUNOFF FROM THE S-SERIES DIVERSION SWALE SYSTEM...
7. CONSTRUCT THE S4 TO S9 STORM SEWER AND DIVERSION SWALE FROM DOWNSTREAM TO UPSTREAM...
8. GERMANTOWN PIKE WIDENING MAY OCCUR AT THIS STAGE, OR AT ANY STAGE AFTER. AFTER INTERSECTION IMPROVEMENTS ARE COMPLETED...
9. BEGIN CONSTRUCTION OF SEDIMENT BASIN 1 OVER FOOTPRINT OF PERMANENT STORMWATER MANAGEMENT BASIN SYSTEM 001...
10. BEGIN MASS GRADING OF SITE IN FOLLOWING ORDER: ESTABLISH DRAINAGE PATTERN INTERNAL TO SITE (FROM WALLS TO SEDIMENT BASIN) TO CONVEY RUNOFF TO SEDIMENT BASIN...
11. PERFORM FINAL GRADING AND LANDSCAPING WHENEVER AND WHEREVER POSSIBLE, STABILIZE WITH TOPSOIL, SEED AND MULCH.
12. CONVERT SEDIMENT BASIN TO PERMANENT STORMWATER MANAGEMENT FACILITY. WORK SHALL BE SCHEDULED AT TIMES OF NO FORECAST PRECIPITATION...
13. WHEN PERMANENT STABILIZATION IS ACHIEVED (90% UNIFORM PERENNIAL GROWTH), REMOVE REMAINING COMPOST SOCK BARRIER CONTROLS.
14. FILE NOTICE OF TERMINATION FOR NPDES PERMIT

ATTENTION: ALL CONSTRUCTION ACTIVITIES MUST BE STOPPED IMMEDIATELY IF ANY EXISTING UTILITIES (SHOW OR NOT SHOWN) ARE BEING DEVELOPED FROM UTILITY COMPANY RECORDS...
CHRISTOPHER W. JENSEN, P.E. LICENSED PROFESSIONAL ENGINEER

Table with 10 columns: NO., DATE, REVISIONS, REVISED PER TOWNSHIP COMMENTS, REVISED PER PA/PPDES SUBMISSION, REVISED PER PA/PPDES SUBMISSION MITG, JPK, ZHR, JPK, ZHR, BGS, JPK, ZHR, BY, CHD.

CHRISTOPHER W. JENSEN, P.E. LICENSED PROFESSIONAL ENGINEER. State of PA License No. PED76404. Includes professional seal.

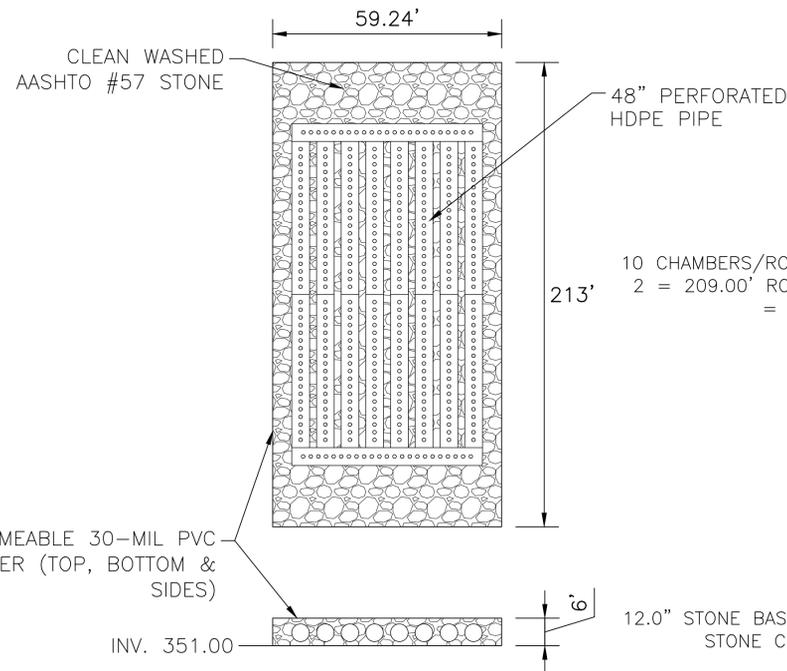
COMMERCE PURSUIT CAPITAL. TROOPER RIDGE SUBDIVISION. 105 NORTH TROOPER ROAD, WORCESTER TOWNSHIP, MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA. EROSION AND SEDIMENT CONTROL DETAILS - 4. Includes project location map.

AND YOUR GOALS. OUR MISSION. 1700 MARKET STREET, SUITE 3110 PHILADELPHIA, PA 19103. TEL 215-282-7850 FAX 215-627-3499. OFFICES LOCATED IN: CALIFORNIA, INDIANA, KENTUCKY, MASSACHUSETTS, MICHIGAN, NEW JERSEY, OHIO AND PENNSYLVANIA. Includes company logo and contact information.

PROJECT INFORMATION: G:\Projects\WDEV\00004\Plans\... FILE PATH: G:\Projects\WDEV\00004\JTL\Lang... FILE NAME: WDEV0004_01.Lang... DATE: 03-Apr-2025, 5:03PM... LAST SAVE BY: C5692940

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 X 7 + 24.0" SIDE STONE X 2 = 59.24'
 BASE WIDTH

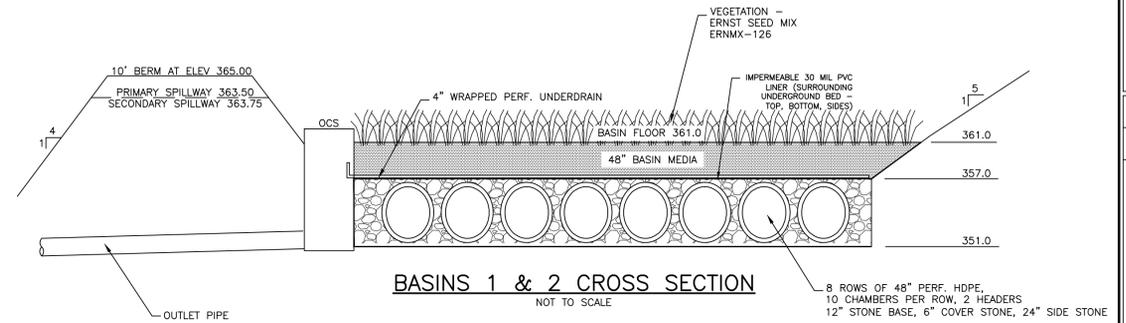


ADS N-12 PIPE & STONE BED
 NOT TO SCALE

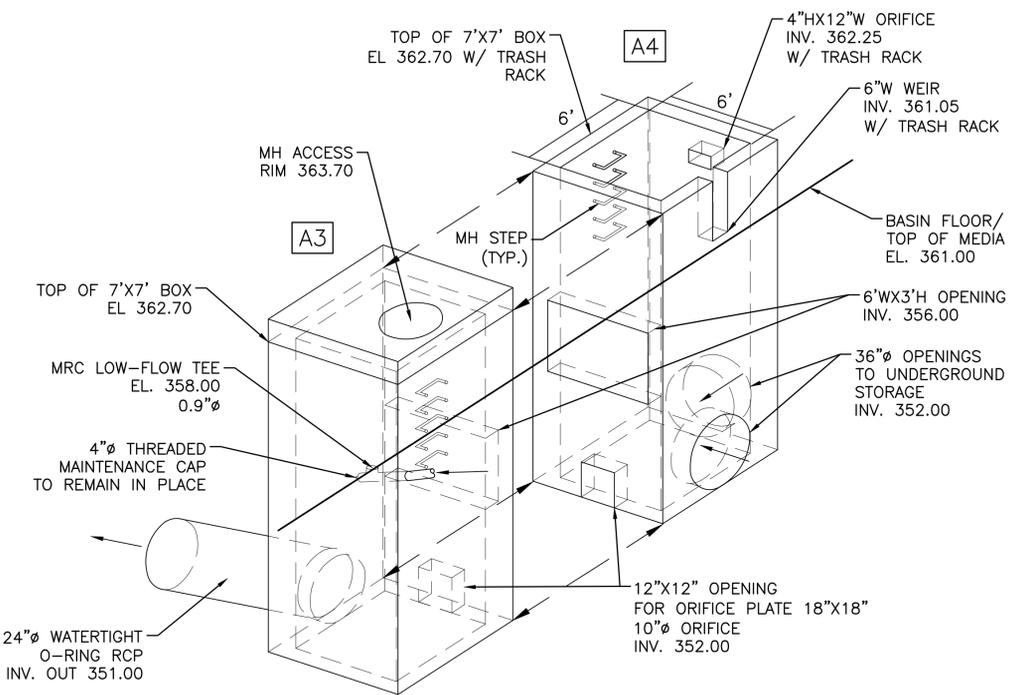


A3 OCS DETAIL - SIDE VIEW

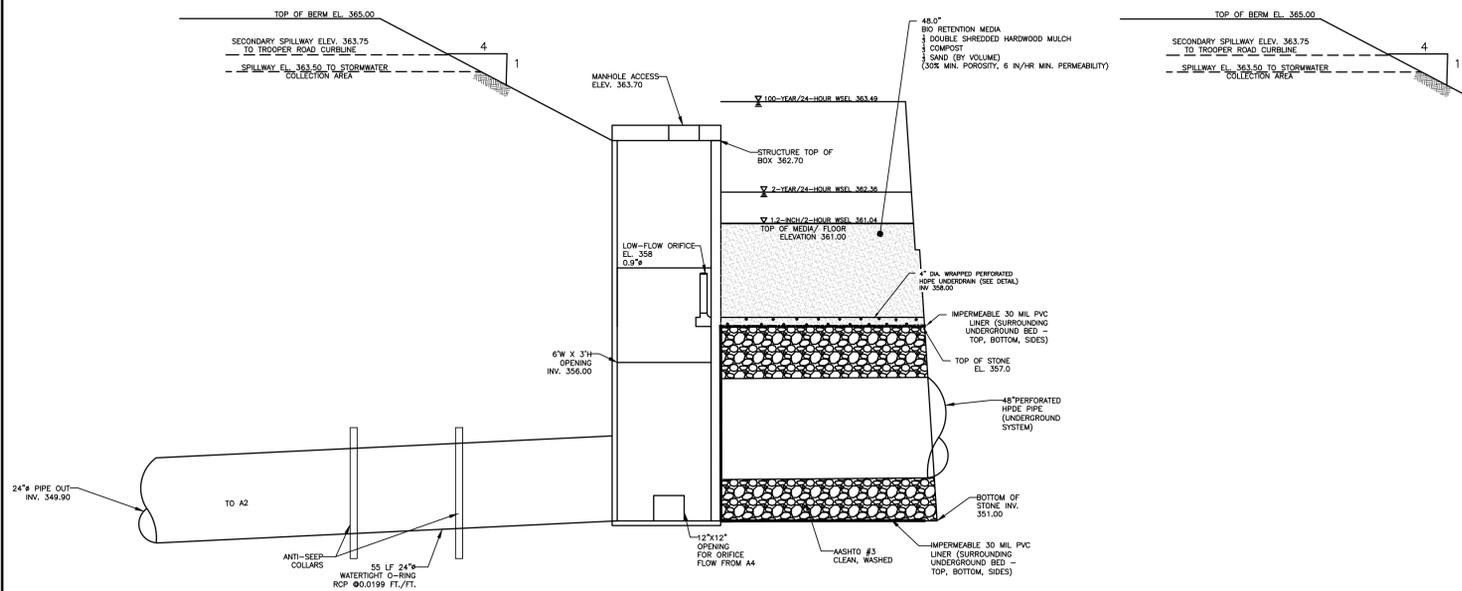
SPILLWAY TO TROOPER ROAD CURBLIN



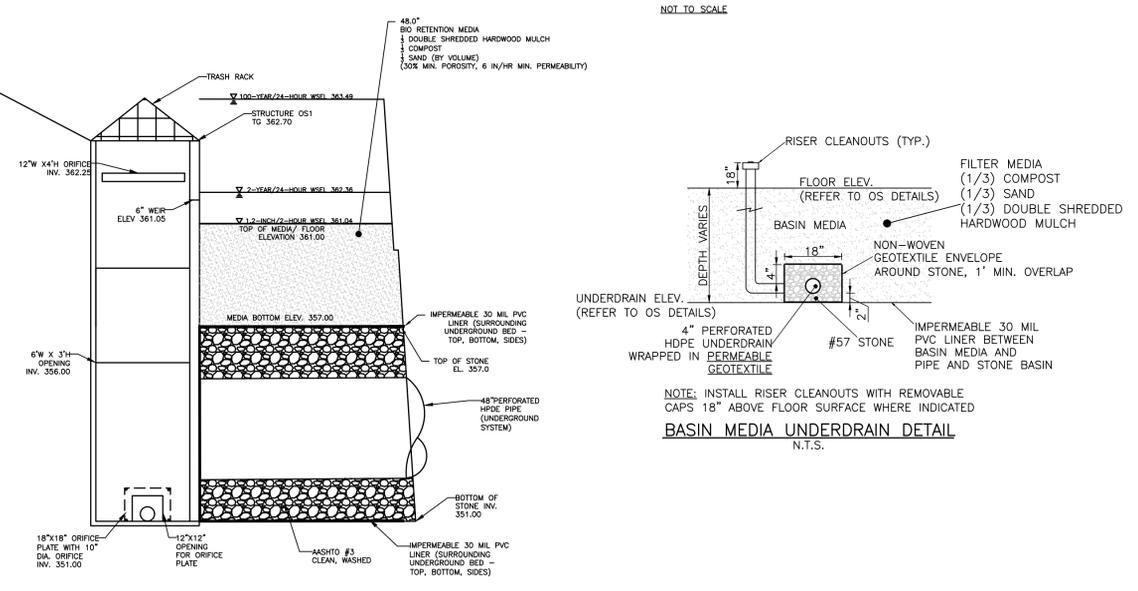
BASINS 1 & 2 CROSS SECTION
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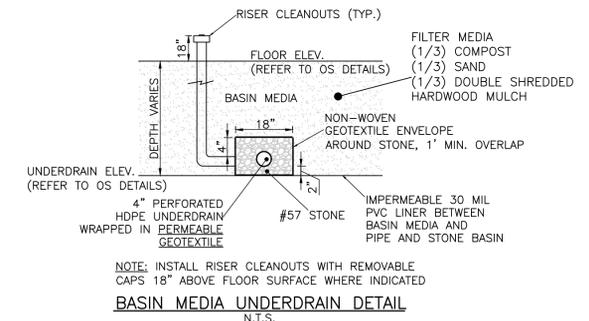
BASIN OCS A3 & A4 - ISOMETRIC VIEW
 NOT TO SCALE



A3 OCS DETAIL - SIDE VIEW
 NOT TO SCALE



A4 OCS DETAIL - SIDE VIEW
 NOT TO SCALE



BASIN MEDIA UNDERDRAIN DETAIL
 N.T.S.

PROJECT INFORMATION: G:\Projects\WDEV\0000A\Plans\...
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 PLOT DATE: 12/19/2024 8:44AM
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NO.	DATE	BY	REVISIONS
1	03/26/25	JPK	REVISED PER TOWNSHIP COMMENTS
2	02/26/25	JPK	UPDATES FOR 48" PIPES SUBMISSION
3	03/26/25	JPK	UPDATES FOR 48" PIPES PRE-SUBMISSION MITG.

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE NO. PE76464

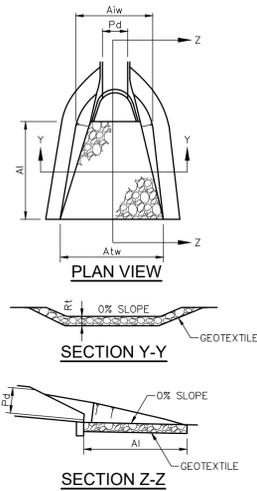
COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
 1035 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS-1



1700 MARKET STREET, SUITE 3110
 PHILADELPHIA, PA 19103
 TEL 215-282-7850
 FAX 215-627-3499

OFFICES LOCATED IN:
 CALIFORNIA, INDIANA, KENTUCKY,
 MASSACHUSETTS, MICHIGAN, NEW JERSEY,
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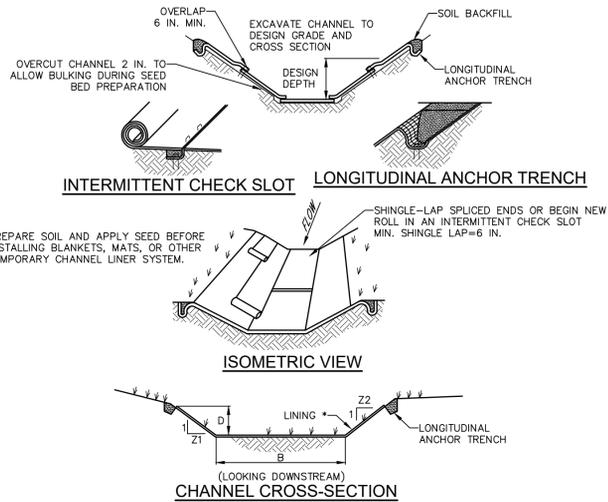
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CHECKED BY BGS/ZHR	SHEET 40
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDEV00004	



OUTLET NO.	PIPE DIA Pd (IN)	RIPRAP		APRON		
		SIZE R- (IN)	THICK. Rt (IN)	LENGTH Al (FT)	INITIAL WIDTH Atw (FT)	TERMINAL WIDTH Atw (FT)
B1	120	R-5	27	40	30	46
B4	24	R-5	27	9	6	10
B15	18	R-4	18	31	4.5	17
C1	18	R-4	18	8	4.5	8

NOTES:
 ALL APRONS SHALL BE CONSTRUCTED TO THE DIMENSIONS SHOWN. TERMINAL WIDTHS SHALL BE ADJUSTED AS NECESSARY TO MATCH RECEIVING CHANNELS.
 ALL APRONS SHALL BE INSPECTED AT LEAST WEEKLY AND AFTER EACH RUNOFF EVENT. DISPLACED RIPRAP WITHIN THE APRON SHALL BE REPLACED IMMEDIATELY.

**STANDARD CONSTRUCTION DETAIL #9-1
 RIPRAP APRON AT PIPE OUTLET
 WITH FLARED END SECTION OR ENDWALL**
 NOT TO SCALE

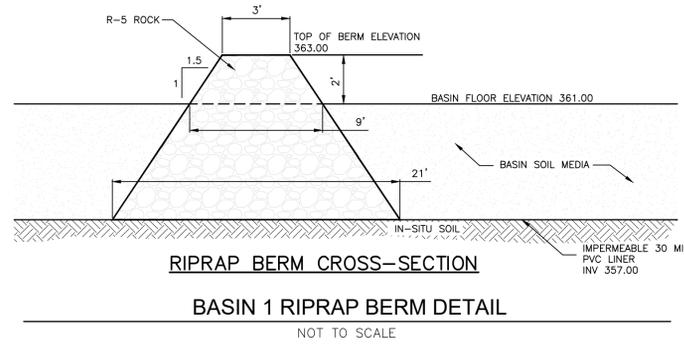


* SEE MANUFACTURER'S LINING INSTALLATION DETAIL FOR STAPLE PATTERNS, VEGETATIVE STABILIZATION FOR SOIL AMENDMENTS, SEED MIXTURES AND MULCHING INFORMATION

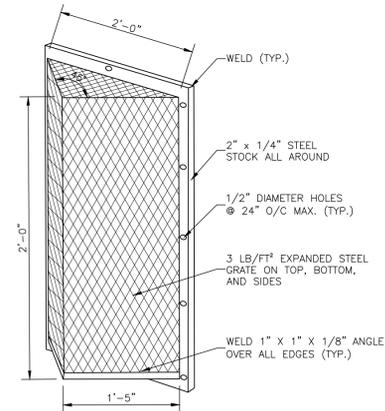
CHANNEL NO.	STATIONS	BOTTOM WIDTH B (FT)	DEPTH D (FT)	TOP WIDTH W (FT)	Z1 (FT)	Z2 (FT)	LINING *
S3.1	ALL	5	1.00	11.0	3	3	R-5 RIP-RAP
S4	ALL	5	1.00	11.0	3	3	R-5 RIP-RAP
S5	ALL	5	1.00	11.0	3	3	R-5 RIP-RAP
S6	ALL	5	1.00	11.0	3	3	R-5 RIP-RAP
S7	ALL	5	1.00	11.0	3	3	R-5 RIP-RAP
S8	ALL	5	1.00	11.0	3	3	R-5 RIP-RAP
S9	ALL	5	1.25	12.5	3	3	R-5 RIP-RAP

NOTES:
 ANCHOR TRENCHES SHALL BE INSTALLED AT BEGINNING AND END OF CHANNEL IN THE SAME MANNER AS LONGITUDINAL ANCHOR TRENCHES.
 CHANNEL DIMENSIONS SHALL BE CONSTANTLY MAINTAINED. CHANNEL SHALL BE CLEANED WHENEVER TOTAL CHANNEL DEPTH IS REDUCED BY 25% AT ANY LOCATION.
 SEDIMENT DEPOSITS SHALL BE REMOVED WITHIN 24 HOURS OF DISCOVERY OR AS SOON AS SOIL CONDITIONS PERMIT ACCESS TO CHANNEL WITHOUT FURTHER DAMAGE. DAMAGED LINING SHALL BE REPAIRED OR REPLACED WITHIN 48 HOURS OF DISCOVERY.
 NO MORE THAN ONE THIRD OF THE SHOOT (GRASS LEAF) SHALL BE REMOVED IN ANY MOWING. GRASS HEIGHT SHALL BE MAINTAINED BETWEEN 2 AND 3 INCHES UNLESS OTHERWISE SPECIFIED. EXCESS VEGETATION SHALL BE REMOVED FROM PERMANENT CHANNELS TO ENSURE SUFFICIENT CHANNEL CAPACITY.

**STANDARD CONSTRUCTION DETAIL #6-1
 VEGETATED CHANNEL**
 NOT TO SCALE



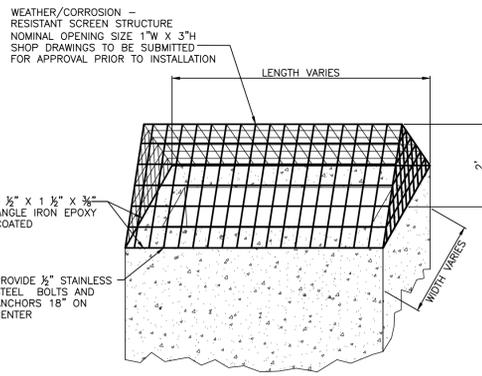
RIPRAP BERM CROSS-SECTION
BASIN 1 RIPRAP BERM DETAIL
 NOT TO SCALE



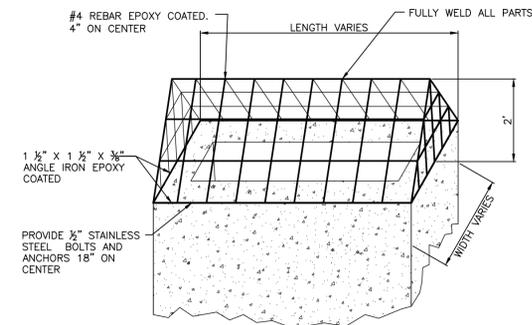
NOTES:
 1. TRASH RACK TO BE CENTERED OVER OPENING.
 2. STEEL TO CONFORM TO ASTM A-36.
 3. ALL SURFACE TO BE COATED WITH ZINC COLD GALVANIZING COMPOUND AFTER WELDING.
 4. TRASH RACK TO BE FASTENED TO WALL WITH 1/2" MASONRY ANCHORS. TRASH RACK TO BE REMOVABLE.

SPECIALTY TRASH RACK DETAIL
 NOT TO SCALE

APPLIES TO INLETS S4, S5, S6, S7, S8 AND S9 AND T9



STORM STRUCTURE DEBRIS SCREEN
 NOT TO SCALE
 APPLIES TO INLETS S4, S5, S6, S7, S8 AND S9 AND T9.



SPECIALTY TRASH RACK
 NOT TO SCALE
 APPLIES TO INLETS S4, S5, S6, S7, S8 AND S9 AND T9

PROJECT INFORMATION:
 FILE PATH: G:\Projects\WDEV\0000A\Plans\
 FILE NAME: WDEV0004_PCSM_DT.dwg
 PROJECT NO: 20240004
 DATE: 27 Mar 2025, 8:44AM
 LAST SAVE BY: J.Kelley

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NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	ZHR
2	02/26/25	UPDATES FOR 141 PIPES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR 141 PIPES PRE-SUBMISSION MITG	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE No. PED76464

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
 1035 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS-2



1700 MARKET STREET, SUITE 3110
 PHILADELPHIA, PA 19103
 TEL 215-282-7850
 FAX 215-627-3499

OFFICES LOCATED IN:
 CALIFORNIA, INDIANA, KENTUCKY,
 MASSACHUSETTS, MICHIGAN, NEW JERSEY,
 OHIO AND PENNSYLVANIA

DESIGNED BY
 JPK/CKS/CMR/ROP/ZHR
 CHECKED BY
 BGS/ZHR
 DRAWN BY
 SCR/CKS/RAM
 DATE
 12/19/2024
 SCALE
 AS NOTED
 PROJ. NO.
 WDEV00004

DRAWING
PCSM-D-2
 SHEET
41
 OF 46

BMP SPECIFICATIONS

BMP 6.4.5 BIORETENTION (MRC):
VEGETATION - SEE APPENDIX B OF PA BMP MANUAL
EXECUTION

- A. SUBGRADE PREPARATION
1. INITIAL EXCAVATION CAN BE PERFORMED DURING ROUGH SITE GRADING BUT SHALL NOT BE CARRIED TO WITHIN ONE FEET OF THE FINAL BOTTOM ELEVATION. FINAL EXCAVATION SHOULD NOT TAKE PLACE UNTIL ALL DISTURBED AREAS IN THE DRAINAGE AREA HAVE BEEN STABILIZED.
2. WHERE EROSION OF SUB-GRADE HAS CAUSED ACCUMULATION OF FINE MATERIALS AND/OR SURFACE PONDING IN THE GRADED BOTTOM, THIS MATERIAL SHALL BE REMOVED.
3. BRING SUB-GRADE OF MRC AREA TO LINE, GRADE, AND ELEVATIONS INDICATED. INSTALL IMPERMEABLE LINER PER MANUFACTURER'S RECOMMENDATIONS. FILL AND LIGHTLY REGRADE ANY AREAS DAMAGED BY EROSION, PONDING, OR TRAFFIC COMPACTION. ALL MRC AREAS SHALL BE LEVEL GRADE ON THE BOTTOM.
4. HALF EXCAVATION AND NOTIFY ENGINEER IMMEDIATELY IF EVIDENCE OF SINKHOLE ACTIVITY OR PINNACLES OF CARBONATE BEDROCK ARE ENCOUNTERED IN THE MRC AREA.

- B. MRC INSTALLATION.
1. UPON COMPLETION OF SUB-GRADE WORK, THE ENGINEER SHALL BE NOTIFIED AND SHALL INSPECT AT HIS/HER DISCRETION BEFORE PROCEEDING WITH MRC INSTALLATION.
2. FOR THE SUBSURFACE STORAGE BED INSTALLATION, UNDERDRAIN AND FILTER MEDIA SHOULD BE PLACED ON THE BOTTOM TO THE SPECIFIED DEPTH.
3. PLANTING SOIL SHALL BE PLACED IMMEDIATELY AFTER APPROVAL OF SUB-GRADE PREPARATION/BED INSTALLATION. ANY ACCUMULATION OF DEBRIS OR SEDIMENT THAT TAKES PLACE AFTER APPROVAL OF SUB-GRADE SHALL BE REMOVED PRIOR TO INSTALLATION OF PLANTING SOIL AT NO EXTRA COST TO THE OWNER.
4. INSTALL PLANTING SOIL (EXCEEDING ALL CRITERIA) IN 18-INCH MAXIMUM LIFTS AND LIGHTLY COMPACT (TAMP WITH BACKHOE BUCKET OR BY HAND). KEEP EQUIPMENT MOVEMENT OVER PLANTING SOIL TO A MINIMUM - DO NOT OVER COMPACT. INSTALL PLANTING SOIL TO GRADES INDICATED ON THE DRAWINGS.
5. PLANT TREES AND SHRUBS ACCORDING TO SUPPLIER'S RECOMMENDATIONS AND ONLY FROM MID-MARCH THROUGH THE END OF JUNE OR FROM MID-SEPTEMBER THROUGH MID-NOVEMBER.
6. INSTALL 2-3" SHREPPED HARDWOOD MULCH (MINIMUM AGE 6 MONTHS) OR COMPOST MULCH EVENLY AS SHOWN ON PLANS DO NOT APPLY MULCH IN AREAS WHERE GROUND COVER IS TO BE GRASS OR WHERE COVER WILL BE ESTABLISHED BY SEEDING.
7. PROTECT MRC AREAS FROM SEDIMENT AT ALL TIMES DURING CONSTRUCTION. HAY BALES, DIVERSION BERMS AND/OR OTHER APPROPRIATE MEASURES SHALL BE USED AT THE TOE OF THE SLOPES THAT ARE ADJACENT TO MRC AREAS TO PREVENT SEDIMENT FROM WASHING INTO THESE AREAS DURING SITE DEVELOPMENT.
8. WHEN THE SITE IS FULLY VEGETATED AND THE SOIL MANITLY STABILIZED THE PLAN DESIGNER SHALL BE NOTIFIED AND SHALL INSPECT THE MRC DRAINAGE AREA AT HIS/HER DISCRETION BEFORE THE AREA IS BROUGHT ONLINE AND SEDIMENT CONTROL DEVICES REMOVED.
9. WATER VEGETATION AT THE END OF EACH DAY FOR TWO WEEKS AFTER PLANTING IS COMPLETED. CONTRACTOR SHOULD PROVIDE A ONE-YEAR BOX CARE AND REPLACEMENT WARRANTY FOR ALL PLANTING BEGINNING AFTER INSTALLATION AND INSPECTION OF ALL PLANTS.

- BMP 6.6.3 UNDERGROUND DETENTION BASIN:
1. SITE PREPARATION
A. THE AREA IMMEDIATELY ADJACENT TO THE BASIN MUST BE STABILIZED IN ACCORDANCE WITH THE PADEP'S EROSION AND SEDIMENT POLLUTION CONTROL PROGRAM MANUAL (2012 OR LATEST EDITION) PRIOR TO BASIN CONSTRUCTION.
2. INSTALLATION
A. INSTALL UNDERGROUND CRATE SYSTEM PER MANUFACTURER'S SPECIFICATIONS. INSTALL SURROUNDING INLET AND OUTLET CONTROL STRUCTURES.
3. OPERATION AND MAINTENANCE
A. AN OPERATION AND MAINTENANCE PLAN IN ACCORDANCE WITH LOCAL OR STATE REGULATIONS WILL BE PREPARED. AT A MINIMUM, AN INSPECTION CHECKLIST SHOULD BE INCLUDED AS PART OF THE OPERATION AND MAINTENANCE PLAN AND PERFORMED AT LEAST ANNUALLY.
BMP 6.4.5 BIORETENTION (MRC):
VEGETATION - SEE APPENDIX B OF PA BMP MANUAL
EXECUTION
A. SUBGRADE PREPARATION
1. INITIAL EXCAVATION CAN BE PERFORMED DURING ROUGH SITE GRADING BUT SHALL NOT BE CARRIED TO WITHIN ONE FEET OF THE FINAL BOTTOM ELEVATION. FINAL EXCAVATION SHOULD NOT TAKE PLACE UNTIL ALL DISTURBED AREAS IN THE DRAINAGE AREA HAVE BEEN STABILIZED.
2. WHERE EROSION OF SUB-GRADE HAS CAUSED ACCUMULATION OF FINE MATERIALS AND/OR SURFACE PONDING IN THE GRADED BOTTOM, THIS MATERIAL SHALL BE REMOVED.
3. BRING SUB-GRADE OF MRC AREA TO LINE, GRADE, AND ELEVATIONS INDICATED. INSTALL IMPERMEABLE LINER PER MANUFACTURER'S RECOMMENDATIONS. FILL AND LIGHTLY REGRADE ANY AREAS DAMAGED BY EROSION, PONDING, OR TRAFFIC COMPACTION. ALL MRC AREAS SHALL BE LEVEL GRADE ON THE BOTTOM.
4. HALF EXCAVATION AND NOTIFY ENGINEER IMMEDIATELY IF EVIDENCE OF SINKHOLE ACTIVITY OR PINNACLES OF CARBONATE BEDROCK ARE ENCOUNTERED IN THE MRC AREA.
B. MRC INSTALLATION.
1. UPON COMPLETION OF SUB-GRADE WORK, THE ENGINEER SHALL BE NOTIFIED AND SHALL INSPECT AT HIS/HER DISCRETION BEFORE PROCEEDING WITH MRC INSTALLATION.
2. FOR THE SUBSURFACE STORAGE BED INSTALLATION, UNDERDRAIN AND FILTER MEDIA SHOULD BE PLACED ON THE BOTTOM TO THE SPECIFIED DEPTH.
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6. INSTALL 2-3" SHREPPED HARDWOOD MULCH (MINIMUM AGE 6 MONTHS) OR COMPOST MULCH EVENLY AS SHOWN ON PLANS DO NOT APPLY MULCH IN AREAS WHERE GROUND COVER IS TO BE GRASS OR WHERE COVER WILL BE ESTABLISHED BY SEEDING.
7. PROTECT MRC AREAS FROM SEDIMENT AT ALL TIMES DURING CONSTRUCTION. HAY BALES, DIVERSION BERMS AND/OR OTHER APPROPRIATE MEASURES SHALL BE USED AT THE TOE OF THE SLOPES THAT ARE ADJACENT TO MRC AREAS TO PREVENT SEDIMENT FROM WASHING INTO THESE AREAS DURING SITE DEVELOPMENT.
8. WHEN THE SITE IS FULLY VEGETATED AND THE SOIL MANITLY STABILIZED THE PLAN DESIGNER SHALL BE NOTIFIED AND SHALL INSPECT THE MRC DRAINAGE AREA AT HIS/HER DISCRETION BEFORE THE AREA IS BROUGHT ONLINE AND SEDIMENT CONTROL DEVICES REMOVED.
9. WATER VEGETATION AT THE END OF EACH DAY FOR TWO WEEKS AFTER PLANTING IS COMPLETED. CONTRACTOR SHOULD PROVIDE A ONE-YEAR BOX CARE AND REPLACEMENT WARRANTY FOR ALL PLANTING BEGINNING AFTER INSTALLATION AND INSPECTION OF ALL PLANTS.

BMP 6.6.3 UNDERGROUND DETENTION BASIN:

- 1. SITE PREPARATION
A. THE AREA IMMEDIATELY ADJACENT TO THE BASIN MUST BE STABILIZED IN ACCORDANCE WITH THE PADEP'S EROSION AND SEDIMENT POLLUTION CONTROL PROGRAM MANUAL (2012 OR LATEST EDITION) PRIOR TO BASIN CONSTRUCTION.
2. INSTALLATION
A. INSTALL UNDERGROUND CRATE SYSTEM PER MANUFACTURER'S SPECIFICATIONS. INSTALL SURROUNDING INLET AND OUTLET CONTROL STRUCTURES.
3. OPERATION AND MAINTENANCE
A. AN OPERATION AND MAINTENANCE PLAN IN ACCORDANCE WITH LOCAL OR STATE REGULATIONS WILL BE PREPARED. AT A MINIMUM, AN INSPECTION CHECKLIST SHOULD BE INCLUDED AS PART OF THE OPERATION AND MAINTENANCE PLAN AND PERFORMED AT LEAST ANNUALLY.

PCSM RECYCLING/DISPOSAL NOTES

- 1. AS PART OF THE ROUTINE MAINTENANCE OF POST CONSTRUCTION BMPs, THE RESPONSIBLE ENTITY SHALL REMOVE FROM THE SITE, RECYCLE, OR DISPOSE OF ANY MATERIAL OR DEBRIS THAT MAY ACCUMULATE IN THE BMPs OVERTIME, IN ACCORDANCE WITH ANY AND ALL APPLICABLE MUNICIPAL OR OTHER GOVERNMENT AGENCY CURRENT REGULATIONS INCLUDING BUT NOT LIMITED TO: THE DEPARTMENT'S SOLID WASTE MANAGEMENT REGULATIONS AT 25 PA. CODE 260.1 ET SEQ., 271.1 ET SEQ., AND 287.1 ET SEQ. THE RESPONSIBLE ENTITY SHALL NOT ILLEGALLY BURY, DUMP, OR DISCHARGE ANY MATERIAL OR DEBRIS AT THE SITE.
2. TRASH OR OTHER WASTE SHALL NOT BE PERMITTED TO ACCUMULATE IN THE BMPs. MATERIALS SLATED FOR REMOVAL FROM THE SITE SHALL BE DISPOSED OF IN ACCORDANCE WITH ANY AND ALL APPLICABLE MUNICIPAL OR OTHER GOVERNMENTAL AGENCY CURRENT REGULATIONS. THESE MATERIALS SHOULD BE RECYCLED OR DISPOSED OF IN ACCORDANCE WITH THE REGULATIONS LISTED ABOVE AND/OR THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION RULES AND REGULATIONS.
3. FOLLOW THE OPERATIONS AND MAINTENANCE PROCEDURES AS SPECIFIED FOR THIS SITE STORMWATER BEST MANAGEMENT PRACTICE (BMP'S)/STORMWATER CONTROL MEASURES (SCM'S). DEBRIS SHALL NOT BE PERMITTED TO ACCUMULATE WITHIN THE PCSM BMP'S. DEBRIS, TRASH, LEAVES, AND SILT COLLECTED IN PRETREATMENT FACILITIES (INLET FILTERS, FOREBAYS, ETC) SHALL BE DISPOSED OF IN ORDINARY SITE REFUSE CONTAINER (DUMPSTER), OR DEPENDING ON QUANTITY, DISPOSED OF IN LANDFILL.
4. REFER TO THE PCSM / RECORD PLAN FOR ADDITIONAL NOTES.

PCSM PLAN GENERAL DESIGN NOTES

- 1. THIS PCSM PLAN PRESERVES THE INTEGRITY OF STREAM CHANNELS AND MAINTAINS AND PROTECTS THE PHYSICAL, BIOLOGICAL AND CHEMICAL QUALITIES OF THE RECEIVING STREAM BY PROTECTING THE EXISTING NATURAL DRAINAGE FEATURES.
2. THIS PCSM PLAN PREVENTS AN INCREASE IN THE RATE OF STORMWATER RUNOFF AND MINIMIZES ANY INCREASE IN STORMWATER RUNOFF VOLUME BY USE OF STRUCTURAL BMPs TO FACILITATE STORAGE AND MANAGED RELEASE OF STORMWATER.
3. THIS PCSM PLAN MAXIMIZES THE EXTENT OF THE PROJECT AREA, IMPERVIOUS AREAS, LAND CLEARING AND GRADING BY CAREFUL SELECTION OF THE USABLE SITE AREA AND MAINTAINING THE MAJORITY OF THE NATURAL AREA.
4. THE PCSM PLAN MINIMIZES THE DURATION OF EARTH DISTURBANCE BY COMPLETING WORK UNDER THE THE CONSTRUCTION SEQUENCE IN ONE PHASE AND WORKING UNDER AN ACCELERATED CONSTRUCTION SCHEDULE.
5. THE PCSM PLAN MAXIMIZES THE PROTECTION OF THE EXISTING DOWNSTREAM DRAINAGE FEATURES AND VEGETATION BY AVOIDING THE STREAM CHANNEL AND UTILIZING PERIMETER CONTROL BMPs (COMPOST FILTER SOCKS) AROUND THE PROJECT AREA.
6. THE PCSM PLAN MINIMIZES SOIL COMPACTION BY A CAREFUL SELECTION OF THE USABLE SITE AREA REQUIRED FOR THE IMPROVEMENTS AND MINIMIZING THE DISTURBANCE OF VIRGIN SOILS. IT ALSO UTILIZES STRUCTURAL OR NONSTRUCTURAL BMPs THAT PREVENT OR MINIMIZE CHANGES IN STORMWATER RUNOFF AND MAINTAIN STREAM BASEFLOW.
7. POST-CONSTRUCTION THERMAL IMPACTS WILL BE MINIMIZED BY THE INSTALLATION OF THE PROPOSED VEGETATED SWALE AND BIO-RETENTION FACILITIES, WHICH WILL ALLOW MIXING AND COOLING OF RUNOFF. DURING CONSTRUCTION, THERMAL IMPACTS ARE MINIMIZED BY RUNOFF FILTERING THROUGH COMPOST FILTER SOCKS.
8. THERE ARE NO EXISTING WETLANDS ON THE SITE.
9. WATERS OF THE U.S. ARE DESIGNATED AS TSF, MF; THEREFORE, NO SPECIAL PROTECTION IS REQUIRED AND RIPARIAN BUFFERS ARE NOT APPLICABLE. PROTECTION OF WETLANDS WITHIN RIPARIAN FOREST BUFFER AND RIPARIAN BUFFER OFFSET IS NOT SHOWN ON THE PLANS AS THESE FEATURES DO NOT EXIST WITHIN THE LIMIT OF DISTURBANCE OR PERMIT AREA.
10. AREAS PROPOSED FOR INFILTRATION BMPs SHALL BE PROTECTED FROM SEDIMENTATION AND COMPACTION DURING THE CONSTRUCTION PHASE, SO AS TO MAINTAIN THEIR MAXIMUM INFILTRATION CAPACITY.
11. INFILTRATION BMPs SHALL NOT BE CONSTRUCTED NOR RECEIVE RUNOFF UNTIL THE ENTIRE CONTRIBUTORY DRAINAGE AREA TO THE INFILTRATION BMP HAS RECEIVED FINAL STABILIZATION.
12. THE STORMWATER MANAGEMENT SYSTEM IS A PERMANENT FIXTURE THAT CAN BE ALTERED OR REMOVED ONLY AFTER APPROVAL OF A REVISED PLAN BY THE MUNICIPALITY, WHICH SHALL BE RECORDED WITH THE RECORD PLAN AND WHICH SHALL BE APPLICABLE TO ALL FUTURE LANDOWNERS.
SIGNATURE OF OWNER
DATE
13. I HEREBY CERTIFY THAT THE DRAINAGE PLAN MEETS ALL DESIGN STANDARDS AND CRITERIA OF THE SITE STORMWATER MANAGEMENT SITE PLAN MEETS ALL DESIGN STANDARDS AND CRITERIA OF THE WORCESTER TOWNSHIP STORMWATER MANAGEMENT ORDINANCE NO. 278.
DESIGN ENGINEER
DATE
14. THE MUNICIPAL ENGINEER OR HIS MUNICIPAL ASSIGNEE SHALL OBSERVE ALL PHASES OF THE INSTALLATION OF THE PERMANENT STORMWATER MANAGEMENT FACILITIES AS DEEM APPROPRIATE BY THE MUNICIPAL ENGINEER.
15. DURING CONSTRUCTION, THE CONTRACTOR MUST NOTIFY THE TOWNSHIP ENGINEER'S OFFICE THREE (3) DAYS PRIOR TO THE CONSTRUCTION OF ANY PROPOSED INFILTRATION BMP STORMWATER FACILITY.
16. THE TOWNSHIP SHALL HAVE THE RIGHT TO ENTER PRIVATE PROPERTY TO INSPECT AND REPAIR, IF NECESSARY, ANY STORMWATER MANAGEMENT FACILITY.
17. THE STORMWATER MANAGEMENT FACILITIES ARE A PERMANENT PART OF THE DEVELOPMENT AND SHALL NOT BE REMOVED, ALTERED, OR MODIFIED.

BMP MAINTENANCE & INSPECTION

- BMP 6.4.5 BIO-RETENTION (MRC):
PROPERLY DESIGNED AND INSTALLED MRC AREAS REQUIRE SOME REGULAR MAINTENANCE.
• WHILE VEGETATION IS BEING ESTABLISHED, PRUNING AND WEEDING MAY BE REQUIRED.
• DETRITUS MAY ALSO NEED TO BE REMOVED EVERY YEAR. PERENNIAL PLANTINGS MAY BE CUT DOWN AT THE END OF THE GROWING SEASON.
• MULCH SHOULD BE RE-Spread WHEN EROSION IS EVIDENT AND BE REPLISHED AS NEEDED, ONCE EVERY 2 TO 3 YEARS THE ENTIRE AREA MAY REQUIRE MULCH REPLACEMENT.
• MRC AREAS SHOULD BE INSPECTED AT LEAST TWO TIMES PER YEAR FOR SEDIMENT BUILDUP, EROSION, VEGETATIVE CONDITIONS, ETC.
• DURING PERIODS OF EXTENDED DROUGHT, MRC AREAS MAY REQUIRE WATERING. TREES AND SHRUBS SHOULD BE INSPECTED TWICE PER YEAR TO EVALUATE HEALTH.

BMP 6.4.8 VEGETATED SWALE:

- SWALES SHALL BE KEPT FREE OF ANY BLOCKAGE AT ALL TIMES. MAINTENANCE ACTIVITIES TO BE DONE ANNUALLY AND WITHIN 48 HOURS AFTER EVERY MAJOR STORM EVENT:
• INSPECT AND CORRECT EROSION PROBLEMS, DAMAGE TO VEGETATION, AND SEDIMENT AND DEBRIS ACCUMULATION (ADDRESS WHEN > 3 INCHES AT ANY SPOT OR COVERING VEGETATION)
• INSPECT VEGETATION ON SIDE SLOPES FOR EROSION AND FORMATION OF RILLS OR GULLIES, CORRECT AS NEEDED PER AMENDED SOIL SEEDING/MULCHING SPECIFICATION).
• INSPECT FOR POOLS OF STANDING WATER; Dewater AND DISCHARGE TO AN APPROVED LOCATION AND RESTORE TO DESIGN GRADE.
• INSPECT FOR UNIFORMITY IN CROSS-SECTION AND LONGITUDINAL SLOPE, CORRECT AS NEEDED
• INSPECT SWALE INLET (CURB CUTS, PIPES, ETC.) AND OUTLET FOR SIGNS OF EROSION OR BLOCKAGE, CORRECT AS NEEDED

MAINTENANCE ACTIVITIES TO BE DONE AS NEEDED:

- PLANT ALTERNATIVE GRASS SPECIES IN THE EVENT OF UNSUCCESSFUL ESTABLISHMENT
• RESEED BARE AREAS; INSTALL APPROPRIATE EROSION CONTROL MEASURES WHEN NATIVE SOIL IS EXPOSED OR EROSION CHANNELS ARE FORMING
• WATER DURING DRY PERIODS, FERTILIZE, AND APPLY PESTICIDE ONLY WHEN ABSOLUTELY NECESSARY

WINTER CONDITIONS ALSO NECESSITATE ADDITIONAL MAINTENANCE CONCERNS, WHICH INCLUDE THE FOLLOWING:

- INSPECT SWALE IMMEDIATELY AFTER THE SPRING MELT, REMOVE RESIDUALS (E.G. SAND) AND INSPECT FOR DAMAGED VEGETATION WITHOUT DISTURBING REMAINING VEGETATION.
• IF ROADSIDE RUNOFF IS DIRECTED TO THE SWALE, MULCHING AND/OR SOIL AERATION/MANIPULATION MAY BE REQUIRED IN THE SPRING TO RESTORE SOIL STRUCTURE AND MOISTURE CAPACITY AND TO REDUCE THE IMPACTS OF DEICING AGENTS.

BMP 6.6.3 UNDERGROUND DETENTION BASIN:

ALL BASIN STRUCTURES EXPOSED TO RECEIVE AND/OR TRAP DEBRIS AND SEDIMENT SHOULD BE INSPECTED FOR CLOGGING AND EXCESSIVE DEBRIS AND SEDIMENT ACCUMULATION AT LEAST FOUR TIMES PER YEAR, AS WELL AS AFTER EVERY STORM GREATER THAN 1 INCH. STRUCTURES INCLUDE BASIN BOTTOMS, OUTLETS STRUCTURES AND INLETS. SEDIMENT REMOVAL SHOULD BE CONDUCTED WHEN THE BASIN IS COMPLETELY DRY. SEDIMENT SHOULD BE DISPOSED OF PROPERLY.

RESPONSIBILITIES FOR FILL MATERIALS

- 1. THE OPERATOR MUST USE ENVIRONMENTAL DUE DILIGENCE TO ENSURE THAT ANY NECESSARY FILL MATERIAL ASSOCIATED WITH THIS PROJECT QUALIFIES AS CLEAN FILL. ALL FILL MATERIAL MUST BE USED IN ACCORDANCE WITH PADEP'S POLICY "MANAGEMENT OF FILL", DOCUMENT NUMBER 255-2182-773. A COPY OF THIS POLICY IS AVAILABLE ONLINE AT WWW.DEPWEB.STATE.PA.US
2. CLEAN FILL IS DEFINED AS: UNCONTAMINATED, NON-WATER SOLUBLE, NON-DECOMPOSED, INERT SOLID MATERIAL. THE TERM INCLUDES SOIL, ROCK, STONE, DREGGED MATERIAL, USED ASPHALT, AND BRICK, BLOCK OR CONCRETE FROM CONSTRUCTION AND DEMOLITION ACTIVITIES THAT IS SEPARATE FROM THE WASTE AND IS RECOGNIZABLE AS SUCH. THE TERM DOES NOT INCLUDE MATERIALS PLACED IN OR ON THE WATERS OF THE COMMONWEALTH UNLESS OTHERWISE AUTHORIZED (THE TERM "USED ASPHALT" DOES NOT INCLUDE MILLED ASPHALT OR ASPHALT THAT HAS BEEN PROCESSED FOR RE-USE).
3. CLEAN FILL AFFECTED BY A SPILL OR RELEASE OF A REGULATED SUBSTANCE: FILL MATERIALS AFFECTED BY A SPILL OR RELEASE OF A REGULATED SUBSTANCE STILL QUALIFIES AS CLEAN FILL PROVIDED THE TESTING REVEALS THAT THE FILL MATERIAL CONTAINS CONCENTRATIONS OF REGULATED SUBSTANCES THAT ARE BELOW THE RESIDENTIAL LIMITS IN TABLES FP-1A AND FP-1B FOUND IN PADEP'S POLICY "MANAGEMENT OF FILL"
4. ANY PERSON PLACING CLEAN FILL THAT HAS BEEN AFFECTED BY A SPILL OR RELEASE OF A REGULATED SUBSTANCE MUST USE PADEP FORM FP-001 TO CERTIFY THE ORIGIN OF THE FILL MATERIAL AND THE RESULTS OF THE ANALYTICAL TESTING TO QUALIFY THE MATERIAL AS CLEAN FILL. FORM FP-001 MUST BE RETAINED BY THE OWNER OF THE PROPERTY RECEIVING THE FILL. A COPY OF FORM FP-001 CAN BE FOUND AT WWW.DEPWEB.STATE.PA.US.
5. ENVIRONMENTAL DUE DILIGENCE: INVESTIGATIVE TECHNIQUES, INCLUDING, BUT NOT LIMITED TO, VISUAL PROPERTY INSPECTIONS, ELECTRONIC DATA BASE SEARCHES, REVIEW OF PROPERTY OWNERSHIP, REVIEW OF PROPERTY USE HISTORY, SANBORN MAPS, ENVIRONMENTAL QUESTIONNAIRES, TRANSACTION SCREEN, ANALYTICAL TESTING, ENVIRONMENTAL ASSESSMENTS OR AUDITS.
6. ANALYTICAL TESTING IS NOT A REQUIRED PART OF DUE DILIGENCE UNLESS VISUAL INSPECTION AND/OR REVIEW OF THE PAST LAND USE OF THE PROPERTY INDICATES THAT THE FILL MAY HAVE BEEN SUBJECTED TO A SPILL OR RELEASE OF A REGULATED SUBSTANCE. IF THE FILL MAY HAVE BEEN AFFECTED BY A SPILL OR RELEASE OF A REGULATED SUBSTANCE, IT MUST BE TESTED TO DETERMINE IF IT QUALIFIES AS CLEAN FILL. TESTING SHOULD BE PERFORMED IN ACCORDANCE WITH APPENDIX A OF PADEP'S POLICY "MANAGEMENT OF FILL".
7. FILL MATERIAL THAT DOES NOT QUALIFY AS CLEAN FILL IS REGULATED FILL. REGULATED FILL IS WASTE AND MUST BE MANAGED IN ACCORDANCE WITH THE MUNICIPAL OR RESIDUAL WASTE REGULATIONS IN 25 PA CODE CHAPTERS 287 RESIDUAL WASTE MANAGEMENT OR 271 MUNICIPAL WASTE MANAGEMENT, WHICHEVER IS APPLICABLE.
8. ALL FILLS SHALL BE COMPACTED SUFFICIENTLY FOR THEIR INTENDED PURPOSE AND AS REQUIRED TO REDUCE SUPPING, EROSION OR EXCESS SATURATION.
9. REFER TO SITE / RECORD PLAN FOR ADDITIONAL NOTES.

BMP CONSTRUCTION SEQUENCES

BMP 6.4.5 BIORETENTION/MRC BASIN:
THE FOLLOWING IS A TYPICAL CONSTRUCTION SEQUENCE; HOWEVER, ALTERATIONS MIGHT BE NECESSARY DEPENDING ON DESIGN VARIATIONS.

- 1. INSTALL TEMPORARY SEDIMENT CONTROL BMPs AS SHOWN ON THE PLANS.
2. COMPLETE SITE GRADING, IF APPLICABLE, CONSTRUCT CURB CUTS OR OTHER INFLOW ENTRANCE BUT PROVIDE PROTECTION SO THAT DRAINAGE IS PROHIBITED FROM ENTERING CONSTRUCTION AREA.
3. EXCAVATE BIORETENTION/MRC BASIN TO PROPOSED INVERT DEPTH. INSTALL LINER AS SHOWN ON BASIN DETAILS.
4. BACKFILL BIORETENTION/MRC BASIN WITH FILTER MEDIA AS SHOWN ON PLANS AND SPECIFICATIONS. OVERTILLING IS RECOMMENDED TO ACCOUNT FOR SETTLEMENT. LIGHT HAND TAMING IS ACCEPTABLE IF NECESSARY.
5. PREASKRIP THE PLANTING SOIL PRIOR TO PLANTING VEGETATION TO AID IN SETTLEMENT.
6. COMPLETE FINAL GRADING TO ACHIEVE PROPOSED DESIGN ELEVATIONS, LEAVING SPACE FOR UPPER LAYER OF COMPOST, MULCH OR TOPSOIL AS SPECIFIED ON PLANS.
7. PLANT VEGETATION ACCORDING TO PLANTING PLAN. MULCH IS SPECIFIED ON PLANS. PROTECT AT SURFACE FLOW ENTRANCES WHERE NECESSARY.

BMP 6.4.8 VEGETATED SWALE:

- 1. BEGIN VEGETATED SWALE CONSTRUCTION ONLY WHEN THE UP-GRADE TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES ARE IN PLACE. VEGETATED SWALES SHOULD BE CONSTRUCTED AND STABILIZED EARLY IN THE CONSTRUCTION SCHEDULE, PREFERABLY BEFORE MASS EARTHWORK AND PAVING INCREASE THE RATE AND VOLUME OF RUNOFF. (EROSION AND SEDIMENT CONTROL METHODS SHALL ADHERE TO THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION'S EROSION AND SEDIMENT POLLUTION CONTROL PROGRAM MANUAL, MARCH 2012 OR LATEST EDITION.)
2. ROUGH GRADE THE VEGETATED SWALE. EQUIPMENT SHALL AVOID EXCESSIVE COMPACTION AND/OR LAND DISTURBANCE. EXCAVATING EQUIPMENT SHOULD OPERATE FROM THE SIDE OF THE SWALE AND NEVER ON THE BOTTOM. IF EXCAVATION LEADS TO SUBSTANTIAL COMPACTION OF THE SUBGRADE (WHERE AN INFILTRATION TRENCH IS NOT PROPOSED), 18 INCHES SHALL BE REMOVED AND REPLACED WITH A BLEND OF TOPSOIL AND SAND TO PROMOTE INFILTRATION AND BIOLOGICAL GROWTH. AT THE VERY LEAST, TOPSOIL SHALL BE THOROUGHLY DEEP PLOWED INTO THE SUBGRADE IN ORDER TO PENETRATE THE COMPACTED ZONE AND PROMOTE AERATION AND THE FORMATION OF MACROPORES. FOLLOWING THIS, THE AREA SHOULD BE DISKED PRIOR TO FINAL GRADING OF TOPSOIL.
3. CONSTRUCT CHECK DAMS, IF REQUIRED.
4. FINE GRADE THE VEGETATED SWALE. ACCURATE GRADING IS CRUCIAL FOR SWALES. EVEN THE SMALLEST NONCONFORMITIES MAY COMPROMISE FLOW CONDITIONS.
5. SEED, VEGETATE AND INSTALL PROTECTIVE LINING AS PER APPROVED PLANS AND ACCORDING TO FINAL PLANTING LIST. PLANT THE SWALE AT A TIME OF THE YEAR WHEN SUCCESSFUL ESTABLISHMENT WITHOUT IRRIGATION IS MOST LIKELY. HOWEVER, TEMPORARY IRRIGATION MAY BE NEEDED IN PERIODS OF LITTLE RAIN OR DROUGHT. VEGETATION SHOULD BE ESTABLISHED AS SOON AS POSSIBLE TO PREVENT EROSION AND SCOUR.
6. ONCE ALL TRIBUTARY AREAS ARE SUFFICIENTLY STABILIZED, REMOVE TEMPORARY EROSION AND SEDIMENT CONTROLS. IT IS VERY IMPORTANT THAT THE SWALE BE STABILIZED BEFORE RECEIVING UPLAND STORMWATER FLOW.
7. FOLLOW MAINTENANCE GUIDELINES, AS DISCUSSED BELOW.
NOTE: IF A VEGETATED SWALE IS USED FOR RUNOFF CONVEYANCE DURING CONSTRUCTION, IT SHOULD BE RE-GRADED AND RESEEDED IMMEDIATELY AFTER CONSTRUCTION AND STABILIZATION HAS OCCURRED. ANY DAMAGED AREAS SHOULD BE FULLY RESTORED TO ENSURE FUTURE FUNCTIONALITY OF THE SWALE.

BMP 6.4.6 UNDERGROUND DETENTION BASIN:

- 1. EXCAVATE AND INSTALL SYSTEM PER MANUFACTURERS SPECIFICATIONS.
2. INSTALL ALL TEMPORARY EROSION AND SEDIMENTATION CONTROLS.
1.1: IF BASIN IS NOT INTENDED TO RECEIVE FLOWS DURING CONSTRUCTION, INSTALL APPROPRIATE DIVERSION MEASURES.
3. BRING BASIN ON-LINE ONCE CONSTRUCTION ACTIVITIES HAVE BEEN COMPLETED AND THE CONTRIBUTING DRAINAGE AREA IS STABILIZED.

ADDITIONAL NOTES:

- 1. ALL CONSTRUCTION ACTIVITIES FOR THE BMP AREAS SHALL OCCUR WITHIN A SHORT TIME PERIOD TO ENSURE THAT SILT AND SEDIMENT DO NOT ENTER THEM.
2. APPROPRIATE MEASURES ARE TO BE TAKEN IN THE EVENT OF SEDIMENT ENTERING AND CLOGGING THE BMP AREAS. SHOULD UNFAVORABLE CONDITIONS (i.e. GROUNDWATER AND/OR BEDROCK, ETC.) BE ENCOUNTERED DURING THE CONSTRUCTION PROCESS OF THE BMP AREAS, THE DESIGN ENGINEER SHALL BE CONTACTED TO ADDRESS SUCH ISSUES.
3. IF INSPECTION INDICATES THAT SOIL OR SEDIMENT HAS ENTERED ANY OF THE BMP AREAS, APPROPRIATE MEASURES (I.E. CLEARING THE SOIL SEDIMENT FROM BMP AREAS) SHALL BE ADDRESSED.
CRITICAL STAGE - INSPECT SEDIMENT BASIN 1 (INCLUDING TEMPORARY OPENING CONFIGURATION IN PERMANENT OUTLET STRUCTURE) THAT IT IS ONLINE AND READY TO RECEIVE RUNOFF FROM DEVELOPMENT SITE.
10. BEGIN MASS GRADING OF SITE IN FOLLOWING ORDER: ESTABLISH DRAINAGE PATTERN INTERNAL TO SITE (FROM WALLS TO SEDIMENT BASIN) TO CONVEY RUNOFF TO SEDIMENT BASIN, TEMPORARY COMPOST SOCK DIVERSIONS SHALL BE UTILIZED TO ACHIEVE DRAINAGE PATTERNS UNTIL FINAL GRADES ACHIEVED. BOX CUT INTERNAL DRIVES UP FROM CONSTRUCTION ENTRANCES SIMULTANEOUSLY. INSTALL STORM SEWER FROM A13 TO A5 AND B3.1 TO B1. CONTINUE INTERNAL DRIVE CONSTRUCTION INSTALLING STORM SEWER, BALANCE OF UTILITIES, CURBING, STONE BASE COURSE AND BITUMINOUS BINDER COURSE. INSTALL INITIALLY SANDBAGS THEN ASPHALT BERMS AT A11-A12 AND B2-B3 TO CAPTURE RUNOFF DOWN DRIVES BEFORE IT ENTERS ROADWAYS. GRADE SWALES SURROUNDING UNITS, INSTALL SWALE LININGS. PAD OUT UNIT BLOCKS, RESERVING STOCKPILE AREA UNITS LAST. INSTALL FOUNDATIONS. BEGIN UNIT CONSTRUCTION.
CRITICAL STAGE - INSPECT PERMANENT STORMWATER BASIN CONFIGURATION, OPENING SEALS AND FUNCTION
13. WHEN PERMANENT STABILIZATION IS ACHIEVED (90% UNIFORM PERENNIAL GROWTH), REMOVE REMAINING COMPOST SOCK BARRIER CONTROLS.
14. FILE NOTICE OF TERMINATION FOR NPDES PERMIT

SEQUENCE OF CONSTRUCTION

PRIOR TO THE START OF EARTH DISTURBANCE ACTIVITIES, PLEASE NOTE THE FOLLOWING AVOIDANCE MEASURE:

THE PROJECT IS LOCATED IN THE VICINITY OF THE NORTHERN LONG-EARNED BAT SPRING STAGING/FALL SWARMING HABITAT. TO ENSURE TAKE IS NOT REASONABLY CERTAIN TO OCCUR, DO NOT CONDUCT TREE REMOVAL FROM MAY 15 TO AUGUST 15.

SEQUENCE OF CONSTRUCTION

- 1. INSTALL GP AND TR SERIES PERIMETER COMPOST FILTER SOCK SEGMENTS.
CRITICAL STAGE - INSPECT PERIMETER COMPOST SOCK
2. INSTALL ROCK CONSTRUCTION ENTRANCES 1 AND 2. CUT IN CONSTRUCTION ENTRANCES AT PROPOSED GRADE, STOCKPILE EXCAVATION AT LOCATIONS INDICATED.
3. CONSTRUCT TROOPER ROAD CURBING AND STORM SEWER FROM EXISTING INLET T1 UP TO PROPOSED INLET T9. DISTURB NO MORE EARTH IN A DAY WHICH CAN BE STABILIZED AT END OF EACH DAY WITH TOPSOIL, SEED AND EROSION BLANKETS FOR AREAS TO BE PERMANENTLY VEGETATED, OR STONE BACKFILL FOR ROADWAY AREAS. INSTALL AND MAINTAIN INLET PROTECTION AS INLETS ARE PLACED.
CRITICAL STAGE - INSPECTION OF TROOPER ROAD IMPROVEMENTS
4. CONSTRUCT STORMWATER COLLECTION AREA AT G2-T11-S1-A1 NEXUS. MAKE EXCAVATION WITHIN EXCAVATION AREA. EXCAVATE AND INSTALL RETAINING WALL AND PIPE STUBS THROUGH WALL AT S1 AND A1, AND HEADWALLS T1.1 AND G2. STABILIZE SURROUNDING SURFACES EXTERNAL TO THE COLLECTION AREA WITH EROSION BLANKETS AS INDICATED. INSTALL RIP-RAP WITHIN THE COLLECTION AREA. INSTALL COMPOST FILTER SOCK BERM IN FRONT OF HEADWALLS G2 AND T1.1.
CRITICAL STAGE - INSPECT STORMWATER COLLECTION AREA THAT IT IS STABILIZED AND ONLINE.
5. INSTALL STORM SEWER FROM S1 UP TO S3 AND HEADWALL S3.1.
6. CRITICAL STAGE - INSPECT STORM SEWER RUN FROM S3.1 TO S1 THAT IT IS ONLINE AND CAN RECEIVE RUNOFF FROM THE S-SERIES DIVERSION SWALE SYSTEM.
7. CONSTRUCT THE S4 TO S9 STORM SEWER AND DIVERSION SWALE FROM DOWNSTREAM TO UPSTREAM. SIMULTANEOUSLY CUT IN EMBANKMENT TO CONSTRUCT RETAINING WALLS BETWEEN S4-S9 STORM SEWER AND UNIT BLOCKS 1-4. SIMILARLY AND SIMULTANEOUSLY, INSTALL STORM SEWER AND DIVERSION SWALES FROM T9 TO T12 ALONG THE NORTH, BEHIND UNIT BLOCK 5. CONSTRUCT STORM SEWER INCREMENTALLY FROM STRUCTURE TO STRUCTURE WORKING FROM DOWNSTREAM TO UPSTREAM. DAILY STABILIZE SWALES WITH BOTH RIP-RAP BOTTOM LINING, AND TOPSOIL, SEED AND EROSION CONTROL BLANKETS ON SIDE SLOPES. EVERY EFFORT SHALL BE MADE TO WORK IN CONDITIONS WHERE PRECIPITATION IS NOT FORECAST. DISTURBANCE SHALL NOT PRACTICABLY EXCEED WHAT CAN BE STABILIZED DAILY. AS SWALES ARE CONSTRUCTED, THEY WILL RECEIVE AND MUST BE STABLE AND ABLE TO CONVEY RUNOFF FROM OFFSITE. INSTALL TRASH RACKS ON INLETS AND HEADWALLS UPON PLACEMENT.
CRITICAL STAGE - INSPECT SWALE S3.1 TO S9 SYSTEM AND T12 TO T9 SYSTEM, THAT THEY ARE STABLE AND IN PERMANENT CONFIGURATION, AND ASSOCIATED RETAINING WALL SYSTEMS BELOW ARE PROPERLY CONSTRUCTED.
8. GERMANTOWN PIKE WIDENING MAY OCCUR AT THIS STAGE, OR AT ANY STAGE HEREAFTER. BOX CUT WIDENING FROM TROOPER INTERSECTION UPHILL. DO NOT PERFORM WORK WHEN PRECIPITATION IS FORECAST. DAILY STABILIZE WITH TOPSOIL, SEED AND EROSION BLANKETS FOR PERMANENTLY VEGETATED AREAS, AND AT A MINIMUM, STONE OR BITUMINOUS BINDER COURSE FOR ROADWAYS. INSTALL CURBING AND STORMWATER STUBS. INSTALL INLET PROTECTION ON STORM SEWER STUBS UPON INLET PLACEMENT.
9. BEGIN CONSTRUCTION OF SEDIMENT BASIN 1 OVER FOOTPRINT OF PERMANENT STORMWATER MANAGEMENT BASIN SYSTEM 001. REMOVE TOPSOIL AND STOCKPILE SEPARATELY. EXCAVATE TO CREATE BASIN VOLUME INCLUDING TROOPER EROSION CONTROL GRADING WITHIN SEDIMENT BASIN. CONSTRUCT BERM, BASIN OUTLET PIPING AND UNIT STRUCTURES TO A1. STABILIZE BASIN SLOPES WITH SKIMMER AND LANDING PAD AND BAFFLE. BEGIN PERMANENT STABILIZATION PROCESS ON OUTSIDE BASIN BERMS WITH TOPSOIL, SEED AND EROSION CONTROL BLANKETS WHERE INDICATED ON BASIN SLOPES. STABILIZE INTERNAL SEDIMENT SLOPES WITH TOPSOIL, SEED AND EROSION CONTROL BLANKETS WHERE INDICATED.

- CRITICAL STAGE - INSPECT SEDIMENT BASIN 1 (INCLUDING TEMPORARY OPENING CONFIGURATION IN PERMANENT OUTLET STRUCTURE) THAT IT IS ONLINE AND READY TO RECEIVE RUNOFF FROM DEVELOPMENT SITE.
10. BEGIN MASS GRADING OF SITE IN FOLLOWING ORDER: ESTABLISH DRAINAGE PATTERN INTERNAL TO SITE (FROM WALLS TO SEDIMENT BASIN) TO CONVEY RUNOFF TO SEDIMENT BASIN, TEMPORARY COMPOST SOCK DIVERSIONS SHALL BE UTILIZED TO ACHIEVE DRAINAGE PATTERNS UNTIL FINAL GRADES ACHIEVED. BOX CUT INTERNAL DRIVES UP FROM CONSTRUCTION ENTRANCES SIMULTANEOUSLY. INSTALL STORM SEWER FROM A13 TO A5 AND B3.1 TO B1. CONTINUE INTERNAL DRIVE CONSTRUCTION INSTALLING STORM SEWER, BALANCE OF UTILITIES, CURBING, STONE BASE COURSE AND BITUMINOUS BINDER COURSE. INSTALL INITIALLY SANDBAGS THEN ASPHALT BERMS AT A11-A12 AND B2-B3 TO CAPTURE RUNOFF DOWN DRIVES BEFORE IT ENTERS ROADWAYS. GRADE SWALES SURROUNDING UNITS, INSTALL SWALE LININGS. PAD OUT UNIT BLOCKS, RESERVING STOCKPILE AREA UNITS LAST. INSTALL FOUNDATIONS. BEGIN UNIT CONSTRUCTION.
CRITICAL STAGE - INSPECT PERMANENT STORMWATER BASIN CONFIGURATION, OPENING SEALS AND FUNCTION

- 11. PERFORM FINAL GRADING AND LANDSCAPING WHENEVER AND WHEREVER POSSIBLE, STABILIZE WITH TOPSOIL, SEED AND MULCH.
CRITICAL STAGE - INSPECT FOR 70% STABILIZATION (UNIFORM PERENNIAL GROWTH), UPON INSPECTION INCLUDING INSPECTION BY CONSERVATION DISTRICT, WITH APPROVAL, PROCEED TO BASIN CONVERSION.
12. CONVERT SEDIMENT BASIN TO PERMANENT STORMWATER MANAGEMENT FACILITY. WORK SHALL BE SCHEDULED AT TIMES OF LOW FORECAST PRECIPITATION AND SHALL OCCUR INCREMENTALLY SO THAT SYSTEM IS PROTECTED AT END OF EACH DAY. FLUSH ALL STORM SEWER OF SEDIMENT AND/OR INSPECT THAT STORM SEWER IS CLEAR. DESILT SEDIMENT BASIN, REMOVE SKIMMER, BAFFLE. EXCAVATE FOR UNDERGROUND DETENTION INSTALLATION. INSTALL UNDERGROUND DETENTION SYSTEM INCLUDING IMPERMEABLE LINER SURROUNDING. INSTALL MRC SURFACE RAINGARDEN OVER UNDERGROUND DETENTION, WITH ITS RESPECTIVE IMPERMEABLE LINER. SEAL TEMPORARY OPENINGS IN OUTLET STRUCTURED FOR EROSION CONTROL WITH PERMANENT WATERTIGHT FITTINGS - SILICONE (OR APPROVED EQUAL) SEALED BOLTED METAL PLATES. INSTALL UNDERDRAIN AND MEDIA INFILL. INSTALL RAINGARDEN PLANTINGS.

- CRITICAL STAGE - INSPECT PERMANENT STORMWATER BASIN CONFIGURATION, OPENING SEALS AND FUNCTION

- 13. WHEN PERMANENT STABILIZATION IS ACHIEVED (90% UNIFORM PERENNIAL GROWTH), REMOVE REMAINING COMPOST SOCK BARRIER CONTROLS.

- 14. FILE NOTICE OF TERMINATION FOR NPDES PERMIT

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
CHRISTOPHER W. JENSEN
NO. 167844
12/19/2024
LICENSED PROFESSIONAL ENGINEER
STATE OF PA LICENSE NO. PD076404

Table with columns: NO., DATE, REVISIONS, CHD, BY, DATE, NO. (Rows 1-3)

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LICENSED PROFESSIONAL ENGINEER

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COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
POST CONSTRUCTION STORMWATER MANAGEMENT DETAILS--3

AND
YOUR GOALS. OUR MISSION.
1700 MARKET STREET, SUITE 3110
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TEL 215-282-7850
FAX 215-627-3459

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NO.	DATE	REVISIONS	BY	CHKD
3	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	BGS
2	02/26/25	UPDATES FOR 641 PIPES SUBMISSION	JPK	ZHR
1	01/24/25	UPDATES FOR 641 PIPES PRE-SUBMISSION MITG	JPK	ZHR

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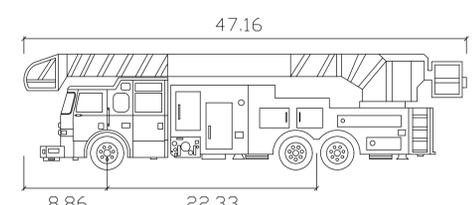
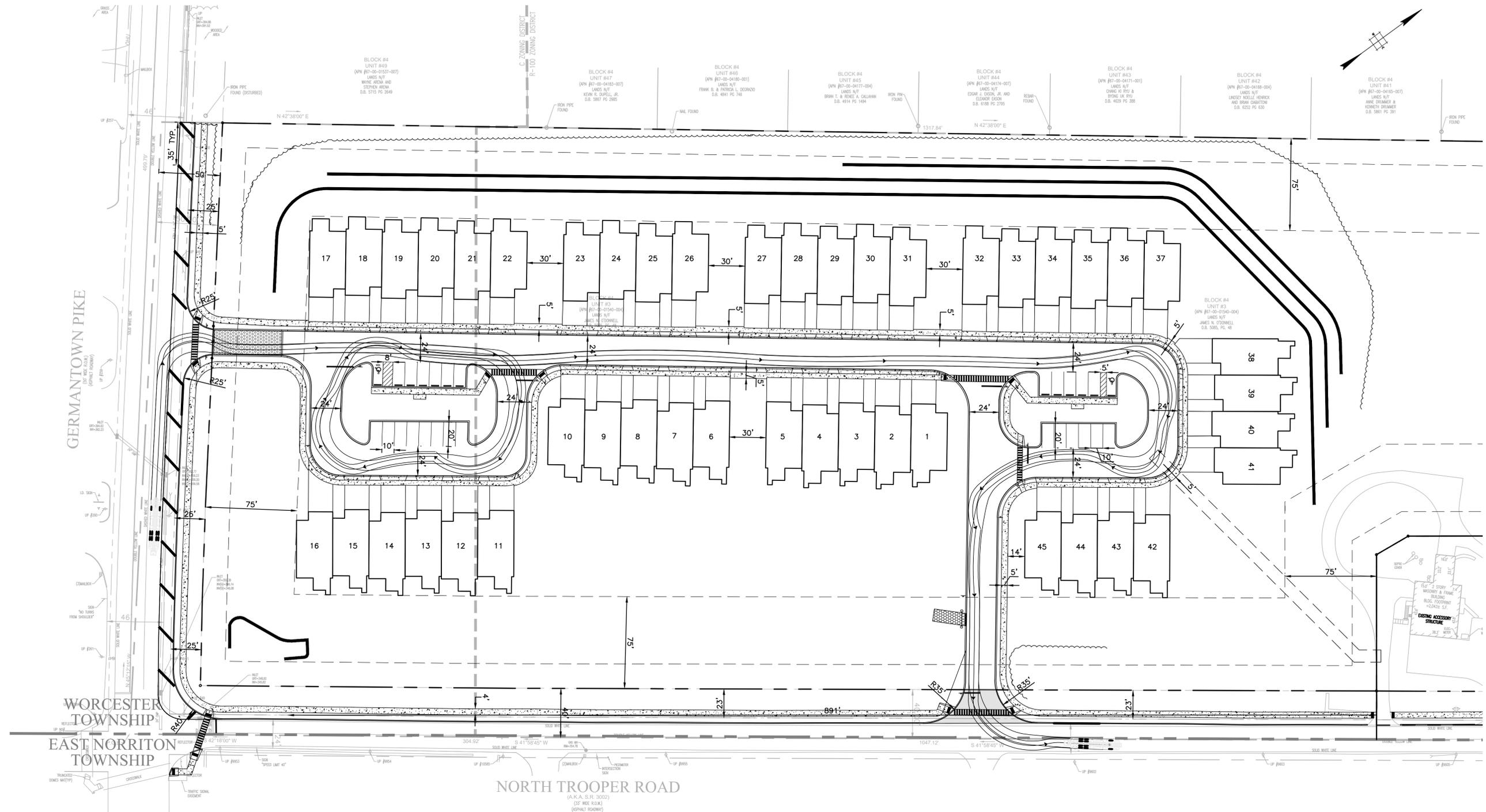
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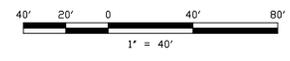
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CHECKED BY BGS/ZHR	SHEET
DRAWN BY SCR/CKS/RAM	43
DATE 12/19/2024	PROJ. NO. OF 46
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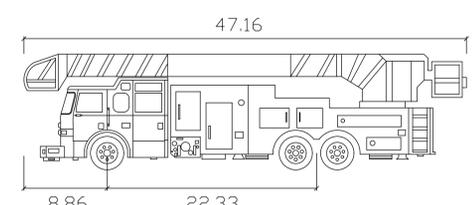
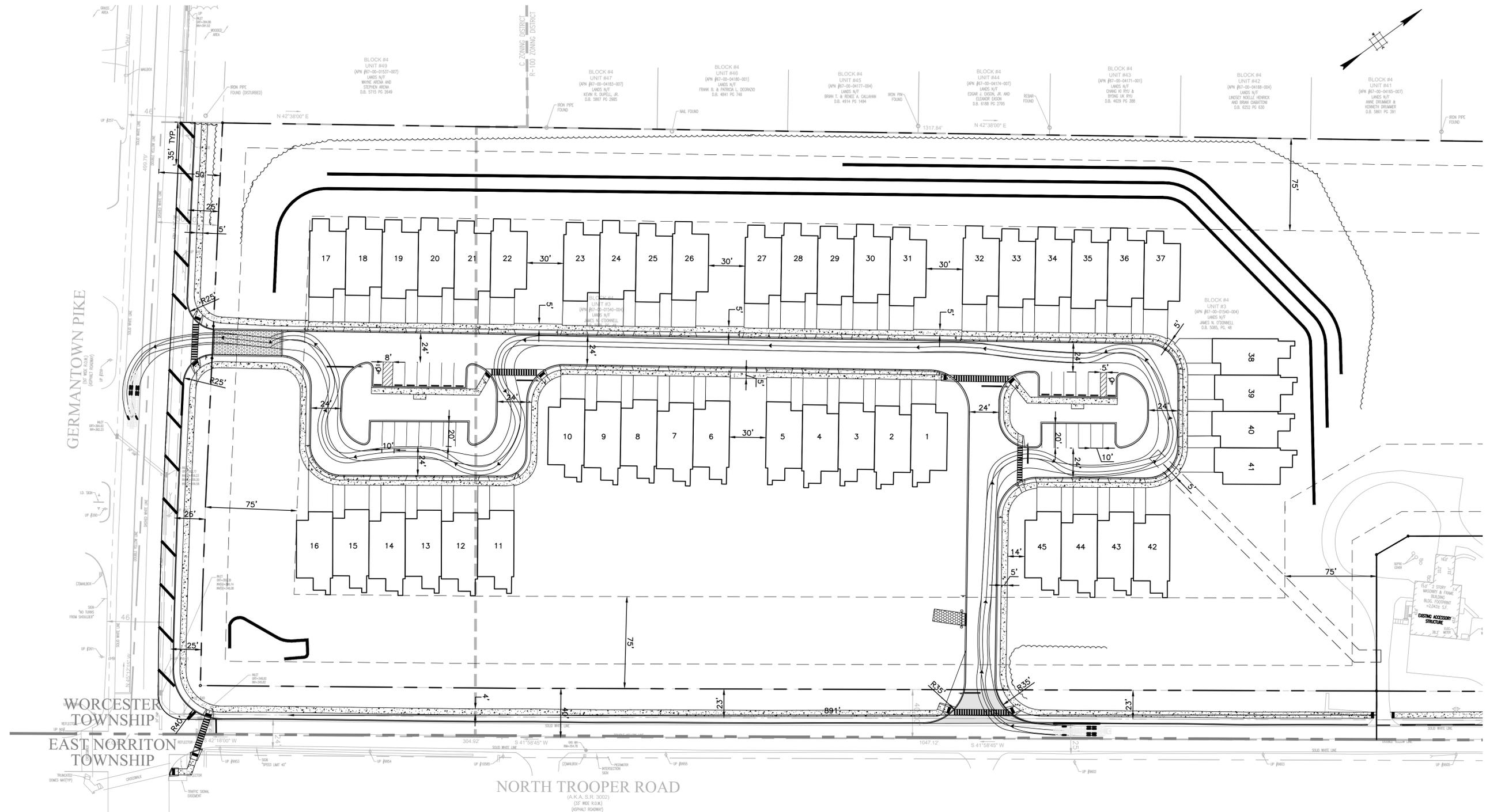
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FIRETRUCK TURNING TEMPLATE - 2



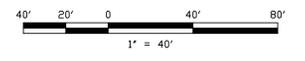
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CHECKED BY BGS/ZHR	SHEET
DRAWN BY SCR/CKS/RAM	44
DATE 12/19/2024	PROJ. NO. AS NOTED
SCALE AS NOTED	OF 46



Pierce Arrow XT
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Lock to Lock Time : 6.0
Steering Angle : 45.5



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MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA

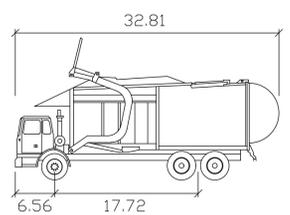
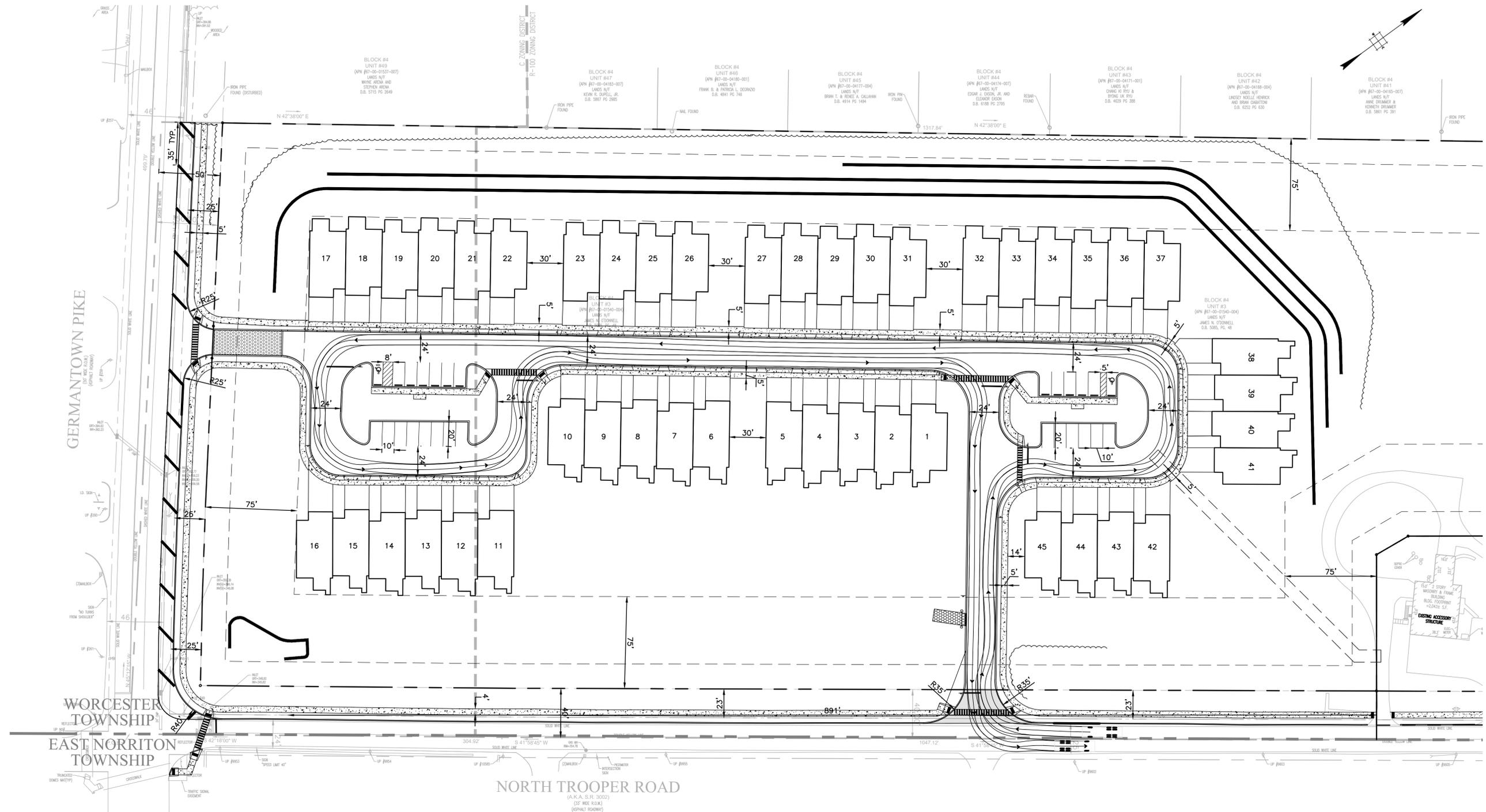
TRASH TRUCK TURNING TEMPLATE



1700 MARKET STREET, SUITE 3110
PHILADELPHIA, PA 19103
TEL 215-282-7850
FAX 215-627-3499

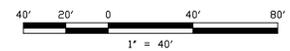
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DESIGNED BY JPK/CKS/CMR/ROP/ZHR	DRAWING TT-3
CHECKED BY BGS/ZHR	SHEET 45
DRAWN BY SCR/CKS/RAM	OF 46
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDEV00004	



Waste Collection Truck

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Track	: 8.53
Lock to Lock Time	: 6.0
Steering Angle	: 27.7

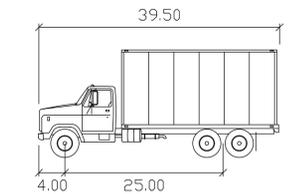
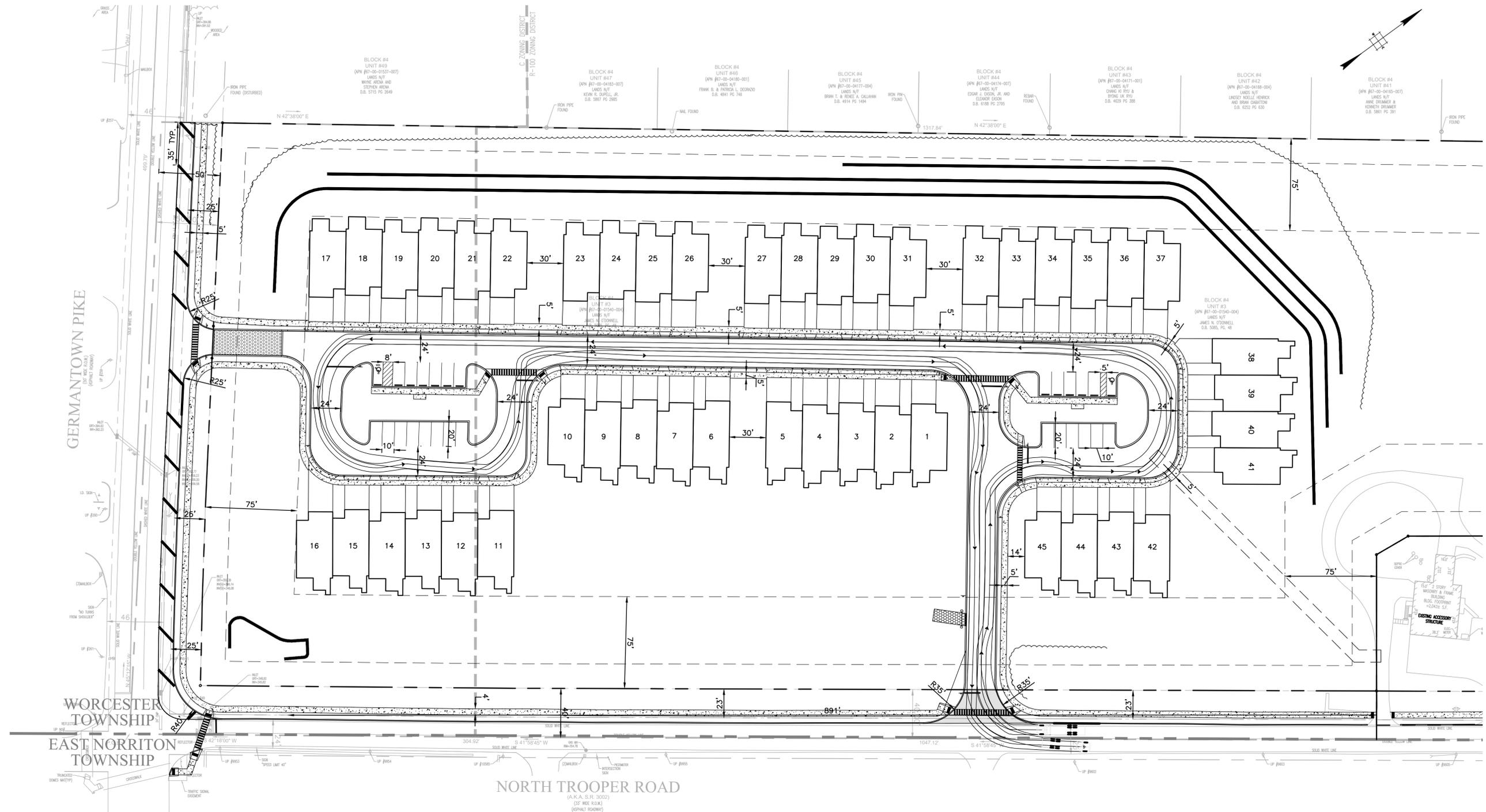


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DATE: 12/19/2024 8:40AM
LAST SAVE BY: J.Kelley

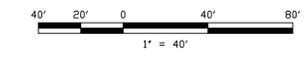
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PROJECT INFORMATION:
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 DATE: 12/19/2024 TIME: 2:17 PM 2025, 8:40AM
 LAST SAVE BY: J. Kelly

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SU-40
 Width : 8.00
 Track : 8.00
 Lock to Lock Time : 6.0
 Steering Angle : 31.8



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NO.	DATE	REVISIONS	BY	CHKD
1	03/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	ZHR
2	02/26/25	REVISED PER TOWNSHIP COMMENTS	JPK	ZHR
3	03/26/25	UPDATES FOR ALL PIPES SUBMISSION	JPK	ZHR
1	03/24/25	UPDATES FOR PIPES PRE-SUBMISSION MITG	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL
 TROOPER RIDGE SUBDIVISION
 1035 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
 BOX TRUCK TURNING TEMPLATE



1700 MARKET STREET, SUITE 3110
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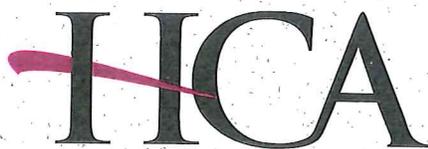
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CHECKED BY BGS/ZHR	SHEET
DRAWN BY SCR/CKS/RAM	46
DATE 12/19/2024	OF 46
SCALE AS NOTED	
PROJ. NO. WDEVA00004	

TRAFFIC IMPACT ASSESSMENT

TROOPER RIDGE TOWNHOUSE DEVELOPMENT

Worcester Township, Montgomery County
Pennsylvania

January 13, 2025
Updated April 3, 2025



Horner & Canter Associates A PROFESSIONAL CORPORATION
TRANSPORTATION AND TRAFFIC ENGINEERING

TRAFFIC IMPACT ASSESSMENT

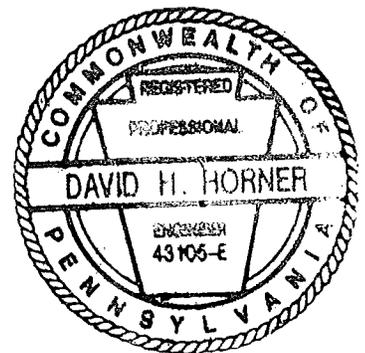
TROOPER RIDGE TOWNHOUSE DEVELOPMENT

North Trooper Road (SR 3002)
Germantown Pike

Worcester Township
Montgomery County
Pennsylvania

Prepared by:

HORNER & CANTER ASSOCIATES
A Professional Corporation
Transportation and Traffic Engineering
4950 York Road, Suite 2G
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Holicong, Pennsylvania 18928



April 3, 2025

A handwritten signature in black ink that reads "David H. Horner".

David H. Horner, P.E., PTOE
Professional Engineer
PA Lic. No. PE-043105-E

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INTRODUCTION

Horner & Canter Associates has prepared this updated Traffic Impact Assessment for the proposed Trooper Ridge townhouse development located at 1035 Trooper Road in Worcester Township, Montgomery County, Pennsylvania. The site is situated in the northwest quadrant of North Trooper Road (SR 3002) and Germantown Pike (Figure 1). The proposed townhouse development will comprise 45 townhouses with access provided via one new residential roadway intersecting North Trooper Road. There is also an emergency-only access driveway proposed to intersect Germantown Pike, a County roadway.

This update to our January 13, 2025 Traffic Impact Assessment has been prepared to address the Transportation Impact Assessment comments contained in the Bowman Traffic Review #3, dated February 5, 2025.

For the purpose of this Traffic Impact Assessment, the completion and occupancy date of the proposed townhouse development is assumed to be 2029.

Scope of Study

The purpose of this Traffic Impact Assessment is to determine the traffic impact the proposed townhouse development will have with respect to the conditions on the adjacent roadways and intersections. A Scoping Meeting Application was submitted to PennDOT. A copy of the application and PennDOT's responses are included for reference in Appendix A, along with the most recent review letter provided by Bowman, the Township's traffic consultant. The study scope, consistent with the Scoping Meeting Application and PennDOT's responses, include the following:

- A site inspection and inventory of existing roadway features such as geometric layout, lane configurations, traffic control devices, and other pertinent physical characteristics.
- Conduct of Manual Turning Movement (MTM) counts for the weekday AM (7:00 AM - 9:00 AM) and weekday PM (4:00 PM - 6:00 PM) peak periods at the following intersection which constitute the study area:

- North Trooper Road (SR 3002)/Germantown Pike
 - North Trooper Road (SR 3002)/Woodlyn Road/Woodland Avenue
 - Germantown Pike/N. Park Avenue/Valley Forge Road (SR 0363)
-
- Projection of development-generated traffic volumes and distribution of this traffic to the study area roadway network.
 - Establishment of future traffic volumes for the study horizon year (2029) including background traffic growth projections, other known developments to be constructed in within the horizon year, and the site-generated traffic.
 - Analysis of existing, future No-Build (without development) and future Build (with development) traffic conditions at the study area intersection and the proposed site access intersection in the build-out horizon year.
 - Formulation of conclusions with regard to the traffic impact of the proposed development on traffic conditions in the study area.

EXISTING CONDITIONS

The study area roadway network was inventoried with regard to the existing physical and operating characteristics as they affect traffic flow. The study area roadway network is described in further detail below.

The site fronts on **North Trooper Road**, a State roadway carrying the SR 3002 designation in a general north-south direction. In the vicinity of the site, North Trooper Road provides one through travel lane in each direction with a posted speed limit of 40 miles per hour. The site is proposed to take direct vehicular access to North Trooper Road.

The site also fronts on **Germantown Pike** which is under Montgomery County jurisdiction and extends in a general east-west direction. In the vicinity of the site, Germantown Pike provides one travel lane in each direction east of its intersection with North Trooper Road. West of the intersection, Germantown Pike widens to provide two westbound travel lanes. The posted speed limit on Germantown Pike is 45 miles per hour. The site will be provided with emergency-only access via Germantown Pike.

The study area intersection of North Trooper Road (SR 3002)/Germantown Pike and Germantown Pike/N. Park Avenue/Valley Forge Road (SR 0363) are signalized. Reduced-size copies of the Traffic Signal Permit Plans for these intersections are provided for reference in Appendix B.

Existing Traffic Volumes

Since the peak hour traffic conditions reflect the critical periods for evaluation of operating conditions and traffic impact, existing traffic volumes were acquired at the study area intersection through the conduct of peak hour Manual Turning Movement (MTM) traffic counts. The counts were conducted during the weekday AM (7:00 – 9:00 AM) and weekday PM (4:00 – 6:00 PM) peak periods in August/September 2024. These count periods were selected to capture both the peak hours of adjacent street traffic and the peak periods of the proposed development. The summarized MTM counts are provided for reference in Appendix C.

The resultant existing peak hour traffic volumes are presented in Figures 2 and 3 for the respective peak periods.

Existing Levels of Service

The operating conditions of the study area intersections were determined through the conduct of a capacity/Level of Service (LOS) analysis using the methodologies contained in the Highway Capacity Manual (HCM 6th Edition). Level of Service (LOS) is a measure of the quality of the traffic flow and generally is expressed as follows:

- Level of Service A - Excellent - Free flow
- B - Very Good - Minor adjustments in traffic flows
- C - Good - Stable flow of traffic
- D - Satisfactory flow - Occasional short periods with minor delays
- E - Approaching Capacity - Regular delays
- F - Forced Flow - Significant delays and queuing

At signalized intersections, LOS is based on the average delay for all movements at the intersection. At unsignalized intersections, LOS is based on the average delay to controlled and yielding movements, such as exiting movements from a stop sign or the left-turn from a through street into a side street. The delay thresholds for various Levels of Service are contained in Appendix D.

The existing LOS findings for the study area intersections are presented in Figure 4. The detailed capacity/LOS analysis worksheets are provided in Appendix E.

SITE TRAFFIC

The determination of the amount of traffic that a proposed development will generate can best be made by comparison with similar sites. The residential development of the site is proposed to comprise 45 townhouses. The Institute of Transportation Engineers (ITE) publication *Trip Generation Manual, 11th Edition* is a compilation of trip generation studies for a variety of land uses and is considered the primary data source for use of trip generation projections. For the proposed residential development, Land Use Code 215 – Single-Family Attached Housing was selected as the most appropriate for the proposed townhouses.

Table 1 presents the projected development-generated traffic for the site based on the ITE database. The trip generation worksheets are provided for reference in Appendix F.

Table 1 Site Trips							
		<i>AM Peak Hour</i>			<i>PM Peak Hour</i>		
	<i>Daily</i>	<i>In</i>	<i>Out</i>	<i>Total</i>	<i>In</i>	<i>Out</i>	<i>Total</i>
Townhouses (45 D.U.)	324	5	17	22	15	11	26

The development-generated traffic was distributed to the proposed site access roadway and to the study area roadway network based on existing traffic patterns. The site traffic distribution percentages are summarized below:

North Trooper Road (SR 3002)	
to/from the south	10%
Germantown Pike	
to/from the east	15%
to/from the west	20%
N. Park Avenue/Valley Forge Road (SR 0363)	
to/from the north	25%
to/from the south	20%

Woodlyn Road/Woodland Avenue

to/from the east	2%
to/from the west	<u>8%</u>
	100%

The resultant distributed site trips are depicted in Figure 5 for both the AM and PM peak periods.

FUTURE CONDITIONS

To assess the impact of the development-generated traffic volumes on the study area roadway network, the future traffic volumes in the anticipated build-out year of the site (2029) were determined. To account for regional growth that is expected to occur during the intervening period, a background traffic growth rate was applied to the existing traffic volumes. Based on PennDOT's growth rates for the area, a 0.17 percent per year background growth was applied (total 1.01 percent over five years) to the existing 2024 traffic volumes. In addition to general background traffic growth, it was confirmed with Worcester Township and Montgomery County that the proposed City View Apartment Development, located along Germantown Pike to the west of the site, will be built-out within the horizon year of this study. Thus, the traffic anticipated to be generated by this development was added to the background traffic. The traffic distribution for this development is provided for reference in Appendix G.

The resultant 2029 No-Build traffic volumes presented on Figures 6 and 7 for the respective peak periods. The total Build 2029 traffic volumes, which overlay the site-generated traffic volumes onto the No-Build traffic volumes, are presented in Figures 8 and 9 for the two study peak periods, respectively. Traffic volume calculation worksheets for each of the study intersections are provided in Appendix H.

Assessment

An assessment of the future 2029 No-Build and Build operating conditions within the study area was completed. The assessment included a Level of Service (LOS) analysis of the study area intersection and the proposed site access roadway in order to determine if the projected traffic volumes can be acceptably accommodated within the study area and whether any roadway or intersection improvements would be required. The future No-Build LOS results are presented in Figure 10. The future Build LOS results are presented in Figure 11. The detailed capacity analysis worksheets for the No-Build and Build conditions analyses are contained in Appendices I and J, respectively.

The Level of Service (LOS) results for each of the study locations are summarized in Table 3 at the end of this section and detailed below.

North Trooper Road (SR 3002)/Germantown Pike – This signalized intersection currently operates at overall LOS C in the AM peak hour and LOS F in the PM peak hour, based on the established traffic signal timings. The North Trooper Road movements are operating at LOS C during both peak periods. The Germantown Pike movements are operating at LOS B/C during the AM peak hour and LOS F during the PM peak hour. The No-Build and Build analyses assumed optimized traffic signal timings, which assumes more greentime allocation to Germantown Pike. Even with signal timing optimization the No-Build and Build LOS findings are similar to the existing conditions.

In accordance with PennDOT's *Highway Occupancy Permit Operations Manual (Pub 282)*, we applied the "10-Second Variance" standard to assess whether the site-generated traffic impact would require mitigation improvements at this intersection. Mitigation is not required if there is either no drop in the overall intersection LOS when comparing the Build conditions to the No-Build conditions or there is a drop but the overall intersection delay increase is less than 10 seconds. If the overall intersection LOS is F in the No-Build condition then an overall intersection delay increase of greater than 10 seconds must be mitigated. The "10-Second Variance" chart for this intersection is below:

	No-Build LOS (Delay)	Build LOS (Delay)	Delay Variance	Requirements Met?
AM Peak Hour	C (27.4)	C (27.7)	n/a	Yes
PM Peak Hour	F (80.5)	F (120.6)	40.1 sec	No

n/a – With no LOS drop, the delay variance is not applicable to the compliance determination

As shown above, since the intersection will operate at overall LOS F in the PM peak hour under No-Build conditions, and the Build conditions show a greater than 10 second overall delay increase, mitigation is required. The following improvements are proposed in conjunction with the proposed development:

- *Widening of approximately 12' along the site's Germantown Pike frontage*
- *Striping for a separate EB left-turn lane on Germantown Pike approaching N. Trooper Road.*
- *Modification of the existing traffic signal timing to provide additional green time to the Germantown Pike approaches*

With these improvements, the Build conditions will meet the LOS mitigation requirements. The Build Improved LOS results are also shown in Figure 11 and Table 3. Left-turn conflict analysis calculations were completed under the improved lane configuration and shows that permitted-only phasing is appropriate for the EB Germantown left-turn movement. The left-turn conflict analysis calculation worksheet is provided in Appendix K.

Germantown Pike/N. Park Avenue/Valley Forge Road (SR 0363) – This signalized intersection currently operates at overall LOS E during both peak hours, based on the established traffic signal timings. The individual traffic movements range in operation from LOS C through LOS F.

In conjunction with the proposed City View apartment development on the SE corner of the intersection, it is proposed to construct a separate right-turn lane on NB N. Park Road and modify the traffic signal timings. These improvements were assumed in place for the No-Build analysis. With these improvements the No-Build LOS is overall LOS E in both peak hours. The individual traffic movements improve slightly although there will remain LOS E/F operations for some movements. In the Build conditions, with the site-generated traffic, the LOS will be consistent with the No-Build conditions.

In accordance with PennDOT's *Highway Occupancy Permit Operations Manual (Pub 282)*, we applied the "10-Second Variance" standard to assess whether the site-generated traffic impact would require mitigation improvements at this intersection. Mitigation is not required if there is either no drop in the overall intersection LOS when comparing the Build conditions to the No-Build conditions or there is a drop but the overall intersection delay increase is less than 10 seconds. If the overall intersection LOS is F in the No-Build condition then an overall intersection delay increase of greater than 10 seconds must be mitigated. The "10-Second Variance" chart for this intersection is below:

	No-Build LOS (Delay)	Build LOS (Delay)	Delay Variance	Requirements Met?
AM Peak Hour	E (55.5)	E (55.7)	n/a	Yes
PM Peak Hour	E (61.0)	E (61.5)	n/a	Yes

n/a – With no LOS drop, the delay variance is not applicable to the compliance determination

As shown above, there is no change in overall LOS from the No-Build to the Build conditions; thus, the mitigation requirements are met. There are no additional improvements required or recommended at this intersection attributable to the proposed Trooper Ridge residential development project.

North Trooper Road (SR 3002)/Woodlyn Road/Woodland Avenue – This unsignalized "T"-intersection currently operates at with all movements at LOS A/B during both peak hours. These LOS findings will continue under both No-Build and Build conditions.

There are no improvements required or recommended at this intersection attributable to the proposed Trooper Ridge residential development project.

North Trooper Road (SR 3002)/Site Access Roadway – The site access roadway will be classified as a "low volume" roadway pursuant to Pennsylvania Code, Chapter 441 guidelines. The access roadway will provide one ingress lane and one egress lane with stop-sign control. With this configuration the unsignalized access intersection will operate with all movements at highly acceptable LOS A during both peak periods.

Queues

The 95th percentile queues for the study area intersections were calculated as part of the capacity/LOS analysis. Table 4 at the end of this section provides a summary of the 95th

percentile queues for the existing, No-Build, and Build conditions at all locations. It is noted that the site traffic has very little effect on the queue conditions.

Sight Distance

Sight distance for entering and exiting vehicles to/from the proposed access roadway onto North Trooper Road (SR 3002) was measured and compared to the desirable sight distance values contained in the Pennsylvania Code, Chapter 441. Table 4 below summarizes the sight distances for entering and exiting vehicles at this proposed access roadway location. As shown in Table 4 all required clear sight distance criteria are met.

Table 2 Sight Distance Summary							
Movement	Direction	Posted Speed Limit (mph)	Approx. Grade	PennDOT Requirements⁽¹⁾ (in feet)		Available Sight Distance (in feet)	Meets Criteria?
				Desirable	Minimum		
North Trooper Road/Site Access Roadway							
Exiting	Looking Left	40	-2%	535	325	>700	Yes
	Looking Right	40	+1%	460	309	>600	Yes
Left Turn Entering	Looking Ahead	40	-2%	370	325	>700	Yes
	From the Rear	40	+1%	370	309	>600	Yes

⁽¹⁾ Based on Pa. Code, Chapter 441.

Auxiliary Turn Lane Warrant Analysis

Auxiliary turn lane warrant analyses were completed at the proposed site access roadway intersection with North Trooper Road (SR 3002) to determine whether separate left- or right-turn lanes are required along North Trooper Road at the proposed access roadway intersection. The results of the analysis show that no auxiliary turn turns are warranted. The analysis results are provided in Appendix L.

**Table 3
Intersection Level of Service Summary**

Intersections	Movement	Weekday AM Peak				Weekday PM Peak			
		Existing	No-Build	Build	Build Impr	Existing	No-Build	Build	Build Impr
N. Trooper Road (SR 3002)/Germantown Pike	EB -/L	-	-	-	C (21.4)	-	-	-	D (45.5)
	EB LTR/TR	C (31.8)	C (34.2)	C (34.8)	D (38.3)	F (120.1)	F (116.5)	F (259.0)	C (27.3)
	WB L	C (24.2)	C (26.4)	C (26.9)	C (25.8)	F (208.9)	F (126.9)	F (126.9)	E (66.9)
	WB TR	B (14.5)	B (14.7)	B (14.7)	B (14.7)	F (91.8)	F (58.3)	F (59.2)	F (66.0)
	NB LTR	C (32.9)	C (33.5)	C (33.5)	C (33.5)	C (33.1)	D (53.6)	E (55.7)	D (48.4)
	SB LTR	C (24.4)	C (24.5)	C (24.8)	C (24.8)	C (24.8)	C (29.0)	C (29.2)	C (28.3)
	Overall	C (26.1)	C (27.4)	C (27.8)	C (28.9)	F (101.6)	F (80.5)	F (120.6)	D (50.1)
Germantown Pike/N. Park Avenue/Valley Forge Road (SR 0363)	EB L	C (28.4)	C (28.6)	C (28.7)	-	D (52.9)	D (54.5)	D (54.5)	-
	EB TR	F (92.4)	F (97.8)	F (98.4)	-	D (50.0)	D (52.7)	D (53.3)	-
	WB L	D (40.2)	D (40.7)	D (42.1)	-	D (52.7)	E (61.0)	E (64.4)	-
	WB T	D (39.9)	D (40.3)	D (40.5)	-	F (83.0)	F (86.3)	F (87.2)	-
	WB R	C (30.2)	C (30.3)	C (30.4)	-	C (32.3)	C (32.4)	C (32.4)	-
	NB L	C (31.0)	C (34.2)	C (34.2)	-	C (30.9)	C (31.0)	C (31.0)	-
	NB TR/T	E (55.5)	D (39.5)	D (39.5)	-	E (67.7)	D (50.1)	D (50.1)	-
	NB -/R	-	C (25.9)	C (25.9)	-	-	C (26.5)	C (26.6)	-
	SB L	C (29.9)	C (26.3)	C (26.3)	-	C (31.0)	C (29.5)	C (29.7)	-
	SB TR	E (56.9)	E (59.2)	E (59.2)	-	E (64.3)	E (69.0)	E (69.0)	-
Overall	E (57.8)	E (55.5)	E (55.7)	-	E (62.4)	E (61.0)	E (61.5)	-	
Trooper Road (SR 3002)/Woodlyn Road/Woodland Avenue	WB L	A (8.9)	A (8.9)	A (8.9)	-	A (8.6)	A (8.6)	A (8.6)	-
	NB LR	B (10.1)	B (10.1)	B (10.1)	-	B (10.8)	B (10.8)	B (10.8)	-
	Overall	A (3.8)	A (3.8)	A (3.8)	-	A (5.6)	A (5.6)	A (5.6)	-
N. Trooper Road (SR 3002)/Site Access	NB L	-	-	A (8.7)	-	-	-	A (8.7)	-
	EB LR	-	-	A (9.5)	-	-	-	A (9.4)	-
	Overall	-	-	A (0.6)	-	-	-	A (0.5)	-

**Table 4
95th Percentile Queue Summary (in feet)**

Intersections	Movement	Storage Length	Weekday AM Peak				Weekday PM Peak			
			Existing	No-Build	Build	Build Impr	Existing	No-Build	Build	Build Impr
N. Trooper Road (SR 3002)/ Germantown Pike	EB -/L	n/a/75'	-	-	-	5	-	-	-	17
	EB LTR/TR	n/a	575	609	616	633	1025	1026	1678	495
	WB L	200'	81	86	88	85	618	439	439	306
	WB TR	n/a	280	284	285	285	1163	900	909	906
	NB LTR	n/a	311	317	318	318	301	386	395	369
	SB LTR	n/a	164	166	180	180	142	159	168	166
Germantown Pike/N. Park Avenue/Valley Forge Road (SR 0363)	EB L	135'	123	125	125	-	223	227	227	-
	EB TR	n/a	897	933	937	-	561	571	577	-
	WB L	230'	144	146	153	-	272	292	301	-
	WB T	n/a	399	407	411	-	801	823	830	-
	WB R	180'	43	45	50	-	81	83	87	-
	NB L	155'	73	88	88	-	46	51	51	-
	NB TR/T	n/a	680	505	505	-	782	628	628	-
	NB -/R	-/430'	-	85	86	-	-	51	54	-
	SB L	140'	65	68	69	-	55	59	63	-
	SB TR	n/a	748	769	769	-	793	833	833	-
Trooper Road (SR 3002)/ Woodlyn Road/Woodland Avenue	WB L	n/a	3	3	3	-	3	3	3	-
	NB LR	n/a	15	15	15	-	30	30	30	-
N. Trooper Road (SR 3002)/Site Access	NB L	n/a	-	-	0	-	-	-	0	-
	EB LR	n/a	-	-	3	-	-	-	0	-

CONCLUSIONS

The conduct of this updated Traffic Impact Assessment for the proposed 45-unit Trooper Ridge townhouse development in Worcester Township, Montgomery County, has led to the following conclusions and recommendations:

1. The proposed residential development will generate an estimated 324 daily trips with 22 trips in the AM peak hour and 26 trips in the PM peak hour.
2. Access to the residential development will be provided via a new residential roadway intersecting North Trooper Road (SR 3002). The access roadway will be classified as a "low volume" roadway.
3. The access intersection will operate at highly acceptable LOS A during both peak periods.
4. The access location will meet or exceed all sight distance requirements and will not require auxiliary left- or right-turn lanes on North Trooper Road.
5. In conjunction with the proposed development it is proposed to implement the following improvements:
 - Widening of approximately 12' along the site's Germantown Pike frontage
 - Striping for a separate EB left-turn lane on Germantown Pike approaching N. Trooper Road.
 - Modification of the existing traffic signal timing to provide additional green time to the Germantown Pike approaches
6. The off-site signalized intersection of North Trooper Road (SR 3002)/Germantown Pike currently experiences LOS F conditions during the PM peak hour. With the above-reference proposed improvements, the site-generated traffic impact is fully mitigated resulting in better LOS under Build Improved conditions than under the unimproved No-Build conditions.

7. The site-generated traffic will have only minimal impact on the other off-site study intersections, with no decline in LOS between the No-Build and Build scenarios. There are no geometric improvements required or recommended at these locations attributable to the proposed residential development project.

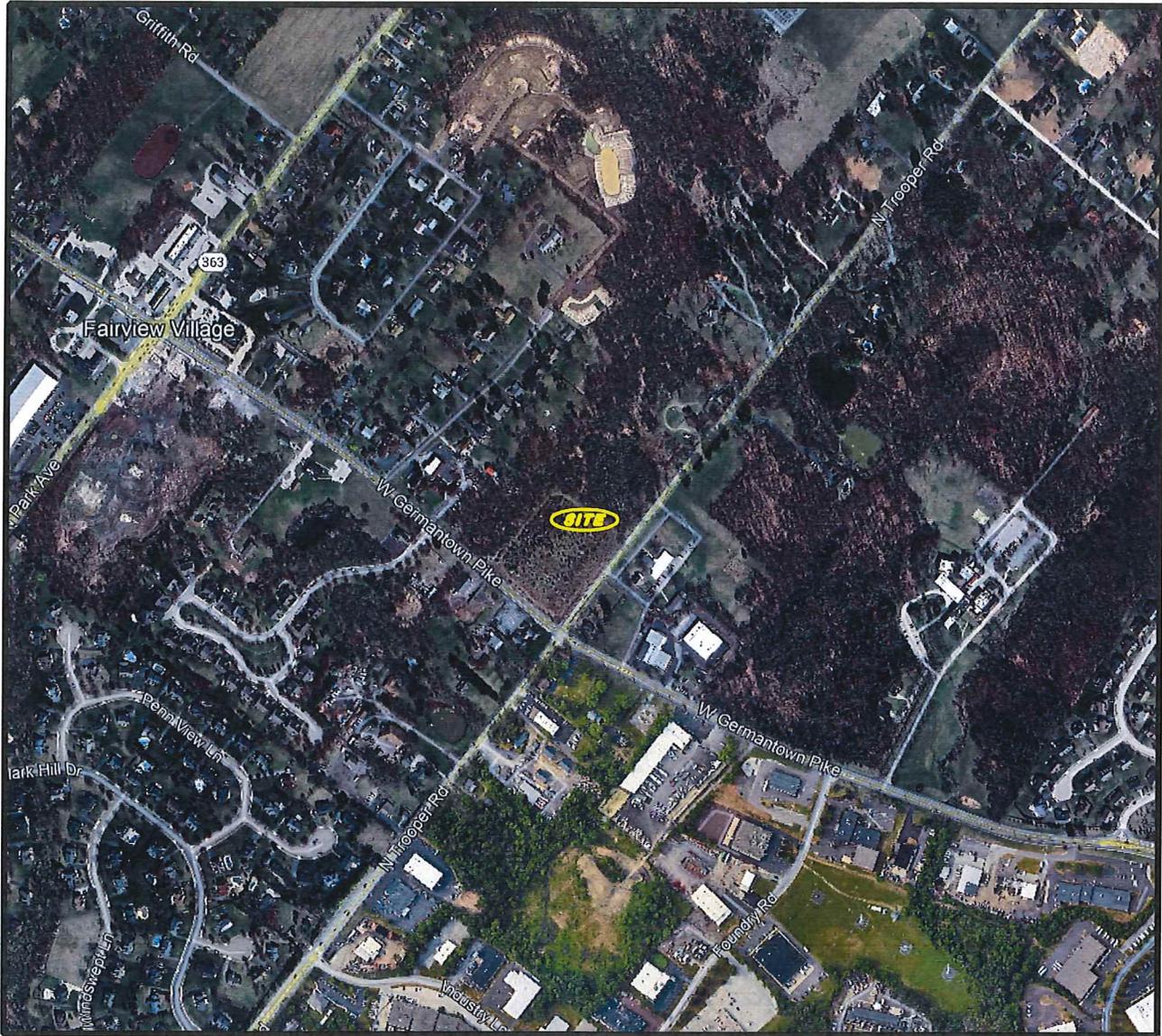
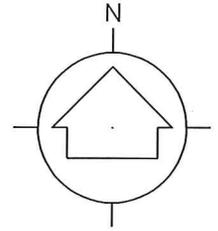


FIGURE 1
 SITE LOCATION MAP

TROOPER RIDGE TOWNHOUSE DEVELOPMENT

WORCESTER TOWNSHIP, MONTGOMERY COUNTY, PA

24-025
 APRIL 2025

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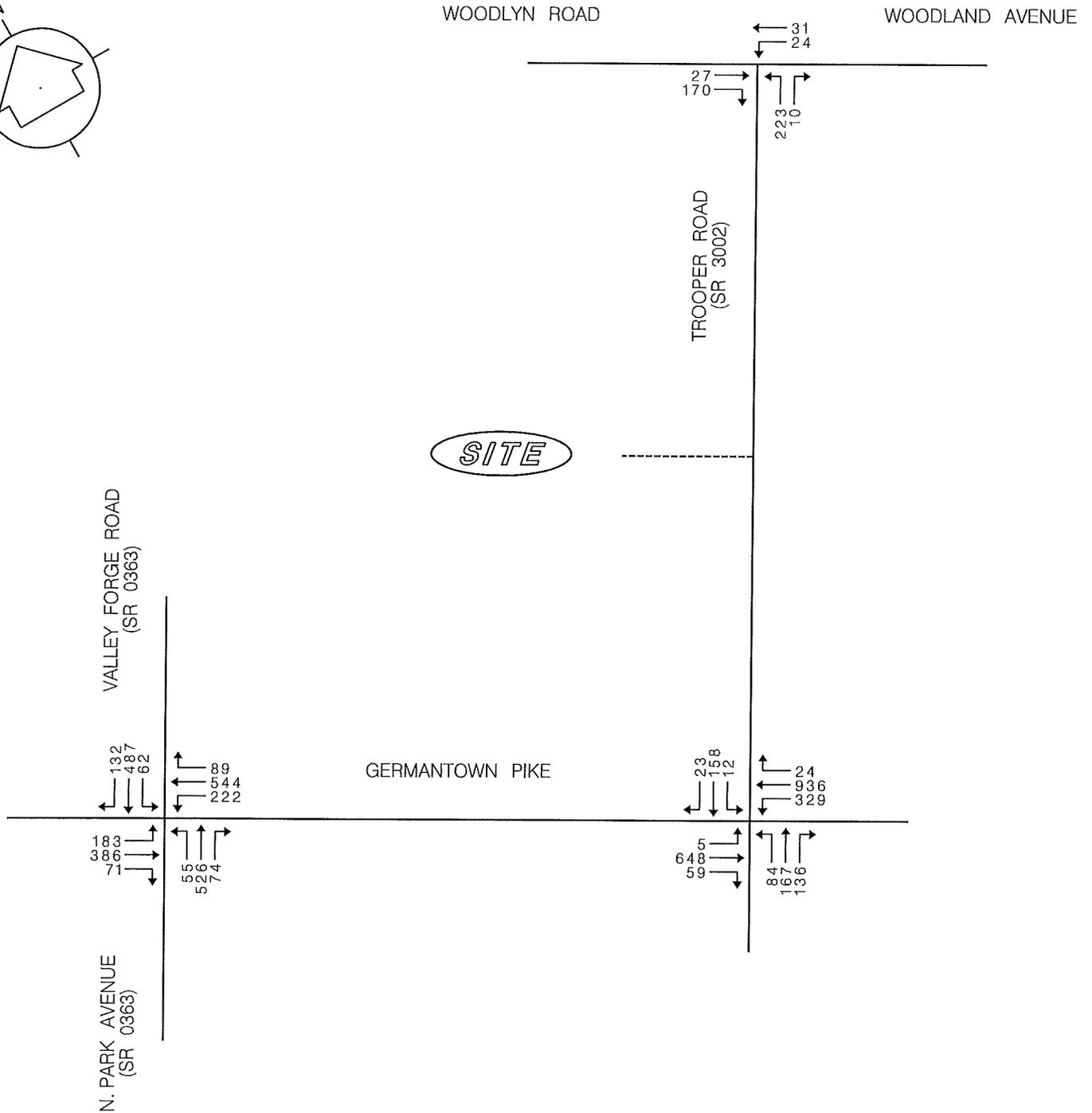
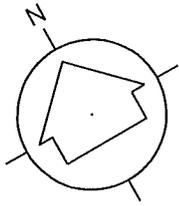
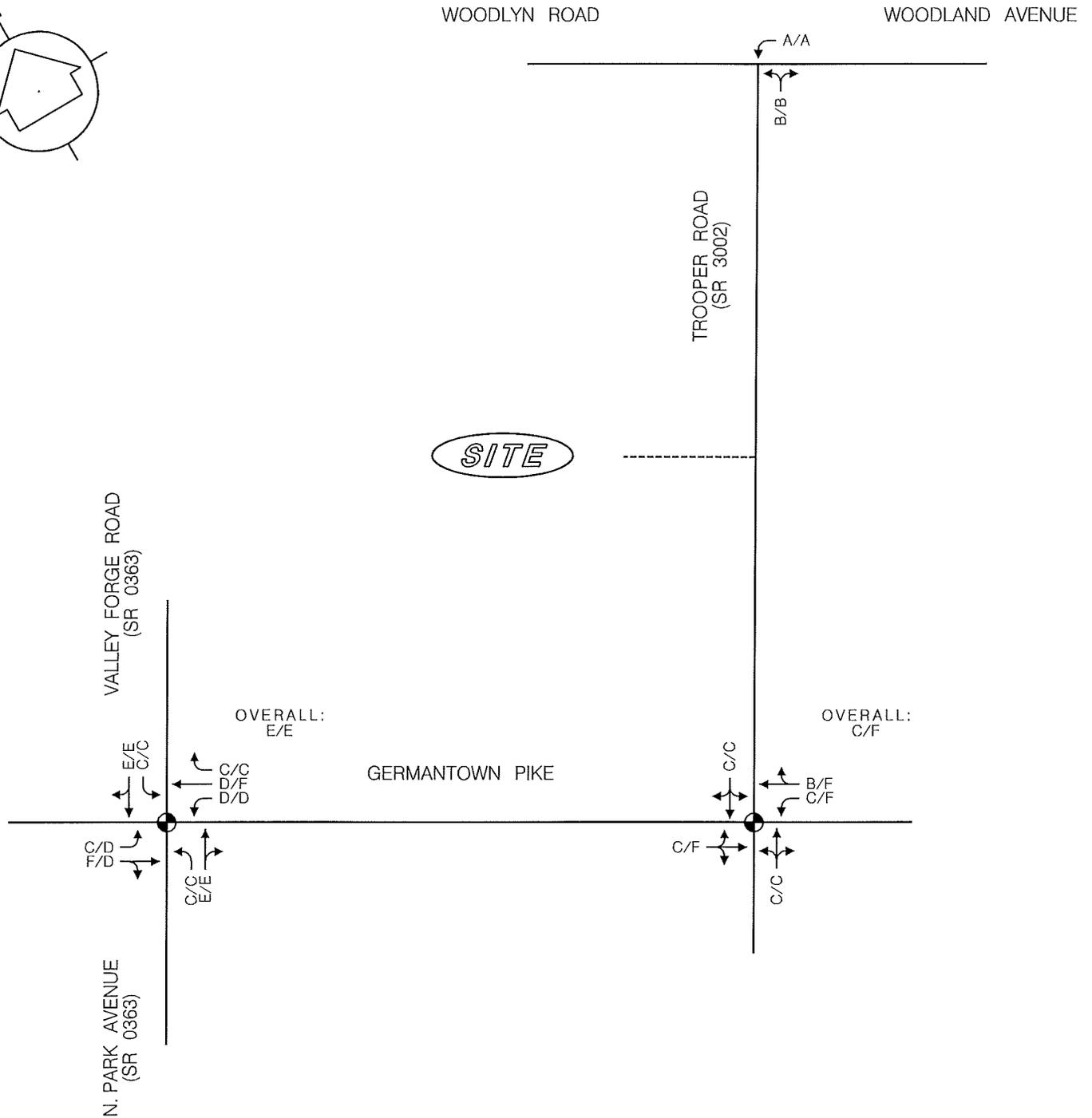


FIGURE 3
 EXISTING WEEKDAY PM PEAK HOUR TRAFFIC VOLUMES

TROOPER RIDGE TOWNHOUSE DEVELOPMENT

WORCESTER TOWNSHIP, MONTGOMERY COUNTY, PA

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LEGEND:

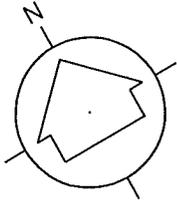
- ← AM/PM PEAK HOUR
- ⊕ TRAFFIC SIGNAL

FIGURE 4
 EXISTING LEVELS OF SERVICE

TROOPER RIDGE TOWNHOUSE DEVELOPMENT

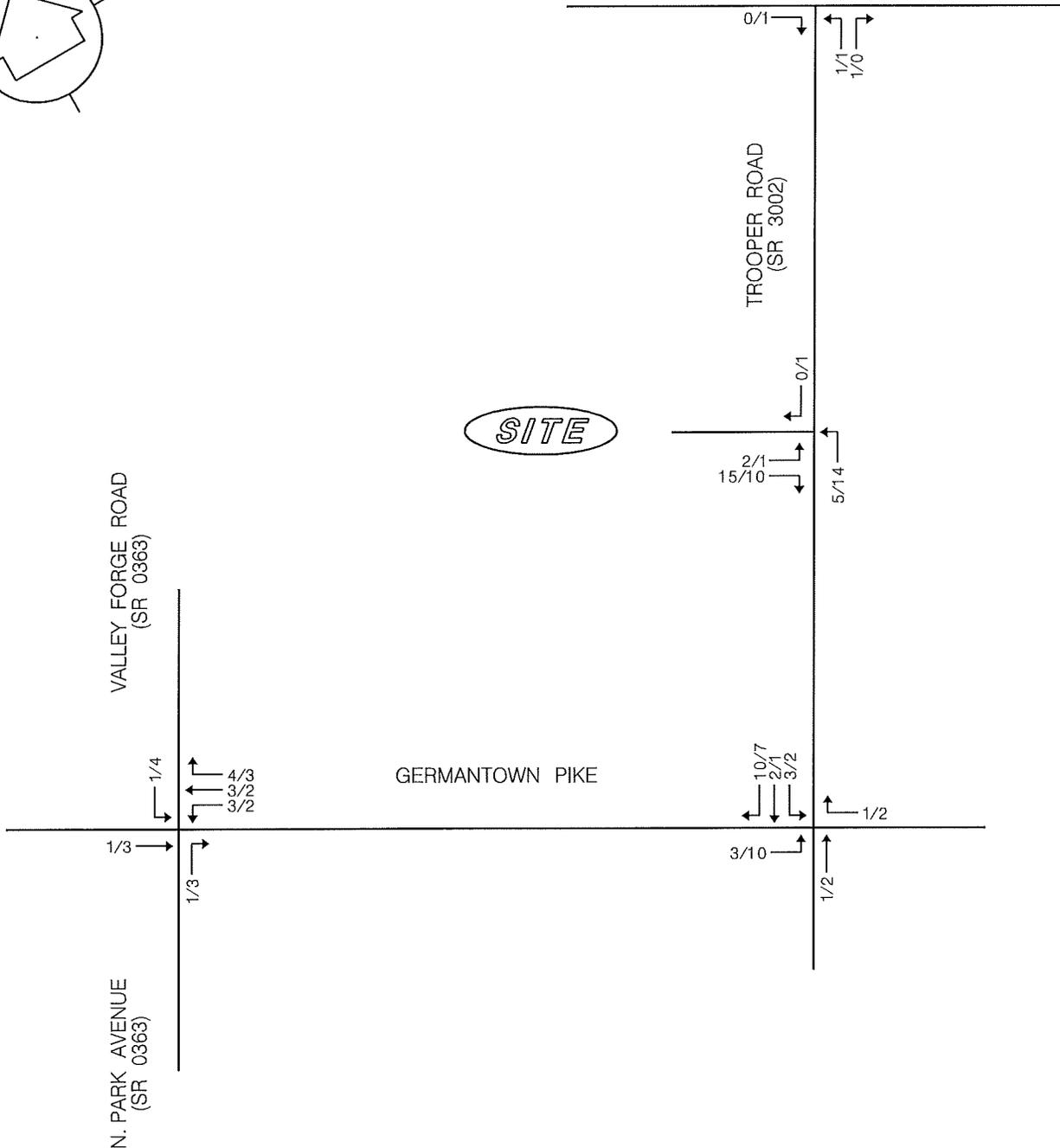
WORCESTER TOWNSHIP, MONTGOMERY COUNTY, PA

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WOODLYN ROAD

WOODLAND AVENUE



LEGEND:

← AM/PM PEAK HOUR

FIGURE 5
 SITE TRIPS

24-025
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TROOPER RIDGE TOWNHOUSE DEVELOPMENT

WORCESTER TOWNSHIP, MONTGOMERY COUNTY, PA

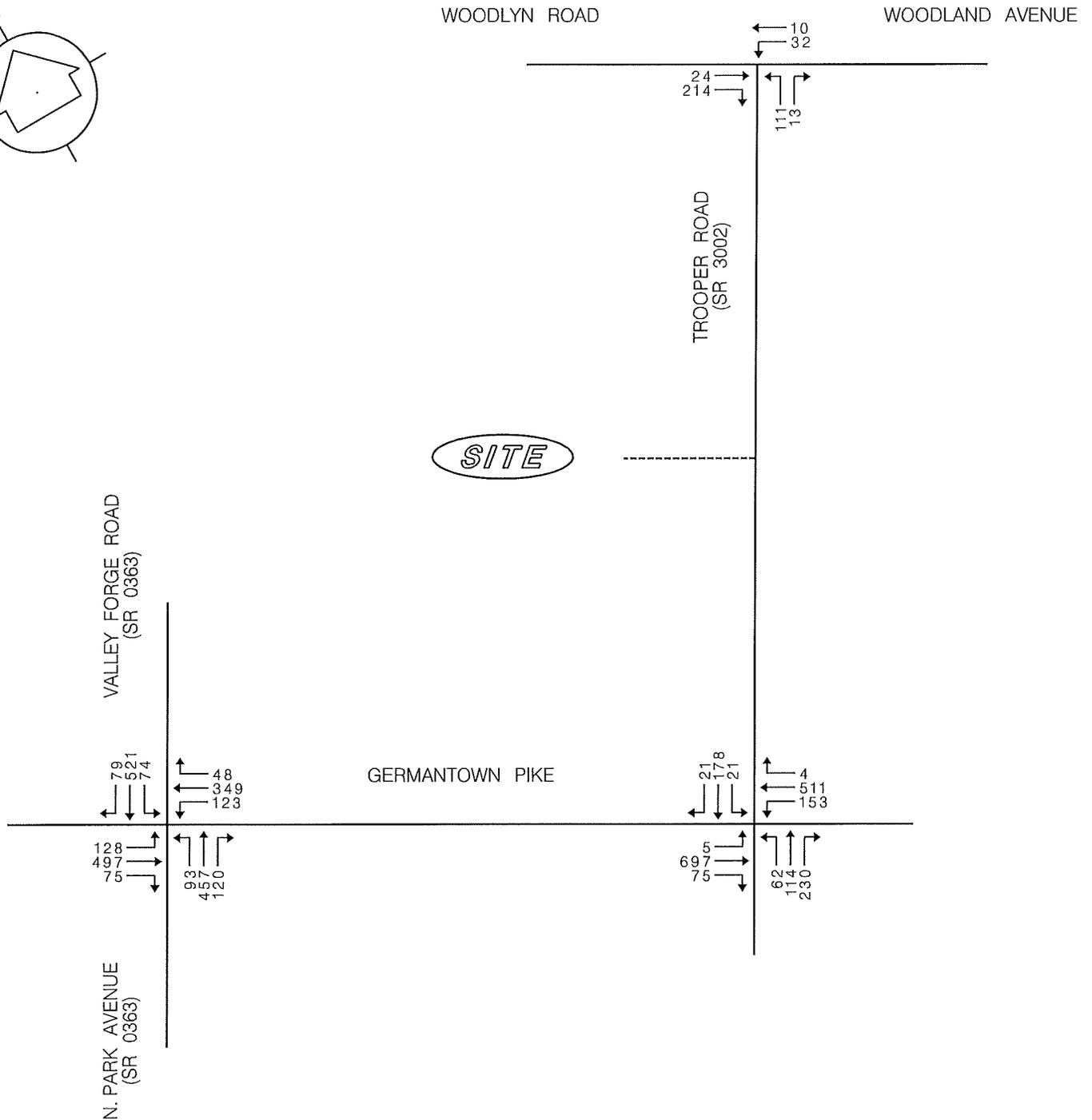
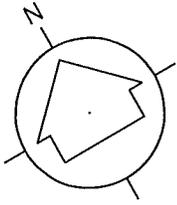


FIGURE 6
 NO-BUILD WEEKDAY AM PEAK HOUR TRAFFIC VOLUMES

TROOPER RIDGE TOWNHOUSE DEVELOPMENT

WORCESTER TOWNSHIP, MONTGOMERY COUNTY, PA

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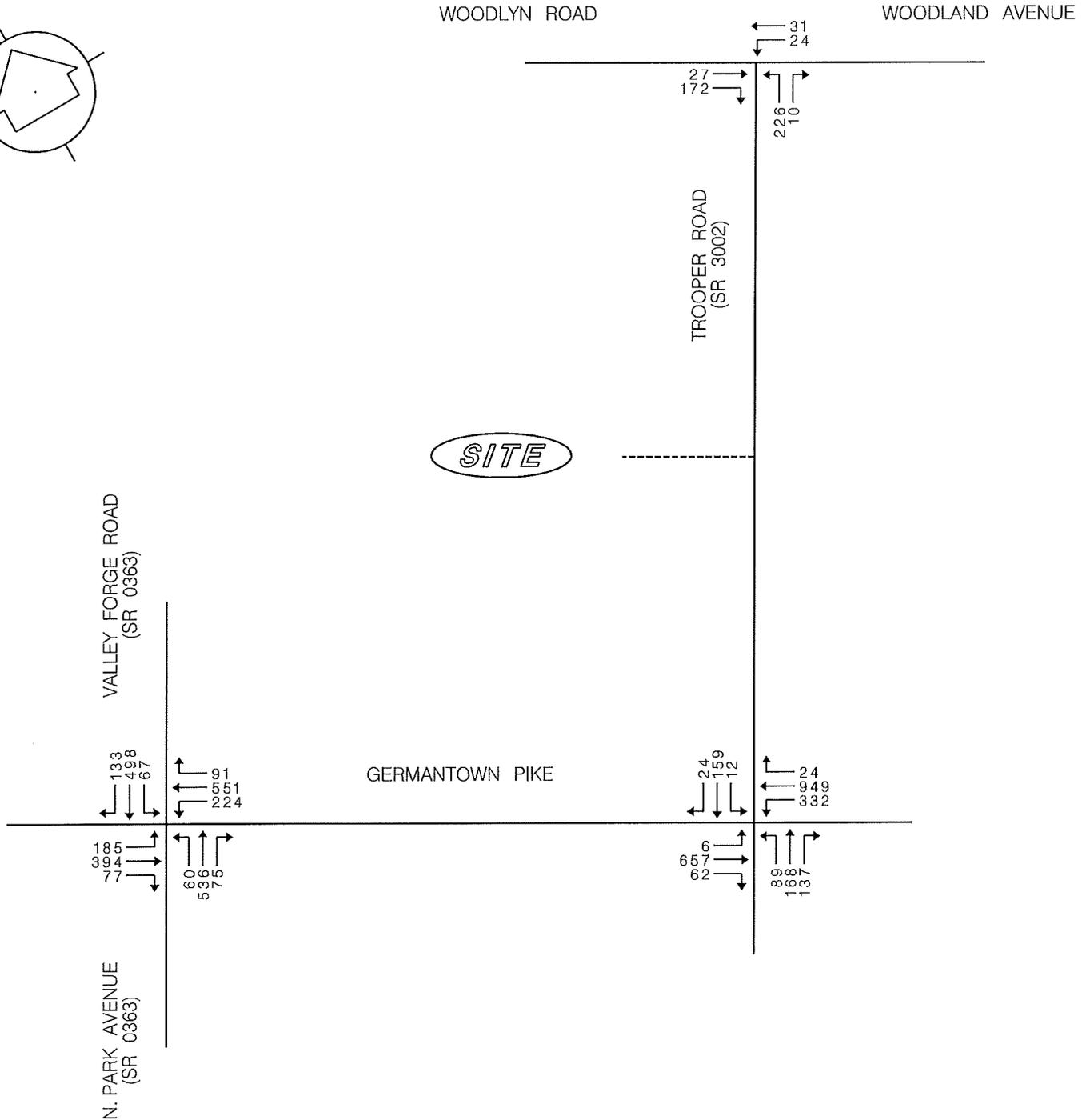
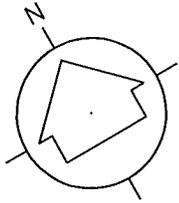


FIGURE 7
 NO-BUILD WEEKDAY PM PEAK HOUR TRAFFIC VOLUMES

TROOPER RIDGE TOWNHOUSE DEVELOPMENT

WORCESTER TOWNSHIP, MONTGOMERY COUNTY, PA

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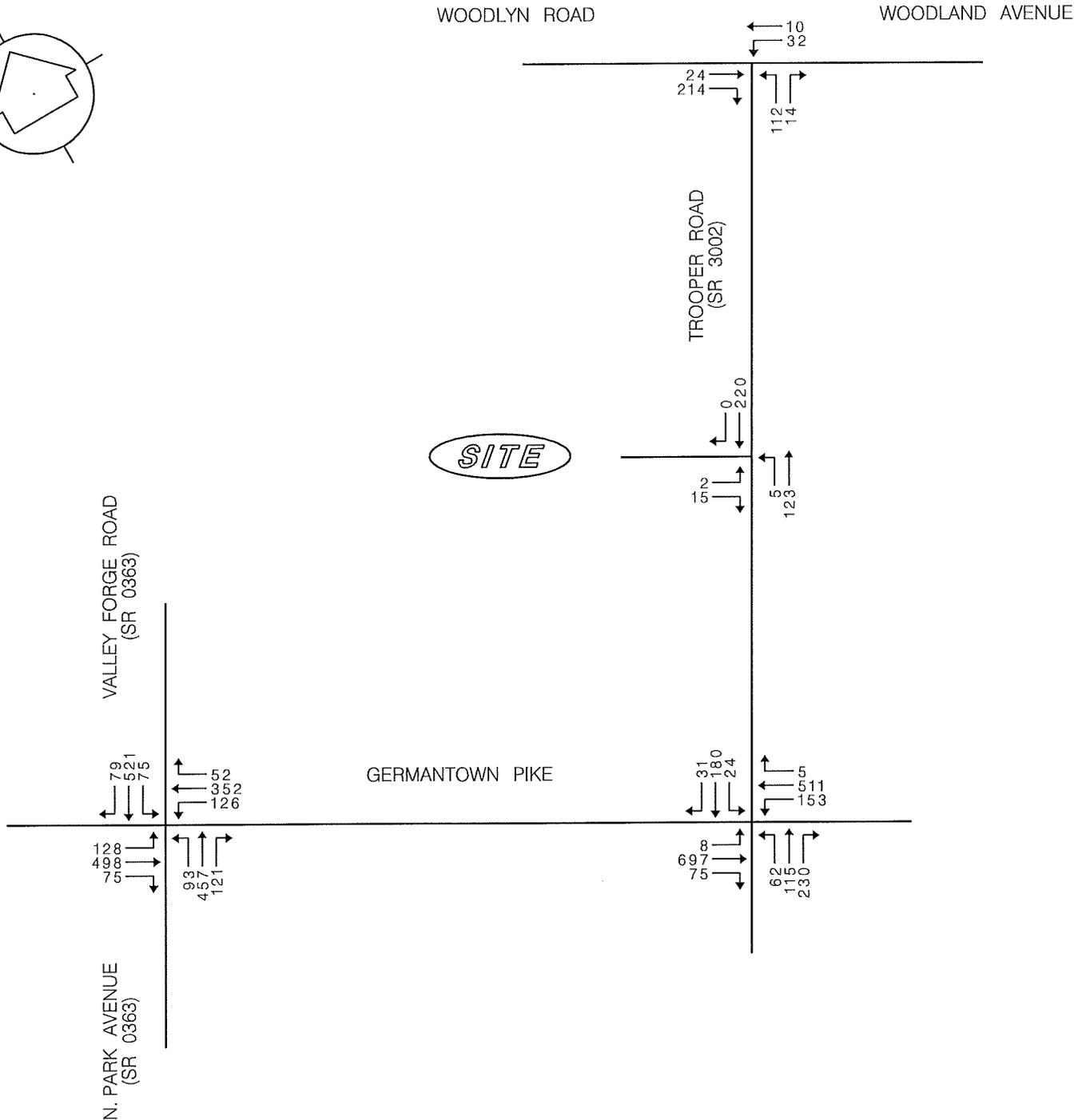


FIGURE 8
 BUILD WEEKDAY AM PEAK HOUR TRAFFIC VOLUMES

TROOPER RIDGE TOWNHOUSE DEVELOPMENT

WORCESTER TOWNSHIP, MONTGOMERY COUNTY, PA

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 APRIL 2025

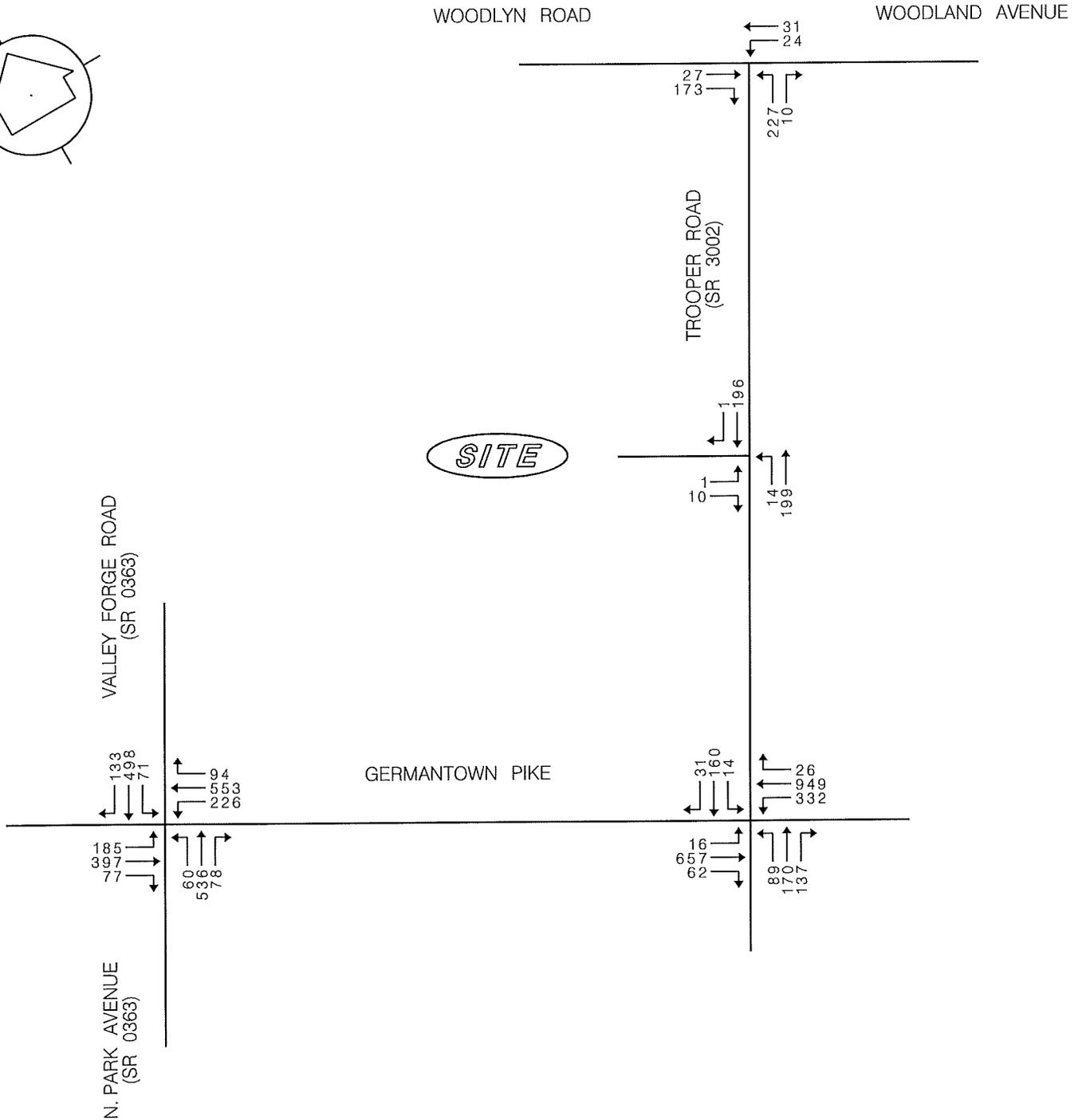
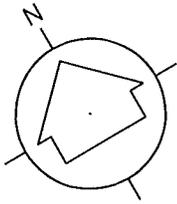
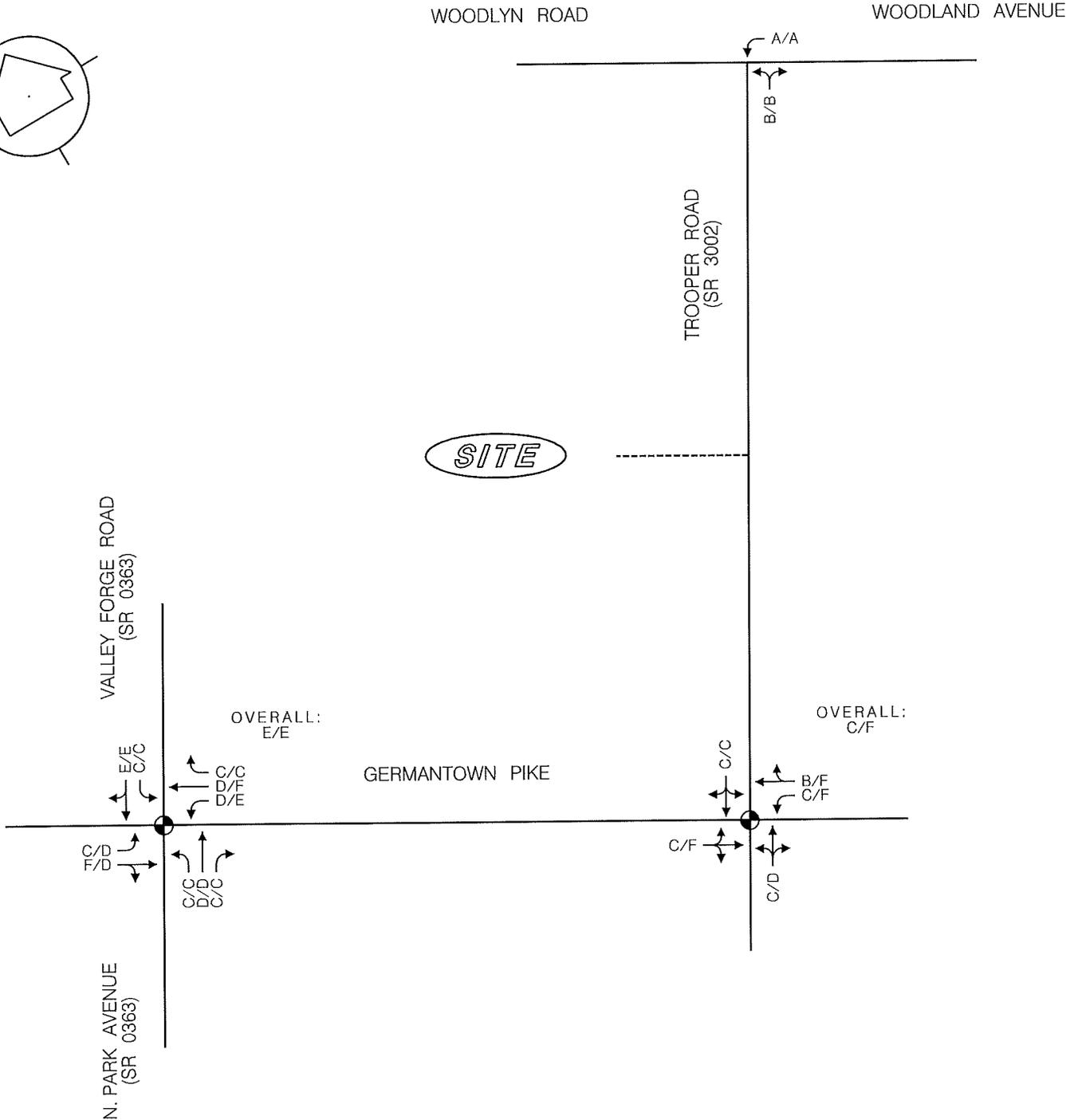
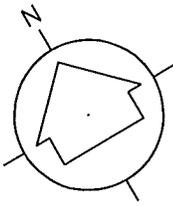


FIGURE 9
 BUILD WEEKDAY PM PEAK HOUR TRAFFIC VOLUMES

TROOPER RIDGE TOWNHOUSE DEVELOPMENT

WORCESTER TOWNSHIP, MONTGOMERY COUNTY, PA

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LEGEND:

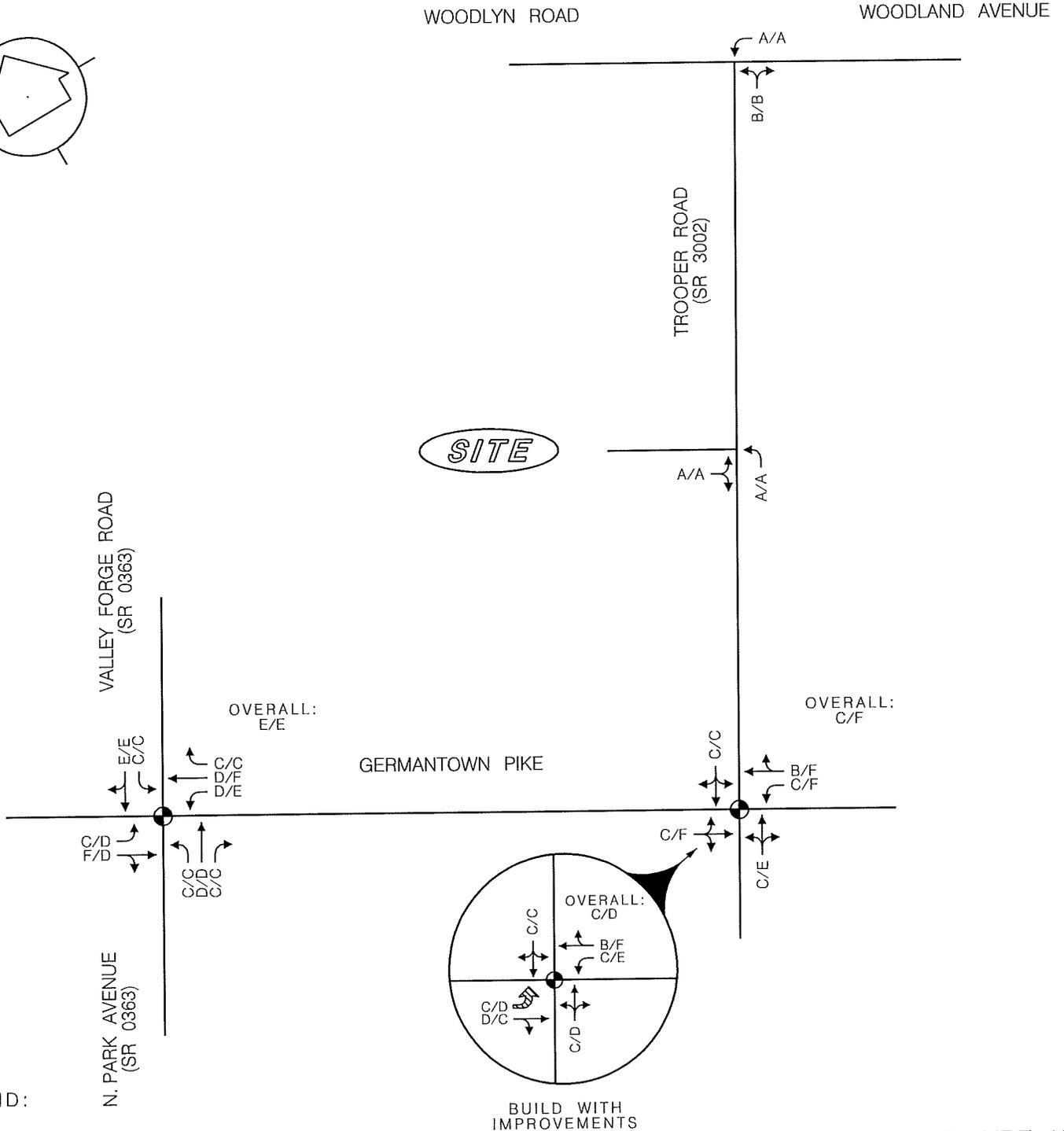
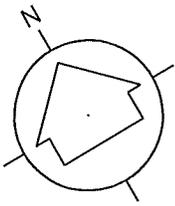
- ← AM/PM PEAK HOUR
- ⊕ TRAFFIC SIGNAL

FIGURE 10
 NO-BUILD LEVELS OF SERVICE

TROOPER RIDGE TOWNHOUSE DEVELOPMENT

WORCESTER TOWNSHIP, MONTGOMERY COUNTY, PA

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LEGEND:

- ← AM/PM PEAK HOUR
- ⊕ TRAFFIC SIGNAL
- ↗ PROPOSED LANE

FIGURE 11
 BUILD LEVELS OF SERVICE

TROOPER RIDGE TOWNHOUSE DEVELOPMENT

WORCESTER TOWNSHIP, MONTGOMERY COUNTY, PA

24-025
 APRIL 2025

APPENDIX A

Relevant PennDOT and Township Correspondence



DAVID H. HORNER, P.E., PTOE, President
HASSON A. KEENE, Associate

MEETING MINUTES

Meeting Date: Monday, March 17, 2025 1:00 PM (Via Zoom)

Project: **Trooper Ridge 45-Unit Townhouse Project**
1035 N. Trooper Road
Worcester Township, Montgomery County, Pennsylvania
HCA File No. 24-025

Attendees: Paul Lutz, PennDOT (plutz@pa.gov)
Casey Moore, Bowman (cmoore@bowman.com)
Michelle Eve, Bowman (meve@bowman.com)
Dan DeMeno, Worcester Township (ddemeno@worcestertwp.com)
John Evarts, CKS Engineers (jevarts@cksengineers.com)
Christian Jones, Worcester Township (cjones@worcestertwp.com)
Krista Heinrich, Gilmore Associates (kheinrich@gilmore-associates.com)
Andy Parker, McCormick Taylor (ajparker@mccormicktaylor.com)
Barry Stingel, T & M Associates (bstingel@tandmassociates.com)
Brian McKenzie, Westrum (bmckenzie@westrum.com)
David H. Horner, Horner & Canter Associates (dhorner@horner-canter.com)

Minutes Prepared By: David H. Horner, P.E., PTOE – March 20, 2025

A meeting was held via Zoom on Monday, March 17, 2025 with regard to the proposed Trooper Ridge 45-unit townhouse development located in the northeast quadrant of Trooper Road (SR 3002) and Germantown Pike in Worcester Township, Montgomery County, Pennsylvania.

The following is a summary of the discussion:

- Dave Horner (traffic consultant for the applicant) provided an overview, identifying that the purpose of this meeting was to discuss improvements to be completed by the applicant along their frontage of Germantown Pike, a County road, and at the intersection of Trooper Road (SR 3002)/Germantown Pike. The proposed improvements are as follows:
 - Widening of Germantown Pike along the site frontage by 12' to enable a future four-lane cross section.
 - Restripe the SB Germantown Pike approach at the intersection for a separate left-turn lane

- Radius improvements at northeast (site) corner of the intersection
 - Andy Parker (County representative) suggested the proposed left-turn lane be longer than 75' in order to accommodate potential queues.
 - Paul Lutz (PennDOT) confirmed that the site's pedestrian linkage to the northeast corner of the signalized intersection will require ADA-compliant ramps on the subject corner and a crosswalk and connecting ramp at the southeast corner, along with man/hand signals. Casey Moore (Worcester Township traffic engineer) suggested that the pedestrians could be accommodated with three crossings instead of four; thus, no ramp installation would be needed on the northwest corner. Paul concurred with this idea.
 - An easement may be needed from the cemetery, for a ramp installation on the southeast corner.
 - A Pedestrian Study will be required with the HOP submission which will help determine whether the fourth crossing is required.
 - There was discussion as to whether the site would have regular vehicular access to Germantown Pike at a right-in/right-out driveway or remain emergency-only as proposed. The entrance is emergency-only access as it would allow direct left-turns in for emergency vehicles where a triangular median would inhibit this movement. Brian McKenzie (applicant representative) represented that it would remain emergency-only.
 - Casey asked whether the County would require an additional 5' widening for a bike lane. Andy said he would review County master plan as some sections of Germantown Pike are proposed for bike lanes and some are not.
 - Andy said that the applicant should file an HOP with the County through Morgan Rouscher.
 - Krista Heinrich (East Norriton Township representative) had no issues with the signal improvements discussed. She confirmed that East Norriton Township owns the traffic signal and would need to sign the forms related to the application. All HOP submission documents and plans (PennDOT and County) should cc: East Norriton Township.
-

Bowman

February 5, 2025

Mr. Dan Demeno
Township Manager
Worcester Township
1721 Valley Forge Road
P.O. Box 767
Worcester, PA 19490

Attention: Christian R. Jones, Assistant Township Manager
Robert D'Hulster, Public Works Director

RE: **Traffic Review #3 – Transportation Impact Assessment and Preliminary Land Development Plans**
1035 North Trooper Road (S.R. 3002) – 45 proposed townhouse units
Worcester Township, Montgomery County, PA
Project No. 314086-01-001

Dear Dan:

In response to the Township's request, Bowman Consulting Group (Bowman) has completed our third (3rd) traffic engineering review associated with the proposed development to be located at 1035 North Trooper Road (S.R. 3002) in Worcester Township, Montgomery County, PA. According to the land development plans provided to our office, the development is proposed to consist of 45 townhouse units with access being provided via one full-movement access/local road to North Trooper Road (S.R. 3002), as well as an emergency-only access to/from West Germantown Pike with a gating system proposed to be provided for first responders to access the community but not others. The existing single-family home and garage will remain on the northern end of the site and will be subdivided on its own lot (lot 1).

The following documents were reviewed in preparation of our comments:

- Transportation Impact Assessment – Trooper Ridge Townhouse Development, prepared by Horner & Canter Associates, Inc., dated January 13, 2025.
- Preliminary Land Development Plans – Trooper Ridge Subdivision, prepared by T & M Associates, Inc., dated December 19, 2024.
- Waiver Request Letter – Trooper Ridge Subdivision, prepared by T & M Associates, Inc., dated December 19, 2024.
- Response to Comments Letter – 1035 North Trooper Road, prepared by Horner & Canter Associates, Inc., dated January 23, 2025.

There has been interim coordination with the applicant's traffic consultant since the prior submission to the Township via email and a few calls to answer questions for them to address technical items leading up to the resubmission of the project plans and materials to the Township.

Based on our review of the documents listed above, Bowman offers the following comments for consideration by the Township and action by the applicant.

General

1. A response letter **must be provided** with the resubmission detailing how each comment below has been addressed, and where each can be found in the resubmission materials (i.e., page number(s)) to assist in the re-review process. Additional comments may follow upon review of any resubmitted during the land development process.
2. According to the Township's Roadway Sufficiency Analysis, the proposed development is located in Transportation Service Area South, which has a corresponding impact fee of \$3,125 per "new" weekday afternoon peak hour trip and the applicant will be required to pay a Transportation Impact Fee in accordance with the Township's Transportation Impact Fee Ordinance. Based on information provided in Table 1 of the study, the proposed 45 townhouse units are expected to generate 26 "new" trips during the weekday afternoon peak hour resulting in a **transportation impact fee of \$81,250**.
3. A Highway Occupancy Permit (HOP) is required for this project from **both** PennDOT and Montgomery County for the proposed site accesses and work that may be completed within the legal right of way on North Trooper Road (S.R. 3002) and West Germantown Pike since North Trooper Road (S.R. 3002) is a State Roadway and West Germantown Pike is a County roadway. Furthermore, since the site borders the adjacent municipality of East Norriton Township, and the site adjacent traffic signal at the intersection of West Germantown Pike and North Trooper Road (S.R. 3002) is owned and maintained by East Norriton Township, any roadway/signal improvements at the intersection or along North Trooper Road (S.R. 3002) extending into that jurisdiction will require the review and approval of that municipality, as well. The Township and our office must be copied on all TIA and HOP submissions, as well as correspondence between the applicant, PennDOT, and Montgomery County, and invited to any and all meetings among these parties.
4. Upon resubmission, our office will evaluate the information in concert with PennDOT and Montgomery County and will provide additional reviews of engineering and supplemental submission details as we receive them.

Transportation Impact Assessment

5. Since the site is situated along North Trooper Road (S.R. 3002), which is a state road, and West Germantown Pike, which is a County road, the transportation impact assessment (TIA) is recommended to be concurrently reviewed by PennDOT and Montgomery County. In addition, since the site is located immediately adjacent to East Norriton Township, the TIA should be shared and reviewed by East Norriton Township for their knowledge of the site access and associated roadway/signal improvements concluded from the study. Any comments from PennDOT, Montgomery County, and East Norriton Township should also be coordinated with our office and the Township and evaluated and addressed accordingly.
6. The TIA submitted by the applicant's traffic engineer was prepared using the industry's generally accepted transportation impact study practices. The TIA was jointly scoped with PennDOT and the Township (via our office) in preparation of the study included for review. It is unclear if the study was scoped with Montgomery County.
7. The study presents the following recommendations/conclusions, that should minimally be required of the applicant. There may be additional or modified improvements, or driveway design considerations based on the comments in this letter and responses to them, as well as those from PennDOT and

Montgomery County, as the applicant must obtain their concurrence and approvals since North Trooper Road (S.R. 3002) is a state highway and West Germantown Pike is a county highway:

West Germantown Pike and North Trooper Road (S.R. 3002)

- Widen West Germantown Pike approximately 12 feet along the site frontage in order to restripe the western leg of this intersection to provide a separate left-turn lane and a shared through/right-turn lane on the eastbound West Germantown Pike approach. *Note: This widening is also intended to provide for a minimum 14-foot curb lane in the westbound direction of West Germantown Pike in the future.* Note: The frontage widening along West Germantown Pike and improvement of the northwest radius of the West Germantown Pike/North Trooper Road (S.R. 3002) intersection will require replacement of the existing signal pole at this corner to accommodate the improvements.
 - Traffic signal timing modifications.
8. With the proposed improvements noted above to widen the West Germantown Pike site frontage and to provide for roadway restriping and a designated eastbound left-turn lane at the intersection, the applicant is helping to mitigate their impact and working towards the larger long-term solution to alleviate the congestion experienced by vehicles along West Germantown Pike in the vicinity of the site. These are improvements that were identified in the West Germantown Pike Corridor Study completed for Montgomery County in the early 2000's as well as the capital improvement plan completed for the adjacent signalized intersection in the Worcester Township Act 209 study., Under the County review, however, they may comment on their desire to provide for a shoulder or designated bike lane between a future westbound travel lane and the currently proposed new curb line along the West Germantown Pike site frontage to accommodate two westbound through lanes and a 5-lane cross-section (plus bike lanes/pedestrian ways).
 9. The widened lane closest to the site should be striped to provide gore pavement markings in the interim and allow for the conversion into an additional westbound through lane (plus shoulder if the County requires) in the future.
 10. The analysis worksheets should be revised to show all analysis inputs (i.e., saturated flow rate, lane widths, grades, heavy vehicles percentages, etc.), in order to confirm the inputs used in the analysis.
 11. The base critical headway and follow up headway factors for all unsignalized intersections should be adjusted to be consistent with **PennDOT Publication 46, Chapter 10** parameters.
 12. The applicant's traffic engineer should verify the traffic signal timings/phasing used in the analysis conditions at the intersection West Germantown Pike and Park Avenue/Valley Forge Road (S.R. 0363) during both peak hours to confirm they match the traffic signal permit plan.
 13. The study utilizes a background growth rate of 0.21 percent per year which is consistent with data contained in PennDOT table entitled, ***Growth Factors for August 2023 to July 2024*** for urban non-interstates in Montgomery County. It should be noted that the study should have used a background growth rate is 0.17 percent per year as contained in PennDOT table entitled, ***Growth Factors for August 2024 to July 2025***, for urban non-interstates in Montgomery County. The analyses do not need to be revised specifically for this growth factor as the growth rate used in the study is higher, and therefore considered more conservative. However, to address other capacity/LOS items the applicant's engineer may re-run analyses with the lower rate.

14. Please provide volume development spreadsheets in the appendices that clearly indicate the existing volumes, baseline traffic growth volumes, traffic generated by planned or approved projects in the study area, and the proposed site volumes.
15. The applicant's traffic engineer should verify if they contacted East Norriton Township to determine if there are any proposed/planned nearby developments in that Township that should have been included in the future conditions traffic volume projections. If this was not done, please do so.
16. The traffic signal timings at the intersection of West Germantown Pike and North Trooper Road (S.R. 3002) should be optimized under 2029 future base conditions as required by current PennDOT TIS guidelines.
17. The HCM worksheets for the unsignalized study intersections during both the weekday morning and weekday afternoon peak hours under all analysis conditions should be revised to include the overall levels-of-service/delay in order to confirm the overall levels-of-service/delay results shown in Table 3.
18. The 2029 future no-build and build queues at the following intersections **exceed the available storage lengths** on one or more of the turn lanes between no-build to build conditions according to the queue analysis provided in Table 4:
 - West Germantown Pike and North Trooper Road (S.R. 3002) – westbound left-turn lane
 - West Germantown Pike and Park Avenue/Valley Forge Road (S.R. 0363) – eastbound left-turn lane

Therefore, the applicant's engineer must evaluate feasible additional improvements required in order to reduce the queue lengths at these intersections during both peak hours or must provide an Alternative Transportation Plan (ATP) to provide necessary storage and/or infrastructure improvements in the study area that are feasible and will improve transportation (multi-modal) mobility.

19. Crash analysis for the most recent five years of available crash data (i.e., 2019–2023) must be included in the study for all study intersections.
20. The applicant's traffic engineer will likely be required by PennDOT to complete a comprehensive pedestrian study for the existing signalized intersection of West Germantown Pike and North Trooper Road (SR 3002). An inquiry should be made to the County and PennDOT to confirm before completing. This pedestrian study would include documentation of the existing pedestrian accommodations and generators at the intersection and improvements proposed as part of the site development. It should be noted that upgrades to the existing pedestrian signal equipment may result from the study with the other intersection improvements at this location, as well as provision of appropriate ADA facilities and crosswalks.
21. It is noted that the applicant is proposing to provide a dedicated left-turn lane for eastbound West Germantown Pike as part of the traffic study and project improvements. Due to curve in West Germantown Pike through the intersection and grades, the vehicles waiting to make the left-turn on the eastbound approach may impact the unobstructed view of oncoming through traffic for motorists turning left from westbound West Germantown Pike onto southbound North Trooper Road (SR 3002). Due to this, PennDOT may necessitate the implementation of protected-prohibited left-turn phasing for the westbound West Germantown Pike left-turn lane. Implementation of protected-prohibited phasing will likely impact the traffic analysis results and could potentially require additional mitigation measures. We request that the applicant's traffic engineer evaluate this potential sight-distance concern in the field,

and then recommend that a technical meeting with PennDOT, County, and Township representatives be scheduled to confirm what, if anything, should be done with the signal timing/phasing for the left turn approaches. With the conclusions and guidance discussed, then revise the TIA accordingly.

22. As noted in a prior comment, the radius improvements proposed on the northwest corner of the existing signalized intersection of West Germantown Pike and North Trooper Road (SR 3002) will impact the existing signal equipment and require it to be relocated and replaced.
23. The applicant's traffic engineer shall provide left-turn conflict analysis calculations to confirm the need for left-turn phases at the existing signalized intersection of West Germantown Pike and North Trooper Road (SR 3002). Additional signal equipment may need to be replaced to accommodate the phasing requirements determined by the analysis, and the structural integrity of the existing equipment must then be evaluated to discern if it needs to be upgraded.
24. To reiterate an earlier point, East Norriton Township owns and maintains the traffic signal at the intersection of West Germantown Pike and North Trooper Road (SR 3002). All design plans and documents related to the traffic signal must be also submitted to East Norriton Township for review and approvals.

Preliminary Land Development Plans

25. The cartway widths along the North Trooper Road (S.R. 3002) and West Germantown Pike site frontages should be clearly labeled on the plans and be in accordance with **Section 130-16.C** of the **Subdivision and Land Development Ordinance**. *The applicant's traffic engineer indicates in its response that the cartway widths have been provided (labeled) on the preliminary land development plans, however, we are unable to locate them in this submission.*
26. A note must be added to the plan stating that the area between legal right-of-way line and ultimate right-of-way line along North Trooper Road (S.R. 3002) and West Germantown Pike should be offered for dedication to the authority having jurisdiction over the road as required by **Section 130-16.C(2)(c)** of the **Subdivision and Land Development Ordinance**. *The applicant's traffic engineer indicates in its response that a note will be added to the land development plans.*
27. According to **Section 130-18.A** of the **Subdivision and Land Development Ordinance**, sidewalk should be provided along the site frontages of North Trooper Road (S.R. 3002) and West Germantown Pike. *The applicant's traffic engineer indicates in its response that sidewalk has been provided along the North Trooper Road (S.R. 3002) and West Germantown Pike site frontages, however, the plans currently show sidewalk along the West Germantown Pike site frontage and along only a portion of the North Trooper Road (S.R. 3002) site frontage from West Germantown Pike to the proposed site access, thereby satisfying the ordinance requirement for West Germantown Pike but not satisfying the ordinance requirement for North Trooper Road (S.R. 3002).* The plans must either be revised to show sidewalk along the entire North Trooper Road (S.R. 3002) site frontage, or a waiver/partial waiver must be requested from this ordinance requirement with a detailed explanation why it is being requested. We note to the Township that no sidewalk currently exists along either side of North Trooper Road (S.R. 3002) in the vicinity of the site. The Board of Supervisors may consider deferring this obligation that is required of the applicant until such a time as may be required by the PennDOT or the Township for this property, whether under present or future land ownership, and at no cost to Worcester Township, or may desire to consider a fee in lieu of sidewalk to be kept in escrow for future sidewalk installations in the Township and/or area of these properties.

28. The plans have been revised to show curbing along the West Germantown Pike site frontage and along the North Trooper Road (S.R. 3002) site frontage for Lot 2 from West Germantown Pike to a point to the north of the gravel driveway for the existing single-family home and garage on the northern end of the site, however, it is unclear if the applicant is proposing to install curbing entirely along the Lot 1 site frontage to the northern property line on North Trooper Road (S.R. 3002) as is required in **Section 130-18.B** of the **Subdivision and Land Development Ordinance**. *The applicant's traffic engineer indicates in its response that curbing is provided along the West Germantown Pike and North Trooper Road (S.R. 3002) site frontages for the parcel (Lot 2).* We recommend that the plans be revised to clearly show curbing along the entire site frontage (both Lots 1 and 2) of North Trooper Road (S.R. 3002), or a waiver/partial waiver must be requested from this ordinance section with a detailed explanation of why it is being requested. We do note to the Township that there is currently no curbing along either side of North Trooper Road (S.R. 3002) in the immediate vicinity of the site. Alternatively, the Board of Supervisors may also consider deferring this obligation that is required of the applicant until such a time as may be required by the PennDOT or the Township for this property, whether under present or future land ownership, and at no cost to Worcester Township, or may desire to consider a fee in lieu of curb to be kept in escrow for future curb installations in the Township and/or area of these properties.

29. As previously commented upon in the prior review, adequate connectivity of the proposed sidewalk along the West Germantown Pike and North Trooper Road (S.R. 3002) site frontages to the signalized intersection of West Germantown Pike/North Trooper Road (S.R. 3002) must be provided. In addition, provision of ADA ramps and a crosswalk across North Trooper Road (S.R. 3002) from the site to the Norriton Presbyterian Cemetery should be incorporated into the plans.

*The applicant's traffic engineer indicates in its response that ADA ramps and crosswalks are not shown on the plans at the intersection of West Germantown Pike and North Trooper Road (S.R. 3002) connecting the site and the Norriton Presbyterian Cemetery since there is no corresponding ADA ramp on the opposite side of North Trooper Road (S.R. 3002) for which to connect a crosswalk, and that **further discussion will be required between the County, PennDOT, and the Township**. We concur that this item should be discussed along with other items in this letter with the agencies involved.*

30. According to **Section 130-18.A(3)** of the **Subdivision and Land Development Ordinance**, a minimum of five feet should be provided between the curb and sidewalk. There is currently approximately four feet of separation between the curb and sidewalk along the roadways throughout the site, and no separation provided between the curb and sidewalk in the island in the northern parking area, thereby not satisfying the ordinance requirement. The plans should be revised to show a minimum of five feet between the curb and sidewalk along the roadways throughout the site and in the island in the northern parking area, or a waiver must be requested from this ordinance requirement with a detailed explanation of why it cannot be provided per ordinance.

31. According to **Section 130-17.B(2)** of the **Subdivision and Land Development Ordinance**, driveways shall be located no less than 40 feet from a street intersection. The plans currently show less than 40 feet between the intersections in the northern and southern parking areas and the driveways for the individual townhouses along the internal roads in the vicinity of these intersections. The plans should be revised to show a minimum of 40 feet between the driveways and intersections in the northern and southern parking areas, or waiver must be requested from this ordinance requirement.

32. The curb radii should be labeled on the plans at the proposed driveway intersections with North Trooper Road (S.R. 3002) and West Germantown Pike and be in accordance with **Section 130-17.B(3)** of the **Subdivision and Land Development Ordinance**. *The applicant's traffic engineer indicates in its response*

that the curb radii at the West Germantown Pike and North Trooper Road (S.R. 3002) driveways are 35 feet and that they will be labeled on future plans.

33. The designer should ensure sufficient sight distance is provided for the proposed driveways along the internal road in accordance with **Section 130-17.B(1)** of the **Subdivision and Land Development Ordinance**. *The applicant's traffic engineer indicates in its response that sight distance requirements for individual driveways along an internal road are not required in Section 130-17 and it will discuss this with the Township Traffic Engineer.* Since this ordinance section pertains to driveway intersections with streets, the sight distance for the individual driveways along the internal road should be provided.
34. According to **Section 130-17.D(2)** of the **Subdivision and Land Development Ordinance**, at no time shall angle or perpendicular parking along the curbs of local, public, or private access roads or streets be permitted. All parking other than parallel parking shall be physically separated from the cartway by a minimum of seven feet and confined to barrier parking. The plans do not show any separation between the perpendicular parking and the cartway in the parking areas on the northern and southern ends of the site, thereby not satisfying the ordinance requirement. The plans should be revised to show a minimum of seven feet of separation between the perpendicular parking and cartways in these parking areas, or a waiver must be requested from this ordinance requirement.
35. Horizontal curvature information should be provided on the plans for the internal roadway and be in accordance with **Section 130-16.B(2)** of the **Subdivision and Land Development Ordinance**.
36. The proposed profiles should be revised to include the points of intersecting streets and be in accordance with **Section 130-16.E.7** of the **Subdivision and Land Development Ordinance**.
37. The proposed profiles on Sheets 20-22 should be updated to provide the proposed elevations on the bottom informational band.
38. The proposed crosswalk areas must be shown on the proposed profiles and have ADA compliant slopes.
39. Detailed ADA designs and CS-4401 forms must be submitted for review for all ADA ramps located within the Township right-of-way, along with any necessary TIF forms, for municipal concurrence. Crosswalks across the accesses should be designed to cross in front of the stop bar.
40. The required and available sight distances must be provided and labeled on the plans for the intersections of the proposed roadway and North Trooper Road (SR 3002) and West Germantown Pike.
41. The designer must evaluate the proposed pipe connection with existing inlet T1, as well as proposed Inlet A11. Based on the information provided, it does not appear that either inlet is constructible.
42. The designer should clarify where the detail for concrete curb on Sheet 23 of the plan set will be used.
43. The design ESALS for the proposed PennDOT pavement legend provided on Sheet 24 of the plan set should be verified.
44. The designer should consider placing the proposed sidewalk closer to the ultimate right-of-way line in order to better accommodate the future ultimate widening of West Germantown Pike.

45. Parking along the edges of both sides of the internal roadway based on the site design, road widths, and location of driveways will need to be prohibited by adequate signing. The Township Engineer and Fire Marshal may also comment on this design. *The applicant's traffic engineer indicates in its response that "No Parking" signs will be added to the plan in future submissions.*
46. Turning templates must be provided demonstrating the ability of trash trucks and the largest expected delivery vehicle/moving trucks to maneuver into and out of the full-movement driveway along North Trooper Road (S.R. 3002), as well as entirely through the site's private street system.

The applicant's traffic engineer indicates in its response that these turning templates have been provided in this submission, however, we are unable to locate them in the submission.

47. The Township Fire Marshal should review the emergency vehicle turning templates for accessibility and circulation needs of emergency apparatus. Ensure that any correspondence, including any review comments and/or approvals, is included in subsequent submissions. *The applicant's traffic engineer indicates in its response that no correspondence from the Fire Marshal has been received to date and any correspondence will be included in future submissions.*
48. All proposed signs should be clearly labeled on the plans in subsequent submissions. *The applicant's traffic engineer indicates in its response that all proposed signs have been labeled on the plans, however, several signs throughout the proposed development are not clearly labeled on the plans.*
49. We recommend that the proposed Knox Box gate should likely be moved closer to the southern side of the emergency-only access along West Germantown Pike just inside the ultimate right-of-way line so that vehicles from West Germantown Pike see it and do not improperly use it to access the site. In addition, both ends of the emergency-only access should be signed to clearly indicate it is for emergency use only with special "Do Not Enter" signs for emergency vehicles only. If this is going to remain an emergency-only access, the County can weigh in on the provision of smaller radii or perhaps a depressed curb driveway, so it is less likely to be mistaken for an access roadway to/from the property for everyday vehicles to use. The pavement section between the curblines and internal roadway should also be discussed and potentially be designed with pavers capable of carrying an emergency vehicle.

The applicant's traffic engineer indicates in its response that the location of the Knox Box gate currently shown on the plans was chosen to allow emergency vehicles to pull off of West Germantown Pike to unlock the gate and that its ultimate location will be discussed with the Fire Marshal. The Fire Marshal should comment on this.

50. A total of 24 guest parking spaces (12 at each end of the development) are proposed. With the provision of narrower roads and parking to be prohibited except in driveways (approximately 20' to 22' deep and 20' wide, allowing up to two driveway cars not in garage) and in the guest parking spaces, the adequacy of parking should be evaluated and provided by the applicant and their team. Depending on the demographic of residents to live in this community, holiday and special gatherings may require more overflow parking than available in this community, and the roadways and site layout are not designed to allow for on-street parking and two-way travel for other vehicles to circulate. No parking is to be provided along West Germantown Pike or North Trooper Road (S.R. 3002).

The applicant's traffic engineer indicates in its response that the proposed number of guest parking spaces complies with Township requirements and that additional guest parking spaces can be added if determined to be necessary. Since the Township Ordinance does not specify any requirements for guest space

parking, we **recommend** that the applicant try to provide as many guest parking spaces as possible throughout the site to accommodate for the potential for additional overflow parking needs throughout the development.

51. Retaining wall design documents, including reports and specifications, must be submitted to the Township Engineer for review and concurrence. *The applicant's traffic engineer indicates in its response that the retaining wall design documents will be submitted to the Township under separate cover.*

We trust that this review letter responds to your request. If you or the Township have any questions, or require clarification, please contact me, Michelle Eve, P.E., or Brian Jones, PTP, TOPS.

Sincerely,



Casey A. Moore, P.E
EVP/Regional Manager - Transportation

BMJ/MEE/CAM

cc: John Evarts, P.E., CKS Engineers (Township Engineer)
Wendy Feiss McKenna, Esq. (Township Solicitor)
Scott Burton, PennDOT
Paul Lutz, PennDOT
Andy Parker, McCormick Taylor (PennDOT and Montgomery County Review Consultant)
Robert Hart, East Norriton Township Manager
Michael Maier, Westrum Development Company (Applicant)
Barry Stingel, PLA, T&M Associates (Applicant's Architect)
Chris Jensen, P.E., T&M Associates (Applicant's Engineer)
Dave Horner, P.E., PTOE, Horner & Canter Associates (Applicant's Traffic Engineer)

Bowman

June 18, 2024

Mr. John J. Finnigan Jr.
Interim Township Manager
Worcester Township
1721 Valley Forge Road
P.O. Box 767
Worcester, PA 19490

Attention: Christian R. Jones, Assistant Township Manager
Mr. Robert D'Hulster, Public Works Director

RE: **Traffic Review #2 – Revised Sketch Plan**
1035 North Trooper Road (S.R. 3002) – 45 proposed townhouse units
Worcester Township, Montgomery County, PA
Project No. 314086-01-001

Dear Jay:

In response to the Township's request, Bowman Consulting Group (Bowman) has completed our second (2nd) traffic engineering review, which entailed the review of a revised Sketch Plan associated with the proposed development to be located at 1035 North Trooper Road (S.R. 3002) in Worcester Township, Montgomery County, PA. According to the updated sketch plan materials resubmitted to our office, the development is now proposed to consist of 45 townhouse units with access being provided via one full-movement access/local road to North Trooper Road (S.R. 3002), as well as an emergency-only access to/from West Germantown Pike with a gating system proposed to be provided for first responders to access the community but not others. The existing single-family home and garage will remain on the northern end of the site and will be subdivided on its own lot (lot 1).

The following documents were reviewed in preparation of our comments:

- Sketch Plan – Trooper Ridge, prepared by T & M Associates, Inc., last revised May 22, 2024.
- Response to Comments Letter – 1035 Trooper Road, prepared by T & M Associates, Inc., dated May 22, 2024.

Based on our review of the documents listed above, Bowman offers the following comments for consideration by the Township and action by the applicant should the sketch plan continue to move forward for a submission for land development:

General

1. Based on information provided in Land Use Code 215 (Single-Family Attached Housing) in the Institute of Transportation Engineers publication, *Trip Generation, 11th Edition*, the proposed 45 townhouse units are expected to generate approximately 22 "new" trips during the weekday morning peak hour and approximately 26 "new" trips during the weekday afternoon peak hour, based on trip generation itself, a full transportation impact study (TIS) is not required for the

proposed development. However, due to the site's location along the highly-trafficked roads of North Trooper Road (S.R. 3002) and West Germantown Pike, as well as located adjacent to the intersection of North Trooper Road (S.R. 3002) and West Germantown Pike which currently experiences congestion during the weekday commuter peak periods, the applicant should submit a transportation impact assessment (TIA) for the proposed development.

The applicant's engineer has indicated in its response that a scoping meeting will be scheduled and a TIA will be prepared and submitted to reviewing agencies.

At a minimum, our office continues to recommend that the TIS scoping meeting application should include the following, but may not be limited to upon official agency scoping:

- Analysis of the weekday morning and weekday afternoon commuter peak hours for existing traffic conditions, as well as opening-year conditions, both without and with the proposed development, at the intersections of North Trooper Road (S.R. 3002)/West Germantown Pike, Park Avenue (S.R. 0363)/West Germantown Pike, Trooper Road, and Woodlyn Road/Woodland Road, as well as the proposed site access. *(Note: The proposed City View apartments by BET Investments at the SE quadrant of West Germantown Pike and Park Avenue (S.R. 0363) will be providing some intersection/signal improvements that should be captured in the traffic evaluations for the subject Westrum site.)*
 - Mitigation improvements, as applicable, to address levels-of-service and queuing issues, as well as degradation must be provided as recommendations in the traffic study and how they will be addressed by the applicant.
 - As discussed at an April 1, 2024 field meeting with County representatives and members of the PC, the applicant's engineers should evaluate roadway alignment improvements for the North Trooper Road (S.R. 3002) approaches to West Germantown Pike with their site design and project. This may involve an adjustment of the section of North Trooper Road (S.R. 3002) adjacent to the applicant's site as well as intersection enhancements.
 - The full-movement driveway along North Trooper Road (S.R. 3002) could be impacted by queuing beyond the access location, as well as sight distance limitations or obstructions that may be caused by queued vehicles, and if so left-turn egress restrictions would be placed upon it. To confirm if such restrictions are prudent, a gap study should be conducted at the proposed driveway location along North Trooper Road (S.R. 3002).
 - Provide sight distance analysis at the driveway along North Trooper Road (S.R. 3002).
 - Conduct left-turn and right-turn auxiliary lane warrant analysis at the proposed driveway along North Trooper Road (S.R. 3002).
 - Provide a crash analysis at the study intersections, as well as along the North Trooper Road (S.R. 3002) and West Germantown Pike site frontages.
 - The applicant must include the electronic Synchro files with the TIA submission for review.
 - Additional comments on the scope will follow upon receipt of the formal TIA scoping application to PennDOT, Montgomery County, and Worcester Township.
2. The applicant and their team should contact Montgomery County for additional information on the *West Germantown Pike Corridor Study* completed for Montgomery County in the early 2000's and the *Montco Pikes Study*, as well as Worcester and East Norriton Townships for access to their current Act 209 Roadway Sufficiency Analyses and Capital Improvement Programs.

The applicant's engineer has indicated in its response that the information will be obtained from Montgomery County.

3. According to the Township's Roadway Sufficiency Analysis, the proposed development is located in Transportation Service Area South, which has a corresponding impact fee of \$3,125 per "new" weekday afternoon peak hour trip and the applicant will be required to pay a Transportation Impact Fee in accordance with the Township's Transportation Impact Fee Ordinance. If the information provided in Land Use Code 215 (Single-Family Attached Housing) in the Institute of Transportation Engineers publication, *Trip Generation, 11th Edition* for proposed 45 townhouse units is the proper land use description for this development, then with the sketch plan it is preliminarily expected the site would generate 26 "new" trips during the weekday afternoon peak hour resulting in a **transportation impact fee of \$81,250.**

The applicant's engineer has acknowledged this comment in its response.

4. A Highway Occupancy Permit (HOP) is required for this project from **both** PennDOT and Montgomery County for the proposed site accesses and work that may be completed within the legal right of way on North Trooper Road and West Germantown Pike since North Trooper Road (S.R. 3002) is a State Roadway and West Germantown Pike is a County Roadway. Furthermore, since the site and/or the intersections in the study border the adjacent municipality of East Norriton Township, and the site adjacent traffic signal at the intersection of West Germantown Pike and North Trooper Road (S.R. 3002) is owned and maintained by East Norriton Township, any roadway/signal improvements extending into that jurisdiction will require the review and approval of that municipality, as well. The Township and our office must be copied on all TIA and HOP submissions, as well as correspondence between the applicant, PennDOT, and Montgomery County, and invited to any and all meetings among these parties. **If it would be beneficial to all parties involved with this application, the applicant and their team may desire to schedule a (virtual) technical meeting with Worcester Township, PennDOT, and Montgomery County representatives to go over the project since all three will be involved with permitting for this project. Upon determination of study area roadway and signal improvements that will be required for the mitigation and development of the subject site, it may be beneficial and/or necessary to include East Norriton Township in future discussions.**

The applicant's engineer has acknowledged this comment in its response.

5. A more detailed review of the site and all transportation-related engineering elements on the plan will be conducted, as the Township deems necessary, if and as the application advances into and through the land development process at the Township. Additional comments may be raised at that point, as well as how the comments herein are satisfied.
6. Upon resubmission, our office will evaluate the information in concert with PennDOT and Montgomery County and will provide additional reviews of engineering and supplemental submission details as we receive them.

7. A response letter **must be provided** with the resubmission detailing how each comment below has been addressed, and where each can be found in the resubmission materials (i.e., page number(s)) to assist in the re-review process.

Sketch Plan

The applicant's engineer has indicated in its response that it has acknowledged the following comments, and this information will be provided on future land development plan submissions in accordance with Township requirements. Therefore, we continue to offer the following comments pertaining to the revised sketch plan provided in this submission that must be addressed by the applicant as the project advances through the Township land development process.

8. The cartway widths along the North Trooper Road (S.R. 3002) and West Germantown Pike site frontages should be clearly labeled on the plan and be in accordance with **Section 130-16.C** of the **Subdivision and Land Development Ordinance**. Frontage widening improvements will be required to satisfy right-of-way and cartway requirements for the classification of the roadway, as well as the provision of curbing and sidewalk unless waivers are requested and granted by the Township.
9. A note must be added to the plan stating that the area between legal right-of-way line and ultimate right-of-way line along North Trooper Road (S.R. 3002) and West Germantown Pike should be offered for dedication to the authority having jurisdiction over the road as required by **Section 130-16.C(2)(c)** of the **Subdivision and Land Development Ordinance**.
10. Adequate sight distance measurements will need to be provided on the land development plans for the proposed driveways along North Trooper Road (S.R. 3002) and West Germantown Pike as required by **Section 130-16.E(5)** of the **Subdivision and Land Development Ordinance**, and to satisfy PennDOT and Montgomery County highway occupancy permits.
11. According to **Section 130-18.A** of the **Subdivision and Land Development Ordinance**, sidewalk should be provided along the site frontages of North Trooper Road (S.R. 3002) and West Germantown Pike. The plan currently does not show any sidewalk along the North Trooper Road (S.R. 3002) and West Germantown Pike site frontages, thereby not satisfying the ordinance requirement. However, the applicant is currently proposing a multi-purpose trail around the perimeter of the townhouse units internal to the site that sits 60 feet or more from the edge of either road abutting the site. In addition, we also note to the Township at this time that no sidewalk currently exists along either side of North Trooper Road (S.R. 3002) and West Germantown Pike in the vicinity of the site.

The applicant's engineer indicates in its response that the trail and sidewalks for the development will be discussed with the Planning Commission to determine what the Township's needs are in this regard. While we continue to recommend the provision of sidewalk and/or a multi-purpose trail on the plan. Adequate connectivity of the trail system to the signalized intersection of West Germantown Pike/North Trooper Road (S.R. 3002) and provision of ADA ramps and a crosswalk across North Trooper Road (S.R. 3002) from the site to the Norriton Presbyterian Cemetery at a minimum should be incorporated. Furthermore, provisions should be made in the design to be constructed with the development or escrow held for future construction of pedestrian connectivity along both roads

fronting the property. The Board of Supervisors may consider deferring this obligation that is required of the applicant until such a time as may be required by the PennDOT, Montgomery County, or the Township for this property, whether under present or future land ownership, and at no cost to Worcester Township, or may desire to consider a fee in lieu of sidewalk to be kept in escrow for future sidewalk installations in the Township and/or area of these properties.

12. According to **Section 130-18.B** of the **Subdivision and Land Development Ordinance**, curbing should be provided along the site frontages of North Trooper Road (S.R. 3002) and West Germantown Pike. The plan currently does not show any curbing along the North Trooper Road (S.R. 3002) and West Germantown Pike site frontages, thereby not satisfying the ordinance requirement. We recommend that the plan be revised to show curbing along the entire site frontages of North Trooper Road (S.R. 3002) and West Germantown Pike, or a waiver must be requested from this ordinance section. We do note to the Township that there is currently no curbing along either side of North Trooper Road (S.R. 3002) and West Germantown Pike in the immediate vicinity of the site. Alternatively, the Board of Supervisors may also consider deferring this obligation that is required of the applicant until such a time as may be required by the PennDOT, Montgomery County, or the Township for this property, whether under present or future land ownership, and at no cost to Worcester Township, or may desire to consider a fee in lieu of curb to be kept in escrow for future curb installations in the Township and/or area of these properties.
13. The curb radii should be labeled on the plan at the proposed driveway intersections with North Trooper Road (S.R. 3002) and West Germantown Pike and be in accordance with **Section 130-17.B(3)** of the **Subdivision and Land Development Ordinance**.
14. The designer should ensure sufficient sight distance is provided for the proposed driveways along the internal road in accordance with **Section 130-17** of the **Subdivision and Land Development Ordinance**.
15. Horizontal curvature information should be provided on the plans for the internal roadway and be in accordance with **Section 130-16.(2)** of the **Subdivision and Land Development Ordinance**.
16. Parking along the edges of both sides of the internal roadway based on the site design, road widths, and location of driveways will need to be prohibited by adequate signing. The Township Engineer and Fire Marshal may also comment on this design.
17. Turning templates must be provided demonstrating the ability for Township emergency vehicles, trash trucks, and the largest expected delivery vehicle/moving trucks to maneuver into and out of the full-movement driveway along North Trooper Road (S.R. 3002), as well as entirely through the site's private street system.
18. The Township Fire Marshal should review the emergency vehicle turning templates for accessibility and circulation needs of emergency apparatus. Ensure that any correspondence, including any review comments and/or approvals, is included in subsequent submissions.

19. The plan(s) must be signed and sealed by a Professional Engineer licensed to practice in the Commonwealth of Pennsylvania.
20. All proposed signs should be clearly labeled on the plan in subsequent submissions.

In addition, we offer the following additional comments pertaining to the revised sketch plan provided in this submission.

21. We recommend that the proposed Knox Box gate should likely be moved closer to the southern side of the emergency-only access along West Germantown Pike just inside the ultimate ROW line so that vehicles from West Germantown Pike see it and do not improperly use it to access the site. In addition, both ends of the emergency-only access should be signed to clearly indicate it is for emergency use only with special "Do Not Enter" signs for emergency vehicles only. If this is going to remain an emergency-only access, the County can weigh in on the provision of smaller radii or perhaps a depressed curb driveway so it is less likely to be mistaken for an access roadway to/from the property for every day vehicles to use.
22. A total of 24 guest parking spaces (12 at each end of the development) are proposed. With the provision of narrower roads and parking to be prohibited except in driveways (approximately 20' to 22' deep and 20' wide, allowing up to two driveway cars not in garage) and in the guest parking spaces, the adequacy of parking should be evaluated and provided by the applicant and their team. Depending on the demographic of residents to live in this community, holiday and special gatherings may require more overflow parking than available in this community, and the roadways and site layout are not designed to allow for on-street parking and two-way travel for other vehicles to circulate. No parking is to be provided along West Germantown Pike or North Trooper Road (S.R. 3002).
23. The parking space dimensions for the guest parking spaces should be labeled on the plan and be in accordance with **Section 130-17.D(11)** of the **Subdivision and Land Development Ordinance**.
24. What appears to be a sidewalk connection at the northwestern most part of the sketch plan along West Germantown Pike should be better clarified and graded appropriately for ADA as it shows an open terminus inside the ultimate right of way.
25. Retaining wall design documents, including reports and specifications, must be submitted to the Township Engineer for review and concurrence.

We trust that this review letter responds to your request. If you or the Township have any questions, or require clarification, please contact me, Michelle Eve, P.E., or Brian Jones, PTP, TOPS.

Sincerely,



Casey A. Moore, P.E.
EVP/Regional Manager - Transportation

BMJ/MEE/CAM

cc: John Evarts, P.E., CKS Engineers (Township Engineer)
Wendy Feiss McKenna, Esq. (Township Solicitor)
Scott Burton, PennDOT
Paul Lutz, PennDOT
Andy Parker, McCormick Taylor (PennDOT and Montgomery County Review Consultant)
Susan M. Guisinger-Colon, P.E., LEED AP (Montgomery County consultant)
Robert Hart, East Norriton Township Manager
Michael Maier, Westrum Development Company (Applicant)
Barry Stingel, PLA, T&M Associates (Applicant's Architect)

Q:\PA-FTWA-MC\MCM\eng\WORCETO1\314086-01-001 - 1035 Trooper Road\Submissions\2024-05-23 Sketch Plan\Review\2024-06-18 Review Letter #2 - 1035 North Trooper Road (finalized).docx



**TRANSPORTATION IMPACT STUDY (TIS)
DETERMINATION & SCOPING MEETING
APPLICATION**

Scoping Meeting Application: [Returned to Applicant](#)

Scoping Meeting Date: _____ Scoping Number: S0620240059

Tax Parcel Number: 67-00-01540-004

Project/Development Name: Trooper Ridge

Applicant Information:

Business Partner ID: _____

Applicant Name: Bristol Ridge Associates LLC

Phone: 215-620-5610 Email 1: maier@westrum.com

Primary Contact: Michael Maier Email 2: _____

Additional Engineering Firm Information:

Business Partner ID: _____

Engineering Firm: _____

Phone: _____ Email 1: _____

Primary Contact: _____ Email 2: _____

Creator Information:

Business Partner ID: 004633 Firm Name: Horner & Canter Associates, P.C.

Phone: 609-654-4104 Email 1: hkeene@horner-canter.com

(1) LOCATION OF PROPOSED DEVELOPMENT:

PennDOT Engineering District: 06 Email: _____

County: Montgomery Email: _____

Municipality: WORCESTER Email: tryan@worcestertwp.com;
worcestertwptrafficengineer@mcmahonassociates.com

NO.	SR	Segment	Offset	Average Daily Trips	Driveway Classification	Local Road
1	3002	0040	0700	383	Low Volume	No

Are there any vehicle weight or size restrictions along the SR in accordance with 75 PA C.S. ss 4902? : No

(2) DESCRIPTION OF PROPOSED DEVELOPMENT (Attach site plan if available):

Proposed site access:

Full access driveway to Trooper Road (SR 3002) approximately 700 feet north of Germantown Pike. Also right-in/right-out access proposed to Germantown Pike, a County Road.

Proposed land uses:

48 townhomes

Community linkages (access to neighboring properties, cross easements, pedestrian and transit accommodations):

n/a

(3) DEVELOPMENT SCHEDULE AND STAGING:

Anticipated Opening Date: 06-01-2026

Full Buildout Date: 06-01-2028

Describe Proposed Development Schedule/Staging:

No development phasing is anticipated

(4) TRIP GENERATION:

Land Use & Size	Land Use Code	Were ITE results used?	Daily Trips	AM Peak Hour		PM Peak Hour		Saturday Peak Hour	
				Enter	Exit	Enter	Exit	Enter	Exit
Townshoues / 48 DU	220	Yes	383	9	29	26	15	10	10
		TOTAL:	383	9	29	26	15	10	10

(5) TRANSPORTATION IMPACT STUDY REQUIRED?

Transportation Impact Study Required? No

If Yes, based on:

Other considerations as described below:

(6) TRANSPORTATION IMPACT ASSESSMENT REQUIRED?

Transportation Impact Assessment Required? Yes

(7) STUDY AREA:

Roadway and Study Intersections:

Trooper Road (SR 3002)/Germantown Pike

Land use context (Refer to PennDOT Design Manual, Part 1X, Appendix B):

Suburban Neighborhood

Known Congestion Areas:

n/a

Known Safety Concerns:

n/a

Known Environmental Constraints:

n/a

Pedestrian/Bike Review (Community Centers, Parks, Schools, etc.):

n/a

Transit Review (Current routes/stops):

n/a

(8) STUDY AREA TYPE:

Study Area Type: Rural _____

(9) TIS ANALYSIS PERIODS AND TIMES:

Analysis period and times notes:

Existing Conditions, Build Out Year Without Development, Build Out Year With Development; Weekday AM Peak Hour and Weekday PM Peak Hour

(10) TRAFFIC ADJUSTMENT FACTORS:

(a) Seasonal Adjustment (Identify counts requiring adjustment and methodology):

n/a

(b) Annual Base Traffic Growth: 0.75% _____ %/yr. **Source:** PennDOT Growth Factor Report _____

(c) Pass-By Trips (Attach justification where required):

NO.	Land Use	%	Source
1	Residential	0%	ITE

(d) Captured Trips for Multi-Use Sites:

n/a

(e) Modal Split Reductions:

n/a

(f) Other Reductions:

n/a

(11) OTHER PROJECTS WITHIN STUDY AREA TO BE ADDED TO BASE TRAFFIC:

Notes:

To be confirmed with the municipality

(12) TRIP DISTRIBUTION AND ASSIGNMENT:

Trip Distribution Notes:

To be determined once counts are completed

(13) APPROVAL OF DATA COLLECTION ELEMENTS AND METHODOLOGIES:

NO.	Location	Period	Type
1	Trooper Rd (SR 3002)/Germantown Pk	AM Peak, PM Peak	Turning Movement Counts

(14) CAPACITY/LOS ANALYSIS:

NO.	Location	Period	Type
1	Trooper Rd (SR 3002)/Germantown Pike	AM Peak, PM Peak	HCM 7th Edition

(15) ROADWAY IMPROVEMENTS/MODIFICATIONS BY OTHERS TO BE INCLUDED:

Roadway Improvements:

To be confirmed with the municipality

(16) OTHER NEEDED ANALYSES:

(a) Sight Distance Analysis:

Access Driveways Only

(b) Signal Warrant Analysis (Identify locations):

n/a

(c) Required Signal Phasing/Timing Modifications (Determine for all signalized intersections; specify methodology):

To be determined

(d) Traffic Signal Corridor/Network Analysis (Identify locations/methodology):

n/a

(e) Analysis of the Need for Turning Lanes (Identify locations/methodology):

Access Driveways Only, PennDOTs Turn Lane Warrant Methodology

(f) Turning Lane Lengths (Identify methodology to be used):

PennDOT's Turn Lane Warrant Methodology

(g) Left Turn Signal Phasing Analysis (Identify locations/methodology):

n/a

(h) Queuing Analysis (Identify locations/methodology):

Trooper Road (Sr 3002)/Germantown Pike

(i) Gap Studies (Identify locations/methodology):

Potentially at Trooper Road access location

(j) Crash Analysis (Identify locations):

n/a

(k) Weaving Analysis (Identify locations):

n/a

(l) Other Required Studies (Specify locations/methodology):

n/a

(17) ADDITIONAL COMMENTS OR RECOMMENDATIONS RELATIVE TO THE SCOPE OF THE TIS:

Additional Comments:

None

PennDOT Review Comments: (Current Cycle Comments)

- 1). The PennDOT project number for this scoping application review, S0620240059, must be referenced when the formal Highway Occupancy Permit (HOP) application is submitted.
- 2). This review is preliminary in nature. The Department reserves the right to make additional comments when the application includes the submission of detailed plans and stormwater calculations. If you have any questions pertaining to the technical aspects of this review, please contact Scott Bechard, AICP at scott.bechard@dawood.net or 855-432-9663.
- 3). Provide copies of correspondence indicating that the municipality is aware of the project and has had a chance to comment.
- 4). With respect to the formal permit application, please ensure that the following items are addressed:
 - a. Please be advised that pursuant to and in accordance with Title 67, Chapter 441.8(h)(2)(iv) of the code, the Safe Stopping Sight Distance is the absolute minimum acceptable sight distance for driveways. It is the designer's responsibility to ensure that this minimum requirement is satisfied.
 - b. It should be understood that in accordance with PennDOT Strike-Off Letter 470-10-03 and pursuant to

section 421 of the State Highway Law (36 P.S. ♦ 670-421) the installation of any drainage facilities within the Legal Right-of-Way may necessitate additional permitting requirements, including, but not limited to, a separate Highway Occupancy Permit from the Municipality for the future maintenance of the new drainage facilities. c. ADA compliance within the limits of work (along the access frontage at a minimum) must be evaluated in the TIS (i.e. new/modified facilities, impact to SEPTA bus stops, etc.). If driveway modifications are proposed, the existing curb ramps must be upgraded to be ADA compliant. At a minimum, the ramp adjacent to the curb replacement would need to be reconstructed. d. Consistent with current Department Policy, applicants for Highway Occupancy Permits must apply for an EPS Business Partner ID (BPID). The BPID is to be used in the establishment of a billing account for the invoicing of inspection costs. For information on obtaining a BPID, you may visit: <https://www.dot14.state.pa.us/EPS/home/manageBPRegistration.jsp>

- 5). Include the Engineering Firm information on the application.
- 6). Section 2 of the scoping form indicates RIRO access on Germantown Pike, but the updated site plan shows a gated emergency access. Please resolve this discrepancy.
- 7). Note section 4 of the scoping application indicates 48 residential units but the revised site plan shows 45. The assumption of 48 units is conservative and will be acceptable.
- 8). Add the full movement site access as a study intersection.
- 9). Identify the roadway typology per the latest edition of PennDOT Publication 13, Chapter 3.6.
- 10). Revise the study area type (scoping section 8) to urban per the Federal Functional Class map designations.
- 11). PennDOT♦s current Growth Factor Report (Growth Factors for September 2023 to July 2024) shows a growth factor of 0.21. Update the Annual Base Traffic Growth accordingly.
- 12). Please utilize Synchro 11 / HCM 6th Edition for this analysis. The most current version has not been fully adopted by the Department.
- 13). Please note 95th percentile queues must be reported in the Queueing Analysis referenced in scoping section 16(h). Queue analysis must also be provided at the full movement site access.
- 14). Address the following related to the revised site plan: ♦ Shift the sidewalk extension closer to the radius of the North Trooper Road (SR 3002) / Germantown Pike intersection. As proposed, pedestrians would be required to cross behind the stop bar opposite a stone wall. ♦ A TE-672 pedestrian study must be completed in conjunction with the TIS to identify pedestrian crossings and needs. ♦ Note that upgrades to pedestrian signal equipment will likely be required.
- 15). The applicant must convey Right-of-Way along the property frontage of SR 3002, North Trooper Road, to enable the Department to better align SR 3002 through the intersection of Germantown Pike in the future.
- 16). A condition statement must be provided with the Highway Occupancy Permit application to facilitate the future transfer the Highway Occupancy Permit from the applicant to Worcester Township, once the local road has been accepted by the municipality.

After review of the scoping meeting application, the Department will contact the applicant regarding the need for a scoping meeting prior to applying for a highway occupancy permit.

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APPENDIX B

Traffic Signal Plans

GENERAL NOTES

NO MODIFICATIONS OF THIS INSTALLATION ARE PERMITTED UNLESS APPROVED BY THE ENGINEER. APPROVAL IS GRANTED IN WRITING BY A REPRESENTATIVE OF THE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION.

ALL MAINTENANCE WORK INCLUDING THE REPAIR OF SIGNS IS THE RESPONSIBILITY OF THE PERMITTEE.

ALL SIGNS AND PLACEMENT MARKERS INDICATED ON THIS DRAWING ARE TO BE MAINTAINED AS PART OF THE PERMIT AND SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH PUBLICATION NO. 212.

POST MOUNTED SIGNALS SHALL BE INSTALLED WITH THE SIGNAL HEADS AT THE END OF THE ROAD. SUPPORT POLES FOR OVERHEAD SIGNALS SHALL ALSO HAVE A MINIMUM CLEARANCE HORIZONTALLY OF 2 FEET.

SIGNALS ERECTED OVER THE ROADWAY SHALL HAVE A MINIMUM VERTICAL CLEARANCE OF 16 FT. ABOVE THE ROADWAY. POST MOUNTED SIGNALS SHALL BE A MINIMUM OF 9 FT. ABOVE THE ROADWAY.

ALL OVERHEAD SIGNALS MUST BE RIGIDLY MOUNTED, TOP AND BOTTOM, AND EQUIPPED WITH BACKLAYS.

THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNALS MEASURED AT RIGHT ANGLES TO THE APPROACH SHALL BE 8 FEET.

EXACT LOCATION OF DETECTORS SHALL BE DETERMINED PRIOR TO INSTALLATION BY A REPRESENTATIVE OF PERIOD.

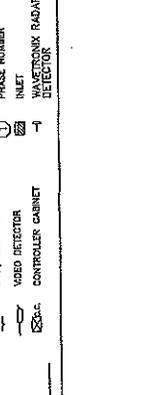
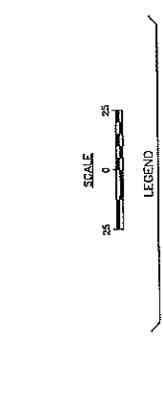
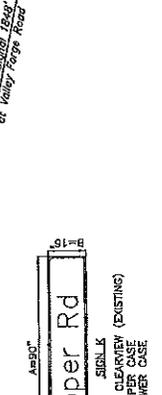
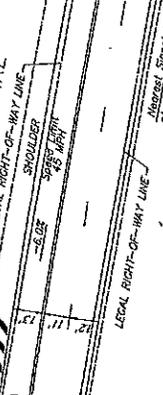
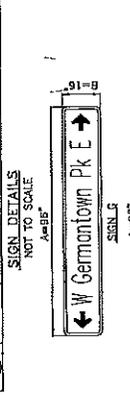
CHUBING TO BE INSTALLED BY MUNICIPALITY AND WHERE NOTED, SHALL BE PLAIN CONCRETE CURBS WITH 2" REINFORCING OF 1/2" DIAMETER UNLESS OTHERWISE NOTED.

PRIOR TO INSTALLATION THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY UTILITIES WHICH MAY BE CREATED DUE TO THE LOCATION OF THE SIGNALS.

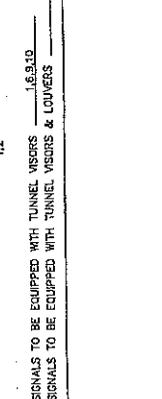
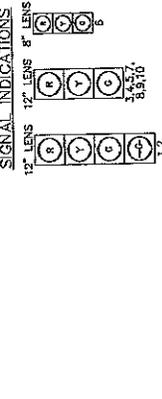
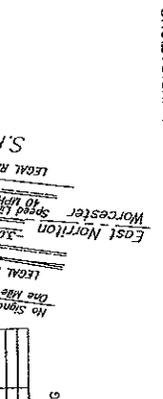
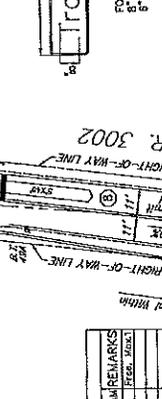
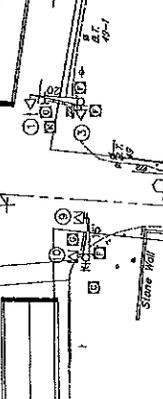
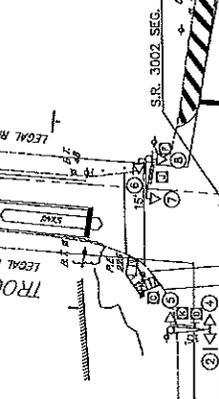
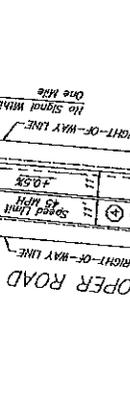
THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLETES WITH THE PROVISIONS OF THE LATEST EDITION TO THE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION UNIFORM SPECIFICATIONS FOR HIGHWAYS AND BRIDGES. THE PERMITTEE MUST SUBMIT TO THE DISTRICT ENGINEER, FOR REVIEW PRIOR TO BIDDING.

PERMITTEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR ANY CHANGES IN INTERSECTION GEOMETRY REQUIRING CONSTRUCTION INSTALLED IN BRUNNEN'S ROADWAY LESS THAN 10 FEET OR WIDENED UNDER THE ROADWAY. INSTALL IN ACCORDANCE WITH TRAFFIC SIGNAL STANDARDS TO-880 SERIES.

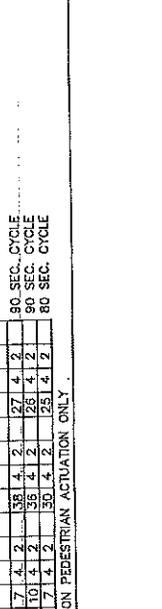
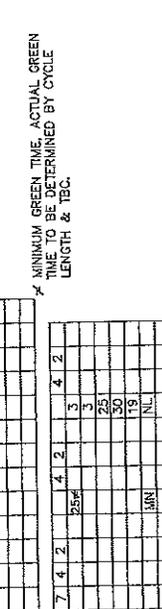
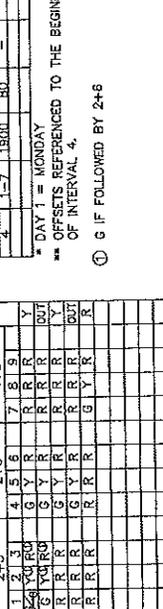
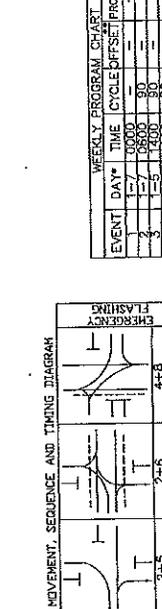
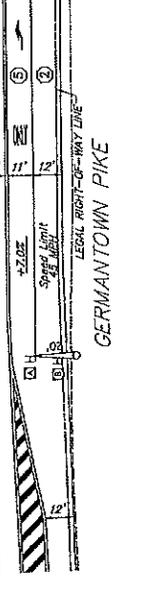
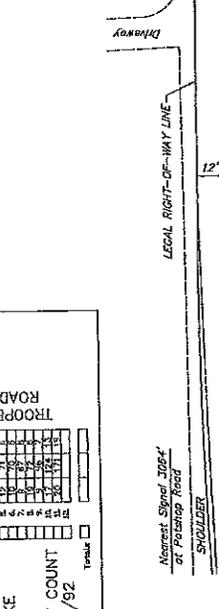
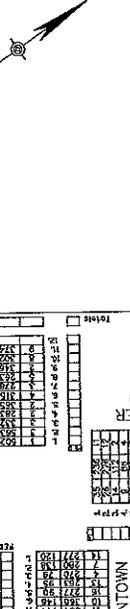
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1	R3-5	30X36	LEFT TURN
2	R3-5R	30X36	OPTIONAL RIGHT TURN
3	R3-5R	30X36	PUSH BUTTON FOR GREEN LIGHT
4	R10-4	30X36	NO TURN ON SHOULDER
5	R3-2	30X36	NO TURN ON SHOULDER
6	R3-2	30X36	NO PEDESTRIAN CROSSING
7	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
8	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
9	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)



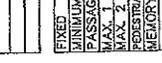
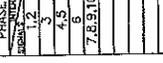
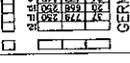
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10	R3-5	30X36	LEFT TURN
11	R3-5R	30X36	OPTIONAL RIGHT TURN
12	R3-5R	30X36	PUSH BUTTON FOR GREEN LIGHT
13	R10-4	30X36	NO TURN ON SHOULDER
14	R3-2	30X36	NO TURN ON SHOULDER
15	R3-2	30X36	NO PEDESTRIAN CROSSING
16	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
17	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
18	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)



PLAN SYMBOL	SERIES NUMBER	SIZE	REMARKS
19	R3-5	30X36	LEFT TURN
20	R3-5R	30X36	OPTIONAL RIGHT TURN
21	R3-5R	30X36	PUSH BUTTON FOR GREEN LIGHT
22	R10-4	30X36	NO TURN ON SHOULDER
23	R3-2	30X36	NO TURN ON SHOULDER
24	R3-2	30X36	NO PEDESTRIAN CROSSING
25	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
26	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
27	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)



PLAN SYMBOL	SERIES NUMBER	SIZE	REMARKS
28	R3-5	30X36	LEFT TURN
29	R3-5R	30X36	OPTIONAL RIGHT TURN
30	R3-5R	30X36	PUSH BUTTON FOR GREEN LIGHT
31	R10-4	30X36	NO TURN ON SHOULDER
32	R3-2	30X36	NO TURN ON SHOULDER
33	R3-2	30X36	NO PEDESTRIAN CROSSING
34	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
35	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
36	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)



PLAN SYMBOL	SERIES NUMBER	SIZE	REMARKS
37	R3-5	30X36	LEFT TURN
38	R3-5R	30X36	OPTIONAL RIGHT TURN
39	R3-5R	30X36	PUSH BUTTON FOR GREEN LIGHT
40	R10-4	30X36	NO TURN ON SHOULDER
41	R3-2	30X36	NO TURN ON SHOULDER
42	R3-2	30X36	NO PEDESTRIAN CROSSING
43	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
44	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
45	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)



PLAN SYMBOL	SERIES NUMBER	SIZE	REMARKS
46	R3-5	30X36	LEFT TURN
47	R3-5R	30X36	OPTIONAL RIGHT TURN
48	R3-5R	30X36	PUSH BUTTON FOR GREEN LIGHT
49	R10-4	30X36	NO TURN ON SHOULDER
50	R3-2	30X36	NO TURN ON SHOULDER
51	R3-2	30X36	NO PEDESTRIAN CROSSING
52	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
53	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
54	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)

PLAN SYMBOL	SERIES NUMBER	SIZE	REMARKS
55	R3-5	30X36	LEFT TURN
56	R3-5R	30X36	OPTIONAL RIGHT TURN
57	R3-5R	30X36	PUSH BUTTON FOR GREEN LIGHT
58	R10-4	30X36	NO TURN ON SHOULDER
59	R3-2	30X36	NO TURN ON SHOULDER
60	R3-2	30X36	NO PEDESTRIAN CROSSING
61	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
62	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
63	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)

PLAN SYMBOL	SERIES NUMBER	SIZE	REMARKS
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65	R3-5R	30X36	OPTIONAL RIGHT TURN
66	R3-5R	30X36	PUSH BUTTON FOR GREEN LIGHT
67	R10-4	30X36	NO TURN ON SHOULDER
68	R3-2	30X36	NO TURN ON SHOULDER
69	R3-2	30X36	NO PEDESTRIAN CROSSING
70	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
71	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
72	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)

PLAN SYMBOL	SERIES NUMBER	SIZE	REMARKS
73	R3-5	30X36	LEFT TURN
74	R3-5R	30X36	OPTIONAL RIGHT TURN
75	R3-5R	30X36	PUSH BUTTON FOR GREEN LIGHT
76	R10-4	30X36	NO TURN ON SHOULDER
77	R3-2	30X36	NO TURN ON SHOULDER
78	R3-2	30X36	NO PEDESTRIAN CROSSING
79	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
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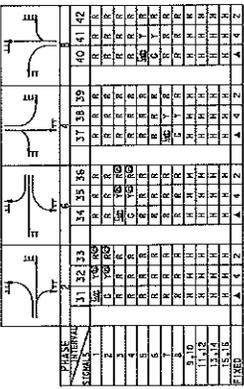
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85	R10-4	30X36	NO TURN ON SHOULDER
86	R3-2	30X36	NO TURN ON SHOULDER
87	R3-2	30X36	NO PEDESTRIAN CROSSING
88	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
89	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
90	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)

PLAN SYMBOL	SERIES NUMBER	SIZE	REMARKS
91	R3-5	30X36	LEFT TURN
92	R3-5R	30X36	OPTIONAL RIGHT TURN
93	R3-5R	30X36	PUSH BUTTON FOR GREEN LIGHT
94	R10-4	30X36	NO TURN ON SHOULDER
95	R3-2	30X36	NO TURN ON SHOULDER
96	R3-2	30X36	NO PEDESTRIAN CROSSING
97	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
98	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
99	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)

PLAN SYMBOL	SERIES NUMBER	SIZE	REMARKS
100	R3-5	30X36	LEFT TURN
101	R3-5R	30X36	OPTIONAL RIGHT TURN
102	R3-5R	30X36	PUSH BUTTON FOR GREEN LIGHT
103	R10-4	30X36	NO TURN ON SHOULDER
104	R3-2	30X36	NO TURN ON SHOULDER
105	R3-2	30X36	NO PEDESTRIAN CROSSING
106	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
107	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
108	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)

PLAN SYMBOL	SERIES NUMBER	SIZE	REMARKS
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110	R3-5R	30X36	OPTIONAL RIGHT TURN
111	R3-5R	30X36	PUSH BUTTON FOR GREEN LIGHT
112	R10-4	30X36	NO TURN ON SHOULDER
113	R3-2	30X36	NO TURN ON SHOULDER
114	R3-2	30X36	NO PEDESTRIAN CROSSING
115	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
116	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)
117	D3-4	30X18	OVERHEAD STREET NAME SIGN (SEE DETAIL)

EMERGENCY PRE-EMPTION PHASING
MOVEMENT SEQUENCE AND TIMING DIAGRAM



EMERGENCY PRE-EMPTION NOTES:

- APPROACH OF PARK AVENUE AND THE WESTBOUND APPROACH OF VALLEY FORGE ROAD (SR 0363), AND THE EASTBOUND AND WESTBOUND APPROACHES OF GERMANTOWN PIKE AND VALLEY FORGE ROAD SHALL BE FLASHING YELLOW AND RED LIGHTS AND THIS EMERGENCY BEACON SIGNALS SHALL BE FLASHING YELLOW LIGHT AND RED LIGHT WHEN THE EMERGENCY VEHICLE HAS CONTROL OF THE INTERSECTION FOR THE APPROPRIATE APPROACH.
- ALL GREEN INDICATORS (INCL. EMT) SHALL BE FLASHING YELLOW.
- RED CLEARANCE INTERVALS SHALL BE FOLLOWED BY THE COMPLETE YELLOW AND RED CLEARANCE INTERVALS. ACCORDINGLY, THEN THE GREEN INTERVAL FOR THE APPROACHING EMERGENCY VEHICLE.
- IF THE SIGNALS WHEN ACTIVATED BY EMERGENCY VEHICLE SHALL TIME OUT OF THE PRE-EMPTION PHASE GOVERNED BY THE APPROACHING EMERGENCY VEHICLE.
- IF THE SIGNAL HAS BEEN ACTIVATED BY A PEDESTRIAN PUSH BUTTON AND THE SIGNAL IS PRE-EMPTED DURING THE "WALK" INTERVAL, THE WALK INTERVAL SHALL BE EXTENDED TO THE NEXT GREEN INTERVAL.
- IF THE SIGNALS WHEN ACTIVATED BY THE APPROPRIATE SELECTIVE CLEARANCES BEFORE PROCEEDING TO THE PRE-EMPTION PHASE.
- IF THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, ARE FLASHING YELLOW, THE SIGNALS SHALL REMAIN FLASHING YELLOW UNTIL THE EMERGENCY VEHICLE HAS DEPARTED THE INTERSECTION.
- THE ORIGINAL PRE-EMPTION PHASE SHALL TIME OUT BEFORE PROCEEDING TO THE NEXT PRE-EMPTION PHASE.
- UPON COMPLETION OF PRE-EMPTION PHASE 2, 4, 6 OR 8 IN RETURNING TO NORMAL OPERATION, PHASE 2+6 INTERVAL 12 SHALL FOLLOW.
- PRE-EMPTION SHALL BE IN EFFECT FOR FIRST GREEN OF OPERATION.
- LOCATION OF EMERGENCY VEHICLE DETECTORS ARE TO BE FIELD ADJUSTED TO ACHIEVE MAXIMUM OPERATION.

PRE-EMPTION NOTES

- IF PRE-EMPTION EQUIPMENT HAS ENCODING CAPABILITY PER VEHICLE IDENTIFICATION, SIGNALS TO NORMAL OPERATION SHALL BE FLASHING YELLOW AND RED LIGHTS TO GIVE UNDOUBTED EMITTERS THE ABILITY TO ACTIVATE THE EMERGENCY PRE-EMPTION.

TABULATION OF QUANTITIES

ITEM NO./QUANTITY	DESCRIPTION
0952-3000 1	EACH CONTROLLER MODIFICATION, RETIMING
0955-3122 8	EACH LED COUNTERDOWN PEDESTRIAN SIGNAL HEAD, TYPE A
0955-0500 8	EACH PEDESTRIAN SUBBUTTON*

CONSTRUCTION NOTES

- * INCLUDES NEW RFD-3E SIGN
- INSTALL PEDESTRIAN SIGNAL HEADS AND PUSHBUTTONS
- INSTALL COUNTERDOWN PEDESTRIAN SIGNAL HEADS 49-16.
- INSTALL NEW PUSHBUTTONS AND STONS
- RE-USE EXISTING WIRING, SIGNAL HEAD WIRING, AND UPDATE PEDESTRIAN TIMINGS IN CONTROLLER.

GENERAL NOTES

NO MODIFICATIONS TO THIS INSTALLATION ARE PERMITTED UNLESS THE APPROVAL IS OBTAINED IN WRITING BY A REPRESENTATIVE OF THE DEPARTMENT OF TRANSPORTATION.

ALL MAINTENANCE WORK INCLUDING TRIMMING OF TREES, AND THE REPAIR OF ANY DAMAGE TO THE SIGNALS IS THE RESPONSIBILITY OF THE PERMITTEE.

ALL SIGNALS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING ARE TO BE MAINTAINED AND KEPT IN GOOD ORDER THROUGHOUT THE PERIOD OF THE PERMIT AND SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH PUBLICATION NO. 212.

POST MOUNTED SIGNALS SHALL BE INSTALLED WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET ABOVE THE FACE OF CURB OR THE FACE OF THE ROADWAY. SIGNALS SHALL BE INSTALLED WITH A MINIMUM CLEARANCE HORIZONTALLY OF 2 FEET, VERTICALLY OF 8 FT. ABOVE THE ROADWAY. POST MOUNTED SIGNALS SHALL BE A MINIMUM OF 8 FT. ABOVE THE ROADWAY OR PAVEMENT.

ALL SIGNALS SHALL BE PROPERLY MOUNTED, TOP AND BOTTOM, AND EQUIPPED WITH BALCOUPLES.

THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNALS MEASURED AT RIGHT ANGLES TO THE APPROACH SHALL BE 8 FEET.

EXACT LOCATION OF DETECTORS SHALL BE DETERMINED PRIOR TO INSTALLATION BY A REPRESENTATIVE OF PERMITTEE.

CURBS TO BE INSTALLED BY MUNICIPALITY AND WHERE NOTED, SHALL BE PLANT CEMENT CONCRETE CURB OR GRANITE CURB, SHALL BE IN ACCORDANCE WITH DEPARTMENT SPECIFICATIONS FROM ADR.

PRIOR TO INSTALLATION THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

THE DRAWING SHOWN BE USED AS A CONSTRUCTION DRAWING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING THE LATEST AMENDMENT TO ACT 387, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES, DATED DECEMBER 26, 1974.

WHEN LIQUID BLENDED MORTAR IS USED, SIGNAL INSTALLATION MUST BE IN ACCORDANCE WITH DEPARTMENT SPECIFICATIONS.

PERMITTEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR ANY CHANGES IN INTERSECTION GEOMETRY REGARDING EXCAVATION, CONDUIT INSTALLED IN BITUMINOUS ROADWAY LESS THAN 5 YEARS OLD, OR CONCRETE ROADWAY REGARDLESS OF AGE, MUST BE BORED TO THE DEPTH OF THE EXCAVATION AND RECONSTRUCTED TO MEET TRAFFIC SIGNAL STANDARDS TO-8800 SERIES.

UPWS #119301
PROJECT #M133

SYSTEM PERMIT #S-0194

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
ENGINEERING DISTRICT 6-0

COUNTY: MONTGOMERY
MUNICIPALITY: WORCESTER TOWNSHIP
INTERSECTION: GERMANTOWN PIKE AND PARK AVENUE / VALLEY FORGE ROAD (SR 0363)

REVISIONS:

DATE: 2/28/81
REVISION: 2/28/81

DOUGLAS W. MAY
MARK L. KRAY

NO.	REVISION	DATE	BY	CHKD.	DATE	BY	CHKD.
1	ADD DOWNSIDE AND PRE-EMPTION	JUL 17/79	WK	12/24/79	DWM	12/28/79	WK
2	NEW DRAWING	MAY 12/79	WK	10/20/79	LIB	6/26/79	WK
3	ADD THE RT. LANE SIGNALS	NOV 16/79	WK	10/24/79	LIB	11/27/79	WK
4	REVISIONS TO THE SIGNALS	NOV 16/79	WK	10/24/79	LIB	11/27/79	WK
5	REVISIONS TO THE SIGNALS	NOV 16/79	WK	10/24/79	LIB	11/27/79	WK
6	REVISIONS TO THE SIGNALS	NOV 16/79	WK	10/24/79	LIB	11/27/79	WK
7	REVISIONS TO THE SIGNALS	NOV 16/79	WK	10/24/79	LIB	11/27/79	WK
8	REVISIONS TO THE SIGNALS	NOV 16/79	WK	10/24/79	LIB	11/27/79	WK

APPENDIX C

Traffic Counts

Horner & Canter Associates
Transportation and Traffic Engineering

4950 York Rd, Suite 2G, P.O. 301, Holicong, PA 18928-0301
 105 Atsion Rd, Suite F, Medford, NJ 08055

NB/SB: Trooper Rd.
 EB/WB: Germantown Pike
 Worcester Twp./ Montgomery Co./ PA
 Tuesday/ AM Clear, PM Rain/ E-14/ GD

File Name : 24-025-001
 Site Code : 24025001
 Start Date : 8/6/2024
 Page No : 1

Groups Printed- Passenger and 2 Axle Vehicles - Buses and Heavy Vehicles

Start Time	Trooper Road Southbound			Germantown Pike Westbound			Trooper Road Northbound			Germantown Pike Eastbound			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:00 AM	5	24	7	56	63	1	12	19	49	0	145	18	399
07:15 AM	6	41	3	64	121	5	6	27	54	0	135	10	472
07:30 AM	3	41	3	65	100	2	9	31	63	1	133	12	463
07:45 AM	3	56	4	35	115	1	17	34	61	0	166	17	509
Total	17	162	17	220	399	9	44	111	227	1	579	57	1843
08:00 AM	4	38	5	44	115	3	16	23	47	2	147	16	460
08:15 AM	10	41	9	40	119	0	17	25	58	0	204	11	534
08:30 AM	4	41	2	33	156	0	10	31	62	1	168	26	534
08:45 AM	3	38	4	42	135	1	17	21	44	0	163	10	478
Total	21	158	20	159	525	4	60	100	211	3	682	63	2006
*** BREAK ***													
04:00 PM	9	54	7	64	202	8	14	48	34	0	161	13	614
04:15 PM	1	28	9	83	242	5	30	39	25	2	162	19	645
04:30 PM	2	34	6	92	232	10	20	40	39	3	159	13	650
04:45 PM	0	42	1	90	260	1	20	40	38	0	166	14	672
Total	12	158	23	329	936	24	84	167	136	5	648	59	2581
05:00 PM	2	35	6	80	186	2	21	38	33	2	152	10	567
05:15 PM	3	37	3	75	217	1	18	42	46	1	170	12	625
05:30 PM	2	36	6	87	212	4	10	34	31	0	121	9	552
05:45 PM	3	22	3	46	154	5	10	42	32	1	87	11	416
Total	10	130	18	288	769	12	59	156	142	4	530	42	2160
Grand Total	60	608	78	996	2629	49	247	534	716	13	2439	221	8590
Apprch %	8	81.5	10.5	27.1	71.6	1.3	16.5	35.7	47.8	0.5	91.2	8.3	
Total %	0.7	7.1	0.9	11.6	30.6	0.6	2.9	6.2	8.3	0.2	28.4	2.6	
Passenger and 2 Axle Vehicles	58	592	75	947	2533	47	225	518	681	13	2344	198	8231
% Passenger and 2 Axle Vehicles	96.7	97.4	96.2	95.1	96.3	95.9	91.1	97	95.1	100	96.1	89.6	95.8
Buses and Heavy Vehicles	2	16	3	49	96	2	22	16	35	0	95	23	359
% Buses and Heavy Vehicles	3.3	2.6	3.8	4.9	3.7	4.1	8.9	3	4.9	0	3.9	10.4	4.2

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Transportation and Traffic Engineering

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 EB/WB: Germantown Pike
 Worcester Twp./ Montgomery Co./ PA
 Tuesday/ AM Clear, PM Rain/ E-14/ GD

File Name : 24-025-001
 Site Code : 24025001
 Start Date : 8/6/2024
 Page No : 2

Start Time	Trooper Road Southbound				Germantown Pike Westbound				Trooper Road Northbound				Germantown Pike Eastbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	3	56	4	63	35	115	1	151	17	34	61	112	0	166	17	183	509
08:00 AM	4	38	5	47	44	115	3	162	16	23	47	86	2	147	16	165	460
08:15 AM	10	41	9	60	40	119	0	159	17	25	58	100	0	204	11	215	534
08:30 AM	4	41	2	47	33	156	0	189	10	31	62	103	1	168	26	195	534
Total Volume	21	176	20	217	152	505	4	661	60	113	228	401	3	685	70	758	2037
% App. Total	9.7	81.1	9.2		23	76.4	0.6		15	28.2	56.9		0.4	90.4	9.2		
PHF	.525	.786	.556	.861	.864	.809	.333	.874	.882	.831	.919	.895	.375	.839	.673	.881	.954
Passenger and 2 Axle Vehicles	20	171	19	210	144	462	4	610	49	108	218	375	3	656	60	719	1914
% Passenger and 2 Axle Vehicles	95.2	97.2	95.0	96.8	94.7	91.5	100	92.3	81.7	95.6	95.6	93.5	100	95.8	85.7	94.9	94.0
Buses and Heavy Vehicles	1	5	1	7	8	43	0	51	11	5	10	26	0	29	10	39	123
% Buses and Heavy Vehicles	4.8	2.8	5.0	3.2	5.3	8.5	0	7.7	18.3	4.4	4.4	6.5	0	4.2	14.3	5.1	6.0
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	9	54	7	70	64	202	8	274	14	48	34	96	0	161	13	174	614
04:15 PM	1	28	9	38	83	242	5	330	30	39	25	94	2	162	19	183	645
04:30 PM	2	34	6	42	92	232	10	334	20	40	39	99	3	159	13	175	650
04:45 PM	0	42	1	43	90	260	1	351	20	40	38	98	0	166	14	180	672
Total Volume	12	158	23	193	329	936	24	1289	84	167	136	387	5	648	59	712	2581
% App. Total	6.2	81.9	11.9		25.5	72.6	1.9		21.7	43.2	35.1		0.7	91	8.3		
PHF	.333	.731	.639	.689	.894	.900	.600	.918	.700	.870	.872	.977	.417	.976	.776	.973	.960
Passenger and 2 Axle Vehicles	12	155	23	190	320	922	23	1265	81	165	133	379	5	625	54	684	2518
% Passenger and 2 Axle Vehicles	100	98.1	100	98.4	97.3	98.5	95.8	98.1	96.4	98.8	97.8	97.9	100	96.5	91.5	96.1	97.6
Buses and Heavy Vehicles	0	3	0	3	9	14	1	24	3	2	3	8	0	23	5	28	63
% Buses and Heavy Vehicles	0	1.9	0	1.6	2.7	1.5	4.2	1.9	3.6	1.2	2.2	2.1	0	3.5	8.5	3.9	2.4

Horner & Canter Associates
Transportation and Traffic Engineering

4950 York Rd, Suite 2G, P.O. 301, Holicong, PA 18928-0301
 105 Atsion Rd, Suite F, Medford, NJ 08055

NB/SB: Valley Forge Rd./ Park Ave.
 EB/WB: Germantown Pike
 Worcester Twp./ Montgomery Co./ PA
 Tuesday/ Clear/ E-14/ GD

File Name : 24-025-101
 Site Code : 24025101
 Start Date : 9/10/2024
 Page No : 1

Groups Printed- Passenger and 2 Axle Vehicles - Buses and Heavy Vehicles

Start Time	Park Ave. Northbound			Germantown Pike Eastbound			Valley Forge Rd. Southbound			Germantown Pike Westbound			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:00 AM	47	104	24	36	115	13	18	122	20	21	97	8	625
07:15 AM	16	122	28	31	108	30	14	133	20	37	87	17	643
07:30 AM	8	118	34	37	136	23	15	133	21	43	83	11	662
07:45 AM	12	98	33	23	132	6	24	127	17	21	76	10	579
Total	83	442	119	127	491	72	71	515	78	122	343	46	2509
08:00 AM	13	95	38	22	150	10	19	128	12	21	71	7	586
08:15 AM	10	105	27	13	130	15	23	133	17	40	72	15	600
08:30 AM	12	95	35	48	101	18	25	146	23	46	48	17	614
08:45 AM	11	91	34	32	115	12	16	110	23	43	67	17	571
Total	46	386	134	115	496	55	83	517	75	150	258	56	2371
*** BREAK ***													
04:00 PM	25	102	20	35	79	17	21	120	38	50	135	14	656
04:15 PM	12	138	18	49	111	18	9	117	41	52	137	9	711
04:30 PM	9	111	14	34	109	22	19	101	41	58	134	16	668
04:45 PM	15	148	15	57	90	17	12	133	37	50	132	28	734
Total	61	499	67	175	389	74	61	471	157	210	538	67	2769
05:00 PM	11	130	14	48	89	16	18	131	33	55	124	21	690
05:15 PM	15	108	18	46	118	20	16	104	29	65	160	18	717
05:30 PM	14	140	27	32	89	18	16	119	33	52	128	22	690
05:45 PM	12	113	21	36	109	19	15	96	38	50	117	28	654
Total	52	491	80	162	405	73	65	450	133	222	529	89	2751
Grand Total	242	1818	400	579	1781	274	280	1953	443	704	1668	258	10400
Apprch %	9.8	73.9	16.3	22	67.6	10.4	10.5	73	16.6	26.8	63.4	9.8	
Total %	2.3	17.5	3.8	5.6	17.1	2.6	2.7	18.8	4.3	6.8	16	2.5	
Passenger and 2 Axle Vehicles	227	1723	384	559	1698	247	258	1855	429	680	1594	236	9890
% Passenger and 2 Axle Vehicles	93.8	94.8	96	96.5	95.3	90.1	92.1	95	96.8	96.6	95.6	91.5	95.1
Buses and Heavy Vehicles	15	95	16	20	83	27	22	98	14	24	74	22	510
% Buses and Heavy Vehicles	6.2	5.2	4	3.5	4.7	9.9	7.9	5	3.2	3.4	4.4	8.5	4.9

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Transportation and Traffic Engineering

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 Worcester Twp./ Montgomery Co./ PA
 Tuesday/ Clear/ E-14/ GD

File Name : 24-025-101
 Site Code : 24025101
 Start Date : 9/10/2024
 Page No : 2

Start Time	Park Ave. Northbound				Germantown Pike Eastbound				Valley Forge Rd. Southbound				Germantown Pike Westbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	47	104	24	175	36	115	13	164	18	122	20	160	21	97	8	126	625
07:15 AM	16	122	28	166	31	108	30	169	14	133	20	167	37	87	17	141	643
07:30 AM	8	118	34	160	37	136	23	196	15	133	21	169	43	83	11	137	662
07:45 AM	12	98	33	143	23	132	6	161	24	127	17	168	21	76	10	107	579
Total Volume	83	442	119	644	127	491	72	690	71	515	78	664	122	343	46	511	2509
% App. Total	12.9	68.6	18.5		18.4	71.2	10.4		10.7	77.6	11.7		23.9	67.1	9		
PHF	.441	.906	.875	.920	.858	.903	.600	.880	.740	.968	.929	.982	.709	.884	.676	.906	.948
Passenger and 2 Axle Vehicles	77	410	115	602	121	454	60	635	61	484	73	618	110	315	37	462	2317
% Passenger and 2 Axle Vehicles	92.8	92.8	96.6	93.5	95.3	92.5	83.3	92.0	85.9	94.0	93.6	93.1	90.2	91.8	80.4	90.4	92.3
Buses and Heavy Vehicles	6	32	4	42	6	37	12	55	10	31	5	46	12	28	9	49	192
% Buses and Heavy Vehicles	7.2	7.2	3.4	6.5	4.7	7.5	16.7	8.0	14.1	6.0	6.4	6.9	9.8	8.2	19.6	9.6	7.7
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	15	148	15	178	57	90	17	164	12	133	37	182	50	132	28	210	734
05:00 PM	11	130	14	155	48	89	16	153	18	131	33	182	55	124	21	200	690
05:15 PM	15	108	18	141	46	118	20	184	16	104	29	149	65	160	18	243	717
05:30 PM	14	140	27	181	32	89	18	139	16	119	33	168	52	128	22	202	690
Total Volume	55	526	74	655	183	386	71	640	62	487	132	681	222	544	89	855	2831
% App. Total	8.4	80.3	11.3		28.6	60.3	11.1		9.1	71.5	19.4		26	63.6	10.4		
PHF	.917	.889	.685	.905	.803	.818	.888	.870	.861	.915	.892	.935	.854	.850	.795	.880	.964
Passenger and 2 Axle Vehicles	54	517	73	644	181	372	67	620	59	471	131	661	214	537	86	837	2762
% Passenger and 2 Axle Vehicles	98.2	98.3	98.6	98.3	98.9	96.4	94.4	96.9	95.2	96.7	99.2	97.1	96.4	98.7	96.6	97.9	97.6
Buses and Heavy Vehicles	1	9	1	11	2	14	4	20	3	16	1	20	8	7	3	18	69
% Buses and Heavy Vehicles	1.8	1.7	1.4	1.7	1.1	3.6	5.6	3.1	4.8	3.3	0.8	2.9	3.6	1.3	3.4	2.1	2.4

Horner & Canter Associates
Transportation and Traffic Engineering

4950 York Rd, Suite 2G, P.O. 301, Hollicong, PA 18928-0301
 105 Atsion Rd, Suite F, Medford, NJ 08055

NB: N. Trooper Rd.
 EB/WB: Woodlyn Rd./ Woodland Rd.
 Worcester Twp./ Montgomery Co./ PA
 Wednesday/ Clear/ E-14/ GD

File Name : 24-025-102
 Site Code : 24025102
 Start Date : 9/11/2024
 Page No : 1

Groups Printed- Passenger and 2 Axle Vehicles - Buses and Heavy Vehicles

Start Time	Woodland Rd. Westbound		N. Trooper Rd. Northbound		Woodlyn Rd. Eastbound		Int. Total
	Left	Thru	Left	Right	Thru	Right	
07:00 AM	5	4	10	2	4	39	64
07:15 AM	4	2	28	2	3	48	87
07:30 AM	5	1	30	4	7	48	95
07:45 AM	6	2	31	3	9	50	101
Total	20	9	99	11	23	185	347
08:00 AM	6	2	25	2	8	51	94
08:15 AM	7	2	25	2	5	48	89
08:30 AM	10	4	25	6	9	56	110
08:45 AM	9	2	33	3	2	56	105
Total	32	10	108	13	24	211	398
*** BREAK ***							
04:00 PM	2	8	48	6	4	50	118
04:15 PM	9	3	58	1	5	44	120
04:30 PM	7	8	48	2	11	40	116
04:45 PM	4	10	52	2	8	42	118
Total	22	29	206	11	28	176	472
05:00 PM	4	10	65	5	3	44	131
05:15 PM	5	13	40	2	7	38	105
05:30 PM	8	11	55	0	2	45	121
05:45 PM	5	5	39	6	7	32	94
Total	22	39	199	13	19	159	451
Grand Total	96	87	612	48	94	731	1668
Apprch %	52.5	47.5	92.7	7.3	11.4	88.6	
Total %	5.8	5.2	36.7	2.9	5.6	43.8	
Passenger and 2 Axle Vehicles	92	84	584	43	91	695	1589
% Passenger and 2 Axle Vehicles	95.8	96.6	95.4	89.6	96.8	95.1	95.3
Buses and Heavy Vehicles	4	3	28	5	3	36	79
% Buses and Heavy Vehicles	4.2	3.4	4.6	10.4	3.2	4.9	4.7

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Transportation and Traffic Engineering

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File Name : 24-025-102
 Site Code : 24025102
 Start Date : 9/11/2024
 Page No : 2

Start Time	Woodland Rd. Westbound			N. Trooper Rd. Northbound			Woodlyn Rd. Eastbound			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	6	2	8	25	2	27	8	51	59	94
08:15 AM	7	2	9	25	2	27	5	48	53	89
08:30 AM	10	4	14	25	6	31	9	56	65	110
08:45 AM	9	2	11	33	3	36	2	56	58	105
Total Volume	32	10	42	108	13	121	24	211	235	398
% App. Total	76.2	23.8		89.3	10.7		10.2	89.8		
PHF	.800	.625	.750	.818	.542	.840	.667	.942	.904	.905
Passenger and 2 Axle Vehicles	31	10	41	99	12	111	23	198	221	373
% Passenger and 2 Axle Vehicles	96.9	100	97.6	91.7	92.3	91.7	95.8	93.8	94.0	93.7
Buses and Heavy Vehicles	1	0	1	9	1	10	1	13	14	25
% Buses and Heavy Vehicles	3.1	0	2.4	8.3	7.7	8.3	4.2	6.2	6.0	6.3

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:15 PM										
04:15 PM	9	3	12	58	1	59	5	44	49	120
04:30 PM	7	8	15	48	2	50	11	40	51	116
04:45 PM	4	10	14	52	2	54	8	42	50	118
05:00 PM	4	10	14	65	5	70	3	44	47	131
Total Volume	24	31	55	223	10	233	27	170	197	485
% App. Total	43.6	56.4		95.7	4.3		13.7	86.3		
PHF	.667	.775	.917	.858	.500	.832	.614	.966	.966	.926
Passenger and 2 Axle Vehicles	24	29	53	215	8	223	26	167	193	469
% Passenger and 2 Axle Vehicles	100	93.5	96.4	96.4	80.0	95.7	96.3	98.2	98.0	96.7
Buses and Heavy Vehicles	0	2	2	8	2	10	1	3	4	16
% Buses and Heavy Vehicles	0	6.5	3.6	3.6	20.0	4.3	3.7	1.8	2.0	3.3

APPENDIX D

Level of Service Delay Thresholds

Level of Service Criteria

Level of Service at intersections is defined in terms of DELAY. Delay is a measure of driver discomfort, frustration, and lost travel time, thus the rating of delay from highly acceptable LOS A to unacceptable LOS F.

At traffic signals, delay is a complex measure and is dependent on a number of variables including signal progression, the cycle length, the green-time ratio, clearance times, trucks, pedestrians, parking, and signal phasing.

At unsignalized intersections, delay is dependent on the available gaps in the two-way flow of the uninterrupted traffic movement, intersection width, and queuing.

Intersection LOS

	<u>Signalized</u>	<u>Unsignalized</u>
LOS A	Less than 10.0 sec/veh	Less than 10.0 sec/veh
B	10.0 to 20.0 sec/veh	10.0 to 15.0 sec/veh
C	20.0 to 35.0 sec/veh	15.0 to 25.0 sec/veh
D	35.0 to 55.0 sec/veh	25.0 to 35.0 sec/veh
E	55.0 to 80.0 sec/veh	35.0 to 50.0 sec/veh
F	Greater than 80.0 sec/veh	Greater than 50.0 sec/veh

LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS

Level of service for signalized intersections is defined in terms of delay. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time.

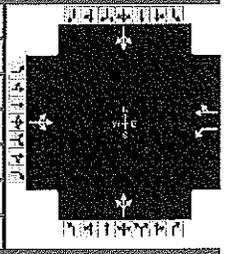
- **LEVEL-OF-SERVICE A** describes operations with very low delay, i.e., less than 10.0 sec per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
- **LEVEL-OF-SERVICE B** describes operations with delay in the range of 10.0 to 20.0 sec per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.
- **LEVEL-OF-SERVICE C** describes operations with delay in the range of 20.0 to 35.0 sec per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear in this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- **LEVEL-OF-SERVICE D** describes operations with delay in the range of 35.0 to 55.0 sec per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
- **LEVEL-OF-SERVICE E** describes operations with delay in the range of 55.0 to 80.0 sec per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.
- **LEVEL-OF-SERVICE F** describes operations with delay in excess of 80.0 sec per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over saturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.00 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

APPENDIX E

Existing Capacity/LOS Analysis Worksheets

HCS Signalized Intersection Input Data

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	AM Peak Hour	PHF	0.95		
Urban Street		Analysis Year	Existing 2024	Analysis Period	1> 7:00		
Intersection	Germantown Pk/Trooper...	File Name	Germantown Pk_Trooper Rd_ea.xus				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	3	685	70	152	505	4	60	113	228	21	176	20

Signal Information													
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On										
Force Mode	Fixed	Simult. Gap N/S	On										
		Green	7.0	38.0	27.0	0.0	0.0	0.0					
		Yellow	4.0	4.0	4.0	0.0	0.0	0.0					
		Red	2.0	2.0	2.0	0.0	0.0	0.0					

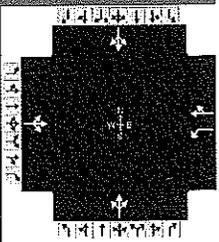
Traffic Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	3	685	70	152	505	4	60	113	228	21	176	20
Initial Queue (Q _b), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s ₀), veh/h	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Parking (N _m), man/h		None			None			None			None	
Heavy Vehicles (P _{HV}), %		5		5	8			7			3	
Ped / Bike / RTOR, /h	0	0	15	0	0	0	0	0	50	0	0	5
Buses (N _b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft		13.0		11.0	12.0			11.0			11.0	
Turn Bay Length, ft		0		0	0			0			0	
Grade (Pg), %		-6			7			1			-3	
Speed Limit, mi/h	45	45	45	45	45	45	45	45	45	40	40	40

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
	Maximum Green (G _{max}) or Phase Split, s		38.0	7.0	51.0		27.0	
Yellow Change Interval (Y), s		4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R _c), s		2.0	2.0	2.0		2.0		2.0
Minimum Green (G _{min}), s		25	7	25		3		3
Start-Up Lost Time (I _f), s	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Extension of Effective Green (e), s	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Passage (PT), s		2.0	2.0	2.0		2.0		2.0
Recall Mode		Min	Off	Min		Off		Off
Dual Entry		Yes	No	Yes		Yes		Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0									
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No									
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No		0.50									

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Horner & Canter Assoc			Duration, h	0.250
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other
Jurisdiction	Worcester Twp	Time Period	AM Peak Hour	PHF	0.95
Urban Street		Analysis Year	Existing 2024	Analysis Period	1> 7:00
Intersection	Germantown Pk/Trooper...	File Name	Germantown Pk_Trooper Rd_ea.xus		
Project Description	24-025 Trooper Ridge Townhouse Devel				



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	3	685	70	152	505	4	60	113	228	21	176	20

Signal Information				Signal Timing (s)								
Cycle, s	90.0	Reference Phase	2	Green	7.0	38.0	27.0	0.0	0.0	0.0	0.0	0.0
Offset, s	0	Reference Point	End	Yellow	4.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Red	2.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On									

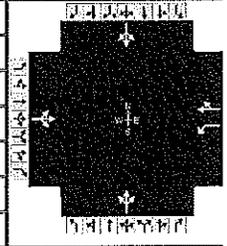
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
	Assigned Phase		2	1	6		8	
Case Number		8.3	1.0	4.0		8.0		8.0
Phase Duration, s		44.0	13.0	57.0		33.0		33.0
Change Period, (Y+R _c), s		6.0	6.0	6.0		6.0		6.0
Max Allow Headway (MAH), s		2.9	3.0	2.9		3.1		3.1
Queue Clearance Time (g _s), s		35.2	7.8	25.7		23.0		11.0
Green Extension Time (g _e), s		1.1	0.0	2.7		0.6		1.1
Phase Call Probability		1.00	1.00	1.00		1.00		1.00
Max Out Probability		1.00	1.00	0.00		0.62		0.00

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h		782		160	536			369			223	
Adjusted Saturation Flow Rate (s), veh/h/ln		2002		1387	1412			1476			1774	
Queue Service Time (g _s), s		3.2		5.3	23.2			11.9			0.0	
Cycle Queue Clearance Time (g _c), s		32.7		5.3	23.2			20.5			8.5	
Green Ratio (g/C)		0.43		0.55	0.58			0.31			0.31	
Capacity (c), veh/h		908		243	816			506			596	
Volume-to-Capacity Ratio (X)		0.862		0.657	0.657			0.730			0.374	
Back of Queue (Q), ft/ln (95 th percentile)		575		80.6	280.3			311.3			163.6	
Back of Queue (Q), veh/ln (95 th percentile)		22.1		3.1	10.5			11.8			6.4	
Queue Storage Ratio (RQ) (95 th percentile)		0.00		0.00	0.00			0.00			0.00	
Uniform Delay (d ₁), s/veh		23.7		19.1	12.9			28.2			24.3	
Incremental Delay (d ₂), s/veh		8.1		5.1	1.5			4.7			0.1	
Initial Queue Delay (d ₃), s/veh		0.0		0.0	0.0			0.0			0.0	
Control Delay (d), s/veh		31.8		24.2	14.5			32.9			24.4	
Level of Service (LOS)		C		C	B			C			C	
Approach Delay, s/veh / LOS	31.8	C		16.7	B		32.9	C		24.4	C	
Intersection Delay, s/veh / LOS	26.1			C			C			C		

Multimodal Results	EB		WB		NB		SB	
	Pedestrian LOS Score / LOS	1.75	B	1.66	B	1.92	B	1.72
Bicycle LOS Score / LOS	1.78	B	1.64	B	1.10	A	0.86	A

HCS Signalized Intersection Input Data

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	PM Peak Hour	PHF	0.96		
Urban Street		Analysis Year	Existing 2024	Analysis Period	1> 7:00		
Intersection	Germantown Pk/Trooper...	File Name	Germantown Pk_Trooper Rd_ep.xus				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	5	648	59	329	936	24	84	167	136	12	158	23

Signal Information													
Cycle, s	90.0	Reference Phase	2	Green	10.0	36.0	26.0	0.0	0.0	0.0			
Offset, s	0	Reference Point	End	Yellow	4.0	4.0	4.0	0.0	0.0	0.0			
Uncoordinated	Yes	Simult. Gap E/W	On	Red	2.0	2.0	2.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On										

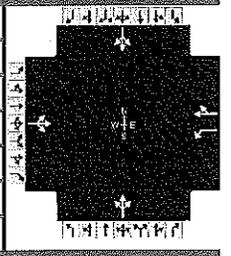
Traffic Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	5	648	59	329	936	24	84	167	136	12	158	23
Initial Queue (Q ₀), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s ₀), veh/h	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Parking (N _m), man/h		None			None			None			None	
Heavy Vehicles (P _{HV}), %		4		3	2			2			2	
Ped / Bike / RTOR, /h	0	0	15	0	0	5	0	0	30	0	0	5
Buses (N _b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (f)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft		13.0		11.0	12.0			11.0			11.0	
Turn Bay Length, ft		0		0	0			0			0	
Grade (P _g), %		-6			7			1			-3	
Speed Limit, mi/h	45	45	45	45	45	45	45	45	45	40	40	40

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G _{max}) or Phase Split, s		36.0	10.0	52.0		26.0		26.0
Yellow Change Interval (Y), s		4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R _c), s		2.0	2.0	2.0		2.0		2.0
Minimum Green (G _{min}), s		25	7	25		3		3
Start-Up Lost Time (l), s	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Extension of Effective Green (e), s	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Passage (PT), s		2.0	2.0	2.0		2.0		2.0
Recall Mode		Min	Off	Min		Off		Off
Dual Entry		Yes	No	Yes		Yes		Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0									
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No									
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50										

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	PM Peak Hour	PHF	0.96		
Urban Street		Analysis Year	Existing 2024	Analysis Period	1 > 7:00		
Intersection	Germantown Pk/Trooper...	File Name	Germantown Pk_Trooper Rd_ep.xus				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	5	648	59	329	936	24	84	167	136	12	158	23

Signal Information				EB			WB			NB			SB		
Cycle, s	90.0	Reference Phase	2												
Offset, s	0	Reference Point	End	Green	10.0	36.0	26.0	0.0	0.0	0.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	0.0	0.0	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		4
Case Number		8.3	1.0	4.0		8.0		8.0
Phase Duration, s		42.0	16.0	58.0		32.0		32.0
Change Period, (Y+R _c), s		6.0	6.0	6.0		6.0		6.0
Max Allow Headway (MAH), s		2.9	3.0	2.9		3.1		3.1
Queue Clearance Time (g _s), s		39.5	13.5	55.5		22.2		10.0
Green Extension Time (g _e), s		0.0	0.0	0.0		0.5		1.0
Phase Call Probability		1.00	1.00	1.00		1.00		1.00
Max Out Probability		1.00	1.00	1.00		0.69		0.00

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h		726		343	995			372			196	
Adjusted Saturation Flow Rate (s), veh/h/ln		1413		1414	1493			1548			1825	
Queue Service Time (g _s), s		0.0		11.0	53.0			12.3			0.0	
Cycle Queue Clearance Time (g _c), s		37.0		11.0	53.0			19.7			7.5	
Green Ratio (g/C)		0.41		0.56	0.59			0.30			0.30	
Capacity (c), veh/h		621		253	879			514			590	
Volume-to-Capacity Ratio (X)		1.168		1.356	1.131			0.724			0.332	
Back of Queue (Q), ft/ln (95 th percentile)		1025.4		618.3	1162.9			301.2			142.4	
Back of Queue (Q), veh/ln (95 th percentile)		39.7		24.2	45.8			11.9			5.6	
Queue Storage Ratio (RQ) (95 th percentile)		0.00		0.00	0.00			0.00			0.00	
Uniform Delay (d ₁), s/veh		27.8		25.3	18.5			28.8			24.7	
Incremental Delay (d ₂), s/veh		92.3		183.7	73.3			4.4			0.1	
Initial Queue Delay (d ₃), s/veh		0.0		0.0	0.0			0.0			0.0	
Control Delay (d), s/veh		120.1		208.9	91.8			33.1			24.8	
Level of Service (LOS)		F		F	F			C			C	
Approach Delay, s/veh / LOS	120.1	F		121.8	F		33.1	C		24.8	C	
Intersection Delay, s/veh / LOS	101.6						F					

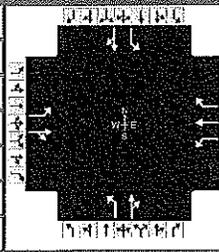
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.73	B	1.66	B	1.93	B	1.72	B
Bicycle LOS Score / LOS	1.69	B	2.69	C	1.10	A	0.81	A

HCS Signalized Intersection Input Data

General Information													Intersection Information				
Agency		Horner & Canter Assoc						Duration, h		0.250							
Analyst		DHH		Analysis Date		Apr 2, 2025		Area Type		Other							
Jurisdiction		Worcester Twp		Time Period		AM Peak Hour		PHF		0.95							
Urban Street				Analysis Year		Existing 2024		Analysis Period		1 > 7:00							
Intersection		Germantown Pk/N Park/...		File Name		Germantown Pk_N Park Rd_Valley Forge Rd_ea....											
Project Description		24-025 Trooper Ridge Townhouse Devel															
Demand Information				EB			WB			NB			SB				
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R		
Demand (v), veh/h				127	491	72	122	343	46	83	442	119	71	515	78		
Signal Information																	
Cycle, s		126.0		Reference Phase		2											
Offset, s		0		Reference Point		End											
Uncoordinated		Yes		Simult. Gap E/W		On											
Force Mode		Fixed		Simult. Gap N/S		On											
				Green		9.0		39.0		7.0		47.0		0.0		0.0	
				Yellow		4.0		4.0		4.0		4.0		0.0		0.0	
				Red		2.0		2.0		2.0		2.0		0.0		0.0	
Traffic Information				EB			WB			NB			SB				
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R		
Demand (v), veh/h				127	491	72	122	343	46	83	442	119	71	515	78		
Initial Queue (Q _b), veh/h				0	0	0	0	0	0	0	0	0	0	0	0		
Base Saturation Flow Rate (s ₀), veh/h				1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800		
Parking (N _m), man/h				None			None			None			None				
Heavy Vehicles (P _{HV}), %				5	9		10	8	20	7	6		14	6			
Ped / Bike / RTOR, /h				0	0	15	0	0	10	0	0	25	0	0	15		
Buses (N _b), buses/h				0	0	0	0	0	0	0	0	0	0	0	0		
Arrival Type (AT)				3	3	3	3	3	3	3	3	3	3	3	3		
Upstream Filtering (f)				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Lane Width (W), ft				11.0	13.0		11.0	12.0	14.0	10.0	11.0		10.0	11.0			
Turn Bay Length, ft				0	0		0	0	0	0	0		0	0			
Grade (Pg), %					-1			-1			3			-1			
Speed Limit, mi/h				35	35	35	35	35	35	45	45	45	35	35	35		
Phase Information				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT						
Maximum Green (G _{max}) or Phase Split, s				9.0	39.0	9.0	39.0	7.0	47.0	7.0	47.0						
Yellow Change Interval (Y), s				4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0						
Red Clearance Interval (R _c), s				2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0						
Minimum Green (G _{min}), s				6	25	7	25	6	3	6	3						
Start-Up Lost Time (lt), s				2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5						
Extension of Effective Green (e), s				3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5						
Passage (PT), s				2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0						
Recall Mode				Off	Min	Off	Min	Off	Off	Off	Off						
Dual Entry				No	Yes	No	Yes	No	Yes	No	Yes						
Walk (Walk), s					0.0		0.0		0.0		0.0						
Pedestrian Clearance Time (PC), s					0.0		0.0		0.0		0.0						
Multimodal Information				EB			WB			NB			SB				
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0		
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0		
Street Width / Island / Curb, ft				0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No		
Width Outside / Bike Lane / Shoulder, ft				12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0		
Pedestrian Signal / Occupied Parking				No	0.50	No	0.50	No	0.50	No	0.50	No	0.50				

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	AM Peak Hour	PHF	0.95		
Urban Street		Analysis Year	Existing 2024	Analysis Period	1 > 7:00		
Intersection	Germantown Pk/N Park/...	File Name	Germantown Pk_N Park Rd_Valley Forge Rd_ea....				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	127	491	72	122	343	46	83	442	119	71	515	78

Signal Information				Signal Timing (s)									
Cycle, s	126.0	Reference Phase	2										
Offset, s	0	Reference Point	End	Green	9.0	39.0	7.0	47.0	0.0	0.0			
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	0.0	0.0			

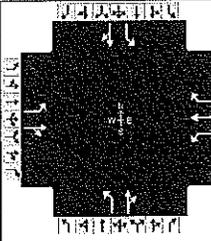
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	15.0	45.0	15.0	45.0	13.0	53.0	13.0	53.0
Change Period, (Y+R _c), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Allow Headway (MAH), s	3.1	3.1	3.1	3.1	3.0	3.0	3.1	3.0
Queue Clearance Time (g _s), s	9.1	42.5	9.1	25.3	6.6	44.4	6.0	45.3
Green Extension Time (g _e), s	0.0	0.0	0.0	1.8	0.0	0.9	0.0	0.6
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	1.00	1.00	0.02	1.00	1.00	1.00	1.00

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	134	577		128	361	38	87	564		75	608	
Adjusted Saturation Flow Rate (s), veh/h/ln	1682	1745		1614	1724	1369	1573	1615		1560	1718	
Queue Service Time (g _s), s	6.6	40.0		6.6	22.8	2.4	4.1	41.9		3.5	42.8	
Cycle Queue Clearance Time (g _c), s	6.6	40.0		6.6	22.8	2.4	4.1	41.9		3.5	42.8	
Green Ratio (g/C)	0.40	0.32		0.40	0.32	0.32	0.44	0.38		0.44	0.38	
Capacity (c), veh/h	301	554		185	547	434	167	615		172	655	
Volume-to-Capacity Ratio (X)	0.444	1.041		0.693	0.660	0.087	0.522	0.917		0.434	0.929	
Back of Queue (Q), ft/ln (95 th percentile)	123.3	896.7		144	398.8	42.5	72.6	679.9		65.4	747.9	
Back of Queue (Q), veh/ln (95 th percentile)	4.7	33.5		5.3	15.0	1.5	2.8	26.0		2.4	28.5	
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (d ₁), s/veh	28.1	43.0		31.3	37.5	30.2	29.6	37.1		29.3	37.4	
Incremental Delay (d ₂), s/veh	0.4	49.4		9.0	2.4	0.0	1.4	18.4		0.6	19.5	
Initial Queue Delay (d ₃), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (d), s/veh	28.4	92.4		40.2	39.9	30.2	31.0	55.5		29.9	56.9	
Level of Service (LOS)	C	F		D	D	C	C	E		C	E	
Approach Delay, s/veh / LOS	80.4		F	39.3		D	52.2		D	54.0		D
Intersection Delay, s/veh / LOS	57.8						E					

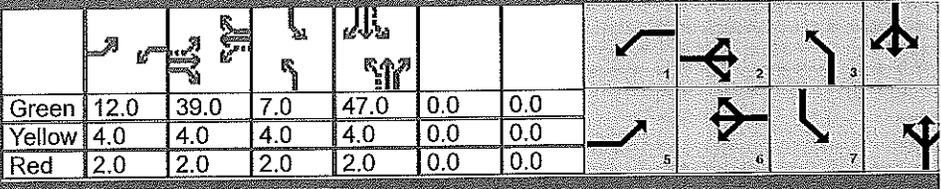
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.97	B	1.96	B	2.13	B	1.95	B
Bicycle LOS Score / LOS	1.66	B	1.36	A	1.56	B	1.61	B

HCS Signalized Intersection Input Data

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	PM Peak Hour	PHF	0.96		
Urban Street		Analysis Year	Existing 2024	Analysis Period	1> 7:00		
Intersection	Germantown Pk/N Park/...	File Name	Germantown Pk_N Park Rd_Valley Forge Rd_ep...				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	183	386	71	222	544	89	55	526	74	62	487	132

Signal Information																								
Cycle, s	129.0	Reference Phase	2	Green	12.0	39.0	7.0	47.0	0.0	0.0	Yellow	4.0	4.0	4.0	4.0	0.0	0.0	Red	2.0	2.0	2.0	2.0	0.0	0.0
Offset, s	0	Reference Point	End	Uncoordinated	Yes	Simult. Gap E/W	On	Force Mode	Fixed	Simult. Gap N/S	On													

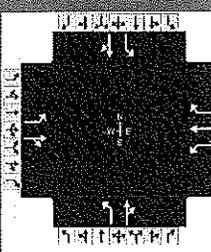
Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	183	386	71	222	544	89	55	526	74	62	487	132
Initial Queue (Q _b), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s ₀), veh/h	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Parking (N _m), man/h		None			None			None			None	
Heavy Vehicles (P _{HV}), %	1	4		4	1	3	2	2		5	3	
Ped / Bike / RTOR, /h	0	0	15	0	0	15	0	0	15	0	0	25
Buses (N _b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (f)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	11.0	13.0		11.0	12.0	14.0	10.0	11.0		10.0	11.0	
Turn Bay Length, ft	0	0		0	0	0	0	0		0	0	
Grade (P _g), %		-1			-1			3			-1	
Speed Limit, mi/h	35	35	35	35	35	35	45	45	45	35	35	35

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G _{max}) or Phase Split, s	12.0	39.0	12.0	39.0	7.0	47.0	7.0	47.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Red Clearance Interval (R _c), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Green (G _{min}), s	6	25	7	25	6	3	6	3
Start-Up Lost Time (f _l), s	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Extension of Effective Green (e), s	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Passage (PT), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Off	Min	Off	Min	Off	Off	Off	Off
Dual Entry	No	Yes	No	Yes	No	Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0									
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No									
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50										

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Horner & Canter Assoc			Duration, h	0.250
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other
Jurisdiction	Worcester Twp	Time Period	PM Peak Hour	PHF	0.96
Urban Street		Analysis Year	Existing 2024	Analysis Period	1> 7:00
Intersection	Germantown Pk/N Park/...	File Name	Germantown Pk_N Park Rd_Valley Forge Rd_ep....		
Project Description	24-025 Trooper Ridge Townhouse Devel				



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	183	386	71	222	544	89	55	526	74	62	487	132

Signal Information				Signal Timing Diagram								
Cycle, s	129.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									
Green	12.0	39.0	7.0	47.0	0.0	0.0						
Yellow	4.0	4.0	4.0	4.0	0.0	0.0						
Red	2.0	2.0	2.0	2.0	0.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	18.0	45.0	18.0	45.0	13.0	53.0	13.0	53.0
Change Period, (Y+R _c), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Allow Headway (MAH), s	3.1	3.1	3.1	3.1	3.0	3.0	3.1	3.0
Queue Clearance Time (g _s), s	12.1	32.9	14.5	42.5	5.1	48.1	5.4	47.3
Green Extension Time (g _e), s	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	0.39	1.00	1.00	1.00	1.00	1.00	1.00

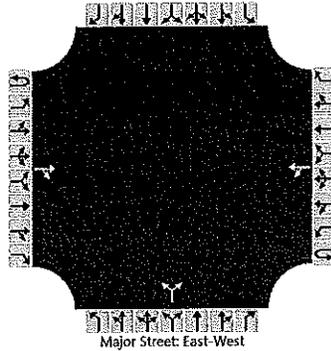
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	191	460		231	567	77	57	609		65	619	
Adjusted Saturation Flow Rate (s), veh/h/ln	1736	1810		1696	1823	1582	1640	1691		1682	1738	
Queue Service Time (g _s), s	9.6	30.4		12.0	40.0	4.6	2.6	45.6		2.9	44.8	
Cycle Queue Clearance Time (g _c), s	9.6	30.4		12.0	40.0	4.6	2.6	45.6		2.9	44.8	
Green Ratio (g/C)	0.41	0.31		0.41	0.31	0.31	0.43	0.37		0.43	0.37	
Capacity (c), veh/h	231	561		271	565	490	158	629		160	647	
Volume-to-Capacity Ratio (X)	0.826	0.820		0.852	1.002	0.157	0.364	0.968		0.403	0.957	
Back of Queue (Q), ft/ln (95 th percentile)	222.7	542		272.2	800.8	81	46.2	781.6		55	792.5	
Back of Queue (Q), veh/ln (95 th percentile)	8.8	21.0		10.6	31.8	3.2	1.8	30.8		2.1	31.0	
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (d ₁), s/veh	32.8	41.2		31.5	44.5	32.3	30.3	39.8		30.4	39.5	
Incremental Delay (d ₂), s/veh	20.0	8.8		21.2	38.5	0.1	0.5	27.9		0.6	24.9	
Initial Queue Delay (d ₃), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (d), s/veh	52.9	50.0		52.7	83.0	32.3	30.9	67.7		31.0	64.3	
Level of Service (LOS)	D	D		D	F	C	C	E		C	E	
Approach Delay, s/veh / LOS	50.8		D	70.5		E	64.5		E	61.2		E
Intersection Delay, s/veh / LOS	62.4						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.96	B	1.97	B	2.14	B	1.95	B
Bicycle LOS Score / LOS	1.56	B	1.93	B	1.59	B	1.62	B

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	DHH			Intersection	Trooper Rd/Woodlyn Rd/Woodland Ave		
Agency/Co.	Horner & Canter Assoc			Jurisdiction	Worcester Twp		
Date Performed	4/2/2025			East/West Street	Woodlyn Rd/Woodland Ave		
Analysis Year	2024			North/South Street	Trooper Road		
Time Analyzed	AM Peak Hour			Peak Hour Factor	0.91		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	24-025 Trooper Ridge Townhouse Devel						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			24	211		32	10			108		13				
Percent Heavy Vehicles (%)						3				8		8				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type Storage					Undivided											

Critical and Follow-up Headways

Base Critical Headway (sec)					4.3				7.1		6.2					
Critical Headway (sec)					4.33				6.48		6.28					
Base Follow-Up Headway (sec)					3.0				3.0		3.1					
Follow-Up Headway (sec)					3.03				3.07		3.17					

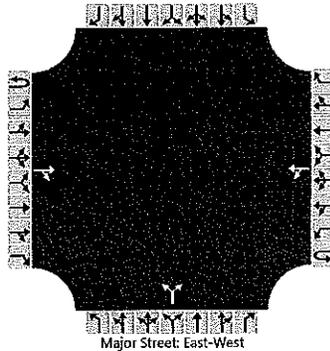
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					35					133						
Capacity, c (veh/h)					970					840						
v/c Ratio					0.04					0.16						
.95% Queue Length, Q ₉₅ (veh)					0.1					0.6						
Control Delay (s/veh)					8.9	0.3				10.1						
Level of Service (LOS)					A	A				B						
Approach Delay (s/veh)					6.8				10.1							
Approach LOS					A				B							

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DHH	Intersection	Trooper Rd/Woodlyn Rd/Woodland Ave
Agency/Co.	Horner & Canter Assoc	Jurisdiction	Worcester Twp
Date Performed	4/2/2025	East/West Street	Woodlyn Rd/Woodland Ave
Analysis Year	2024	North/South Street	Trooper Road
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.93
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	24-025 Trooper Ridge Townhouse Devel		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			27	170		24	31			223		10				
Percent Heavy Vehicles (%)						0				4		20				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.3				7.1		6.2				
Critical Headway (sec)						4.30				6.44		6.40				
Base Follow-Up Headway (sec)						3.0				3.0		3.1				
Follow-Up Headway (sec)						3.00				3.04		3.28				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						26						251				
Capacity, c (veh/h)						1016						874				
v/c Ratio						0.03						0.29				
95% Queue Length, Q ₉₅ (veh)						0.1						1.2				
Control Delay (s/veh)						8.6	0.2					10.8				
Level of Service (LOS)						A	A					B				
Approach Delay (s/veh)					3.9				10.8							
Approach LOS					A				B							

APPENDIX F

Trip Generation Worksheets

Single-Family Attached Housing (215)

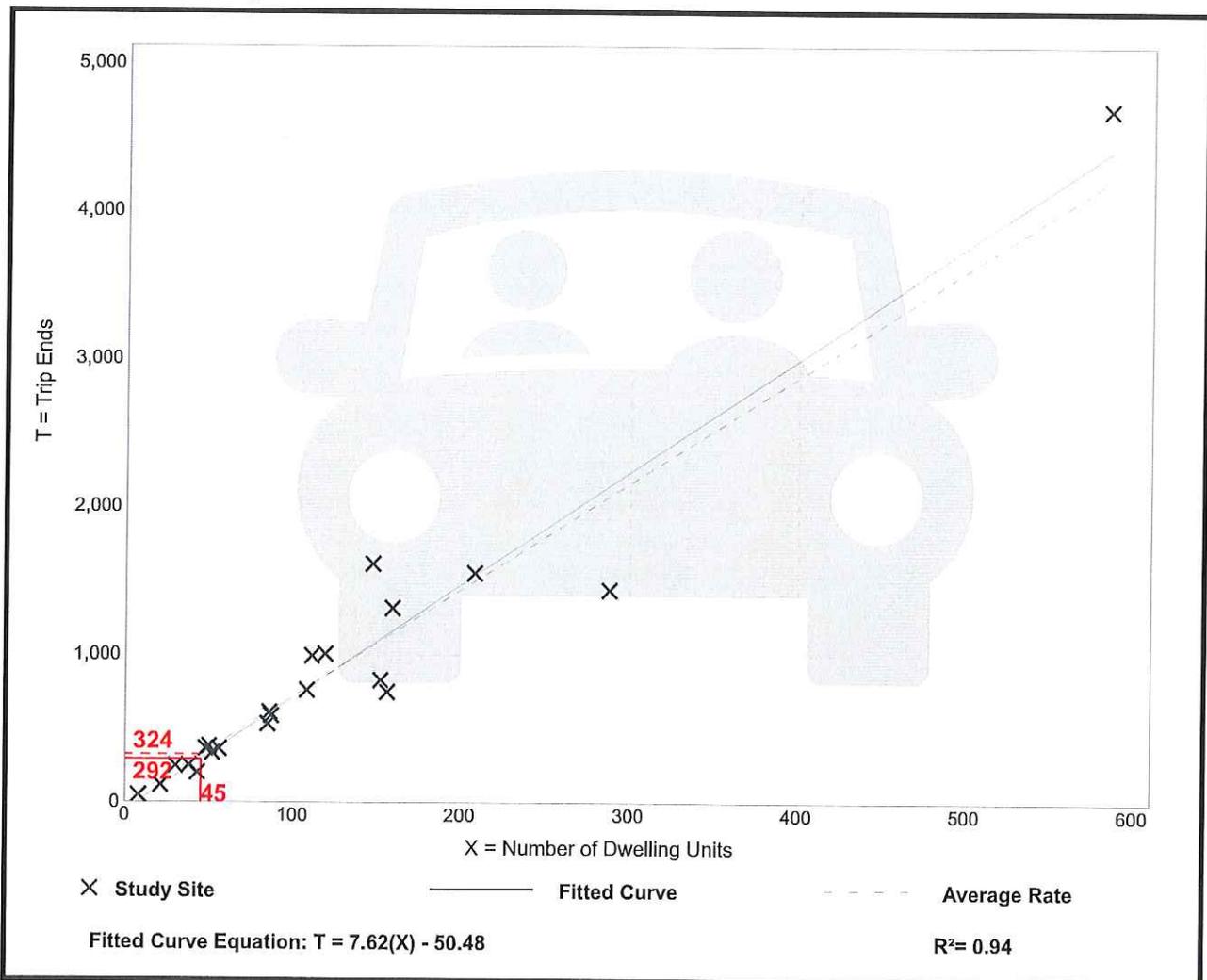
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 22
Avg. Num. of Dwelling Units: 120
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
7.20	4.70 - 10.97	1.61

Data Plot and Equation



Single-Family Attached Housing (215)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Setting/Location: General Urban/Suburban

Number of Studies: 46

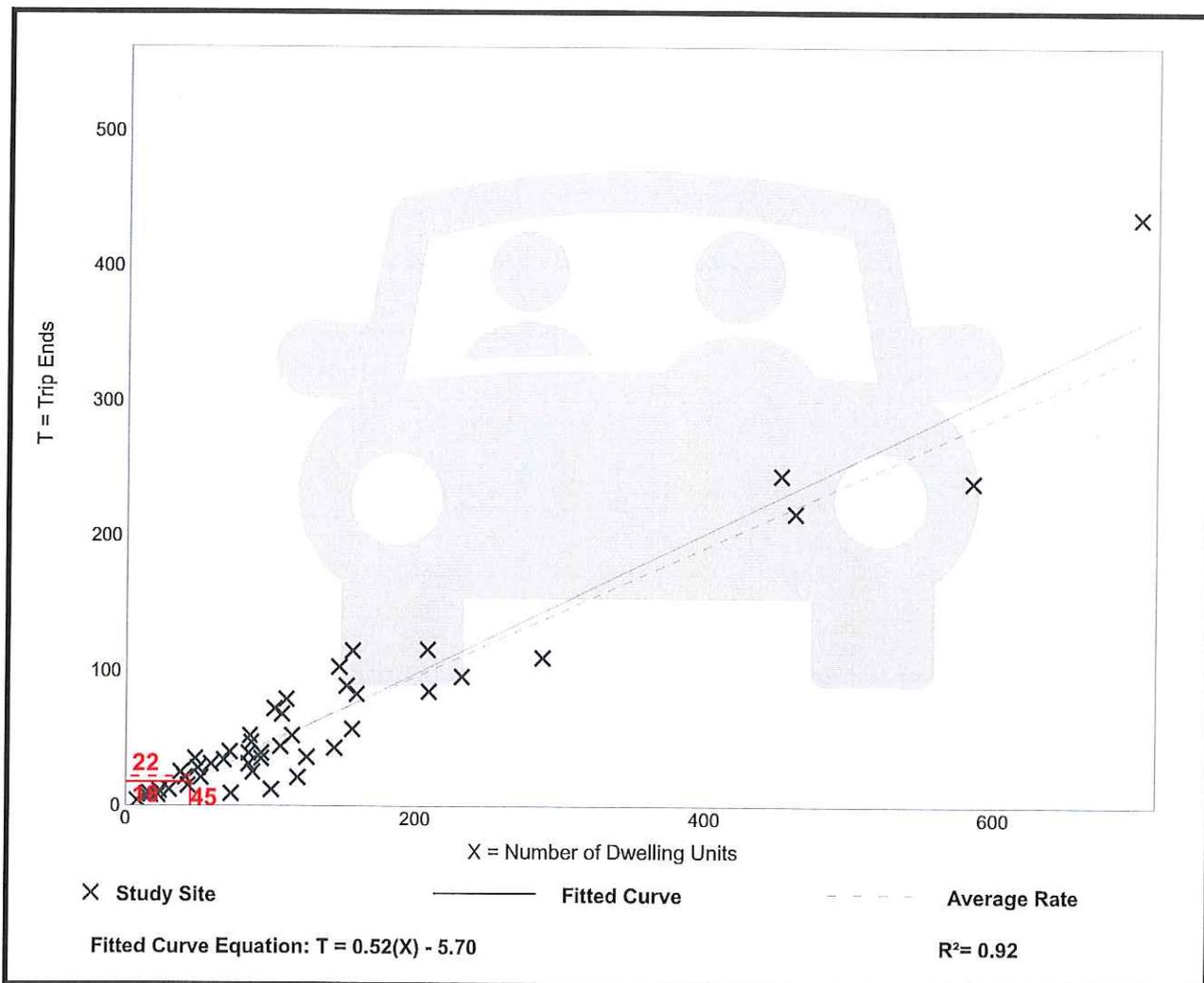
Avg. Num. of Dwelling Units: 135

Directional Distribution: 25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.48	0.12 - 0.74	0.14

Data Plot and Equation



Single-Family Attached Housing (215)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 51

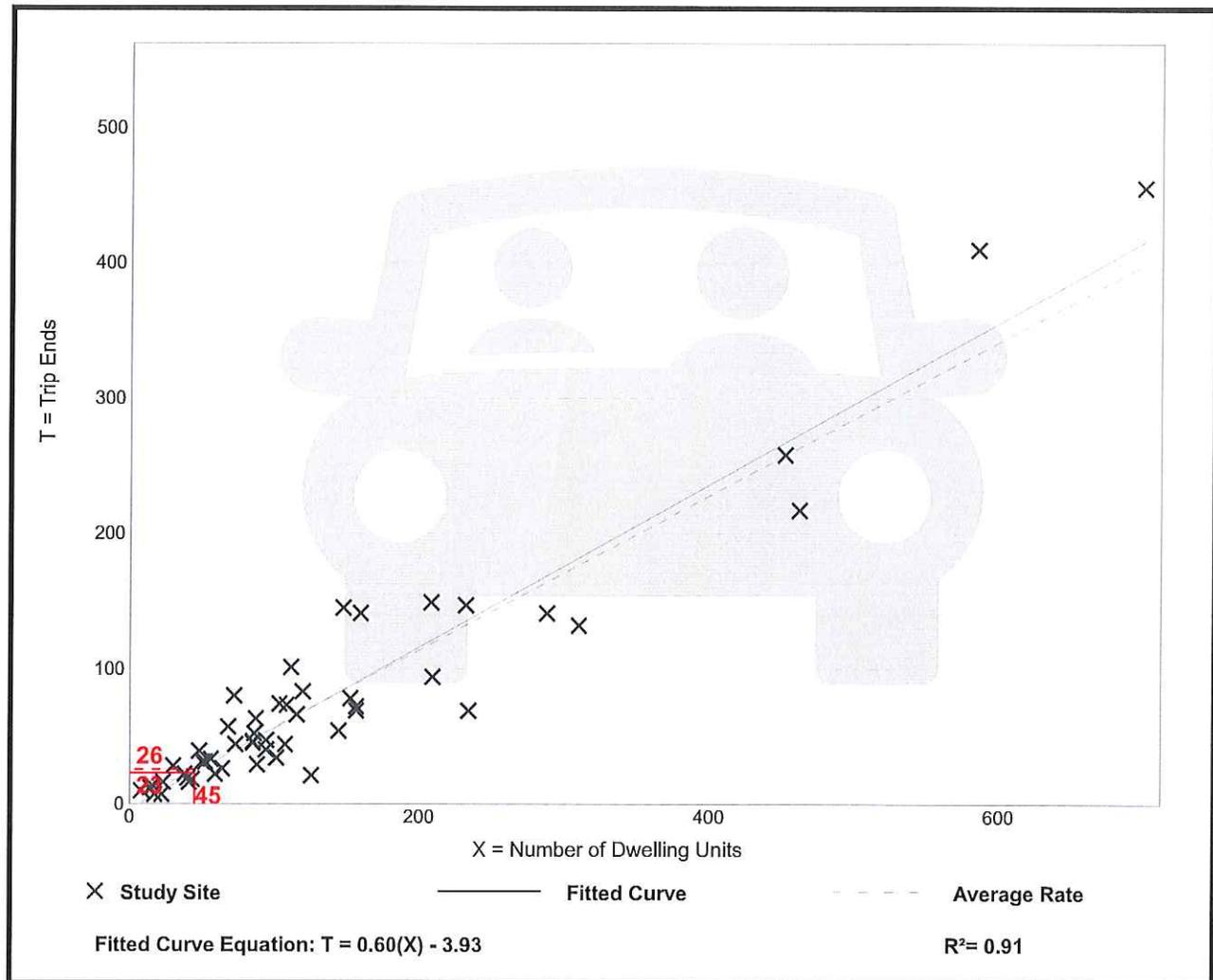
Avg. Num. of Dwelling Units: 136

Directional Distribution: 59% entering, 41% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.57	0.17 - 1.25	0.18

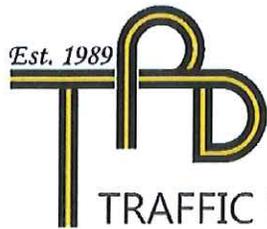
Data Plot and Equation



APPENDIX G

Other Development Trip Distribution

January 27, 2022
(Last Revised April 3, 2023)
TPD# BETI.00009

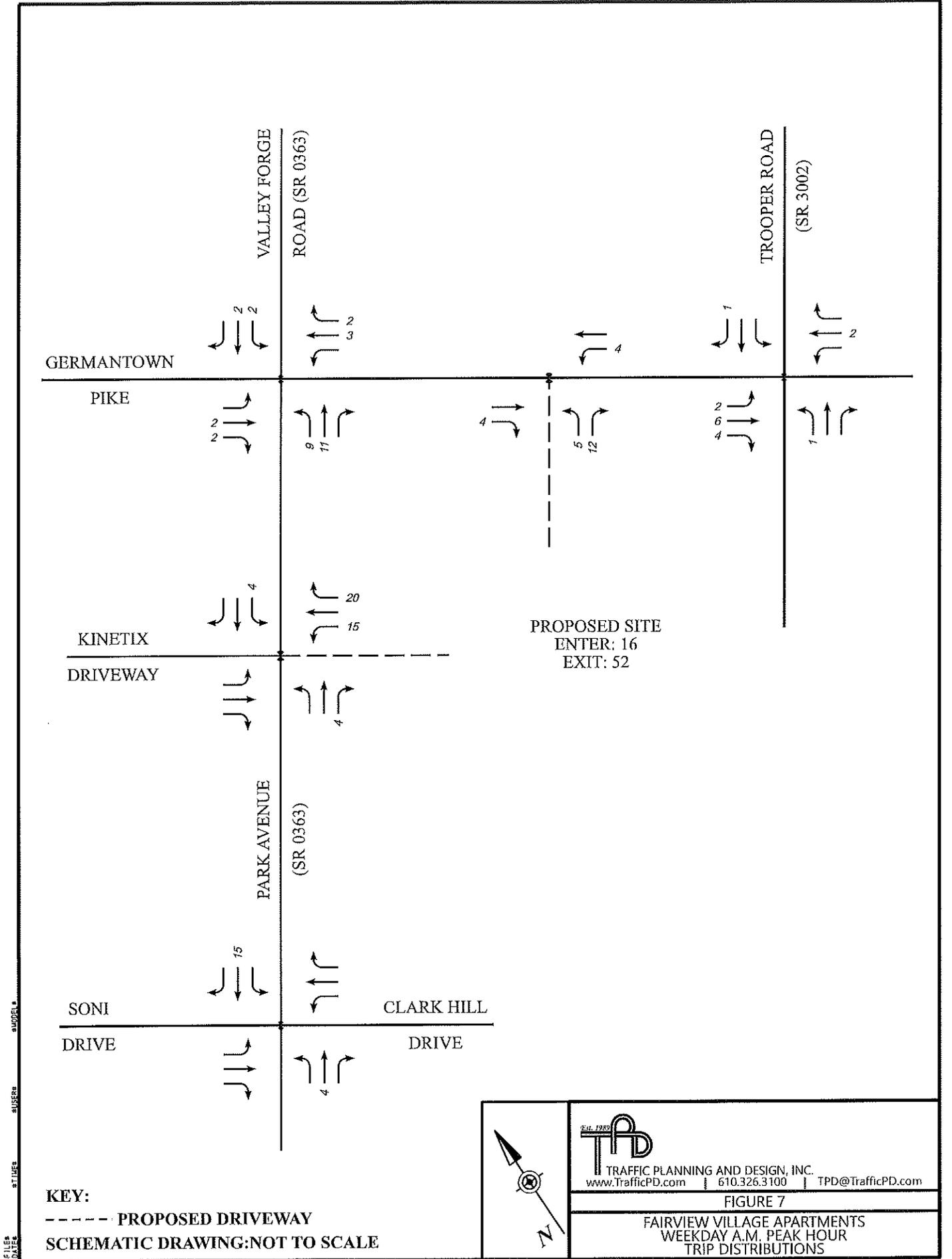


TRAFFIC PLANNING AND DESIGN, INC.

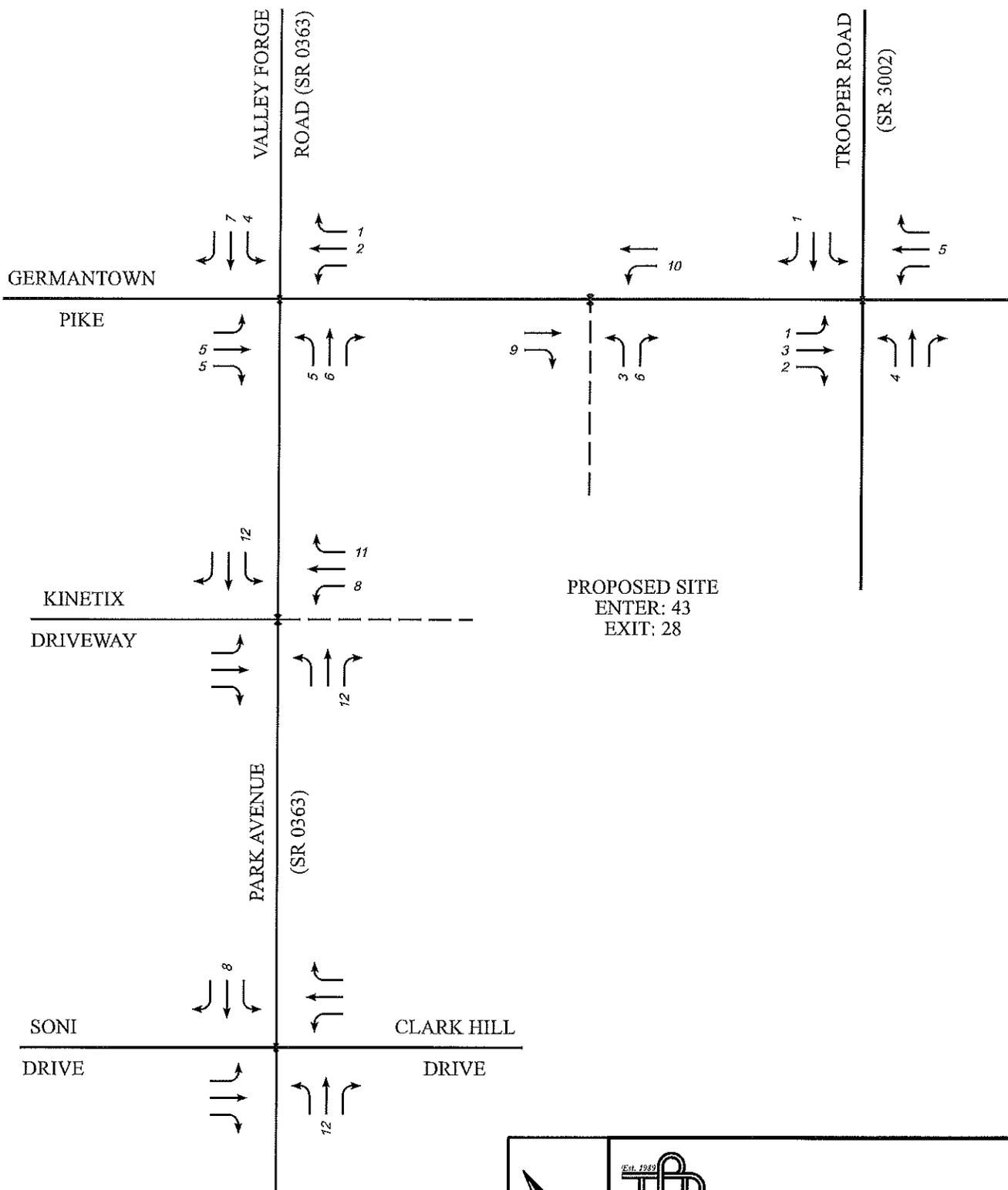


City View Apartment Development
Transportation Impact Assessment
Worcester Township, Montgomery County

For Submission To:
PennDOT 6-0, Worcester Township, Montgomery County



SCALE: AS SHOWN
DATE: 11/15/11
PROJECT: FAIRVIEW VILLAGE APARTMENTS



KEY:
----- PROPOSED DRIVEWAY
SCHEMATIC DRAWING: NOT TO SCALE


Est. 1989
TPD
TRAFFIC PLANNING AND DESIGN, INC.
www.TrafficPD.com | 610.326.3100 | TPD@TrafficPD.com
FIGURE 8
FAIRVIEW VILLAGE APARTMENTS
WEEKDAY P.M. PEAK HOUR
TRIP DISTRIBUTIONS

APPENDIX H

Traffic Volume Calculation Worksheets

Traffic Volume Calculation Worksheet

Trooper Ridge Townhouse Development (HCA Project No. 24-025)
 Worcester Township, Montgomery County, PA

Trooper Road (SR 3002)/Germantown Pike

	Trooper Rd NB			Trooper Rd SB			Germantown Pk EB			Germantown Pk WB		
	L	T	R	L	T	R	L	T	R	L	T	R
AM Peak Hour												
Existing 2024 Traffic Volumes	60	113	228	21	176	20	3	685	70	152	505	4
w/ 1.009% 5-yr Background Growth	61	114	230	21	178	20	3	691	71	153	509	4
Plus Other Known Developments												
City View Apartment Development	1	0	0	0	0	1	2	6	4	0	2	0
Total Other Developments	1	0	0	0	0	1	2	6	4	0	2	0
2029 No-Build Traffic Volumes	62	114	230	21	178	21	5	697	75	153	511	4
Proposed Trooper Ridge Project	0	1	0	3	2	10	3	0	0	0	0	1
2029 Build Traffic Volumes	62	115	230	24	180	31	8	697	75	153	511	5

PM Peak Hour												
Existing 2024 Traffic Volumes	84	167	136	12	158	23	5	648	59	329	936	24
w/ 1.009% 5-yr Background Growth	85	168	137	12	159	23	5	654	60	332	944	24
Plus Other Known Developments												
City View Apartment Development	4	0	0	0	0	1	1	3	2	0	5	0
Total Other Developments	4	0	0	0	0	1	1	3	2	0	5	0
2029 No-Build Traffic Volumes	89	168	137	12	159	24	6	657	62	332	949	24
Proposed Trooper Ridge Project	0	2	0	2	1	7	10	0	0	0	0	2
2029 Build Traffic Volumes	89	170	137	14	160	31	16	657	62	332	949	26

Traffic Volume Calculation Worksheet

Trooper Ridge Townhouse Development (HCA Project No. 24-025)
 Worcester Township, Montgomery County, PA

Valley Forge Road (SR 0663)/Germantown Pike

	Valley Forge Rd NB			Valley Forge Rd SB			Germantown Pk EB			Germantown Pk WB		
	L	T	R	L	T	R	L	T	R	L	T	R
AM Peak Hour												
Existing 2024 Traffic Volumes	83	442	119	71	515	78	127	491	72	122	343	46
w/ 1.009% 5-yr Background Growth	84	446	120	72	519	79	128	495	73	123	346	46
Plus Other Known Developments												
City View Apartment Development	9	11	0	2	2	0	0	2	2	0	3	2
Total Other Developments	9	11	0	2	2	0	0	2	2	0	3	2
2029 No-Build Traffic Volumes	93	457	120	74	521	79	128	497	75	123	349	48
Proposed Trooper Ridge Project	0	0	1	1	0	0	0	1	0	3	3	4
2029 Build Traffic Volumes	93	457	121	75	521	79	128	498	75	126	352	52

PM Peak Hour												
Existing 2024 Traffic Volumes	55	526	74	62	487	132	183	386	71	222	544	89
w/ 1.009% 5-yr Background Growth	55	530	75	63	491	133	185	389	72	224	549	90
Plus Other Known Developments												
City View Apartment Development	5	6	0	4	7	0	0	5	5	0	2	1
Total Other Developments	5	6	0	4	7	0	0	5	5	0	2	1
2029 No-Build Traffic Volumes	60	536	75	67	498	133	185	394	77	224	551	91
Proposed Trooper Ridge Project	0	0	3	4	0	0	0	3	0	2	2	3
2029 Build Traffic Volumes	60	536	78	71	498	133	185	397	77	226	553	94

Traffic Volume Calculation Worksheet

Trooper Ridge Townhouse Development (HCA Project No. 24-025)
 Worcester Township, Montgomery County, PA

Woodlyn Rd/Woodland Ave/Trooper Road (SR 3002)

	Trooper Rd NB						Woodlyn Rd EB			Woodland Ave WB		
	L	T	R				L	T	R	L	T	R
AM Peak Hour												
Existing 2024 Traffic Volumes	108	0	13	0	0	0	0	24	211	32	10	0
w/ 1.009% 5-yr Background Growth	109	0	13	0	0	0	0	24	213	32	10	0
Plus Other Known Developments												
City View Apartment Development	2	0	0	0	0	0	0	0	1	0	0	0
Total Other Developments	2	0	0	0	0	0	0	0	1	0	0	0
2029 No-Build Traffic Volumes	111	0	13	0	0	0	0	24	214	32	10	0
Proposed Trooper Ridge Project												
2029 Build Traffic Volumes	112	0	14	0	0	0	0	24	214	32	10	0

PM Peak Hour												
Existing 2024 Traffic Volumes	223	0	10	0	0	0	0	27	170	24	31	0
w/ 1.009% 5-yr Background Growth	225	0	10	0	0	0	0	27	171	24	31	0
Plus Other Known Developments												
City View Apartment Development	1	0	0	0	0	0	0	0	1	0	0	0
Total Other Developments	1	0	0	0	0	0	0	0	1	0	0	0
2029 No-Build Traffic Volumes	226	0	10	0	0	0	0	27	172	24	31	0
Proposed Trooper Ridge Project												
2029 Build Traffic Volumes	227	0	10	0	0	0	0	27	173	24	31	0

Traffic Volume Calculation Worksheet

Trooper Ridge Townhouse Development (HCA Project No. 24-025)
 Worcester Township, Montgomery County, PA

Trooper Road (SR 3002)/Site Access

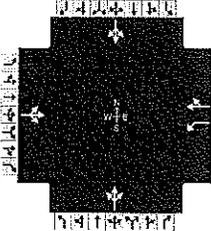
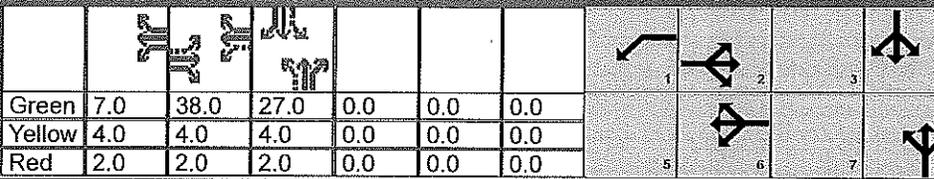
	Trooper Rd NB			Trooper Rd SB			Site Access EB			L	T	R
	L	T	R	L	T	R	L	T	R			
AM Peak Hour												
Existing 2024 Traffic Volumes	0	120	0	0	217	0	0	0	0	0	0	0
w/ 1.009% 5-yr Background Growth	0	121	0	0	219	0	0	0	0	0	0	0
Plus Other Known Developments												
City View Apartment Development	0	2	0	0	1	0	0	0	0	0	0	0
Total Other Developments	0	2	0	0	1	0	0	0	0	0	0	0
2029 No-Build Traffic Volumes	0	123	0	0	220	0	0	0	0	0	0	0
Proposed Trooper Ridge Project												
2029 Build Traffic Volumes	5	0	0	0	0	0	2	0	15	0	0	0

PM Peak Hour												
Existing 2024 Traffic Volumes	0	196	0	0	193	0	0	0	0	0	0	0
w/ 1.009% 5-yr Background Growth	0	198	0	0	195	0	0	0	0	0	0	0
Plus Other Known Developments												
City View Apartment Development	0	1	0	0	1	0	0	0	0	0	0	0
Total Other Developments	0	1	0	0	1	0	0	0	0	0	0	0
2029 No-Build Traffic Volumes	0	199	0	0	196	0	0	0	0	0	0	0
Proposed Trooper Ridge Project												
2029 Build Traffic Volumes	14	0	0	0	0	1	1	0	10	0	0	0

APPENDIX I

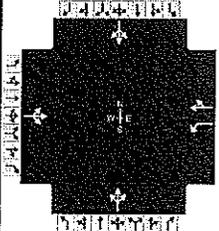
No-Build Capacity/LOS Analysis Worksheets

HCS Signalized Intersection Input Data

General Information				Intersection Information											
Agency	Horner & Canter Assoc			Duration, h	0.250										
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other										
Jurisdiction	Worcester Twp	Time Period	AM Peak Hour	PHF	0.95										
Urban Street		Analysis Year	2029 No-Build	Analysis Period	1 > 7:00										
Intersection	Germantown Pk/Trooper...	File Name	Germantown Pk_Trooper Rd_na.xus												
Project Description	24-025 Trooper Ridge Townhouse Devel														
Demand Information				EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R			
Demand (v), veh/h	5	697	75	153	511	4	62	114	230	21	178	21			
Signal Information															
Cycle, s	90.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Green	7.0	38.0	27.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Yellow	4.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Red	2.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Traffic Information				EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R			
Demand (v), veh/h	5	697	75	153	511	4	62	114	230	21	178	21			
Initial Queue (Q _b), veh/h	0	0	0	0	0	0	0	0	0	0	0	0			
Base Saturation Flow Rate (s ₀), veh/h	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800			
Parking (N _m), man/h		None			None			None			None				
Heavy Vehicles (P _{HV}), %		5		5	8			7			3				
Ped / Bike / RTOR, /h	0	0	15	0	0	0	0	0	50	0	0	5			
Buses (N _b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0			
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3			
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Lane Width (W), ft		13.0		11.0	12.0			11.0			11.0				
Turn Bay Length, ft		0		0	0			0			0				
Grade (Pg), %		-6			7			1			-3				
Speed Limit, mi/h	45	45	45	45	45	45	45	45	45	40	40	40			
Phase Information				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Maximum Green (G _{max}) or Phase Split, s		38.0	7.0	51.0		27.0		27.0							
Yellow Change Interval (Y), s		4.0	4.0	4.0		4.0		4.0							
Red Clearance Interval (R _c), s		2.0	2.0	2.0		2.0		2.0							
Minimum Green (G _{min}), s		25	7	25		3		3							
Start-Up Lost Time (I _l), s	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5							
Extension of Effective Green (e), s	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5							
Passage (PT), s		2.0	2.0	2.0		2.0		2.0							
Recall Mode		Min	Off	Min		Off		Off							
Dual Entry		Yes	No	Yes		Yes		Yes							
Walk (Walk), s		0.0		0.0		0.0		0.0							
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0							
Multimodal Information				EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0			
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0			
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No			
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0			
Pedestrian Signal / Occupied Parking	No	0.50	No	0.50	No	0.50	No	0.50	No	0.50	No	0.50			

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	AM Peak Hour	PHF	0.95		
Urban Street		Analysis Year	2029 No-Build	Analysis Period	1> 7:00		
Intersection	Germantown Pk/Trooper...	File Name	Germantown Pk_Trooper Rd_na.xus				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	5	697	75	153	511	4	62	114	230	21	178	21

Signal Information													
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	7.0	38.0	27.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0			
				Red	2.0	2.0	2.0	0.0	0.0	0.0			

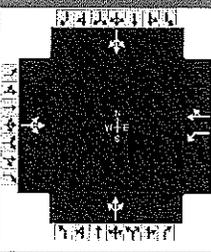
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		4
Case Number		8.3	1.0	4.0		8.0		8.0
Phase Duration, s		44.0	13.0	57.0		33.0		33.0
Change Period, (Y+Rc), s		6.0	6.0	6.0		6.0		6.0
Max Allow Headway (MAH), s		2.9	3.0	2.9		3.2		3.2
Queue Clearance Time (gs), s		36.7	7.8	26.2		23.4		11.2
Green Extension Time (ge), s		0.6	0.0	2.7		0.6		1.1
Phase Call Probability		1.00	1.00	1.00		1.00		1.00
Max Out Probability		1.00	1.00	0.00		0.78		0.00

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	802			161	542		375			226		
Adjusted Saturation Flow Rate (s), veh/h/ln	1998			1387	1412		1475			1770		
Queue Service Time (gs), s	6.8			5.3	23.7		12.2			0.0		
Cycle Queue Clearance Time (gc), s	34.2			5.3	23.7		20.9			8.7		
Green Ratio (g/C)	0.43			0.55	0.58		0.31			0.31		
Capacity (c), veh/h	906			233	816		506			595		
Volume-to-Capacity Ratio (X)	0.885			0.690	0.664		0.741			0.381		
Back of Queue (Q), ft/ln (95 th percentile)	608.9			86.4	284.2		317			166		
Back of Queue (Q), veh/ln (95 th percentile)	23.4			3.3	10.7		12.0			6.5		
Queue Storage Ratio (RQ) (95 th percentile)	0.00			0.00	0.00		0.00			0.00		
Uniform Delay (d1), s/veh	24.1			19.4	13.0		28.4			24.3		
Incremental Delay (d2), s/veh	10.1			7.0	1.7		5.1			0.1		
Initial Queue Delay (d3), s/veh	0.0			0.0	0.0		0.0			0.0		
Control Delay (d), s/veh	34.2			26.4	14.7		33.5			24.5		
Level of Service (LOS)	C			C	B		C			C		
Approach Delay, s/veh / LOS	34.2	C		17.4	B		33.5	C		24.5	C	
Intersection Delay, s/veh / LOS	27.4						C					

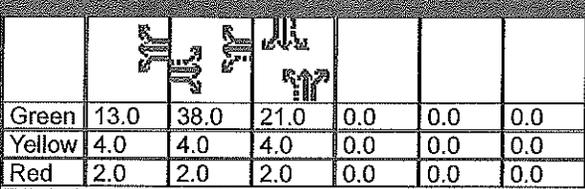
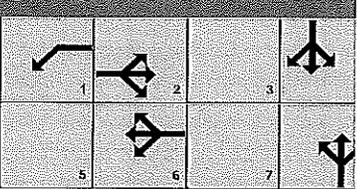
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.75	B	1.66	B	1.92	B	1.72	B
Bicycle LOS Score / LOS	1.81	B	1.65	B	1.11	A	0.86	A

HCS Signalized Intersection Input Data

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	PM Peak Hour	PHF	0.96		
Urban Street		Analysis Year	2029 No-Build	Analysis Period	1 > 7:00		
Intersection	Germantown Pk/Trooper...	File Name	Germantown Pk_Trooper Rd_np.xus				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	6	657	62	332	949	24	89	168	137	12	159	24

Signal Information													
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	13.0	38.0	21.0	0.0	0.0	0.0			
				Yellow	4.0	4.0	4.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	0.0	0.0	0.0			

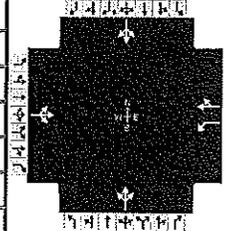
Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	6	657	62	332	949	24	89	168	137	12	159	24
Initial Queue (Q _b), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s ₀), veh/h	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Parking (N _m), man/h		None			None			None			None	
Heavy Vehicles (P _{HV}), %		4		3	2			2			2	
Ped / Bike / RTOR, /h	0	0	15	0	0	5	0	0	30	0	0	5
Buses (N _b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (f)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft		13.0		11.0	12.0			11.0			11.0	
Turn Bay Length, ft		0		0	0			0			0	
Grade (Pg), %		-6			7			1			-3	
Speed Limit, mi/h	45	45	45	45	45	45	45	45	45	40	40	40

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G _{max}) or Phase Split, s		38.0	13.0	57.0		21.0		21.0
Yellow Change Interval (Y), s		4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R _c), s		2.0	2.0	2.0		2.0		2.0
Minimum Green (G _{min}), s		25	7	25		3		3
Start-Up Lost Time (l), s	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Extension of Effective Green (e), s	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Passage (PT), s		2.0	2.0	2.0		2.0		2.0
Recall Mode		Min	Off	Min		Off		Off
Dual Entry		Yes	No	Yes		Yes		Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0									
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No									
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50										

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	PM Peak Hour	PHF	0.96		
Urban Street		Analysis Year	2029 No-Build	Analysis Period	1> 7:00		
Intersection	Germantown Pk/Trooper...	File Name	Germantown Pk_Trooper Rd_np.xus				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	6	657	62	332	949	24	89	168	137	12	159	24

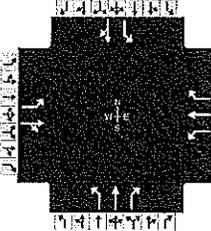
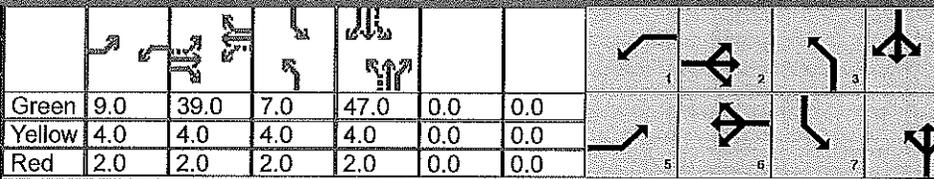
Signal Information																	
Cycle, s	90.0	Reference Phase	2														
Offset, s	0	Reference Point	End	Green	13.0	38.0	21.0	0.0	0.0	0.0	Green	13.0	38.0	21.0	0.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0	Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	0.0	0.0	0.0	Red	2.0	2.0	2.0	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		4
Case Number		8.3	1.0	4.0		8.0		8.0
Phase Duration, s		44.0	19.0	63.0		27.0		27.0
Change Period, (Y+R _c), s		6.0	6.0	6.0		6.0		6.0
Max Allow Headway (MAH), s		3.0	3.0	3.0		3.1		3.1
Queue Clearance Time (g _s), s		41.5	16.5	60.5		24.5		10.6
Green Extension Time (g _e), s		0.0	0.0	0.0		0.0		0.9
Phase Call Probability		1.00	1.00	1.00		1.00		1.00
Max Out Probability		1.00	1.00	1.00		1.00		0.02

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	740			346	1008		379			198		
Adjusted Saturation Flow Rate (s), veh/h/ln	1378			1414	1493		1538			1797		
Queue Service Time (g _s), s	0.0			14.0	58.0		13.9			0.0		
Cycle Queue Clearance Time (g _c), s	39.0			14.0	58.0		22.0			8.1		
Green Ratio (g/C)	0.43			0.62	0.64		0.24			0.24		
Capacity (c), veh/h	637			300	962		426			482		
Volume-to-Capacity Ratio (X)	1.161			1.153	1.048		0.890			0.411		
Back of Queue (Q), ft/ln (95 th percentile)	1025.5			438.8	899.6		385.7			159.1		
Back of Queue (Q), veh/ln (95 th percentile)	39.7			17.1	35.4		15.2			6.3		
Queue Storage Ratio (RQ) (95 th percentile)	0.00			0.00	0.00		0.00			0.00		
Uniform Delay (d ₁), s/veh	27.6			26.9	16.0		33.9			28.8		
Incremental Delay (d ₂), s/veh	88.8			100.0	42.3		19.6			0.2		
Initial Queue Delay (d ₃), s/veh	0.0			0.0	0.0		0.0			0.0		
Control Delay (d), s/veh	116.5			126.9	58.3		53.6			29.0		
Level of Service (LOS)	F			F	F		D			C		
Approach Delay, s/veh / LOS	116.5	F		75.9	E		53.6	D		29.0	C	
Intersection Delay, s/veh / LOS	80.5						F					

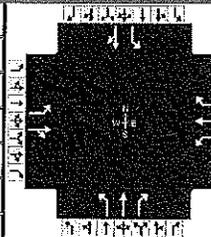
Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.72	B		1.65	B		1.94	B		1.72	B	
Bicycle LOS Score / LOS	1.71	B		2.72	C		1.11	A		0.81	A	

HCS Signalized Intersection Input Data

General Information				Intersection Information											
Agency	Horner & Canter Assoc			Duration, h	0.250										
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other										
Jurisdiction	Worcester Twp	Time Period	AM Peak Hour	PHF	0.95										
Urban Street		Analysis Year	2029 No-Build	Analysis Period	1 > 7:00										
Intersection	Germantown Pk/N Park/...	File Name	Germantown Pk_N Park Rd_Valley Forge Rd_na...												
Project Description	24-025 Trooper Ridge Townhouse Devel														
Demand Information				EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R			
Demand (v), veh/h	128	497	75	123	349	48	93	457	120	74	521	79			
Signal Information															
Cycle, s	126.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Green	9.0	39.0	7.0	47.0	0.0	0.0									
Yellow	4.0	4.0	4.0	4.0	0.0	0.0									
Red	2.0	2.0	2.0	2.0	0.0	0.0									
Traffic Information				EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R			
Demand (v), veh/h	128	497	75	123	349	48	93	457	120	74	521	79			
Initial Queue (Q _b), veh/h	0	0	0	0	0	0	0	0	0	0	0	0			
Base Saturation Flow Rate (s ₀), veh/h	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800			
Parking (N _m), man/h		None			None			None			None				
Heavy Vehicles (P _{HV}), %	5	9		10	8	20	7	7	3	14	6				
Ped / Bike / RTOR, /h	0	0	15	0	0	10	0	0	30	0	0	15			
Buses (N _b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0			
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3			
Upstream Filtering (f)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Lane Width (W), ft	11.0	13.0		11.0	12.0	14.0	10.0	11.0	12.0	10.0	11.0				
Turn Bay Length, ft	0	0		0	0	0	0	0	0	0	0				
Grade (Pg), %		-1			-1			3			-1				
Speed Limit, mi/h	35	35	35	35	35	35	45	45	45	35	35	35			
Phase Information				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Maximum Green (G _{max}) or Phase Split, s	9.0			39.0			9.0			39.0					
Yellow Change Interval (Y), s	4.0			4.0			4.0			4.0					
Red Clearance Interval (R _c), s	2.0			2.0			2.0			2.0					
Minimum Green (G _{min}), s	6			25			7			25					
Start-Up Lost Time (f), s	2.5			2.5			2.5			2.5					
Extension of Effective Green (e), s	3.5			3.5			3.5			3.5					
Passage (PT), s	2.0			2.0			2.0			2.0					
Recall Mode	Off			Min			Off			Min					
Dual Entry	No			Yes			No			Yes					
Walk (Walk), s				0.0						0.0					
Pedestrian Clearance Time (PC), s				0.0						0.0					
Multimodal Information				EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0			
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0			
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No			
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0			
Pedestrian Signal / Occupied Parking	No			0.50			No			0.50					

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	AM Peak Hour	PHF	0.95		
Urban Street		Analysis Year	2029 No-Build	Analysis Period	1 > 7:00		
Intersection	Germantown Pk/N Park/...	File Name	Germantown Pk_N Park Rd_Valley Forge Rd_na....				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	128	497	75	123	349	48	93	457	120	74	521	79

Signal Information														
Cycle, s	126.0	Reference Phase	2											
Offset, s	0	Reference Point	End											
Uncoordinated	Yes	Simult. Gap E/W	On	Green	9.0	39.0	7.0	47.0	0.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0				
				Red	2.0	2.0	2.0	2.0	0.0	0.0				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	3.0	1.1	3.0	1.1	4.0
Phase Duration, s	15.0	45.0	15.0	45.0	13.0	53.0	13.0	53.0
Change Period, (Y+R _c), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Allow Headway (MAH), s	3.1	3.1	3.1	3.1	3.0	3.0	3.1	3.0
Queue Clearance Time (g _s), s	9.1	42.5	9.1	25.8	7.1	34.6	6.2	46.1
Green Extension Time (g _e), s	0.0	0.0	0.0	1.8	0.0	2.2	0.0	0.4
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	1.00	1.00	0.03	1.00	0.07	1.00	1.00

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	135	586		129	367	40	98	481	95	78	616	
Adjusted Saturation Flow Rate (s), veh/h/ln	1682	1744		1614	1724	1369	1573	1652	1447	1560	1718	
Queue Service Time (g _s), s	6.6	40.0		6.6	23.3	2.6	4.6	32.1	5.5	3.7	43.6	
Cycle Queue Clearance Time (g _c), s	6.6	40.0		6.6	23.3	2.6	4.6	32.1	5.5	3.7	43.6	
Green Ratio (g/C)	0.40	0.32		0.40	0.32	0.32	0.44	0.38	0.38	0.44	0.38	
Capacity (c), veh/h	297	554		185	547	434	163	629	551	240	655	
Volume-to-Capacity Ratio (X)	0.454	1.059		0.699	0.671	0.092	0.602	0.765	0.172	0.325	0.941	
Back of Queue (Q), ft/ln (95 th percentile)	124.5	933.2		146.2	407	44.9	87.9	504.5	84.9	67.7	769.4	
Back of Queue (Q), veh/ln (95 th percentile)	4.8	34.8		5.4	15.3	1.5	3.3	19.1	3.3	2.4	29.4	
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay (d ₁), s/veh	28.2	43.0		31.3	37.7	30.2	29.9	34.5	25.8	26.0	37.6	
Incremental Delay (d ₂), s/veh	0.4	54.8		9.4	2.6	0.0	4.4	5.0	0.1	0.3	21.5	
Initial Queue Delay (d ₃), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veh	28.6	97.8		40.7	40.3	30.3	34.2	39.5	25.9	26.3	59.2	
Level of Service (LOS)	C	F		D	D	C	C	D	C	C	E	
Approach Delay, s/veh / LOS	84.9	F		39.6	D		36.8	D		55.5	E	
Intersection Delay, s/veh / LOS	55.5						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.17	B	1.96	B	2.13	B	1.95	B
Bicycle LOS Score / LOS	1.68	B	1.37	A	1.60	B	1.63	B

HCS Signalized Intersection Input Data

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	PM Peak Hour	PHF	0.96		
Urban Street		Analysis Year	2029 No-Build	Analysis Period	1> 7:00		
Intersection	Germantown Pk/N Park/...	File Name	Germantown Pk_N Park Rd_Valley Forge Rd_np....				
Project Description	24-025 Trooper Ridge Townhouse Devel						

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	185	394	77	224	551	91	60	536	75	67	498	133

Signal Information															
Cycle, s	129.0	Reference Phase	2	Green	12.0	39.0	7.0	47.0	0.0	0.0	Green	7.0	47.0	0.0	0.0
Offset, s	0	Reference Point	End	Yellow	4.0	4.0	4.0	4.0	0.0	0.0	Yellow	4.0	4.0	4.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Red	2.0	2.0	2.0	2.0	0.0	0.0	Red	2.0	2.0	2.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On												

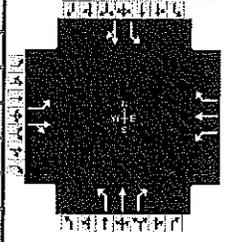
Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	185	394	77	224	551	91	60	536	75	67	498	133
Initial Queue (Q _b), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s ₀), veh/h	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Parking (N _m), man/h		None			None			None			None	
Heavy Vehicles (P _{HV}), %	1	4		4	1	3	2	2	1	5	3	
Ped / Bike / RTOR, /h	0	0	15	0	0	15	0	0	20	0	0	25
Buses (N _b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (f)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	11.0	13.0		11.0	12.0	14.0	10.0	11.0	12.0	10.0	11.0	
Turn Bay Length, ft	0	0		0	0	0	0	0	0	0	0	
Grade (Pg), %		-1			-1			3			-1	
Speed Limit, mi/h	35	35	35	35	35	35	45	45	45	35	35	35

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G _{max}) or Phase Split, s	12.0	39.0	12.0	39.0	7.0	47.0	7.0	47.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Red Clearance Interval (R _c), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Green (G _{min}), s	6	25	7	25	6	3	6	3
Start-Up Lost Time (f), s	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Extension of Effective Green (e), s	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Passage (PT), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Off	Min	Off	Min	Off	Off	Off	Off
Dual Entry	No	Yes	No	Yes	No	Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0									
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No									
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50										

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	PM Peak Hour	PHF	0.96		
Urban Street		Analysis Year	2029 No-Build	Analysis Period	1 > 7:00		
Intersection	Germantown Pk/N Park/...	File Name	Germantown Pk_N Park Rd_Valley Forge Rd_np....				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	185	394	77	224	551	91	60	536	75	67	498	133

Signal Information				Signal Phases									
Cycle, s	129.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On										
Force Mode	Fixed	Simult. Gap N/S	On										
Green	12.0	39.0	7.0	47.0	0.0	0.0							
Yellow	4.0	4.0	4.0	4.0	0.0	0.0							
Red	2.0	2.0	2.0	2.0	0.0	0.0							

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	3.0	1.1	3.0	1.1	4.0
Phase Duration, s	18.0	45.0	18.0	45.0	13.0	53.0	13.0	53.0
Change Period, (Y+R _c), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Allow Headway (MAH), s	3.1	3.1	3.1	3.1	3.0	3.0	3.1	3.0
Queue Clearance Time (g _s), s	12.3	34.2	14.6	42.5	5.4	41.4	5.7	48.7
Green Extension Time (g _e), s	0.0	1.3	0.0	0.0	0.0	1.6	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	0.60	1.00	1.00	1.00	0.49	1.00	1.00

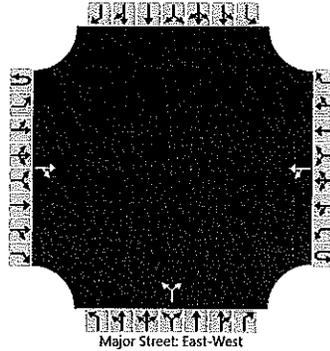
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	193	475		233	574	79	63	558	57	70	631	
Adjusted Saturation Flow Rate (s), veh/h/ln	1736	1807		1696	1823	1582	1640	1722	1471	1682	1739	
Queue Service Time (g _s), s	9.8	31.7		12.1	40.0	4.7	2.9	38.9	3.3	3.2	46.2	
Cycle Queue Clearance Time (g _c), s	9.8	31.7		12.1	40.0	4.7	2.9	38.9	3.3	3.2	46.2	
Green Ratio (g/C)	0.41	0.31		0.41	0.31	0.31	0.43	0.37	0.37	0.43	0.37	
Capacity (c), veh/h	231	560		261	565	490	158	641	547	197	647	
Volume-to-Capacity Ratio (X)	0.835	0.848		0.895	1.015	0.161	0.397	0.872	0.105	0.354	0.976	
Back of Queue (Q), ft/ln (95 th percentile)	227.2	570.9		291.6	823.2	83.2	50.7	627.6	51.4	59.3	833	
Back of Queue (Q), veh/ln (95 th percentile)	9.0	22.1		11.3	32.7	3.3	2.0	24.7	2.0	2.3	32.5	
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay (d ₁), s/veh	33.1	41.6		31.8	44.5	32.3	30.4	38.1	26.5	29.1	39.9	
Incremental Delay (d ₂), s/veh	21.4	11.1		29.2	41.8	0.1	0.6	12.0	0.0	0.4	29.1	
Initial Queue Delay (d ₃), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veh	54.5	52.7		61.0	86.3	32.4	31.0	50.1	26.5	29.5	69.0	
Level of Service (LOS)	D	D		E	F	C	C	D	C	C	E	
Approach Delay, s/veh / LOS	53.2		D	74.8		E	46.4		D	65.1		E
Intersection Delay, s/veh / LOS	61.0						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.16	B	1.97	B	2.14	B	1.95	B
Bicycle LOS Score / LOS	1.59	B	1.95	B	1.61	B	1.64	B

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DHH	Intersection	Trooper Rd/Woodlyn Rd/Woodland Ave
Agency/Co.	Horner & Canter Assoc	Jurisdiction	Worcester Twp
Date Performed	4/2/2025	East/West Street	Woodlyn Rd/Woodland Ave
Analysis Year	2029	North/South Street	Trooper Road
Time Analyzed	AM Peak Hour - No-Build	Peak Hour Factor	0.91
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	24-025 Trooper Ridge Townhouse Devel		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Number of Lanes																
Configuration				TR		LT					LR					
Volume (veh/h)			24	214		32	10			111		13				
Percent Heavy Vehicles (%)						3				8		8				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.3					7.1		6.2			
Critical Headway (sec)						4.33					6.48		6.28			
Base Follow-Up Headway (sec)						3.0					3.0		3.1			
Follow-Up Headway (sec)						3.03					3.07		3.17			

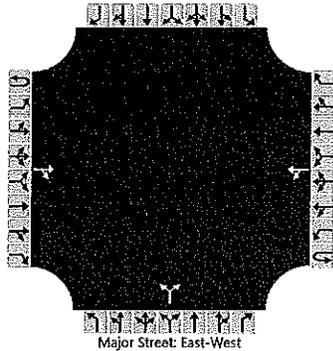
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						35						136				
Capacity, c (veh/h)						967						838				
v/c Ratio						0.04						0.16				
95% Queue Length, Q ₉₅ (veh)						0.1						0.6				
Control Delay (s/veh)						8.9	0.3					10.1				
Level of Service (LOS)						A	A					B				
Approach Delay (s/veh)					6.8				10.1							
Approach LOS					A				B							

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DHH	Intersection	Trooper Rd/Woodlyn Rd/Woodland Ave
Agency/Co.	Horner & Canter Assoc	Jurisdiction	Worcester Twp
Date Performed	4/2/2025	East/West Street	Woodlyn Rd/Woodland Ave
Analysis Year	2029	North/South Street	Trooper Road
Time Analyzed	PM Peak Hour - No-Build	Peak Hour Factor	0.93
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	24-025 Trooper Ridge Townhouse Devel		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			27	172		24	31			226		10				
Percent Heavy Vehicles (%)						0				4		20				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.3					7.1		6.2			
Critical Headway (sec)						4.30					6.44		6.40			
Base Follow-Up Headway (sec)						3.0					3.0		3.1			
Follow-Up Headway (sec)						3.00					3.04		3.28			

Delay, Queue Length, and Level of Service

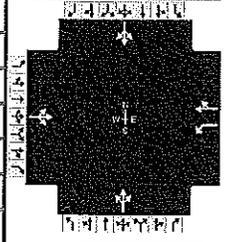
Flow Rate, v (veh/h)						26						254				
Capacity, c (veh/h)						1015						872				
v/c Ratio						0.03						0.29				
95% Queue Length, Q ₉₅ (veh)						0.1						1.2				
Control Delay (s/veh)						8.6	0.2					10.8				
Level of Service (LOS)						A	A					B				
Approach Delay (s/veh)					3.9				10.8							
Approach LOS					A				B							

APPENDIX J

Build Capacity/LOS Analysis Worksheets

HCS Signalized Intersection Input Data

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	AM Peak Hour	PHF	0.95		
Urban Street		Analysis Year	2029 Build	Analysis Period	1 > 7:00		
Intersection	Germantown Pk/Trooper...	File Name	Germantown Pk_Trooper Rd_ba.xus				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	8	697	75	153	511	5	62	115	230	24	180	31

Signal Information													
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	7.0	38.0	27.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0			
				Red	2.0	2.0	2.0	0.0	0.0	0.0			

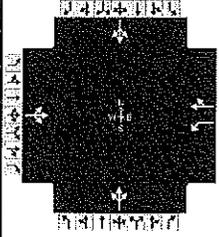
Traffic Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	8	697	75	153	511	5	62	115	230	24	180	31
Initial Queue (Q _b), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s ₀), veh/h	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Parking (N _m), man/h		None			None			None			None	
Heavy Vehicles (P _{HV}), %		5		5	8			7			3	
Ped / Bike / RTOR, /h	0	0	15	0	0	0	0	0	50	0	0	5
Buses (N _b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft		13.0		11.0	12.0			11.0			11.0	
Turn Bay Length, ft		0		0	0			0			0	
Grade (P _g), %		-6			7			1			-3	
Speed Limit, mi/h	45	45	45	45	45	45	45	45	45	40	40	40

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
	Maximum Green (G _{max}) or Phase Split, s		38.0	7.0	51.0		27.0	
Yellow Change Interval (Y), s		4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R _c), s		2.0	2.0	2.0		2.0		2.0
Minimum Green (G _{min}), s		25	7	25		3		3
Start-Up Lost Time (I _t), s	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Extension of Effective Green (e), s	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Passage (P _T), s		2.0	2.0	2.0		2.0		2.0
Recall Mode		Min	Off	Min		Off		Off
Dual Entry		Yes	No	Yes		Yes		Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (P _C), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0									
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No									
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50										

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	AM Peak Hour	PHF	0.95		
Urban Street		Analysis Year	2029 Build	Analysis Period	1> 7:00		
Intersection	Germantown Pk/Trooper...	File Name	Germantown Pk_Trooper Rd_ba.xus				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	8	697	75	153	511	5	62	115	230	24	180	31

Signal Information				EB				WB				NB				SB											
Cycle, s	90.0	Reference Phase	2																								
Offset, s	0	Reference Point	End	Green	7.0	38.0	27.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

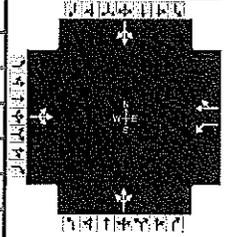
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		4
Case Number		8.3	1.0	4.0		8.0		8.0
Phase Duration, s		44.0	13.0	57.0		33.0		33.0
Change Period, (Y+R _c), s		6.0	6.0	6.0		6.0		6.0
Max Allow Headway (MAH), s		3.0	3.0	3.0		3.2		3.2
Queue Clearance Time (g _s), s		37.0	7.8	26.3		23.4		11.9
Green Extension Time (g _e), s		0.5	0.0	2.8		0.6		1.2
Phase Call Probability		1.00	1.00	1.00		1.00		1.00
Max Out Probability		1.00	1.00	0.00		0.81		0.00

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	805			161	543		376			242		
Adjusted Saturation Flow Rate (s), veh/h/ln	1995			1387	1412		1476			1745		
Queue Service Time (g _s), s	9.5			5.3	23.8		11.5			0.0		
Cycle Queue Clearance Time (g _c), s	34.5			5.3	23.8		20.9			9.4		
Green Ratio (g/C)	0.43			0.55	0.58		0.31			0.31		
Capacity (c), veh/h	905			231	816		506			587		
Volume-to-Capacity Ratio (X)	0.890			0.696	0.666		0.742			0.412		
Back of Queue (Q), ft/ln (95 th percentile)	616.4			87.5	285.4		318			180.1		
Back of Queue (Q), veh/ln (95 th percentile)	23.7			3.4	10.7		12.0			7.0		
Queue Storage Ratio (RQ) (95 th percentile)	0.00			0.00	0.00		0.00			0.00		
Uniform Delay (d ₁), s/veh	24.2			19.5	13.0		28.4			24.6		
Incremental Delay (d ₂), s/veh	10.6			7.4	1.7		5.2			0.2		
Initial Queue Delay (d ₃), s/veh	0.0			0.0	0.0		0.0			0.0		
Control Delay (d), s/veh	34.8			26.9	14.7		33.5			24.8		
Level of Service (LOS)	C			C	B		C			C		
Approach Delay, s/veh / LOS	34.8	C		17.5	B		33.5	C		24.8	C	
Intersection Delay, s/veh / LOS	27.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.75	B	1.66	B	1.92	B	1.72	B
Bicycle LOS Score / LOS	1.82	B	1.65	B	1.11	A	0.89	A

HCS Signalized Intersection Input Data

General Information					Intersection Information				
Agency	Horner & Canter Assoc				Duration, h	0.250			
Analyst	DHH	Analysis Date	Apr 2, 2025		Area Type	Other			
Jurisdiction	Worcester Twp	Time Period	PM Peak Hour		PHF	0.96			
Urban Street		Analysis Year	2029 Build		Analysis Period	1 > 7:00			
Intersection	Germantown Pk/Trooper...	File Name	Germantown Pk_Trooper Rd_bp.xus						
Project Description	24-025 Trooper Ridge Townhouse Devel								



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	16	657	62	332	949	26	89	170	137	14	160	31

Signal Information													
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	13.0	38.0	21.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0			
				Red	2.0	2.0	2.0	0.0	0.0	0.0			

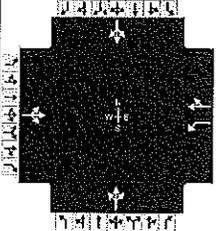
Traffic Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	16	657	62	332	949	26	89	170	137	14	160	31
Initial Queue (Q _b), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s ₀), veh/h	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Parking (N _m), man/h		None			None			None			None	
Heavy Vehicles (P _{HV}), %		4			3	2			2			2
Ped / Bike / RTOR, /h	0	0	15	0	0	5	0	0	30	0	0	5
Buses (N _b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft		13.0			11.0	12.0			11.0			11.0
Turn Bay Length, ft		0			0	0			0			0
Grade (Pg), %		-6			7				1			-3
Speed Limit, mi/h	45	45	45	45	45	45	45	45	45	40	40	40

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
	Maximum Green (G _{max}) or Phase Split, s		38.0	13.0	57.0		21.0	
Yellow Change Interval (Y), s		4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R _c), s		2.0	2.0	2.0		2.0		2.0
Minimum Green (G _{min}), s		25	7	25		3		3
Start-Up Lost Time (I), s	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Extension of Effective Green (e), s	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Passage (PT), s		2.0	2.0	2.0		2.0		2.0
Recall Mode		Min	Off	Min		Off		Off
Dual Entry		Yes	No	Yes		Yes		Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0									
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No									
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50										

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	PM Peak Hour	PHF	0.96		
Urban Street		Analysis Year	2029 Build	Analysis Period	1> 7:00		
Intersection	Germantown Pk/Trooper...	File Name	Germantown Pk_Trooper Rd_bp.xus				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	16	657	62	332	949	26	89	170	137	14	160	31

Signal Information				Signal Timing (s)						Signal Phases			
Cycle, s	90.0	Reference Phase	2	Green	13.0	38.0	21.0	0.0	0.0	0.0	1	2	3
Offset, s	0	Reference Point	End	Yellow	4.0	4.0	4.0	0.0	0.0	0.0	4	5	6
Uncoordinated	Yes	Simult. Gap E/W	On	Red	2.0	2.0	2.0	0.0	0.0	0.0	7	8	9
Force Mode	Fixed	Simult. Gap N/S	On										

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		4
Case Number		8.3	1.0	4.0		8.0		8.0
Phase Duration, s		44.0	19.0	63.0		27.0		27.0
Change Period, (Y+R _c), s		6.0	6.0	6.0		6.0		6.0
Max Allow Headway (MAH), s		3.0	3.0	3.0		3.1		3.1
Queue Clearance Time (g _s), s		41.5	16.5	60.5		24.5		11.2
Green Extension Time (g _e), s		0.0	0.0	0.0		0.0		0.9
Phase Call Probability		1.00	1.00	1.00		1.00		1.00
Max Out Probability		1.00	1.00	1.00		1.00		0.03

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	750			346	1010		381			208		
Adjusted Saturation Flow Rate (s), veh/h/ln	1070			1414	1493		1526			1778		
Queue Service Time (g _s), s	0.0			14.0	58.0		13.3			0.0		
Cycle Queue Clearance Time (g _c), s	39.0			14.0	58.0		22.0			8.7		
Green Ratio (g/C)	0.43			0.62	0.64		0.24			0.24		
Capacity (c), veh/h	505			300	962		423			477		
Volume-to-Capacity Ratio (X)	1.486			1.153	1.050		0.902			0.436		
Back of Queue (Q), ft/ln (95 th percentile)	1678.1			438.5	908.6		395.1			168.4		
Back of Queue (Q), veh/ln (95 th percentile)	65.0			17.1	35.8		15.6			6.6		
Queue Storage Ratio (RQ) (95 th percentile)	0.00			0.00	0.00		0.00			0.00		
Uniform Delay (d ₁), s/veh	29.7			26.9	16.0		34.1			29.0		
Incremental Delay (d ₂), s/veh	229.3			100.0	43.2		21.5			0.2		
Initial Queue Delay (d ₃), s/veh	0.0			0.0	0.0		0.0			0.0		
Control Delay (d), s/veh	259.0			126.9	59.2		55.7			29.2		
Level of Service (LOS)	F			F	F		E			C		
Approach Delay, s/veh / LOS	259.0	F		76.4	E		55.7	E		29.2	C	
Intersection Delay, s/veh / LOS	120.6						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.72	B	1.65	B	1.94	B	1.72	B
Bicycle LOS Score / LOS	1.73	B	2.73	C	1.12	A	0.83	A

HCS Signalized Intersection Input Data

General Information						Intersection Information					
Agency	Horner & Canter Assoc					Duration, h	0.250				
Analyst	DHH		Analysis Date	Apr 2, 2025		Area Type	Other				
Jurisdiction	Worcester Twp		Time Period	AM Peak Hour		PHF	0.95				
Urban Street			Analysis Year	2029 Build Impr		Analysis Period	1> 7:00				
Intersection	Germantown Pk/Trooper...		File Name	Germantown Pk_Trooper Rd_ba_impr.xus							
Project Description	24-025 Trooper Ridge Townhouse Devel										

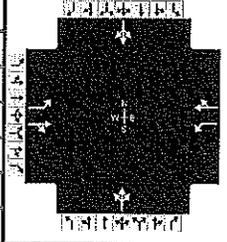
Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	8	697	75	153	511	5	62	115	230	24	180	31

Signal Information				Signal Timing (s)						Signal Phases			
Cycle, s	90.0	Reference Phase	2	Green	7.0	38.0	27.0	0.0	0.0	0.0	1	2	3
Offset, s	0	Reference Point	End	Yellow	4.0	4.0	4.0	0.0	0.0	0.0	5	6	7
Uncoordinated	Yes	Simult. Gap E/W	On	Red	2.0	2.0	2.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On										

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	8	697	75	153	511	5	62	115	230	24	180	31
Initial Queue (Q _b), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s ₀), veh/h	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Parking (N _m), man/h		None			None			None			None	
Heavy Vehicles (P _{HV}), %	0	5		5	8			7			3	
Ped / Bike / RTOR, /h	0	0	15	0	0	0	0	0	50	0	0	5
Buses (N _b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	13.0		11.0	12.0			11.0			11.0	
Turn Bay Length, ft	0	0		0	0			0			0	
Grade (P _g), %		-6			7			1			-3	
Speed Limit, mi/h	45	45	45	45	45	45	45	45	45	40	40	40

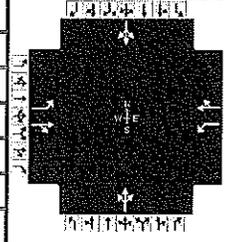
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G _{max}) or Phase Split, s		38.0	7.0	51.0		27.0		27.0
Yellow Change Interval (Y), s		4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R _c), s		2.0	2.0	2.0		2.0		2.0
Minimum Green (G _{min}), s		25	7	25		3		3
Start-Up Lost Time (I _l), s	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Extension of Effective Green (e), s	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Passage (PT), s		2.0	2.0	2.0		2.0		2.0
Recall Mode		Min	Off	Min		Off		Off
Dual Entry		Yes	No	Yes		Yes		Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0									
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No									
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50										



HCS Signalized Intersection Results Summary

General Information					Intersection Information				
Agency	Horner & Canter Assoc				Duration, h	0.250			
Analyst	DHH	Analysis Date	Apr 2, 2025		Area Type	Other			
Jurisdiction	Worcester Twp	Time Period	AM Peak Hour		PHF	0.95			
Urban Street		Analysis Year	2029 Build Impr		Analysis Period	1> 7:00			
Intersection	Germantown Pk/Trooper...	File Name	Germantown Pk_Trooper Rd_ba_impr.xus						
Project Description	24-025 Trooper Ridge Townhouse Devel								



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	8	697	75	153	511	5	62	115	230	24	180	31

Signal Information													
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	7.0	38.0	27.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0			
				Red	2.0	2.0	2.0	0.0	0.0	0.0			

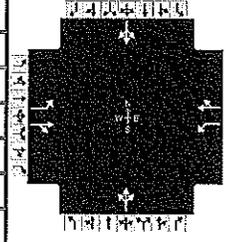
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		4
Case Number		6.3	1.0	4.0		8.0		8.0
Phase Duration, s		44.0	13.0	57.0		33.0		33.0
Change Period, (Y+Rc), s		6.0	6.0	6.0		6.0		6.0
Max Allow Headway (MAH), s		3.0	3.0	3.0		3.2		3.2
Queue Clearance Time (gs), s		36.2	7.8	26.3		23.4		11.9
Green Extension Time (ge), s		0.7	0.0	2.7		0.6		1.2
Phase Call Probability		1.00	1.00	1.00		1.00		1.00
Max Out Probability		1.00	1.00	0.00		0.81		0.00

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	8	797		161	543			376			242	
Adjusted Saturation Flow Rate (s), veh/h/ln	877	2002		1387	1412			1476			1745	
Queue Service Time (gs), s	0.6	33.7		5.3	23.8			11.5			0.0	
Cycle Queue Clearance Time (gc), s	11.4	33.7		5.3	23.8			20.9			9.4	
Green Ratio (g/C)	0.43	0.43		0.55	0.58			0.31			0.31	
Capacity (c), veh/h	355	868		236	816			506			587	
Volume-to-Capacity Ratio (X)	0.024	0.919		0.682	0.666			0.742			0.412	
Back of Queue (Q), ft/ln (95 th percentile)	5.2	632.7		85	285.4			318			180.1	
Back of Queue (Q), veh/ln (95 th percentile)	0.2	24.3		3.3	10.7			12.0			7.0	
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00		0.00	0.00			0.00			0.00	
Uniform Delay (d1), s/veh	21.4	24.0		19.3	13.0			28.4			24.6	
Incremental Delay (d2), s/veh	0.0	14.3		6.5	1.7			5.2			0.2	
Initial Queue Delay (d3), s/veh	0.0	0.0		0.0	0.0			0.0			0.0	
Control Delay (d), s/veh	21.4	38.3		25.8	14.7			33.5			24.8	
Level of Service (LOS)	C	D		C	B			C			C	
Approach Delay, s/veh / LOS	38.1		D	17.3		B	33.5		C	24.8		C
Intersection Delay, s/veh / LOS	28.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.75	B	1.66	B	1.92	B	1.94	B
Bicycle LOS Score / LOS	1.82	B	1.65	B	1.11	A	0.89	A

HCS Signalized Intersection Input Data

General Information					Intersection Information					
Agency	Horner & Canter Assoc				Duration, h	0.250				
Analyst	DHH	Analysis Date	Apr 2, 2025		Area Type	Other				
Jurisdiction	Worcester Twp	Time Period	PM Peak Hour		PHF	0.96				
Urban Street		Analysis Year	2029 Build Impr		Analysis Period	1> 7:00				
Intersection	Germantown Pk/Trooper...	File Name	Germantown Pk_Trooper Rd_bp_impr.xus							
Project Description	24-025 Trooper Ridge Townhouse Devel									



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	16	657	62	332	949	26	89	170	137	14	160	31

Signal Information													
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	11.0	39.0	22.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0			
				Red	2.0	2.0	2.0	0.0	0.0	0.0			

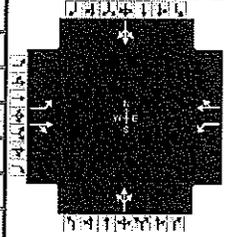
Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	16	657	62	332	949	26	89	170	137	14	160	31
Initial Queue (Q _b), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s ₀), veh/h	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Parking (N _m), man/h	None			None			None			None		
Heavy Vehicles (P _{HV}), %	0	4		3	2			2			2	
Ped / Bike / RTOR, /h	0	0	15	0	0	5	0	0	30	0	0	5
Buses (N _b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	13.0		11.0	12.0			11.0			11.0	
Turn Bay Length, ft	0	0		0	0			0			0	
Grade (P _g), %		-6			7			1			-3	
Speed Limit, mi/h	45	45	45	45	45	45	45	45	45	40	40	40

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G _{max}) or Phase Split, s		39.0	11.0	56.0		22.0		22.0
Yellow Change Interval (Y), s		4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R _c), s		2.0	2.0	2.0		2.0		2.0
Minimum Green (G _{min}), s		25	7	25		3		3
Start-Up Lost Time (I _t), s	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Extension of Effective Green (e), s	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Passage (PT), s		2.0	2.0	2.0		2.0		2.0
Recall Mode		Min	Off	Min		Off		Off
Dual Entry		Yes	No	Yes		Yes		Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0									
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No									
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50										

HCS Signalized Intersection Results Summary

General Information					Intersection Information				
Agency	Horner & Canter Assoc				Duration, h	0.250			
Analyst	DHH		Analysis Date	Apr 2, 2025	Area Type	Other			
Jurisdiction	Worcester Twp		Time Period	PM Peak Hour	PHF	0.96			
Urban Street			Analysis Year	2029 Build Impr	Analysis Period	1> 7:00			
Intersection	Germantown Pk/Trooper...		File Name	Germantown Pk_Trooper Rd_bp_impr.xus					
Project Description	24-025 Trooper Ridge Townhouse Devel								



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	16	657	62	332	949	26	89	170	137	14	160	31

Signal Information													
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	11.0	39.0	22.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0			
				Red	2.0	2.0	2.0	0.0	0.0	0.0			

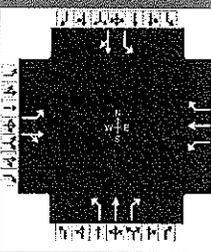
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		4
Case Number		6.3	1.0	4.0		8.0		8.0
Phase Duration, s		45.0	17.0	62.0		28.0		28.0
Change Period, (Y+Rc), s		6.0	6.0	6.0		6.0		6.0
Max Allow Headway (MAH), s		3.0	3.0	3.0		3.1		3.1
Queue Clearance Time (gs), s		42.5	14.5	59.5		24.6		11.1
Green Extension Time (ge), s		0.0	0.0	0.0		0.0		1.0
Phase Call Probability		1.00	1.00	1.00		1.00		1.00
Max Out Probability		1.00	1.00	1.00		1.00		0.02

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	17	733		346	1010			381			208	
Adjusted Saturation Flow Rate (s), veh/h/ln	567	2021		1414	1493			1534			1784	
Queue Service Time (gs), s	0.0	28.5		12.0	57.0			13.6			0.0	
Cycle Queue Clearance Time (gc), s	40.0	28.5		12.0	57.0			22.1			8.6	
Green Ratio (g/C)	0.44	0.44		0.61	0.63			0.26			0.26	
Capacity (c), veh/h	80	898		346	945			442			499	
Volume-to-Capacity Ratio (X)	0.208	0.816		0.999	1.069			0.863			0.418	
Back of Queue (Q), ft/ln (95 th percentile)	16.5	495.4		306.4	966.2			369.3			165.6	
Back of Queue (Q), veh/ln (95 th percentile)	0.7	19.2		12.0	38.0			14.5			6.5	
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00		0.00	0.00			0.00			0.00	
Uniform Delay (d1), s/veh	45.0	21.8		18.8	16.5			33.0			28.1	
Incremental Delay (d2), s/veh	0.5	5.5		48.1	49.5			15.3			0.2	
Initial Queue Delay (d3), s/veh	0.0	0.0		0.0	0.0			0.0			0.0	
Control Delay (d), s/veh	45.5	27.3		66.9	66.0			48.4			28.3	
Level of Service (LOS)	D	C		E	F			D			C	
Approach Delay, s/veh / LOS	27.7	C		66.2	E		48.4	D		28.3	C	
Intersection Delay, s/veh / LOS	50.1						D					

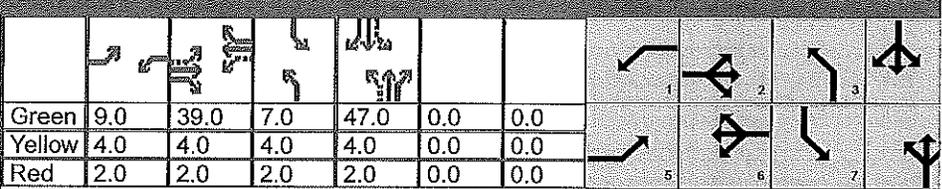
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.72	B	1.65	B	1.93	B	1.95	B
Bicycle LOS Score / LOS	1.73	B	2.73	C	1.12	A	0.83	A

HCS Signalized Intersection Input Data

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	AM Peak Hour	PHF	0.95		
Urban Street		Analysis Year	2029 Build	Analysis Period	1> 7:00		
Intersection	Germantown Pk/N Park/...	File Name	Germantown Pk_N Park Rd_Valley Forge Rd_ba....				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	128	498	75	126	352	52	93	457	121	75	521	79

Signal Information												
Cycle, s	126.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									
Green	9.0	39.0	7.0	47.0	0.0	0.0						
Yellow	4.0	4.0	4.0	4.0	0.0	0.0						
Red	2.0	2.0	2.0	2.0	0.0	0.0						

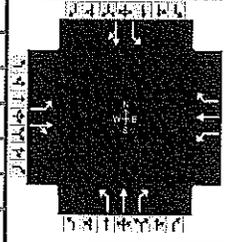
Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	128	498	75	126	352	52	93	457	121	75	521	79
Initial Queue (Q _b), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s ₀), veh/h	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Parking (N _m), man/h	None			None			None			None		
Heavy Vehicles (P _{HV}), %	5	9		10	8	20	7	7	3	14	6	
Ped / Bike / RTOR, /h	0	0	15	0	0	10	0	0	30	0	0	15
Buses (N _b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (f)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	11.0	13.0		11.0	12.0	14.0	10.0	11.0	12.0	10.0	11.0	
Turn Bay Length, ft	0	0		0	0	0	0	0	0	0	0	
Grade (P _g), %		-1			-1			3			-1	
Speed Limit, mi/h	35	35	35	35	35	35	45	45	45	35	35	35

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G _{max}) or Phase Split, s	9.0	39.0	9.0	39.0	7.0	47.0	7.0	47.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Red Clearance Interval (R _c), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Green (G _{min}), s	6	25	7	25	6	3	6	3
Start-Up Lost Time (l), s	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Extension of Effective Green (e), s	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Passage (PT), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Off	Min	Off	Min	Off	Off	Off	Off
Dual Entry	No	Yes	No	Yes	No	Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0									
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No									
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50										

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	AM Peak Hour	PHF	0.95		
Urban Street		Analysis Year	2029 Build	Analysis Period	1 > 7:00		
Intersection	Germantown Pk/N Park/...	File Name	Germantown Pk_N Park Rd_Valley Forge Rd_ba....				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	128	498	75	126	352	52	93	457	121	75	521	79

Signal Information				Signal Phases								
Cycle, s	126.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									
Green	9.0	39.0	7.0	47.0	0.0	0.0						
Yellow	4.0	4.0	4.0	4.0	0.0	0.0						
Red	2.0	2.0	2.0	2.0	0.0	0.0						

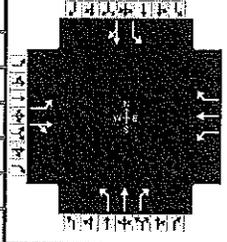
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	3.0	1.1	3.0	1.1	4.0
Phase Duration, s	15.0	45.0	15.0	45.0	13.0	53.0	13.0	53.0
Change Period, (Y+R _c), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Allow Headway (MAH), s	3.1	3.1	3.1	3.1	3.0	3.0	3.1	3.0
Queue Clearance Time (g _s), s	9.1	42.5	9.3	26.1	7.1	34.6	6.2	46.1
Green Extension Time (g _e), s	0.0	0.0	0.0	1.8	0.0	2.2	0.0	0.4
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	1.00	1.00	0.03	1.00	0.07	1.00	1.00

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	135	587		133	371	44	98	481	96	79	616	
Adjusted Saturation Flow Rate (s), veh/h/ln	1682	1744		1614	1724	1369	1573	1652	1447	1560	1718	
Queue Service Time (g _s), s	6.6	40.0		6.8	23.6	2.9	4.6	32.1	5.5	3.7	43.6	
Cycle Queue Clearance Time (g _c), s	6.6	40.0		6.8	23.6	2.9	4.6	32.1	5.5	3.7	43.6	
Green Ratio (g/C)	0.40	0.32		0.40	0.32	0.32	0.44	0.38	0.38	0.44	0.38	
Capacity (c), veh/h	294	554		185	547	434	163	629	551	240	655	
Volume-to-Capacity Ratio (X)	0.458	1.061		0.716	0.677	0.102	0.602	0.765	0.174	0.329	0.941	
Back of Queue (Q), ft/ln (95 th percentile)	124.5	937.2		152.8	411.2	49.7	87.9	504.5	86	68.7	769.4	
Back of Queue (Q), veh/ln (95 th percentile)	4.8	35.0		5.7	15.5	1.7	3.3	19.1	3.4	2.5	29.4	
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay (d ₁), s/veh	28.3	43.0		31.3	37.8	30.3	29.9	34.5	25.9	26.0	37.6	
Incremental Delay (d ₂), s/veh	0.4	55.4		10.8	2.8	0.0	4.4	5.0	0.1	0.3	21.5	
Initial Queue Delay (d ₃), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veh	28.7	98.4		42.1	40.5	30.4	34.2	39.5	25.9	26.3	59.2	
Level of Service (LOS)	C	F		D	D	C	C	D	C	C	E	
Approach Delay, s/veh / LOS	85.4	F		40.1	D		36.8	D		55.4	E	
Intersection Delay, s/veh / LOS	55.7						E					

Multimodal Results	EB	WB	NB	SB
Pedestrian LOS Score / LOS	2.17 / B	1.96 / B	2.13 / B	1.95 / B
Bicycle LOS Score / LOS	1.68 / B	1.39 / A	1.60 / B	1.63 / B

HCS Signalized Intersection Input Data

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	PM Peak Hour	PHF	0.96		
Urban Street		Analysis Year	2029 Build	Analysis Period	1> 7:00		
Intersection	Germantown Pk/N Park/...	File Name	Germantown Pk_N Park Rd_Valley Forge Rd_bp....				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	185	397	77	226	553	94	60	536	78	71	498	133

Signal Information												
Cycle, s	129.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	12.0	39.0	7.0	47.0	0.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0	0.0	0.0
				Red	2.0	2.0	2.0	2.0	0.0	0.0	0.0	0.0

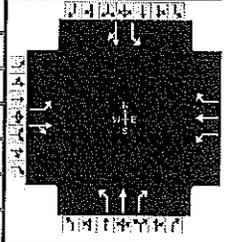
Traffic Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	185	397	77	226	553	94	60	536	78	71	498	133
Initial Queue (Q _b), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s ₀), veh/h	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Parking (N _m), man/h	None			None			None			None		
Heavy Vehicles (P _{HV}), %	1	4		4	1	3	2	2	1	5	3	
Ped / Bike / RTOR, /h	0	0	15	0	0	15	0	0	20	0	0	25
Buses (N _b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (f)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	11.0	13.0		11.0	12.0	14.0	10.0	11.0	12.0	10.0	11.0	
Turn Bay Length, ft	0	0		0	0	0	0	0	0	0	0	
Grade (Pg), %		-1			-1			3			-1	
Speed Limit, mi/h	35	35	35	35	35	35	45	45	45	35	35	35

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G _{max}) or Phase Split, s	12.0	39.0	12.0	39.0	7.0	47.0	7.0	47.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Red Clearance Interval (R _c), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Green (G _{min}), s	6	25	7	25	6	3	6	3
Start-Up Lost Time (l), s	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Extension of Effective Green (e), s	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Passage (PT), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Off	Min	Off	Min	Off	Off	Off	Off
Dual Entry	No	Yes	No	Yes	No	Yes	No	Yes
Walk (Walk), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0									
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No									
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50										

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Horner & Canter Assoc			Duration, h	0.250		
Analyst	DHH	Analysis Date	Apr 2, 2025	Area Type	Other		
Jurisdiction	Worcester Twp	Time Period	PM Peak Hour	PHF	0.96		
Urban Street		Analysis Year	2029 Build	Analysis Period	1 > 7:00		
Intersection	Germantown Pk/N Park/...	File Name	Germantown Pk_N Park Rd_Valley Forge Rd_bp....				
Project Description	24-025 Trooper Ridge Townhouse Devel						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	185	397	77	226	553	94	60	536	78	71	498	133

Signal Information				Signal Phases									
Cycle, s	129.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On										
Force Mode	Fixed	Simult. Gap N/S	On										
Green	12.0	39.0	7.0	47.0	0.0	0.0							
Yellow	4.0	4.0	4.0	4.0	0.0	0.0							
Red	2.0	2.0	2.0	2.0	0.0	0.0							

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	3.0	1.1	3.0	1.1	4.0
Phase Duration, s	18.0	45.0	18.0	45.0	13.0	53.0	13.0	53.0
Change Period, (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Allow Headway (MAH), s	3.1	3.1	3.1	3.1	3.0	3.0	3.1	3.0
Queue Clearance Time (gs), s	12.3	34.5	14.8	42.5	5.4	41.4	5.9	48.7
Green Extension Time (ge), s	0.0	1.3	0.0	0.0	0.0	1.6	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	0.65	1.00	1.00	1.00	0.49	1.00	1.00

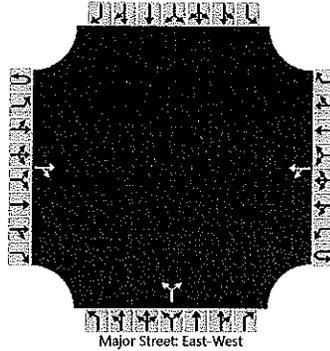
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	193	478		235	576	82	63	558	60	74	631	
Adjusted Saturation Flow Rate (s), veh/h/ln	1736	1808		1696	1823	1582	1640	1722	1471	1682	1739	
Queue Service Time (gs), s	9.8	32.0		12.3	40.0	4.9	2.9	38.9	3.5	3.4	46.2	
Cycle Queue Clearance Time (gc), s	9.8	32.0		12.3	40.0	4.9	2.9	38.9	3.5	3.4	46.2	
Green Ratio (g/C)	0.41	0.31		0.41	0.31	0.31	0.43	0.37	0.37	0.43	0.37	
Capacity (c), veh/h	231	561		259	565	490	158	641	547	197	647	
Volume-to-Capacity Ratio (X)	0.835	0.853		0.910	1.019	0.168	0.397	0.872	0.110	0.375	0.976	
Back of Queue (Q), ft/ln (95 th percentile)	227.2	577.1		300.6	829.8	86.7	50.7	627.6	54.4	63	833	
Back of Queue (Q), veh/ln (95 th percentile)	9.0	22.4		11.7	32.9	3.4	2.0	24.7	2.2	2.4	32.5	
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay (d1), s/veh	33.1	41.7		31.9	44.5	32.4	30.4	38.1	26.5	29.2	39.9	
Incremental Delay (d2), s/veh	21.4	11.6		32.5	42.7	0.1	0.6	12.0	0.0	0.4	29.1	
Initial Queue Delay (d3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veh	54.5	53.3		64.4	87.2	32.4	31.0	50.1	26.6	29.7	69.0	
Level of Service (LOS)	D	D		E	F	C	C	D	C	C	E	
Approach Delay, s/veh / LOS	53.7	D		76.2	E		46.3	D		64.9	E	
Intersection Delay, s/veh / LOS	61.5						E					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.16	B		1.97	B		2.14	B		1.95	B	
Bicycle LOS Score / LOS	1.59	B		1.96	B		1.61	B		1.65	B	

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	DHH			Intersection	Trooper Rd/Woodlyn Rd/Woodland Ave		
Agency/Co.	Horner & Canter Assoc			Jurisdiction	Worcester Twp		
Date Performed	4/2/2025			East/West Street	Woodlyn Rd/Woodland Ave		
Analysis Year	2029			North/South Street	Trooper Road		
Time Analyzed	AM Peak Hour - Build			Peak Hour Factor	0.91		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	24-025 Trooper Ridge Townhouse Devel						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			24	214		32	10			112		14				
Percent Heavy Vehicles (%)						3				8		8				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.3				7.1		6.2				
Critical Headway (sec)						4.33				6.48		6.28				
Base Follow-Up Headway (sec)						3.0				3.0		3.1				
Follow-Up Headway (sec)						3.03				3.07		3.17				

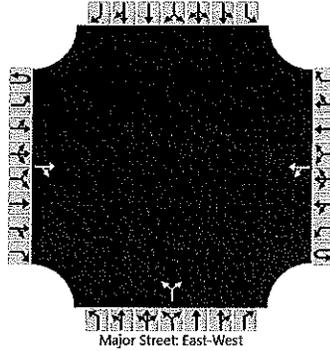
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						35						138				
Capacity, c (veh/h)						967						838				
v/c Ratio						0.04						0.17				
95% Queue Length, Q ₉₅ (veh)						0.1						0.6				
Control Delay (s/veh)						8.9	0.3					10.1				
Level of Service (LOS)						A	A					B				
Approach Delay (s/veh)					6.8				10.1							
Approach LOS					A				B							

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DHH	Intersection	Trooper Rd/Woodlyn Rd/Woodland Ave
Agency/Co.	Horner & Canter Assoc	Jurisdiction	Worcester Twp
Date Performed	4/2/2025	East/West Street	Woodlyn Rd/Woodland Ave
Analysis Year	2029	North/South Street	Trooper Road
Time Analyzed	PM Peak Hour - Build	Peak Hour Factor	0.93
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	24-025 Trooper Ridge Townhouse Devel		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority	1				4					7				10		
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			27	173		24	31			227		10				
Percent Heavy Vehicles (%)						0				4		20				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.3				7.1		6.2				
Critical Headway (sec)						4.30				6.44		6.40				
Base Follow-Up Headway (sec)						3.0				3.0		3.1				
Follow-Up Headway (sec)						3.00				3.04		3.28				

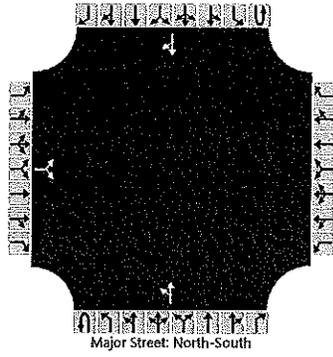
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						26					255					
Capacity, c (veh/h)						1014					872					
v/c Ratio						0.03					0.29					
95% Queue Length, Q ₉₅ (veh)						0.1					1.2					
Control Delay (s/veh)						8.6	0.2				10.8					
Level of Service (LOS)						A	A				B					
Approach Delay (s/veh)					3.9				10.8							
Approach LOS					A				B							

HCS Two-Way Stop Control Report

General Information				Site Information			
Analyst	DHH			Intersection	Trooper Rd/Site Access		
Agency/Co.	Horner & Canter Assoc			Jurisdiction	Worcester Twp		
Date Performed	4/2/2025			East/West Street	Site Access		
Analysis Year	2029			North/South Street	Trooper Road		
Time Analyzed	AM Peak Hour - Build			Peak Hour Factor	0.90		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	24-025 Trooper Ridge Townhouse Devel						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		2		15						5	123				220	0
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.3						
Critical Headway (sec)		6.43		6.23						4.33						
Base Follow-Up Headway (sec)		3.0		3.1						3.0						
Follow-Up Headway (sec)		3.03		3.13						3.03						

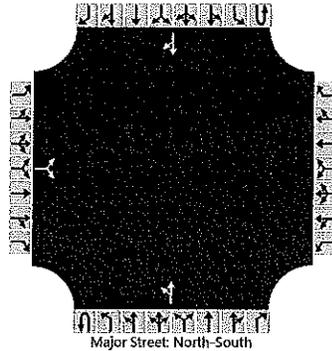
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			19							6						
Capacity, c (veh/h)			816							981						
v/c Ratio			0.02							0.01						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			9.5							8.7	0.1					
Level of Service (LOS)			A							A	A					
Approach Delay (s/veh)	9.5								0.4							
Approach LOS	A								A							

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	DHH			Intersection	Trooper Rd/Site Access		
Agency/Co.	Horner & Canter Assoc.			Jurisdiction	Worcester Twp		
Date Performed	4/2/2025			East/West Street	Site Access		
Analysis Year	2029			North/South Street	Trooper Road		
Time Analyzed	PM Peak Hour - Build			Peak Hour Factor	0.90		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	24-025 Trooper Ridge Townhouse Devel						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		1		10						14	199				196	1
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.3						
Critical Headway (sec)		6.43		6.23						4.33						
Base Follow-Up Headway (sec)		3.0		3.1						3.0						
Follow-Up Headway (sec)		3.03		3.13						3.03						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			12							16						
Capacity, c (veh/h)			834							1001						
v/c Ratio			0.01							0.02						
95% Queue Length, Q ₉₅ (veh)			0.0							0.0						
Control Delay (s/veh)			9.4							8.7	0.2					
Level of Service (LOS)			A							A	A					
Approach Delay (s/veh)	9.4								0.7							
Approach LOS	A								A							

APPENDIX K

Left-Turn Conflict Analysis Worksheet

Conflict Factor (CF) Calculation Worksheet

Intersection of Trooper Road (SR 3002)/Germantown Pike -2029 Build

Trooper Ridge Townhouse Development
HCA File No. 24-025

Calculated By: DHH
4/2/2025

Intersection (Approach)	Left Lane Present?	# of Opp lanes	AM Peak Hour			PM Peak Hour			Meets?
			Left	Opp TR	CF	Left	Opp TR	CF	
Trooper Rd (SR 3002)/Germantown Pk									
EB Germantown Pk	Yes	1	8	516	4,128	16	975	15,600	No
WB Germantown Pk	Yes	1	153	772	118,116	332	719	238,708	Yes
NB Trooper Rd (SR 3002)	No	1	62	211	13,082	89	191	16,999	No
SB Trooper Rd (SR 3002)	No	1	24	345	8,280	14	307	4,298	No

Consider Protected/Permitted Left-Turn Phasing:

When:

- a) A separate left-turn lane is NOT present and:
 - a. One opposing lane exists; then two or more one-hour period conflict factors (CF) need to be greater than 35,000
 - b. Two opposing lanes exist; then two or more one-hour period conflict factors (CF) need to be greater than 45,000

- b) A separate left-turn lane is present and:

- a. One opposing lane exists; then two or more one-hour period conflict factors (CF) need to be greater than 50,000
- b. Two opposing lanes exist; then two or more one-hour period conflict factors (CF) need to be greater than 65,000

Consider Protected/Prohibited Left-Turn Phasing (must have a separate left-turn lane):

When:

- a. One opposing lane exists; then two or more one-hour period conflict factors (CF) need to be greater than 67,500
- b. Two opposing lanes exist; then two or more one-hour period conflict factors (CF) need to be greater than 90,000

APPENDIX L

Auxiliary Lane Warrant Worksheets

Turn Lane Warrant and Length Analysis Workbook

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality: Worcester Township	Analysis Date: 1/9/2025
County: Montgomery County	Conducted By: DHH
PennDOT Engineering District: 6	Checked By: DHH
	Agency/Company Name: Horner & Canter Assoc
Intersection & Approach Description: Trooper Road (SR 3002)/Site Access	
Analysis Period: 2029 Build	Number of Approach Lanes: 1
Design Hour: AM Peak Hour	Undivided or Divided Highway: Undivided
Intersection Control: Unsignalized	Type of Analysis
Posted Speed Limit (MPH): 40	
Type of Terrain: Level	
	Left or Right-Turn Lane Analysis: Left Turn Lane

VOLUME CALCULATIONS

Left Turn Lane Volume Calculations					
Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	Yes	5	3.0%	6
	Through	-	123	3.0%	125
	Right	No	0	0.0%	N/A
Opposing	Left	No	0	0.0%	N/A
	Through	-	220	3.0%	224
	Right	Yes	0	3.0%	0

Advancing Volume:	131
Opposing Volume:	224
Left Turn Volume:	6
% Left Turns in Advancing Volume: 4.58%	

Right Turn Lane Volume Calculations					
Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	No	0	0.0%	N/A
	Through	-	220	3.0%	N/A
	Right	-	0	3.0%	N/A

Advancing Volume:	N/A
Right Turn Volume:	N/A

TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings	Right Turn Lane Warrant Findings
Applicable Warrant Figure: Figure 2	Applicable Warrant Figure: N/A
Warrant Met?: No	Warrant Met?: N/A

TURN LANE LENGTH CALCULATIONS

Intersection Control: Unsignalized	
Design Hour Volume of Turning Lane: 6	
Cycles Per Hour (Assumed): 60	
Cycles Per Hour (If Known): 60	Average # of Vehicles/Cycle: N/A

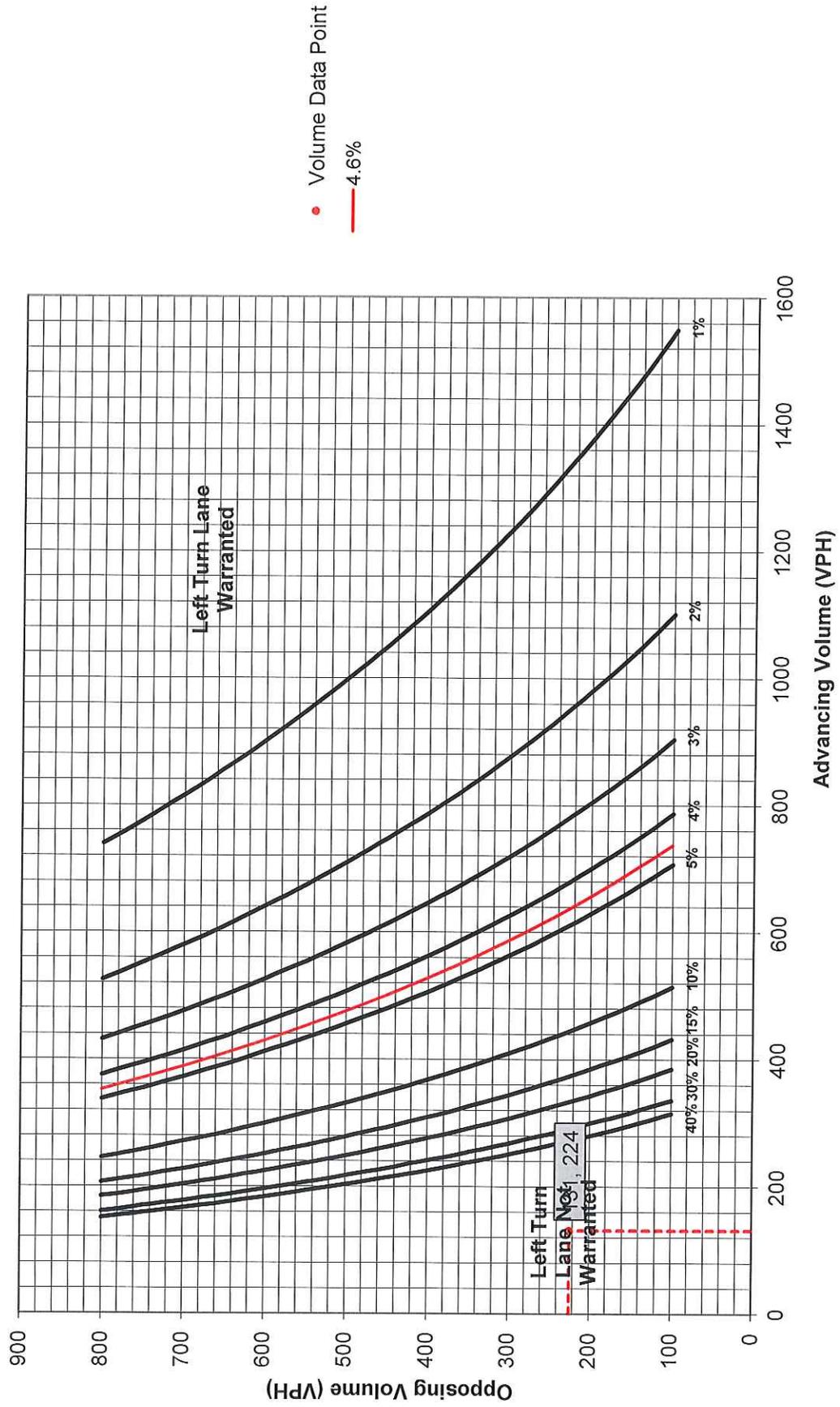
Type of Traffic Control	PennDOT Publication 46, Exhibit 11-6					
	Speed (MPH)					
	25-35		40-45		50-60	
	Turn Demand Volume					
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B

Left Turn Lane Storage Length, Condition A:	N/A	Feet
Condition B:	N/A	Feet
Condition C:	N/A	Feet
Required Left Turn Lane Storage Length:	N/A	Feet

Additional Findings: N/A

Additional Comments / Justifications:

**Figure 2. Warrant for left turn lanes on two-lane highways
(40 mph speed, unsignalized and signalized intersections)**
(L = % Left Turns in Advancing Volume)



Turn Lane Warrant and Length Analysis Workbook

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality: <input type="text" value="Worcester Township"/> County: <input type="text" value="Montgomery County"/> PennDOT Engineering District: <input type="text" value="6"/>	Analysis Date: <input type="text" value="1/9/2025"/> Conducted By: <input type="text" value="DHH"/> Checked By: <input type="text" value="DHH"/> Agency/Company Name: <input type="text" value="Horner & Canter Assoc"/>
Intersection & Approach Description: <input style="width: 100%;" type="text" value="Trooper Road (SR 3002)/Site Access"/>	
Analysis Period: <input type="text" value="2029 Build"/> Design Hour: <input type="text" value="PM Peak Hour"/> Intersection Control: <input type="text" value="Unsignalized"/> Posted Speed Limit (MPH): <input type="text" value="40"/> Type of Terrain: <input type="text" value="Level"/>	Number of Approach Lanes: <input type="text" value="1"/> Undivided or Divided Highway: <input type="text" value="Undivided"/> Left or Right-Turn Lane Analysis?: <input style="border: 2px solid red;" type="text" value="Type of Analysis"/> Left Turn Lane

VOLUME CALCULATIONS

Left Turn Lane Volume Calculations					
Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	Yes	14	3.0%	15
	Through	-	199	2.0%	201
	Right	No	0	0.0%	N/A
Opposing	Left	No	0	0.0%	N/A
	Through	-	196	2.0%	198
	Right	Yes	1	3.0%	2

Advancing Volume:	<input type="text" value="216"/>
Opposing Volume:	<input type="text" value="200"/>
Left Turn Volume:	<input type="text" value="15"/>
% Left Turns in Advancing Volume: <input type="text" value="6.94%"/>	

Right Turn Lane Volume Calculations					
Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	No	0	0.0%	N/A
	Through	-	196	2.0%	N/A
	Right	-	1	3.0%	N/A

Advancing Volume:	<input type="text" value="N/A"/>
Right Turn Volume:	<input type="text" value="N/A"/>

TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings Applicable Warrant Figure: <input style="width: 100%;" type="text" value="Figure 2"/> Warrant Met?: <input style="width: 100%;" type="text" value="No"/>	Right Turn Lane Warrant Findings Applicable Warrant Figure: <input style="width: 100%;" type="text" value="N/A"/> Warrant Met?: <input style="width: 100%;" type="text" value="N/A"/>
---	--

TURN LANE LENGTH CALCULATIONS

Intersection Control: <input type="text" value="Unsignalized"/> Design Hour Volume of Turning Lane: <input type="text" value="15"/> Cycles Per Hour (Assumed): <input type="text" value="60"/> Cycles Per Hour (If Known): <input type="text" value="60"/>	Average # of Vehicles/Cycle: <input style="width: 100%;" type="text" value="N/A"/>
---	--

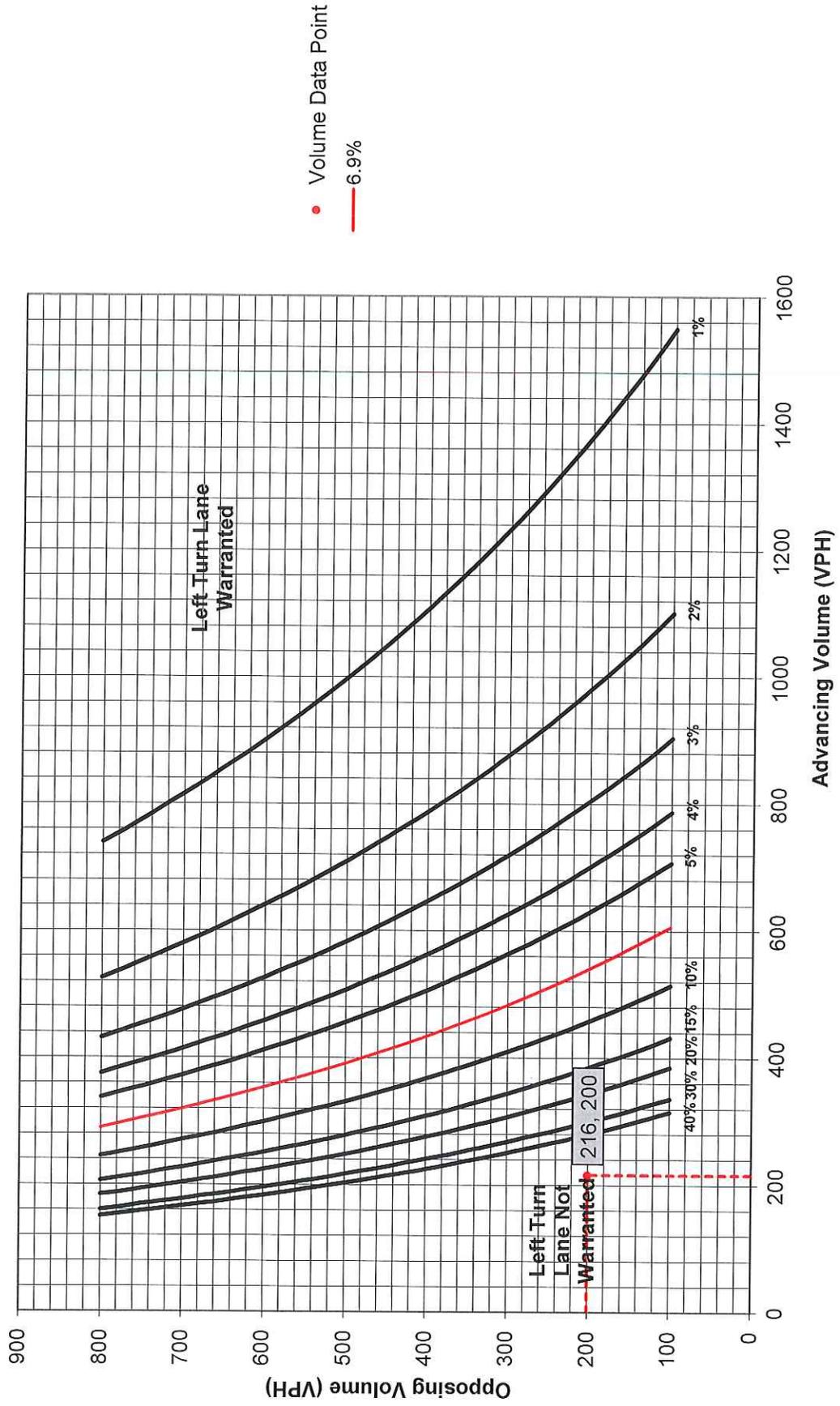
Type of Traffic Control	PennDOT Publication 46, Exhibit 11-6					
	Speed (MPH)					
	25-35		40-45		50-60	
Turn Demand Volume						
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B

Left Turn Lane Storage Length, Condition A:	<input style="width: 100%;" type="text" value="N/A"/>	Feet
Condition B:	<input style="width: 100%;" type="text" value="N/A"/>	Feet
Condition C:	<input style="width: 100%;" type="text" value="N/A"/>	Feet
Required Left Turn Lane Storage Length:	<input style="width: 100%;" type="text" value="N/A"/>	Feet

Additional Findings:

Additional Comments / Justifications:

**Figure 2. Warrant for left turn lanes on two-lane highways
(40 mph speed, unsignalized and signalized intersections)**
(L = % Left Turns in Advancing Volume)



Turn Lane Warrant and Length Analysis Workbook

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality: <input type="text" value="Worcester Township"/> County: <input type="text" value="Montgomery County"/> PennDOT Engineering District: <input type="text" value="6"/>	Analysis Date: <input type="text" value="1/9/2025"/> Conducted By: <input type="text" value="DHH"/> Checked By: <input type="text" value="DHH"/> Agency/Company Name: <input type="text" value="Horner & Canter Assoc"/>
Intersection & Approach Description: <input style="width: 100%;" type="text" value="Trooper Road (SR 3002)/Site Access"/>	
Analysis Period: <input type="text" value="2029 Build"/> Design Hour: <input type="text" value="AM Peak Hour"/> Intersection Control: <input type="text" value="Unsignalized"/> Posted Speed Limit (MPH): <input type="text" value="40"/> Type of Terrain: <input type="text" value="Level"/>	Number of Approach Lanes: <input type="text" value="1"/> Undivided or Divided Highway: <input type="text" value="Undivided"/> Left or Right-Turn Lane Analysis?: Type of Analysis <input type="text" value="Right Turn Lane"/>

VOLUME CALCULATIONS

Left Turn Lane Volume Calculations					
Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	Yes	5	3.0%	N/A
	Through	-	123	3.0%	N/A
	Right	No	0	0.0%	N/A
Opposing	Left	No	0	0.0%	N/A
	Through	-	220	3.0%	N/A
	Right	Yes	0	3.0%	N/A

Advancing Volume:
 Opposing Volume:
 Left Turn Volume:
 % Left Turns in Advancing Volume:

Right Turn Lane Volume Calculations					
Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	No	0	0.0%	N/A
	Through	-	220	3.0%	224
	Right	-	0	3.0%	0

Advancing Volume:
 Right Turn Volume:

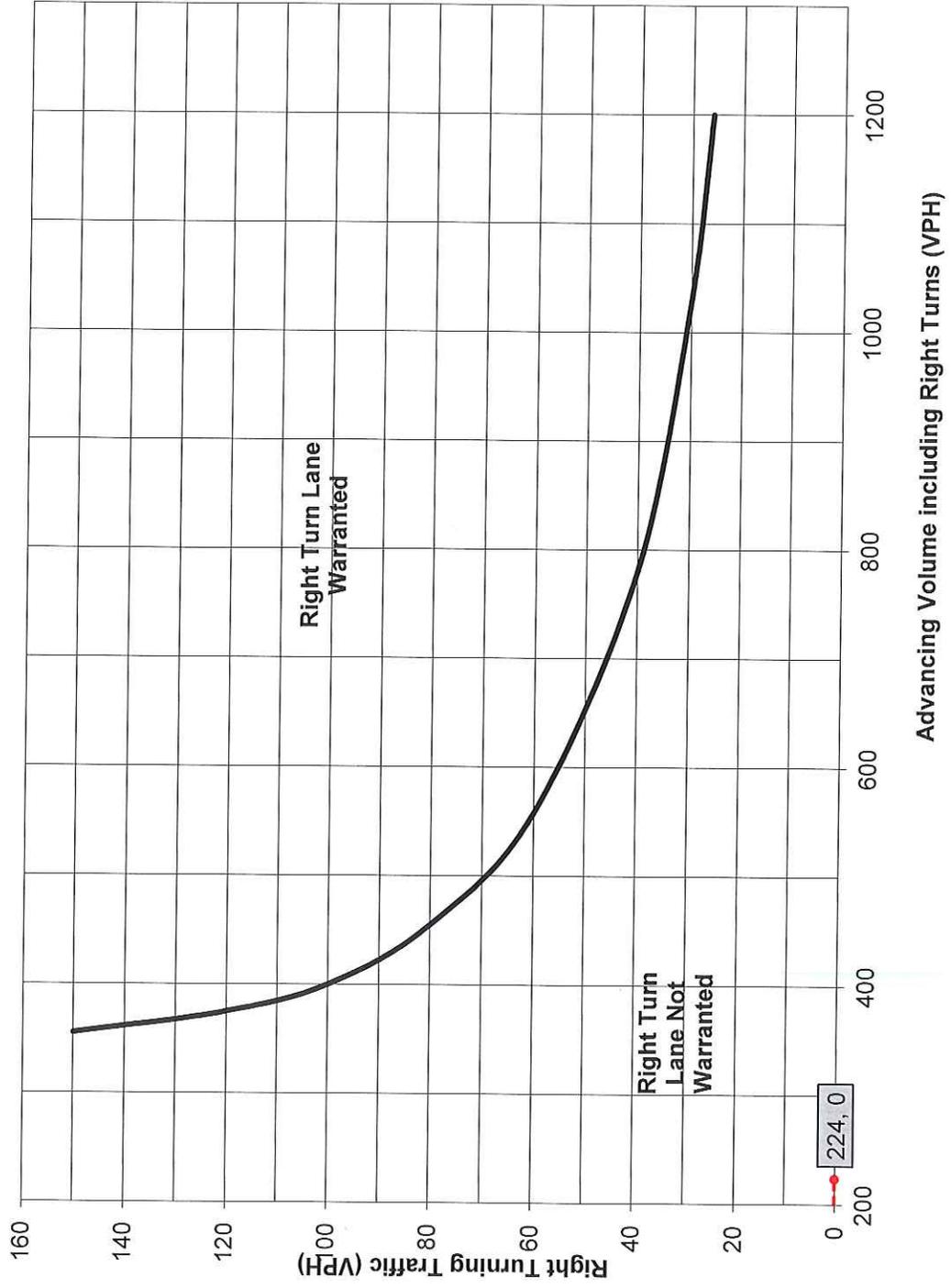
TURN LANE WARRANT FINDINGS

<div style="background-color: #D3D3D3; padding: 5px; text-align: center; font-weight: bold;">Left Turn Lane Warrant Findings</div> Applicable Warrant Figure: <input style="width: 100%;" type="text" value="N/A"/> Warrant Met?: <input style="width: 100%;" type="text" value="N/A"/>	<div style="background-color: #D3D3D3; padding: 5px; text-align: center; font-weight: bold;">Right Turn Lane Warrant Findings</div> Applicable Warrant Figure: <input style="width: 100%;" type="text" value="Figure 9"/> Warrant Met?: <input style="width: 100%;" type="text" value="No"/>
--	---

TURN LANE LENGTH CALCULATIONS

Intersection Control: <input type="text" value="Unsignalized"/> Design Hour Volume of Turning Lane: <input type="text" value="0"/> Cycles Per Hour (Assumed): <input type="text" value="60"/> Cycles Per Hour (If Known): <input type="text" value="60"/>	Average # of Vehicles/Cycle: <input style="width: 100%;" type="text" value="N/A"/>																																								
PennDOT Publication 46, Exhibit 11-6																																									
<table border="1" style="width: 100%; border-collapse: collapse; font-size: 8px;"> <thead> <tr> <th rowspan="3" style="width: 15%;">Type of Traffic Control</th> <th colspan="6" style="background-color: #F5DEB3;">Speed (MPH)</th> </tr> <tr> <th colspan="2" style="background-color: #F5DEB3;">25-35</th> <th colspan="2" style="background-color: #F5DEB3;">40-45</th> <th colspan="2" style="background-color: #F5DEB3;">50-60</th> </tr> <tr> <th colspan="6" style="background-color: #F5DEB3;">Turn Demand Volume</th> </tr> <tr> <th></th> <th style="background-color: #F5DEB3;">High</th> <th style="background-color: #F5DEB3;">Low</th> <th style="background-color: #F5DEB3;">High</th> <th style="background-color: #F5DEB3;">Low</th> <th style="background-color: #F5DEB3;">High</th> <th style="background-color: #F5DEB3;">Low</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Signalized</td> <td style="text-align: center;">A</td> <td style="text-align: center;">A</td> <td style="text-align: center;">B or C</td> </tr> <tr> <td style="text-align: center;">Unsignalized</td> <td style="text-align: center;">A</td> <td style="text-align: center;">A</td> <td style="text-align: center;">C</td> <td style="text-align: center;">B</td> <td style="text-align: center;">B or C</td> <td style="text-align: center;">B</td> </tr> </tbody> </table>		Type of Traffic Control	Speed (MPH)						25-35		40-45		50-60		Turn Demand Volume							High	Low	High	Low	High	Low	Signalized	A	A	B or C	B or C	B or C	B or C	Unsignalized	A	A	C	B	B or C	B
Type of Traffic Control	Speed (MPH)																																								
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	Turn Demand Volume																																								
	High	Low	High	Low	High	Low																																			
Signalized	A	A	B or C	B or C	B or C	B or C																																			
Unsignalized	A	A	C	B	B or C	B																																			
Right Turn Lane Storage Length, Condition A: <input style="width: 100%;" type="text" value="N/A"/> Feet Condition B: <input style="width: 100%;" type="text" value="N/A"/> Feet Condition C: <input style="width: 100%;" type="text" value="N/A"/> Feet Required Right Turn Lane Storage Length: <input style="width: 100%;" type="text" value="N/A"/> Feet																																									
Additional Findings: <input style="width: 100%;" type="text" value="N/A"/>																																									
Additional Comments / Justifications: <div style="border: 1px solid black; height: 40px; width: 100%;"></div>																																									

Figure 9. Warrant for right turn lanes on two-lane roadways
(40 mph or lower speeds, unsignalized and signalized intersections)



• Volume Data Point

Turn Lane Warrant and Length Analysis Workbook

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality: <input type="text" value="Worcester Township"/> County: <input type="text" value="Montgomery County"/> PennDOT Engineering District: <input type="text" value="6"/>	Analysis Date: <input type="text" value="1/9/2025"/> Conducted By: <input type="text" value="DHH"/> Checked By: <input type="text" value="DHH"/> Agency/Company Name: <input type="text" value="Horner & Canter Assoc"/>
Intersection & Approach Description: <input type="text" value="Trooper Road (SR 3002)/Site Access"/>	
Analysis Period: <input type="text" value="2029 Build"/> Design Hour: <input type="text" value="PM Peak Hour"/> Intersection Control: <input type="text" value="Unsignalized"/> Posted Speed Limit (MPH): <input type="text" value="40"/> Type of Terrain: <input type="text" value="Level"/>	Number of Approach Lanes: <input type="text" value="1"/> Undivided or Divided Highway: <input type="text" value="Undivided"/> Type of Analysis: Type of Analysis Left or Right-Turn Lane Analysis?: <input type="text" value="Right Turn Lane"/>

VOLUME CALCULATIONS

Left Turn Lane Volume Calculations					
Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	Yes	14	3.0%	N/A
	Through	-	199	2.0%	N/A
	Right	No	0	0.0%	N/A
Opposing	Left	No	0	0.0%	N/A
	Through	-	196	2.0%	N/A
	Right	Yes	1	3.0%	N/A

Advancing Volume:	<input type="text" value="N/A"/>
Opposing Volume:	<input type="text" value="N/A"/>
Left Turn Volume:	<input type="text" value="N/A"/>
% Left Turns in Advancing Volume:	<input type="text" value="N/A"/>

Right Turn Lane Volume Calculations					
Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	No	0	0.0%	N/A
	Through	-	196	2.0%	198
	Right	-	1	3.0%	2

Advancing Volume:	<input type="text" value="200"/>
Right Turn Volume:	<input type="text" value="2"/>

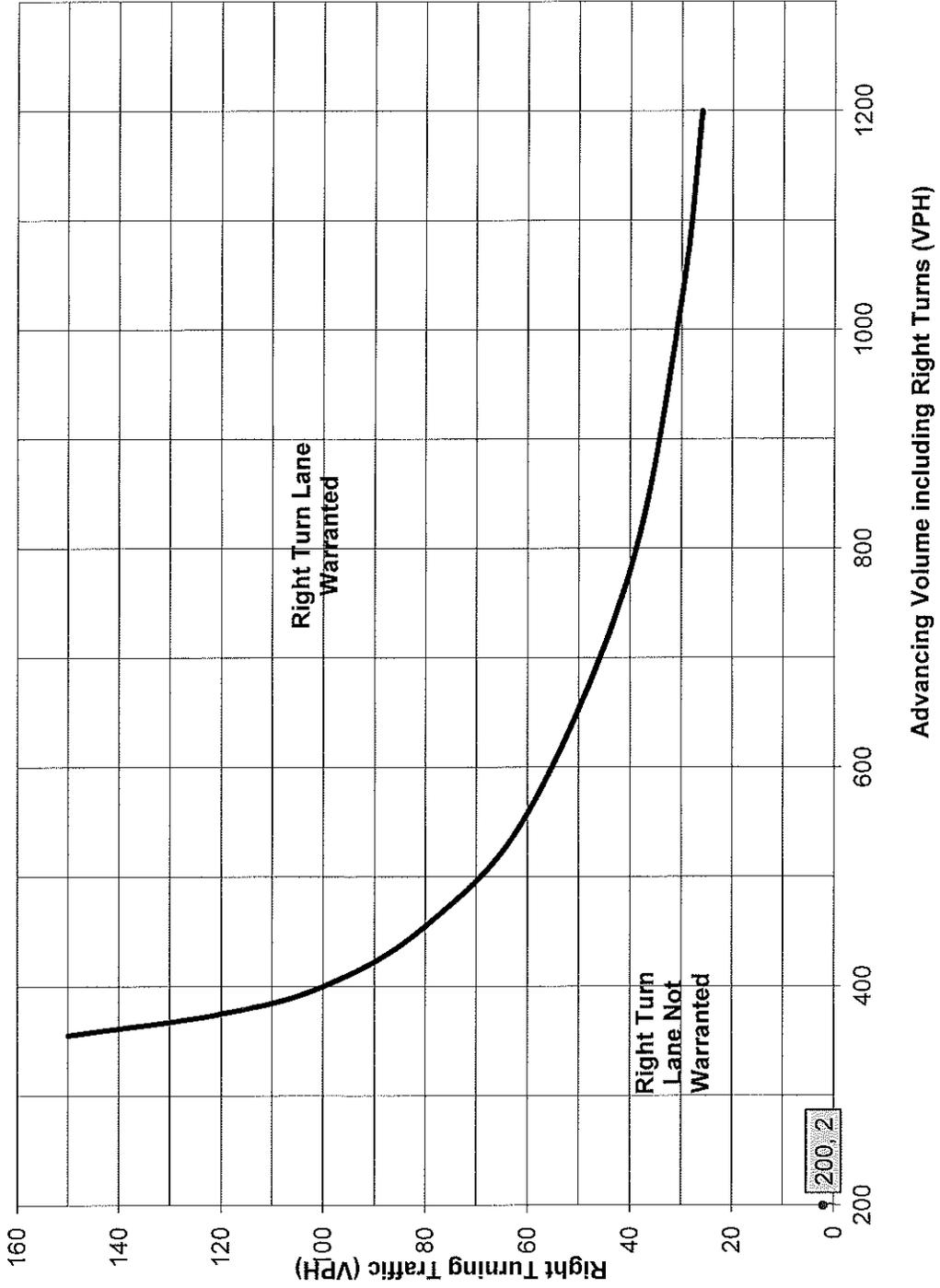
TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings	Right Turn Lane Warrant Findings
Applicable Warrant Figure: <input type="text" value="N/A"/>	Applicable Warrant Figure: <input type="text" value="Figure 9"/>
Warrant Met?: <input type="text" value="N/A"/>	Warrant Met?: <input type="text" value="No"/>

TURN LANE LENGTH CALCULATIONS

Intersection Control: <input type="text" value="Unsignalized"/> Design Hour Volume of Turning Lane: <input type="text" value="2"/> Cycles Per Hour (Assumed): <input type="text" value="60"/> Cycles Per Hour (If Known): <input type="text" value="60"/>	Average # of Vehicles/Cycle: <input type="text" value="N/A"/>																																								
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Type of Traffic Control	Speed (MPH)																																								
	25-35		40-45		50-60																																				
	Turn Demand Volume																																								
	High	Low	High	Low	High	Low																																			
Signalized	A	A	B or C	B or C	B or C	B or C																																			
Unsignalized	A	A	C	B	B or C	B																																			
Right Turn Lane Storage Length, Condition A: <input type="text" value="N/A"/> Feet Condition B: <input type="text" value="N/A"/> Feet Condition C: <input type="text" value="N/A"/> Feet Required Right Turn Lane Storage Length: <input type="text" value="N/A"/> Feet																																									
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Additional Comments / Justifications: <div style="border: 1px solid black; height: 30px; width: 100%;"></div>																																									

**Figure 9. Warrant for right turn lanes on two-lane roadways
(40 mph or lower speeds, unsignalized and signalized intersections)**



• Volume Data Point

TROOPER RIDGE SUBDIVISION

WORCESTER TOWNSHIP
MONTGOMERY COUNTY, PENNSYLVANIA

POST CONSTRUCTION STORMWATER MANAGEMENT & EROSION AND SEDIMENT CONTROL REPORT

Revised January 24th, 2025
Revised February 26th, 2025
Revised March 25th, 2025

Prepared for:
Commerce Pursuit Capitol, LLC



ASSOCIATES

2000 Market Street, Suite 800
Philadelphia, PA 19103
Phone: (215) 282-7850
Fax: (215) 627-3459

Prepared by



Zachary H. Ranstead
Zachary H. Ranstead
P.A. License No. 063078-E

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POST CONSTRUCTION STORMWATER MANAGEMENT & EROSION AND SEDIMENT CONTROL NARRATIVE

**Commerce Pursuit Capitol, LLC
Trooper Ridge Subdivision
Worcester Township, Montgomery County, Pennsylvania**

PROJECT DESCRIPTION

Commerce Pursuit Capitol, LLC proposes a 45-unit townhome development at 1035 Trooper Road in Worcester Township. An existing residence and barn exist on the 15.11 Acre tract, which is to be subdivided to create a separate parcel for the townhome development. As part of its responsibilities as site engineers for the proposed development, T&M Associates has prepared Land Development Plans and this Stormwater Management & Erosion and Sediment Control Report. This report includes the design of an underground detention facility and bioretention facility as best management practices (BMPs) as well as soil erosion control measures.

The disturbance of 10.16 acres will exceed 1.0 acres, therefore the project will require a General NPDES Permit. The permit boundary is approximately 11.22 acres. The overall site is shown on the included portion of the Collegeville USGS Quadrangle map.

PCSM and E&S PLANS – GENERAL INFORMATION

The PCSM and E&S plan preserves the integrity of stream channels and maintains and protects the physical, biological and chemical qualities of the receiving stream by utilizing BMPs to slow-release stormwater to the receiving stream.

This PCSM and E&S plan prevents an increase in the rate of stormwater runoff and minimizes any increase in stormwater runoff volume by reducing the impervious area on-site and implementing BMPs.

This PCSM and E&S plan minimizes the extent of the project area, impervious areas, land clearing and grading by grading only where necessary to facilitate proper drainage of the proposed parking lot.

The PCSM and E&S plan minimizes the duration of earth disturbance by completing work under the construction sequence in minimal stages and working under an accelerated construction schedule.

The PCSM and E&S plan maximizes the protection of the existing downstream drainage features and vegetation by utilizing perimeter control BMPs (compost filter socks) around the project area.

The PCSM and E&S plan minimizes soil compaction by a careful selection of the usable site area required for the improvements. It also utilizes structural BMPs that allow for slow release of lower return frequency storms.

Post-construction thermal impacts will be minimized by use of the BMPs, which will allow mixing and cooling of runoff. During construction, thermal impacts are minimized by use of a sediment basin and runoff filtering through compost filter socks.

MODIFIED PCSM **WORKSHEET # 22**
PLAN PREPARER RECORD OF TRAINING AND EXPERIENCE IN
POST CONSTRUCTION STORMWATER MANAGEMENT DESIGN AND TECHNIQUES

NAME OF PLAN PREPARER: Zachary H. Ranstead, P.E., LEED AP

FORMAL EDUCATION:

Name of College or Technical Institute: University of Mississippi, Oxford MS.

Curriculum or Program: Civil Engineering

Dates of Attendance: **From:** August, 1994 **To:** May, 1998

Degree Received Bachelor of Science in Civil Engineering

OTHER TRAINING:

Name of Training: Erosion & Sediment Manual Training 2012 Chapter 102 Update Training for the Regulated Community

Presented By: Mark Lonergan Kenneth Murin

Date: September 24, 2012 November 2, 2010

EMPLOYMENT HISTORY:

Current Employer: T&M Associates (2010-Present)

Telephone: 215-282-7850

Former Employer: CMX (2008-2010) Stout, Tacconelli & Associates (1998-2008)

Telephone: 215-361-6050

RECENT E&S PLANS PREPARED:

Name of Project: Carriage Homes Cluster Dev. Promenade at Granite Run Housenick Park

County: Chester Delaware Northampton

Municipality: West Whiteland Middletown Township Bethlehem Township

Permit Number: PAI011515018 PAG02002315030 PAI024814012

Approving Agency: CCCD/Southeast DEP DCCD NCCD/Northeast DEP

102.8(f)(1) - EXISTING TOPOGRAPHIC FEATURES

The location of the project is shown on the included USGS map. The entire project area was surveyed by a licensed surveyor. The area contours, boundary lines, and other features of interest are shown on the project drawings. The existing groundcover within the proposed limit of disturbance consists of fallow former agricultural areas with some wooded areas. Slopes range from 3% to upwards of 20%.

102.8(f)(2) – SOIL CHARACTERISTICS, LIMITATIONS & RESOLUTIONS

The soil types are typically determined from the soils inventory listed in the Web Soil Survey (WSS) as prepared by the United States Department of Agriculture, Soil Conservation Service (SCS).

Symbol	Hydrologic Soil Group	Full Name	Slope (percent)
AbB	D	Abbotstown Silt Loam	3-8%
ReB	C	Readington Silt Loam	3-8%
RhC	D	Reaville Silt Loam	8-15%

Due to soil constraints the following resolutions may be applicable and should be utilized accordingly:

1. Low ph: for soils with ph values lower than 5.5; adjust ph by applying lime at rates determined by soils testing in combination with selecting and planting vegetative species tolerant of acidic conditions.
2. Low fertility: incorporate additional soil nutrients at rates determined by soil testing in combination with selecting and planting vegetative species tolerant of low fertility conditions.
3. Dry or droughty soils: Select vegetative species tolerant of dry conditions.
4. High water table or wet/hydric soils prone to flooding: select vegetative species tolerant of wet conditions. If buildings are in said soils, provide sump pumps with back flow prevention devices in basements. If high water is encountered during construction, contractor shall utilize pumped water filtration methods (i.e. Dirt bag). For basin construction in areas of wet soils, preferably relocate stormwater and sediment basins and facilities in soils more conducive to such facilities. If facilities cannot be relocated, provide pumped water sediment removal facilities for basin construction, limit reservoir depths, and limit clean out elevations.
5. Erodible soils types: for soils with erodibility values higher than 0.36, contractor should incorporate some or all of the following stabilization techniques. In proposed channels, provide temporary linings until grass is established, provide permanent grass reinforced linings through the installation of sod or select permanent linings other than grasses. Decrease channel grades and increase channel widths to help reduce erosion.
6. Soils prone to instability piping and seeping: if stormwater or sediment basin/traps cannot be relocated to other soils types, limit embankment slope steepness, provide clay embankment cores and import other soils for construction of embankment facilities as necessary.
7. Soils unsuitable for winter grading, prone to frost action, or difficult to compact: grading during periods prone to frost should be limited. Construction of structural embankment should be performed during the period of May to October if such facilities cannot be relocated to an area with more conducive soils.
8. Soils susceptible to sinkhole and solution channel/chamber formation: Locate sediment basin, traps and stormwater management detention, retention and infiltration facilities in areas designated with soils more suitable for said facilities. If the facilities cannot be relocated to a more suitable area, standing water depths and retention times should be limited. Impermeable

reservoir linings should be utilized for water retention facilities, and/or stormwater detention facilities with extensive holding times.

9. Geologic formations– there are no known geologic formations or other soil conditions that may cause pollution by construction of this project.

102.8(f)(3) – PROJECT SITE CHARACTERISTICS, PAST, PRESENT AND PROPOSED LAND USE AND PROPOSED ALTERATIONS

The project site has been undeveloped for longer than the past 50 years and has been passively used as a fallow field for more than the last 5 years. Prior to the site’s development, it was agricultural land. The site drains southward to Stony Creek (TSF-MF). The project frontage is along Trooper Road (S.R. 3002) and Germantown Pike.

The project consists of developing the site for 45 townhomes, including grading, retaining walls, internal driven, common parking areas and community area, and stormwater management system. New public water services will be constructed to service the units. Connection to public sanitary sewer is provided via low pressure force mains.

102.8(f)(4) – DRAINAGE- NET CHANGE IN VOLUME & RATE OF STORMWATER

REFER TO THE ATTACHED “STORMWATER RUNOFF CALCULATIONS” FOR DETAILED DESIGN PARAMETERS AND HYDROGRAPHS

Calculation Methodology

Overall pre- and post-development conditions and hydrograph routing were performed with the TR-55 method with the HydroCAD 10.20-5c program . The Web Soil Survey result for the project identified the the project area as Abbotstown, Hydrologic Class “D” soils, Readington, Hydrologic Class “C” soils, and Reaville, Hydrologic Class “D” soils. A runoff CN of 71/78 was input for meadow conditions and 70/77 for forested conditions per TR-55 Chapter 2, p 2-11. Lawn was modeled with a CN of 74/80 in the post-development condition. Storm sewer calculations were also performed in the post-development SSA model. The storm sewer system was designed for a 100-year storm per Worcester Township requirements.

Existing Drainage Conditions

The site is underlain by Abbotstown, Readington and Reaville soils as defined by the USDA WSS. The WSS classifies this area as a combination of “C” & “D” soils. The runoff analysis for the site was divided into two (2) points of interest (POI). POI 1 is the existing portion of the site draining to Trooper Road, ultimately to a tributary to Stony Creek. POI 1 discharges into a single existing type “M” inlet at the intersection with Germantown Pike, with an 18-inch pipe leaving the inlet. POI 2 is the portion of the property which discharges to Germantown Pike. There is a storm sewer line down Germantown Pike that culminates at a type “M” inlet (separate from Trooper Road) with a 24-inch diameter pipe leaving. The sub-shed analysis is provided to demonstrate that runoff is not increased within the disturbed area of the development that culminates in a combination of the POI 1 and 2 sheds. There are significant offsite areas to the north that flow into the site. These areas are ultimately also tributary to the Trooper/Germantown intersection but are proposed to be bypassed around the development area. The soils infiltration testing for the site was in conformance with the expected results from the WSS soil types. Infiltration was poor and is not a viable method for stormwater volume control.

Proposed Conditions

The proposed site conditions include an MRC raingarden which nearly the entirety of the developed site is designed to drain to. The vegetated MRC raingarden is situated over an underground perforated HDPE pipe and stone rate control facility. Both the raingarden and underground systems have respective impermeable liners to cause the proper filtering function and keep out potential groundwater. All runoff

first enters the surface raingarden and then is designed to overtop an inlet structure for secondary routing in the underground facility. As previously described, offsite areas are designed to bypass the developed area. The combination swale/storm sewer systems “S” and “T” are designed with excess capacity as a safety precaution. Upstream of the Trooper Ridge development, to the north, Windy Hill Road was observed to be designed as superelevated, to pitch runoff west towards Germantown Pike. This was confirmed in an actual precipitation event on December 11, 2024. In a larger 24-hour 100 year storm, the depth of runoff along Windy Hill Road could exceed the south embankment and flow down to the development site. The “S” system of swale/storm sewer above the site is intended to help safely convey this offsite runoff. The development by nature of its drainage design, reduces the pre-existing runoff towards Germantown Pike and Trooper Roads by capture into its internal stormwater management basin system. All runoff from the site and offsite areas culminates at the Germantown Pike/Trooper Road intersection. A stormwater collection area has been designed just above and behind the intersection with same-diameter pipe extensions to both the Germantown Pike and Trooper Road storm sewers. The basin discharge and offsite discharge combine in this collection area that will then route into the storm sewer. This is the best conceivable manner to replicate the existing drainage regime in the proposed condition, while lessening the runoff peaks. Stormwater volume “delta-2” is managed solely by the upper MRC raingarden. A completed NPDES worksheet is included to demonstrate its viability. runoff infiltration requirement and Worcester Township peak rate reduction requirements met through a combination of underground detention and bioretention BMPs.

Pre- to Post-Development Comparison Summary:

Refer to Summary in Appendix A

102.8(f)(5) – RECEIVING SURFACE WATERS

The project is tributary to unnamed tributaries to Stony Creek (TSF-MF).

EROSION AND SEDIMENT CONTROL SEQUENCE NOTES

AT LEAST 7 DAYS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITIES, THE OPERATOR SHALL INVITE ALL

CONTRACTORS INVOLVED IN THOSE ACTIVITIES, THE LANDOWNER, ALL APPROPRIATE MUNICIPAL OFFICIALS, THE

EROSION AND SEDIMENT CONTROL PLAN PREPARER, AND THE CONSERVATION DISTRICT TO AN ON-SITE MEETING.

ALSO, AT LEAST 3 WORKING DAYS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITIES, ALL CONTRACTORS

INVOLVED IN THOSE ACTIVITIES SHALL NOTIFY THE PENNSYLVANIA ONE CALL SYSTEM INCORPORATED AT 1-800-

242-1776 FOR BURIED UTILITIES LOCATIONS.

EROSION AND SEDIMENT BMPS MUST BE CONSTRUCTED, STABILIZED, AND FUNCTIONAL BEFORE SITE DISTURBANCE BEGINS WITHIN THE TRIBUTARY AREAS OF THOSE BMPS.

ALL EARTH DISTURBANCE ACTIVITIES SHALL PROCEED IN ACCORDANCE WITH THE FOLLOWING SEQUENCE. EACH STAGE SHALL BE COMPLETED BEFORE ANY FOLLOWING STAGE IS INITIATED. CLEARING AND GRUBBING SHALL BE LIMITED ONLY TO THOSE AREAS DESCRIBED IN EACH STAGE.

CRITICAL STAGE ITEMS THAT REQUIRE INSPECTION BY THE ENGINEER ARE SPECIFIED.

NOTE: NO ACTIVITIES SHALL DISTURB IDENTIFIED WATERS OF THE U.S. WITHOUT PRIOR APPROVAL OF PADEP.

DISTURBANCES SHALL BE IN STRICT ACCORDANCE WITH IDENTIFIED PLAN AREAS WHICH ARE MINIMIZED FOR

PROPOSED IMPROVEMENTS.

SITE CONSTRUCTION SEQUENCE

1. Install GP and TR series perimeter compost filter sock segments.

Critical Stage – Inspect perimeter compost sock

2. Install Rock Construction Entrances 1 and 2. Cut in construction entrances at proposed grade, stockpile excavation at locations indicated.
3. Construct Trooper Road Curbing and Storm Sewer from existing inlet T1 up to Proposed inlet T9. Disturb no more earth in a day which can be stabilized at end of each day with topsoil, seed and erosion blankets for areas to be permanently vegetated, or stone backfill for roadway areas. Install and maintain inlet protection as inlets are placed. Install curbing.

Critical Stage – Inspection of Trooper Road improvements

4. Construct stormwater collection area at G2-T1.1-S1-A1 nexus. Make storm sewer connection to G1 and T1. Excavate area, install retaining wall and pipe stubs through wall at S1 and A1, and headwalls T1.1 and G2. Stabilize surrounding surfaces external to the collection area with erosion blankets as indicated. Install rip-rap within the collection area. Install compost filter sock berm in front of headwalls G2 and T1.1.

Critical Stage – Inspect stormwater collection area that it is stabilized and online.

5. Install storm sewer from S1 up to S3 and Headwall S3.1.

Critical Stage – Inspect Storm sewer run from S3.1 to S1 that it is online and can receive runoff from the S-Series diversion swale system.

6. Construct the S4 to S9 Storm sewer and diversion swale from downstream to upstream. Simultaneously cut in embankment to construct retaining walls between S4-S9 storm sewer and unit blocks 1-4. Similarly and simultaneously, install storm sewer and diversion swales from T9 to T12 along the north, behind unit block 5. Construct storm sewer incrementally from structure to structure working from downstream to upstream. Daily stabilize swales with both rip-rap bottom lining, and topsoil, seed and erosion control blankets on side slopes. Every effort shall be made to work in conditions where precipitation is not forecast. Disturbance shall not practicably exceed what can be stabilized daily. As swales are constructed, they will receive and must be stable and able to convey runoff from offsite. Install trash racks on inlets and headwalls upon placement.

Critical Stage – Inspect Swale S3.1 to S9 system and T12 to T9 system., that they are stable and in permanent configuration, and associated retaining wall systems below are properly constructed.

7. Germantown Pike widening may occur at this stage, or at any stage hereafter. Box cut widening from Trooper intersection uphill. Do not perform work when precipitation is forecast. Daily stabilize with topsoil, seed and erosion blankets for permanently vegetated areas, and at a minimum, stone or bituminous binder course for roadways. Install curbing and storm sewer stubs. Install inlet protection on storm sewer stubs upon inlet placement.
8. Begin construction of Sediment Basin 1 over footprint of permanent stormwater management basin system 001. Remove topsoil and stockpile separately. Excavate to create basin volume including temporary erosion control grading within sediment basin. Construct berm, basin outlet piping and outlet structures to A1, swale A1, basin spillway, skimmer and landing pad and baffle. Begin permanent stabilization process on outside basin berms with topsoil, seed and erosion control blankets where

indicated on basin slopes. Stabilize internal sedbasin slopes with topsoil, seed and erosion control blankets where indicated.

9. Critical Stage – Inspect Sediment Basin 1 (including temporary opening configuration in permanent outlet structure) that it is online and ready to receive runoff from development site.
10. Begin mass grading of site in following order: Establish drainage pattern internal to site (From walls to sediment basin) to convey runoff to sediment basin, temporary compost sock diversions shall be utilized to achieve drainage patterns until final grades achieved. Box cut internal drives up from construction entrances simultaneously installing storm sewer From A13 to A5 and B3.1 to B1. Continue internal drive construction installing storm sewer, balance of utilities, curbing, stone base course and bituminous binder course. Install initially sandbags then asphalt berms at A11-A12 and B2-B3 to capture runoff down drives before it enters roadways. Grade swales surrounding units, install swale linings. Pad out unit blocks, reserving stockpile area units last. Install foundations. Begin unit construction.
11. Perform final grading and landscaping whenever and wherever possible, stabilize with topsoil, seed and mulch.

Critical Stage – Inspect for 70% stabilization (uniform perennial growth). Upon inspection including inspection by Conservation District, with approval, proceed to basin conversion.

12. Convert sediment basin to permanent stormwater management facility. Work shall be scheduled at times of no forecast precipitation and shall occur incrementally so that system is protected at end of each day. Flush all storm sewer of sediment and/or inspect that storm sewer is clear. Desilt sediment basin, remove skimmer, baffle. Excavate for underground detention installation. Install underground detention system including impermeable liner surrounding. Install MRC surface raingarden over underground detention, with its respective impermeable liner. Seal temporary openings in outlet structured for erosion control with permanent watertight fittings – silicone (or approved equal) sealed bolted metal plates. Install underdrain and media infill. Install raingarden plantings.

Critical Stage – Inspect permanent stormwater basin configuration, opening seals and function

13. When permanent stabilization is achieved (90% uniform perennial growth), remove remaining compost sock barrier controls.
14. File Notice of Termination for NPDES permit

102.8(f)(8) – SUPPORTING CALCULATIONS

Stormwater Runoff Calculations are found in the attached “Stormwater Runoff Calculations” Report. Volume Credit calculations are found on BMP Worksheets.

102.8(f)(9) – PLAN DRAWINGS

The location, construction details, and final grading for the PCSM BMPs are shown on the PCSM Plan.

102.4(b)(5)(x) MAINTENANCE OF EROSION CONTROL FACILITIES

1. The operator shall be responsible for the proper construction, stabilization and maintenance of all erosion and sedimentation controls and related items included within the plan herewith. The contractor shall schedule and conduct his operations to minimize erosion of soils and to prevent silting and muddying of streams, rivers and drainage systems.
2. Erosion and sedimentation pollution control specialists’ contacts:

Montgomery County Conservation District: (610) 489-4506

3. All erosion and sedimentation pollution control measures must remain in place until the site is stabilized, regardless if construction is taking place or not.
4. Until the site is stabilized, all erosion and sediment pollution controls (BMPs) must be properly maintained. Maintenance must include inspections of all erosion and sediment control BMPs after each runoff event and on a weekly basis. All preventative and remedial maintenance work, including clean out, repair, replacement, regrading, reseeding, mulching, and renetting, must be performed immediately. If erosion and sediment control BMPs fail to perform as expected, replacement controls or modifications of those installed will be required.
5. Sediment removed from BMPs shall be disposed of in landscaped areas outside of steep slopes, wetlands, floodplains or drainage swales and immediately stabilized, or placed in topsoil stockpiles.
6. Seeded areas that wash out must be filled and graded as necessary, and then reseeded, an anchoring method should then be used to hold seed and mulch in place; this is especially important around water courses, in swales, and areas of concentrated flows, and on slopes. In the event owners of the property or the operator fails to properly maintain the control facilities, the Township of Northampton shall have the right to enter said area and perform the required maintenance after proper notification of the owners.
7. In the event that the Department of Environmental Protection, the county conservation district, the municipality or the design engineer or their agents deem that additional controls, measures or procedures beyond those shown or described are necessary to control or correct conditions which were unforeseen during the design stage, the contractor shall be responsible to implement additional controls, measures or procedures as is deemed reasonably necessary and warranted.
8. No sediment, stones or debris shall be tracked on to surrounding roads. Any sediment that is tracked onto the surrounding roads must be cleaned off before the end of the day utilizing mechanical methods or via hand sweeping to the satisfaction of the county conservation district and township engineer.
9. Any filter fabric fence, which has been undermined or topped, must be replaced immediately with rock filter outlets.
10. Any soil borrow or spoil sites, on or offsite shall have an approved and implemented erosion control plan by the county conservation district. Transportation of any excess materials shall be such that spillage, tracking off site and other disturbances are kept to a minimum.
11. The contractor shall periodically and especially after heavy rainfall, inspect all control facilities for proper function. Facilities shall be repaired if damages or malfunctioning or replaced as necessary. Maintenance of all control facilities shall continue until the entire area tributary to the facility is stabilized.
12. The county conservation district must be contacted prior to removal of any erosion and sedimentation control device such as filter fabric fences, rock filters, inlet protection, temporary channels, etc. Temporary controls may be removed only after a minimum uniform 70% perennial vegetative cover, with a density capable of resisting accelerated erosion and sedimentation has been achieved across the upslope areas.

MONITORING, INSPECTION, AND REPORTING REQUIREMENTS

Visual Inspections

The permittee and co-permittee(s) must ensure that visual site inspections are conducted weekly, and within 24 hours after each measurable rainfall event throughout the duration of construction and until the receipt and acknowledgement of the Notice of Termination (NOT) by the department or authorized conservation district. The visual site inspections and reports shall be completed in a format provided by the department, and conducted by qualified personnel, trained and experienced in erosion and sediment control, to ascertain that E&S BMPs and PCSM BMPs are properly constructed and maintained to effectively minimize pollution to the waters of this commonwealth. A written report of each inspection shall be kept and include at a minimum:

- 1) A summary of site conditions, E&S BMP and PCSM BMP, implementation and 16 maintenance and compliance actions; and
- 2) The date, time, name and signature of the person conducting the inspection.

Noncompliance Reporting

Where E&S, PCSM or PPC BMPs are found to be inoperative or ineffective during an inspection, or any other time, the permittee and co-permittee(s) shall, within 24 hours, contact the department or authorized conservation district, by phone or personal contact, followed by the submission of a written report within 5 days of the initial contact.

Noncompliance reports shall include the following information:

- 1) Any condition on the project site which may endanger public health, safety, or the environment, or involve incidents which cause or threaten pollution;
- 2) The period of noncompliance, including the exact dates and times and/or anticipated time when the activity will return to compliance;
- 3) Steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance; and
- 4) The date or schedule of dates, and identifying remedies for correcting noncompliance conditions.

Reduction, Loss, or Failure of the BMPs

Upon reduction, loss, or failure of the BMPs, the permittee and co-permittee(s) shall take immediate action to restore the BMPs or provide an alternate method of treatment. Such restored BMPs or alternate treatment shall be at least as effective as the original BMPs.

102.8(f)(11) – RECYCLING OR DISPOSAL OF MATERIALS

The operator shall remove from the site, recycle, or dispose of all building materials and wastes in accordance with any and all applicable municipal or other governmental agency current regulations including but not limited to: The Department's Solid Waste Management Regulations at 25 Pa. Code 260.1 et seq., 271.1 et seq., and 287.1 et seq. The contractor shall not illegally bury, dump, or discharge any building material or wastes at the site.

Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain on the property, demolished or excavated materials shall be removed from the site. Materials slated for removal from the site shall be disposed of in accordance with any and all applicable municipal or other governmental agency current regulations.

Debris shall not be permitted to accumulate on the job-site. Dust and dirt shall be held to a minimum during demolition, by wetting down, as required. On site burning of materials will not be permitted. At the completion of work, the entire area involved shall be clean and left in a neat condition, free of rubbish and debris.

Recycling or disposal of materials associated with or from this project site shall be undertaken in accordance with Pennsylvania Department of Environmental Protection rules and regulations.

Sediment removed from control facilities as a part of regular maintenance shall be disposed of upslope of control facilities in landscaped areas outside of steep slopes, wetlands, floodplains or drainage swales and immediately stabilized, or placed in topsoil stockpiles.

102.8(f)(12) – GEOLOGIC FORMATIONS OR SOIL CONDITIONS

According to the <http://www.depgis.state.pa.us/emappa/> website, the project is underlain by the "Lockatong" formation. This formation is defined as argillite with black shale. Soil contamination has been identified due to the site's prior use and will require an Individual NPDES permit.

102.8(f)(13) - POTENTIAL THERMAL IMPACTS

Post-construction thermal impacts will be minimized by greatly reducing the impervious area onsite and routing runoff through the stormwater detention areas, which allows for mixing and cooling. During construction, thermal impacts are minimized by use of a sediment basin and runoff filtering through

compost filter socks.

102.8(F)(14) - RIPARIAN FOREST BUFFER MANAGEMENT PLAN

Waters of the U.S. are designated as TSF-MF (Tributary to Stony Creek) so riparian buffers are not applicable.

RESPONSIBILITY FOR CLEAN FILL MATERIALS

1. The operator must use environmental due diligence to ensure that any necessary fill material associated with this project qualifies as clean fill. All fill material must be used in accordance with PaDEP's policy "Management of Fill" Document Number 258-2182-773. A copy of this policy is available online at www.depweb.state.pa.us.
2. Clean fill is defined as: uncontaminated, non-water soluble, non-decomposed, inert, solid material. The term includes soil, rock, stone, dredged material, used asphalt, and brick, block, or concrete from construction and demolition activities that is separate from the waste and is recognizable as such. The term does not include materials placed in or on the waters of the commonwealth unless otherwise authorized. (The term "used asphalt" does not include milled asphalt or asphalt that has been processed for re-use).
3. **Clean fill affected by a spill or release of a regulated substance:** Fill materials affected by a spill or release of a regulated substance still qualifies as clean fill provided the testing reveals that the fill material contains concentrations of regulated substances that are below the residential limits in Tables FP-1A and FP-1B found in PaDEP's policy "Management of fill".
4. Any person placing clean fill that has been affected by a spill or release of a regulated substance must use PaDEP Form FP-001 to certify the origin of the fill material and the results of the analytical testing to qualify the material as clean fill. Form FP-001 must be retained by the owner of the property receiving the fill. A copy of Form FP-001 can be found at www.depweb.state.pa.us.
5. **Environmental due diligence:** Investigative techniques, including, but not limited to, visual property inspections, electronic data base searches, review of property ownership, review of property use history, sanborn maps, environmental questionnaires, transaction screen, analytical testing, environmental assessments or audits.
6. Analytical testing is not a required part of due diligence unless visual inspection and/or review of the past land use of the property indicates that the fill may have been subjected to a spill or release of a regulated substance. If the fill may have been affected by a spill or release of a regulated substance, it must be tested to determine if it qualifies as clean fill. Testing should be performed in accordance with Appendix A of PADEP's policy "Management of Fill".
7. Fill material that does not qualify as clean fill is regulated fill. Regulated fill is waste and must be managed in accordance with the Department's Municipal or Residual Waste Regulations Base of 25 Pa Code Chapters 287 Residual waste or 271 Municipal Waste Management, whichever is applicable.
8. All fills shall be compacted sufficiently for their intended purpose and as required to reduce slipping, erosion, or excess saturation.

UTILITY LINE TRENCH EXCAVATION / DISTURBANCE GUIDELINES

1. Limit advance clearing and grubbing operations to a distance equal to two (2) times the length of pipe installation that can be completed in one (1) day.
2. Limit daily trench excavation to the length of pipe placement, plug placement, and backfilling that can be completed the same day. Daily backfilling may be delayed a maximum of six (6) days if pressure testing is required.
3. Water which accumulates in the open trench shall be completely removed by pumping before pipe placement and/or backfilling begins. Water removed from the trench shall be pumped through a filtration device such as a pumped water filter bag.
4. On the day following pipe placement and trench backfilling, the disturbed area shall be graded to final contours.
5. See specifications and details for backfilling and compaction requirements in utility trench. All fill, compaction, and backfill materials required for utility installation shall be as per the

recommendations provided in the geotechnical report and shall be coordinated with the applicable utility company specifications.

6. The contractor shall comply to the fullest extent with the latest standards of OSHA directives, or any other agency having jurisdiction for excavation and trenching procedures. The contractor is responsible for determining the “Means and Methods” required to meet the intent and performance criteria of OSHA, as well as any other entity that has jurisdiction for excavation and/or trenching procedures.

7. Seeding and mulching of all disturbed areas shall be done within two (2) calendar days

APPENDIX A
GLOBAL FLOW SUMMARY
PADEP PCSM SPREADSHEETS

General Information

Instructions
General
Volume
Rate
Quality

<p>Project Name: <input style="width: 90%;" type="text" value="Trooper Ridge"/></p> <p>County: <input style="width: 90%;" type="text" value="Montgomery"/></p> <p>Project Type: <input style="width: 90%;" type="text" value="Multi-Family Housing"/></p> <p>Area: <input style="width: 15%; text-align: center;" type="text" value="11.46"/> acres <i>(In Watershed)</i></p> <p>No. of Post-Construction Points of Analysis: <input style="width: 10%; text-align: center;" type="text" value="2"/></p>	<p>Application Type: <input style="width: 90%;" type="text" value="PAG-02 NOI"/></p> <p>Municipality: <input style="width: 90%;" type="text" value="Worcester Township"/></p> <p> <input checked="" type="radio"/> New Project <input type="radio"/> Minor / Major Amendment </p> <p>Total Earth Disturbance: <input style="width: 15%; text-align: center;" type="text" value="10.34"/> acres <i>(In Watershed)</i></p> <p>at: <input style="width: 10%; text-align: center;" type="text" value="001"/></p>
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Point of Analysis (POA) No.	Drainage Area (DA) (acres)	Earth Disturbance in DA (acres)	Existing Impervious in DA (acres)	Proposed Impervious in DA (acres)	Receiving Waters	Ch. 93 Class	Structural SCM(s)
001	10.44	9.32	0.04	3.80	Discharge to MS4	TSF, MF	Yes
002	0.84	0.84	0.03	0.21	Discharge to MS4	TSF	No
Undetained Areas	0.18	0.18	0.18	0.18			
Totals:	11.46	10.34	0.25	4.19			

Volume Management

Project: Trooper Ridge

- Instructions
- General
- Volume
- Rate
- Quality

2-Year / 24-Hour Storm Event (NOAA Atlas 14): inches Alternative 2-Year / 24-Hour Storm Event inches

Alternative Source:

Pre-Construction Conditions: No. Rows: Exempt from Meadow in Good Condition Automatically Calculate CN, Ia, Runoff and Volume

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Forested (Good Condition)	3.97	C	70	0.857	0.85	12,270
Forested (Good Condition)	1.32	D	77	0.597	1.24	5,944
Pervious as Meadow	2.94	C	71	0.817	0.90	9,629
Pervious as Meadow	1.86	D	78	0.564	1.30	8,796
Impervious as Meadow	0.02	C	71	0.817	0.90	66
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	0.05	N/A	98	0.041	3.01	546
Impervious Areas: Streets and Roads - Paved; Open Ditches (Including ROW)	0.18	N/A	93	0.151	2.48	1,623
TOTAL (ACRES):	10.34					
					TOTAL (CF):	38,874

Area for pavement restoration associated with off-site utility work is excluded from 20% meadow requirement per PA Code Ch. 102.8.(g)(2)(ii)

Post-Construction Conditions: No. Rows:

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	4.01	N/A	98	0.041	3.01	43,776

Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	4.13	C	74	0.703	1.06	15,951
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	2.02	D	80	0.500	1.43	10,506
Impervious Areas: Streets and Roads - Paved; Open Ditches (Including ROW)	0.18	N/A	93	0.151	2.48	1,623

TOTAL (ACRES): 10.34

TOTAL (CF): 71,856

Area for pavement restoration associated with off-site utility work is excluded from 20% meadow requirement per PA Code Ch. 102.8.(g)(2)(ii)

NET CHANGE IN VOLUME TO MANAGE (CF): 32,982

Non-Structural SCM Volume Credits:

Tree Planting Credit

Other (attach calculations):

Description:

CREDIT (CF):

Structural SCM Volume Credits:

No. Structural SCMs: 1

Start SCM Numbering at: 1

POA No.	SCM No.	SCM Name	MRC?	Discharge	Incremental SCM DA (acres)	Volume Routed to SCM (CF)	Infiltration / Vegetated Area (SF)	Infiltration Rate (in/hr)	Infiltration Period (hrs)	Vegetated?	Media Depth (ft)	Storage Volume (CF)	Infiltration Credit (CF)	ET Credit (CF)
001	1	Rain Garden / Bioretention	Y	Off-Site	7.07	55,759	13,086			Yes	1.0	1,972		

Totals:

INFILTRATION & ET CREDITS (CF):

MANAGED RELEASE CREDIT (CF): 55,759

NET CHANGE IN VOLUME TO MANAGE (CF): 32,982

TOTAL CREDITS (CF): 55,759

VOLUME REQUIREMENT SATISFIED

Rate Control

Project: Trooper Ridge

Instructions

General

Volume

Rate

Quality

Precipitation Amounts:

NOAA 2-Year 24-Hour Storm Event (in):

3.24

Alternative 2-Year 24-Hour Storm Event (in):

NOAA 10-Year 24-Hour Storm Event (in):

4.75

Alternative 10-Year 24-Hour Storm Event (in):

NOAA 50-Year 24-Hour Storm Event (in):

6.56

Alternative 50-Year 24-Hour Storm Event (in):

NOAA 100-Year 24-Hour Storm Event (in):

7.45

Alternative 100-Year 24-Hour Storm Event (in):

Report Summary of Peak Rates Only

Attach model input and output data or other calculations to support the rates reported below.

	<i>Peak Discharge Rates (cfs)</i>			
	Pre-Construction	Post-Construction	Net Change	
2-Year Storm:	10.61	5.67	-4.94	<i>Rate Control Satisfied</i>
10-Year Storm:	22.94	11.91	-11.03	<i>Rate Control Satisfied</i>
50-Year Storm:	39.46	21.95	-17.51	<i>Rate Control Satisfied</i>
100-Year Storm:	47.94	34.59	-13.35	<i>Rate Control Satisfied</i>

Water Quality

Project: Trooper Ridge

[PRINT](#)

- Instructions
- General
- Volume
- Rate
- Quality

Pre-Construction Pollutant Loads:

Land Cover (from Volume Worksheet)	Land Cover for Water Quality	Area (acres)	Soil Group	Runoff Volume (cf)	Pollutant Conc. (mg/L)			Pollutant Loads (lbs)		
					TSS	TP	TN	TSS	TP	TN
Forested (Good Condition)	Deciduous Forest/Evergreen Forest/Mixed Forest	3.97	C	12,270	45.0	0.13	1.05	34.48	0.10	0.80
Forested (Good Condition)	Deciduous Forest/Evergreen Forest/Mixed Forest	1.32	D	5,944	45.0	0.13	1.05	16.70	0.05	0.39
Pervious as Meadow	Grassland/Herbaceous	2.94	C	9,629	48.8	0.22	2.30	29.34	0.13	1.38
Pervious as Meadow	Grassland/Herbaceous	1.86	D	8,796	48.8	0.22	2.30	26.80	0.12	1.26
Impervious as Meadow	Grassland/Herbaceous	0.02	C	66	48.8	0.22	2.30	0.20	0.00	0.01
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	Residential	0.05	N/A	546	65.0	0.29	2.05	2.22	0.01	0.07
Impervious Areas: Streets and Roads - Paved; Open Ditches (Including ROW)	Highway (general)	0.18	N/A	1,623	141.0	0.43	2.65	14.29	0.04	0.27

TOTAL (ACRES): 10.34

TOTALS: 124.03 0.46 4.19

Post-Construction Pollutant Loads (without BMPs):

Land Cover (from Volume Worksheet)	Land Cover for Water Quality	Area (acres)	Soil Group	Runoff Volume (cf)	Pollutant Conc. (mg/L)			Pollutant Loads (lbs)		
					TSS	TP	TN	TSS	TP	TN
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	Residential	4.01	N/A	43,776	65.0	0.29	2.05	177.68	0.79	5.60
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	Open Space	4.13	C	15,951	78.0	0.25	1.25	77.69	0.25	1.25
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	Open Space	2.02	D	10,506	78.0	0.25	1.25	51.17	0.16	0.82
Impervious Areas: Streets and Roads - Paved; Open Ditches (Including ROW)	Highway (general)	0.18	N/A	1,623	141.0	0.43	2.65	14.29	0.04	0.27

TOTAL (ACRES): 10.34

TOTALS: 320.82 1.25 7.94

POLLUTANT LOAD REDUCTION REQUIREMENTS (LBS):

196.79	0.79	3.75
---------------	-------------	-------------

Characterize Undetained Areas (for Untreated Stormwater)

Land Cover	Area (acres)	Soil Group	CN	la (in)	Q Runoff (in)	Runoff Volume (cf)

Non-Structural SCM Water Quality Credits:

Pervious Undetained Area Credit

--	--	--

Other (attach calculations)

TSS	TP	TN

Description:

Structural SCM Water Quality Credits:

Use default SCM Outflows and Median SCM Outflow Concentrations

POA No.	SCM No.	SCM Name	MRC?	SCM DA (acres)	Vol. Routed to SCM (CF)	Inf. & ET Credits (CF)	Capture & Buffer Credits (CF)	Outflow (CF)	Outflow Conc. (mg/L)			Pollutant Loads (lbs)		
									TSS	TP	TN	TSS	TP	TN
001	1	Rain Garden / Bioretention	Y	7.07	55,759			55,759	-	-	-	-	-	-

	TSS	TP	TN
POLLUTANT LOADS FROM STRUCTURAL SCM (TREATED) OUTFLOWS (LBS):	0.00	0.00	0.00
POLLUTANT LOADS FROM UNTREATED STORMWATER (LBS):	71.87	0.28	1.78
NON-STRUCTURAL SCM WATER QUALITY CREDITS (LBS):			
NET POLLUTANT LOADS FROM SITE, POST-CONSTRUCTION (LBS):	71.87	0.28	1.78
POLLUTANT LOADS FROM SITE, PRE-CONSTRUCTION (LBS):	124.03	0.46	4.19

WATER QUALITY REQUIREMENT SATISFIED

CERTIFICATION

I certify under penalty of law and subject to the penalties of 18 Pa.C.S. § 4904 (relating to unsworn falsification to authorities) that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I further certify that the structure, function, and calculations contained in this spreadsheet have not been modified in comparison to the spreadsheet DEP has posted to its website or, if modifications were made, an explanation of the modifications made is attached to this spreadsheet.

John P. Kelley

Spreadsheet User Name

2/25/2025

Date

APPENDIX B

NOAA RAINFALL DATA

PRE-DEVELOPMENT HYDROCAD REPORT

POST-DEVELOPMENT HYDROCAD REPORT

BASIN MEDIA STORAGE CALCULATION

RECHARGE VOLUME CALCULATIONS

WATER QUALITY CALCULATIONS

EMERGENCY SPILLWAY CALCULATIONS

INLET DRAINAGE AREA TABLE

PENNDOT RAINFALL INTENSITIES

OFFSITE AREA TCs

SSA 100-YR PIPE CONVEYANCE CALCULATIONS



NOAA Atlas 14, Volume 2, Version 3
Location name: Norristown, Pennsylvania, USA*
Latitude: 40.1274°, Longitude: -75.4015°
Elevation: 201 ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aeriels](#)

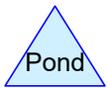
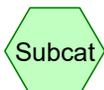
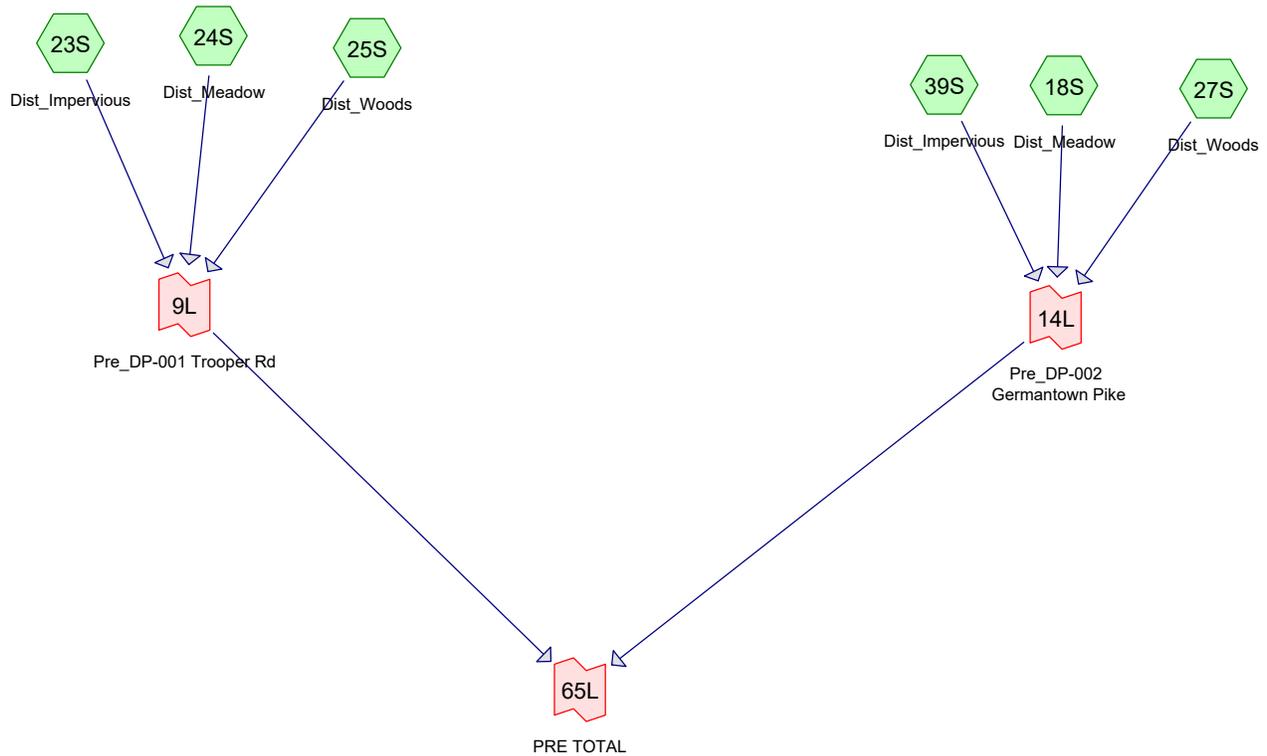
PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.344 (0.317-0.375)	0.410 (0.377-0.447)	0.479 (0.440-0.522)	0.528 (0.484-0.575)	0.586 (0.534-0.637)	0.625 (0.566-0.679)	0.662 (0.598-0.721)	0.695 (0.630-0.758)	0.730 (0.650-0.799)	0.756 (0.669-0.831)
10-min	0.550 (0.506-0.599)	0.655 (0.603-0.714)	0.768 (0.704-0.836)	0.845 (0.775-0.920)	0.934 (0.851-1.02)	0.995 (0.901-1.08)	1.05 (0.950-1.15)	1.10 (0.988-1.20)	1.16 (1.03-1.26)	1.19 (1.05-1.31)
15-min	0.687 (0.632-0.749)	0.824 (0.758-0.898)	0.971 (0.891-1.06)	1.07 (0.980-1.16)	1.18 (1.08-1.29)	1.26 (1.14-1.37)	1.33 (1.20-1.45)	1.39 (1.25-1.52)	1.45 (1.29-1.59)	1.50 (1.32-1.64)
30-min	0.942 (0.867-1.03)	1.14 (1.05-1.24)	1.38 (1.27-1.50)	1.55 (1.42-1.69)	1.75 (1.60-1.91)	1.90 (1.72-2.06)	2.04 (1.84-2.22)	2.16 (1.94-2.36)	2.31 (2.06-2.53)	2.42 (2.14-2.66)
60-min	1.18 (1.08-1.28)	1.43 (1.31-1.56)	1.77 (1.62-1.93)	2.02 (1.85-2.20)	2.34 (2.13-2.54)	2.57 (2.33-2.80)	2.81 (2.53-3.06)	3.03 (2.72-3.31)	3.32 (2.95-3.63)	3.54 (3.13-3.88)
2-hr	1.40 (1.28-1.54)	1.70 (1.56-1.87)	2.12 (1.94-2.33)	2.44 (2.22-2.67)	2.86 (2.59-3.13)	3.20 (2.87-3.49)	3.52 (3.15-3.85)	3.85 (3.42-4.22)	4.30 (3.76-4.71)	4.63 (4.02-5.09)
3-hr	1.53 (1.40-1.68)	1.86 (1.70-2.04)	2.32 (2.11-2.55)	2.67 (2.43-2.93)	3.14 (2.83-3.44)	3.50 (3.14-3.83)	3.87 (3.45-4.24)	4.24 (3.75-4.65)	4.74 (4.14-5.22)	5.11 (4.42-5.64)
6-hr	1.91 (1.75-2.10)	2.31 (2.11-2.54)	2.87 (2.62-3.16)	3.33 (3.02-3.65)	3.96 (3.57-4.34)	4.46 (3.99-4.89)	5.00 (4.43-5.47)	5.55 (4.87-6.08)	6.32 (5.46-6.95)	6.94 (5.90-7.64)
12-hr	2.32 (2.12-2.58)	2.80 (2.56-3.11)	3.50 (3.19-3.88)	4.09 (3.70-4.52)	4.93 (4.42-5.43)	5.64 (5.01-6.20)	6.40 (5.62-7.04)	7.21 (6.25-7.95)	8.39 (7.13-9.28)	9.37 (7.82-10.4)
24-hr	2.70 (2.47-2.95)	3.24 (2.97-3.55)	4.07 (3.72-4.45)	4.75 (4.33-5.19)	5.73 (5.20-6.25)	6.56 (5.93-7.15)	7.45 (6.70-8.11)	8.41 (7.51-9.15)	9.81 (8.66-10.7)	11.0 (9.58-11.9)
2-day	3.11 (2.84-3.42)	3.76 (3.43-4.13)	4.72 (4.30-5.19)	5.49 (4.99-6.04)	6.60 (5.97-7.23)	7.51 (6.77-8.22)	8.48 (7.59-9.28)	9.50 (8.46-10.4)	11.0 (9.68-12.0)	12.2 (10.7-13.3)
3-day	3.28 (3.00-3.61)	3.96 (3.62-4.36)	4.96 (4.53-5.45)	5.76 (5.25-6.33)	6.91 (6.27-7.57)	7.85 (7.10-8.60)	8.85 (7.96-9.69)	9.91 (8.85-10.9)	11.4 (10.1-12.5)	12.6 (11.1-13.9)
4-day	3.46 (3.16-3.80)	4.16 (3.81-4.58)	5.20 (4.76-5.72)	6.04 (5.51-6.63)	7.22 (6.56-7.91)	8.20 (7.42-8.97)	9.23 (8.32-10.1)	10.3 (9.25-11.3)	11.9 (10.5-13.0)	13.1 (11.6-14.4)
7-day	4.03 (3.72-4.41)	4.84 (4.46-5.28)	5.97 (5.51-6.53)	6.90 (6.35-7.54)	8.23 (7.54-8.98)	9.33 (8.51-10.2)	10.5 (9.52-11.4)	11.7 (10.6-12.8)	13.5 (12.1-14.7)	14.9 (13.2-16.3)
10-day	4.58 (4.25-4.97)	5.48 (5.08-5.93)	6.67 (6.18-7.23)	7.63 (7.06-8.26)	8.96 (8.26-9.69)	10.0 (9.22-10.9)	11.1 (10.2-12.1)	12.3 (11.2-13.3)	13.9 (12.6-15.1)	15.2 (13.6-16.5)
20-day	6.20 (5.78-6.66)	7.35 (6.86-7.90)	8.77 (8.17-9.42)	9.88 (9.19-10.6)	11.4 (10.6-12.2)	12.5 (11.6-13.4)	13.7 (12.7-14.7)	14.9 (13.7-16.0)	16.5 (15.1-17.7)	17.7 (16.1-19.0)
30-day	7.72 (7.28-8.18)	9.09 (8.57-9.64)	10.6 (9.98-11.2)	11.7 (11.1-12.5)	13.3 (12.5-14.1)	14.4 (13.5-15.3)	15.5 (14.6-16.5)	16.7 (15.5-17.7)	18.1 (16.8-19.2)	19.2 (17.8-20.4)
45-day	9.79 (9.28-10.3)	11.5 (10.9-12.1)	13.2 (12.5-13.9)	14.5 (13.7-15.3)	16.1 (15.3-17.0)	17.3 (16.4-18.3)	18.5 (17.4-19.5)	19.5 (18.4-20.6)	20.8 (19.6-22.0)	21.8 (20.4-23.1)
60-day	11.7 (11.1-12.3)	13.7 (13.1-14.5)	15.7 (14.9-16.5)	17.1 (16.3-18.0)	18.9 (17.9-19.9)	20.2 (19.2-21.3)	21.4 (20.3-22.5)	22.5 (21.3-23.7)	23.9 (22.6-25.2)	24.9 (23.4-26.2)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical



Routing Diagram for Trooper Ridge Pre and Post 2025-01
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Trooper Ridge Pre and Post 2025-01

Prepared by T&M Associates

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Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr	Type II 24-hr		Default	24.00	1	2.69	2
2	1.2in/2-hr	NJ DEP 2-hr		Default	2.00	1	1.20	2
3	2-yr	Type II 24-hr		Default	24.00	1	3.24	2
4	5-yr	Type II 24-hr		Default	24.00	1	4.06	2
5	10-yr	Type II 24-hr		Default	24.00	1	4.75	2
6	25-yr	Type II 24-hr		Default	24.00	1	5.73	2
7	50-yr	Type II 24-hr		Default	24.00	1	6.56	2
8	100-yr	Type II 24-hr		Default	24.00	1	7.45	2

Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 1-yr Rainfall=2.69"

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Page 3

Summary for Subcatchment 18S: Dist_Meadow

Runoff = 0.31 cfs @ 12.18 hrs, Volume= 1,261 cf, Depth= 0.59"

Routed to Link 14L : Pre_DP-002 Germantown Pike

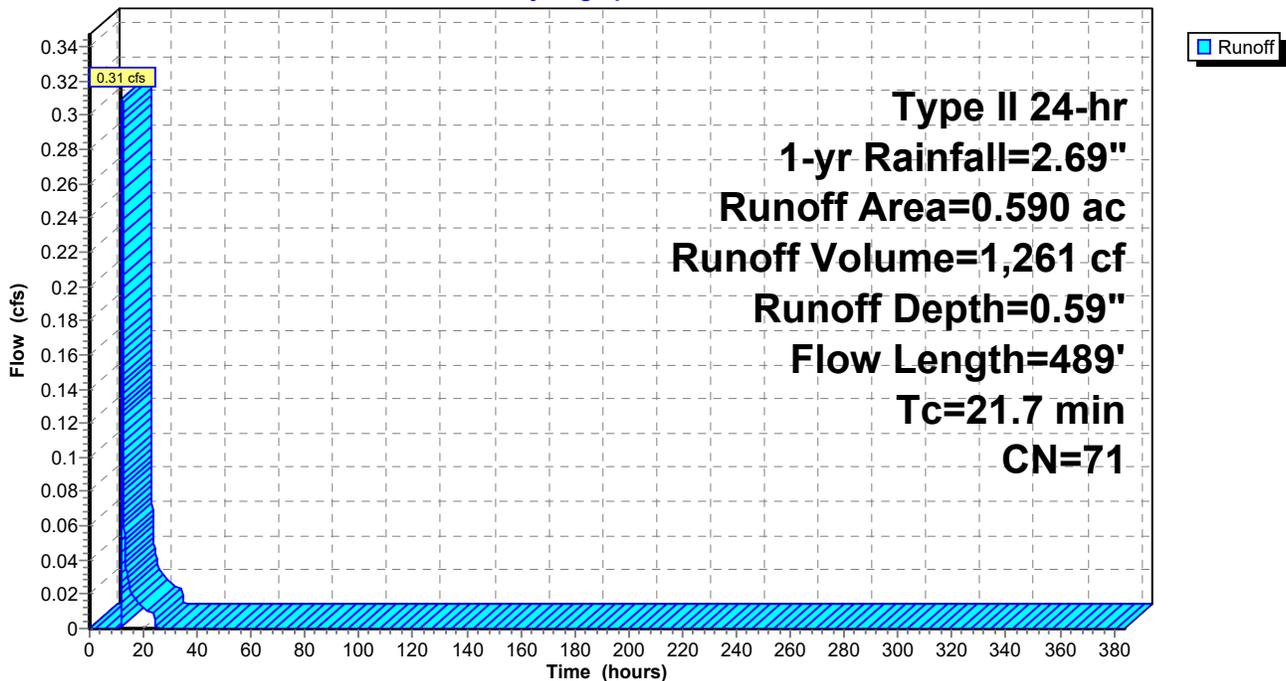
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-yr Rainfall=2.69"

Area (ac)	CN	Description
0.590	71	Meadow, non-grazed, HSG C
0.590		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	100	0.1000	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	389	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
21.7	489	Total			

Subcatchment 18S: Dist_Meadow

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 1-yr Rainfall=2.69"

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Summary for Subcatchment 23S: Dist_Impervious

Runoff = 0.16 cfs @ 11.96 hrs, Volume= 357 cf, Depth= 2.46"

Routed to Link 9L : Pre_DP-001 Trooper Rd

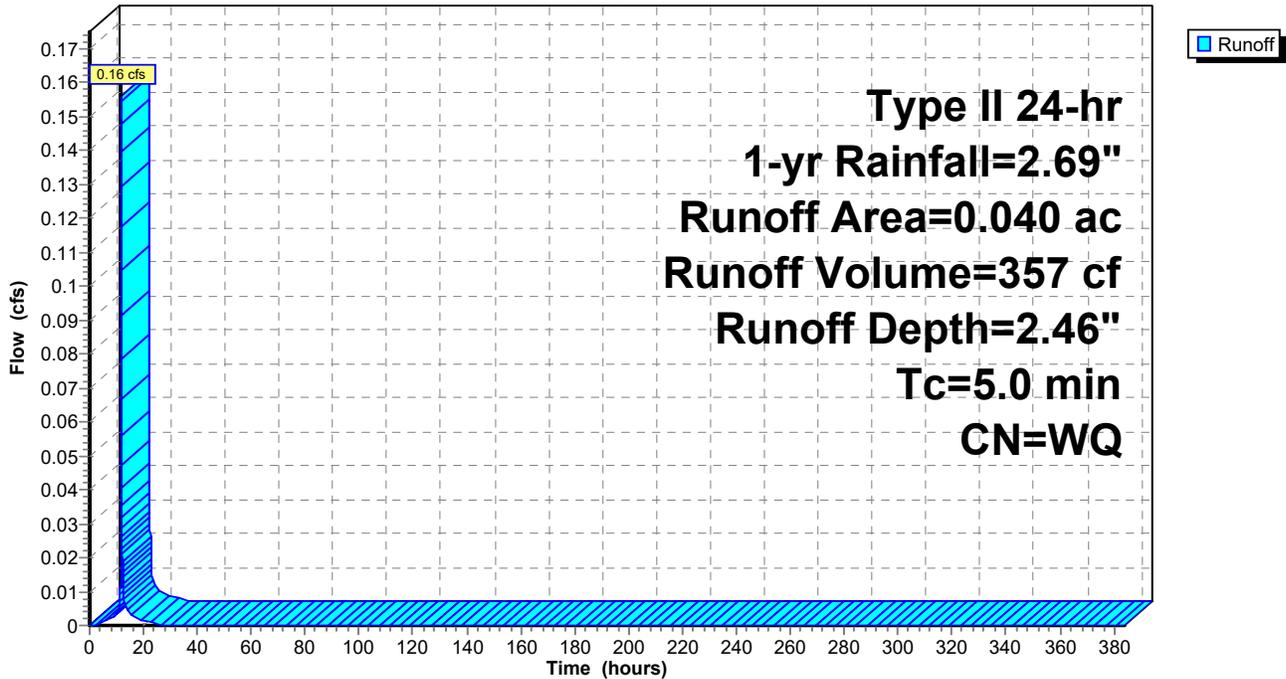
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-yr Rainfall=2.69"

Area (ac)	CN	Description
* 0.020	98	ROW
* 0.020	98	
0.040		Weighted Average
0.040		100.00% Impervious Area

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

Subcatchment 23S: Dist_Impervious

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 1-yr Rainfall=2.69"

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Summary for Subcatchment 24S: Dist_Meadow

Runoff = 3.08 cfs @ 12.15 hrs, Volume= 11,193 cf, Depth= 0.73"

Routed to Link 9L : Pre_DP-001 Trooper Rd

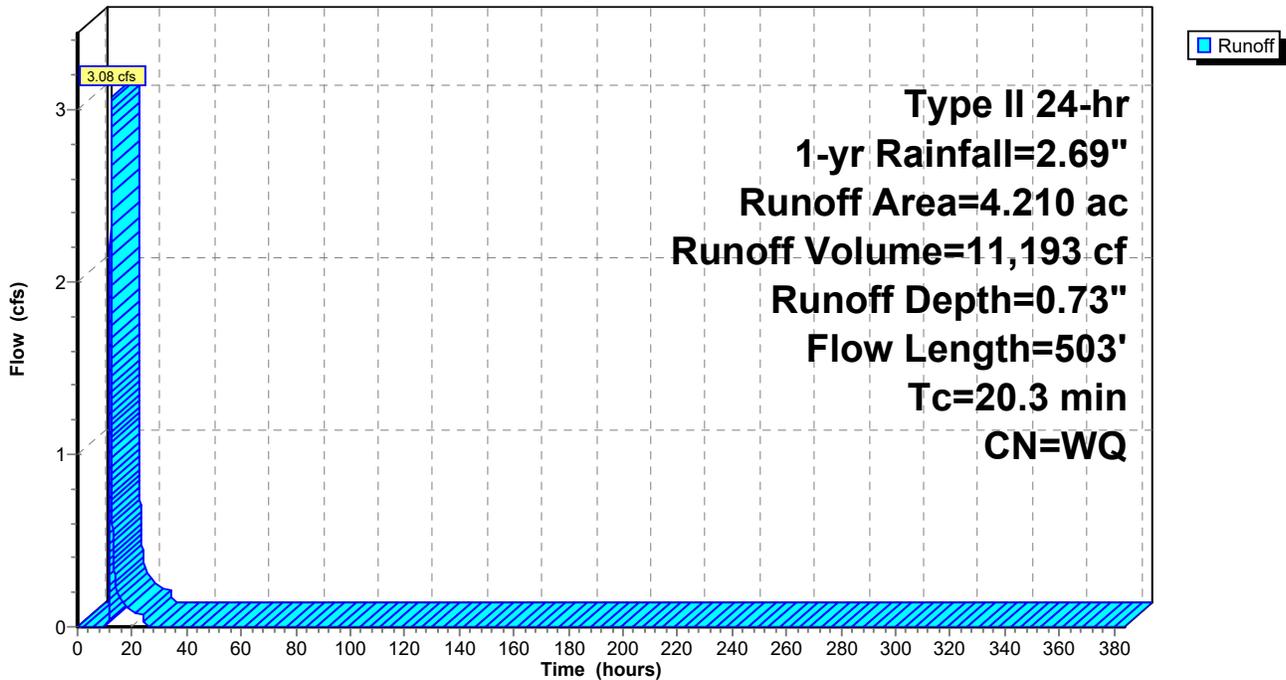
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-yr Rainfall=2.69"

Area (ac)	CN	Description
2.350	71	Meadow, non-grazed, HSG C
1.860	78	Meadow, non-grazed, HSG D
4.210		Weighted Average
4.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	100	0.1200	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	403	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.3	503	Total			

Subcatchment 24S: Dist_Meadow

Hydrograph



Trooper Ridge Pre and Post 2025-01

Prepared by T&M Associates

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Type II 24-hr 1-yr Rainfall=2.69"

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Summary for Subcatchment 25S: Dist_Woods

Runoff = 3.22 cfs @ 12.16 hrs, Volume= 12,108 cf, Depth= 0.66"

Routed to Link 9L : Pre_DP-001 Trooper Rd

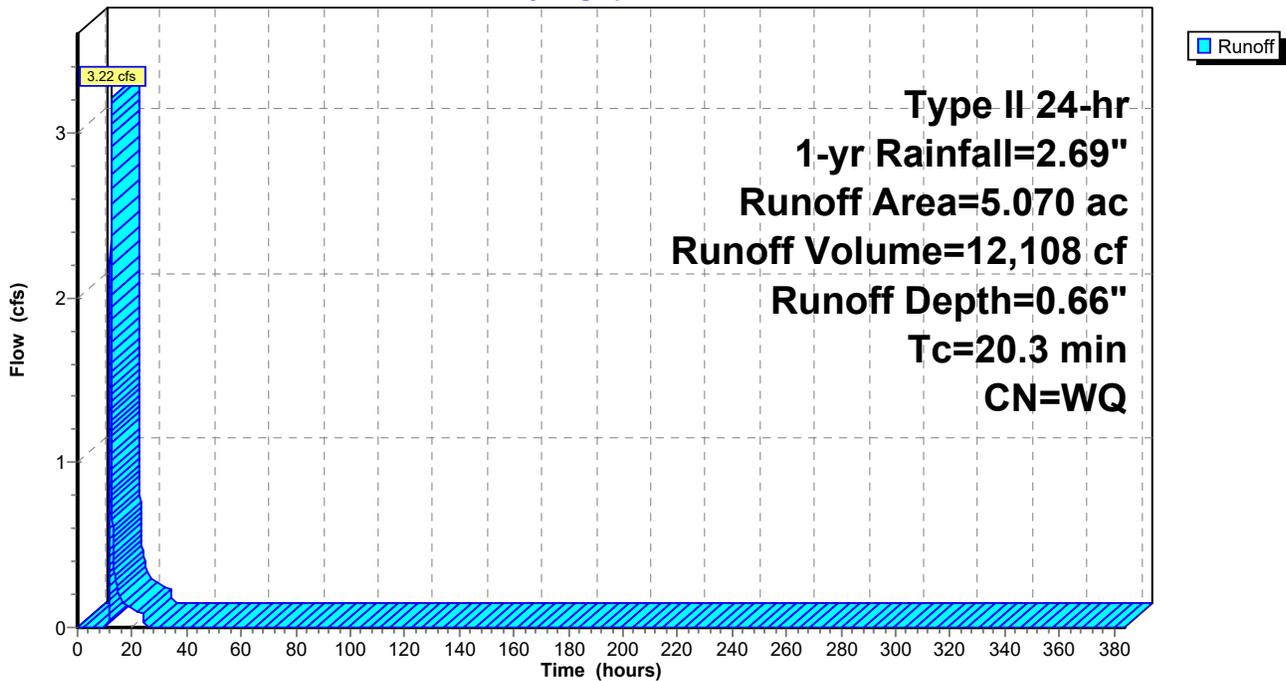
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-yr Rainfall=2.69"

Area (ac)	CN	Description
3.750	70	Woods, Good, HSG C
1.320	79	Woods, Fair, HSG D
5.070		Weighted Average
5.070		100.00% Pervious Area

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

Subcatchment 25S: Dist_Woods

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 1-yr Rainfall=2.69"

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Summary for Subcatchment 27S: Dist_Woods

Runoff = 0.10 cfs @ 12.18 hrs, Volume= 438 cf, Depth= 0.55"

Routed to Link 14L : Pre_DP-002 Germantown Pike

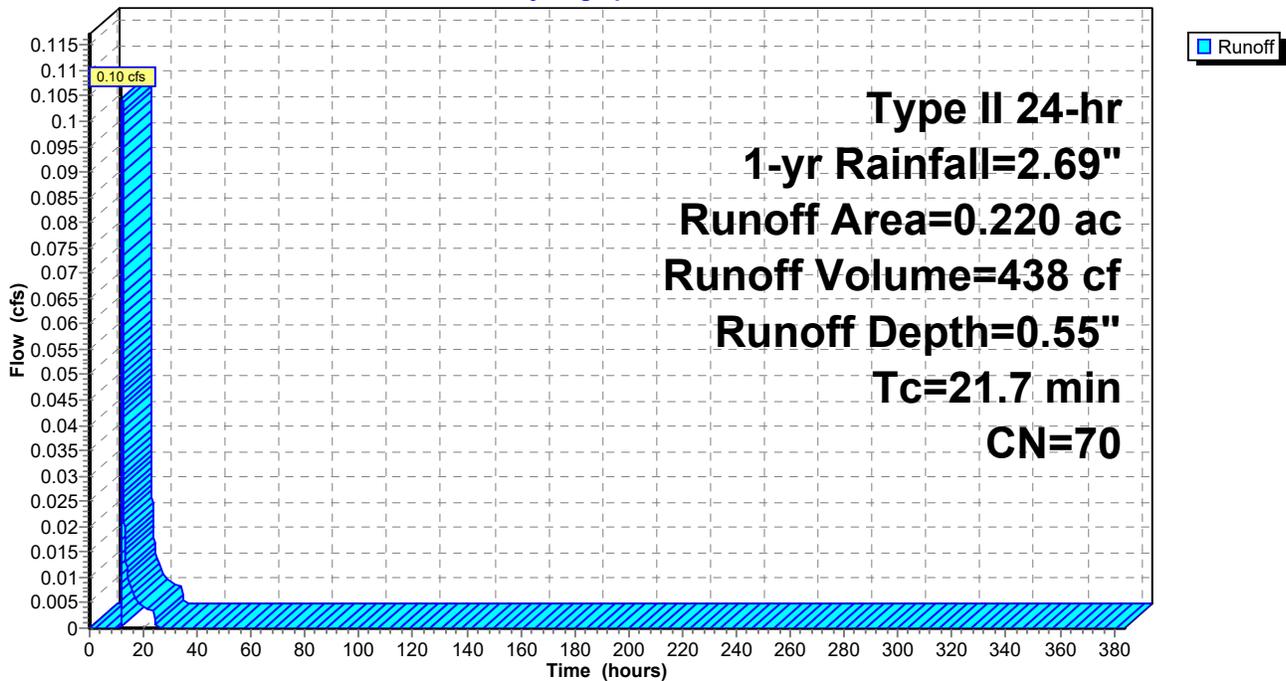
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-yr Rainfall=2.69"

Area (ac)	CN	Description
0.220	70	Woods, Good, HSG C
0.220		100.00% Pervious Area

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

Subcatchment 27S: Dist_Woods

Hydrograph



Summary for Subcatchment 39S: Dist_Impervious

Runoff = 0.12 cfs @ 11.96 hrs, Volume= 268 cf, Depth= 2.46"

Routed to Link 14L : Pre_DP-002 Germantown Pike

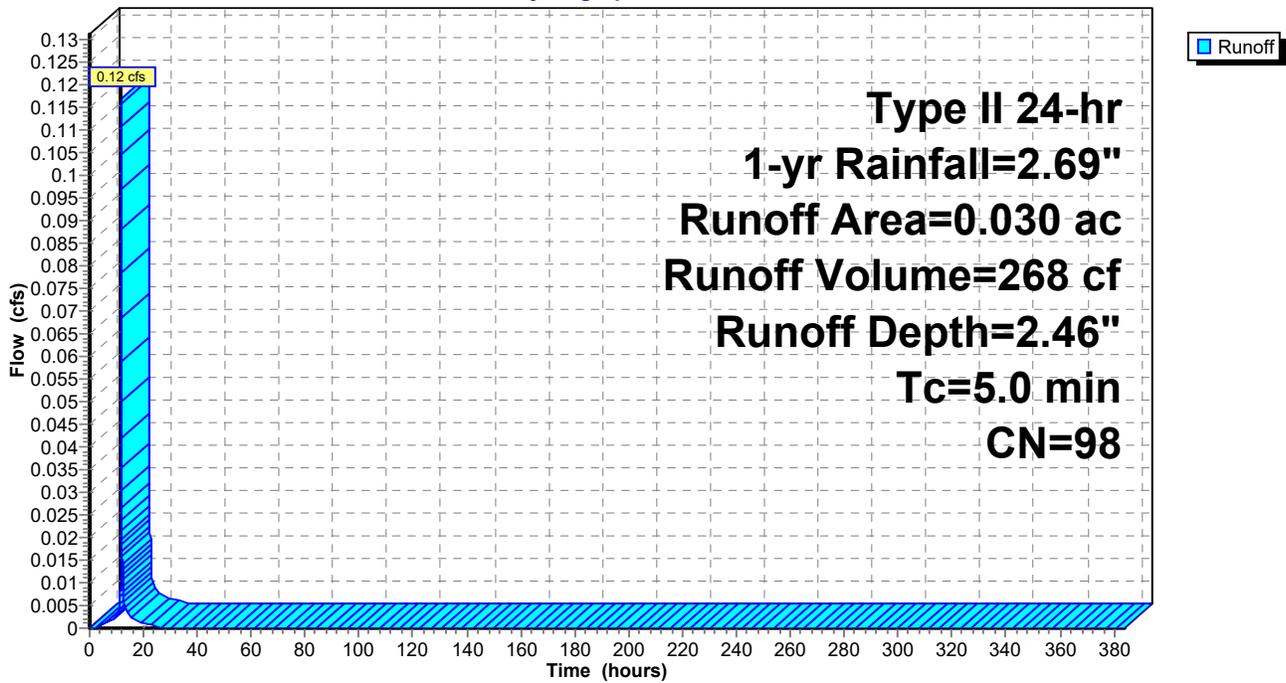
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-yr Rainfall=2.69"

Area (ac)	CN	Description
* 0.030	98	ROW
0.030		100.00% Impervious Area

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

Subcatchment 39S: Dist_Impervious

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 1-yr Rainfall=2.69"

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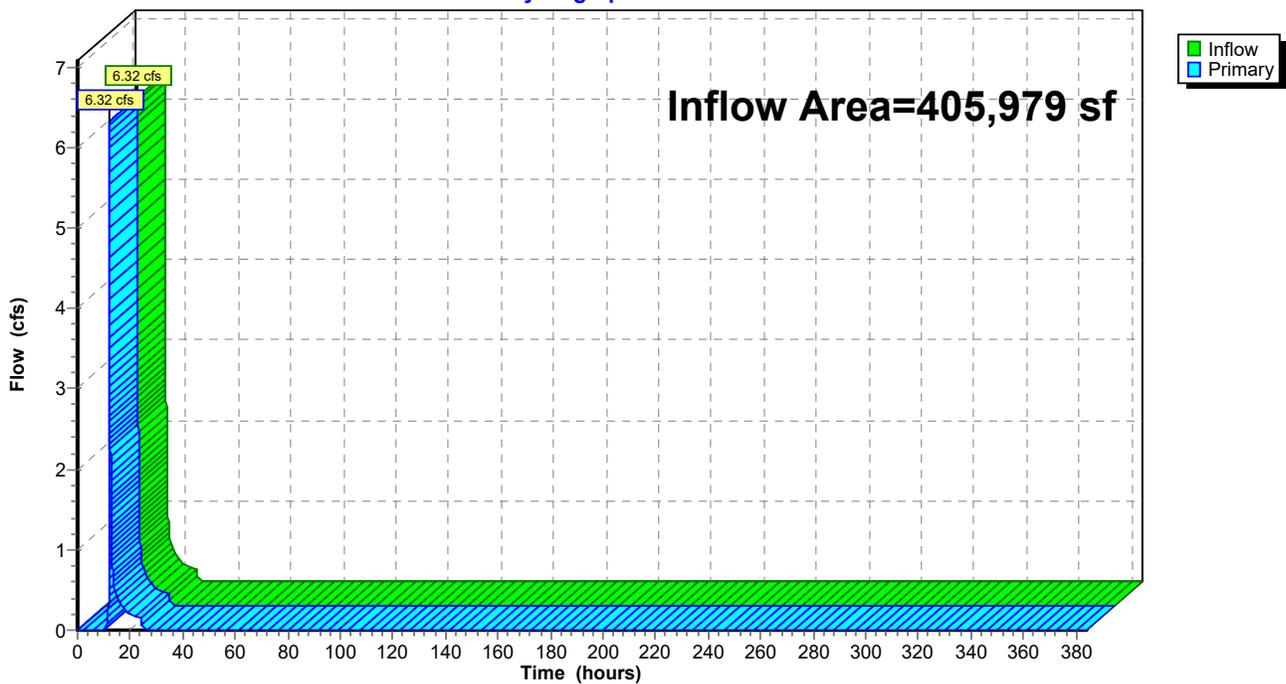
Summary for Link 9L: Pre_DP-001 Trooper Rd

Inflow Area = 405,979 sf, 0.43% Impervious, Inflow Depth = 0.70" for 1-yr event
Inflow = 6.32 cfs @ 12.15 hrs, Volume= 23,658 cf
Primary = 6.32 cfs @ 12.15 hrs, Volume= 23,658 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 9L: Pre_DP-001 Trooper Rd

Hydrograph



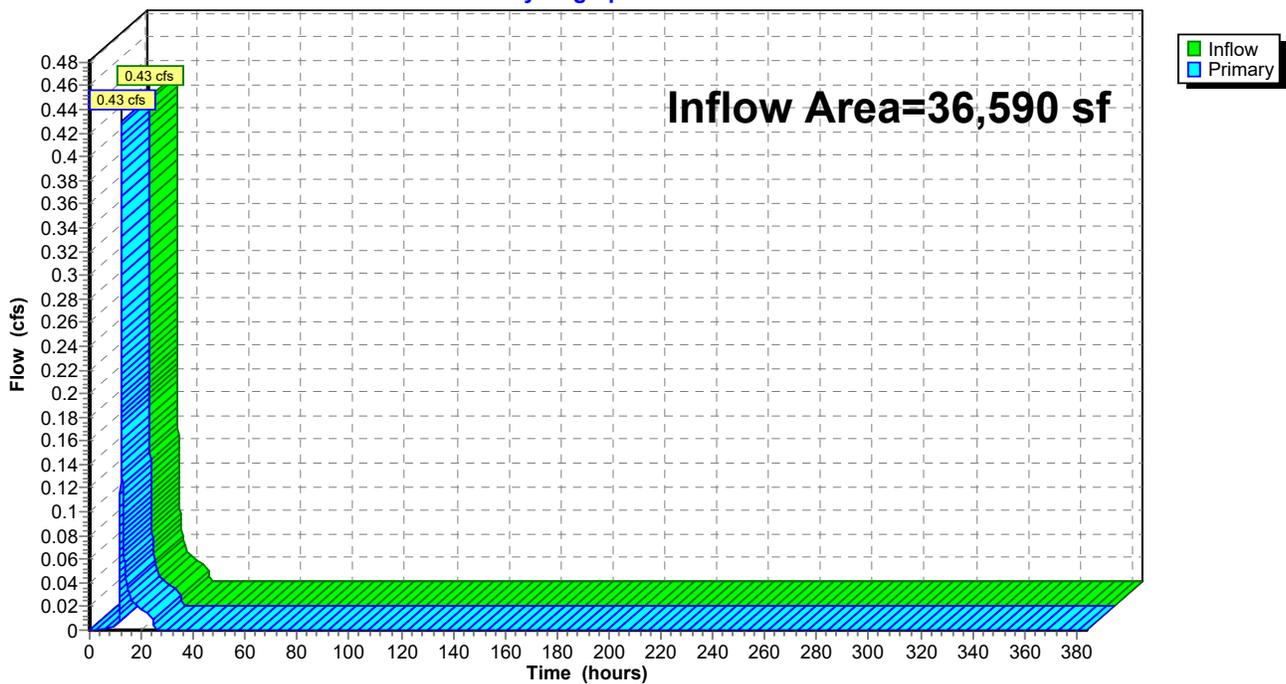
Summary for Link 14L: Pre_DP-002 Germantown Pike

Inflow Area = 36,590 sf, 3.57% Impervious, Inflow Depth = 0.65" for 1-yr event
Inflow = 0.43 cfs @ 12.18 hrs, Volume= 1,968 cf
Primary = 0.43 cfs @ 12.18 hrs, Volume= 1,968 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 14L: Pre_DP-002 Germantown Pike

Hydrograph



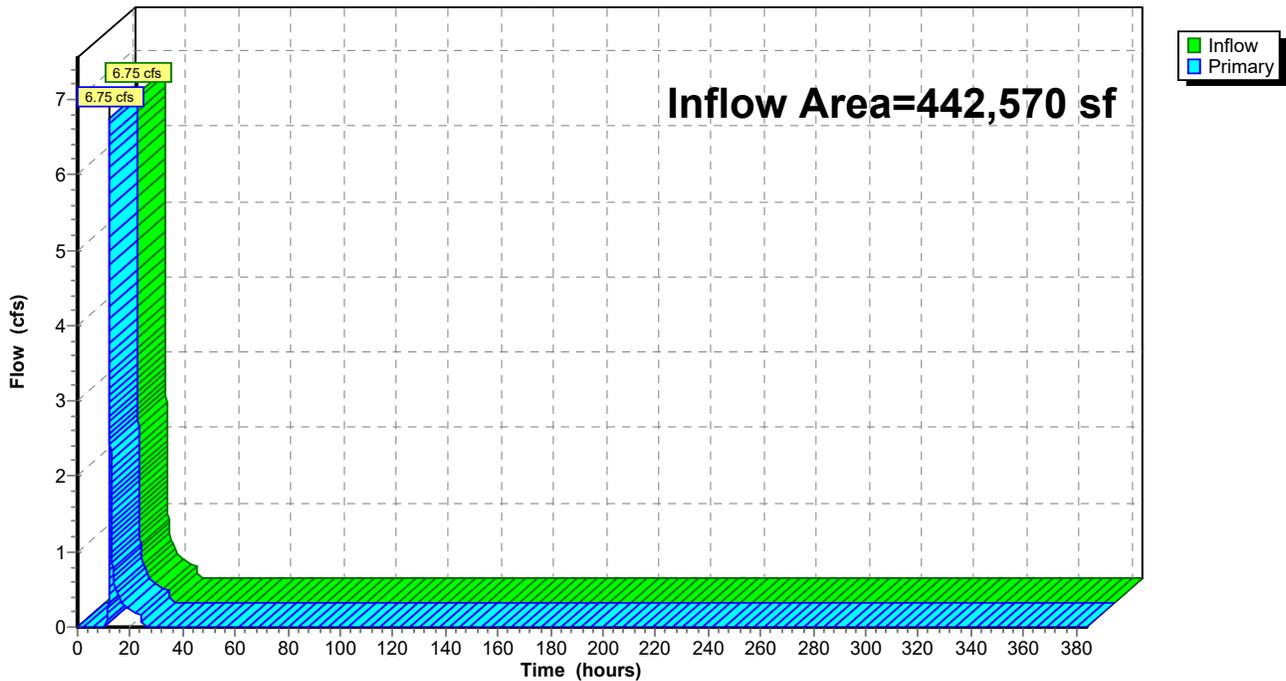
Summary for Link 65L: PRE TOTAL

Inflow Area = 442,570 sf, 0.69% Impervious, Inflow Depth = 0.69" for 1-yr event
Inflow = 6.75 cfs @ 12.16 hrs, Volume= 25,626 cf
Primary = 6.75 cfs @ 12.16 hrs, Volume= 25,626 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 65L: PRE TOTAL

Hydrograph



Summary for Subcatchment 18S: Dist_Meadow

Runoff = 0.02 cfs @ 1.81 hrs, Volume= 70 cf, Depth= 0.03"

Routed to Link 14L : Pre_DP-002 Germantown Pike

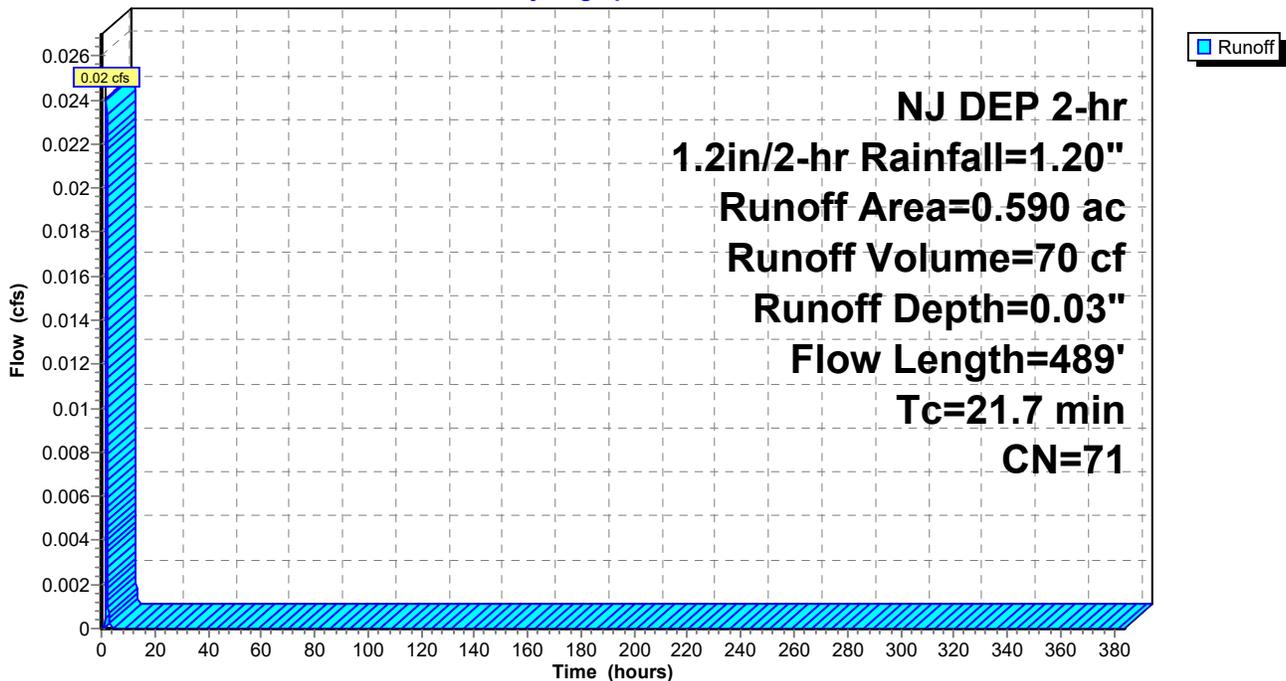
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr 1.2in/2-hr Rainfall=1.20"

Area (ac)	CN	Description
0.590	71	Meadow, non-grazed, HSG C
0.590		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	100	0.1000	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	389	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
21.7	489	Total			

Subcatchment 18S: Dist_Meadow

Hydrograph



Trooper Ridge Pre and Post 2025-01

NJ DEP 2-hr 1.2in/2-hr Rainfall=1.20"

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Summary for Subcatchment 23S: Dist_Impervious

Runoff = 0.11 cfs @ 1.10 hrs, Volume= 143 cf, Depth= 0.99"

Routed to Link 9L : Pre_DP-001 Trooper Rd

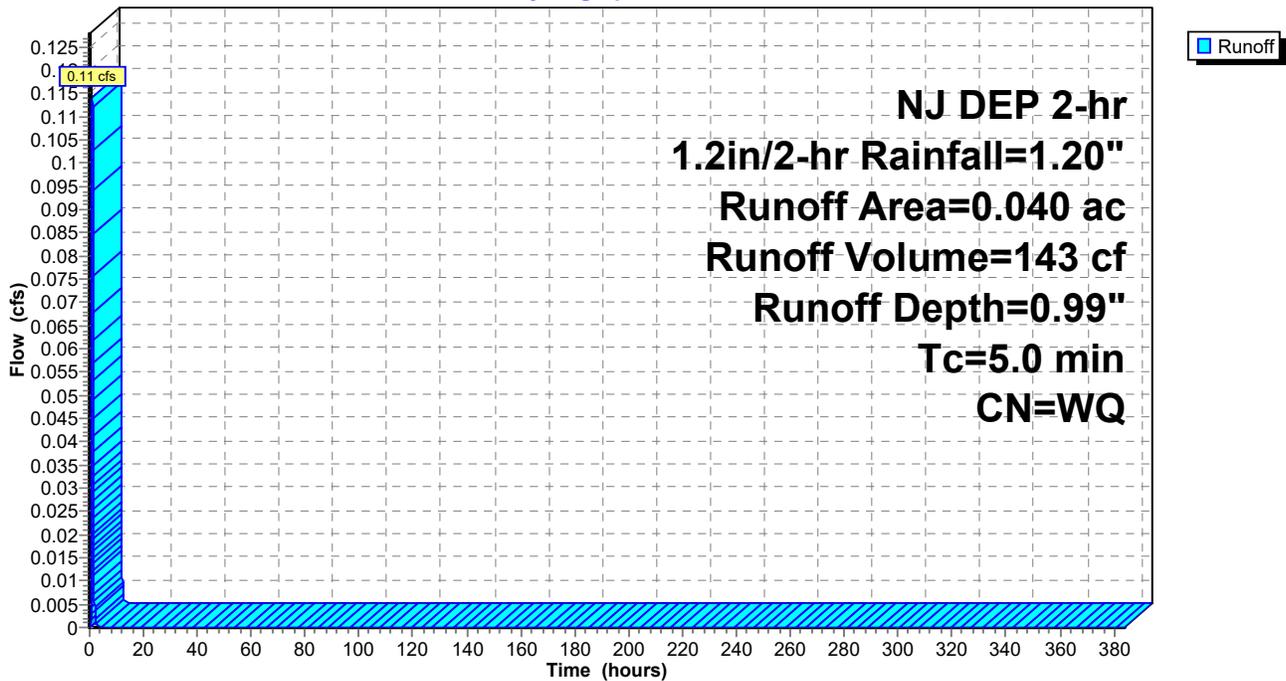
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr 1.2in/2-hr Rainfall=1.20"

Area (ac)	CN	Description
* 0.020	98	ROW
* 0.020	98	
0.040		Weighted Average
0.040		100.00% Impervious Area

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

Subcatchment 23S: Dist_Impervious

Hydrograph



Summary for Subcatchment 24S: Dist_Meadow

Runoff = 0.40 cfs @ 1.42 hrs, Volume= 1,070 cf, Depth= 0.07"

Routed to Link 9L : Pre_DP-001 Trooper Rd

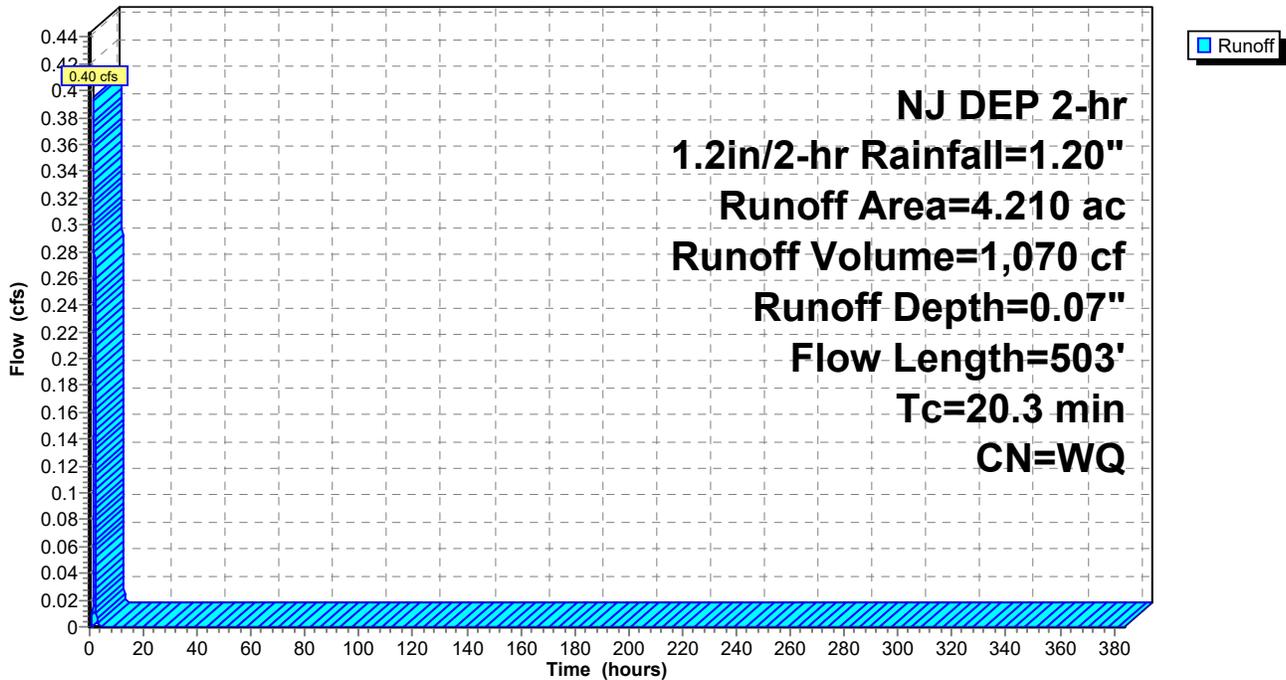
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr 1.2in/2-hr Rainfall=1.20"

Area (ac)	CN	Description
2.350	71	Meadow, non-grazed, HSG C
1.860	78	Meadow, non-grazed, HSG D
4.210		Weighted Average
4.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	100	0.1200	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	403	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.3	503	Total			

Subcatchment 24S: Dist_Meadow

Hydrograph



Trooper Ridge Pre and Post 2025-01

NJ DEP 2-hr 1.2in/2-hr Rainfall=1.20"

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Summary for Subcatchment 25S: Dist_Woods

Runoff = 0.34 cfs @ 1.42 hrs, Volume= 989 cf, Depth= 0.05"

Routed to Link 9L : Pre_DP-001 Trooper Rd

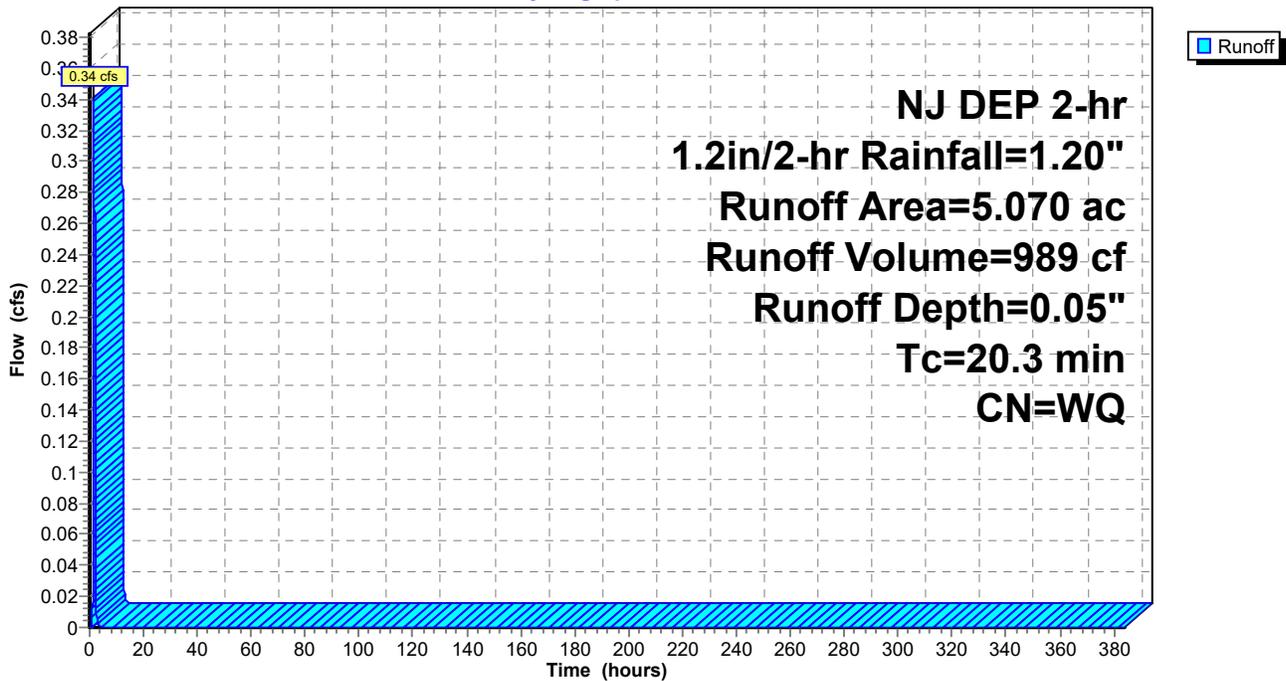
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr 1.2in/2-hr Rainfall=1.20"

Area (ac)	CN	Description
3.750	70	Woods, Good, HSG C
1.320	79	Woods, Fair, HSG D
5.070		Weighted Average
5.070		100.00% Pervious Area

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

Subcatchment 25S: Dist_Woods

Hydrograph



Summary for Subcatchment 27S: Dist_Woods

Runoff = 0.01 cfs @ 1.85 hrs, Volume= 20 cf, Depth= 0.03"

Routed to Link 14L : Pre_DP-002 Germantown Pike

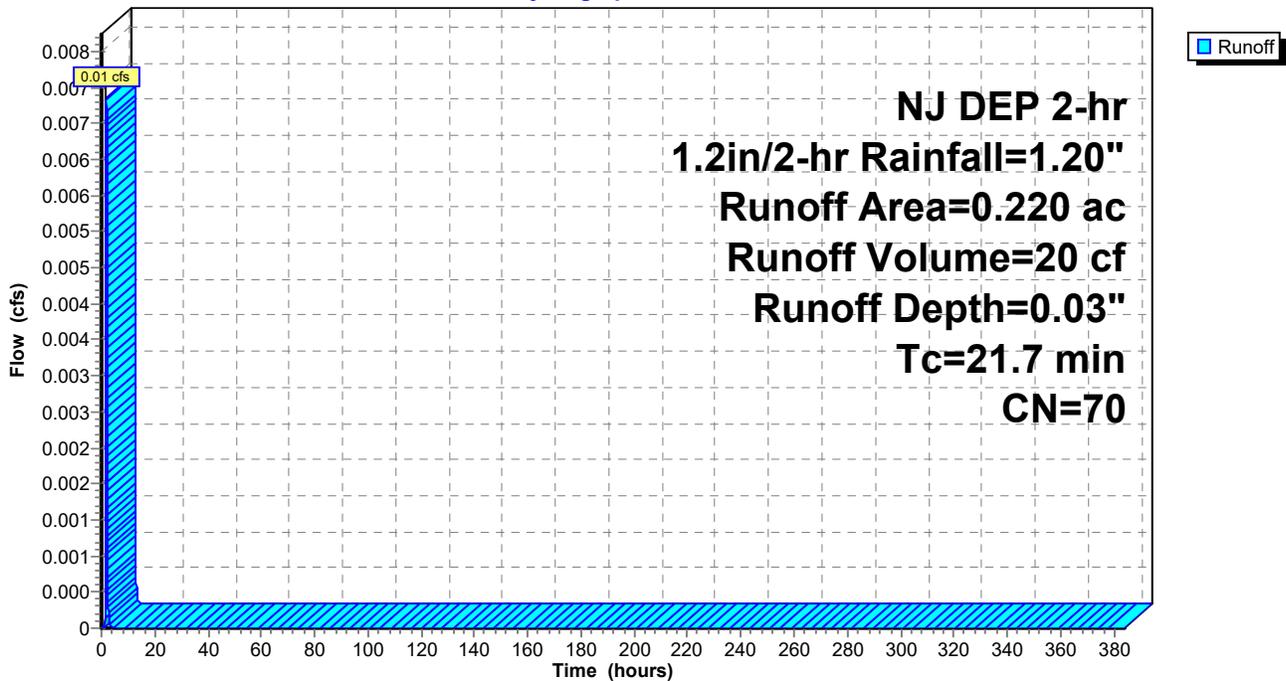
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr 1.2in/2-hr Rainfall=1.20"

Area (ac)	CN	Description
0.220	70	Woods, Good, HSG C
0.220		100.00% Pervious Area

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

Subcatchment 27S: Dist_Woods

Hydrograph



Summary for Subcatchment 39S: Dist_Impervious

Runoff = 0.09 cfs @ 1.10 hrs, Volume= 107 cf, Depth= 0.99"

Routed to Link 14L : Pre_DP-002 Germantown Pike

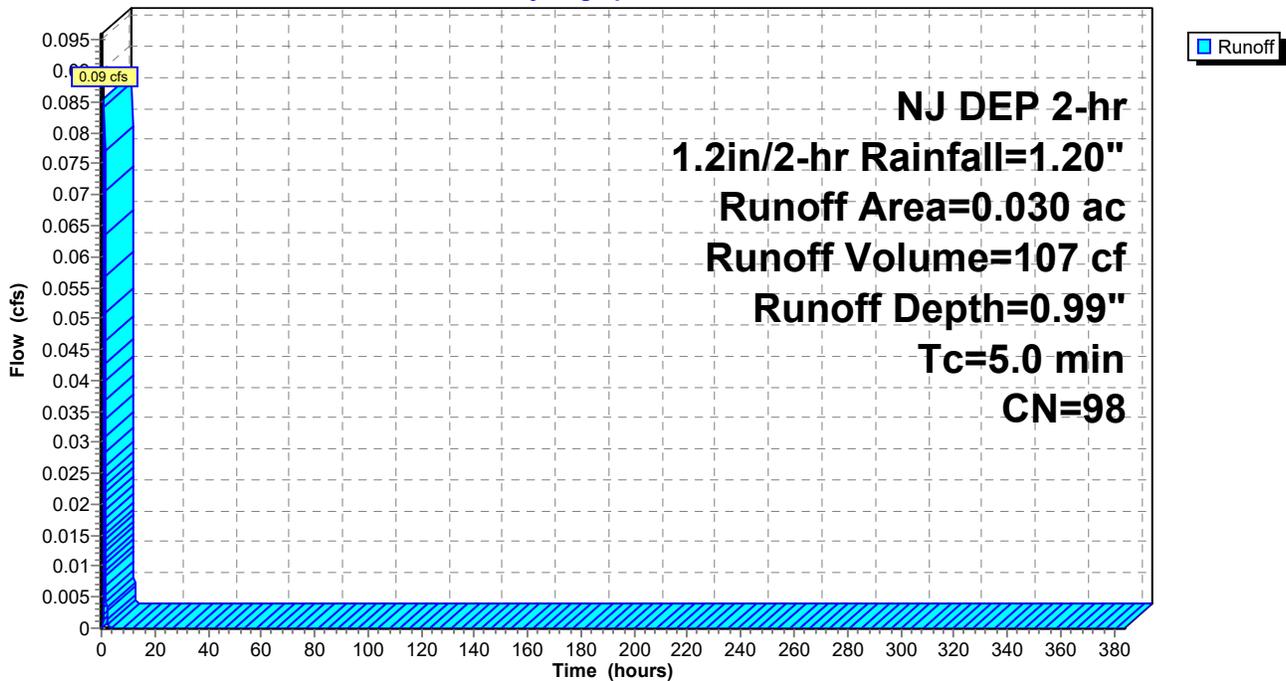
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr 1.2in/2-hr Rainfall=1.20"

Area (ac)	CN	Description
* 0.030	98	ROW
0.030		100.00% Impervious Area

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

Subcatchment 39S: Dist_Impervious

Hydrograph



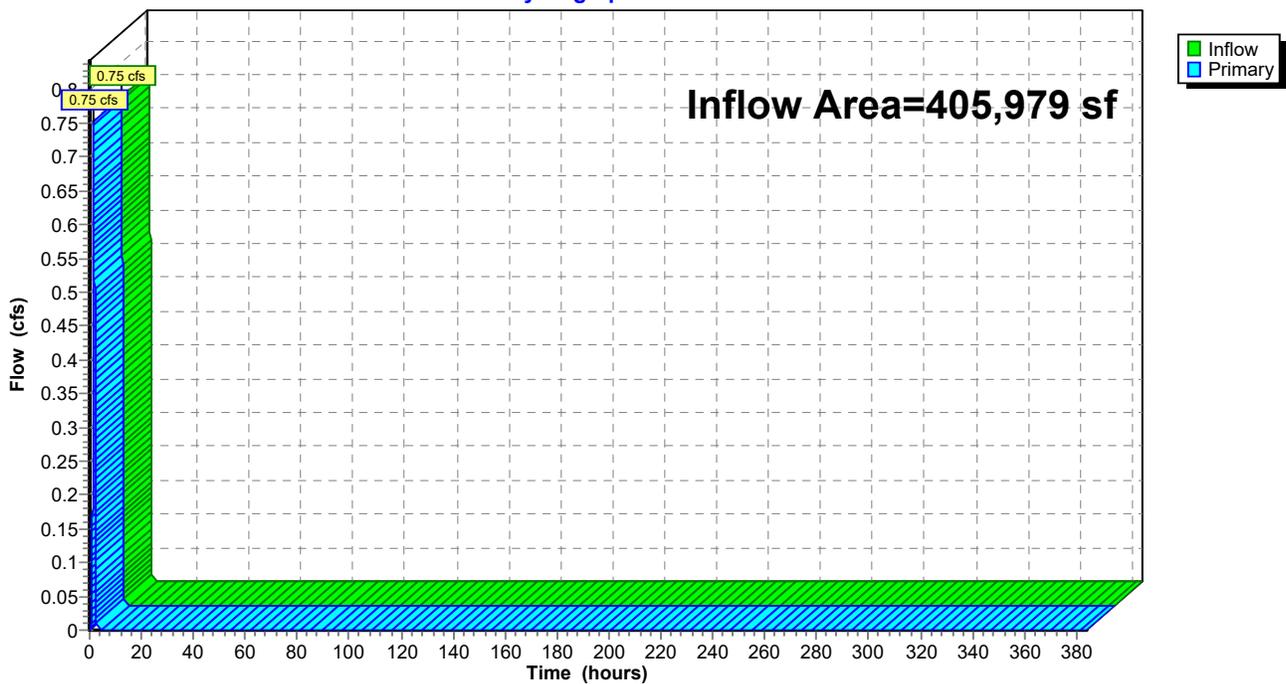
Summary for Link 9L: Pre_DP-001 Trooper Rd

Inflow Area = 405,979 sf, 0.43% Impervious, Inflow Depth = 0.07" for 1.2in/2-hr event
Inflow = 0.75 cfs @ 1.42 hrs, Volume= 2,202 cf
Primary = 0.75 cfs @ 1.42 hrs, Volume= 2,202 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 9L: Pre_DP-001 Trooper Rd

Hydrograph



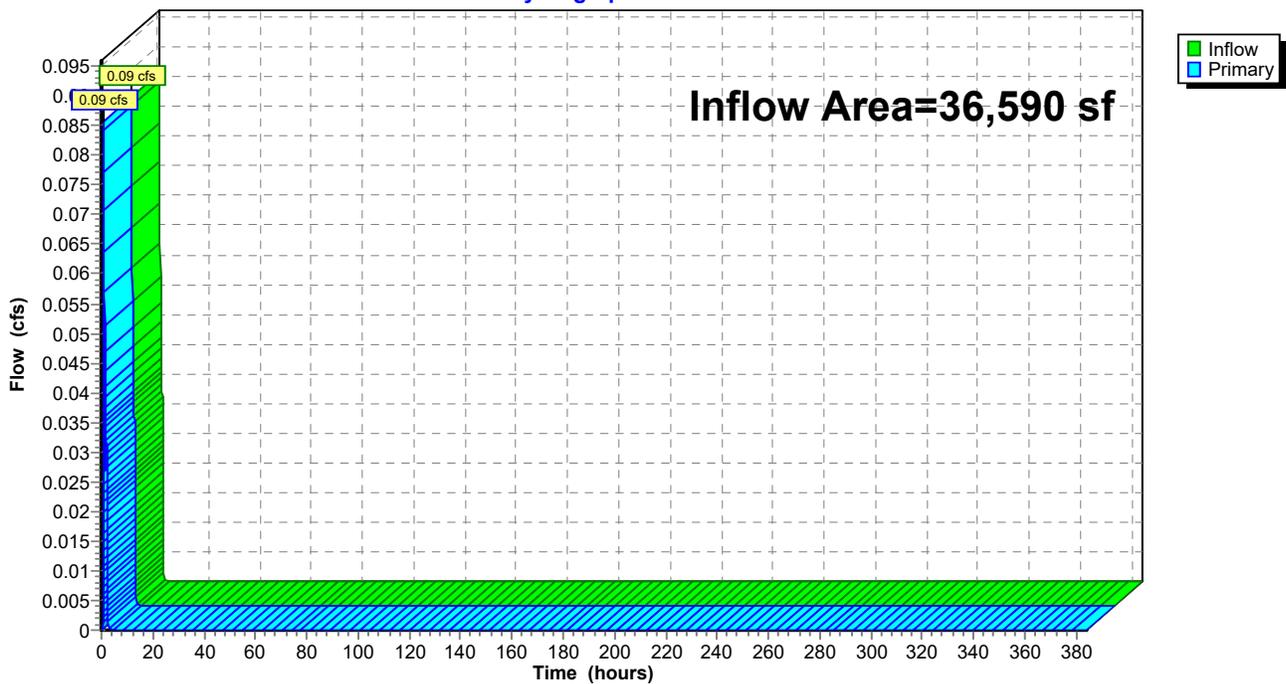
Summary for Link 14L: Pre_DP-002 Germantown Pike

Inflow Area = 36,590 sf, 3.57% Impervious, Inflow Depth = 0.06" for 1.2in/2-hr event
Inflow = 0.09 cfs @ 1.10 hrs, Volume= 198 cf
Primary = 0.09 cfs @ 1.10 hrs, Volume= 198 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 14L: Pre_DP-002 Germantown Pike

Hydrograph



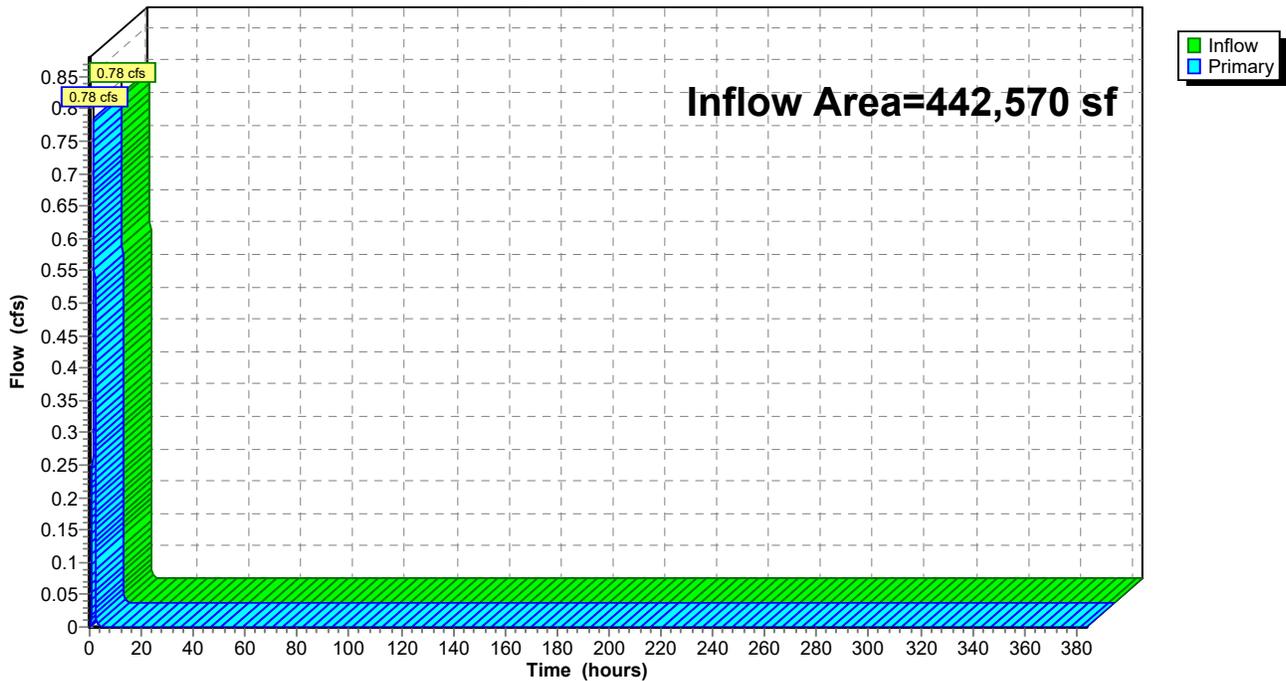
Summary for Link 65L: PRE TOTAL

Inflow Area = 442,570 sf, 0.69% Impervious, Inflow Depth = 0.07" for 1.2in/2-hr event
Inflow = 0.78 cfs @ 1.42 hrs, Volume= 2,400 cf
Primary = 0.78 cfs @ 1.42 hrs, Volume= 2,400 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 65L: PRE TOTAL

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.24"

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Summary for Subcatchment 18S: Dist_Meadow

Runoff = 0.51 cfs @ 12.17 hrs, Volume= 1,932 cf, Depth= 0.90"

Routed to Link 14L : Pre_DP-002 Germantown Pike

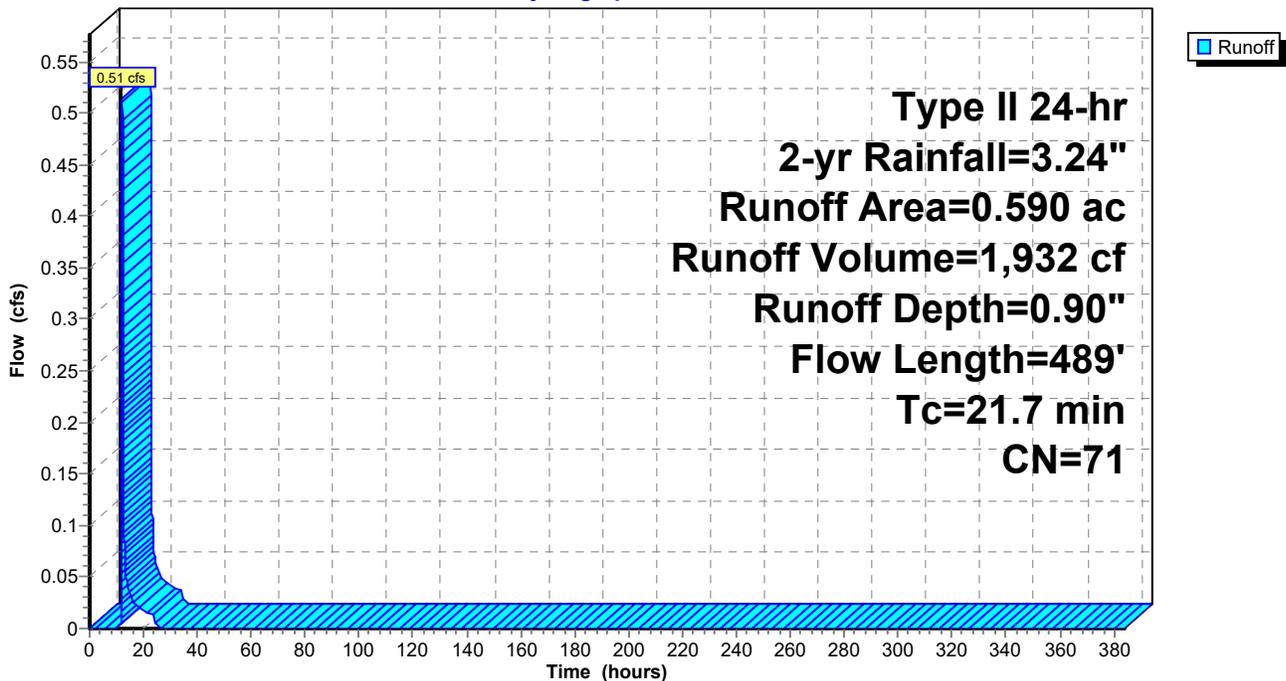
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-yr Rainfall=3.24"

Area (ac)	CN	Description
0.590	71	Meadow, non-grazed, HSG C
0.590		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	100	0.1000	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	389	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
21.7	489	Total			

Subcatchment 18S: Dist_Meadow

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.24"

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Summary for Subcatchment 23S: Dist_Impervious

Runoff = 0.19 cfs @ 11.96 hrs, Volume= 437 cf, Depth= 3.01"

Routed to Link 9L : Pre_DP-001 Trooper Rd

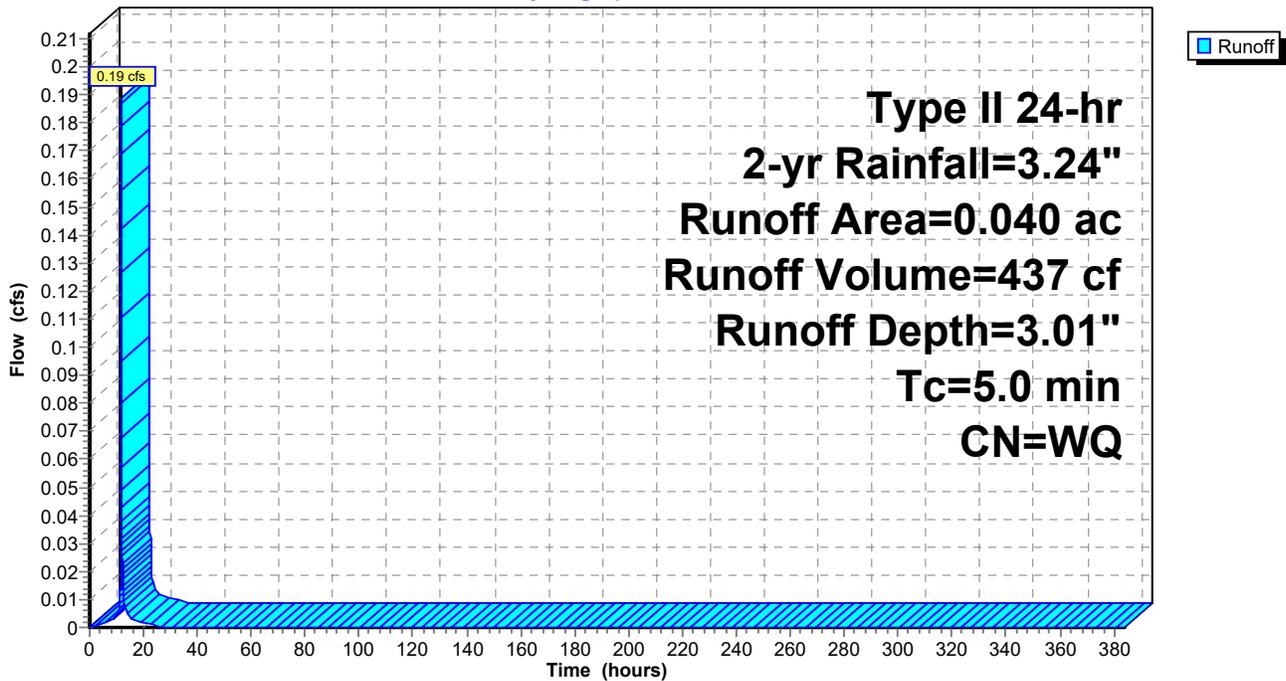
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-yr Rainfall=3.24"

Area (ac)	CN	Description
* 0.020	98	ROW
* 0.020	98	
0.040		Weighted Average
0.040		100.00% Impervious Area

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

Subcatchment 23S: Dist_Impervious

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.24"

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Summary for Subcatchment 24S: Dist_Meadow

Runoff = 4.75 cfs @ 12.14 hrs, Volume= 16,492 cf, Depth= 1.08"

Routed to Link 9L : Pre_DP-001 Trooper Rd

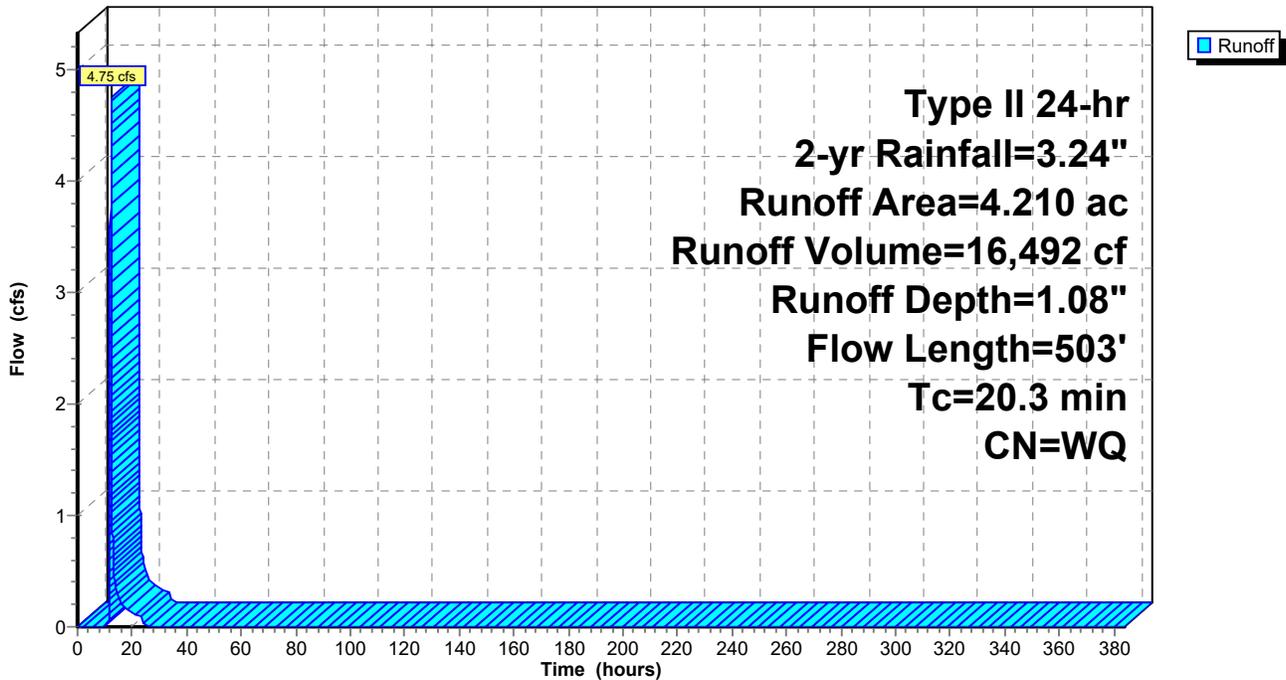
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=3.24"

Area (ac)	CN	Description
2.350	71	Meadow, non-grazed, HSG C
1.860	78	Meadow, non-grazed, HSG D
4.210		Weighted Average
4.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	100	0.1200	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	403	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.3	503	Total			

Subcatchment 24S: Dist_Meadow

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.24"

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Summary for Subcatchment 25S: Dist_Woods

Runoff = 5.12 cfs @ 12.15 hrs, Volume= 18,140 cf, Depth= 0.99"

Routed to Link 9L : Pre_DP-001 Trooper Rd

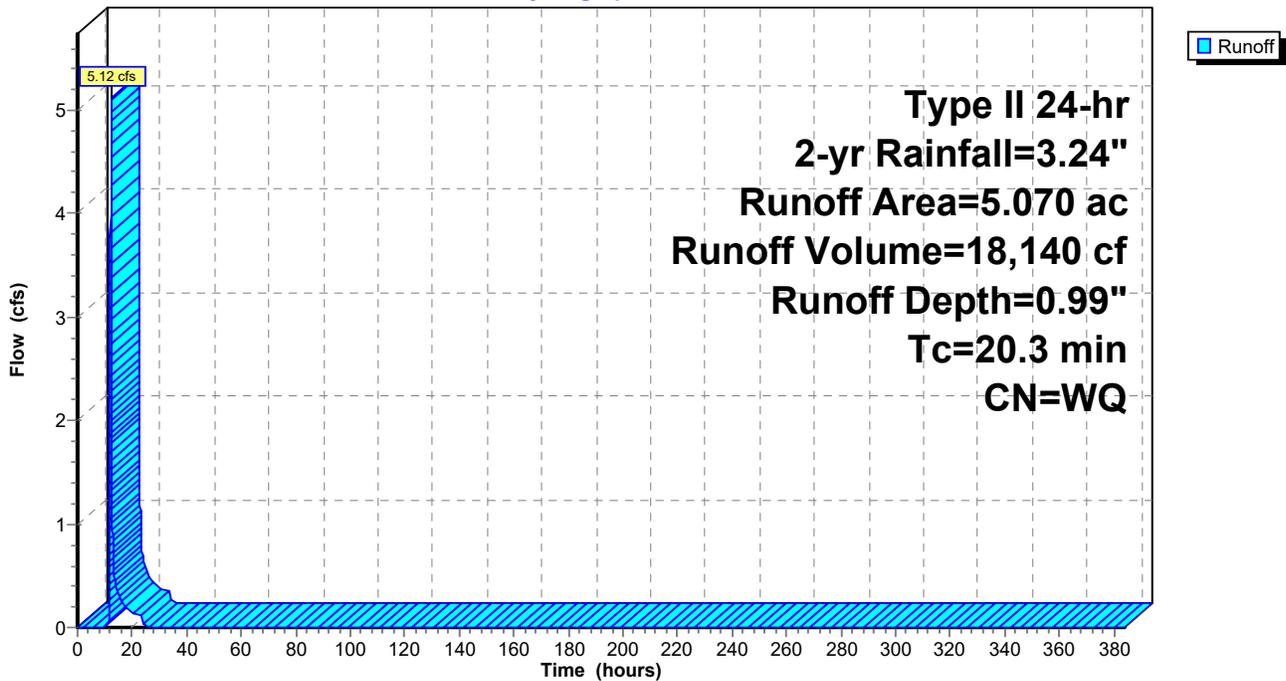
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-yr Rainfall=3.24"

Area (ac)	CN	Description
3.750	70	Woods, Good, HSG C
1.320	79	Woods, Fair, HSG D
5.070		Weighted Average
5.070		100.00% Pervious Area

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

Subcatchment 25S: Dist_Woods

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.24"

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Summary for Subcatchment 27S: Dist_Woods

Runoff = 0.18 cfs @ 12.17 hrs, Volume= 680 cf, Depth= 0.85"

Routed to Link 14L : Pre_DP-002 Germantown Pike

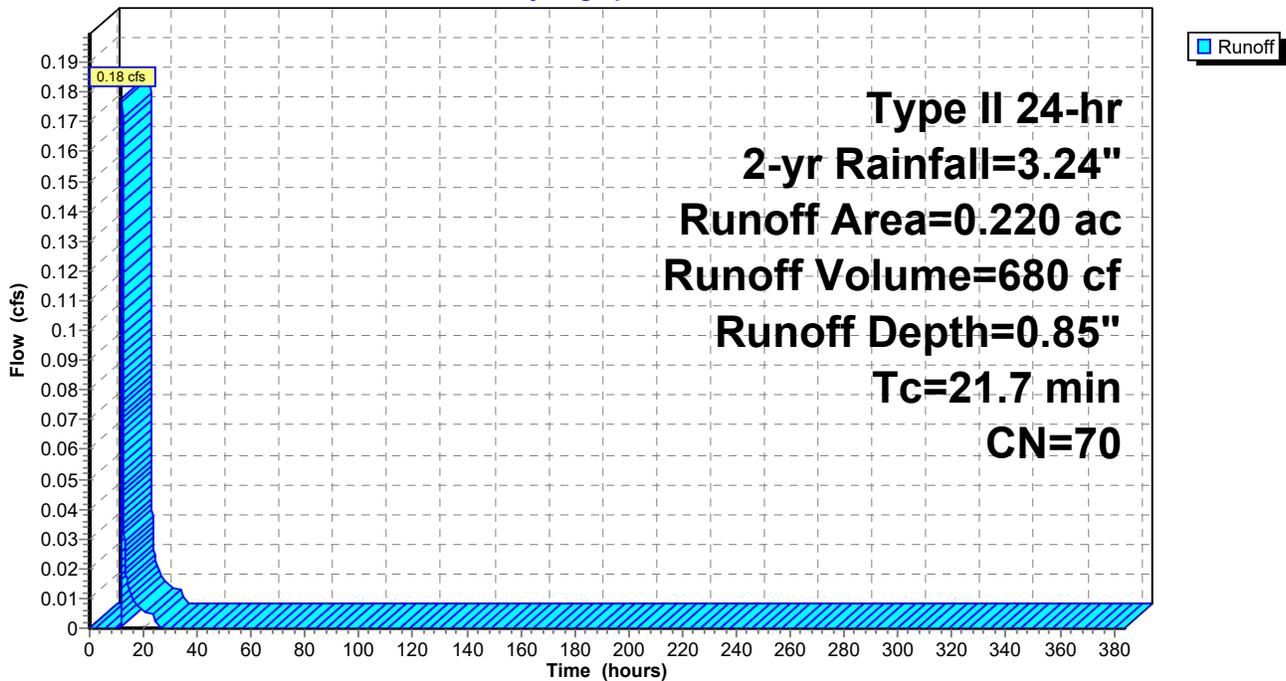
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-yr Rainfall=3.24"

Area (ac)	CN	Description
0.220	70	Woods, Good, HSG C
0.220		100.00% Pervious Area

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

Subcatchment 27S: Dist_Woods

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.24"

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Summary for Subcatchment 39S: Dist_Impervious

Runoff = 0.14 cfs @ 11.96 hrs, Volume= 327 cf, Depth= 3.01"

Routed to Link 14L : Pre_DP-002 Germantown Pike

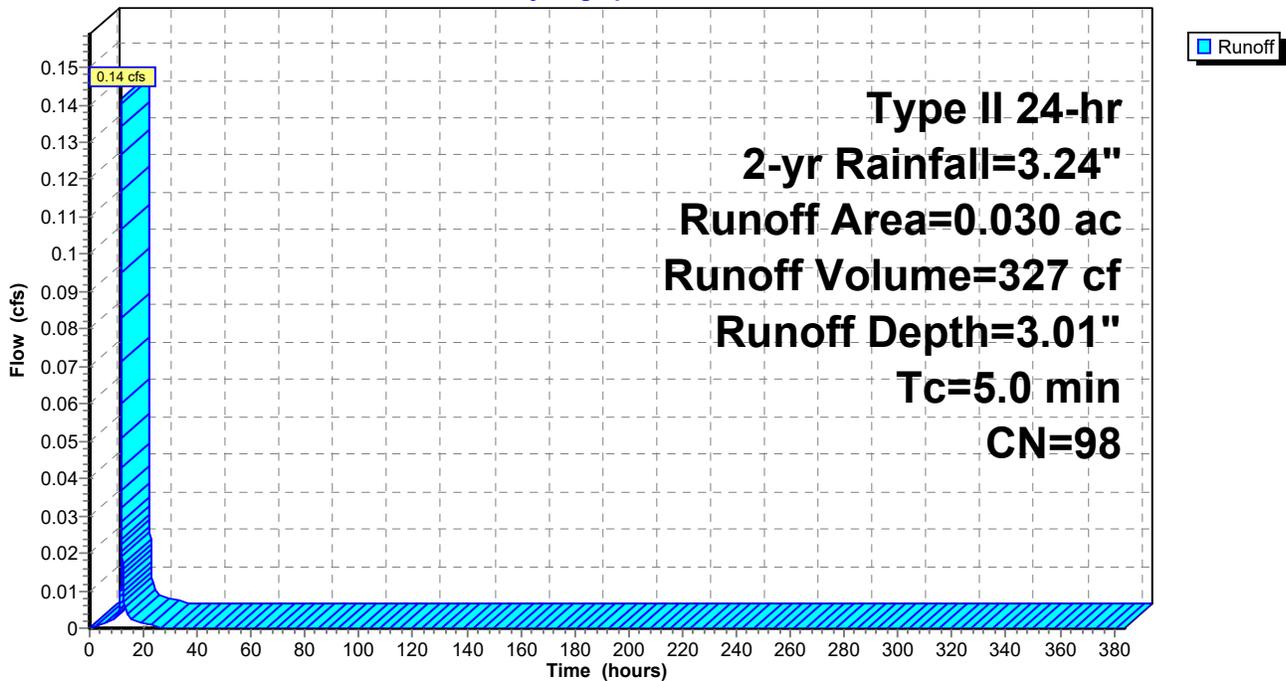
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-yr Rainfall=3.24"

Area (ac)	CN	Description
* 0.030	98	ROW
0.030		100.00% Impervious Area

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

Subcatchment 39S: Dist_Impervious

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.24"

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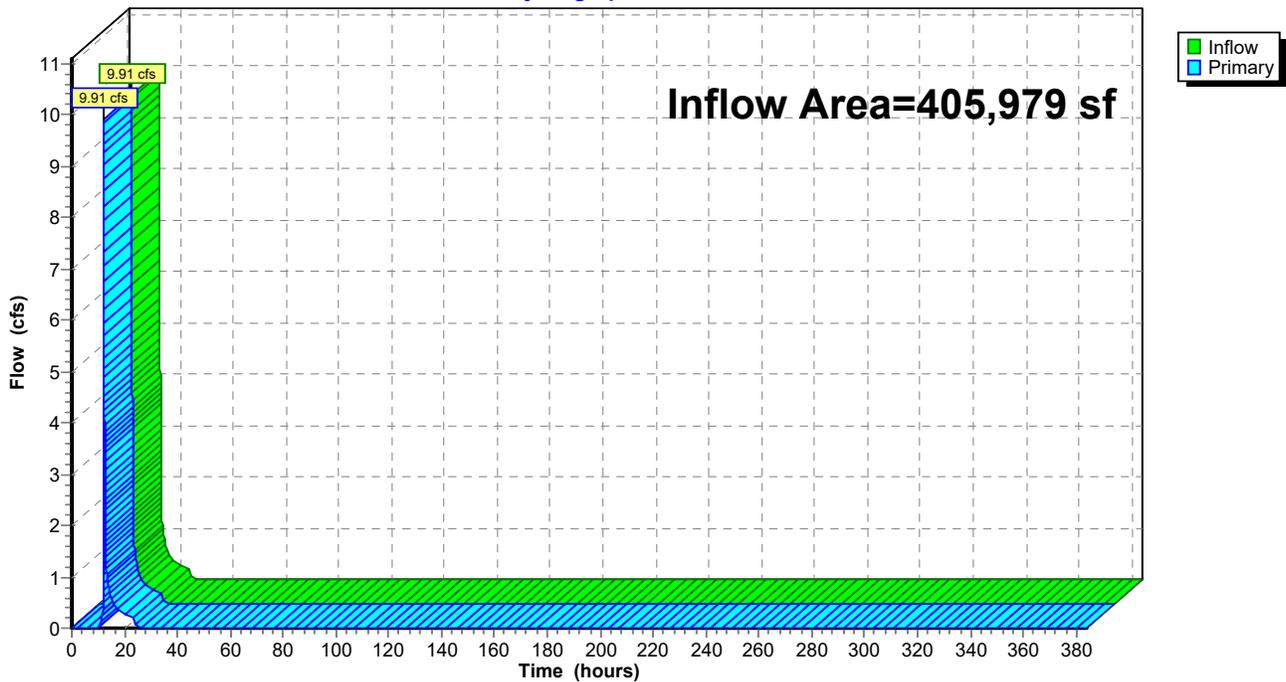
Summary for Link 9L: Pre_DP-001 Trooper Rd

Inflow Area = 405,979 sf, 0.43% Impervious, Inflow Depth = 1.04" for 2-yr event
Inflow = 9.91 cfs @ 12.15 hrs, Volume= 35,069 cf
Primary = 9.91 cfs @ 12.15 hrs, Volume= 35,069 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 9L: Pre_DP-001 Trooper Rd

Hydrograph



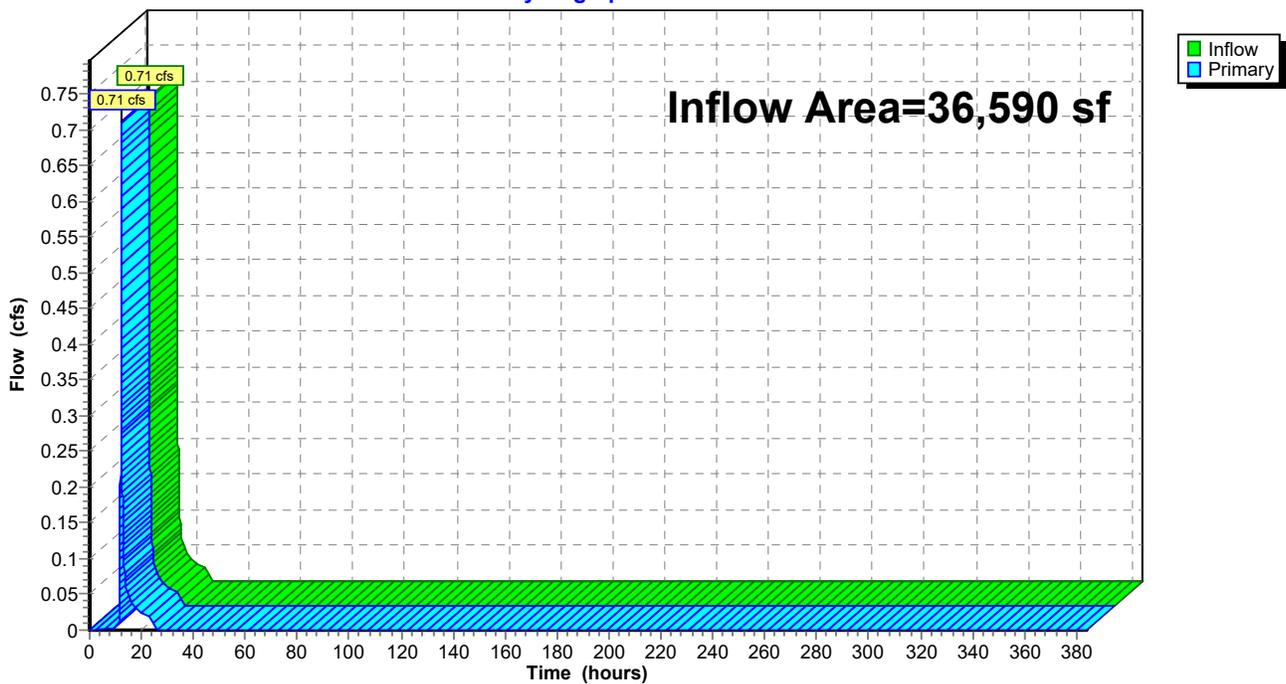
Summary for Link 14L: Pre_DP-002 Germantown Pike

Inflow Area = 36,590 sf, 3.57% Impervious, Inflow Depth = 0.96" for 2-yr event
Inflow = 0.71 cfs @ 12.17 hrs, Volume= 2,940 cf
Primary = 0.71 cfs @ 12.17 hrs, Volume= 2,940 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 14L: Pre_DP-002 Germantown Pike

Hydrograph



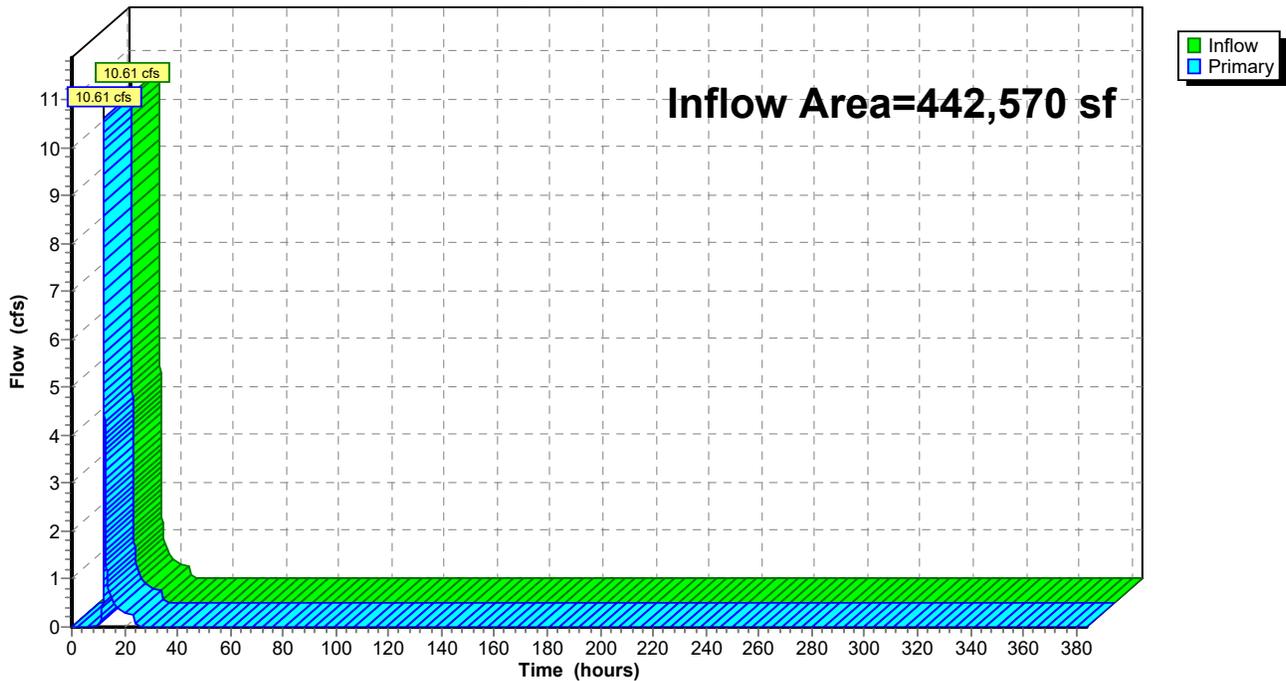
Summary for Link 65L: PRE TOTAL

Inflow Area = 442,570 sf, 0.69% Impervious, Inflow Depth = 1.03" for 2-yr event
Inflow = 10.61 cfs @ 12.15 hrs, Volume= 38,009 cf
Primary = 10.61 cfs @ 12.15 hrs, Volume= 38,009 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 65L: PRE TOTAL

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 5-yr Rainfall=4.06"

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Summary for Subcatchment 18S: Dist_Meadow

Runoff = 0.86 cfs @ 12.16 hrs, Volume= 3,074 cf, Depth= 1.44"

Routed to Link 14L : Pre_DP-002 Germantown Pike

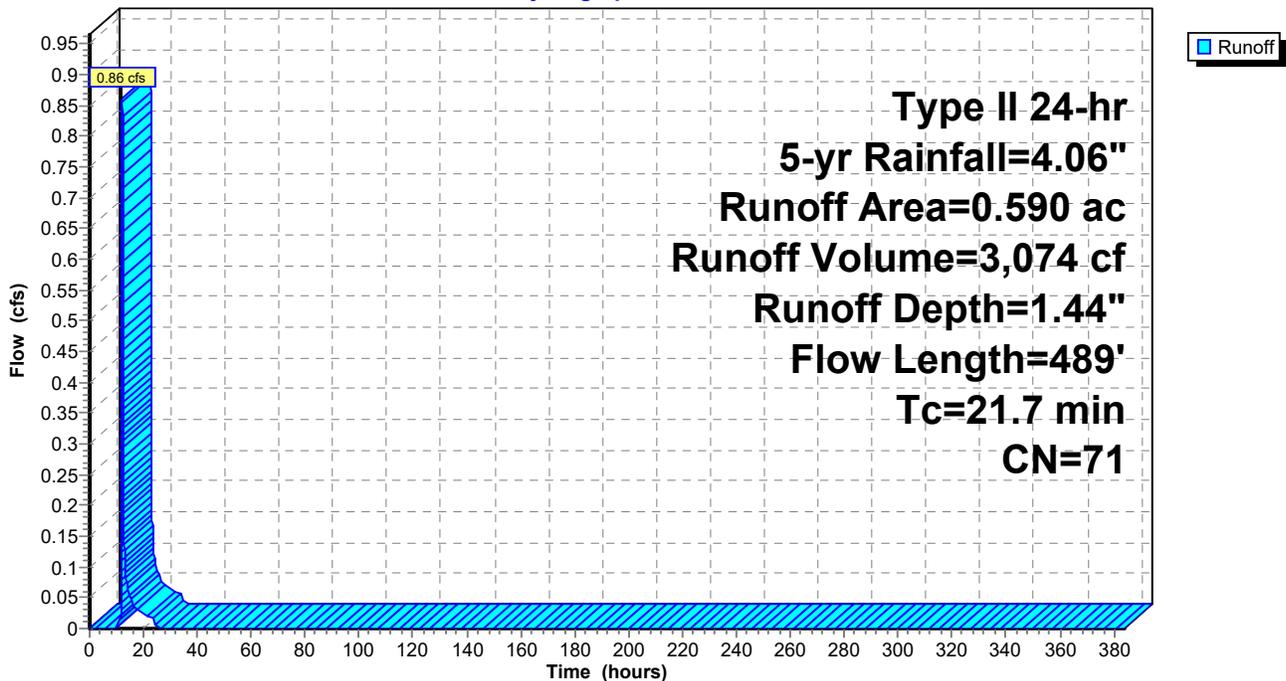
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-yr Rainfall=4.06"

Area (ac)	CN	Description
0.590	71	Meadow, non-grazed, HSG C
0.590		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	100	0.1000	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	389	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
21.7	489	Total			

Subcatchment 18S: Dist_Meadow

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 5-yr Rainfall=4.06"

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Summary for Subcatchment 23S: Dist_Impervious

Runoff = 0.24 cfs @ 11.96 hrs, Volume= 555 cf, Depth= 3.82"

Routed to Link 9L : Pre_DP-001 Trooper Rd

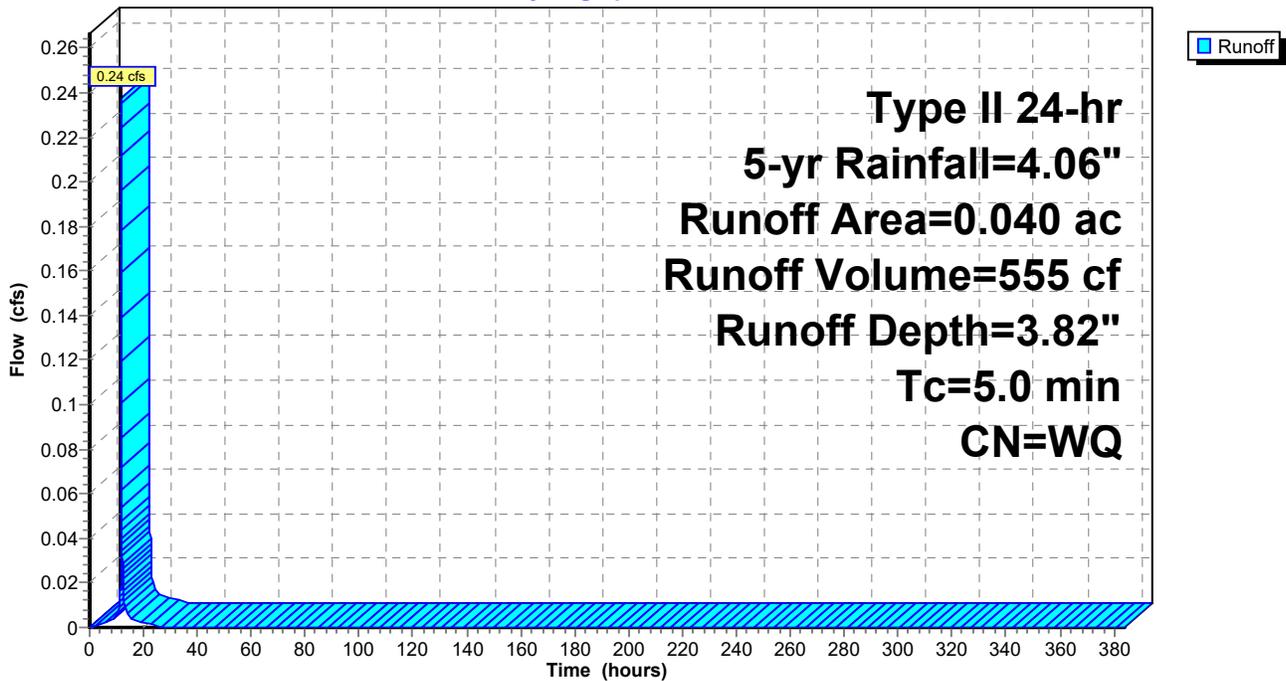
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-yr Rainfall=4.06"

Area (ac)	CN	Description
* 0.020	98	ROW
* 0.020	98	
0.040		Weighted Average
0.040		100.00% Impervious Area

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

Subcatchment 23S: Dist_Impervious

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 5-yr Rainfall=4.06"

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Summary for Subcatchment 24S: Dist_Meadow

Runoff = 7.53 cfs @ 12.14 hrs, Volume= 25,308 cf, Depth= 1.66"

Routed to Link 9L : Pre_DP-001 Trooper Rd

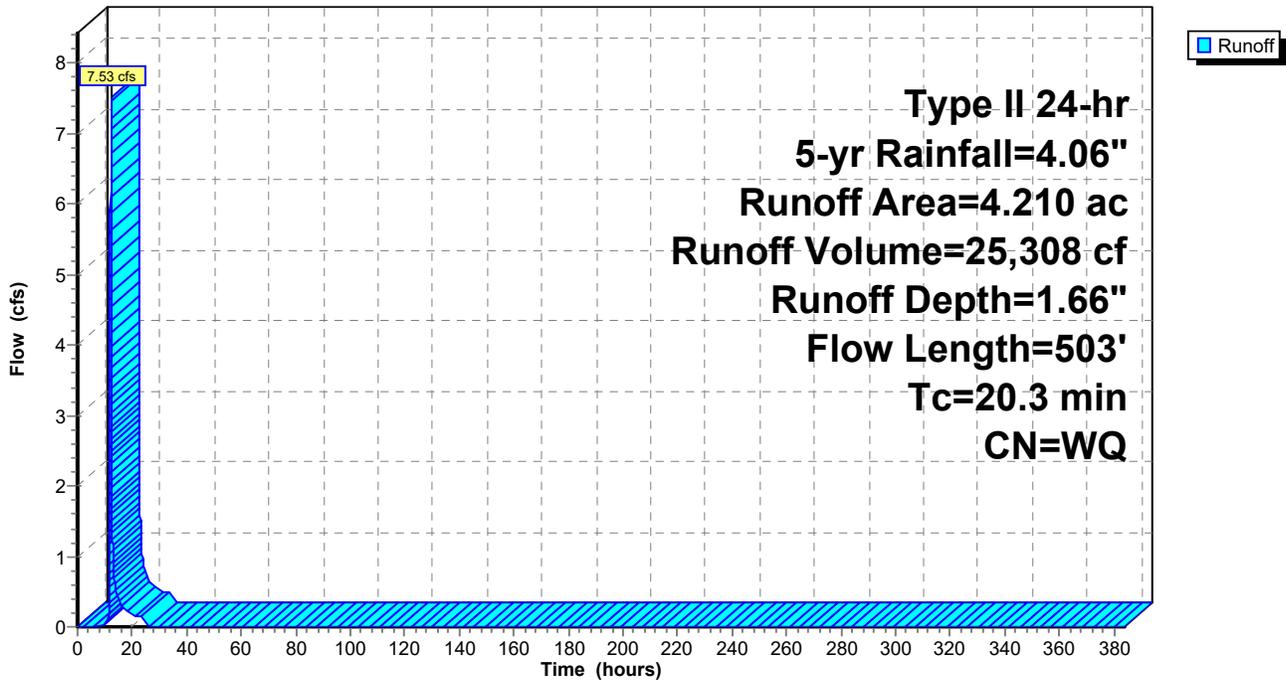
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-yr Rainfall=4.06"

Area (ac)	CN	Description
2.350	71	Meadow, non-grazed, HSG C
1.860	78	Meadow, non-grazed, HSG D
4.210		Weighted Average
4.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	100	0.1200	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	403	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.3	503	Total			

Subcatchment 24S: Dist_Meadow

Hydrograph



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Type II 24-hr 5-yr Rainfall=4.06"

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Summary for Subcatchment 25S: Dist_Woods

Runoff = 8.32 cfs @ 12.14 hrs, Volume= 28,289 cf, Depth= 1.54"

Routed to Link 9L : Pre_DP-001 Trooper Rd

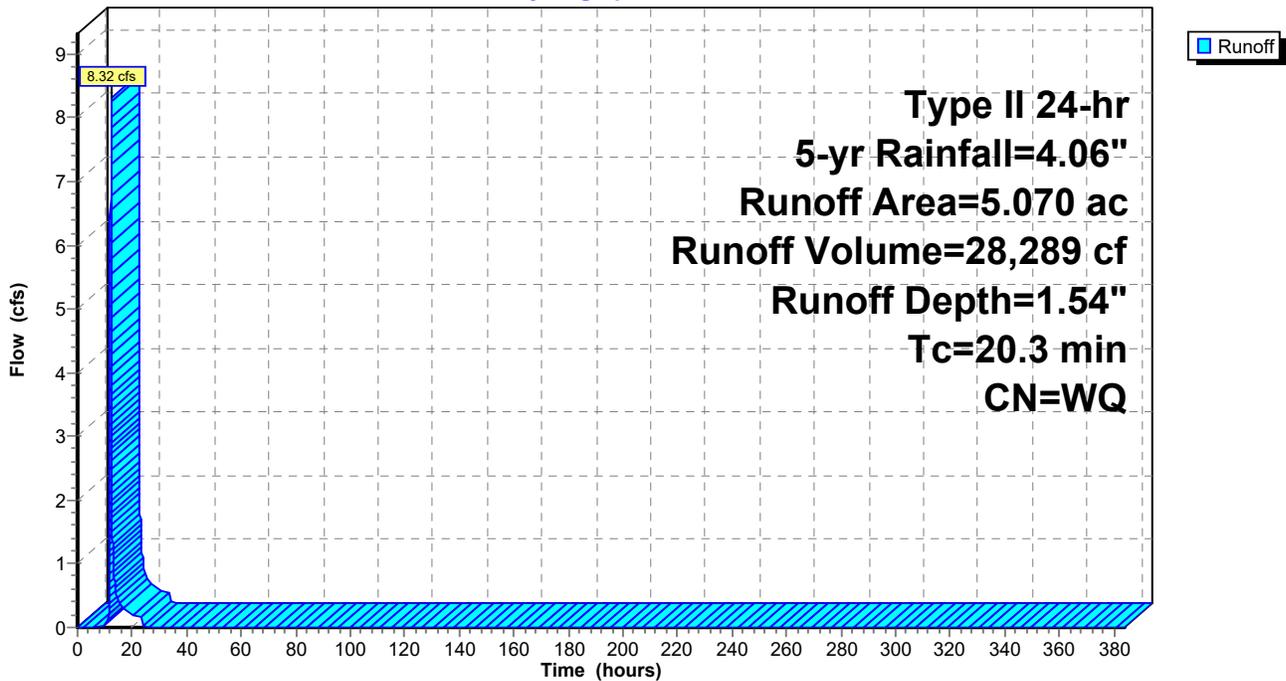
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-yr Rainfall=4.06"

Area (ac)	CN	Description
3.750	70	Woods, Good, HSG C
1.320	79	Woods, Fair, HSG D
5.070		Weighted Average
5.070		100.00% Pervious Area

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

Subcatchment 25S: Dist_Woods

Hydrograph



Summary for Subcatchment 27S: Dist_Woods

Runoff = 0.30 cfs @ 12.16 hrs, Volume= 1,094 cf, Depth= 1.37"

Routed to Link 14L : Pre_DP-002 Germantown Pike

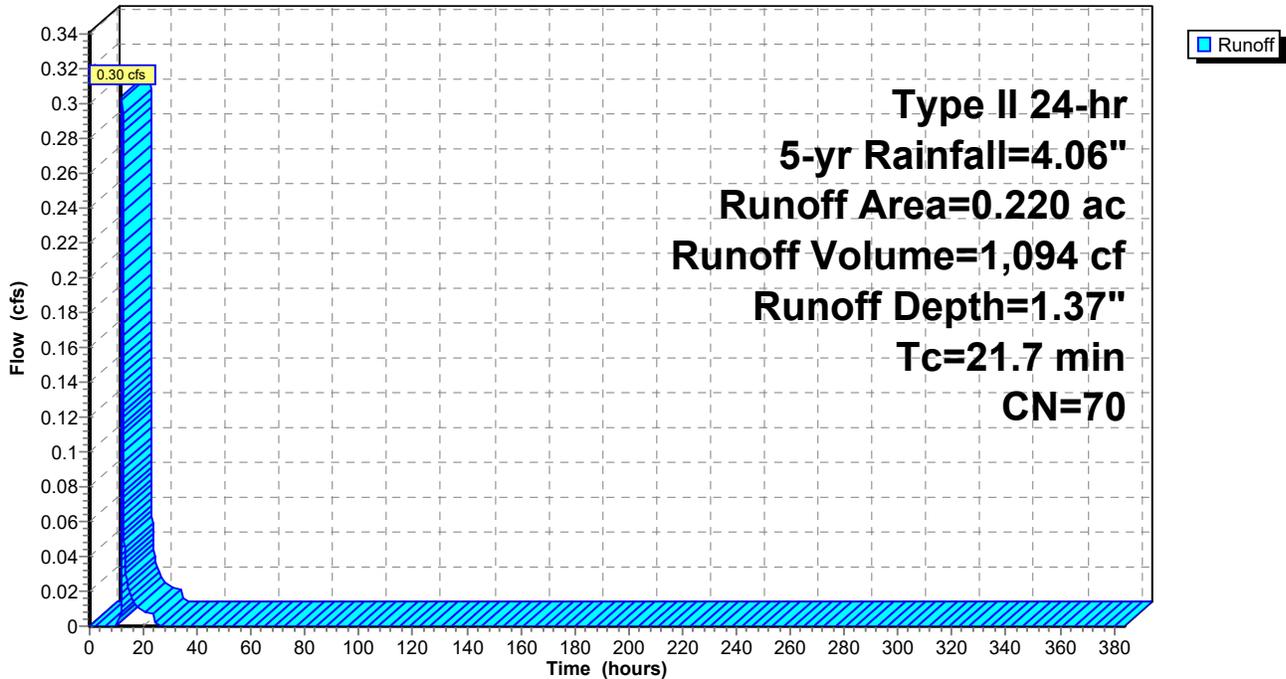
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-yr Rainfall=4.06"

Area (ac)	CN	Description
0.220	70	Woods, Good, HSG C
0.220		100.00% Pervious Area

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

Subcatchment 27S: Dist_Woods

Hydrograph



Summary for Subcatchment 39S: Dist_Impervious

Runoff = 0.18 cfs @ 11.96 hrs, Volume= 417 cf, Depth= 3.82"

Routed to Link 14L : Pre_DP-002 Germantown Pike

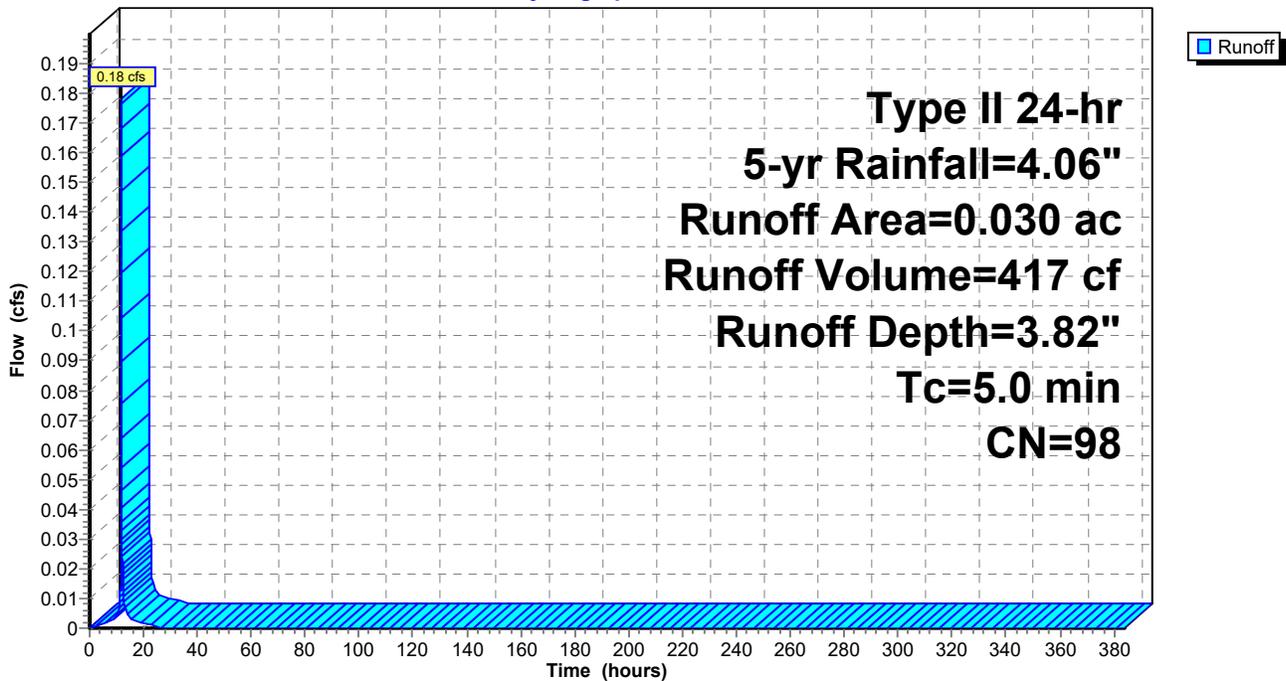
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-yr Rainfall=4.06"

Area (ac)	CN	Description
* 0.030	98	ROW
0.030		100.00% Impervious Area

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

Subcatchment 39S: Dist_Impervious

Hydrograph



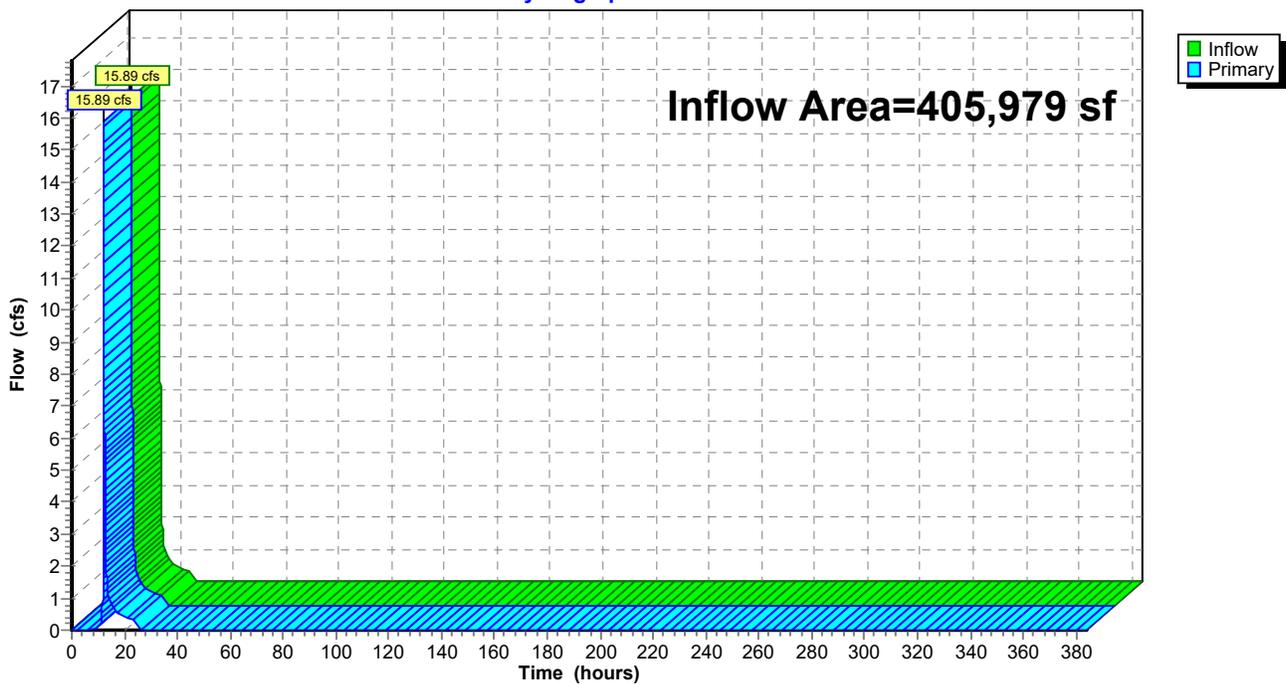
Summary for Link 9L: Pre_DP-001 Trooper Rd

Inflow Area = 405,979 sf, 0.43% Impervious, Inflow Depth = 1.60" for 5-yr event
Inflow = 15.89 cfs @ 12.14 hrs, Volume= 54,153 cf
Primary = 15.89 cfs @ 12.14 hrs, Volume= 54,153 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 9L: Pre_DP-001 Trooper Rd

Hydrograph



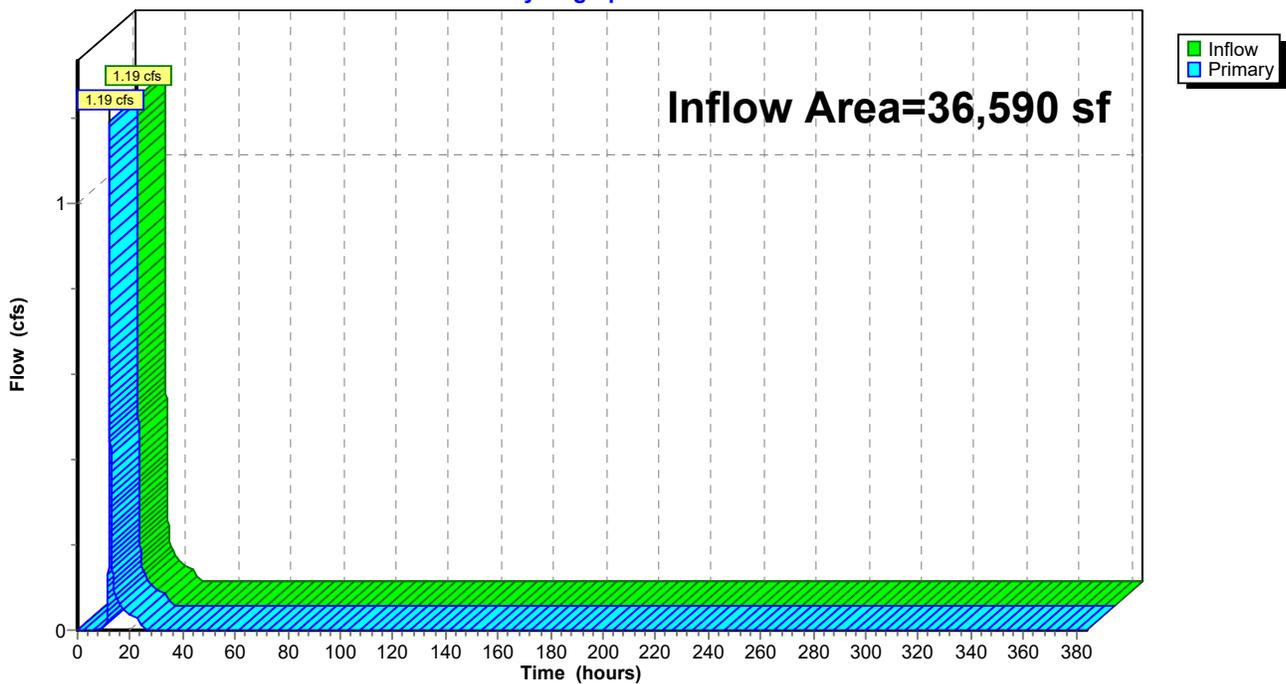
Summary for Link 14L: Pre_DP-002 Germantown Pike

Inflow Area = 36,590 sf, 3.57% Impervious, Inflow Depth = 1.50" for 5-yr event
Inflow = 1.19 cfs @ 12.15 hrs, Volume= 4,585 cf
Primary = 1.19 cfs @ 12.15 hrs, Volume= 4,585 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 14L: Pre_DP-002 Germantown Pike

Hydrograph



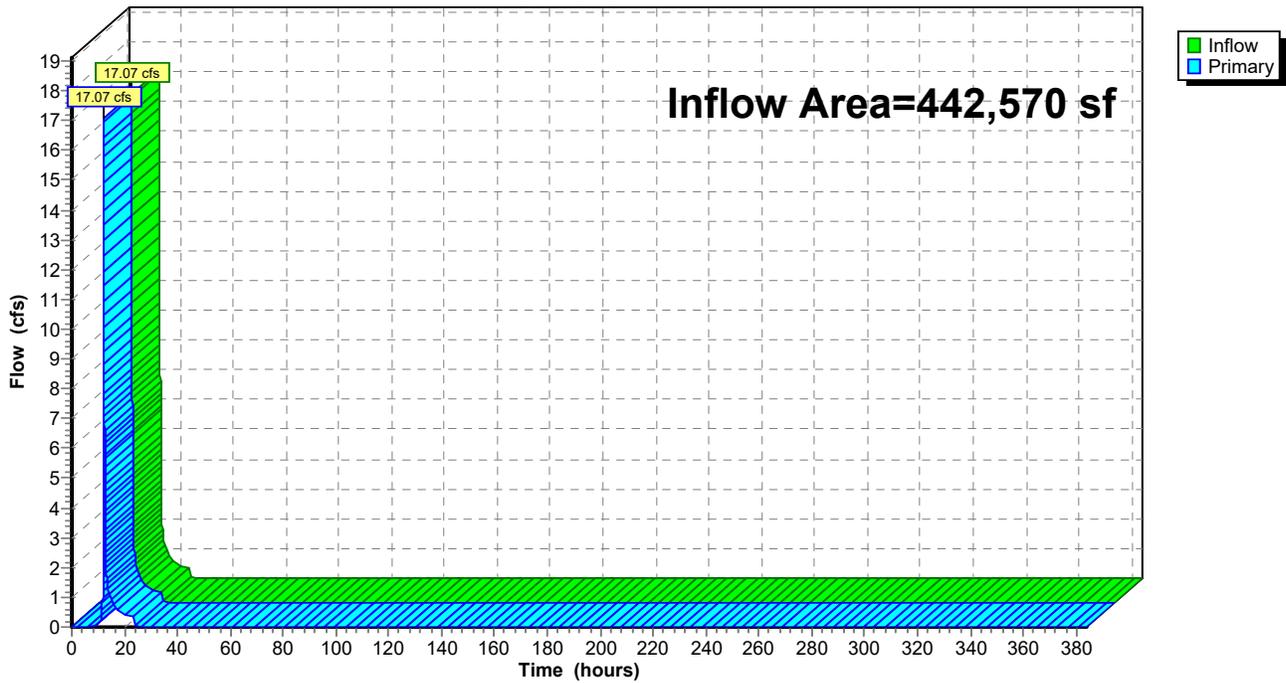
Summary for Link 65L: PRE TOTAL

Inflow Area = 442,570 sf, 0.69% Impervious, Inflow Depth = 1.59" for 5-yr event
Inflow = 17.07 cfs @ 12.14 hrs, Volume= 58,737 cf
Primary = 17.07 cfs @ 12.14 hrs, Volume= 58,737 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 65L: PRE TOTAL

Hydrograph



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Type II 24-hr 10-yr Rainfall=4.75"

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Summary for Subcatchment 18S: Dist_Meadow

Runoff = 1.18 cfs @ 12.15 hrs, Volume= 4,132 cf, Depth= 1.93"

Routed to Link 14L : Pre_DP-002 Germantown Pike

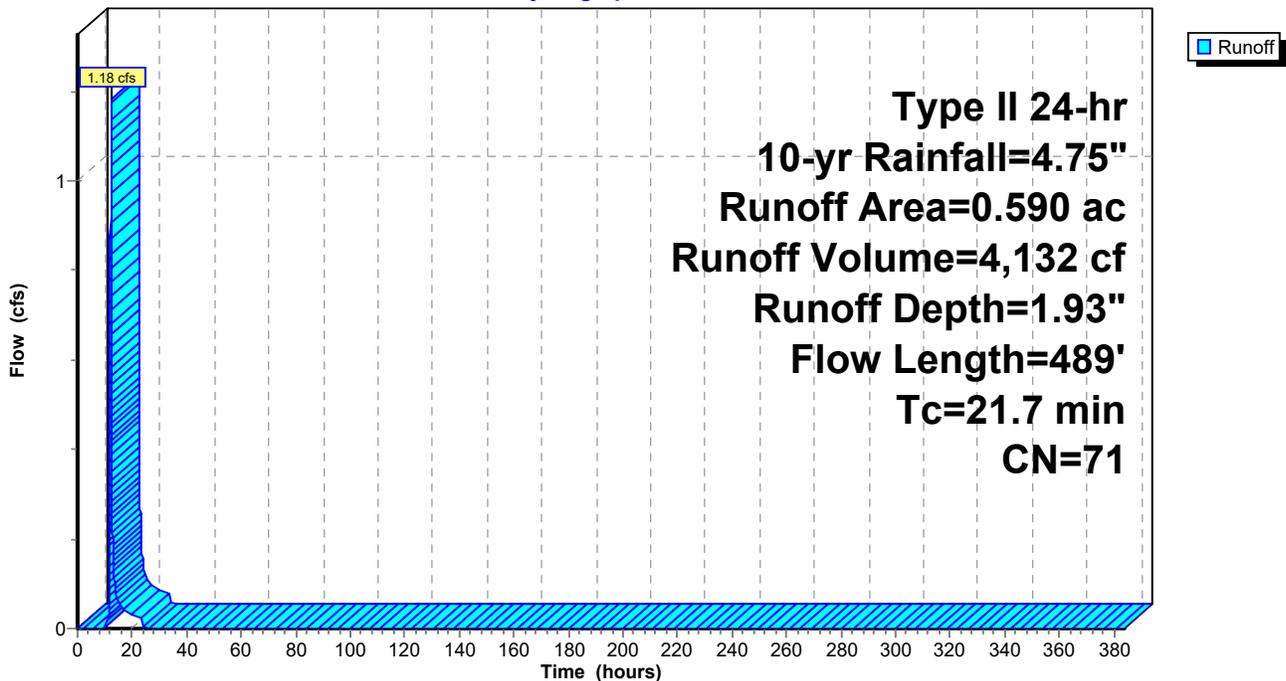
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=4.75"

Area (ac)	CN	Description
0.590	71	Meadow, non-grazed, HSG C
0.590		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	100	0.1000	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	389	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
21.7	489	Total			

Subcatchment 18S: Dist_Meadow

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 10-yr Rainfall=4.75"

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Summary for Subcatchment 23S: Dist_Impervious

Runoff = 0.28 cfs @ 11.96 hrs, Volume= 655 cf, Depth= 4.51"

Routed to Link 9L : Pre_DP-001 Trooper Rd

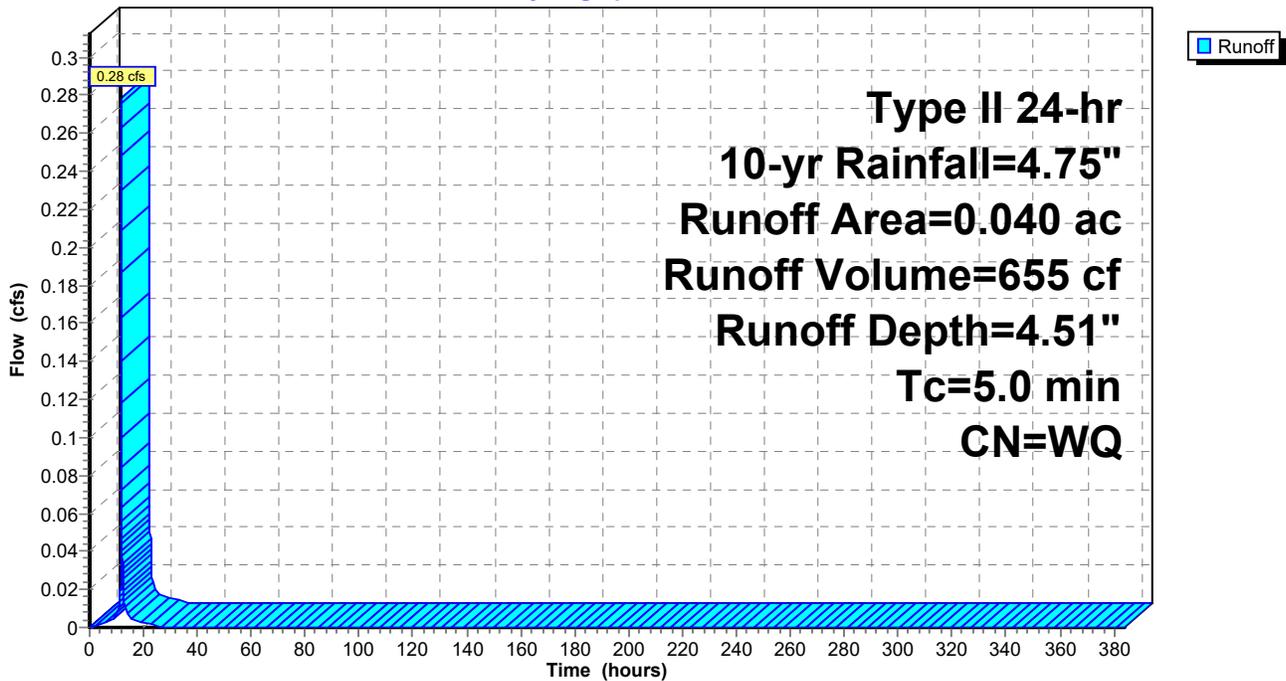
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-yr Rainfall=4.75"

Area (ac)	CN	Description
* 0.020	98	ROW
* 0.020	98	
0.040		Weighted Average
0.040		100.00% Impervious Area

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

Subcatchment 23S: Dist_Impervious

Hydrograph



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Type II 24-hr 10-yr Rainfall=4.75"

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Summary for Subcatchment 24S: Dist_Meadow

Runoff = 10.03 cfs @ 12.13 hrs, Volume= 33,344 cf, Depth= 2.18"

Routed to Link 9L : Pre_DP-001 Trooper Rd

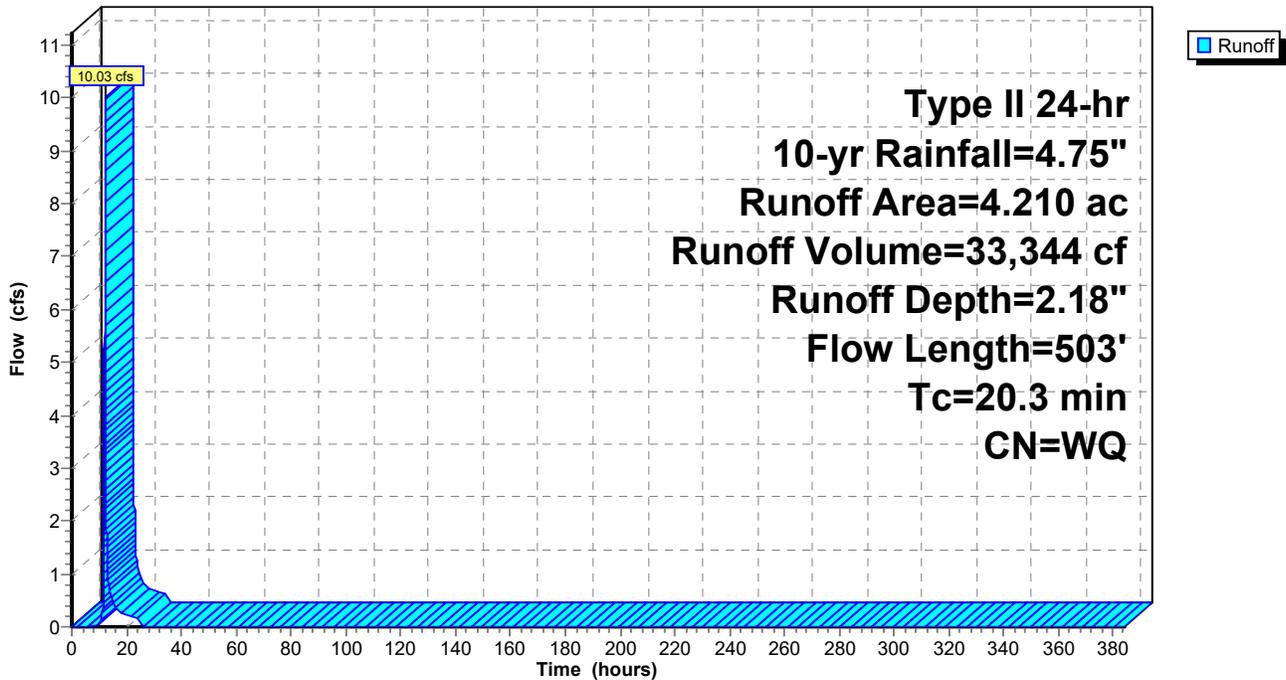
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-yr Rainfall=4.75"

Area (ac)	CN	Description
2.350	71	Meadow, non-grazed, HSG C
1.860	78	Meadow, non-grazed, HSG D
4.210		Weighted Average
4.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	100	0.1200	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	403	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.3	503	Total			

Subcatchment 24S: Dist_Meadow

Hydrograph



Trooper Ridge Pre and Post 2025-01

Type II 24-hr 10-yr Rainfall=4.75"

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Summary for Subcatchment 25S: Dist_Woods

Runoff = 11.24 cfs @ 12.14 hrs, Volume= 37,622 cf, Depth= 2.04"

Routed to Link 9L : Pre_DP-001 Trooper Rd

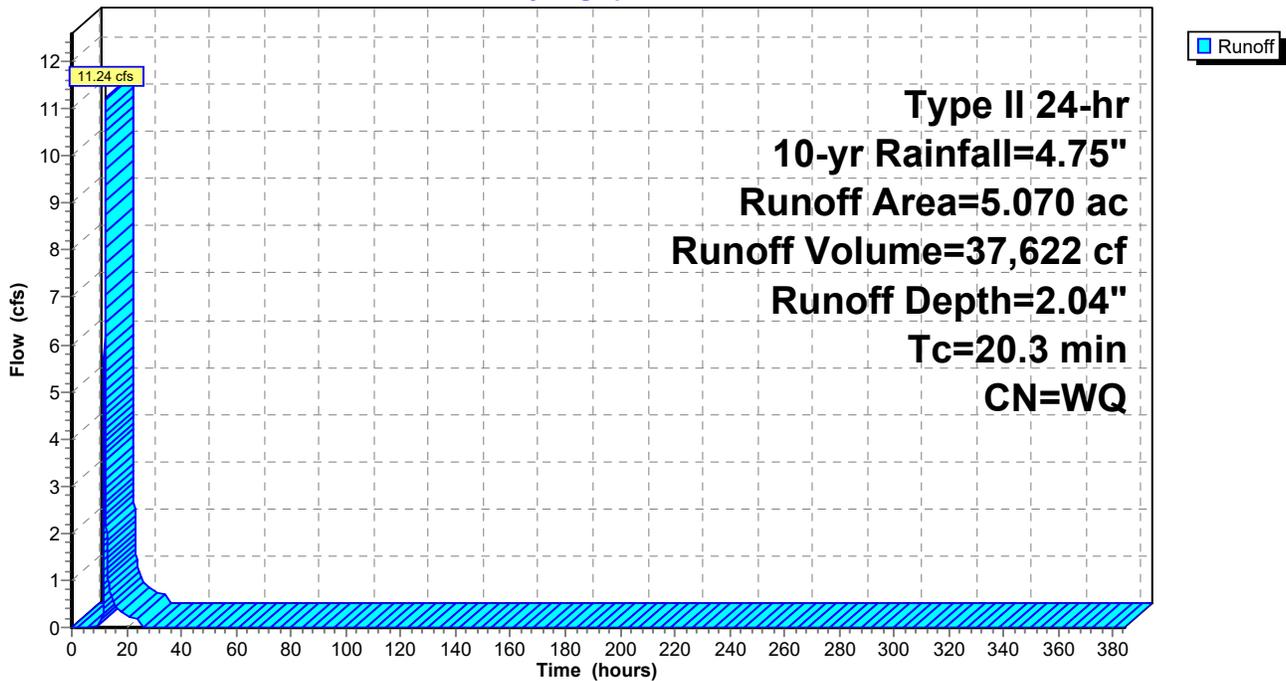
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-yr Rainfall=4.75"

Area (ac)	CN	Description
3.750	70	Woods, Good, HSG C
1.320	79	Woods, Fair, HSG D
5.070		Weighted Average
5.070		100.00% Pervious Area

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

Subcatchment 25S: Dist_Woods

Hydrograph



Summary for Subcatchment 27S: Dist_Woods

Runoff = 0.42 cfs @ 12.15 hrs, Volume= 1,480 cf, Depth= 1.85"

Routed to Link 14L : Pre_DP-002 Germantown Pike

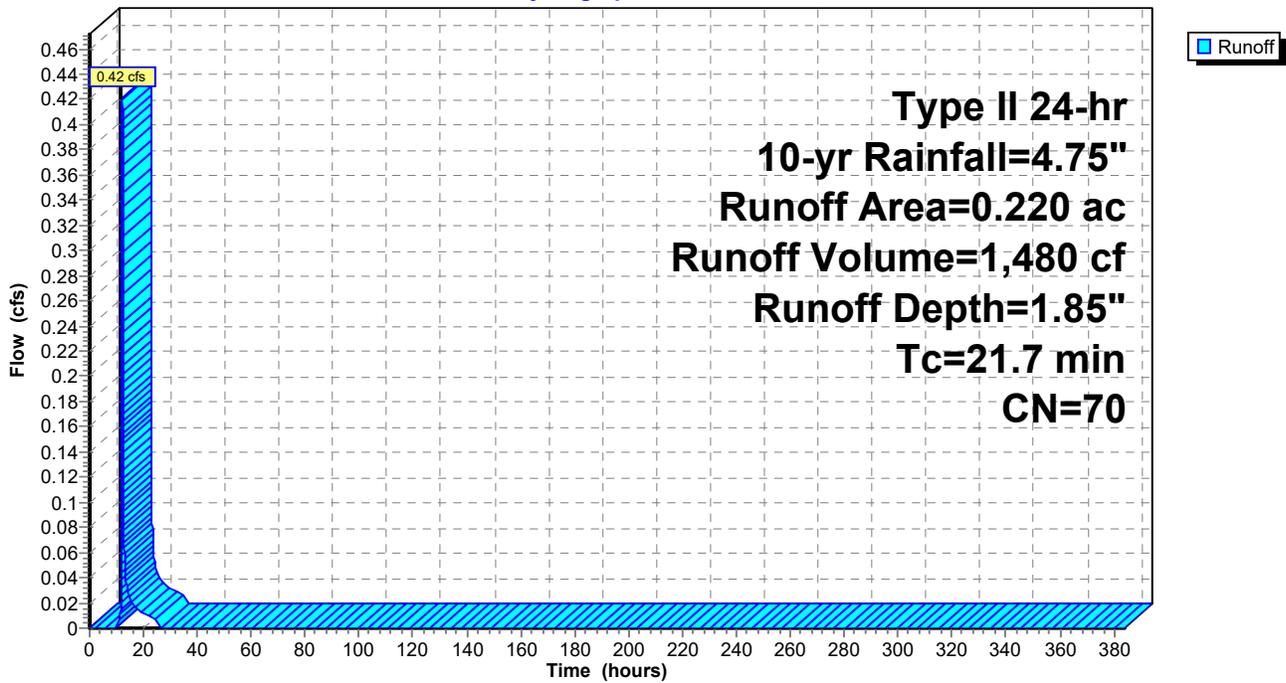
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-yr Rainfall=4.75"

Area (ac)	CN	Description
0.220	70	Woods, Good, HSG C
0.220		100.00% Pervious Area

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

Subcatchment 27S: Dist_Woods

Hydrograph



Summary for Subcatchment 39S: Dist_Impervious

Runoff = 0.21 cfs @ 11.96 hrs, Volume= 492 cf, Depth= 4.51"

Routed to Link 14L : Pre_DP-002 Germantown Pike

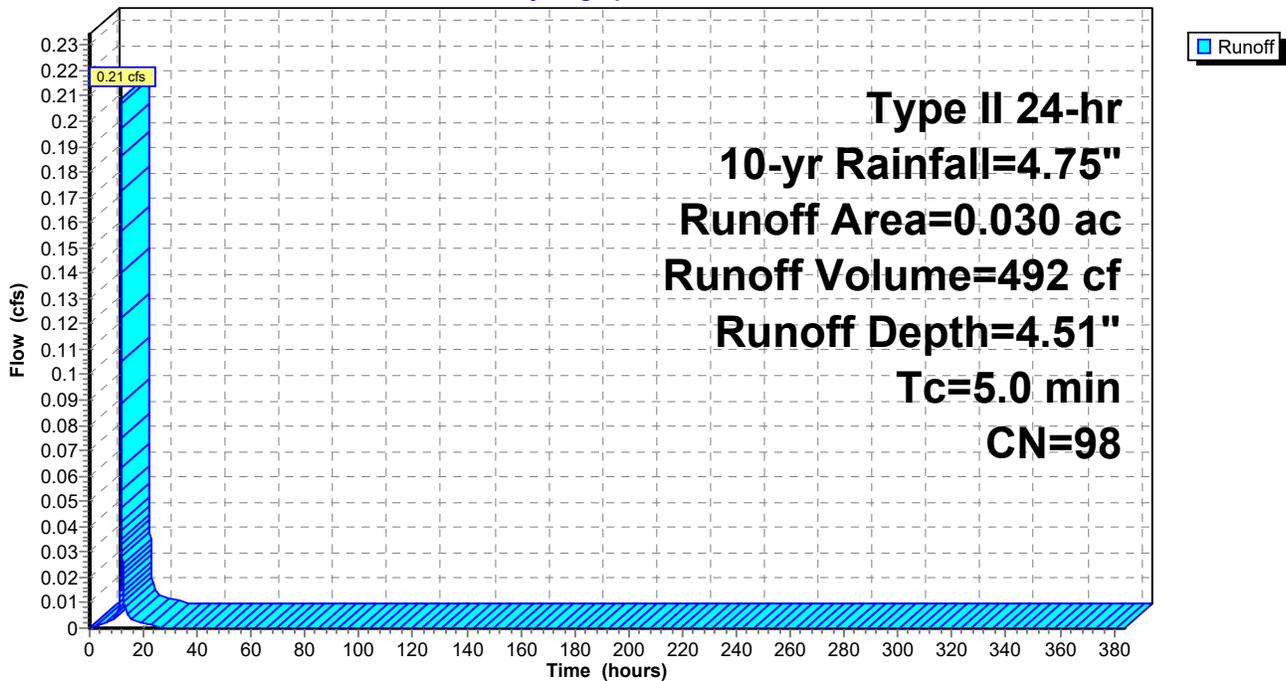
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-yr Rainfall=4.75"

Area (ac)	CN	Description
* 0.030	98	ROW
0.030		100.00% Impervious Area

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

Subcatchment 39S: Dist_Impervious

Hydrograph



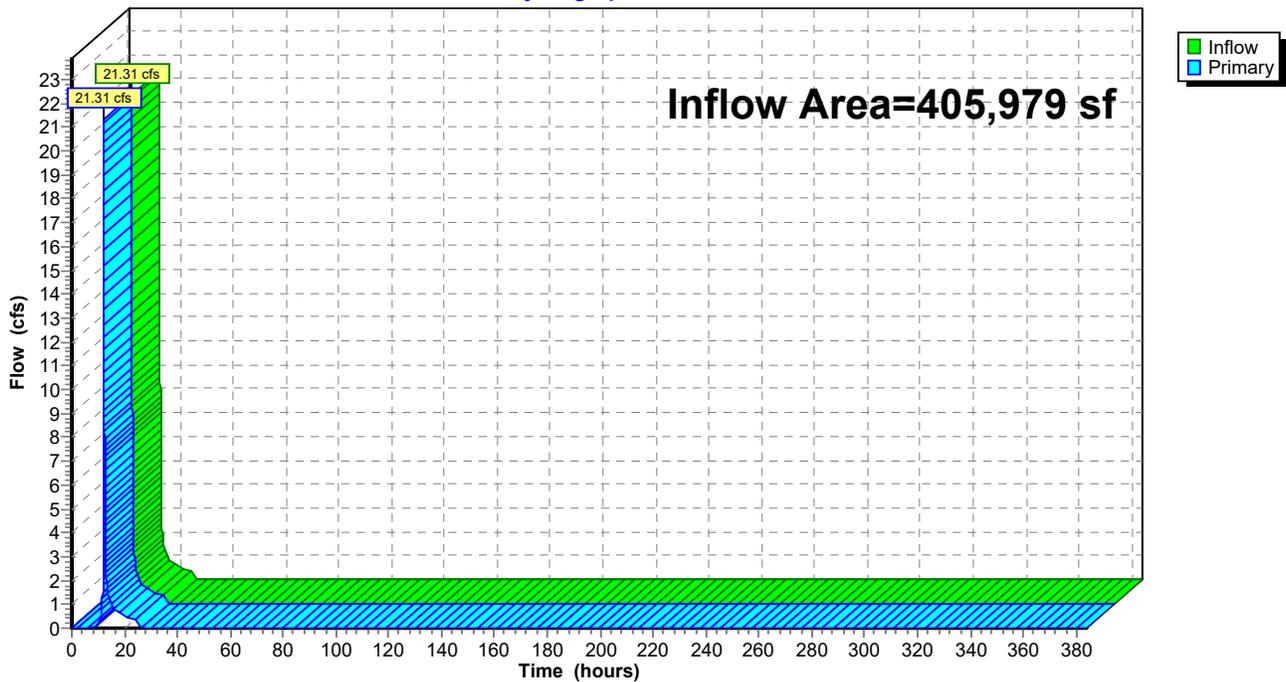
Summary for Link 9L: Pre_DP-001 Trooper Rd

Inflow Area = 405,979 sf, 0.43% Impervious, Inflow Depth = 2.12" for 10-yr event
Inflow = 21.31 cfs @ 12.14 hrs, Volume= 71,621 cf
Primary = 21.31 cfs @ 12.14 hrs, Volume= 71,621 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 9L: Pre_DP-001 Trooper Rd

Hydrograph



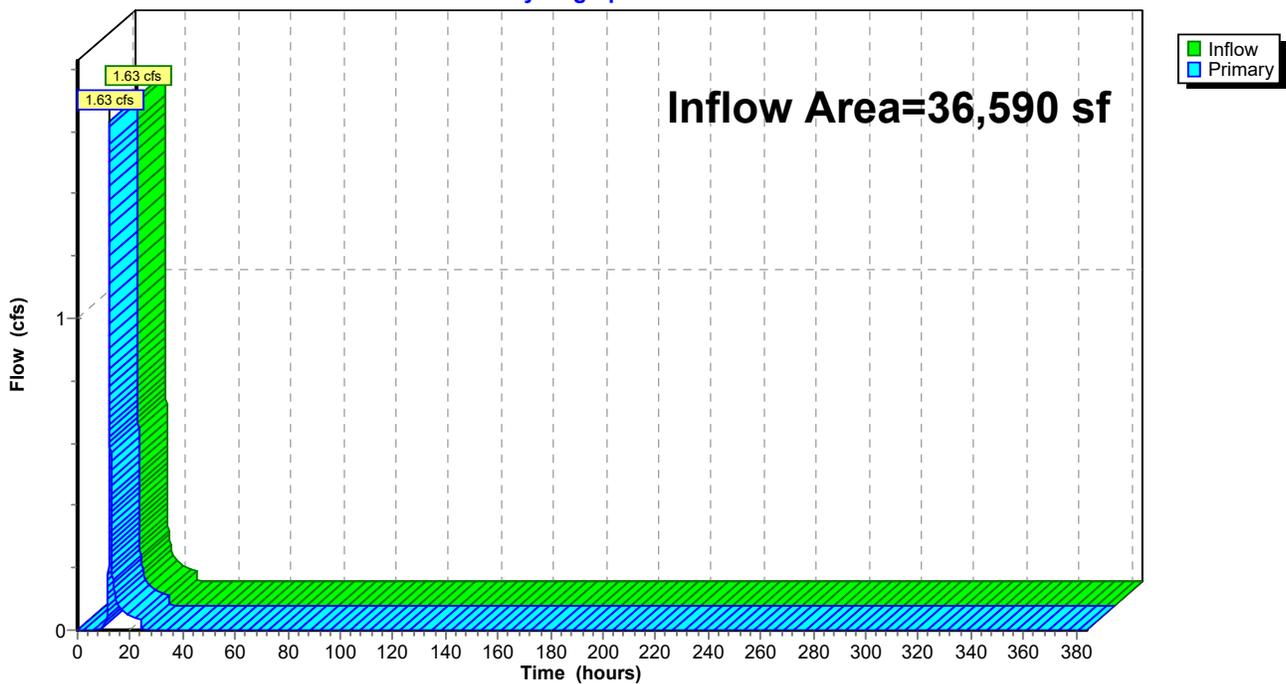
Summary for Link 14L: Pre_DP-002 Germantown Pike

Inflow Area = 36,590 sf, 3.57% Impervious, Inflow Depth = 2.00" for 10-yr event
Inflow = 1.63 cfs @ 12.15 hrs, Volume= 6,104 cf
Primary = 1.63 cfs @ 12.15 hrs, Volume= 6,104 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 14L: Pre_DP-002 Germantown Pike

Hydrograph



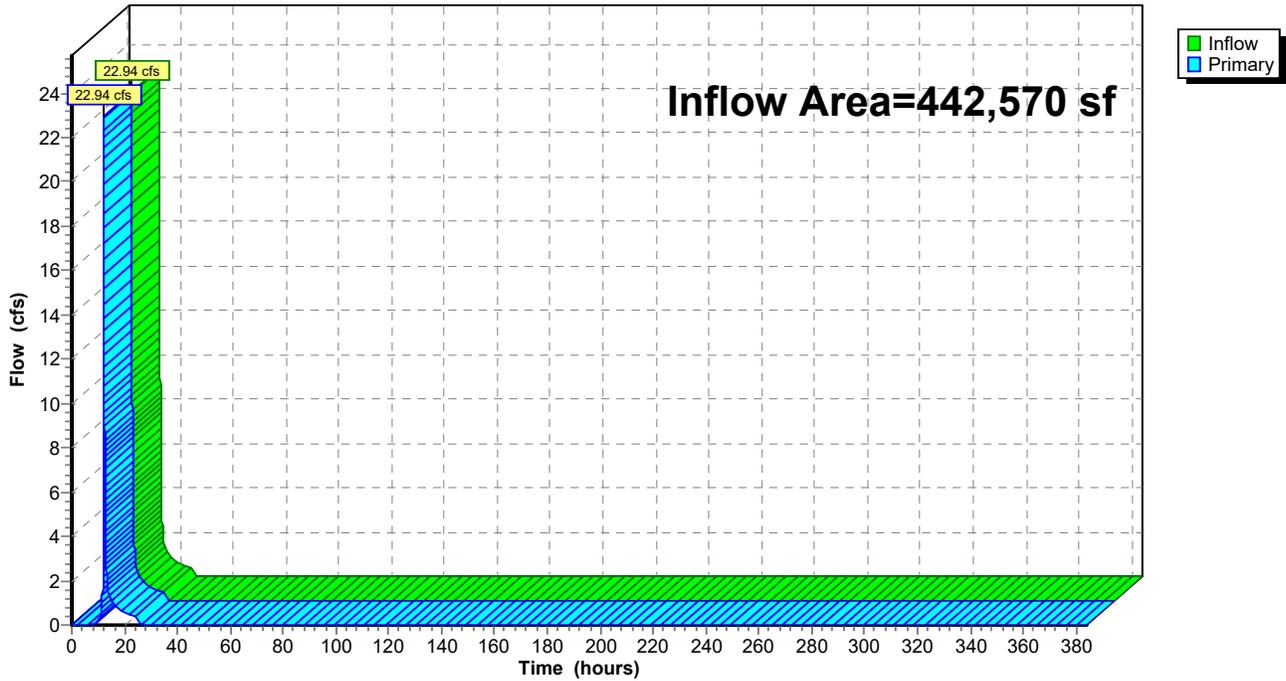
Summary for Link 65L: PRE TOTAL

Inflow Area = 442,570 sf, 0.69% Impervious, Inflow Depth = 2.11" for 10-yr event
Inflow = 22.94 cfs @ 12.14 hrs, Volume= 77,725 cf
Primary = 22.94 cfs @ 12.14 hrs, Volume= 77,725 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 65L: PRE TOTAL

Hydrograph



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Type II 24-hr 25-yr Rainfall=5.73"

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Summary for Subcatchment 18S: Dist_Meadow

Runoff = 1.67 cfs @ 12.15 hrs, Volume= 5,746 cf, Depth= 2.68"

Routed to Link 14L : Pre_DP-002 Germantown Pike

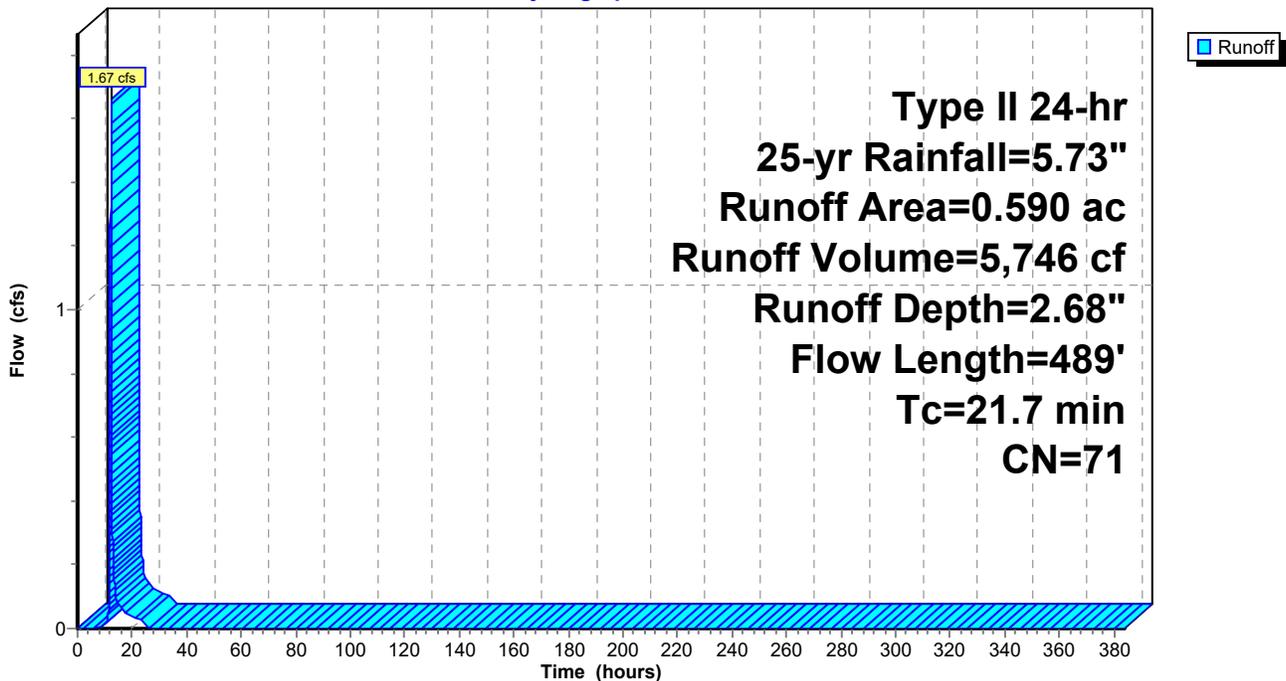
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-yr Rainfall=5.73"

Area (ac)	CN	Description
0.590	71	Meadow, non-grazed, HSG C
0.590		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	100	0.1000	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	389	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
21.7	489	Total			

Subcatchment 18S: Dist_Meadow

Hydrograph



Trooper Ridge Pre and Post 2025-01

Type II 24-hr 25-yr Rainfall=5.73"

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Summary for Subcatchment 23S: Dist_Impervious

Runoff = 0.34 cfs @ 11.96 hrs, Volume= 797 cf, Depth= 5.49"

Routed to Link 9L : Pre_DP-001 Trooper Rd

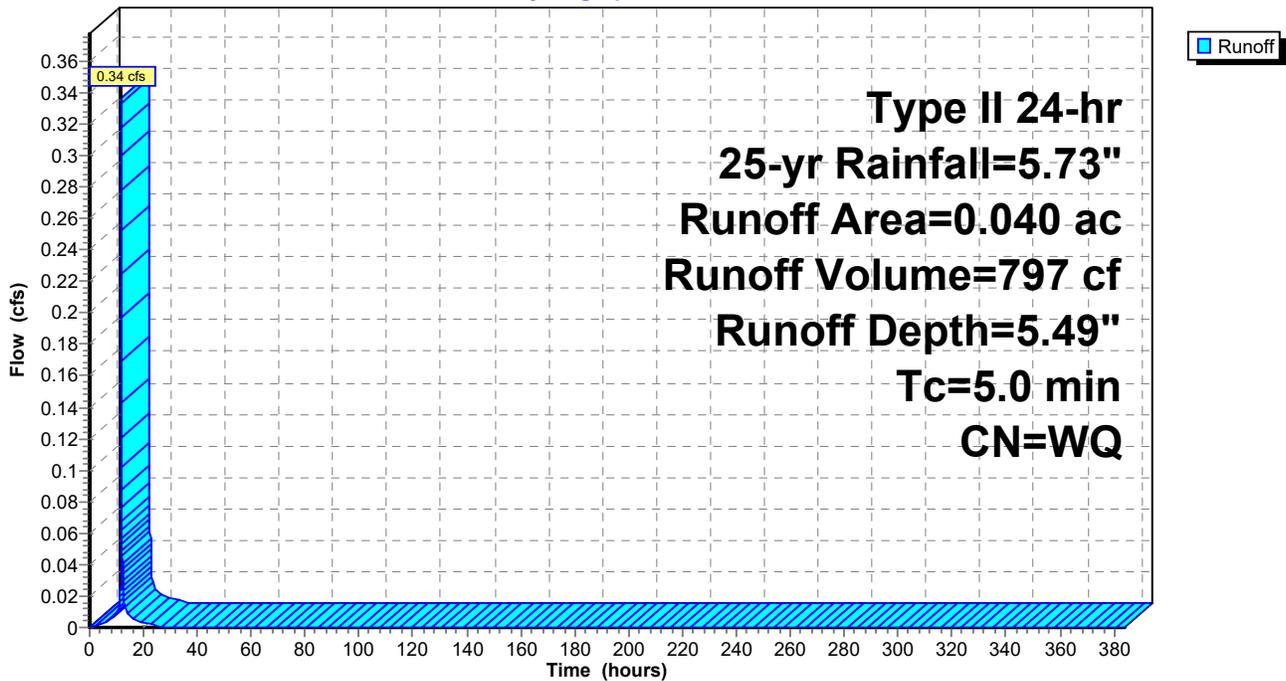
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-yr Rainfall=5.73"

Area (ac)	CN	Description
* 0.020	98	ROW
* 0.020	98	
0.040		Weighted Average
0.040		100.00% Impervious Area

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

Subcatchment 23S: Dist_Impervious

Hydrograph



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Type II 24-hr 25-yr Rainfall=5.73"

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Summary for Subcatchment 24S: Dist_Meadow

Runoff = 13.76 cfs @ 12.13 hrs, Volume= 45,446 cf, Depth= 2.97"

Routed to Link 9L : Pre_DP-001 Trooper Rd

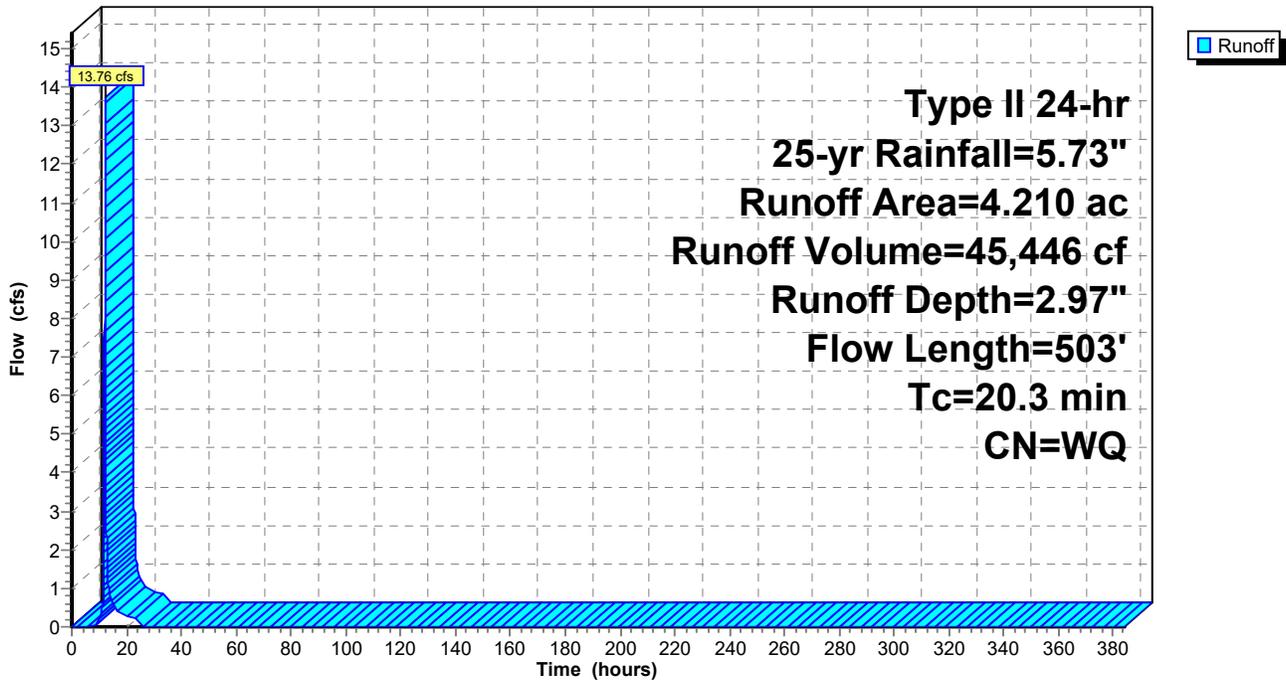
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=5.73"

Area (ac)	CN	Description
2.350	71	Meadow, non-grazed, HSG C
1.860	78	Meadow, non-grazed, HSG D
4.210		Weighted Average
4.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	100	0.1200	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	403	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.3	503	Total			

Subcatchment 24S: Dist_Meadow

Hydrograph



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Type II 24-hr 25-yr Rainfall=5.73"

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Summary for Subcatchment 25S: Dist_Woods

Runoff = 15.63 cfs @ 12.13 hrs, Volume= 51,773 cf, Depth= 2.81"

Routed to Link 9L : Pre_DP-001 Trooper Rd

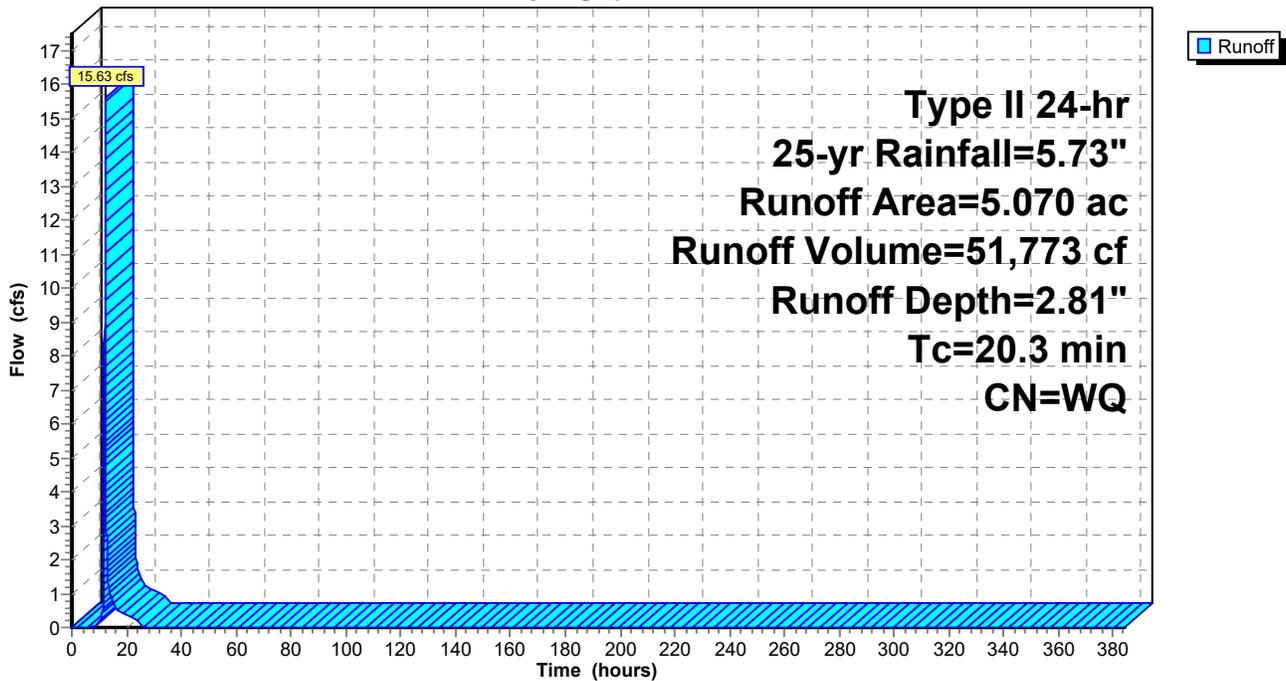
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-yr Rainfall=5.73"

Area (ac)	CN	Description
3.750	70	Woods, Good, HSG C
1.320	79	Woods, Fair, HSG D
5.070		Weighted Average
5.070		100.00% Pervious Area

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

Subcatchment 25S: Dist_Woods

Hydrograph



Summary for Subcatchment 27S: Dist_Woods

Runoff = 0.60 cfs @ 12.15 hrs, Volume= 2,070 cf, Depth= 2.59"

Routed to Link 14L : Pre_DP-002 Germantown Pike

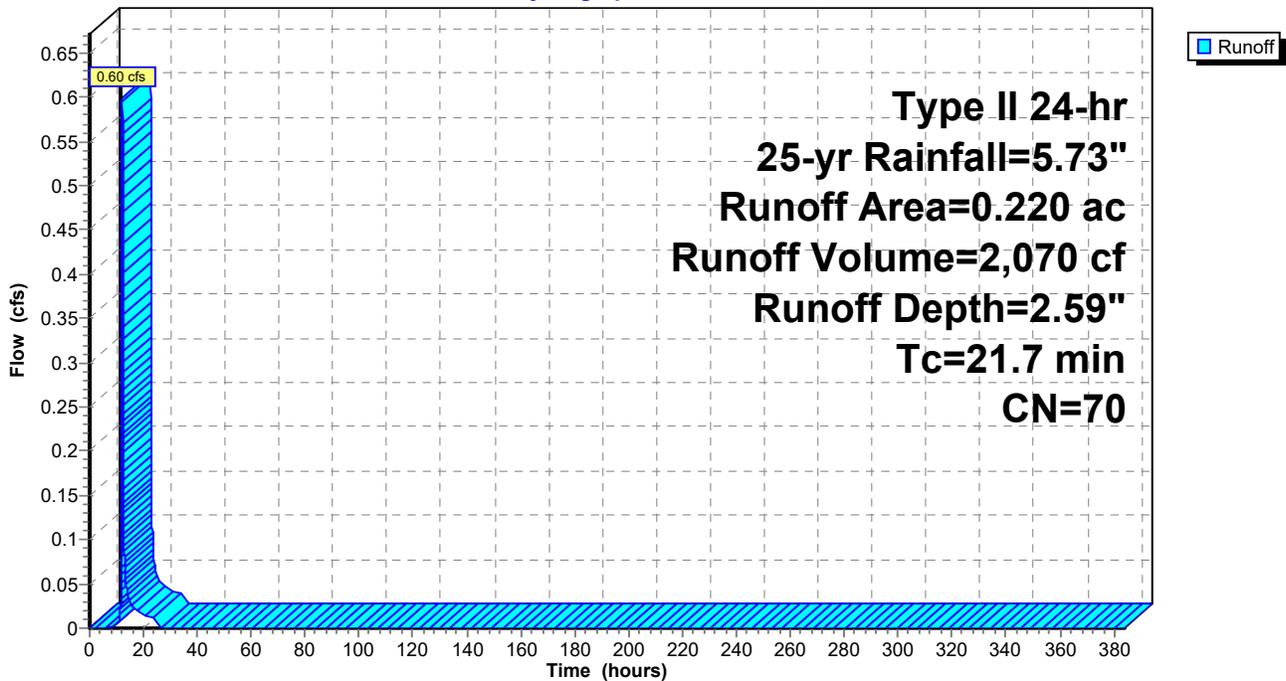
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-yr Rainfall=5.73"

Area (ac)	CN	Description
0.220	70	Woods, Good, HSG C
0.220		100.00% Pervious Area

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

Subcatchment 27S: Dist_Woods

Hydrograph



Summary for Subcatchment 39S: Dist_Impervious

Runoff = 0.25 cfs @ 11.96 hrs, Volume= 598 cf, Depth= 5.49"

Routed to Link 14L : Pre_DP-002 Germantown Pike

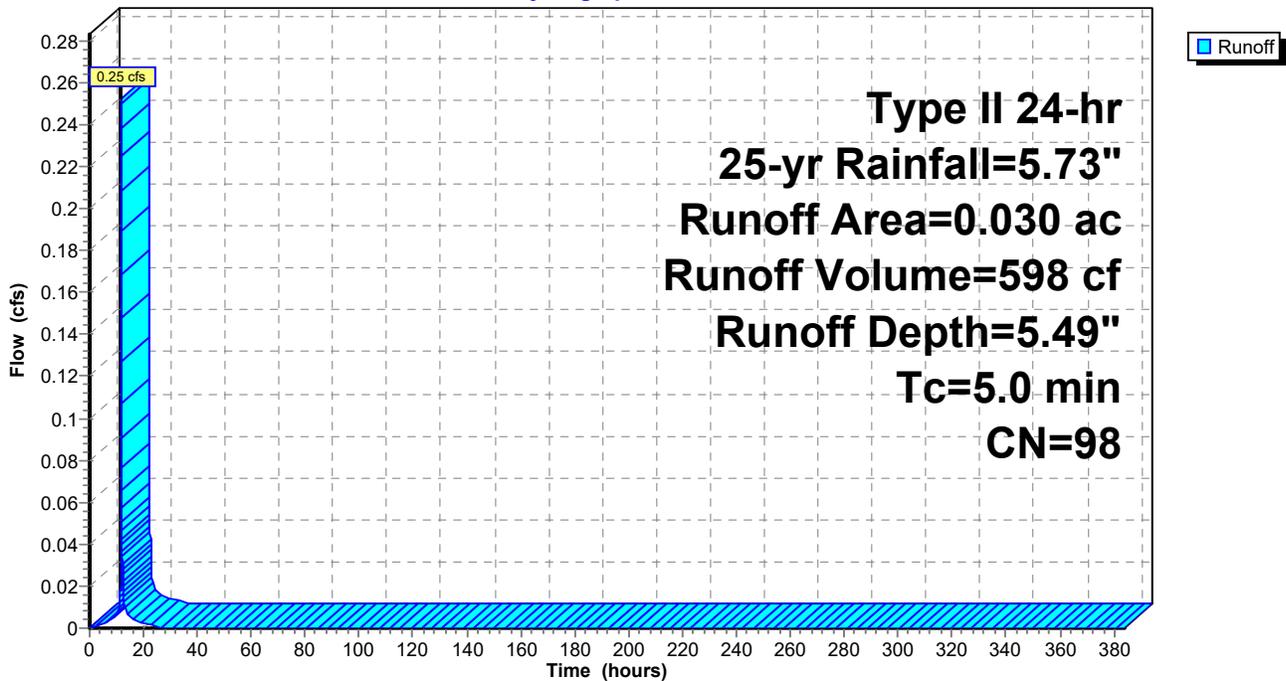
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-yr Rainfall=5.73"

Area (ac)	CN	Description
* 0.030	98	ROW
0.030		100.00% Impervious Area

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

Subcatchment 39S: Dist_Impervious

Hydrograph



Trooper Ridge Pre and Post 2025-01

Prepared by T&M Associates

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Type II 24-hr 25-yr Rainfall=5.73"

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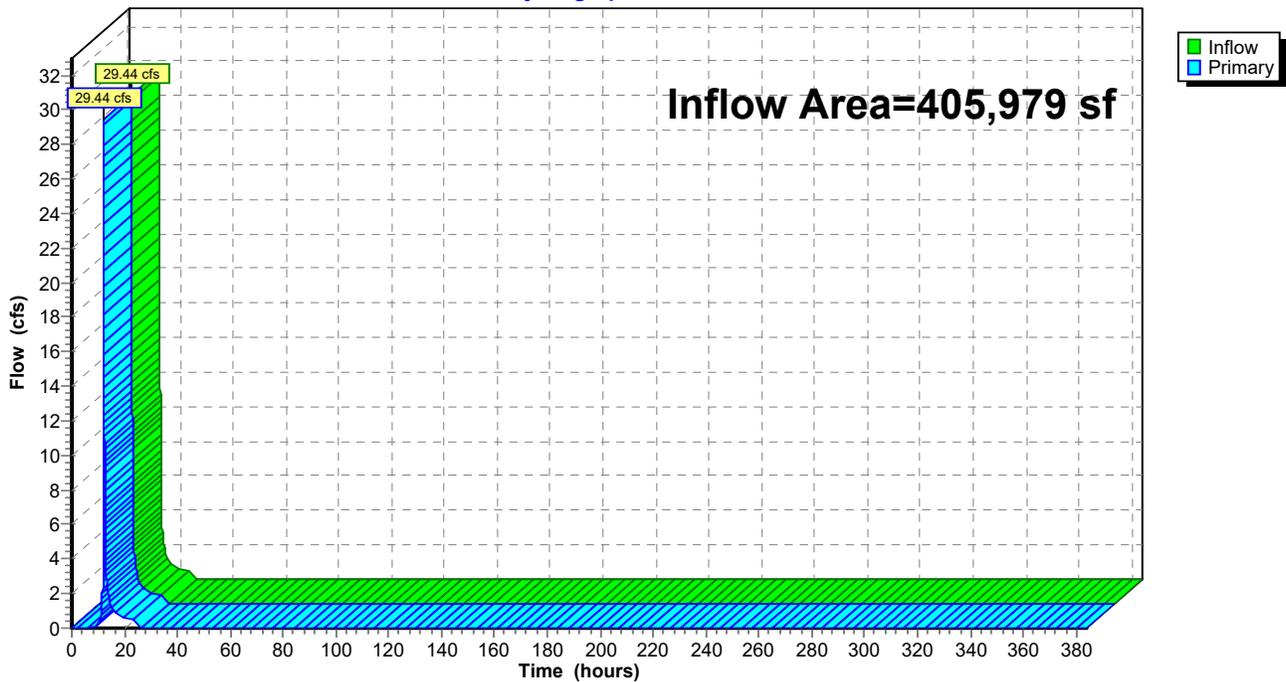
Summary for Link 9L: Pre_DP-001 Trooper Rd

Inflow Area = 405,979 sf, 0.43% Impervious, Inflow Depth = 2.90" for 25-yr event
Inflow = 29.44 cfs @ 12.13 hrs, Volume= 98,017 cf
Primary = 29.44 cfs @ 12.13 hrs, Volume= 98,017 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 9L: Pre_DP-001 Trooper Rd

Hydrograph



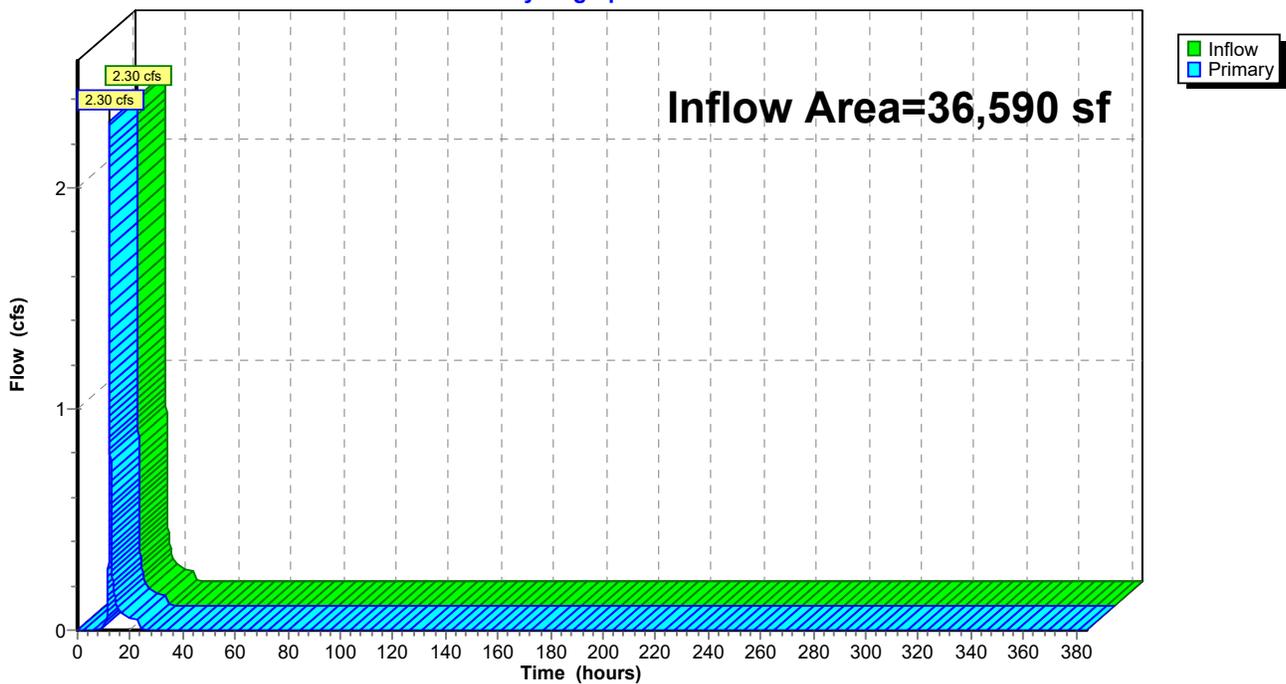
Summary for Link 14L: Pre_DP-002 Germantown Pike

Inflow Area = 36,590 sf, 3.57% Impervious, Inflow Depth = 2.76" for 25-yr event
Inflow = 2.30 cfs @ 12.15 hrs, Volume= 8,414 cf
Primary = 2.30 cfs @ 12.15 hrs, Volume= 8,414 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 14L: Pre_DP-002 Germantown Pike

Hydrograph



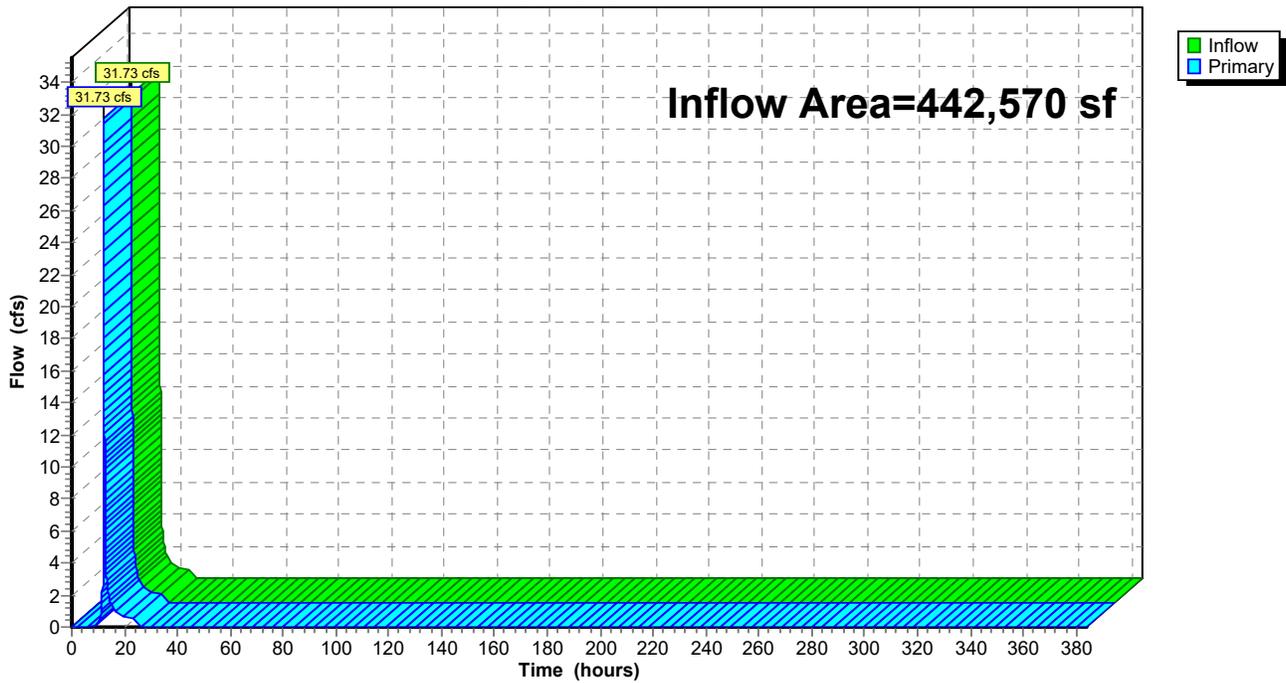
Summary for Link 65L: PRE TOTAL

Inflow Area = 442,570 sf, 0.69% Impervious, Inflow Depth = 2.89" for 25-yr event
Inflow = 31.73 cfs @ 12.13 hrs, Volume= 106,431 cf
Primary = 31.73 cfs @ 12.13 hrs, Volume= 106,431 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 65L: PRE TOTAL

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 50-yr Rainfall=6.56"

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Summary for Subcatchment 18S: Dist_Meadow

Runoff = 2.10 cfs @ 12.15 hrs, Volume= 7,188 cf, Depth= 3.36"

Routed to Link 14L : Pre_DP-002 Germantown Pike

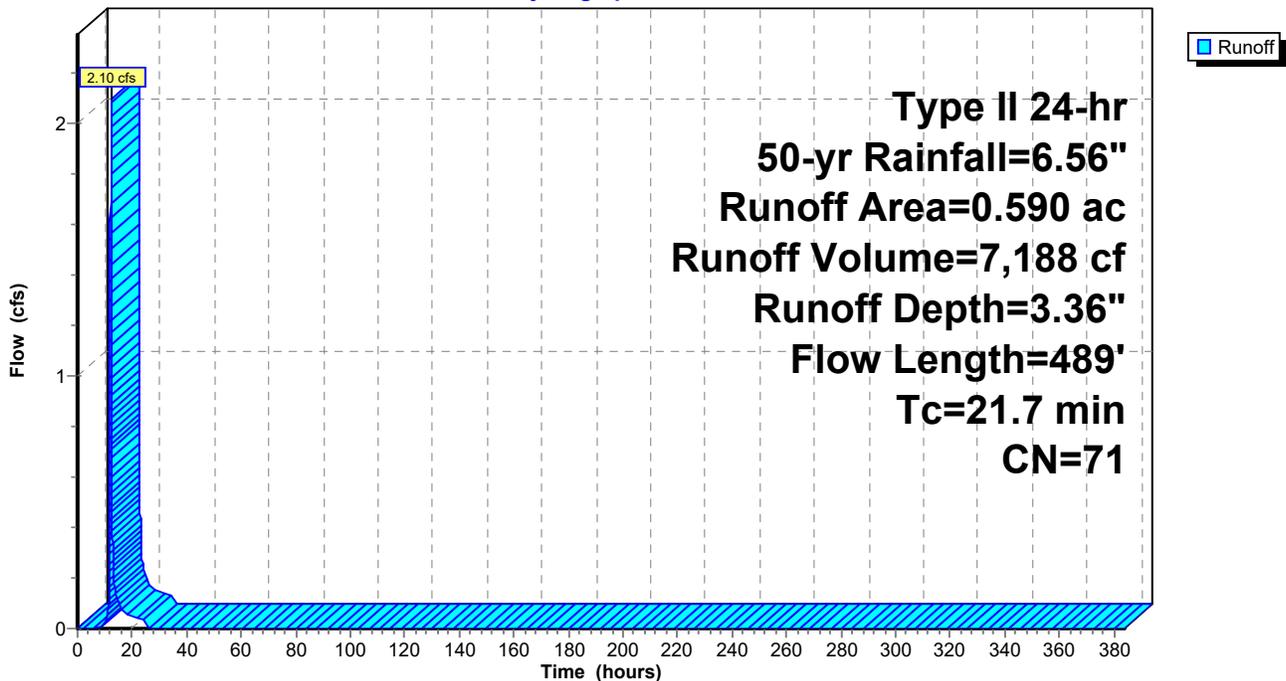
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-yr Rainfall=6.56"

Area (ac)	CN	Description
0.590	71	Meadow, non-grazed, HSG C
0.590		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	100	0.1000	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	389	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
21.7	489	Total			

Subcatchment 18S: Dist_Meadow

Hydrograph



Trooper Ridge Pre and Post 2025-01

Type II 24-hr 50-yr Rainfall=6.56"

Prepared by T&M Associates

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Summary for Subcatchment 23S: Dist_Impervious

Runoff = 0.39 cfs @ 11.96 hrs, Volume= 918 cf, Depth= 6.32"

Routed to Link 9L : Pre_DP-001 Trooper Rd

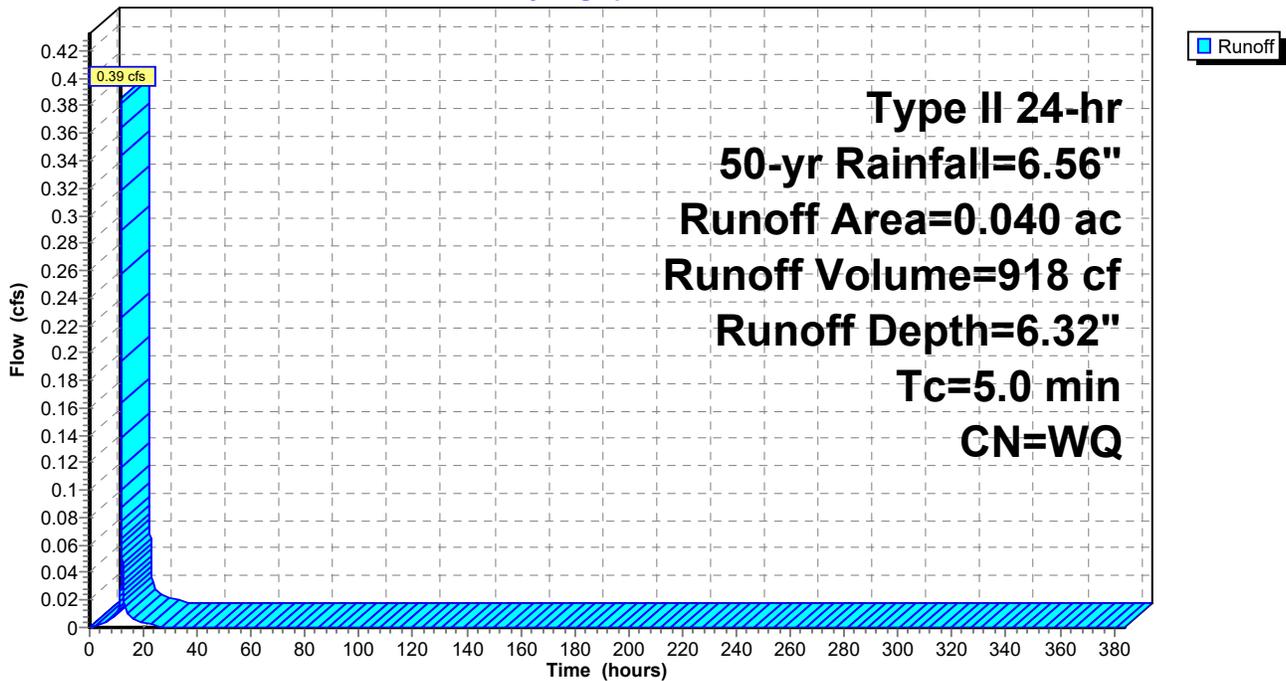
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-yr Rainfall=6.56"

Area (ac)	CN	Description
* 0.020	98	ROW
* 0.020	98	
0.040		Weighted Average
0.040		100.00% Impervious Area

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

Subcatchment 23S: Dist_Impervious

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 50-yr Rainfall=6.56"

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Summary for Subcatchment 24S: Dist_Meadow

Runoff = 17.03 cfs @ 12.13 hrs, Volume= 56,162 cf, Depth= 3.67"

Routed to Link 9L : Pre_DP-001 Trooper Rd

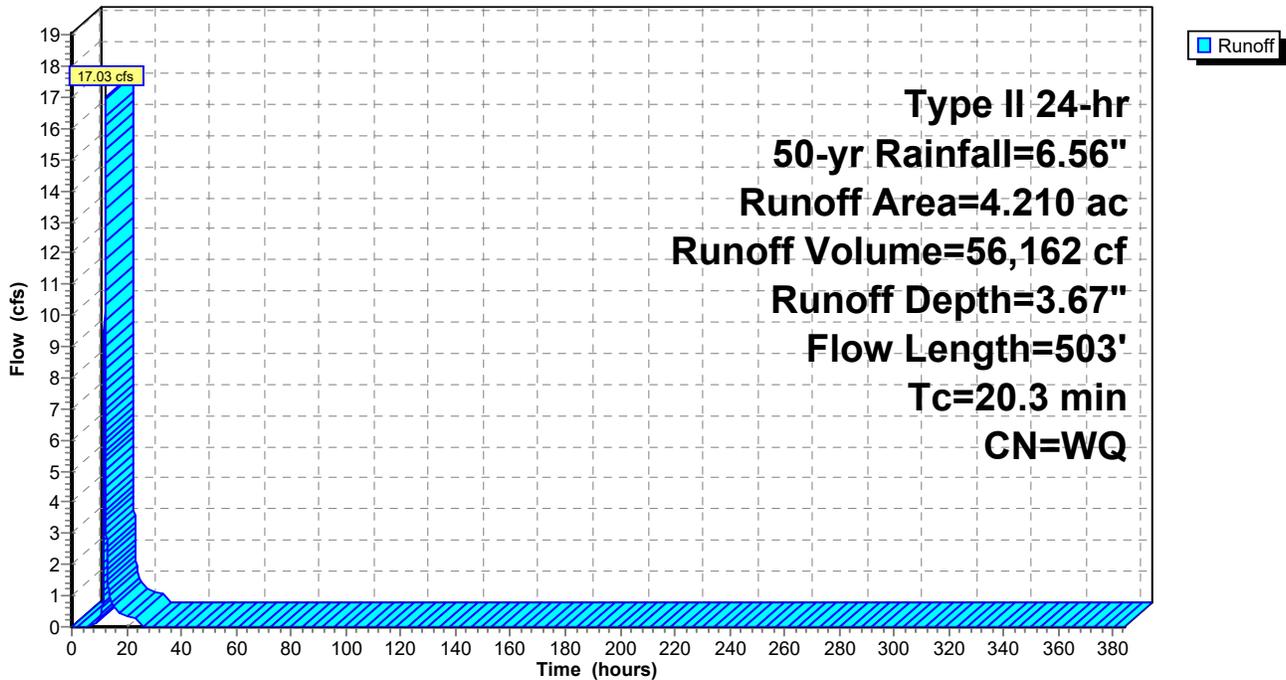
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=6.56"

Area (ac)	CN	Description
2.350	71	Meadow, non-grazed, HSG C
1.860	78	Meadow, non-grazed, HSG D
4.210		Weighted Average
4.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	100	0.1200	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	403	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.3	503	Total			

Subcatchment 24S: Dist_Meadow

Hydrograph



Trooper Ridge Pre and Post 2025-01

Type II 24-hr 50-yr Rainfall=6.56"

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Summary for Subcatchment 25S: Dist_Woods

Runoff = 19.49 cfs @ 12.13 hrs, Volume= 64,368 cf, Depth= 3.50"

Routed to Link 9L : Pre_DP-001 Trooper Rd

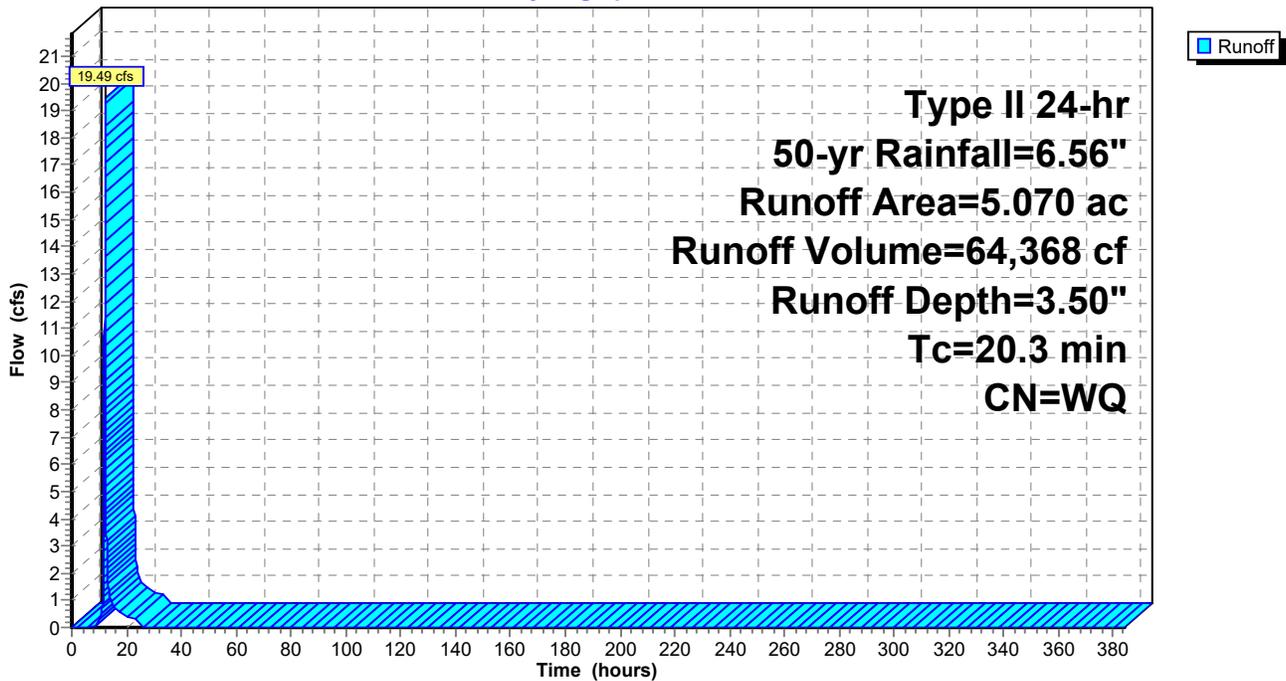
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-yr Rainfall=6.56"

Area (ac)	CN	Description
3.750	70	Woods, Good, HSG C
1.320	79	Woods, Fair, HSG D
5.070		Weighted Average
5.070		100.00% Pervious Area

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

Subcatchment 25S: Dist_Woods

Hydrograph



Trooper Ridge Pre and Post 2025-01

Type II 24-hr 50-yr Rainfall=6.56"

Prepared by T&M Associates

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Summary for Subcatchment 27S: Dist_Woods

Runoff = 0.76 cfs @ 12.15 hrs, Volume= 2,600 cf, Depth= 3.26"

Routed to Link 14L : Pre_DP-002 Germantown Pike

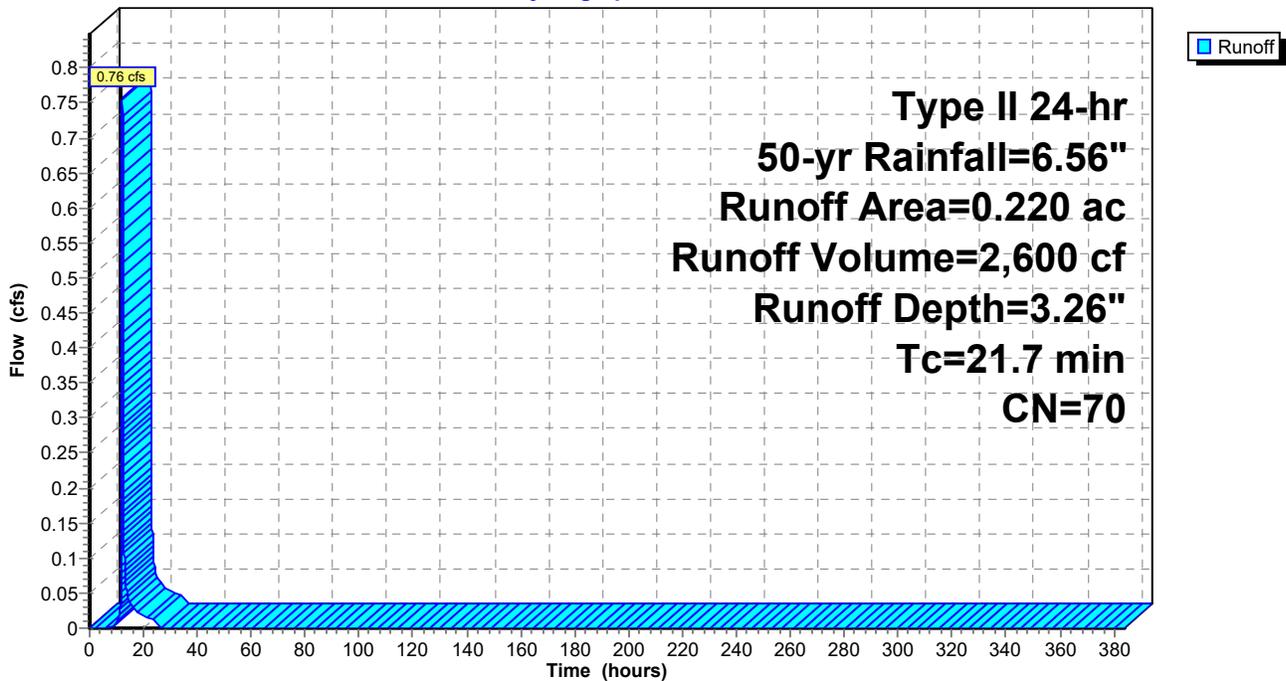
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-yr Rainfall=6.56"

Area (ac)	CN	Description
0.220	70	Woods, Good, HSG C
0.220		100.00% Pervious Area

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

Subcatchment 27S: Dist_Woods

Hydrograph



Summary for Subcatchment 39S: Dist_Impervious

Runoff = 0.29 cfs @ 11.96 hrs, Volume= 688 cf, Depth= 6.32"

Routed to Link 14L : Pre_DP-002 Germantown Pike

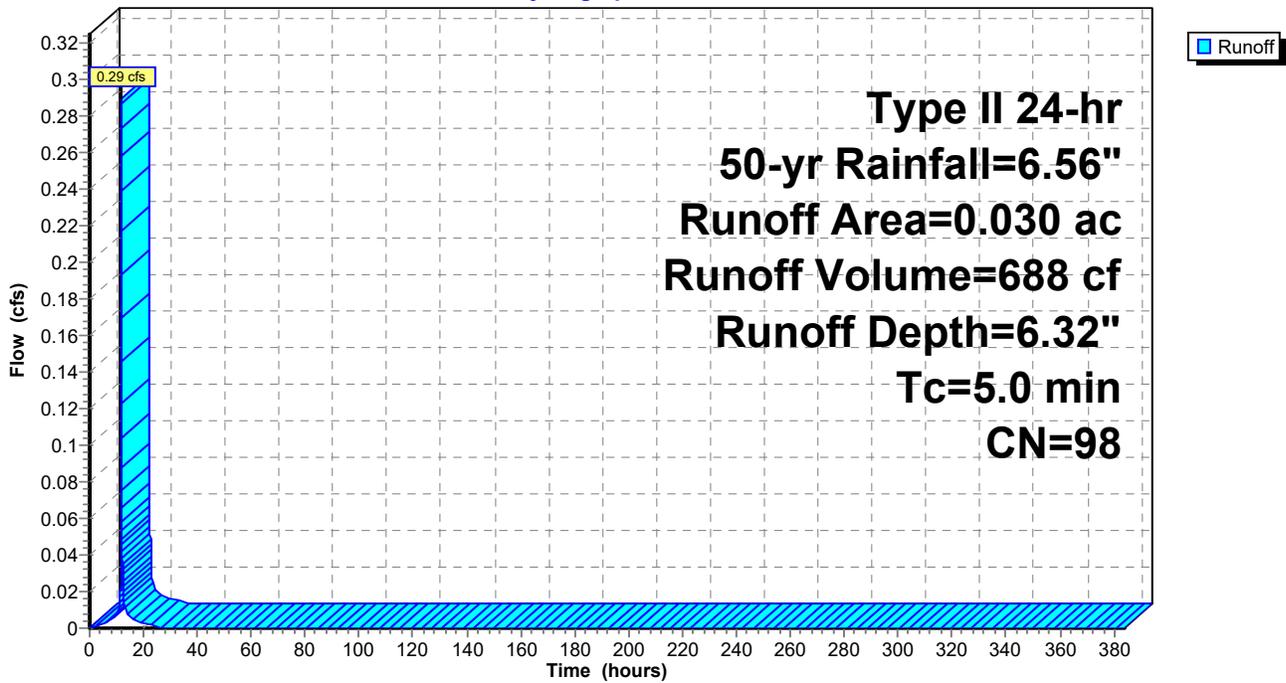
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-yr Rainfall=6.56"

Area (ac)	CN	Description
* 0.030	98	ROW
0.030		100.00% Impervious Area

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

Subcatchment 39S: Dist_Impervious

Hydrograph



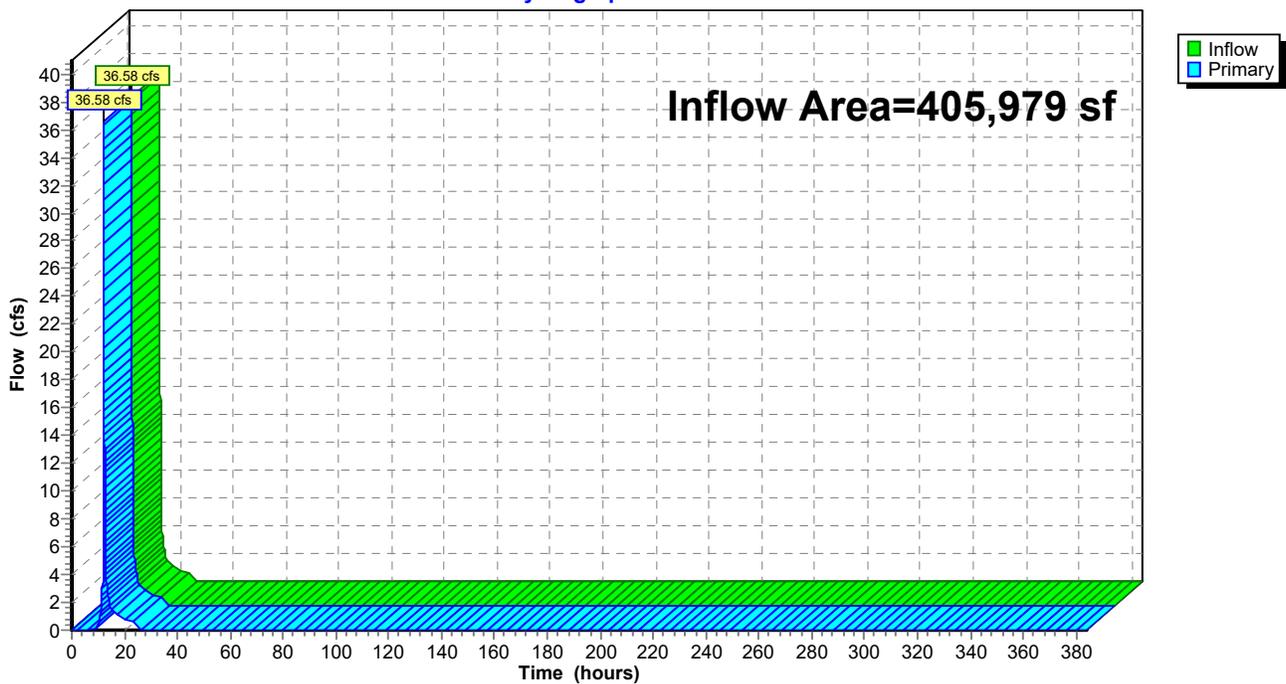
Summary for Link 9L: Pre_DP-001 Trooper Rd

Inflow Area = 405,979 sf, 0.43% Impervious, Inflow Depth = 3.59" for 50-yr event
Inflow = 36.58 cfs @ 12.13 hrs, Volume= 121,448 cf
Primary = 36.58 cfs @ 12.13 hrs, Volume= 121,448 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 9L: Pre_DP-001 Trooper Rd

Hydrograph



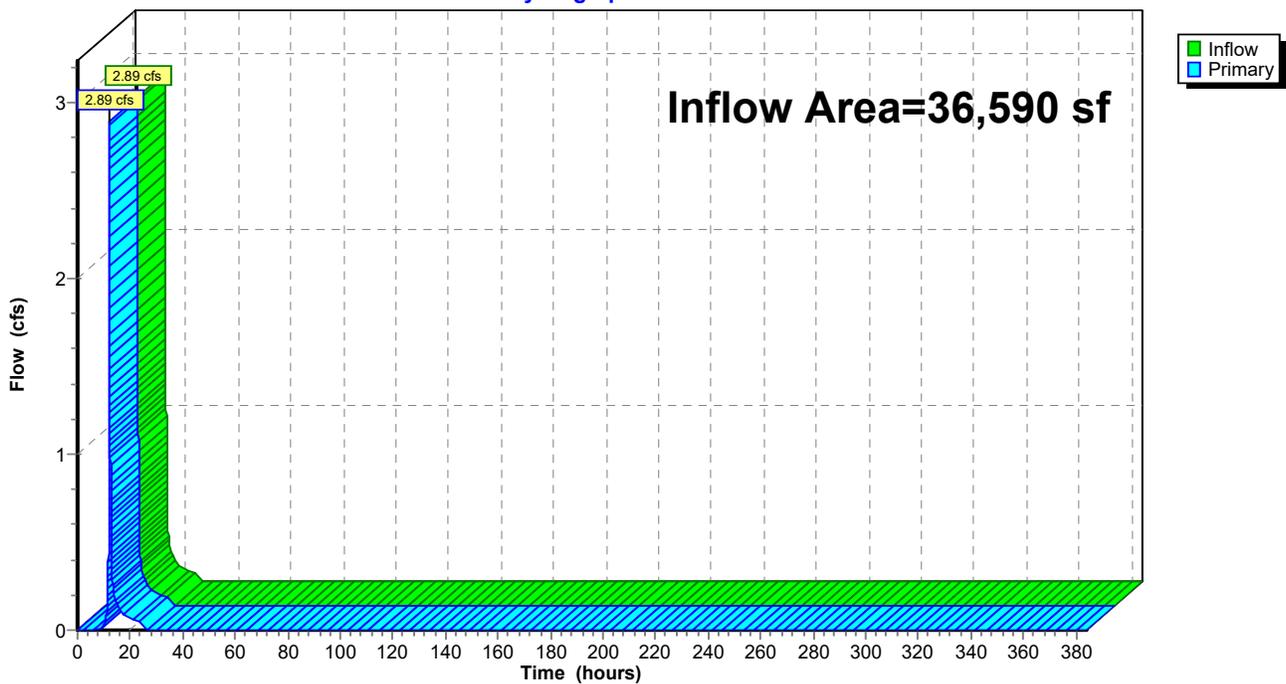
Summary for Link 14L: Pre_DP-002 Germantown Pike

Inflow Area = 36,590 sf, 3.57% Impervious, Inflow Depth = 3.44" for 50-yr event
Inflow = 2.89 cfs @ 12.15 hrs, Volume= 10,477 cf
Primary = 2.89 cfs @ 12.15 hrs, Volume= 10,477 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 14L: Pre_DP-002 Germantown Pike

Hydrograph



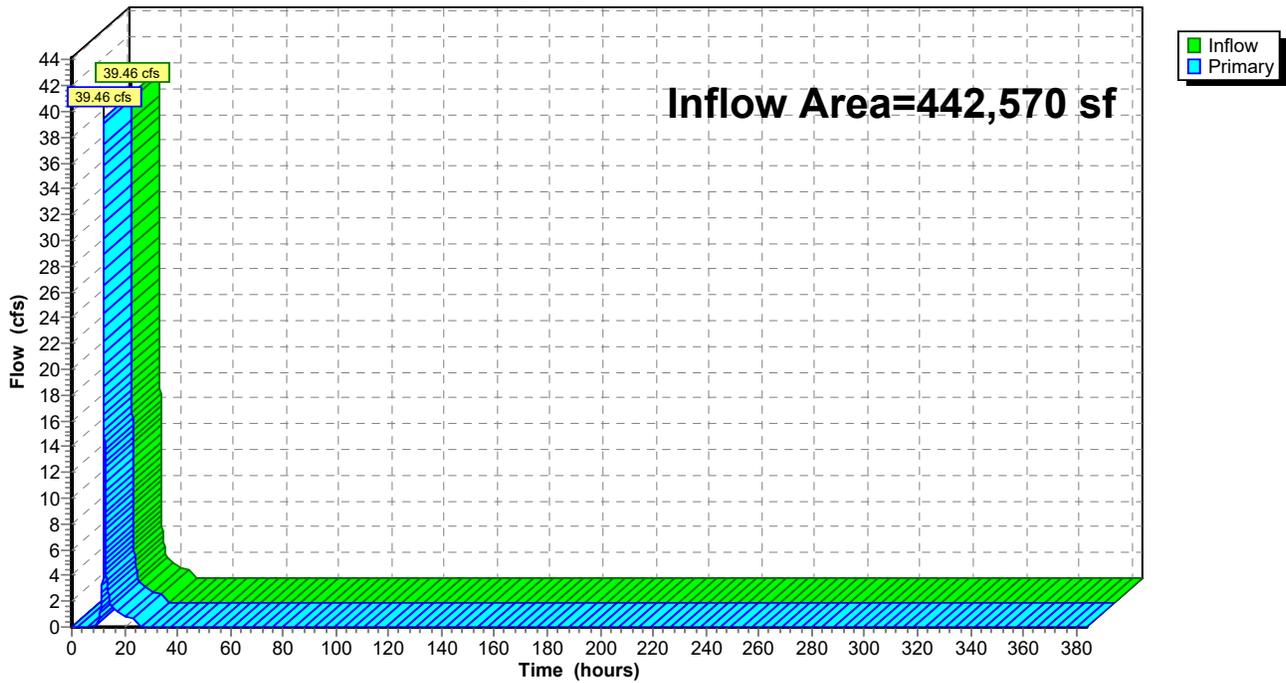
Summary for Link 65L: PRE TOTAL

Inflow Area = 442,570 sf, 0.69% Impervious, Inflow Depth = 3.58" for 50-yr event
Inflow = 39.46 cfs @ 12.13 hrs, Volume= 131,924 cf
Primary = 39.46 cfs @ 12.13 hrs, Volume= 131,924 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 65L: PRE TOTAL

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 100-yr Rainfall=7.45"

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Summary for Subcatchment 18S: Dist_Meadow

Runoff = 2.57 cfs @ 12.15 hrs, Volume= 8,792 cf, Depth= 4.11"

Routed to Link 14L : Pre_DP-002 Germantown Pike

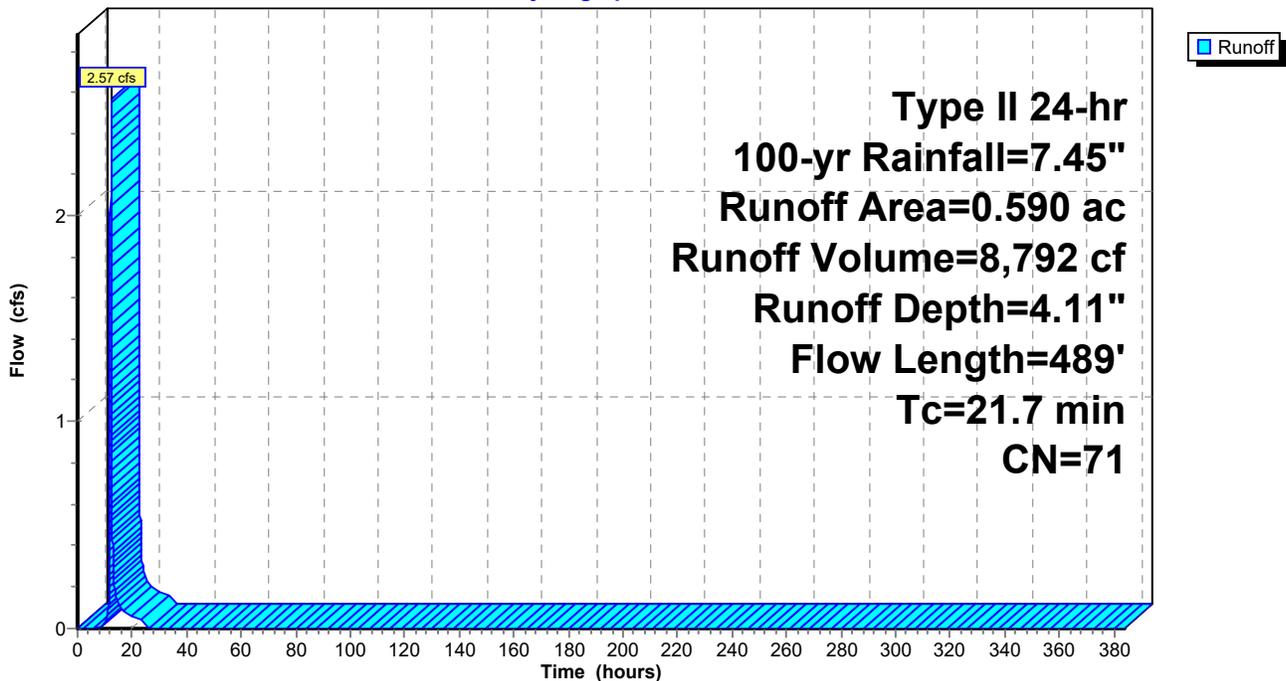
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.590	71	Meadow, non-grazed, HSG C
0.590		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	100	0.1000	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	389	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
21.7	489	Total			

Subcatchment 18S: Dist_Meadow

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 100-yr Rainfall=7.45"

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Summary for Subcatchment 23S: Dist_Impervious

Runoff = 0.44 cfs @ 11.96 hrs, Volume= 1,047 cf, Depth= 7.21"

Routed to Link 9L : Pre_DP-001 Trooper Rd

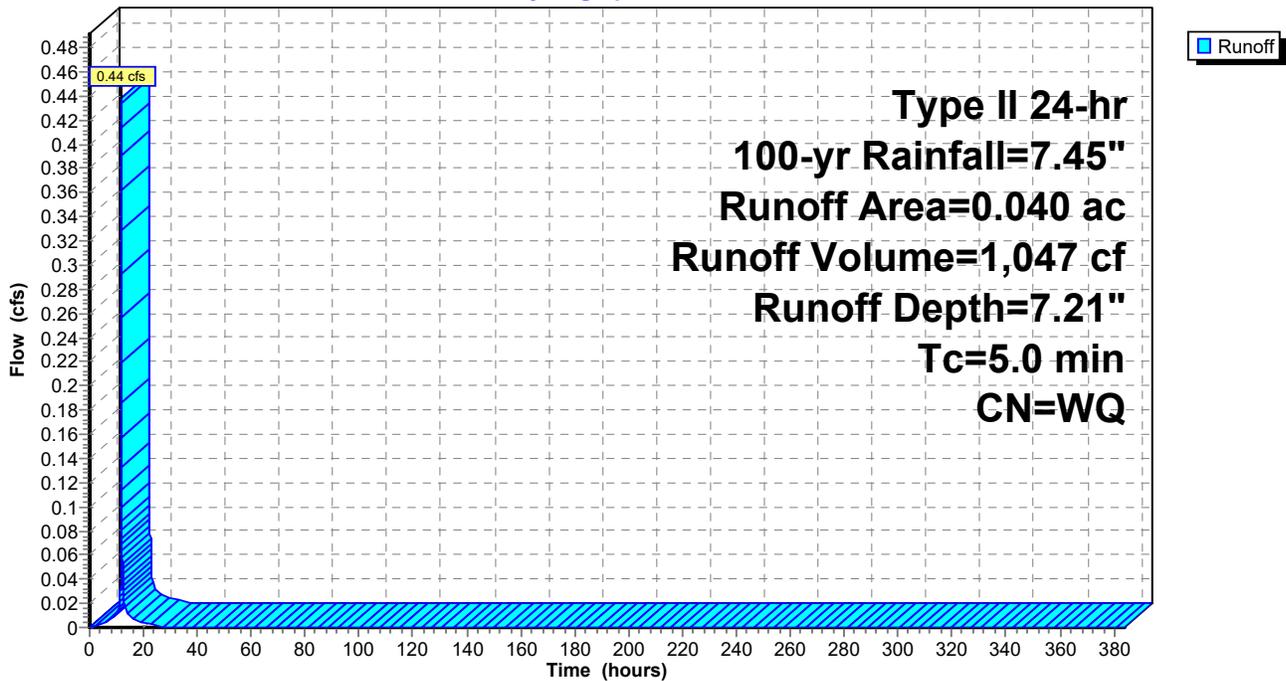
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
* 0.020	98	ROW
* 0.020	98	
0.040		Weighted Average
0.040		100.00% Impervious Area

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

Subcatchment 23S: Dist_Impervious

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 100-yr Rainfall=7.45"

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Summary for Subcatchment 24S: Dist_Meadow

Runoff = 20.60 cfs @ 12.13 hrs, Volume= 68,002 cf, Depth= 4.45"

Routed to Link 9L : Pre_DP-001 Trooper Rd

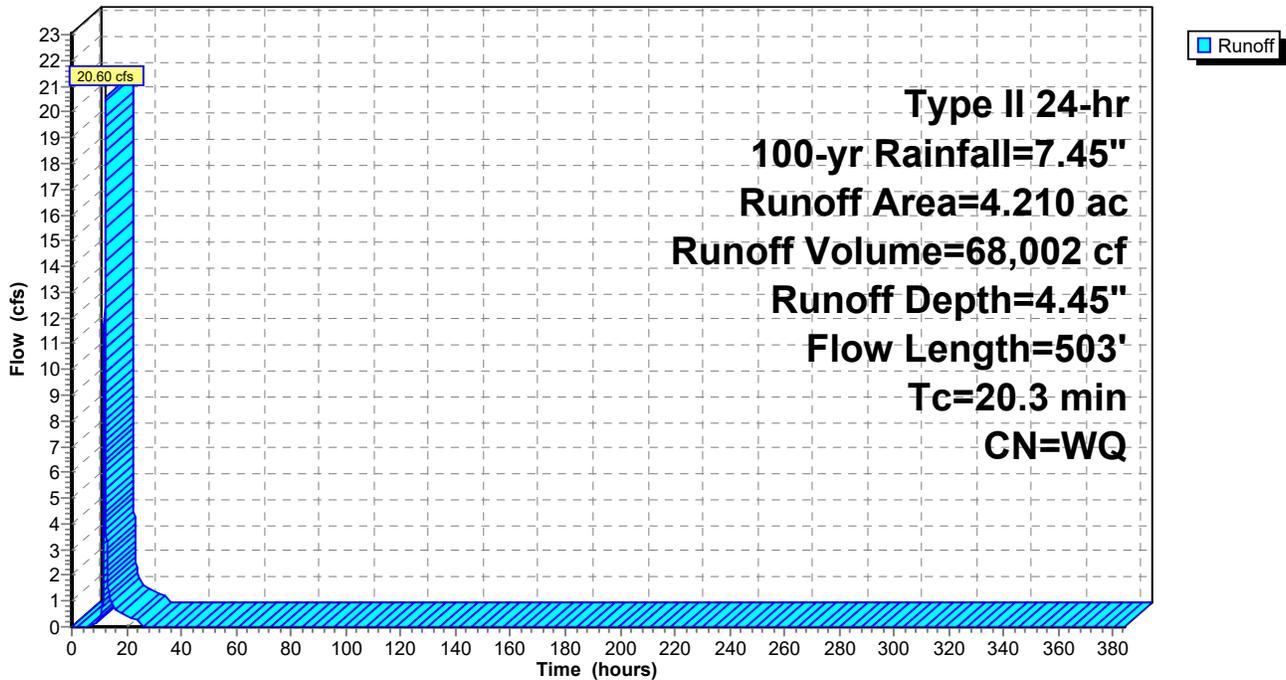
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
2.350	71	Meadow, non-grazed, HSG C
1.860	78	Meadow, non-grazed, HSG D
4.210		Weighted Average
4.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	100	0.1200	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.5	403	0.0740	4.38		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.3	503	Total			

Subcatchment 24S: Dist_Meadow

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 100-yr Rainfall=7.45"

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Summary for Subcatchment 25S: Dist_Woods

Runoff = 23.73 cfs @ 12.13 hrs, Volume= 78,338 cf, Depth= 4.26"

Routed to Link 9L : Pre_DP-001 Trooper Rd

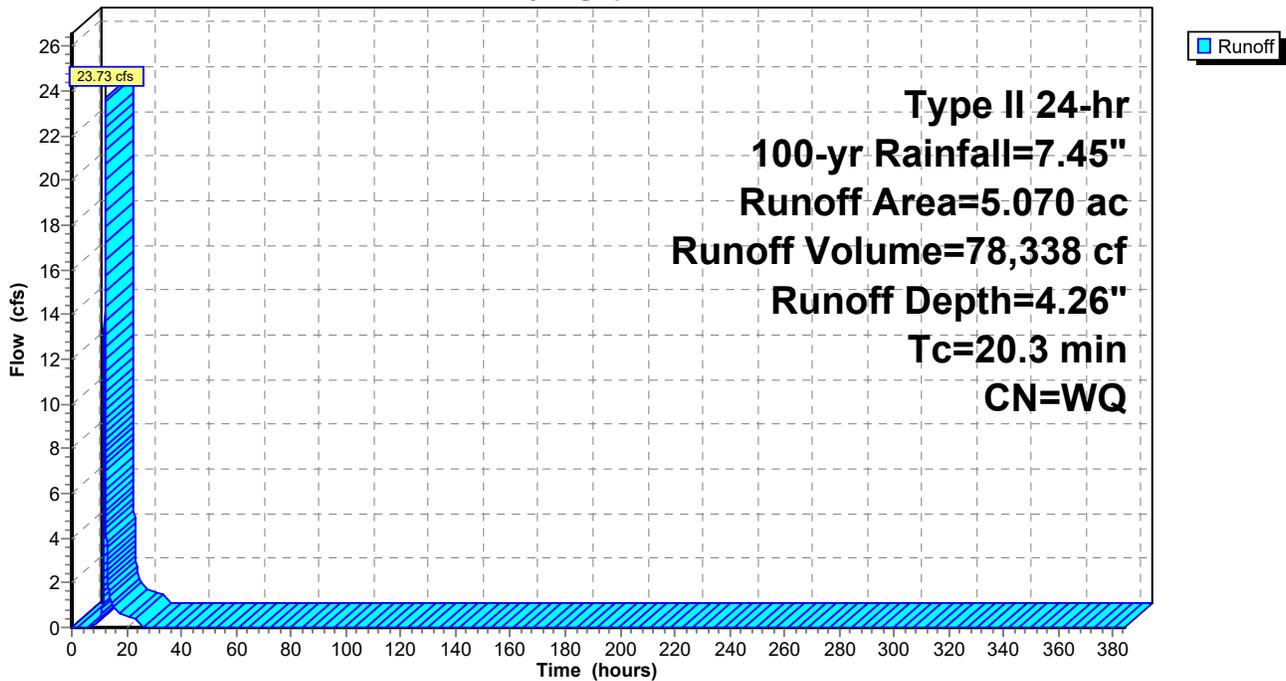
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
3.750	70	Woods, Good, HSG C
1.320	79	Woods, Fair, HSG D
5.070		Weighted Average
5.070		100.00% Pervious Area

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

Subcatchment 25S: Dist_Woods

Hydrograph



Trooper Ridge Pre and Post 2025-01

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Type II 24-hr 100-yr Rainfall=7.45"

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Summary for Subcatchment 27S: Dist_Woods

Runoff = 0.93 cfs @ 12.15 hrs, Volume= 3,191 cf, Depth= 4.00"

Routed to Link 14L : Pre_DP-002 Germantown Pike

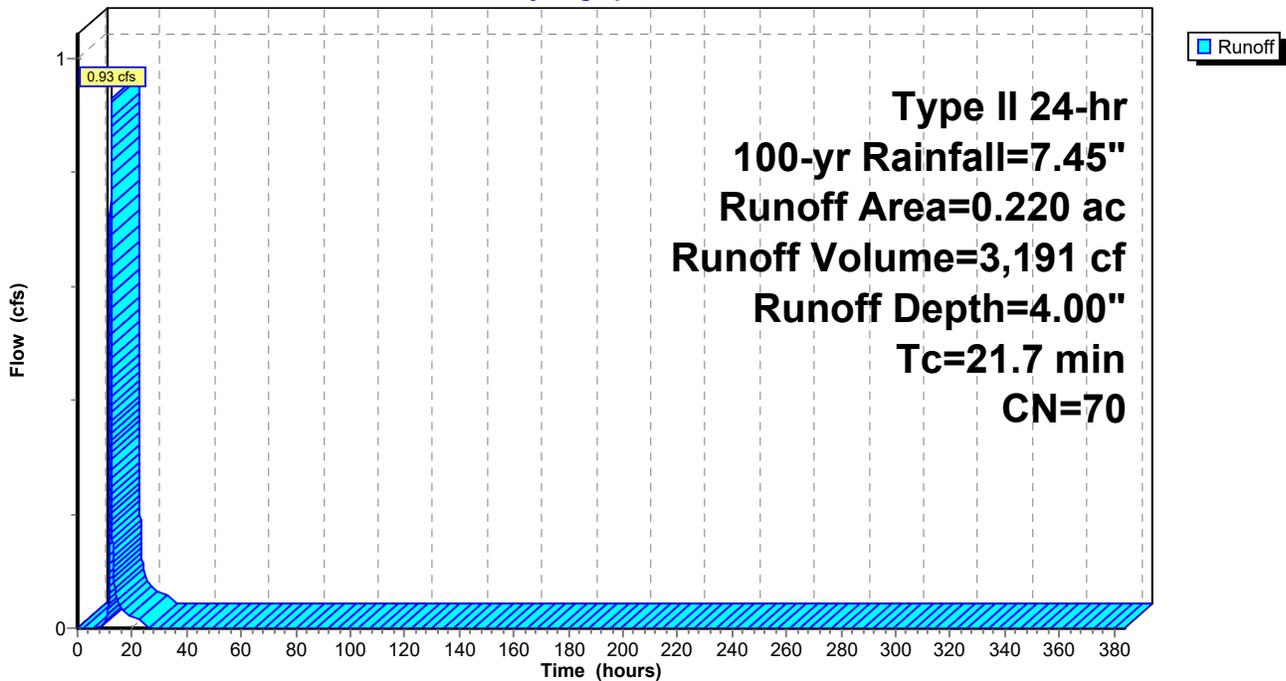
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.220	70	Woods, Good, HSG C
0.220		100.00% Pervious Area

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

Subcatchment 27S: Dist_Woods

Hydrograph



Summary for Subcatchment 39S: Dist_Impervious

Runoff = 0.33 cfs @ 11.96 hrs, Volume= 785 cf, Depth= 7.21"

Routed to Link 14L : Pre_DP-002 Germantown Pike

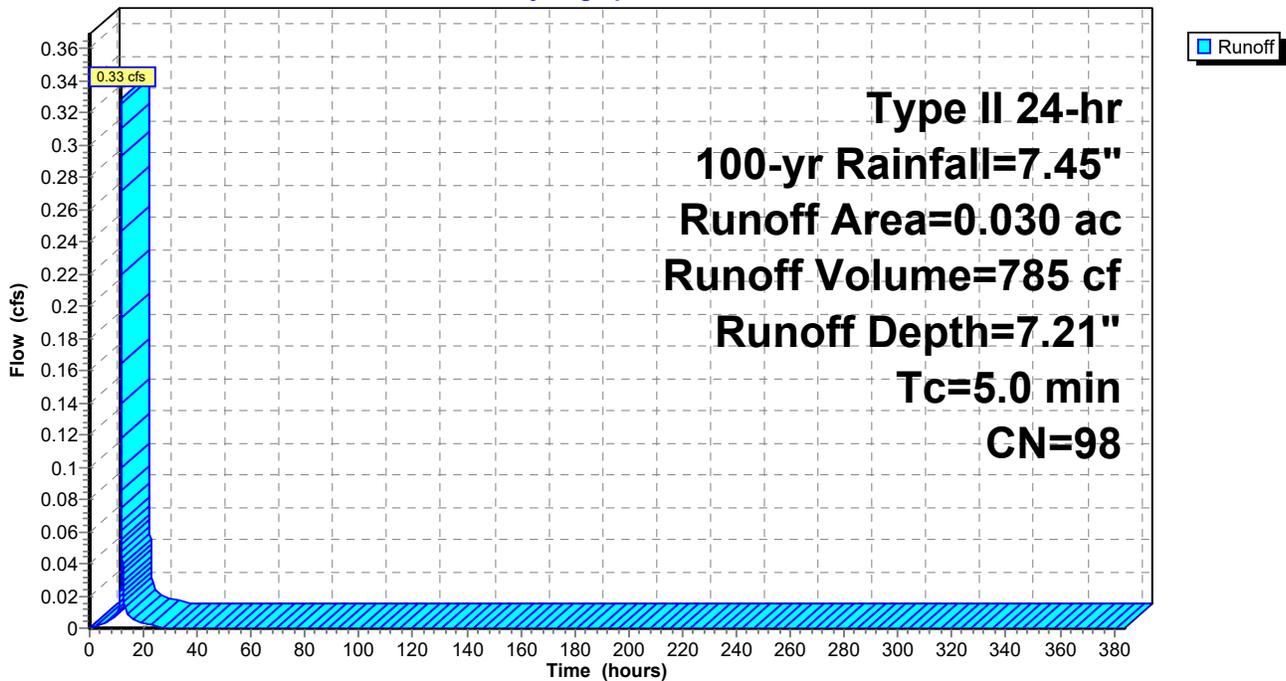
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
* 0.030	98	ROW
0.030		100.00% Impervious Area

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

Subcatchment 39S: Dist_Impervious

Hydrograph



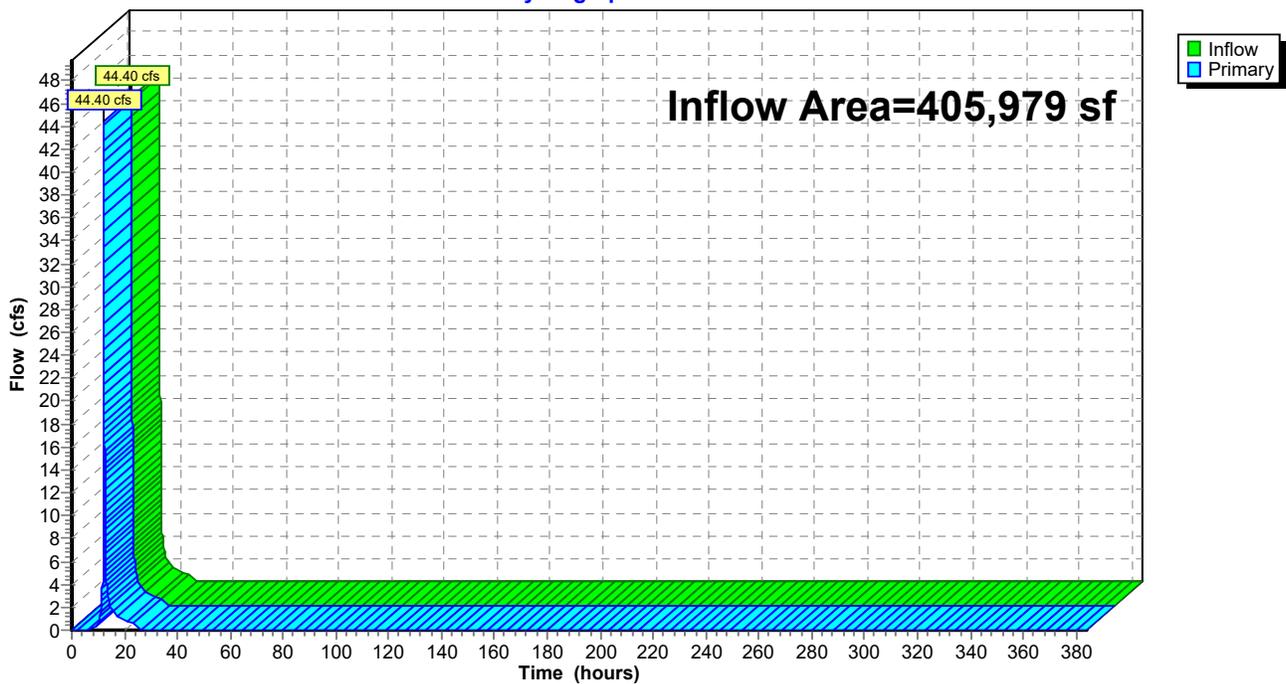
Summary for Link 9L: Pre_DP-001 Trooper Rd

Inflow Area = 405,979 sf, 0.43% Impervious, Inflow Depth = 4.36" for 100-yr event
Inflow = 44.40 cfs @ 12.13 hrs, Volume= 147,386 cf
Primary = 44.40 cfs @ 12.13 hrs, Volume= 147,386 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 9L: Pre_DP-001 Trooper Rd

Hydrograph



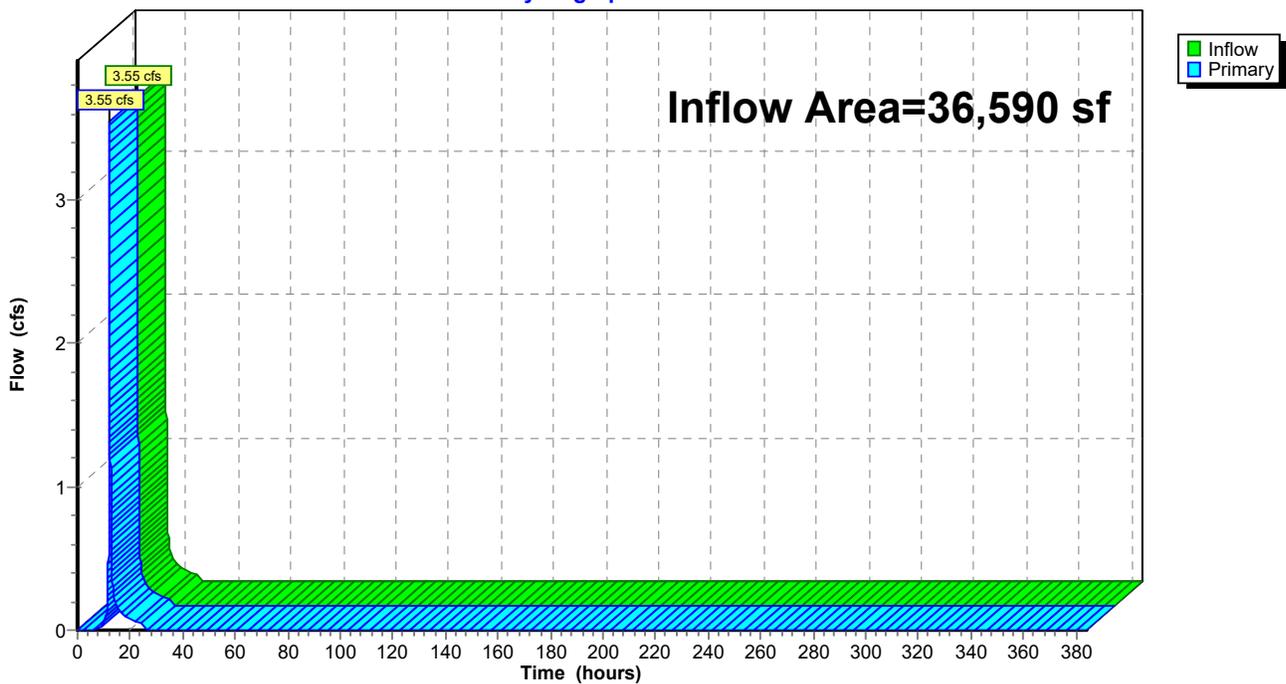
Summary for Link 14L: Pre_DP-002 Germantown Pike

Inflow Area = 36,590 sf, 3.57% Impervious, Inflow Depth = 4.19" for 100-yr event
Inflow = 3.55 cfs @ 12.15 hrs, Volume= 12,768 cf
Primary = 3.55 cfs @ 12.15 hrs, Volume= 12,768 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 65L : PRE TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 14L: Pre_DP-002 Germantown Pike

Hydrograph



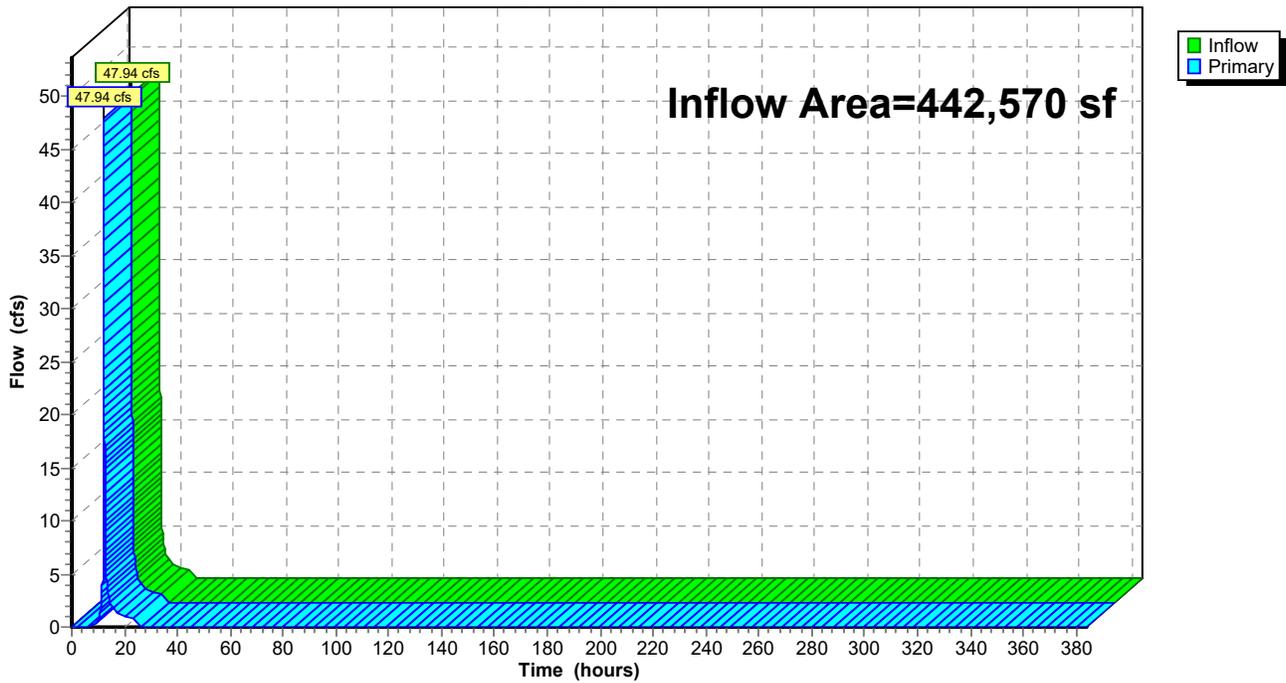
Summary for Link 65L: PRE TOTAL

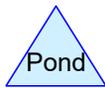
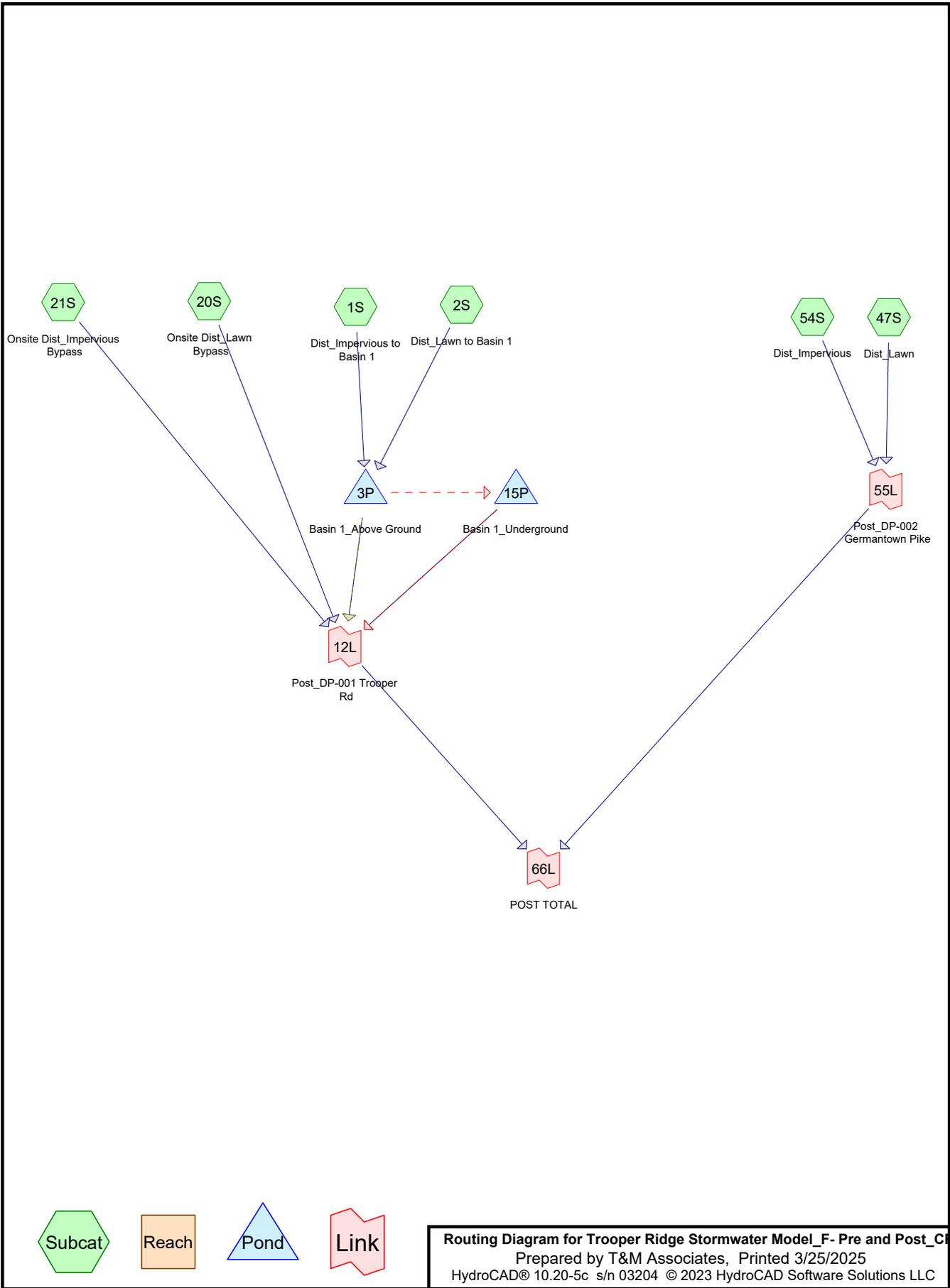
Inflow Area = 442,570 sf, 0.69% Impervious, Inflow Depth = 4.34" for 100-yr event
Inflow = 47.94 cfs @ 12.13 hrs, Volume= 160,155 cf
Primary = 47.94 cfs @ 12.13 hrs, Volume= 160,155 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 65L: PRE TOTAL

Hydrograph





Routing Diagram for Trooper Ridge Stormwater Model_F- Pre and Post_C

Prepared by T&M Associates, Printed 3/25/2025

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Trooper Ridge Stormwater Model_F- Pre and Post_CR

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Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr	Type II 24-hr		Default	24.00	1	2.69	2
2	1.2in/2-hr	NJ DEP 2-hr		Default	2.00	1	1.20	2
3	2-yr	Type II 24-hr		Default	24.00	1	3.24	2
4	5-yr	Type II 24-hr		Default	24.00	1	4.06	2
5	10-yr	Type II 24-hr		Default	24.00	1	4.75	2
6	25-yr	Type II 24-hr		Default	24.00	1	5.73	2
7	50-yr	Type II 24-hr		Default	24.00	1	6.56	2
8	100-yr	Type II 24-hr		Default	24.00	1	7.45	2

Summary for Subcatchment 1S: Dist_Impervious to Basin 1

Runoff = 14.26 cfs @ 11.96 hrs, Volume= 32,590 cf, Depth= 2.46"
 Routed to Pond 3P : Basin 1_Above Ground

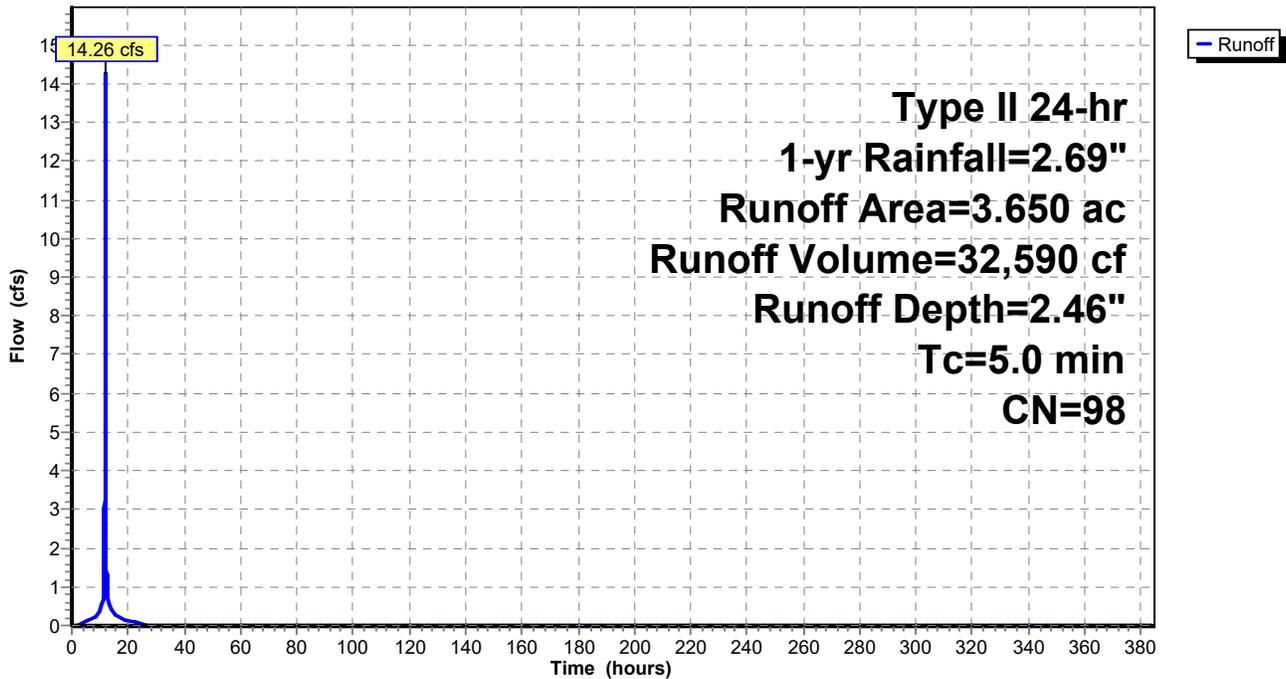
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-yr Rainfall=2.69"

Area (ac)	CN	Description
* 1.370	98	impervious - roadway, sidewalk
* 2.280	98	impervious - 40 total units
3.650	98	Weighted Average
3.650		100.00% Impervious Area

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

Subcatchment 1S: Dist_Impervious to Basin 1

Hydrograph



Summary for Subcatchment 2S: Dist_Lawn to Basin 1

Runoff = 5.79 cfs @ 11.97 hrs, Volume= 11,343 cf, Depth= 0.91"
 Routed to Pond 3P : Basin 1_Above Ground

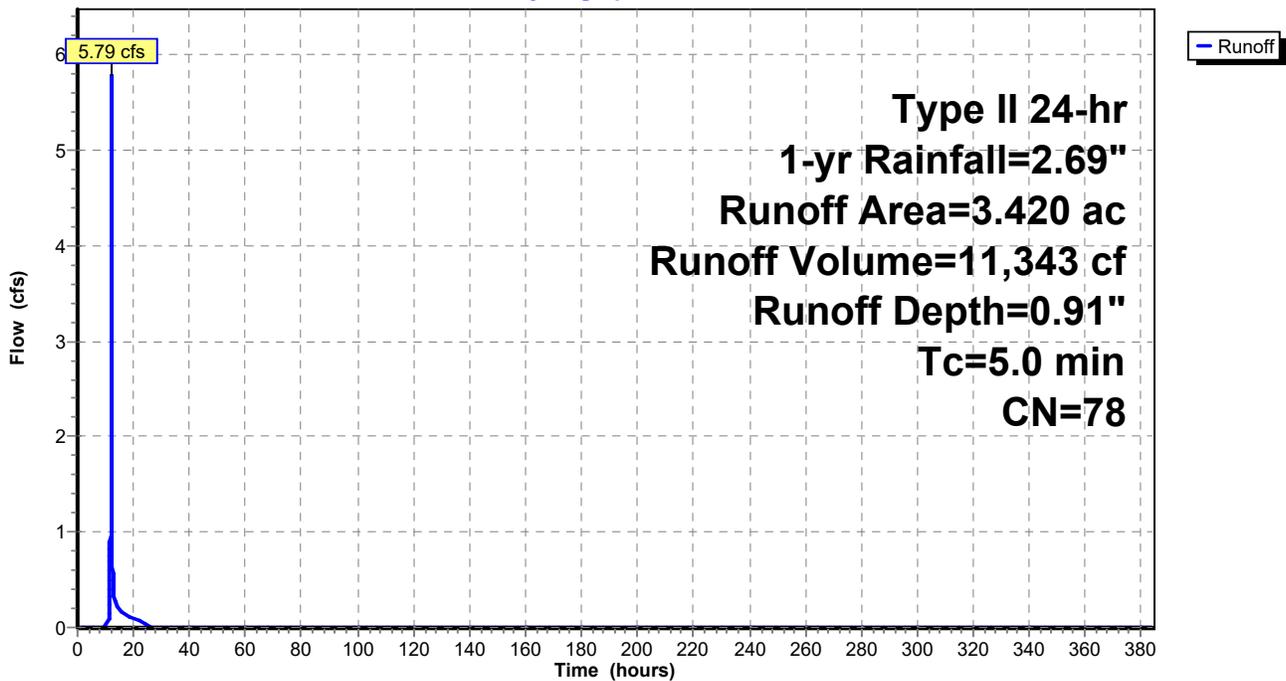
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-yr Rainfall=2.69"

Area (ac)	CN	Description
1.400	74	>75% Grass cover, Good, HSG C
2.020	80	>75% Grass cover, Good, HSG D
3.420	78	Weighted Average
3.420		100.00% Pervious Area

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

Subcatchment 2S: Dist_Lawn to Basin 1

Hydrograph



Summary for Subcatchment 20S: Onsite Dist_Lawn Bypass

Runoff = 2.51 cfs @ 12.02 hrs, Volume= 6,151 cf, Depth= 0.72"
 Routed to Link 12L : Post_DP-001 Trooper Rd

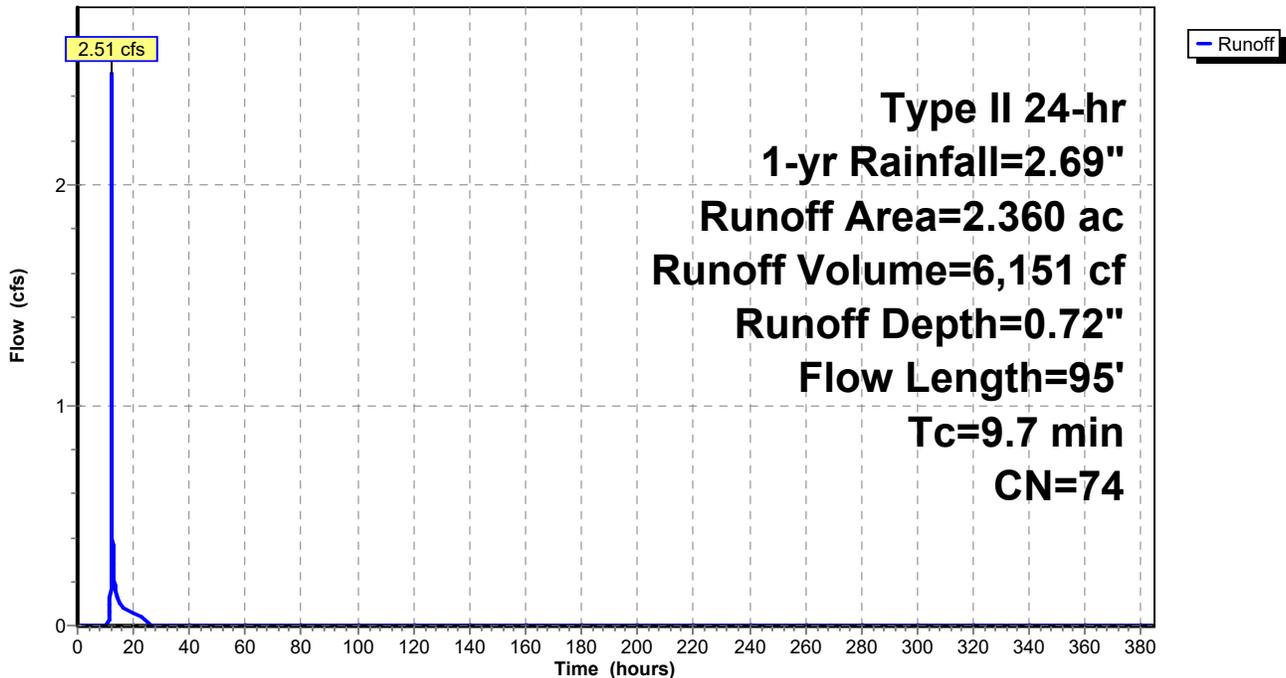
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-yr Rainfall=2.69"

Area (ac)	CN	Description
2.360	74	>75% Grass cover, Good, HSG C
2.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	35	0.2500	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
5.7	60	0.3000	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
9.7	95	Total			

Subcatchment 20S: Onsite Dist_Lawn Bypass

Hydrograph



Summary for Subcatchment 21S: Onsite Dist_Impervious Bypass

Runoff = 0.74 cfs @ 11.96 hrs, Volume= 1,696 cf, Depth= 2.46"
 Routed to Link 12L : Post_DP-001 Trooper Rd

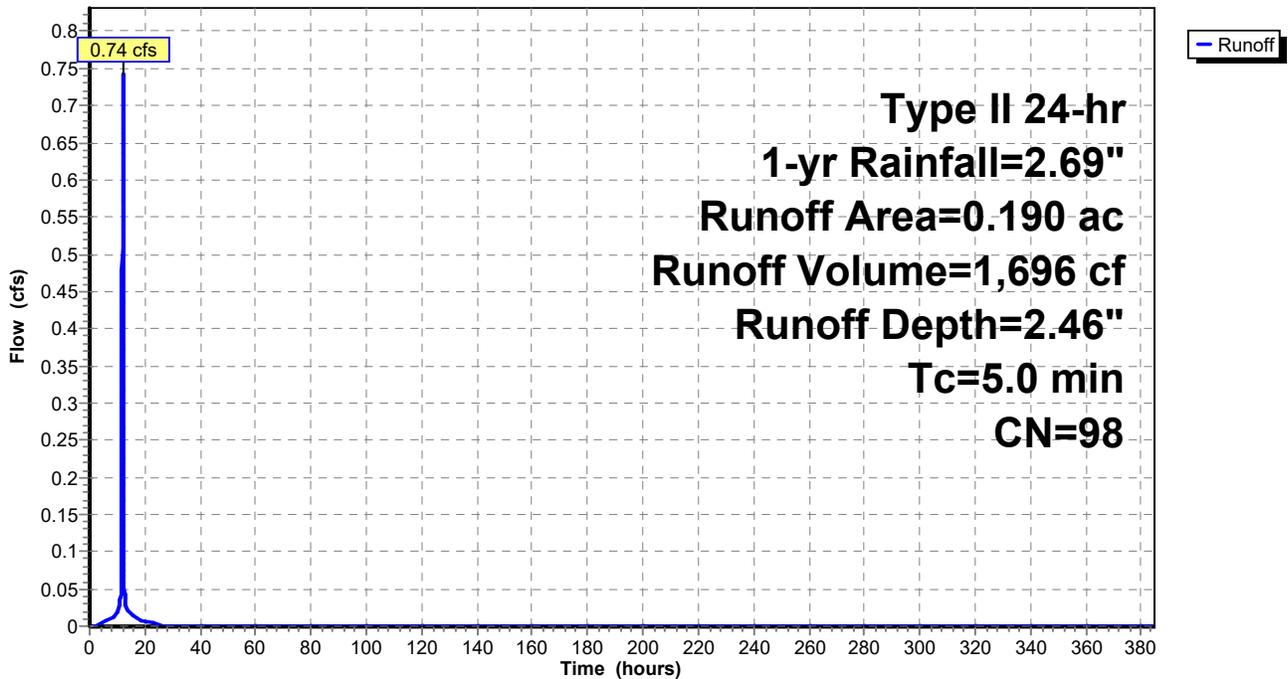
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-yr Rainfall=2.69"

Area (ac)	CN	Description
* 0.190	98	
0.190		100.00% Impervious Area

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

Subcatchment 21S: Onsite Dist_Impervious Bypass

Hydrograph



Summary for Subcatchment 47S: Dist_Lawn

Runoff = 0.32 cfs @ 12.06 hrs, Volume= 886 cf, Depth= 0.72"
 Routed to Link 55L : Post_DP-002 Germantown Pike

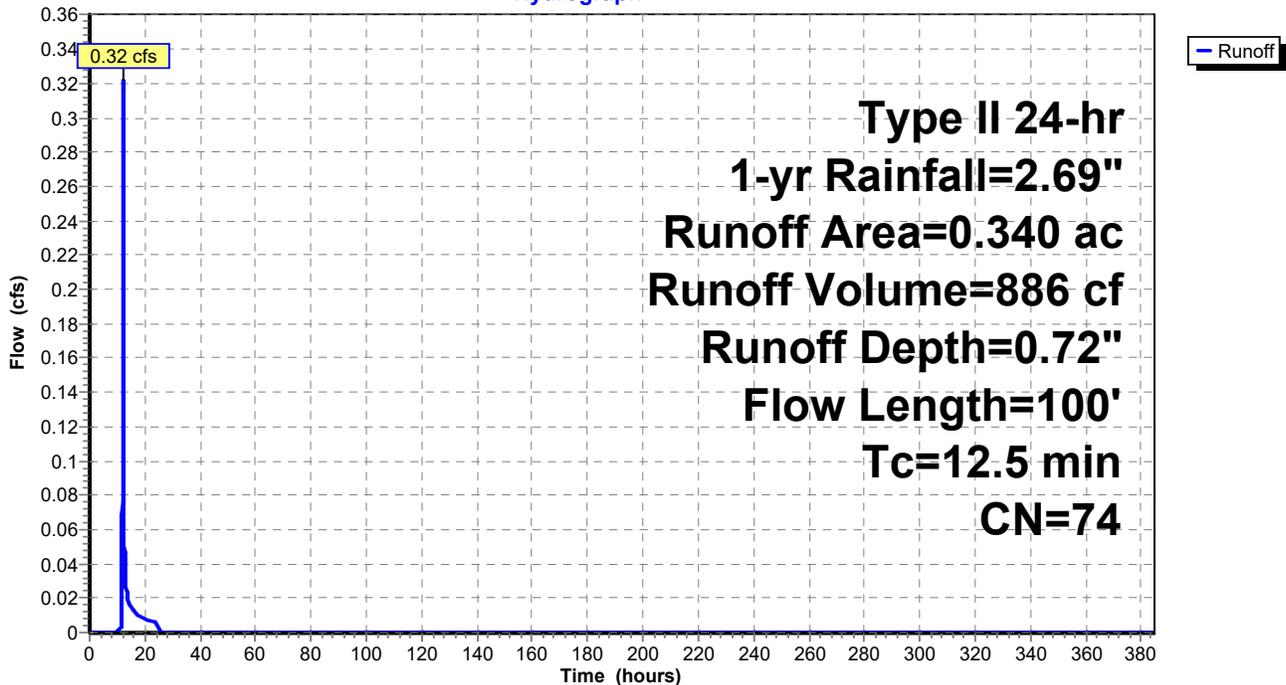
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-yr Rainfall=2.69"

Area (ac)	CN	Description
0.340	74	>75% Grass cover, Good, HSG C
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.3300	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
7.7	50	0.1000	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
12.5	100	Total			

Subcatchment 47S: Dist_Lawn

Hydrograph



Summary for Subcatchment 54S: Dist_Impervious

Runoff = 0.82 cfs @ 11.96 hrs, Volume= 1,875 cf, Depth= 2.46"
 Routed to Link 55L : Post_DP-002 Germantown Pike

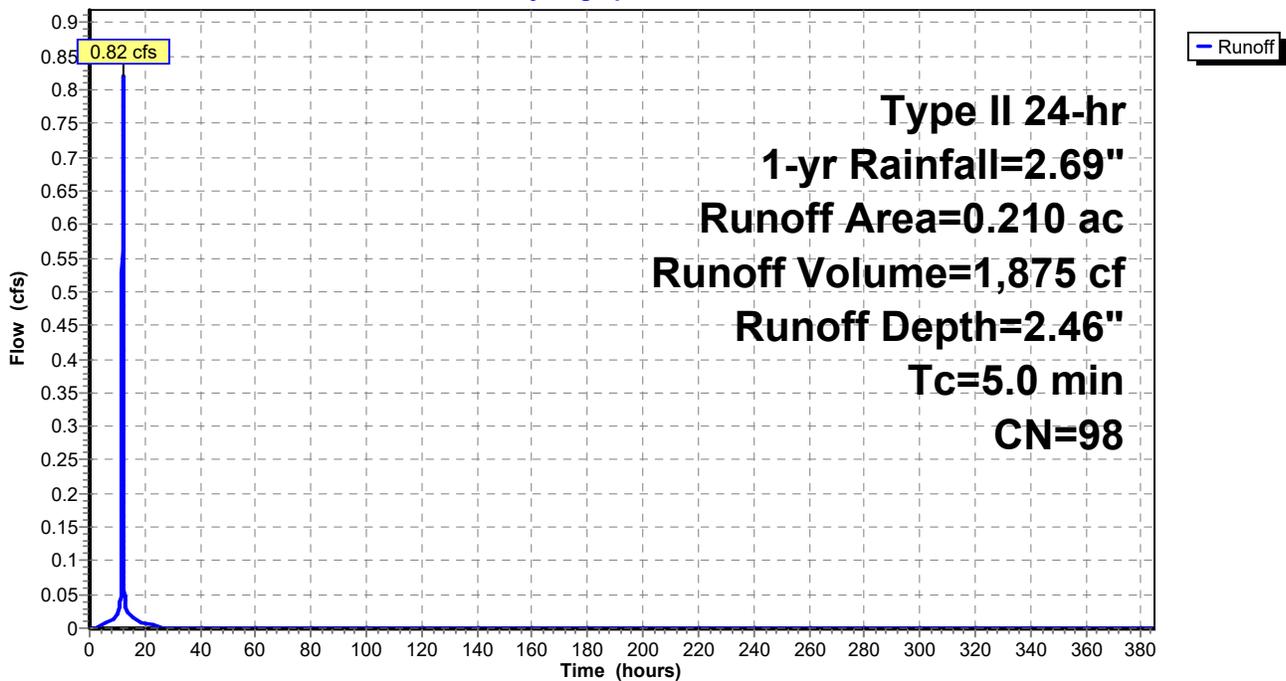
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-yr Rainfall=2.69"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.210		100.00% Impervious Area

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

Subcatchment 54S: Dist_Impervious

Hydrograph



Summary for Pond 3P: Basin 1_Above Ground

Inflow Area = 307,969 sf, 51.63% Impervious, Inflow Depth = 1.71" for 1-yr event
 Inflow = 20.00 cfs @ 11.96 hrs, Volume= 43,933 cf
 Outflow = 0.92 cfs @ 13.09 hrs, Volume= 41,961 cf, Atten= 95%, Lag= 67.7 min
 Primary = 0.04 cfs @ 13.09 hrs, Volume= 15,987 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd
 Secondary = 0.88 cfs @ 13.09 hrs, Volume= 25,974 cf
 Routed to Pond 15P : Basin 1_Underground
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 361.94' @ 13.09 hrs Surf.Area= 15,921 sf Storage= 27,416 cf

Plug-Flow detention time= 1,756.2 min calculated for 41,961 cf (96% of inflow)
 Center-of-Mass det. time= 1,729.2 min (2,510.3 - 781.1)

Volume	Invert	Avail.Storage	Storage Description
#1	357.00'	67,002 cf	Raingarden Custom Stage Data (Prismatic) , listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	1,962	0	0
357.99	1,962	1,942	1,942
358.00	3,925	29	1,972
359.00	3,925	3,925	5,897
360.00	3,925	3,925	9,822
360.99	3,925	3,886	13,708
361.00	13,086	85	13,793
362.00	16,104	14,595	28,388
363.00	19,270	17,687	46,075
364.00	22,584	20,927	67,002

Device	Routing	Invert	Outlet Devices
#1	Primary	358.00'	0.9" Vert. MRC Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Secondary	362.25'	12.0" W x 4.0" H Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Secondary	362.70'	24.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	361.05'	0.5' long OCS_Sharp-Crested Rectangular Weir 2 End Contraction(s)
#5	Tertiary	363.75'	90.0' long + 5.0 ' SideZ x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

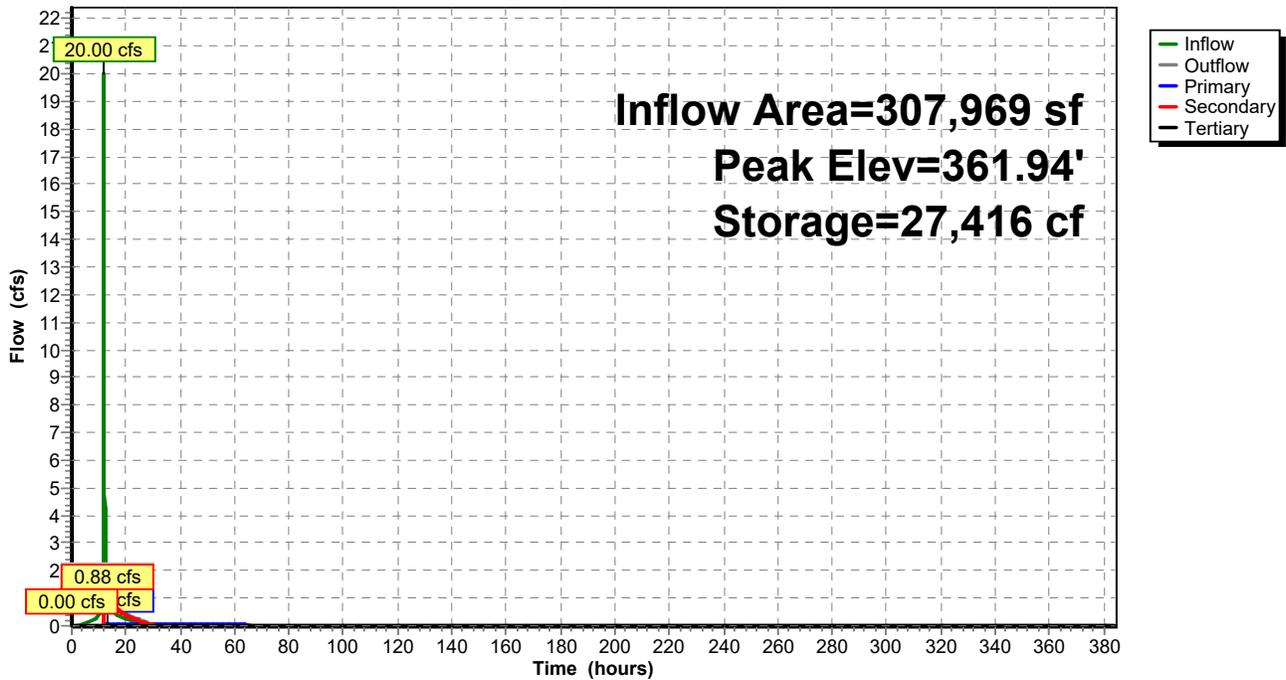
Primary OutFlow Max=0.04 cfs @ 13.09 hrs HW=361.94' (Free Discharge)
 ↳1=MRC Orifice/Grate (Orifice Controls 0.04 cfs @ 9.51 fps)

Secondary OutFlow Max=0.88 cfs @ 13.09 hrs HW=361.94' (Free Discharge)
 ↳2=Orifice (Controls 0.00 cfs)
 ↳3=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)
 ↳4=OCS_Shape-Crested Rectangular Weir(Weir Controls 0.88 cfs @ 3.08 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=357.00' (Free Discharge)
 ↳5=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 3P: Basin 1_Above Ground

Hydrograph



Summary for Pond 15P: Basin 1_Underground

Inflow = 0.88 cfs @ 13.09 hrs, Volume= 25,974 cf
 Outflow = 0.84 cfs @ 14.14 hrs, Volume= 25,974 cf, Atten= 5%, Lag= 63.3 min
 Primary = 0.84 cfs @ 14.14 hrs, Volume= 25,974 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 351.51' @ 14.14 hrs Surf.Area= 11,564 sf Storage= 2,338 cf

Plug-Flow detention time= 65.4 min calculated for 25,973 cf (100% of inflow)
 Center-of-Mass det. time= 65.5 min (1,119.1 - 1,053.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	351.00'	17,650 cf	54.29'W x 213.00'L x 6.00'H Field A 69,387 cf Overall - 25,263 cf Embedded = 44,124 cf x 40.0% Voids
#2A	352.00'	21,087 cf	ADS N-12 48" x 80 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 80 Chambers in 8 Rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3	357.00'	108 cf	ocs (Prismatic) Listed below (Recalc)
		38,845 cf	Total Available Storage

Storage Group A created with Chamber Wizard

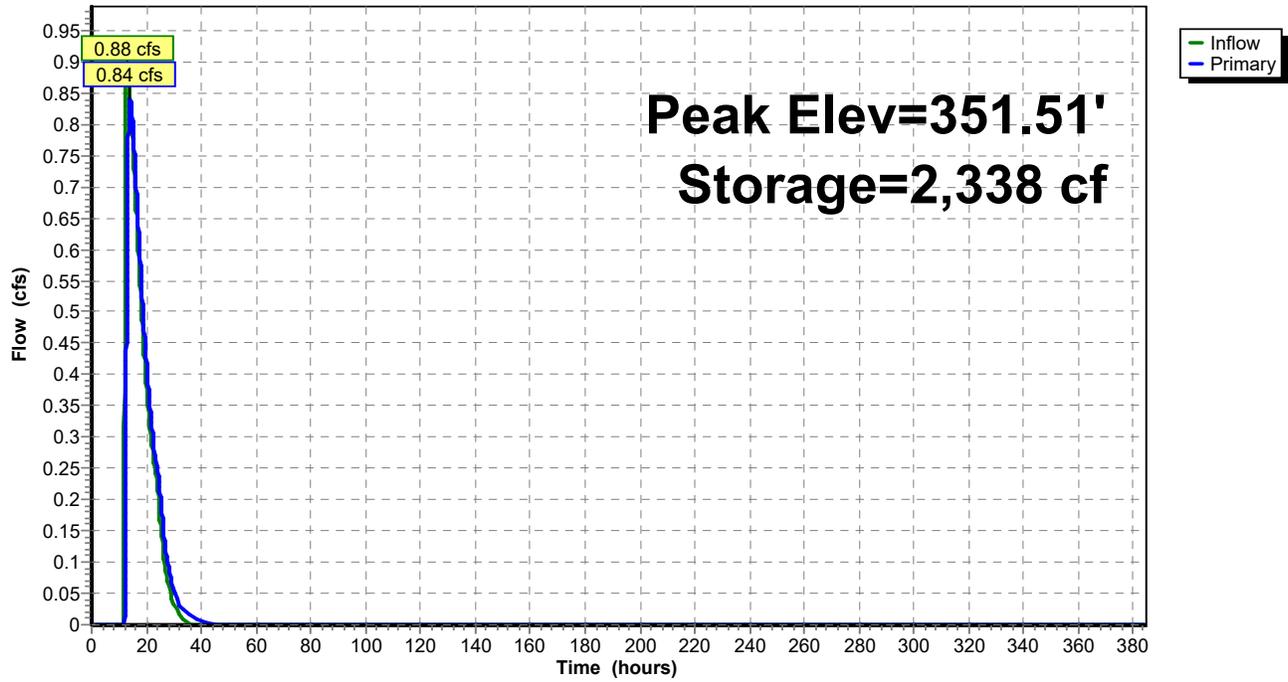
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	36	0	0
358.00	36	36	36
359.00	36	36	72
360.00	36	36	108

Device	Routing	Invert	Outlet Devices
#1	Primary	351.00'	24.0" Round Culvert Outlet Pipe from OCS L= 230.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 351.00' / 346.50' S= 0.0196 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	351.00'	10.0" Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	356.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=0.84 cfs @ 14.14 hrs HW=351.51' (Free Discharge)
 1=Culvert Outlet Pipe from OCS (Passes 0.84 cfs of 1.51 cfs potential flow)
 2=Orifice (Orifice Controls 0.84 cfs @ 2.42 fps)
 3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 15P: Basin 1_Underground

Hydrograph

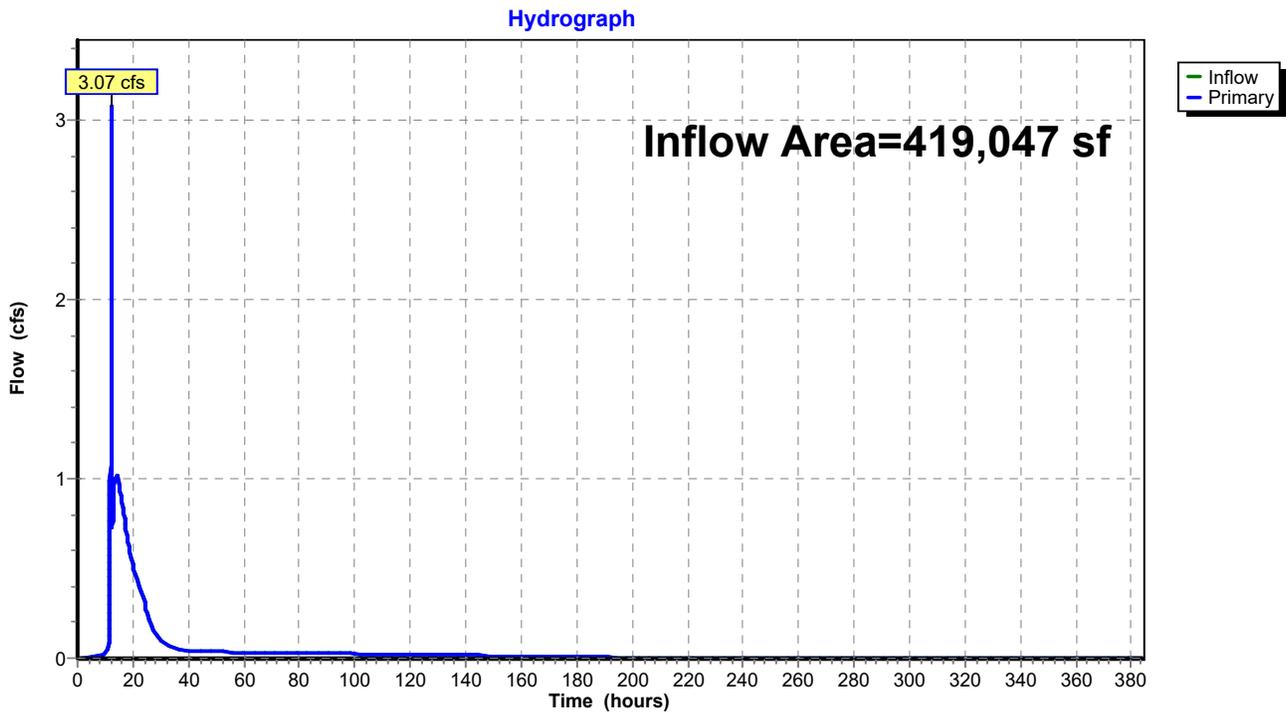


Summary for Link 12L: Post_DP-001 Trooper Rd

Inflow Area = 419,047 sf, 39.92% Impervious, Inflow Depth = 1.43" for 1-yr event
Inflow = 3.07 cfs @ 12.01 hrs, Volume= 49,808 cf
Primary = 3.07 cfs @ 12.01 hrs, Volume= 49,808 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 12L: Post_DP-001 Trooper Rd

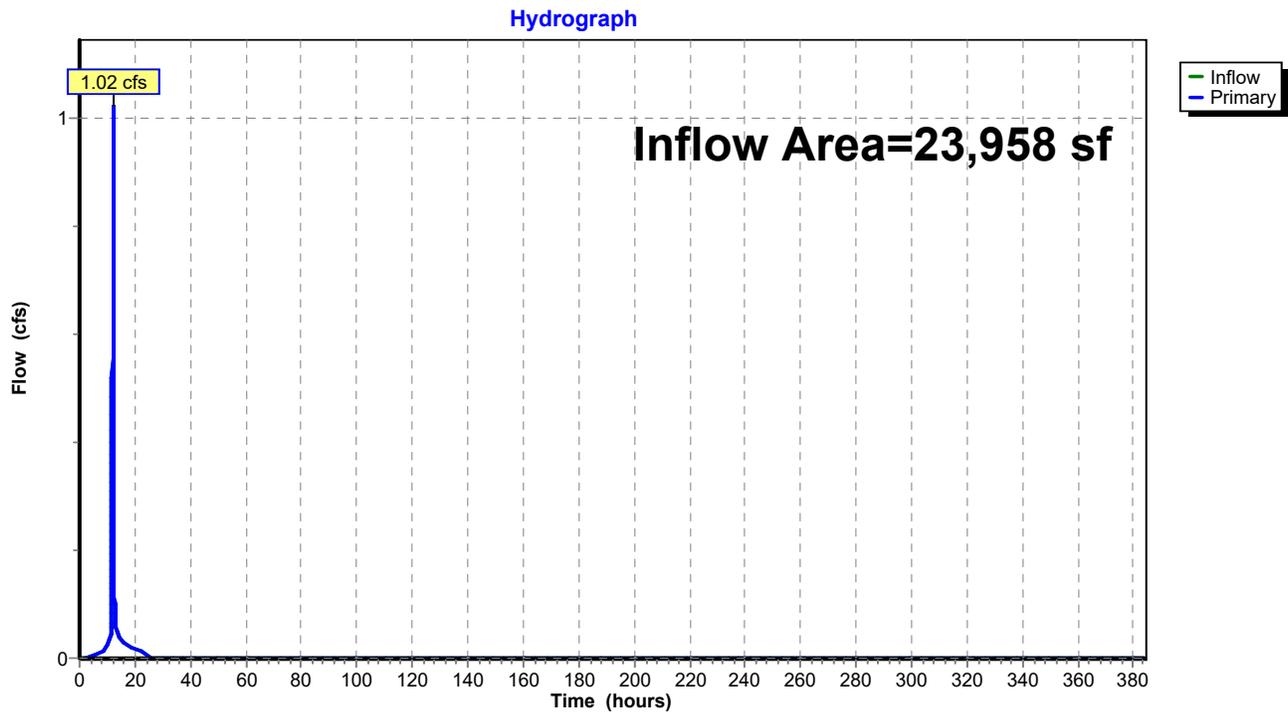


Summary for Link 55L: Post_DP-002 Germantown Pike

Inflow Area = 23,958 sf, 38.18% Impervious, Inflow Depth = 1.38" for 1-yr event
Inflow = 1.02 cfs @ 11.97 hrs, Volume= 2,761 cf
Primary = 1.02 cfs @ 11.97 hrs, Volume= 2,761 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 55L: Post_DP-002 Germantown Pike



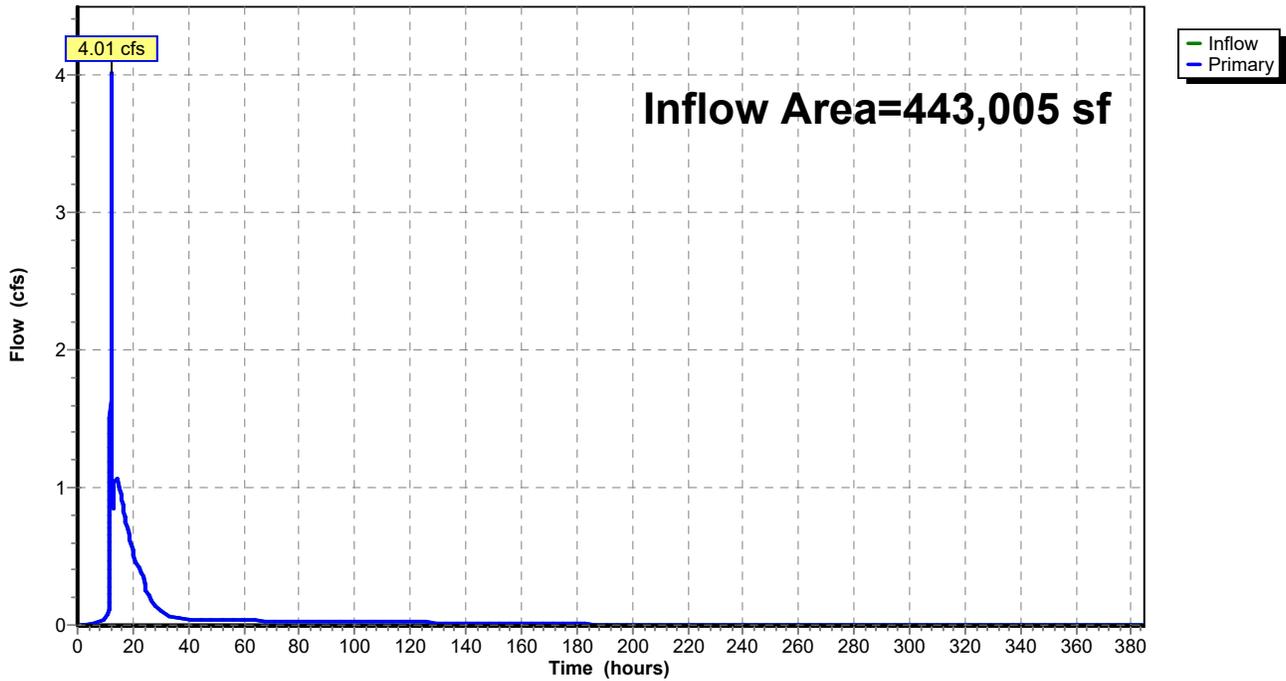
Summary for Link 66L: POST TOTAL

Inflow Area = 443,005 sf, 39.82% Impervious, Inflow Depth = 1.42" for 1-yr event
Inflow = 4.01 cfs @ 12.00 hrs, Volume= 52,569 cf
Primary = 4.01 cfs @ 12.00 hrs, Volume= 52,569 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 66L: POST TOTAL

Hydrograph



Summary for Subcatchment 1S: Dist_Impervious to Basin 1

Runoff = 10.42 cfs @ 1.10 hrs, Volume= 13,059 cf, Depth= 0.99"
 Routed to Pond 3P : Basin 1_Above Ground

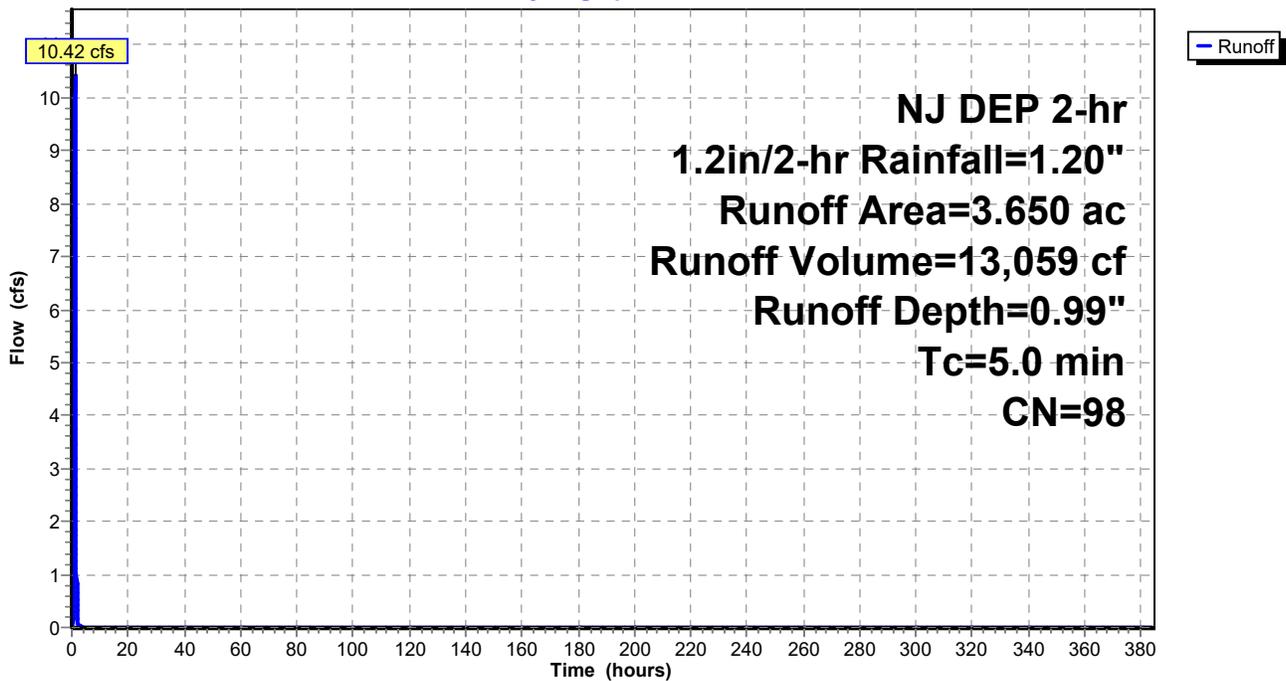
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr 1.2in/2-hr Rainfall=1.20"

Area (ac)	CN	Description
* 1.370	98	impervious - roadway, sidewalk
* 2.280	98	impervious - 40 total units
3.650	98	Weighted Average
3.650		100.00% Impervious Area

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

Subcatchment 1S: Dist_Impervious to Basin 1

Hydrograph



Summary for Subcatchment 2S: Dist_Lawn to Basin 1

Runoff = 1.09 cfs @ 1.13 hrs, Volume= 1,452 cf, Depth= 0.12"
 Routed to Pond 3P : Basin 1_Above Ground

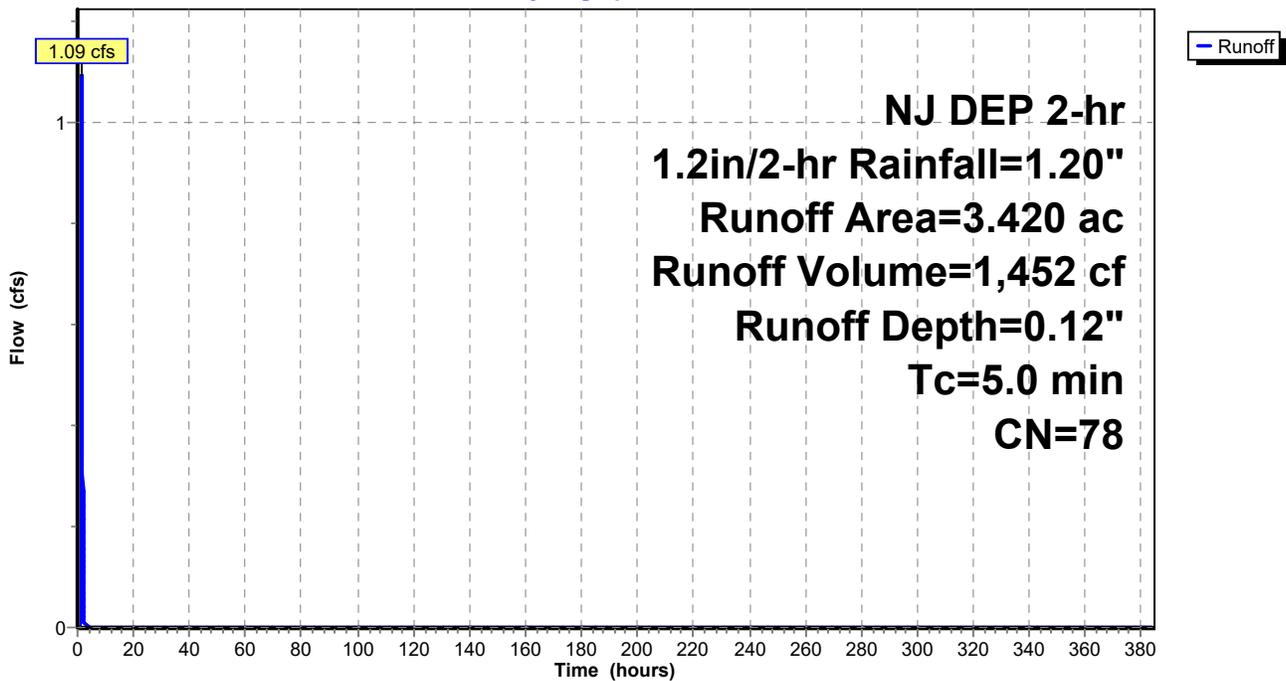
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr 1.2in/2-hr Rainfall=1.20"

Area (ac)	CN	Description
1.400	74	>75% Grass cover, Good, HSG C
2.020	80	>75% Grass cover, Good, HSG D
3.420	78	Weighted Average
3.420		100.00% Pervious Area

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

Subcatchment 2S: Dist_Lawn to Basin 1

Hydrograph



Summary for Subcatchment 20S: Onsite Dist_Lawn Bypass

Runoff = 0.25 cfs @ 1.27 hrs, Volume= 528 cf, Depth= 0.06"
 Routed to Link 12L : Post_DP-001 Trooper Rd

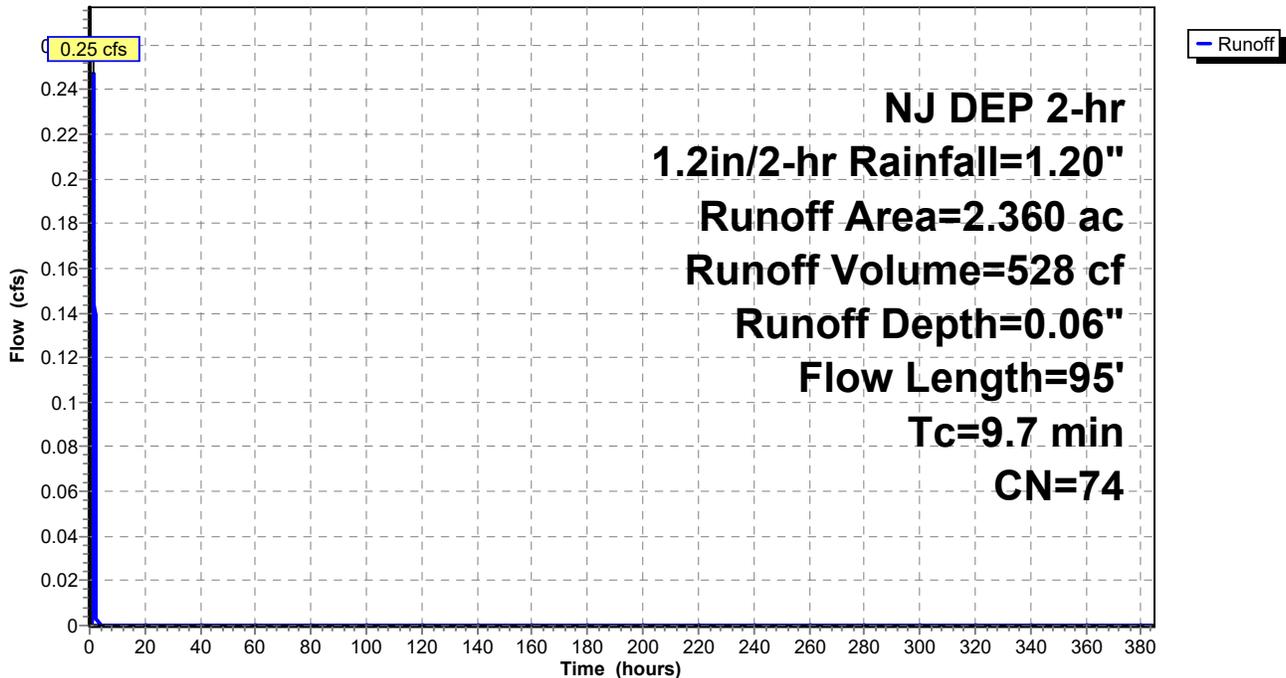
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr 1.2in/2-hr Rainfall=1.20"

Area (ac)	CN	Description
2.360	74	>75% Grass cover, Good, HSG C
2.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	35	0.2500	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
5.7	60	0.3000	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
9.7	95	Total			

Subcatchment 20S: Onsite Dist_Lawn Bypass

Hydrograph



Summary for Subcatchment 21S: Onsite Dist_Impervious Bypass

Runoff = 0.54 cfs @ 1.10 hrs, Volume= 680 cf, Depth= 0.99"
 Routed to Link 12L : Post_DP-001 Trooper Rd

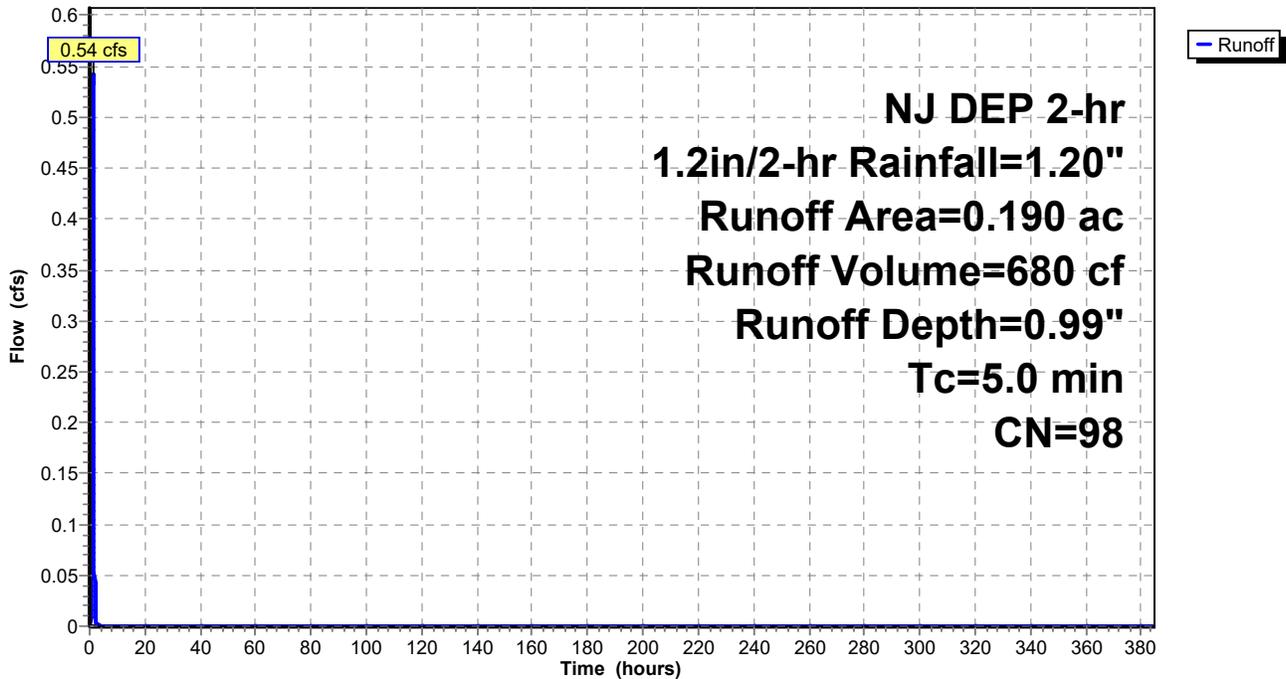
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr 1.2in/2-hr Rainfall=1.20"

Area (ac)	CN	Description
* 0.190	98	
0.190		100.00% Impervious Area

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

Subcatchment 21S: Onsite Dist_Impervious Bypass

Hydrograph



Summary for Subcatchment 47S: Dist_Lawn

Runoff = 0.03 cfs @ 1.32 hrs, Volume= 76 cf, Depth= 0.06"
 Routed to Link 55L : Post_DP-002 Germantown Pike

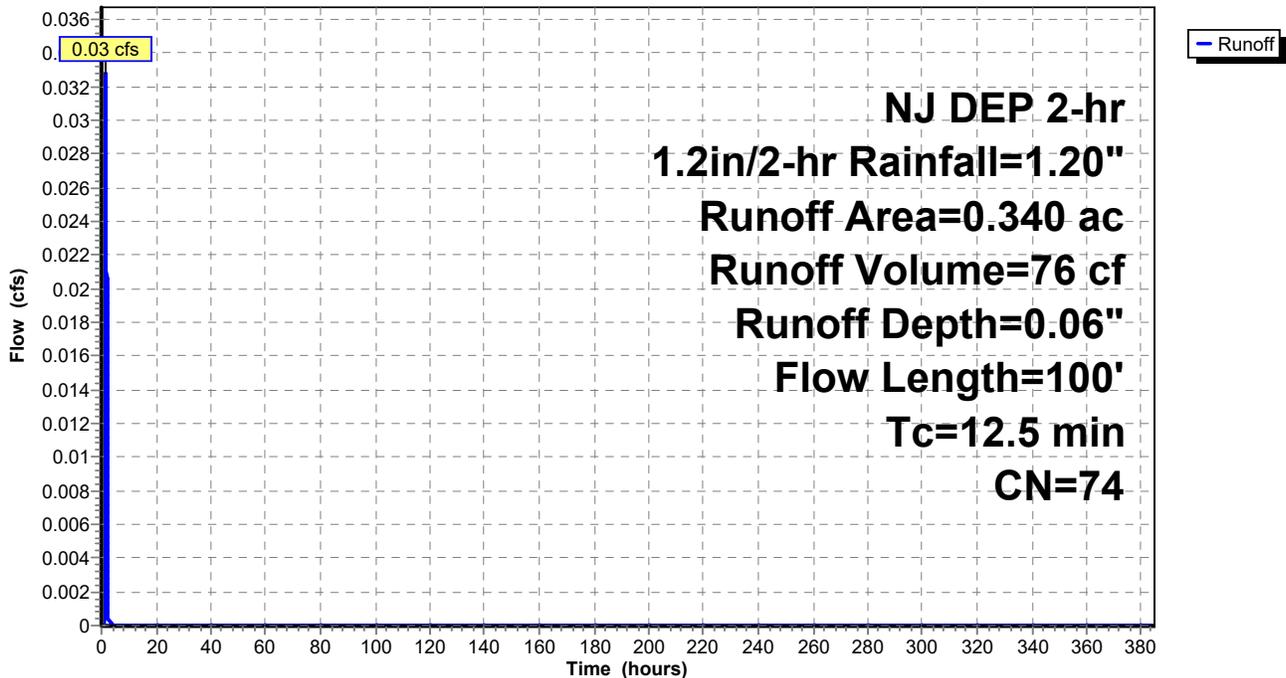
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr 1.2in/2-hr Rainfall=1.20"

Area (ac)	CN	Description
0.340	74	>75% Grass cover, Good, HSG C
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.3300	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
7.7	50	0.1000	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
12.5	100	Total			

Subcatchment 47S: Dist_Lawn

Hydrograph



Summary for Subcatchment 54S: Dist_Impervious

Runoff = 0.60 cfs @ 1.10 hrs, Volume= 751 cf, Depth= 0.99"
 Routed to Link 55L : Post_DP-002 Germantown Pike

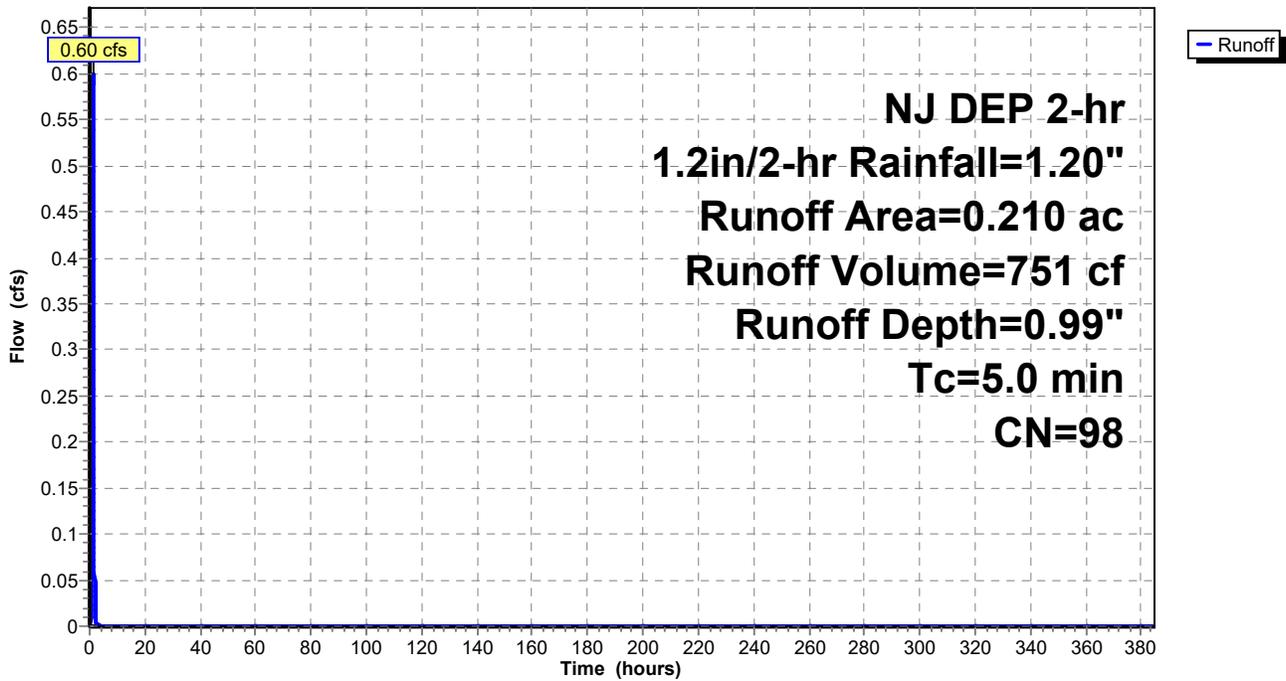
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr 1.2in/2-hr Rainfall=1.20"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.210		100.00% Impervious Area

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

Subcatchment 54S: Dist_Impervious

Hydrograph



Summary for Pond 3P: Basin 1_Above Ground

Inflow Area = 307,969 sf, 51.63% Impervious, Inflow Depth = 0.57" for 1.2in/2-hr event
 Inflow = 11.29 cfs @ 1.11 hrs, Volume= 14,512 cf
 Outflow = 0.04 cfs @ 2.13 hrs, Volume= 12,540 cf, Atten= 100%, Lag= 61.6 min
 Primary = 0.04 cfs @ 2.13 hrs, Volume= 12,540 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond 15P : Basin 1_Underground
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 361.04' @ 2.13 hrs Surf.Area= 13,219 sf Storage= 14,373 cf

Plug-Flow detention time= 3,748.9 min calculated for 12,540 cf (86% of inflow)
 Center-of-Mass det. time= 3,744.1 min (3,815.0 - 70.9)

Volume	Invert	Avail.Storage	Storage Description
#1	357.00'	67,002 cf	Raingarden Custom Stage Data (Prismatic) , listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	1,962	0	0
357.99	1,962	1,942	1,942
358.00	3,925	29	1,972
359.00	3,925	3,925	5,897
360.00	3,925	3,925	9,822
360.99	3,925	3,886	13,708
361.00	13,086	85	13,793
362.00	16,104	14,595	28,388
363.00	19,270	17,687	46,075
364.00	22,584	20,927	67,002

Device	Routing	Invert	Outlet Devices
#1	Primary	358.00'	0.9" Vert. MRC Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Secondary	362.25'	12.0" W x 4.0" H Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Secondary	362.70'	24.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	361.05'	0.5' long OCS_Sharp-Crested Rectangular Weir 2 End Contraction(s)
#5	Tertiary	363.75'	90.0' long + 5.0 ' SideZ x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

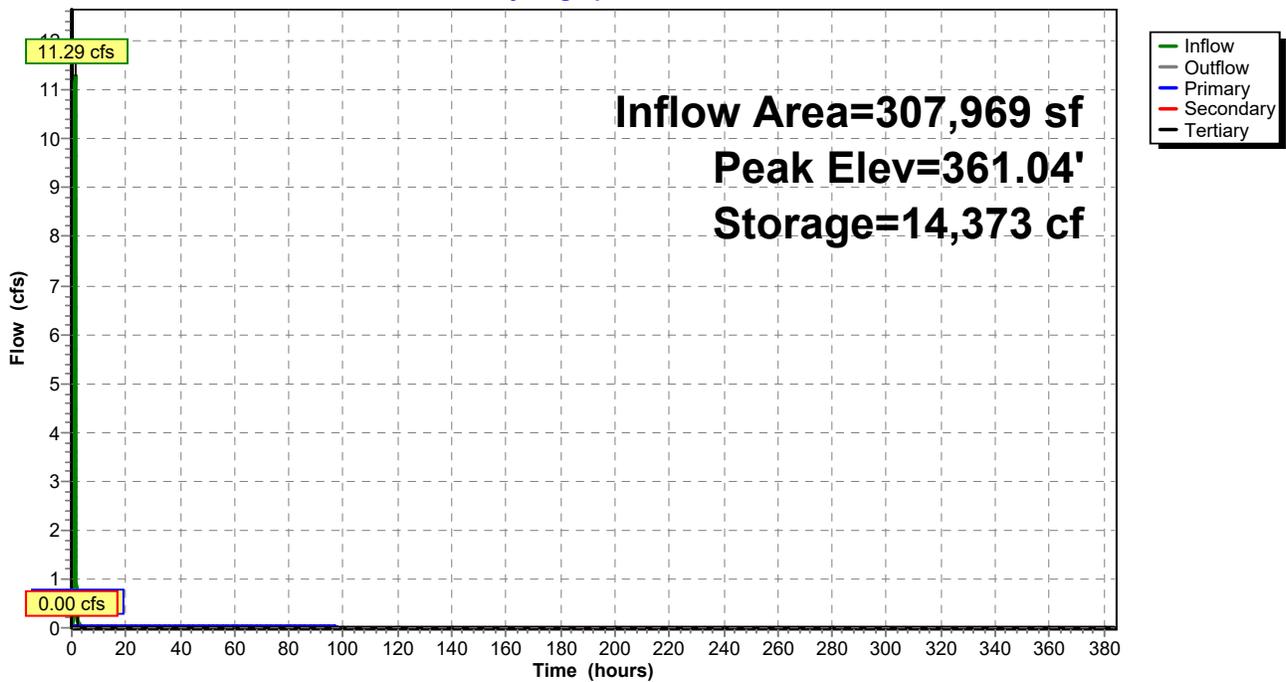
Primary OutFlow Max=0.04 cfs @ 2.13 hrs HW=361.04' (Free Discharge)
 ↳1=MRC Orifice/Grate (Orifice Controls 0.04 cfs @ 8.35 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=357.00' (Free Discharge)
 ↳2=Orifice (Controls 0.00 cfs)
 ↳3=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)
 ↳4=OCS_Shape-Crested Rectangular Weir(Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=357.00' (Free Discharge)
 ↳5=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 3P: Basin 1_Above Ground

Hydrograph



Summary for Pond 15P: Basin 1_Underground

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 351.00' @ 0.00 hrs Surf.Area= 11,564 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	351.00'	17,650 cf	54.29'W x 213.00'L x 6.00'H Field A 69,387 cf Overall - 25,263 cf Embedded = 44,124 cf x 40.0% Voids
#2A	352.00'	21,087 cf	ADS N-12 48" x 80 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 80 Chambers in 8 Rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3	357.00'	108 cf	ocs (Prismatic) Listed below (Recalc)
		38,845 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	36	0	0
358.00	36	36	36
359.00	36	36	72
360.00	36	36	108

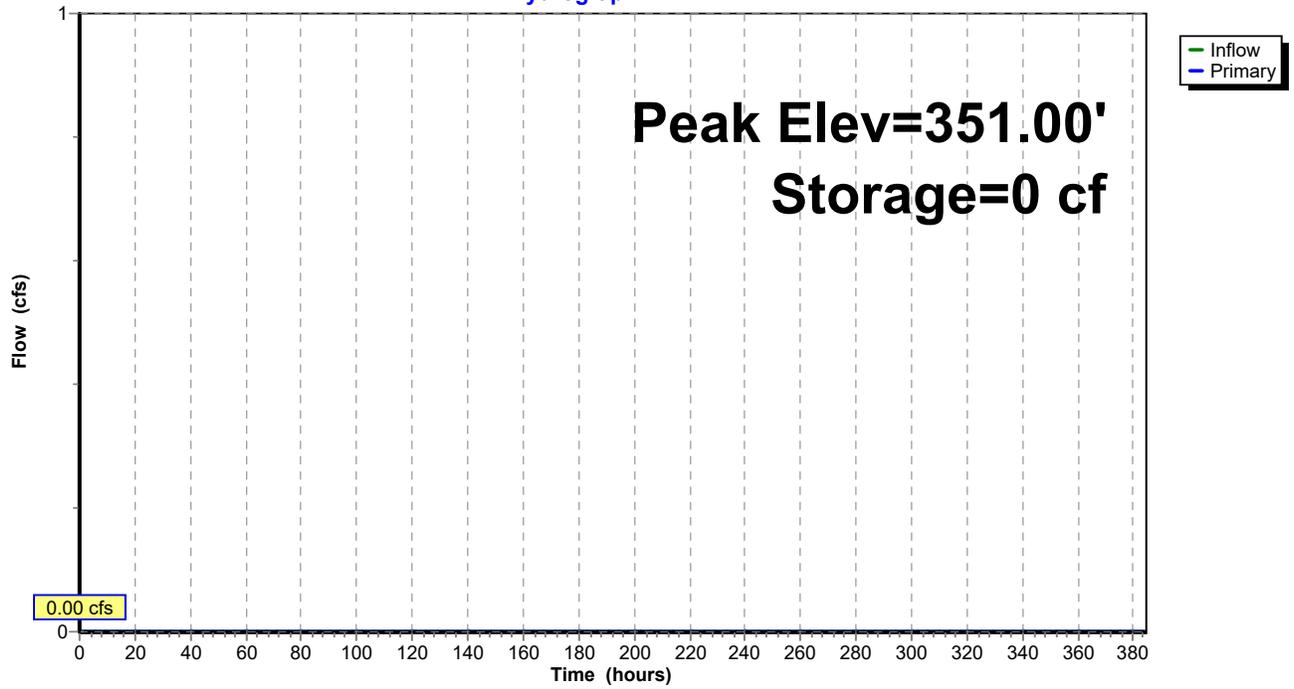
Device	Routing	Invert	Outlet Devices
#1	Primary	351.00'	24.0" Round Culvert Outlet Pipe from OCS L= 230.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 351.00' / 346.50' S= 0.0196 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	351.00'	10.0" Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	356.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=351.00' (Free Discharge)

- ↑ 1=Culvert Outlet Pipe from OCS (Controls 0.00 cfs)
- ↑ 2=Orifice (Controls 0.00 cfs)
- ↑ 3=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 15P: Basin 1_Underground

Hydrograph

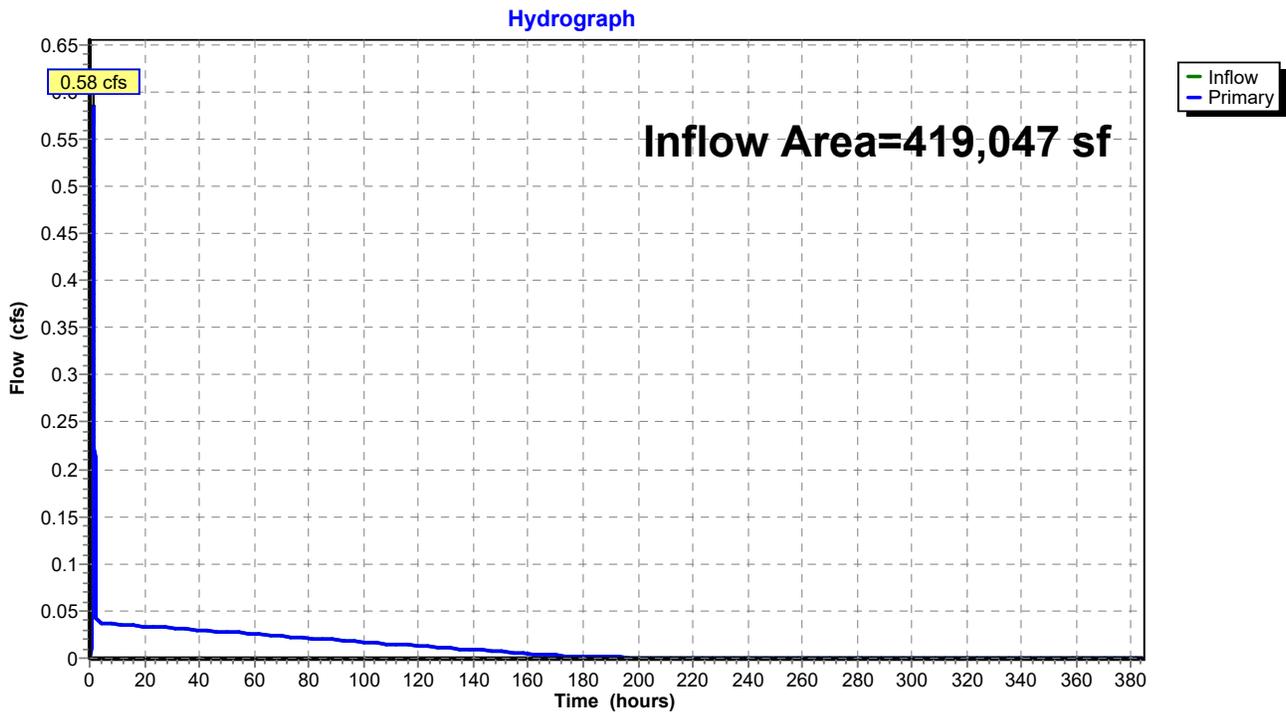


Summary for Link 12L: Post_DP-001 Trooper Rd

Inflow Area = 419,047 sf, 39.92% Impervious, Inflow Depth = 0.39" for 1.2in/2-hr event
Inflow = 0.58 cfs @ 1.11 hrs, Volume= 13,748 cf
Primary = 0.58 cfs @ 1.11 hrs, Volume= 13,748 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 12L: Post_DP-001 Trooper Rd



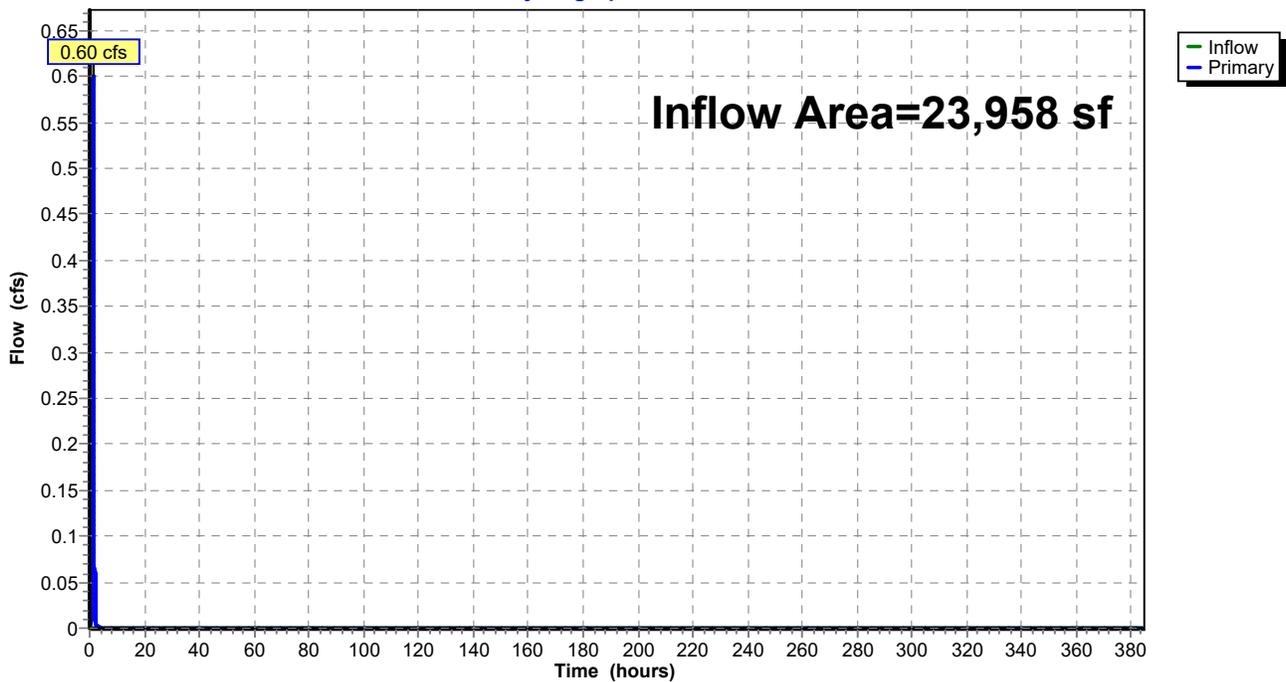
Summary for Link 55L: Post_DP-002 Germantown Pike

Inflow Area = 23,958 sf, 38.18% Impervious, Inflow Depth = 0.41" for 1.2in/2-hr event
Inflow = 0.60 cfs @ 1.10 hrs, Volume= 827 cf
Primary = 0.60 cfs @ 1.10 hrs, Volume= 827 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 55L: Post_DP-002 Germantown Pike

Hydrograph



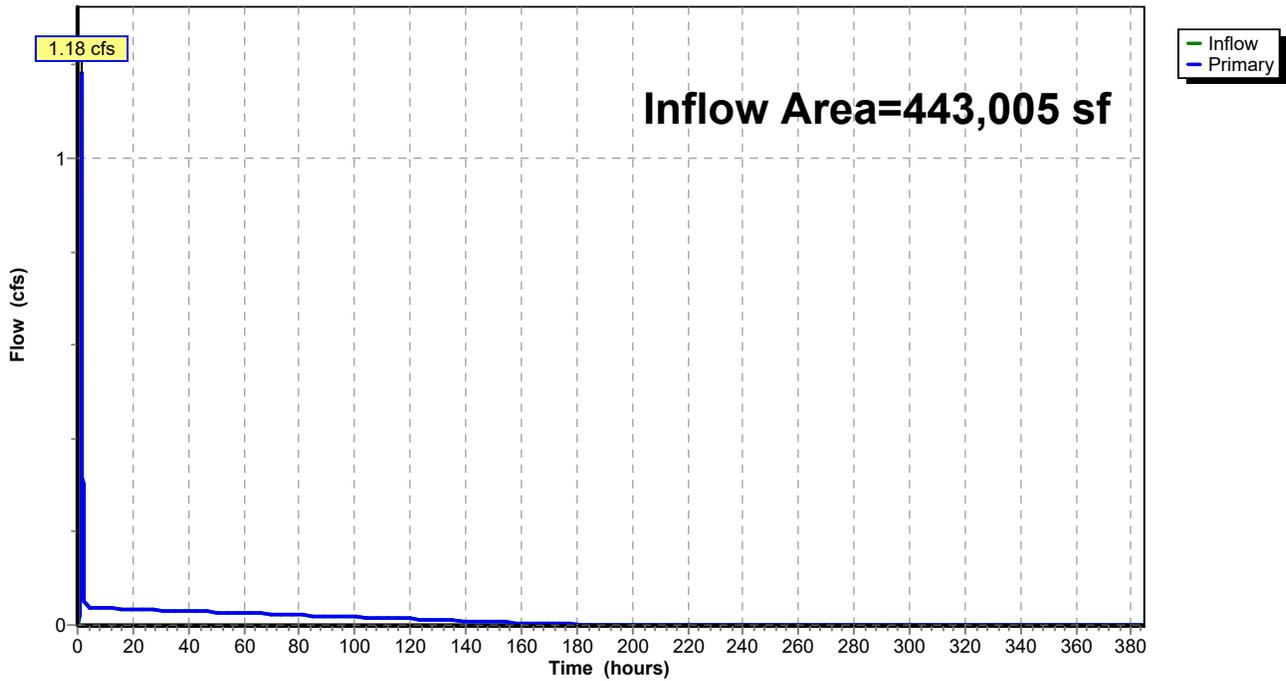
Summary for Link 66L: POST TOTAL

Inflow Area = 443,005 sf, 39.82% Impervious, Inflow Depth = 0.39" for 1.2in/2-hr event
Inflow = 1.18 cfs @ 1.11 hrs, Volume= 14,575 cf
Primary = 1.18 cfs @ 1.11 hrs, Volume= 14,575 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 66L: POST TOTAL

Hydrograph



Summary for Subcatchment 1S: Dist_Impervious to Basin 1

Runoff = 17.26 cfs @ 11.96 hrs, Volume= 39,846 cf, Depth= 3.01"
 Routed to Pond 3P : Basin 1_Above Ground

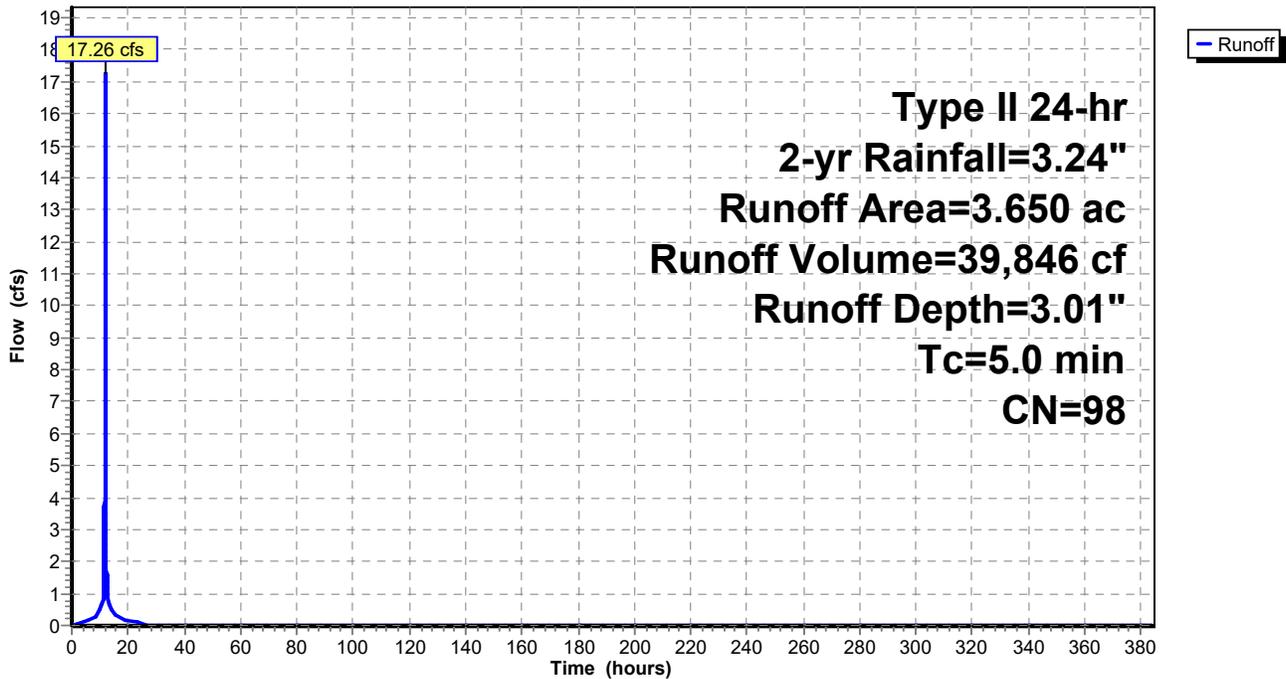
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-yr Rainfall=3.24"

Area (ac)	CN	Description
* 1.370	98	impervious - roadway, sidewalk
* 2.280	98	impervious - 40 total units
3.650	98	Weighted Average
3.650		100.00% Impervious Area

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

Subcatchment 1S: Dist_Impervious to Basin 1

Hydrograph



Summary for Subcatchment 2S: Dist_Lawn to Basin 1

Runoff = 8.30 cfs @ 11.97 hrs, Volume= 16,173 cf, Depth= 1.30"
 Routed to Pond 3P : Basin 1_Above Ground

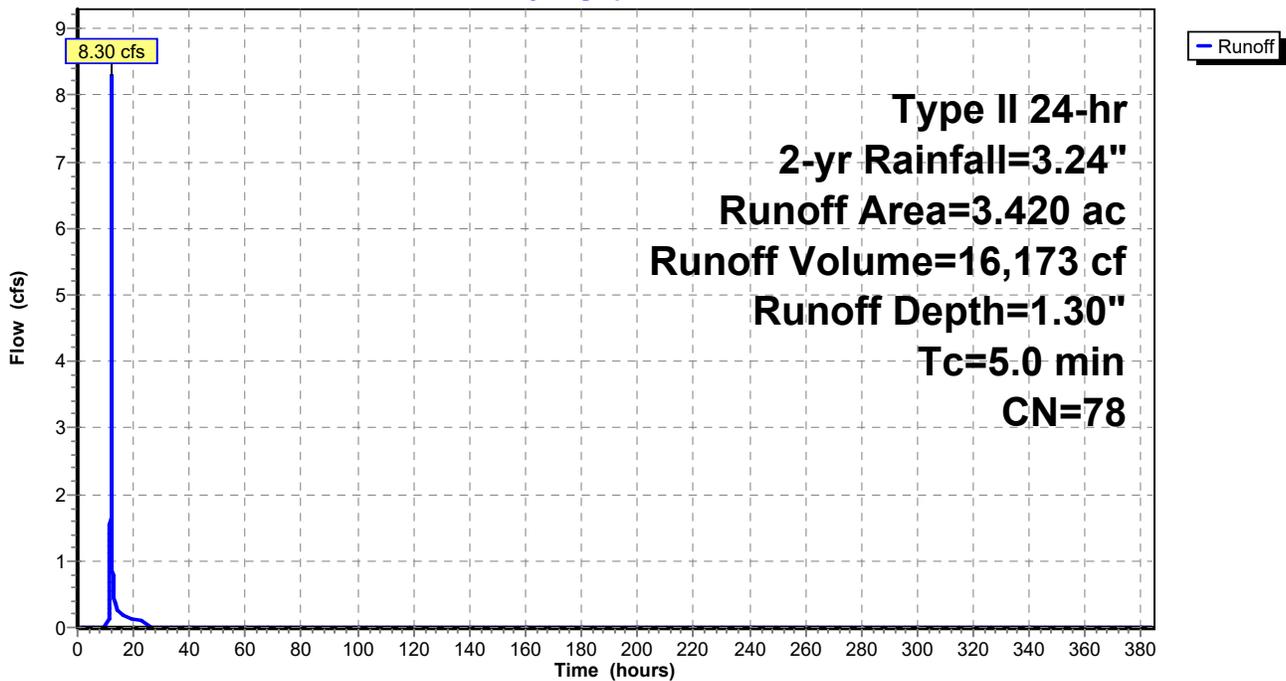
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-yr Rainfall=3.24"

Area (ac)	CN	Description
1.400	74	>75% Grass cover, Good, HSG C
2.020	80	>75% Grass cover, Good, HSG D
3.420	78	Weighted Average
3.420		100.00% Pervious Area

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

Subcatchment 2S: Dist_Lawn to Basin 1

Hydrograph



Summary for Subcatchment 20S: Onsite Dist_Lawn Bypass

Runoff = 3.84 cfs @ 12.02 hrs, Volume= 9,115 cf, Depth= 1.06"
 Routed to Link 12L : Post_DP-001 Trooper Rd

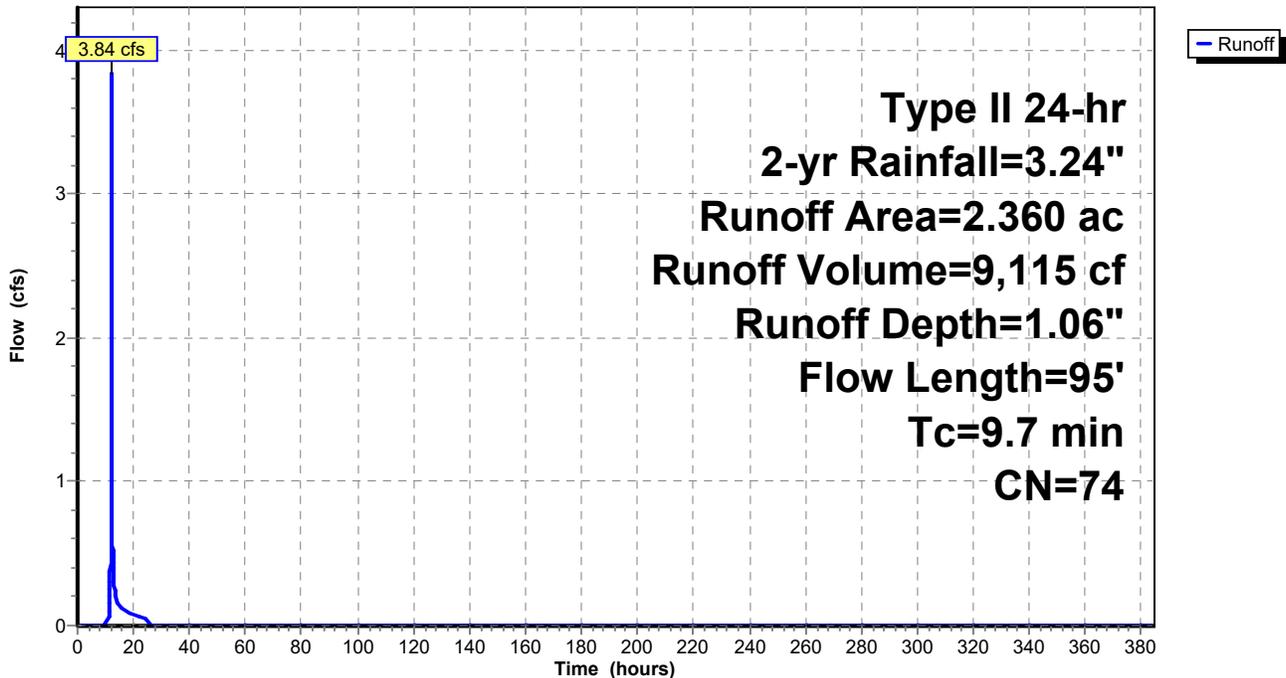
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-yr Rainfall=3.24"

Area (ac)	CN	Description
2.360	74	>75% Grass cover, Good, HSG C
2.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	35	0.2500	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
5.7	60	0.3000	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
9.7	95	Total			

Subcatchment 20S: Onsite Dist_Lawn Bypass

Hydrograph



Summary for Subcatchment 21S: Onsite Dist_Impervious Bypass

Runoff = 0.90 cfs @ 11.96 hrs, Volume= 2,074 cf, Depth= 3.01"
 Routed to Link 12L : Post_DP-001 Trooper Rd

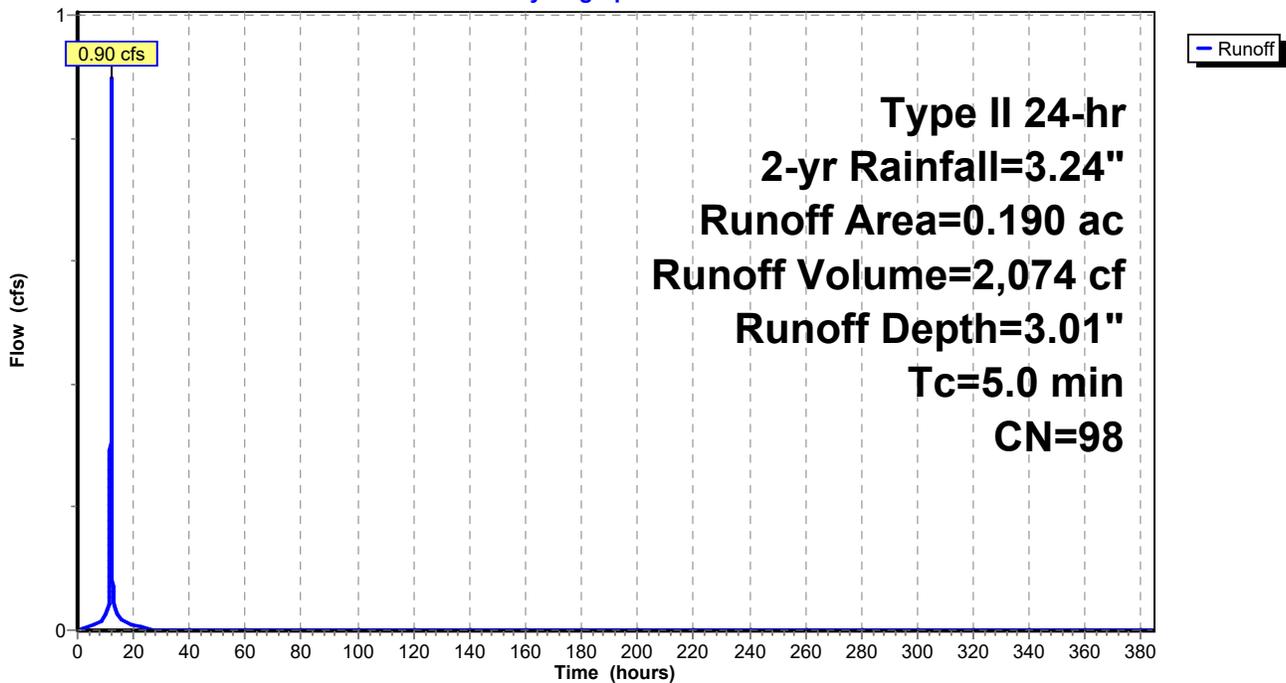
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-yr Rainfall=3.24"

Area (ac)	CN	Description
* 0.190	98	
0.190		100.00% Impervious Area

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

Subcatchment 21S: Onsite Dist_Impervious Bypass

Hydrograph



Summary for Subcatchment 47S: Dist_Lawn

Runoff = 0.50 cfs @ 12.05 hrs, Volume= 1,313 cf, Depth= 1.06"
 Routed to Link 55L : Post_DP-002 Germantown Pike

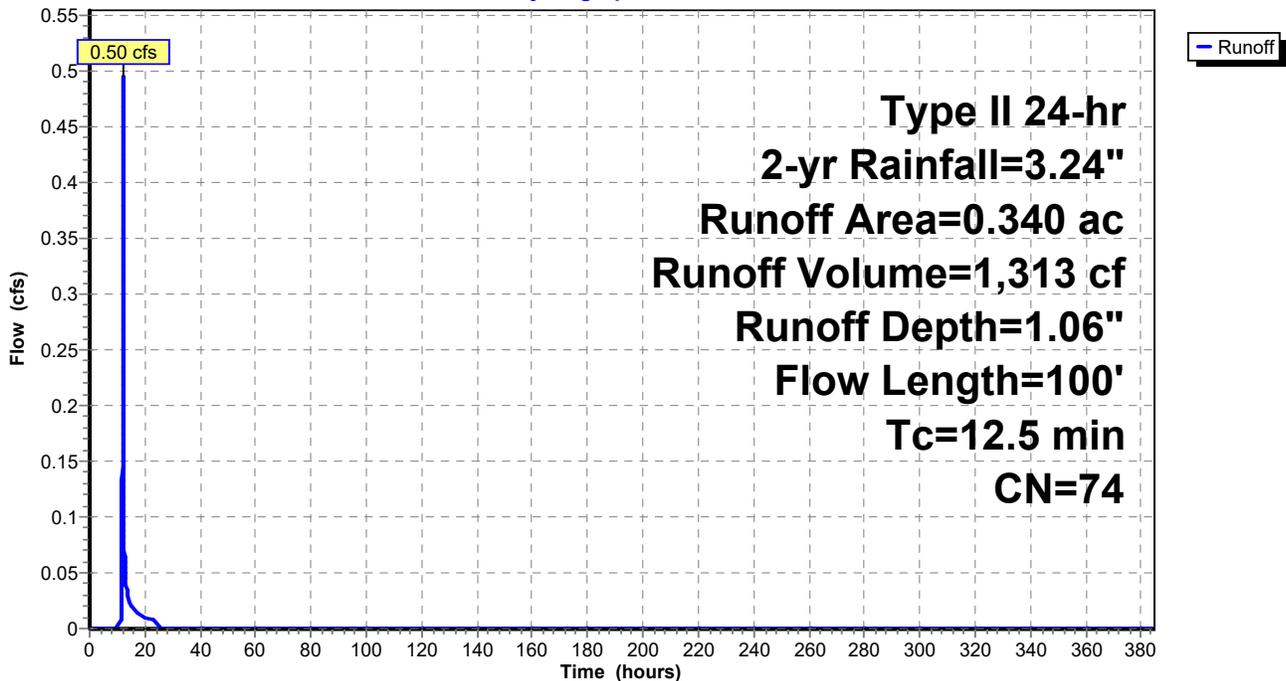
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-yr Rainfall=3.24"

Area (ac)	CN	Description
0.340	74	>75% Grass cover, Good, HSG C
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.3300	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
7.7	50	0.1000	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
12.5	100	Total			

Subcatchment 47S: Dist_Lawn

Hydrograph



Summary for Subcatchment 54S: Dist_Impervious

Runoff = 0.99 cfs @ 11.96 hrs, Volume= 2,292 cf, Depth= 3.01"
 Routed to Link 55L : Post_DP-002 Germantown Pike

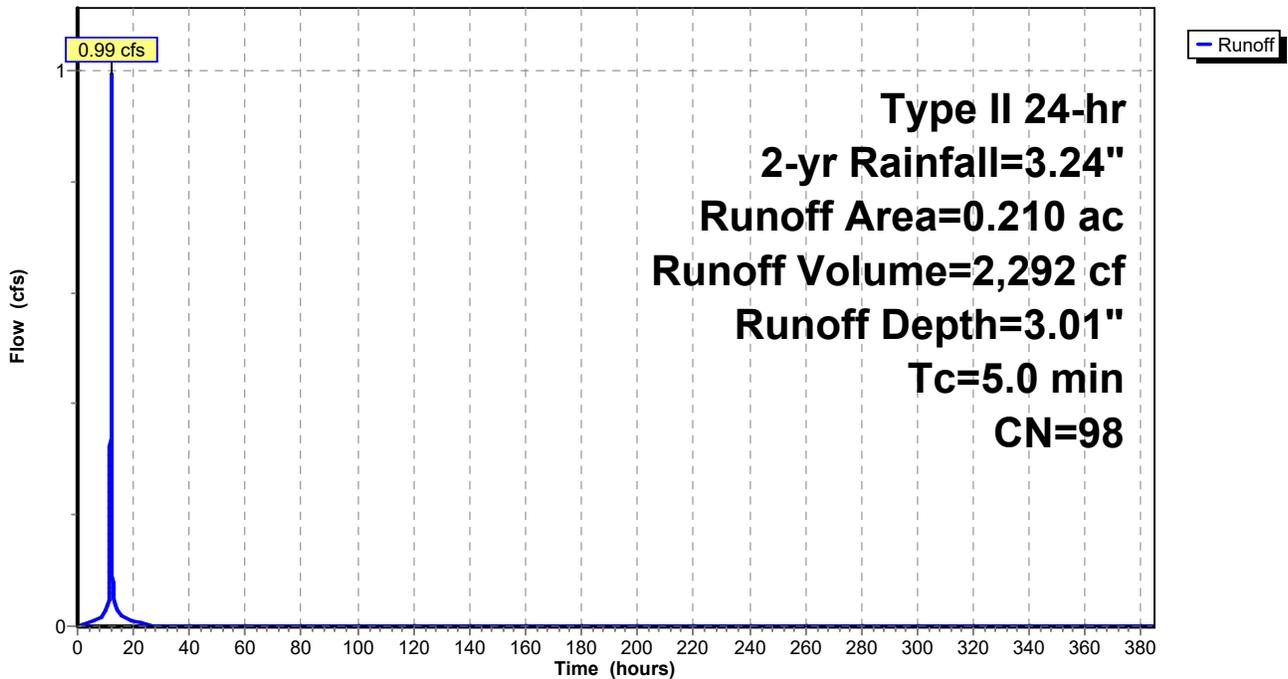
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-yr Rainfall=3.24"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.210		100.00% Impervious Area

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

Subcatchment 54S: Dist_Impervious

Hydrograph



Summary for Pond 3P: Basin 1_Above Ground

Inflow Area = 307,969 sf, 51.63% Impervious, Inflow Depth = 2.18" for 2-yr event
 Inflow = 25.51 cfs @ 11.96 hrs, Volume= 56,019 cf
 Outflow = 1.39 cfs @ 12.84 hrs, Volume= 54,047 cf, Atten= 95%, Lag= 53.1 min
 Primary = 0.04 cfs @ 12.84 hrs, Volume= 16,276 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd
 Secondary = 1.35 cfs @ 12.84 hrs, Volume= 37,771 cf
 Routed to Pond 15P : Basin 1_Underground
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 362.36' @ 12.84 hrs Surf.Area= 17,242 sf Storage= 34,383 cf

Plug-Flow detention time= 1,443.2 min calculated for 54,047 cf (96% of inflow)
 Center-of-Mass det. time= 1,421.5 min (2,199.6 - 778.1)

Volume	Invert	Avail.Storage	Storage Description
#1	357.00'	67,002 cf	Raingarden Custom Stage Data (Prismatic) , listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	1,962	0	0
357.99	1,962	1,942	1,942
358.00	3,925	29	1,972
359.00	3,925	3,925	5,897
360.00	3,925	3,925	9,822
360.99	3,925	3,886	13,708
361.00	13,086	85	13,793
362.00	16,104	14,595	28,388
363.00	19,270	17,687	46,075
364.00	22,584	20,927	67,002

Device	Routing	Invert	Outlet Devices
#1	Primary	358.00'	0.9" Vert. MRC Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Secondary	362.25'	12.0" W x 4.0" H Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Secondary	362.70'	24.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	361.05'	0.5' long OCS_Sharp-Crested Rectangular Weir 2 End Contraction(s)
#5	Tertiary	363.75'	90.0' long + 5.0 ' SideZ x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

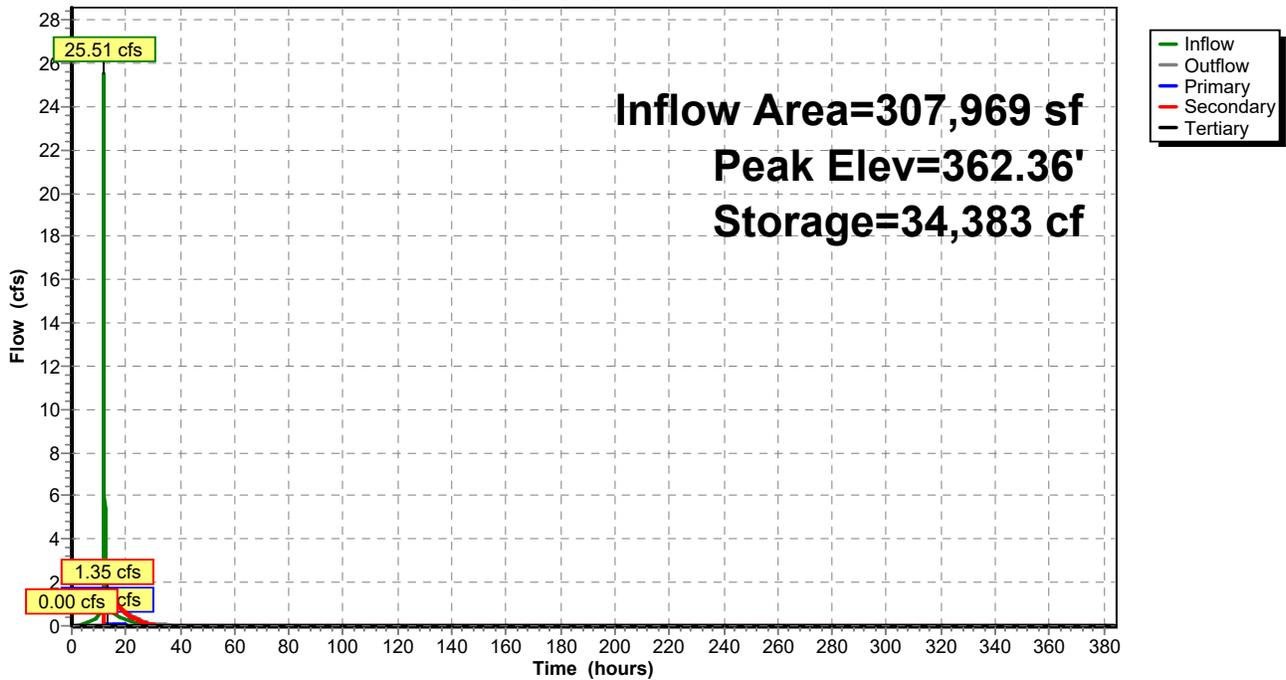
Primary OutFlow Max=0.04 cfs @ 12.84 hrs HW=362.36' (Free Discharge)
 ↳1=MRC Orifice/Grate (Orifice Controls 0.04 cfs @ 10.01 fps)

Secondary OutFlow Max=1.34 cfs @ 12.84 hrs HW=362.36' (Free Discharge)
 ↳2=Orifice (Orifice Controls 0.12 cfs @ 1.06 fps)
 ↳3=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)
 ↳4=OCS_Sharp-Crested Rectangular Weir(Weir Controls 1.23 cfs @ 3.74 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=357.00' (Free Discharge)
 ↳5=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 3P: Basin 1_Above Ground

Hydrograph



Summary for Pond 15P: Basin 1_Underground

Inflow = 1.35 cfs @ 12.84 hrs, Volume= 37,771 cf
 Outflow = 1.23 cfs @ 13.62 hrs, Volume= 37,771 cf, Atten= 9%, Lag= 46.7 min
 Primary = 1.23 cfs @ 13.62 hrs, Volume= 37,771 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 351.64' @ 13.62 hrs Surf.Area= 11,564 sf Storage= 2,970 cf

Plug-Flow detention time= 55.8 min calculated for 37,771 cf (100% of inflow)
 Center-of-Mass det. time= 55.8 min (1,107.2 - 1,051.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	351.00'	17,650 cf	54.29'W x 213.00'L x 6.00'H Field A 69,387 cf Overall - 25,263 cf Embedded = 44,124 cf x 40.0% Voids
#2A	352.00'	21,087 cf	ADS N-12 48" x 80 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 80 Chambers in 8 Rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3	357.00'	108 cf	ocs (Prismatic) Listed below (Recalc)
		38,845 cf	Total Available Storage

Storage Group A created with Chamber Wizard

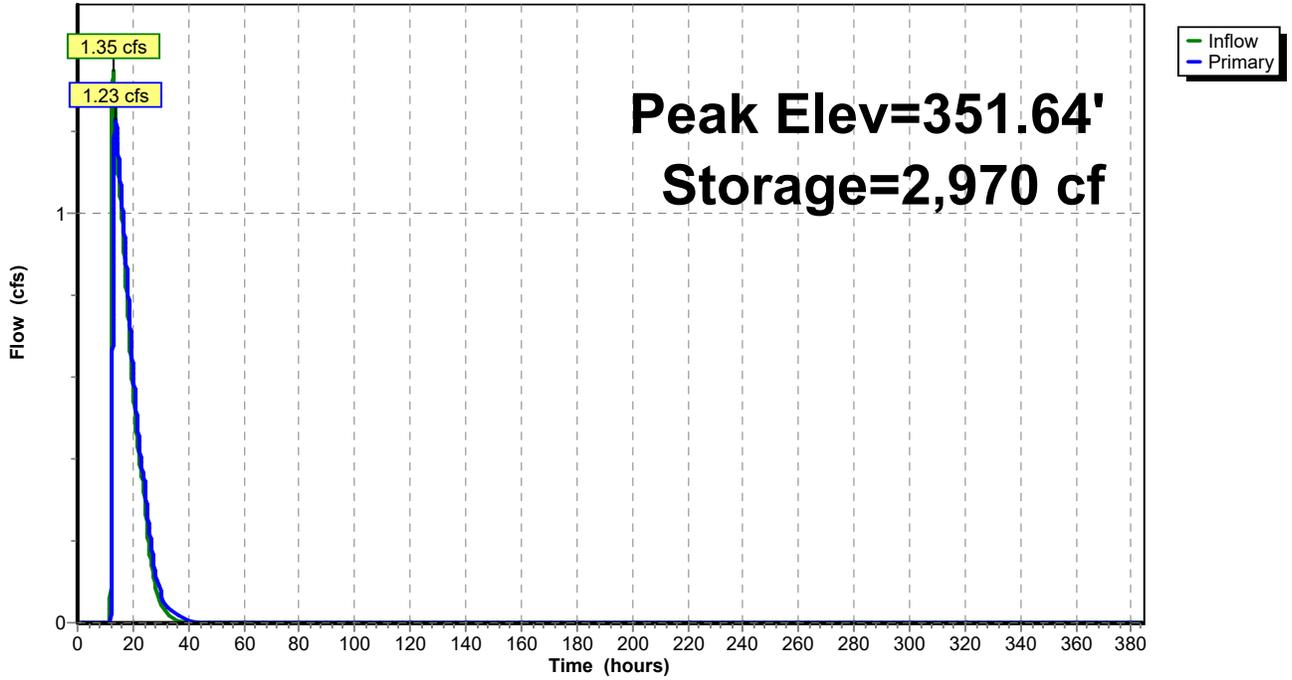
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	36	0	0
358.00	36	36	36
359.00	36	36	72
360.00	36	36	108

Device	Routing	Invert	Outlet Devices
#1	Primary	351.00'	24.0" Round Culvert Outlet Pipe from OCS L= 230.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 351.00' / 346.50' S= 0.0196 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	351.00'	10.0" Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	356.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=1.23 cfs @ 13.62 hrs HW=351.64' (Free Discharge)
 1=Culvert Outlet Pipe from OCS (Passes 1.23 cfs of 2.37 cfs potential flow)
 2=Orifice (Orifice Controls 1.23 cfs @ 2.73 fps)
 3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 15P: Basin 1_Underground

Hydrograph

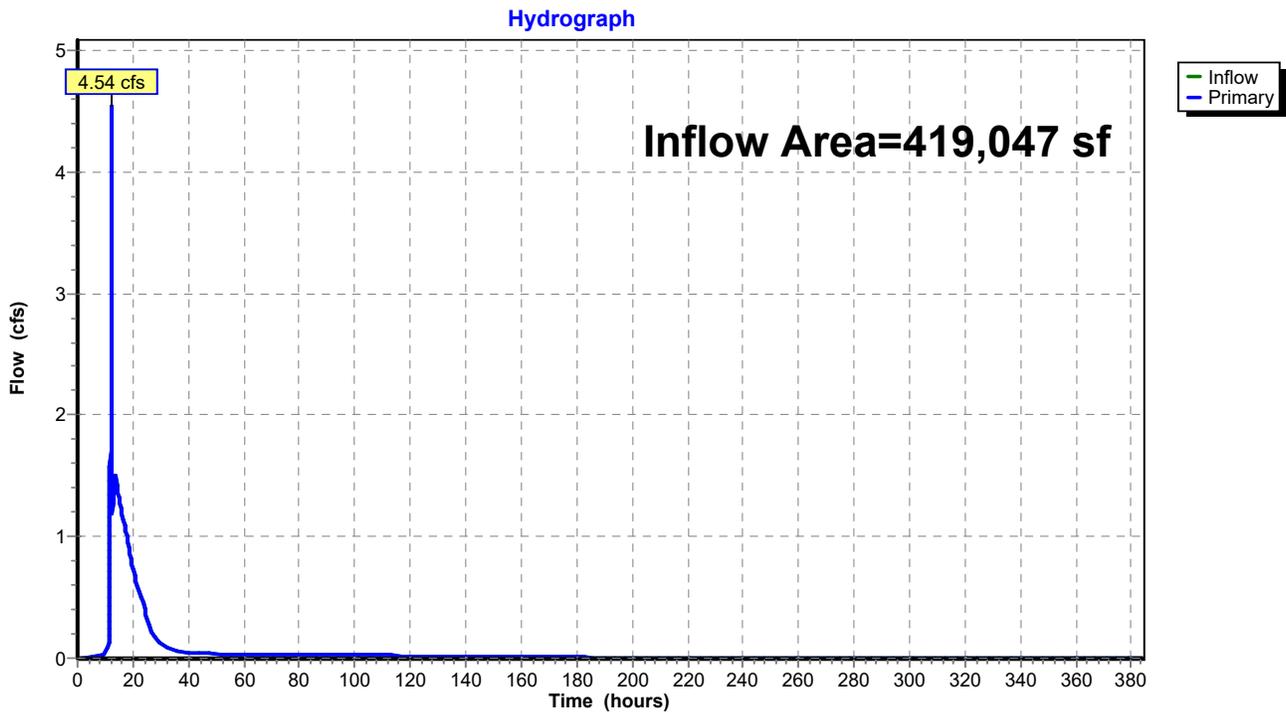


Summary for Link 12L: Post_DP-001 Trooper Rd

Inflow Area = 419,047 sf, 39.92% Impervious, Inflow Depth = 1.87" for 2-yr event
Inflow = 4.54 cfs @ 12.01 hrs, Volume= 65,236 cf
Primary = 4.54 cfs @ 12.01 hrs, Volume= 65,236 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 12L: Post_DP-001 Trooper Rd

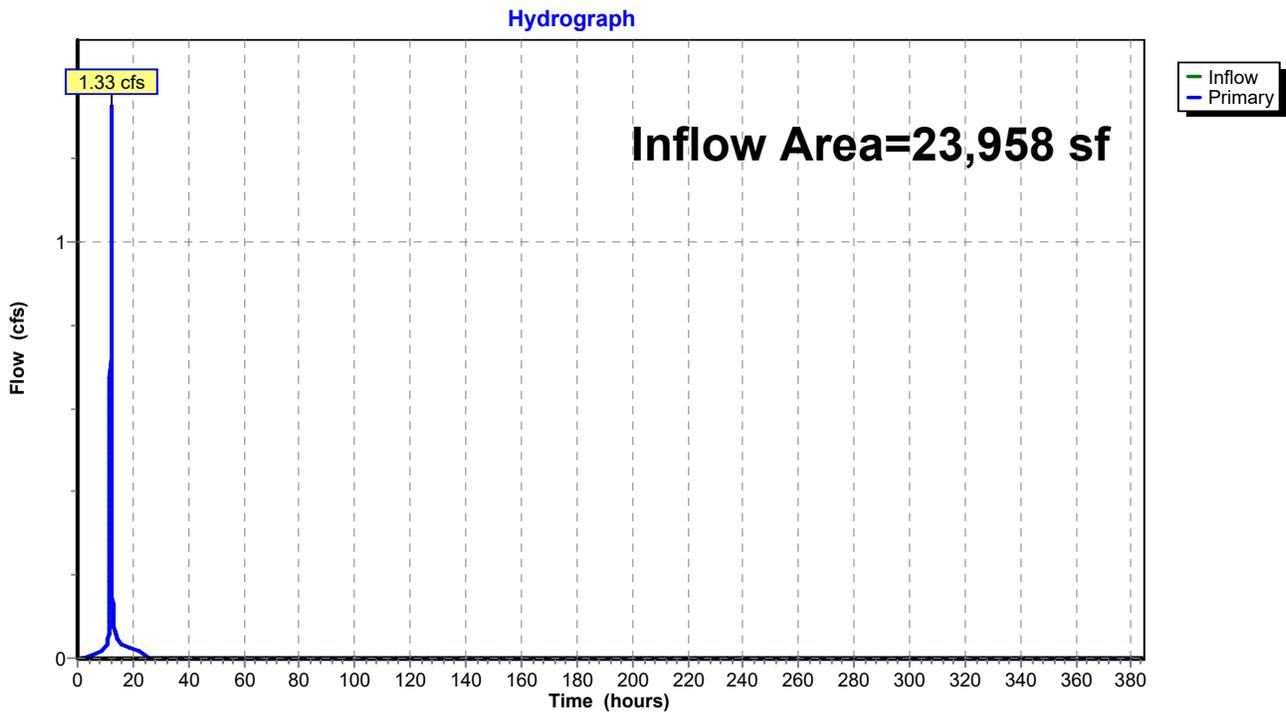


Summary for Link 55L: Post_DP-002 Germantown Pike

Inflow Area = 23,958 sf, 38.18% Impervious, Inflow Depth = 1.81" for 2-yr event
 Inflow = 1.33 cfs @ 11.97 hrs, Volume= 3,606 cf
 Primary = 1.33 cfs @ 11.97 hrs, Volume= 3,606 cf, Atten= 0%, Lag= 0.0 min
 Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 55L: Post_DP-002 Germantown Pike



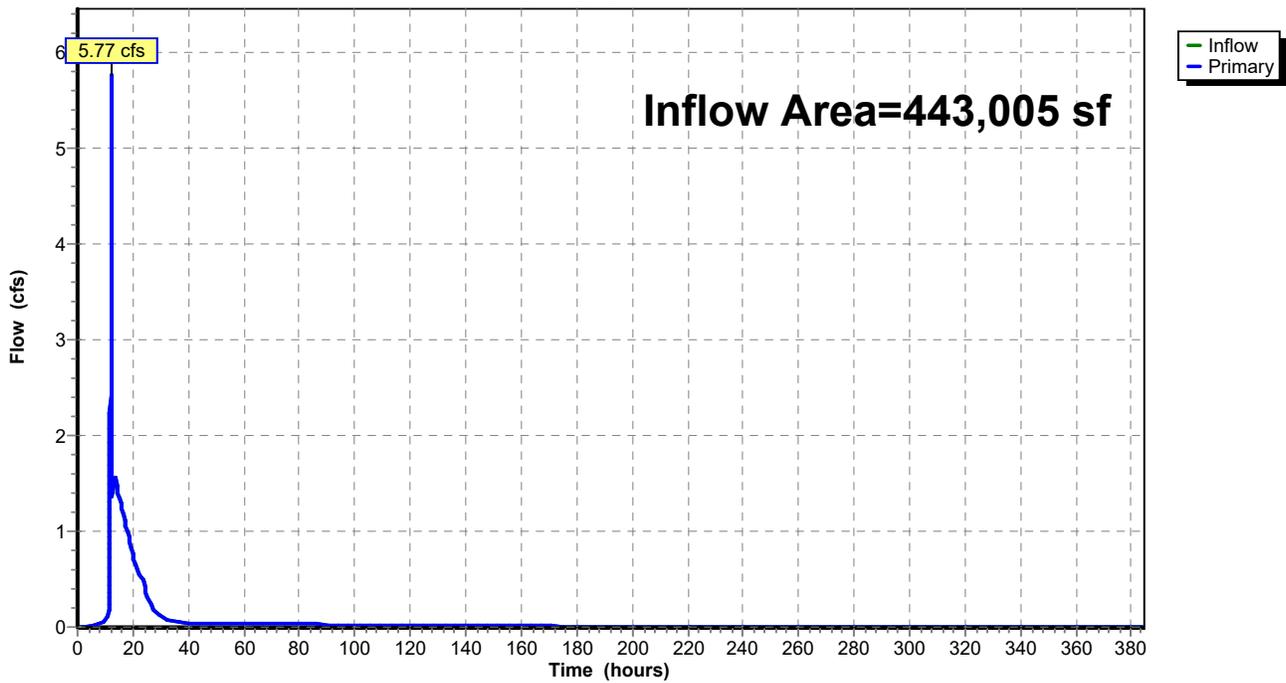
Summary for Link 66L: POST TOTAL

Inflow Area = 443,005 sf, 39.82% Impervious, Inflow Depth = 1.86" for 2-yr event
Inflow = 5.77 cfs @ 12.00 hrs, Volume= 68,842 cf
Primary = 5.77 cfs @ 12.00 hrs, Volume= 68,842 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 66L: POST TOTAL

Hydrograph



Summary for Subcatchment 1S: Dist_Impervious to Basin 1

Runoff = 21.72 cfs @ 11.96 hrs, Volume= 50,679 cf, Depth= 3.82"
 Routed to Pond 3P : Basin 1_Above Ground

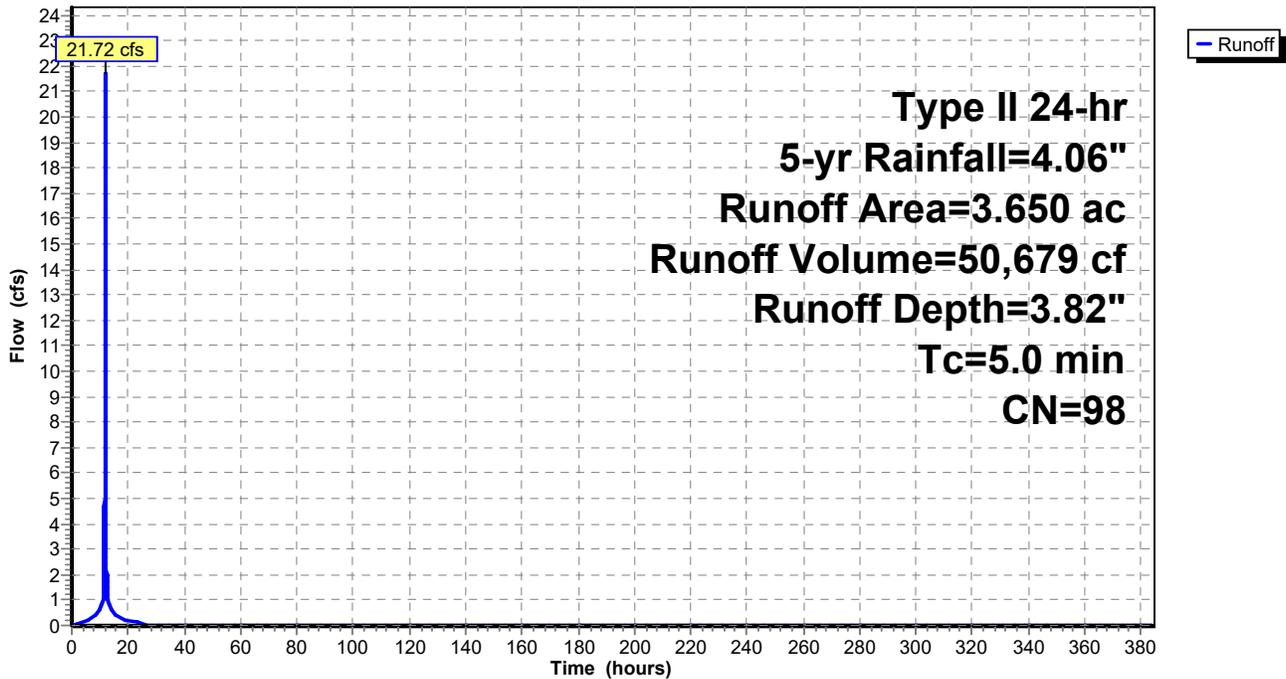
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-yr Rainfall=4.06"

Area (ac)	CN	Description
* 1.370	98	impervious - roadway, sidewalk
* 2.280	98	impervious - 40 total units
3.650	98	Weighted Average
3.650		100.00% Impervious Area

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

Subcatchment 1S: Dist_Impervious to Basin 1

Hydrograph



Summary for Subcatchment 2S: Dist_Lawn to Basin 1

Runoff = 12.29 cfs @ 11.96 hrs, Volume= 24,020 cf, Depth= 1.93"
 Routed to Pond 3P : Basin 1_Above Ground

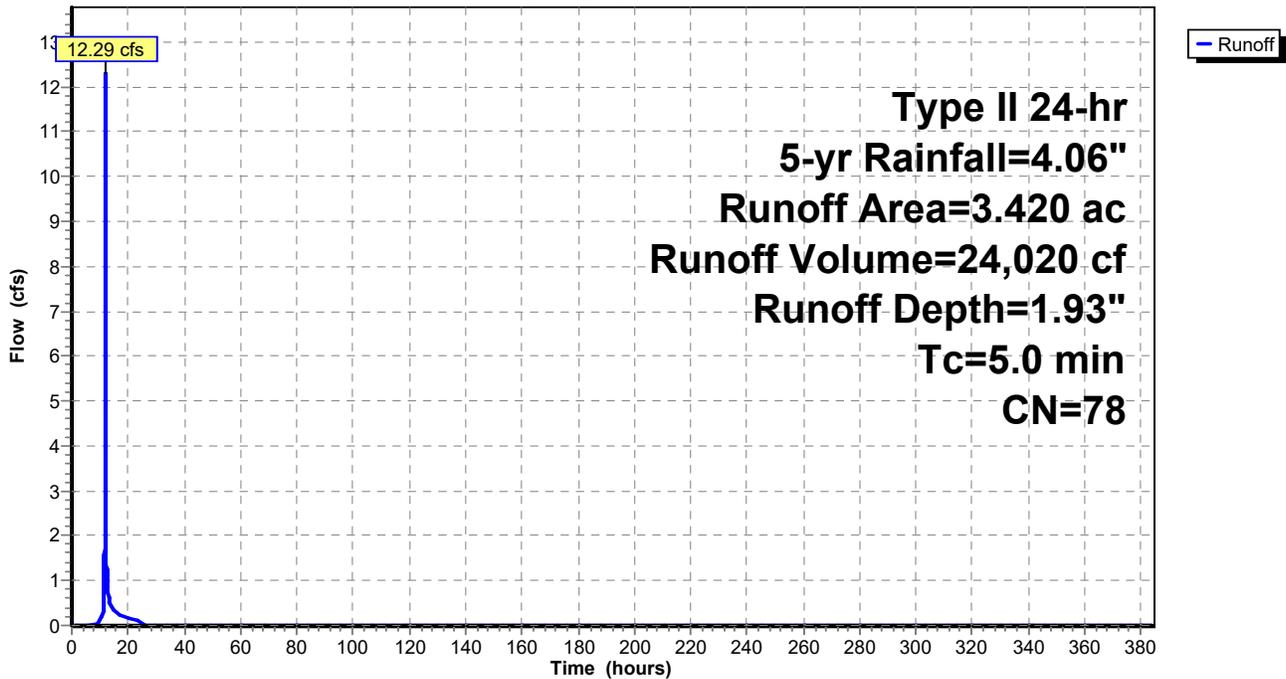
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-yr Rainfall=4.06"

Area (ac)	CN	Description
1.400	74	>75% Grass cover, Good, HSG C
2.020	80	>75% Grass cover, Good, HSG D
3.420	78	Weighted Average
3.420		100.00% Pervious Area

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

Subcatchment 2S: Dist_Lawn to Basin 1

Hydrograph



Summary for Subcatchment 20S: Onsite Dist_Lawn Bypass

Runoff = 6.02 cfs @ 12.02 hrs, Volume= 14,054 cf, Depth= 1.64"
 Routed to Link 12L : Post_DP-001 Trooper Rd

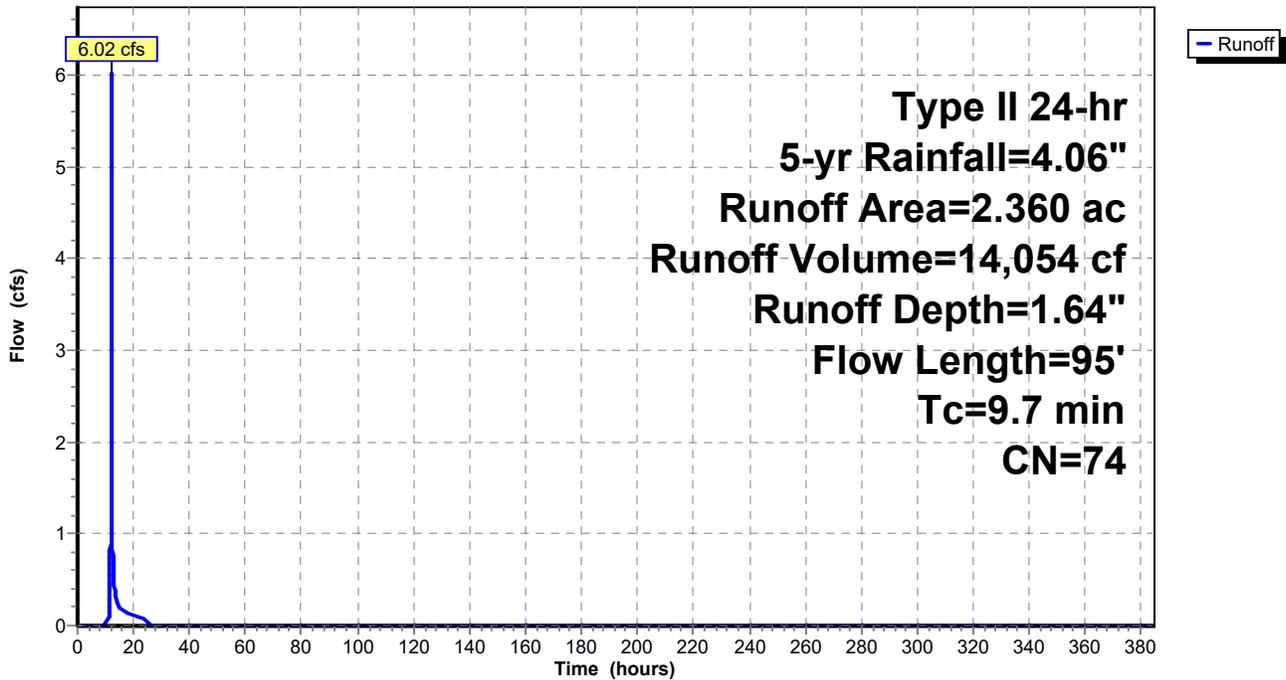
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-yr Rainfall=4.06"

Area (ac)	CN	Description
2.360	74	>75% Grass cover, Good, HSG C
2.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	35	0.2500	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
5.7	60	0.3000	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
9.7	95	Total			

Subcatchment 20S: Onsite Dist_Lawn Bypass

Hydrograph



Summary for Subcatchment 21S: Onsite Dist_Impervious Bypass

Runoff = 1.13 cfs @ 11.96 hrs, Volume= 2,638 cf, Depth= 3.82"
 Routed to Link 12L : Post_DP-001 Trooper Rd

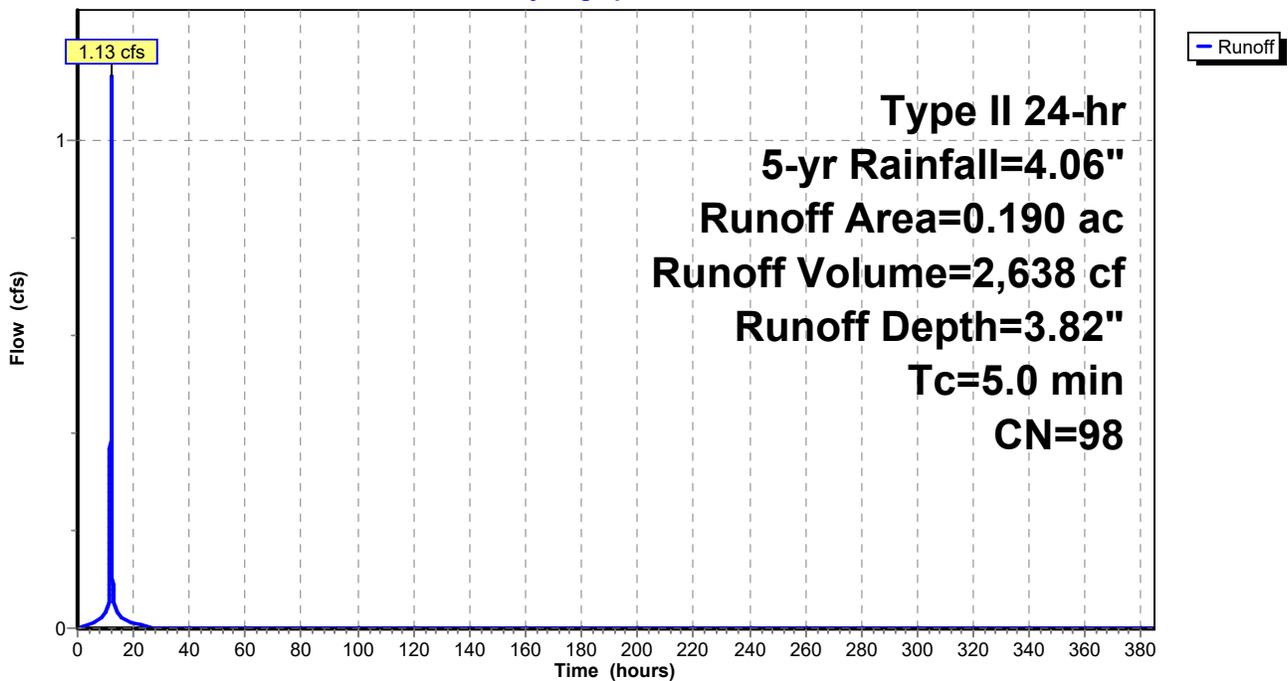
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-yr Rainfall=4.06"

Area (ac)	CN	Description
* 0.190	98	
0.190		100.00% Impervious Area

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

Subcatchment 21S: Onsite Dist_Impervious Bypass

Hydrograph



Summary for Subcatchment 47S: Dist_Lawn

Runoff = 0.78 cfs @ 12.05 hrs, Volume= 2,025 cf, Depth= 1.64"
 Routed to Link 55L : Post_DP-002 Germantown Pike

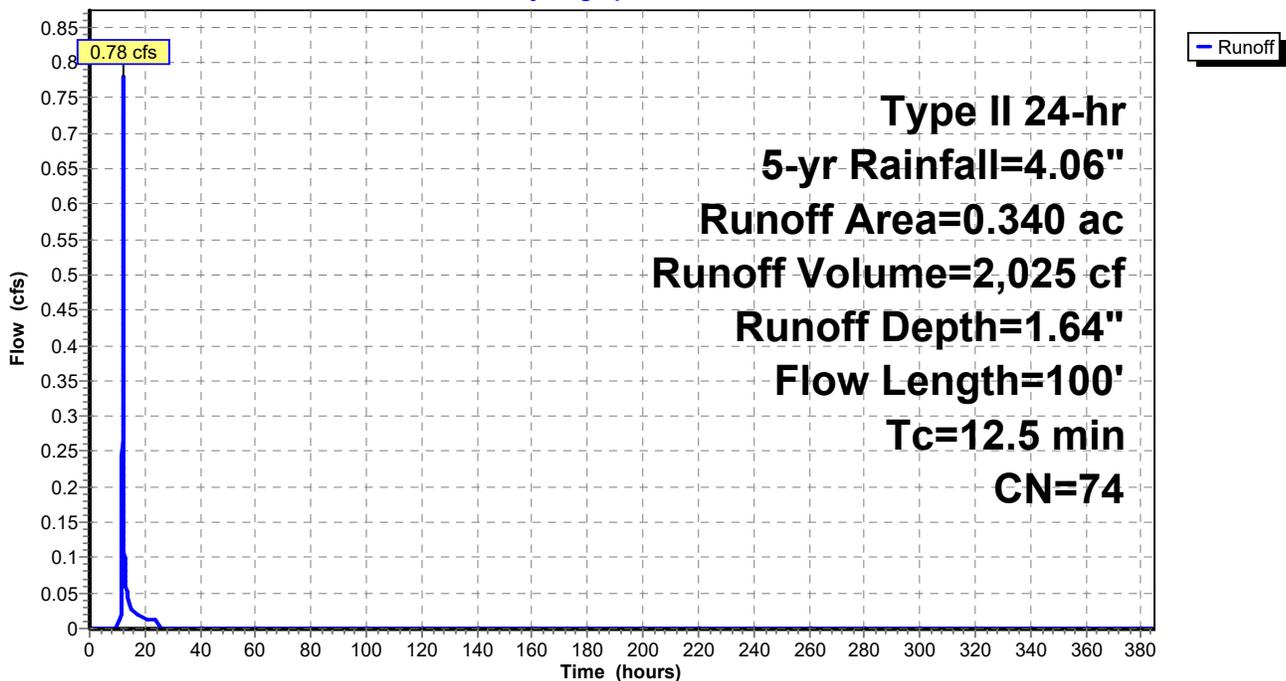
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-yr Rainfall=4.06"

Area (ac)	CN	Description
0.340	74	>75% Grass cover, Good, HSG C
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.3300	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
7.7	50	0.1000	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
12.5	100	Total			

Subcatchment 47S: Dist_Lawn

Hydrograph



Summary for Subcatchment 54S: Dist_Impervious

Runoff = 1.25 cfs @ 11.96 hrs, Volume= 2,916 cf, Depth= 3.82"
 Routed to Link 55L : Post_DP-002 Germantown Pike

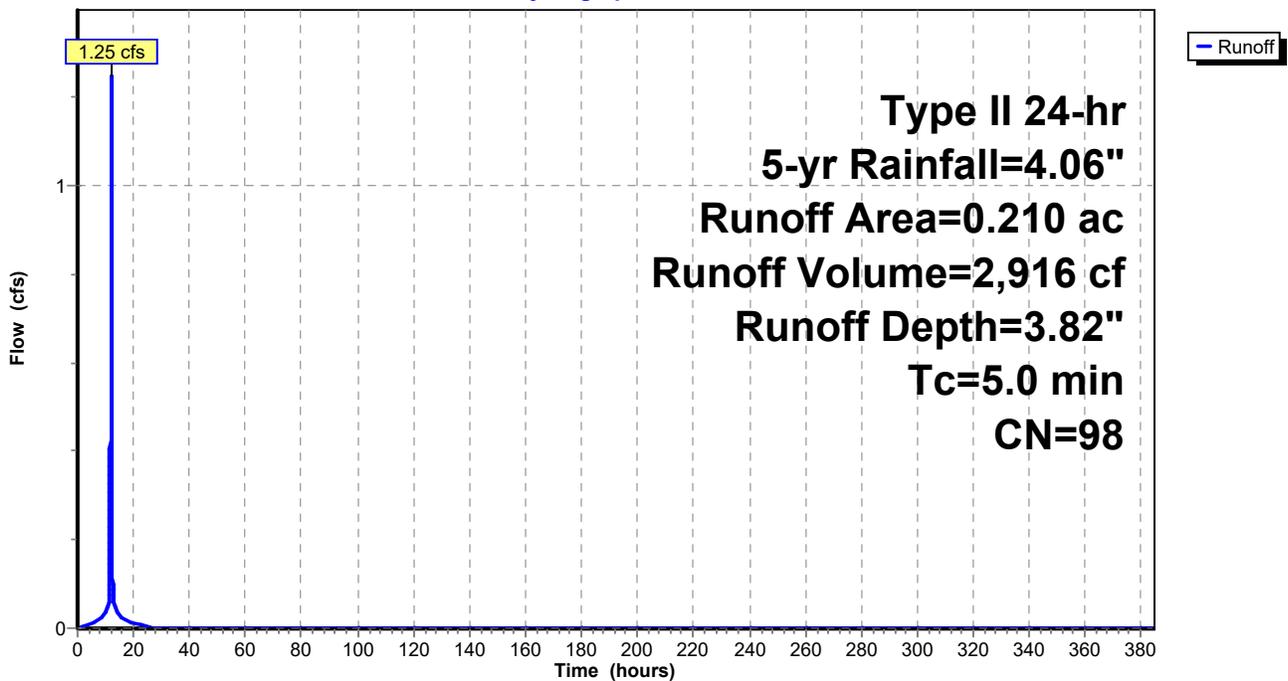
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-yr Rainfall=4.06"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.210		100.00% Impervious Area

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

Subcatchment 54S: Dist_Impervious

Hydrograph



Summary for Pond 3P: Basin 1_Above Ground

Inflow Area = 307,969 sf, 51.63% Impervious, Inflow Depth = 2.91" for 5-yr event
 Inflow = 33.97 cfs @ 11.96 hrs, Volume= 74,699 cf
 Outflow = 4.97 cfs @ 12.15 hrs, Volume= 72,727 cf, Atten= 85%, Lag= 11.7 min
 Primary = 0.05 cfs @ 12.15 hrs, Volume= 16,564 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd
 Secondary = 4.93 cfs @ 12.15 hrs, Volume= 56,163 cf
 Routed to Pond 15P : Basin 1_Underground
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 362.79' @ 12.15 hrs Surf.Area= 18,592 sf Storage= 42,022 cf

Plug-Flow detention time= 1,125.2 min calculated for 72,727 cf (97% of inflow)
 Center-of-Mass det. time= 1,108.5 min (1,882.9 - 774.4)

Volume	Invert	Avail.Storage	Storage Description
#1	357.00'	67,002 cf	Raingarden Custom Stage Data (Prismatic) , listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	1,962	0	0
357.99	1,962	1,942	1,942
358.00	3,925	29	1,972
359.00	3,925	3,925	5,897
360.00	3,925	3,925	9,822
360.99	3,925	3,886	13,708
361.00	13,086	85	13,793
362.00	16,104	14,595	28,388
363.00	19,270	17,687	46,075
364.00	22,584	20,927	67,002

Device	Routing	Invert	Outlet Devices
#1	Primary	358.00'	0.9" Vert. MRC Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Secondary	362.25'	12.0" W x 4.0" H Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Secondary	362.70'	24.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	361.05'	0.5' long OCS_Sharp-Crested Rectangular Weir 2 End Contraction(s)
#5	Tertiary	363.75'	90.0' long + 5.0 ' SideZ x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

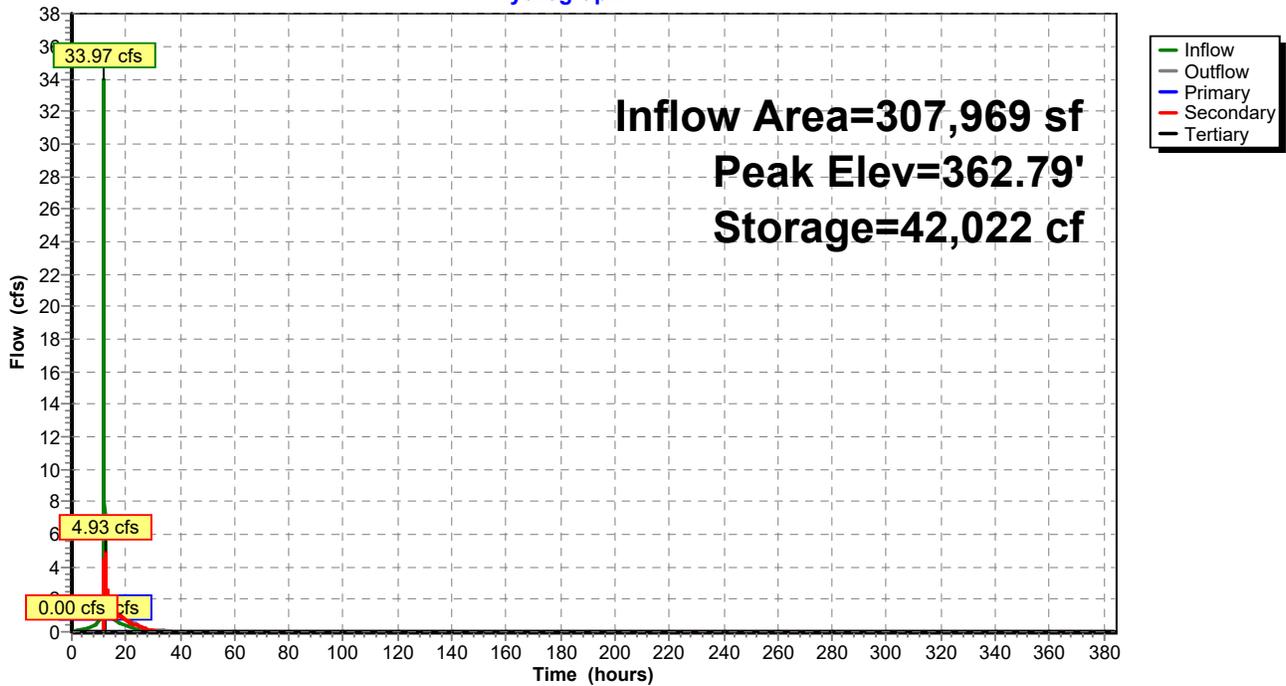
Primary OutFlow Max=0.05 cfs @ 12.15 hrs HW=362.79' (Free Discharge)
 ↳1=MRC Orifice/Grate (Orifice Controls 0.05 cfs @ 10.49 fps)

Secondary OutFlow Max=4.81 cfs @ 12.15 hrs HW=362.79' (Free Discharge)
 ↳2=Orifice (Orifice Controls 0.97 cfs @ 2.90 fps)
 ↳3=Sharp-Crested Rectangular Weir (Weir Controls 1.97 cfs @ 0.96 fps)
 ↳4=OCS_Shape-Crested Rectangular Weir (Weir Controls 1.87 cfs @ 4.31 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=357.00' (Free Discharge)
 ↳5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: Basin 1_Above Ground

Hydrograph



Summary for Pond 15P: Basin 1_Underground

Inflow = 4.93 cfs @ 12.15 hrs, Volume= 56,163 cf
 Outflow = 2.51 cfs @ 12.89 hrs, Volume= 56,163 cf, Atten= 49%, Lag= 44.1 min
 Primary = 2.51 cfs @ 12.89 hrs, Volume= 56,163 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 352.33' @ 12.89 hrs Surf.Area= 11,564 sf Storage= 5,897 cf

Plug-Flow detention time= 49.2 min calculated for 56,163 cf (100% of inflow)
 Center-of-Mass det. time= 49.2 min (1,059.0 - 1,009.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	351.00'	17,650 cf	54.29'W x 213.00'L x 6.00'H Field A 69,387 cf Overall - 25,263 cf Embedded = 44,124 cf x 40.0% Voids
#2A	352.00'	21,087 cf	ADS N-12 48" x 80 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 80 Chambers in 8 Rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3	357.00'	108 cf	ocs (Prismatic) Listed below (Recalc)
		38,845 cf	Total Available Storage

Storage Group A created with Chamber Wizard

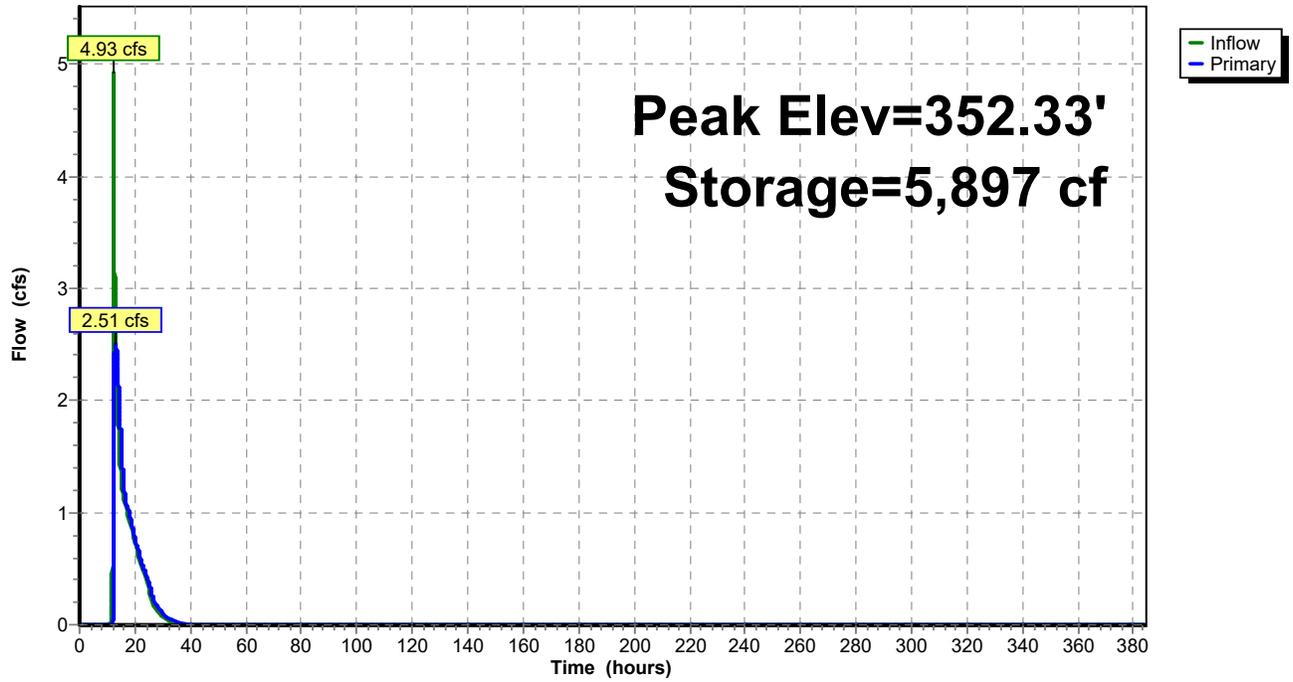
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	36	0	0
358.00	36	36	36
359.00	36	36	72
360.00	36	36	108

Device	Routing	Invert	Outlet Devices
#1	Primary	351.00'	24.0" Round Culvert Outlet Pipe from OCS L= 230.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 351.00' / 346.50' S= 0.0196 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	351.00'	10.0" Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	356.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=2.51 cfs @ 12.89 hrs HW=352.33' (Free Discharge)
 ↖ **1=Culvert Outlet Pipe from OCS** (Passes 2.51 cfs of 8.71 cfs potential flow)
 ↖ **2=Orifice** (Orifice Controls 2.51 cfs @ 4.60 fps)
 ↖ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 15P: Basin 1_Underground

Hydrograph



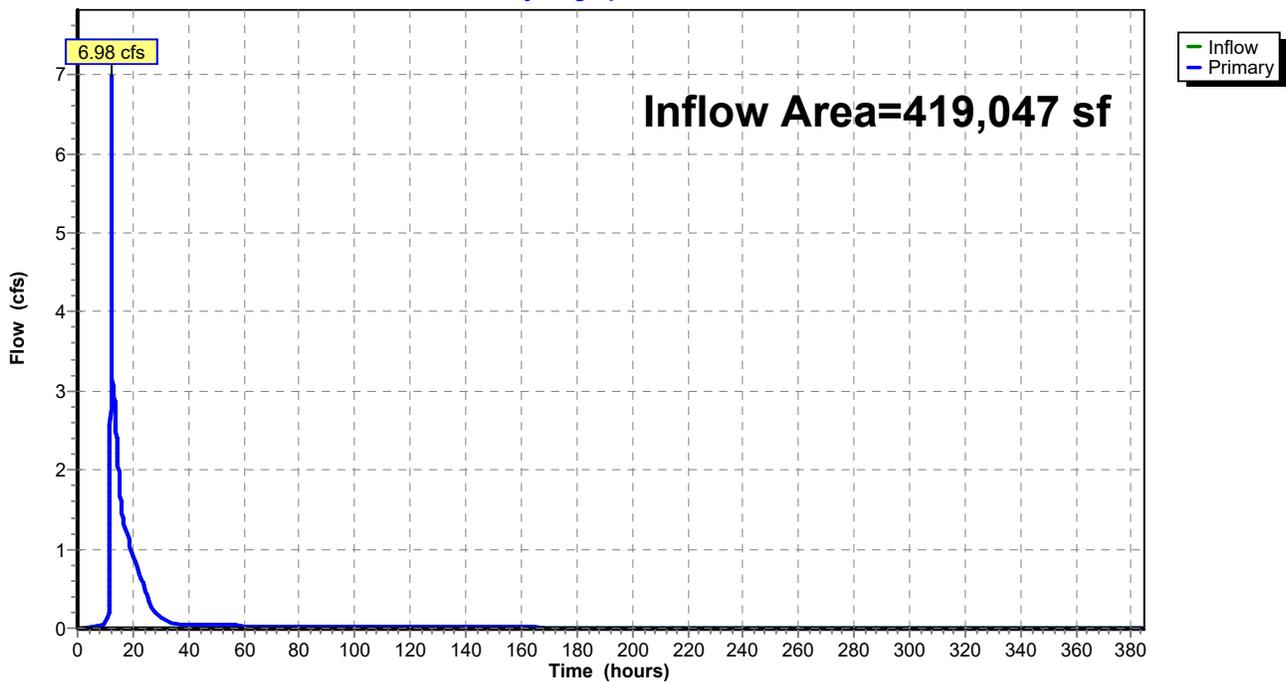
Summary for Link 12L: Post_DP-001 Trooper Rd

Inflow Area = 419,047 sf, 39.92% Impervious, Inflow Depth = 2.56" for 5-yr event
Inflow = 6.98 cfs @ 12.01 hrs, Volume= 89,419 cf
Primary = 6.98 cfs @ 12.01 hrs, Volume= 89,419 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 12L: Post_DP-001 Trooper Rd

Hydrograph

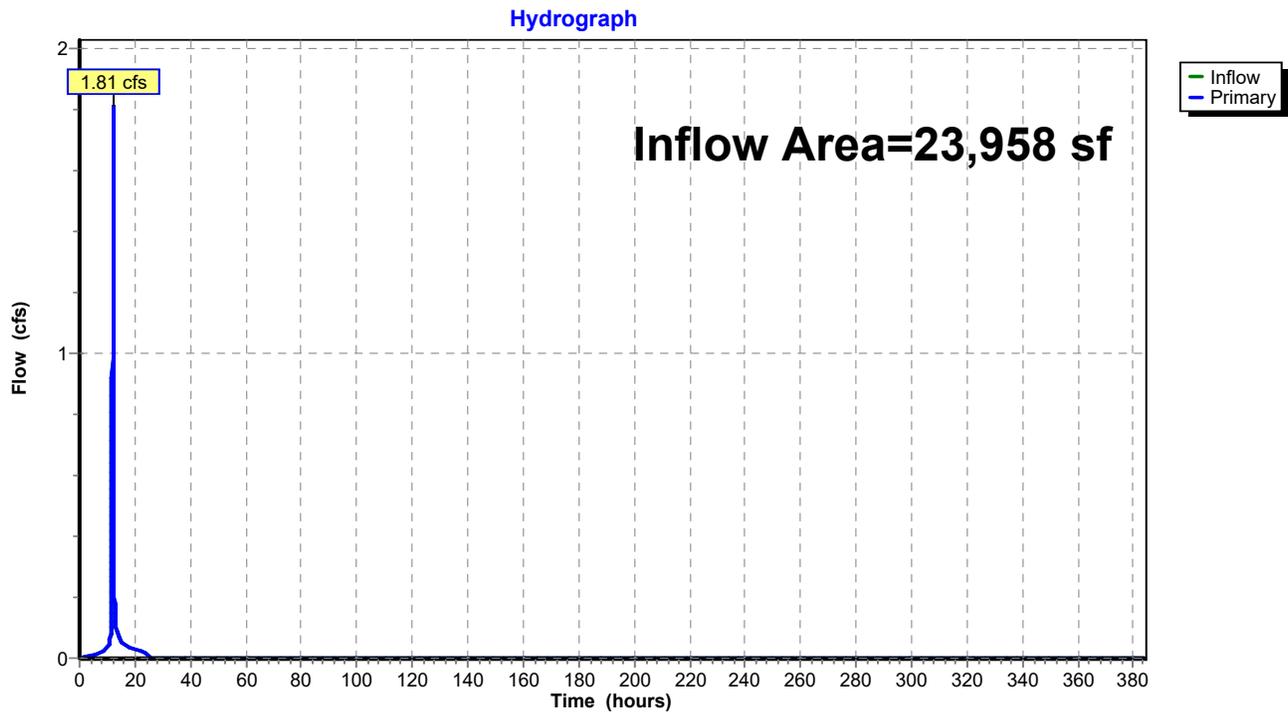


Summary for Link 55L: Post_DP-002 Germantown Pike

Inflow Area = 23,958 sf, 38.18% Impervious, Inflow Depth = 2.47" for 5-yr event
Inflow = 1.81 cfs @ 11.97 hrs, Volume= 4,940 cf
Primary = 1.81 cfs @ 11.97 hrs, Volume= 4,940 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 55L: Post_DP-002 Germantown Pike



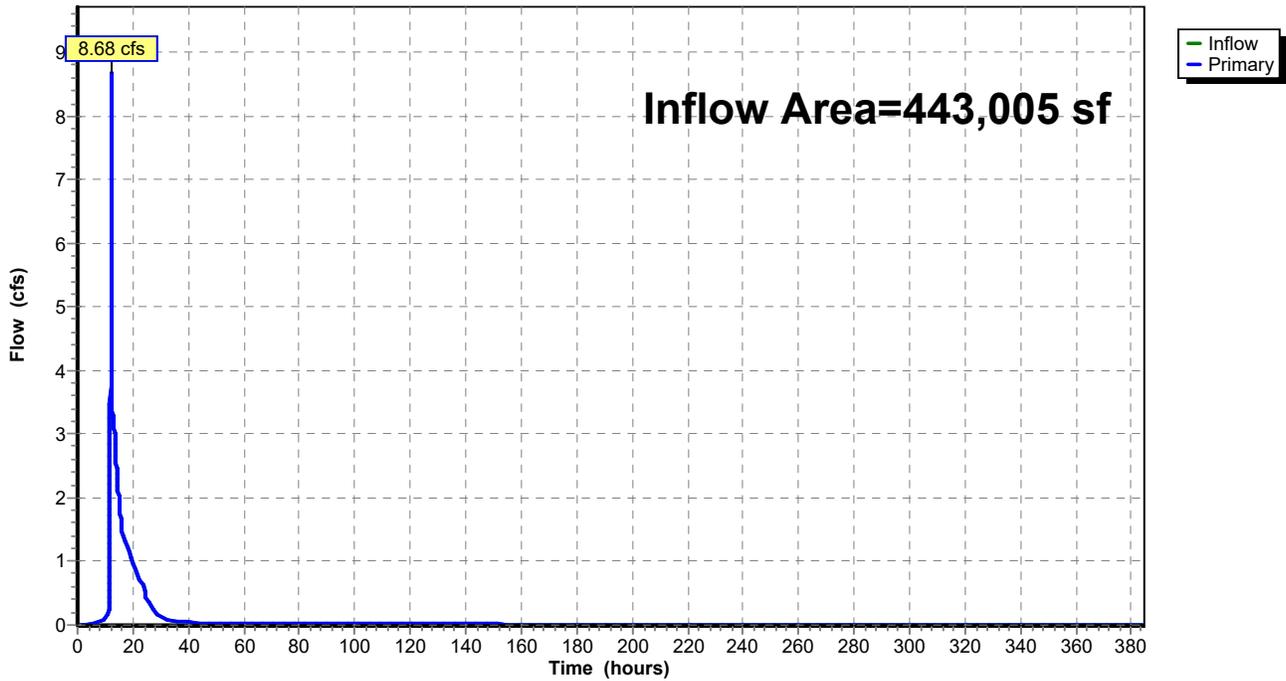
Summary for Link 66L: POST TOTAL

Inflow Area = 443,005 sf, 39.82% Impervious, Inflow Depth = 2.56" for 5-yr event
Inflow = 8.68 cfs @ 12.00 hrs, Volume= 94,360 cf
Primary = 8.68 cfs @ 12.00 hrs, Volume= 94,360 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 66L: POST TOTAL

Hydrograph



Summary for Subcatchment 1S: Dist_Impervious to Basin 1

Runoff = 25.46 cfs @ 11.96 hrs, Volume= 59,803 cf, Depth= 4.51"
 Routed to Pond 3P : Basin 1_Above Ground

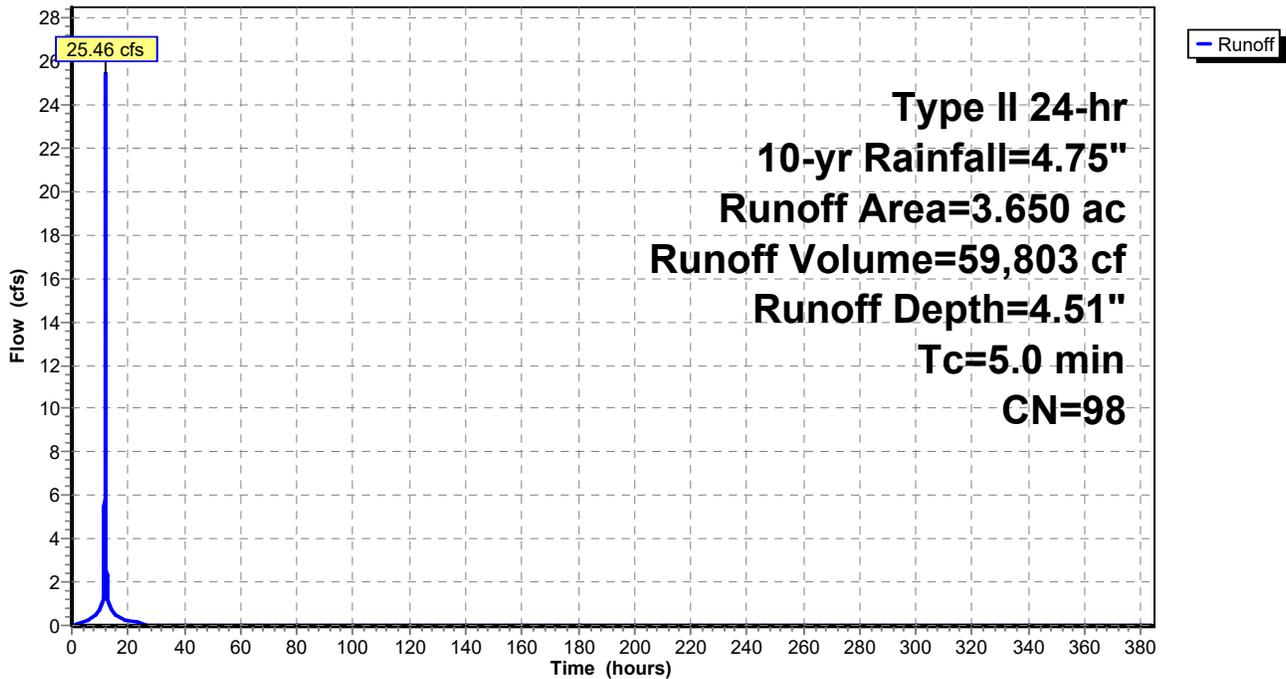
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-yr Rainfall=4.75"

Area (ac)	CN	Description
* 1.370	98	impervious - roadway, sidewalk
* 2.280	98	impervious - 40 total units
3.650	98	Weighted Average
3.650		100.00% Impervious Area

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

Subcatchment 1S: Dist_Impervious to Basin 1

Hydrograph



Summary for Subcatchment 2S: Dist_Lawn to Basin 1

Runoff = 15.80 cfs @ 11.96 hrs, Volume= 31,047 cf, Depth= 2.50"
 Routed to Pond 3P : Basin 1_Above Ground

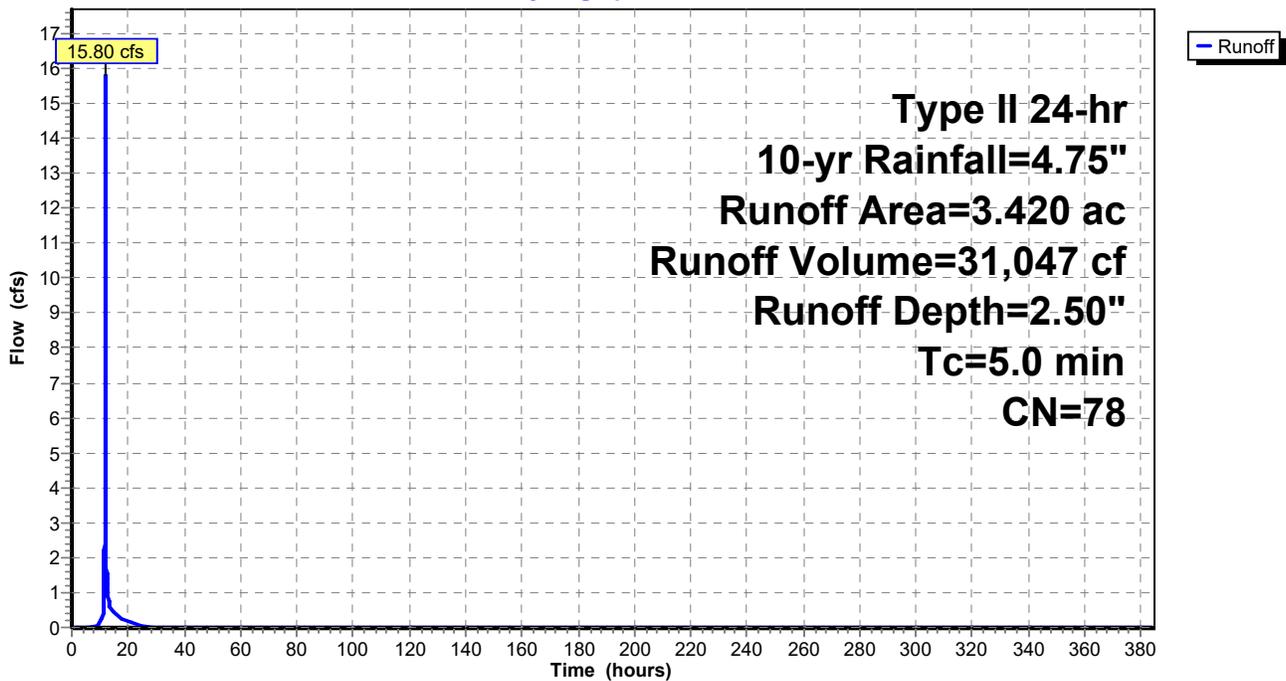
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-yr Rainfall=4.75"

Area (ac)	CN	Description
1.400	74	>75% Grass cover, Good, HSG C
2.020	80	>75% Grass cover, Good, HSG D
3.420	78	Weighted Average
3.420		100.00% Pervious Area

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

Subcatchment 2S: Dist_Lawn to Basin 1

Hydrograph



Summary for Subcatchment 20S: Onsite Dist_Lawn Bypass

Runoff = 7.98 cfs @ 12.02 hrs, Volume= 18,560 cf, Depth= 2.17"
 Routed to Link 12L : Post_DP-001 Trooper Rd

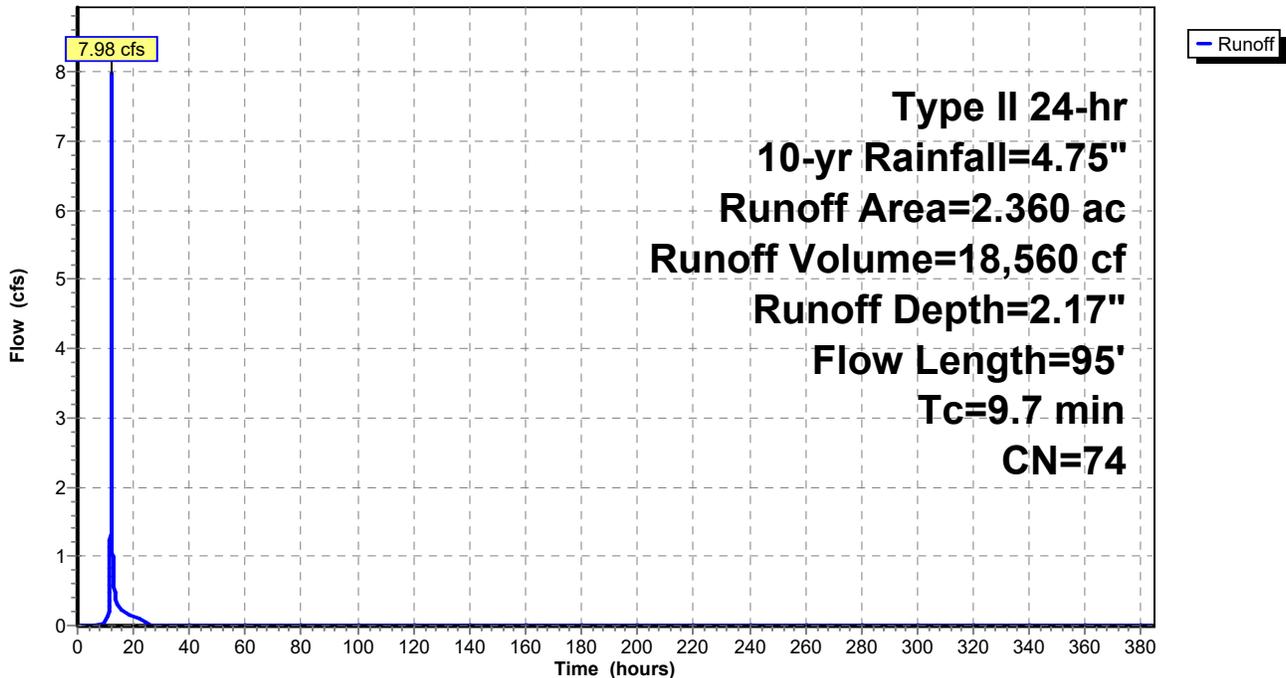
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-yr Rainfall=4.75"

Area (ac)	CN	Description
2.360	74	>75% Grass cover, Good, HSG C
2.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	35	0.2500	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
5.7	60	0.3000	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
9.7	95	Total			

Subcatchment 20S: Onsite Dist_Lawn Bypass

Hydrograph



Summary for Subcatchment 21S: Onsite Dist_Impervious Bypass

Runoff = 1.33 cfs @ 11.96 hrs, Volume= 3,113 cf, Depth= 4.51"
 Routed to Link 12L : Post_DP-001 Trooper Rd

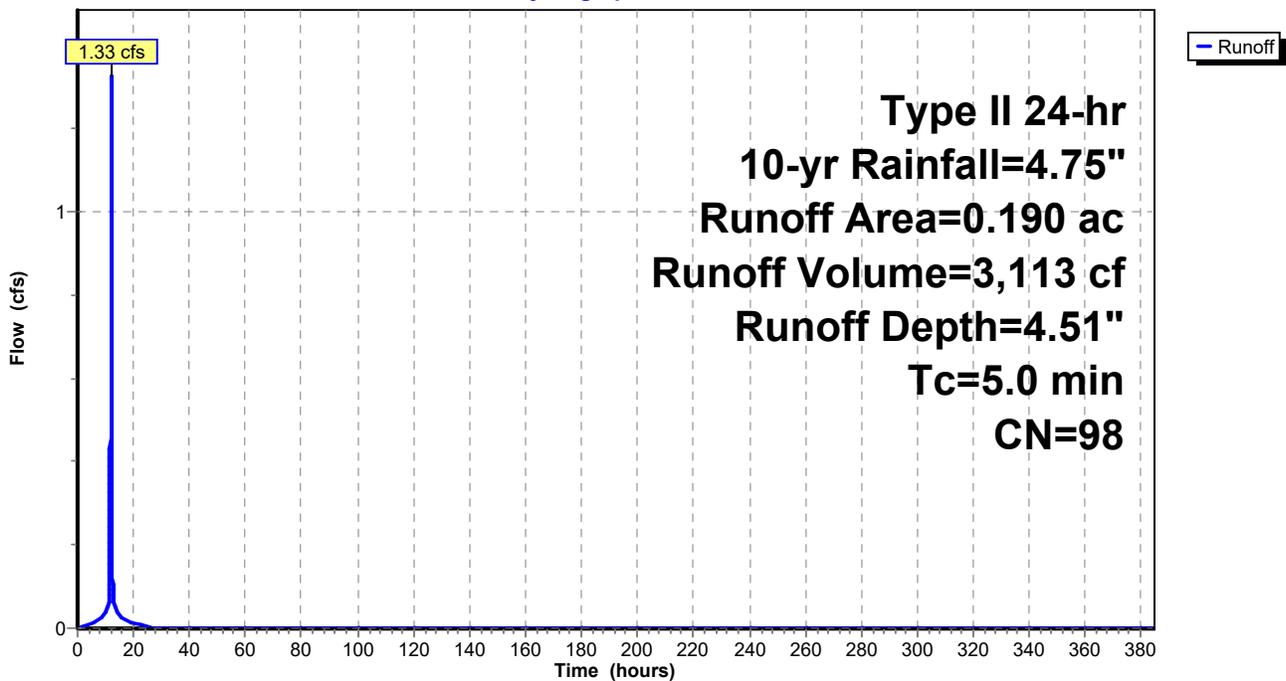
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-yr Rainfall=4.75"

Area (ac)	CN	Description
* 0.190	98	
0.190		100.00% Impervious Area

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

Subcatchment 21S: Onsite Dist_Impervious Bypass

Hydrograph



Summary for Subcatchment 47S: Dist_Lawn

Runoff = 1.04 cfs @ 12.05 hrs, Volume= 2,674 cf, Depth= 2.17"
 Routed to Link 55L : Post_DP-002 Germantown Pike

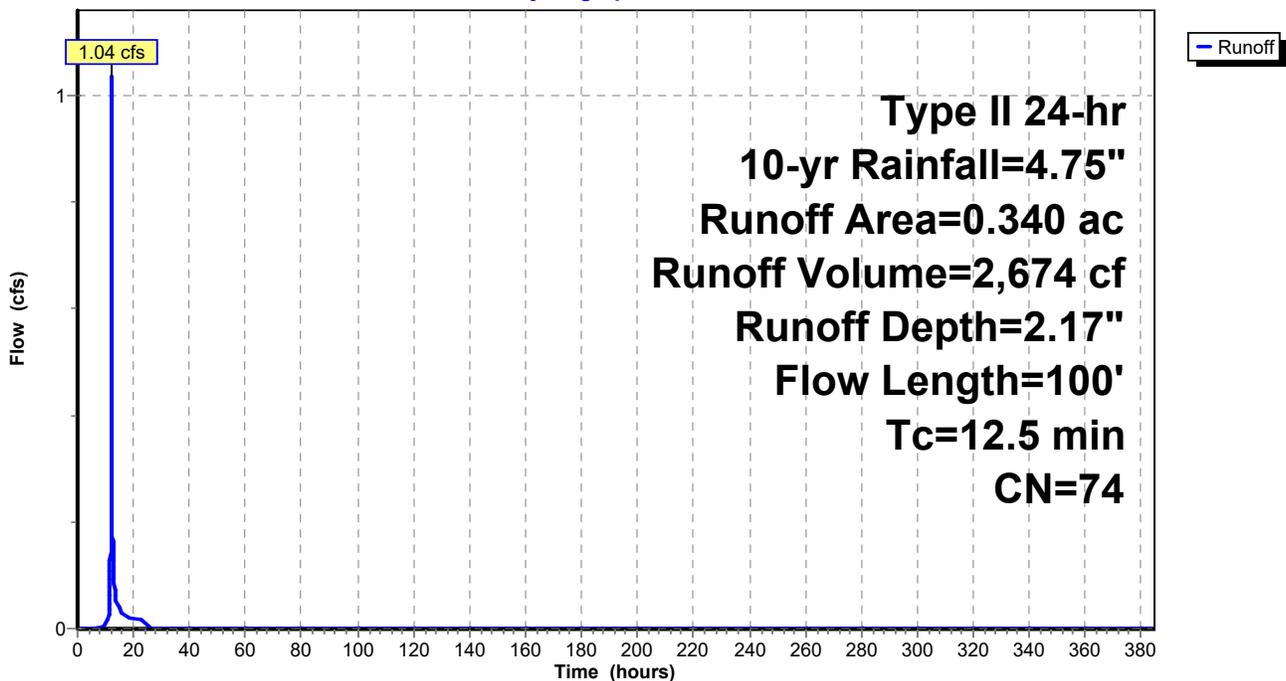
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-yr Rainfall=4.75"

Area (ac)	CN	Description
0.340	74	>75% Grass cover, Good, HSG C
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.3300	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
7.7	50	0.1000	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
12.5	100	Total			

Subcatchment 47S: Dist_Lawn

Hydrograph



Summary for Subcatchment 54S: Dist_Impervious

Runoff = 1.46 cfs @ 11.96 hrs, Volume= 3,441 cf, Depth= 4.51"
 Routed to Link 55L : Post_DP-002 Germantown Pike

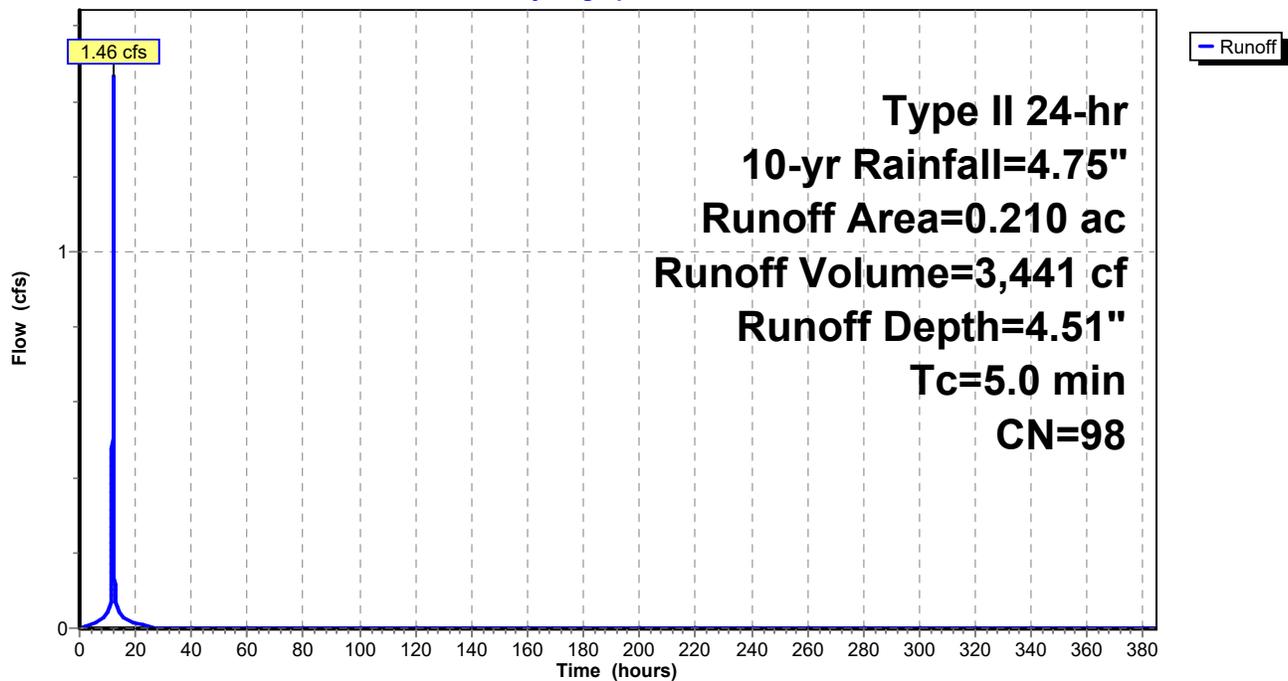
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-yr Rainfall=4.75"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.210		100.00% Impervious Area

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

Subcatchment 54S: Dist_Impervious

Hydrograph



Summary for Pond 3P: Basin 1_Above Ground

Inflow Area = 307,969 sf, 51.63% Impervious, Inflow Depth = 3.54" for 10-yr event
 Inflow = 41.22 cfs @ 11.96 hrs, Volume= 90,849 cf
 Outflow = 18.10 cfs @ 12.05 hrs, Volume= 88,877 cf, Atten= 56%, Lag= 5.5 min
 Primary = 0.05 cfs @ 12.05 hrs, Volume= 16,751 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd
 Secondary = 18.05 cfs @ 12.05 hrs, Volume= 72,126 cf
 Routed to Pond 15P : Basin 1_Underground
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 363.03' @ 12.05 hrs Surf.Area= 19,354 sf Storage= 46,563 cf

Plug-Flow detention time= 944.2 min calculated for 88,875 cf (98% of inflow)
 Center-of-Mass det. time= 930.8 min (1,702.5 - 771.7)

Volume	Invert	Avail.Storage	Storage Description
#1	357.00'	67,002 cf	Raingarden Custom Stage Data (Prismatic) , listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	1,962	0	0
357.99	1,962	1,942	1,942
358.00	3,925	29	1,972
359.00	3,925	3,925	5,897
360.00	3,925	3,925	9,822
360.99	3,925	3,886	13,708
361.00	13,086	85	13,793
362.00	16,104	14,595	28,388
363.00	19,270	17,687	46,075
364.00	22,584	20,927	67,002

Device	Routing	Invert	Outlet Devices
#1	Primary	358.00'	0.9" Vert. MRC Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Secondary	362.25'	12.0" W x 4.0" H Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Secondary	362.70'	24.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	361.05'	0.5' long OCS_Sharp-Crested Rectangular Weir 2 End Contraction(s)
#5	Tertiary	363.75'	90.0' long + 5.0 ' SideZ x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

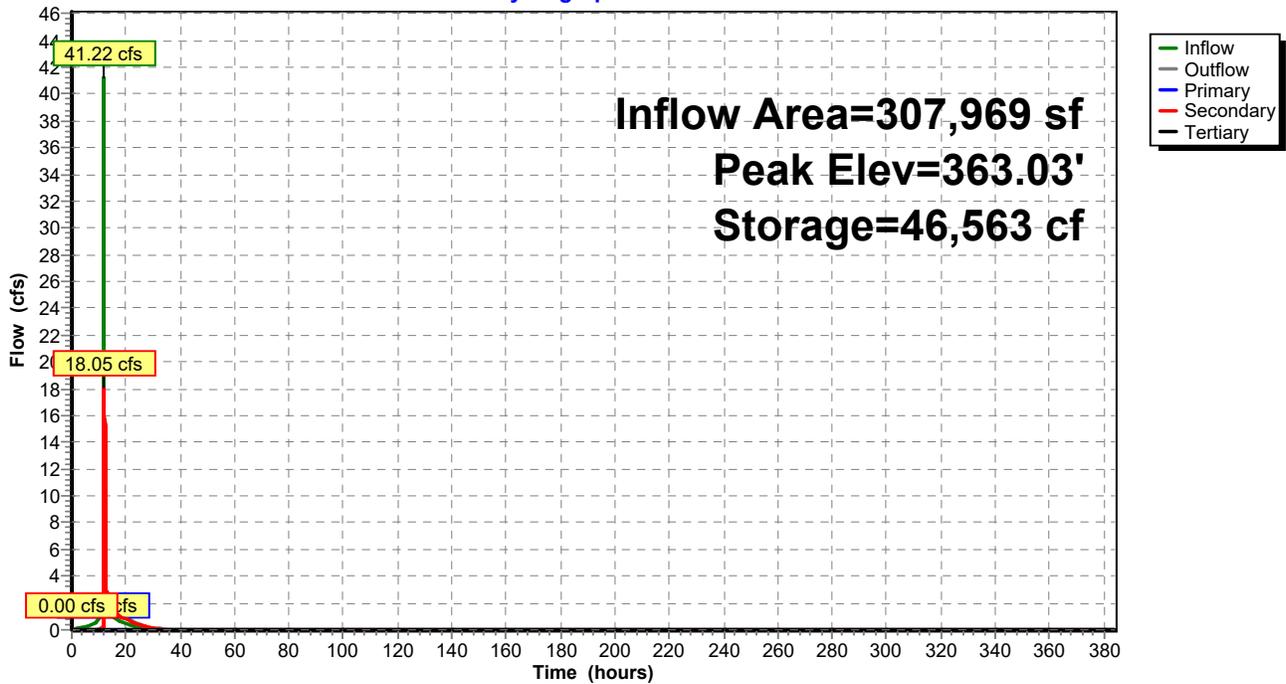
Primary OutFlow Max=0.05 cfs @ 12.05 hrs HW=363.03' (Free Discharge)
 ↳1=MRC Orifice/Grate (Orifice Controls 0.05 cfs @ 10.75 fps)

Secondary OutFlow Max=18.03 cfs @ 12.05 hrs HW=363.03' (Free Discharge)
 ↳2=Orifice (Orifice Controls 1.25 cfs @ 3.74 fps)
 ↳3=Sharp-Crested Rectangular Weir(Weir Controls 14.51 cfs @ 1.86 fps)
 ↳4=OCS_Shape-Crested Rectangular Weir(Weir Controls 2.27 cfs @ 4.60 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=357.00' (Free Discharge)
 ↳5=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 3P: Basin 1_Above Ground

Hydrograph



Summary for Pond 15P: Basin 1_Underground

Inflow = 18.05 cfs @ 12.05 hrs, Volume= 72,126 cf
 Outflow = 3.65 cfs @ 12.58 hrs, Volume= 72,126 cf, Atten= 80%, Lag= 31.9 min
 Primary = 3.65 cfs @ 12.58 hrs, Volume= 72,126 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 353.35' @ 12.58 hrs Surf.Area= 11,564 sf Storage= 12,993 cf

Plug-Flow detention time= 52.0 min calculated for 72,124 cf (100% of inflow)
 Center-of-Mass det. time= 52.1 min (1,028.7 - 976.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	351.00'	17,650 cf	54.29'W x 213.00'L x 6.00'H Field A 69,387 cf Overall - 25,263 cf Embedded = 44,124 cf x 40.0% Voids
#2A	352.00'	21,087 cf	ADS N-12 48" x 80 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 80 Chambers in 8 Rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3	357.00'	108 cf	ocs (Prismatic) Listed below (Recalc)
		38,845 cf	Total Available Storage

Storage Group A created with Chamber Wizard

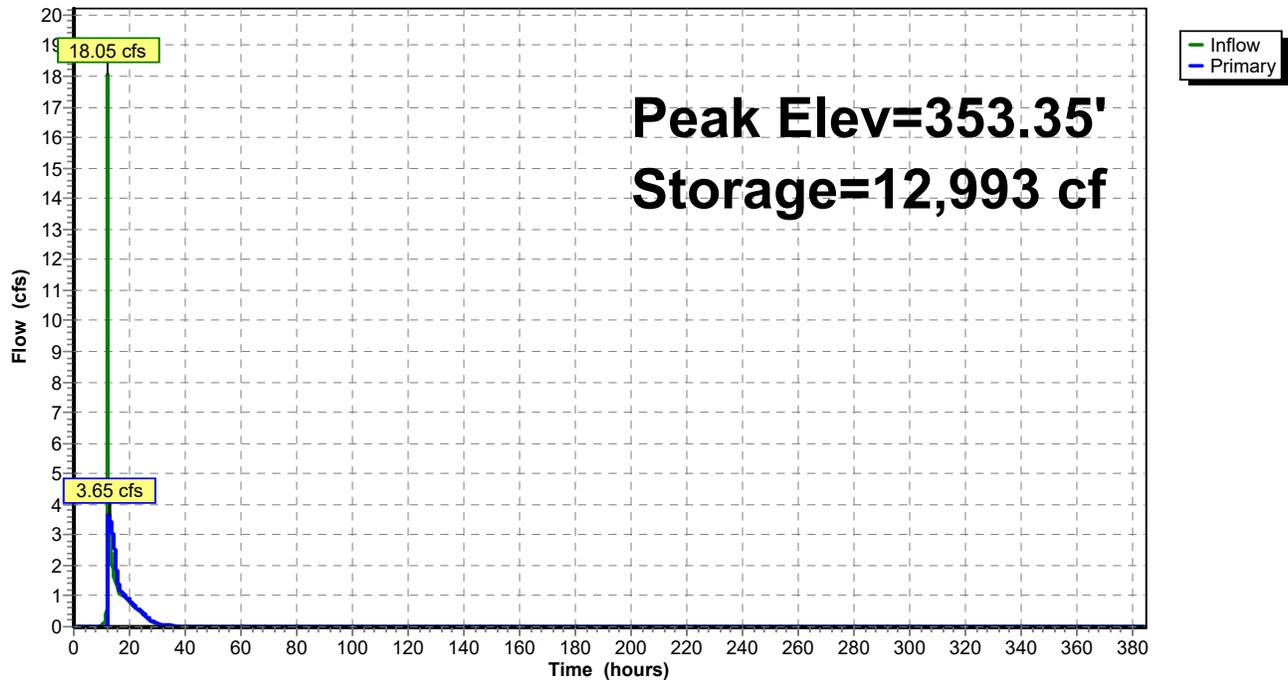
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	36	0	0
358.00	36	36	36
359.00	36	36	72
360.00	36	36	108

Device	Routing	Invert	Outlet Devices
#1	Primary	351.00'	24.0" Round Culvert Outlet Pipe from OCS L= 230.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 351.00' / 346.50' S= 0.0196 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	351.00'	10.0" Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	356.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=3.65 cfs @ 12.58 hrs HW=353.35' (Free Discharge)
 1=Culvert Outlet Pipe from OCS (Passes 3.65 cfs of 17.57 cfs potential flow)
 2=Orifice (Orifice Controls 3.65 cfs @ 6.69 fps)
 3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 15P: Basin 1_Underground

Hydrograph



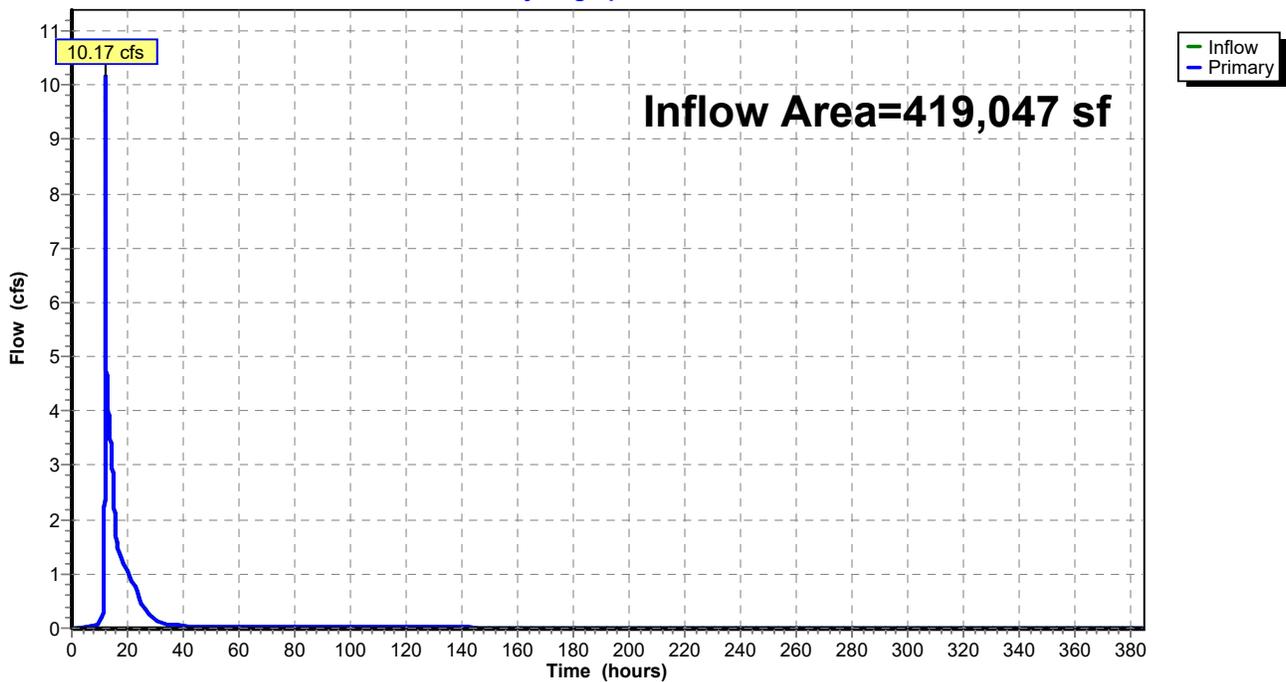
Summary for Link 12L: Post_DP-001 Trooper Rd

Inflow Area = 419,047 sf, 39.92% Impervious, Inflow Depth = 3.17" for 10-yr event
Inflow = 10.17 cfs @ 12.03 hrs, Volume= 110,550 cf
Primary = 10.17 cfs @ 12.03 hrs, Volume= 110,550 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 12L: Post_DP-001 Trooper Rd

Hydrograph

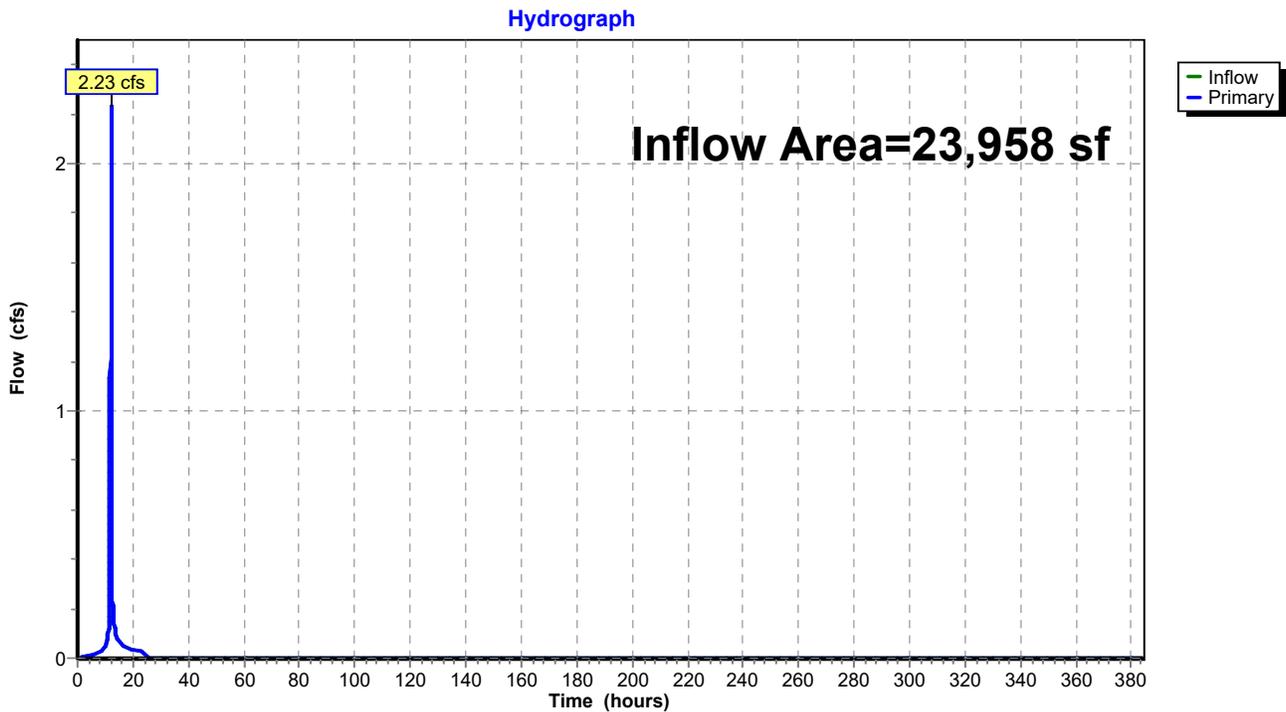


Summary for Link 55L: Post_DP-002 Germantown Pike

Inflow Area = 23,958 sf, 38.18% Impervious, Inflow Depth = 3.06" for 10-yr event
Inflow = 2.23 cfs @ 11.97 hrs, Volume= 6,115 cf
Primary = 2.23 cfs @ 11.97 hrs, Volume= 6,115 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 55L: Post_DP-002 Germantown Pike



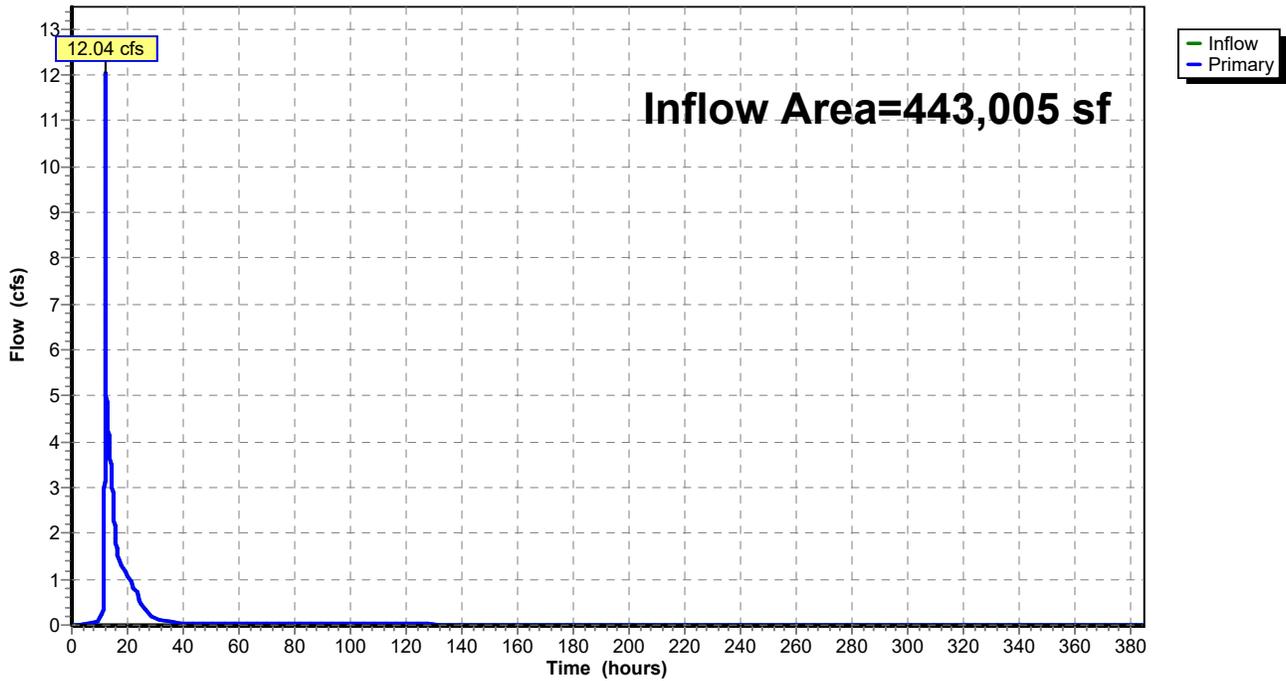
Summary for Link 66L: POST TOTAL

Inflow Area = 443,005 sf, 39.82% Impervious, Inflow Depth = 3.16" for 10-yr event
Inflow = 12.04 cfs @ 12.03 hrs, Volume= 116,665 cf
Primary = 12.04 cfs @ 12.03 hrs, Volume= 116,665 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 66L: POST TOTAL

Hydrograph



Summary for Subcatchment 1S: Dist_Impervious to Basin 1

Runoff = 30.76 cfs @ 11.96 hrs, Volume= 72,768 cf, Depth= 5.49"
 Routed to Pond 3P : Basin 1_Above Ground

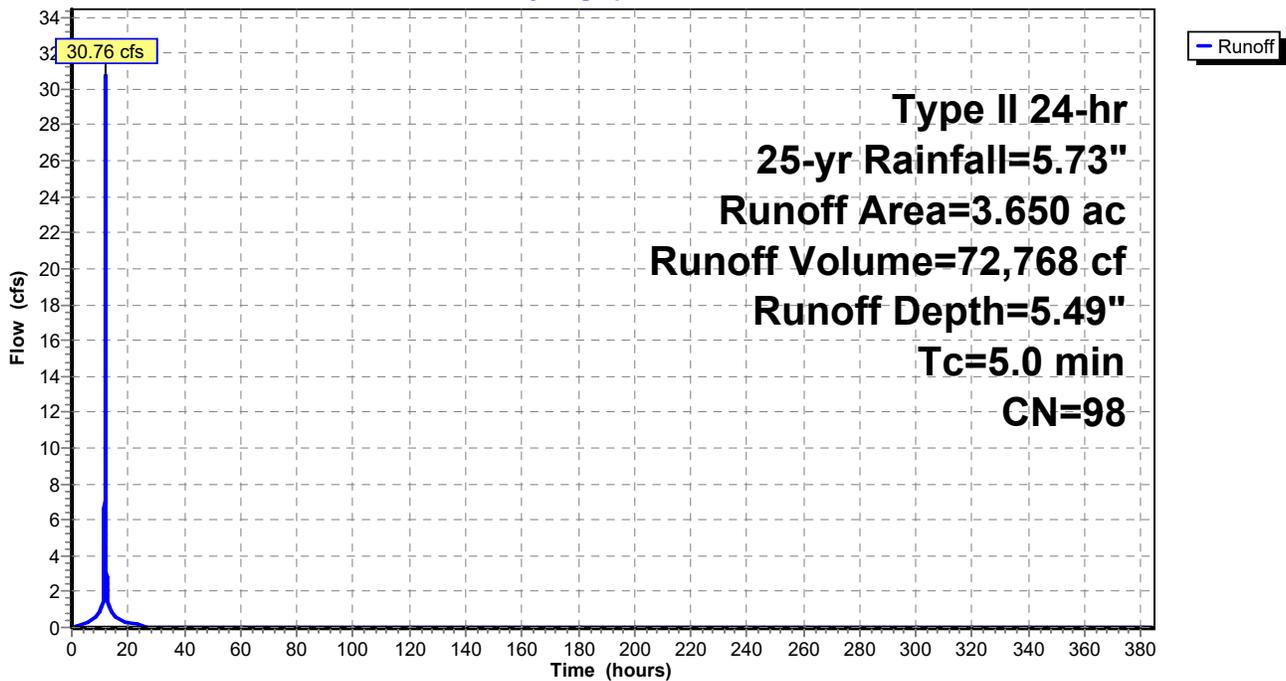
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-yr Rainfall=5.73"

Area (ac)	CN	Description
* 1.370	98	impervious - roadway, sidewalk
* 2.280	98	impervious - 40 total units
3.650	98	Weighted Average
3.650		100.00% Impervious Area

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

Subcatchment 1S: Dist_Impervious to Basin 1

Hydrograph



Summary for Subcatchment 2S: Dist_Lawn to Basin 1

Runoff = 20.90 cfs @ 11.96 hrs, Volume= 41,483 cf, Depth= 3.34"
 Routed to Pond 3P : Basin 1_Above Ground

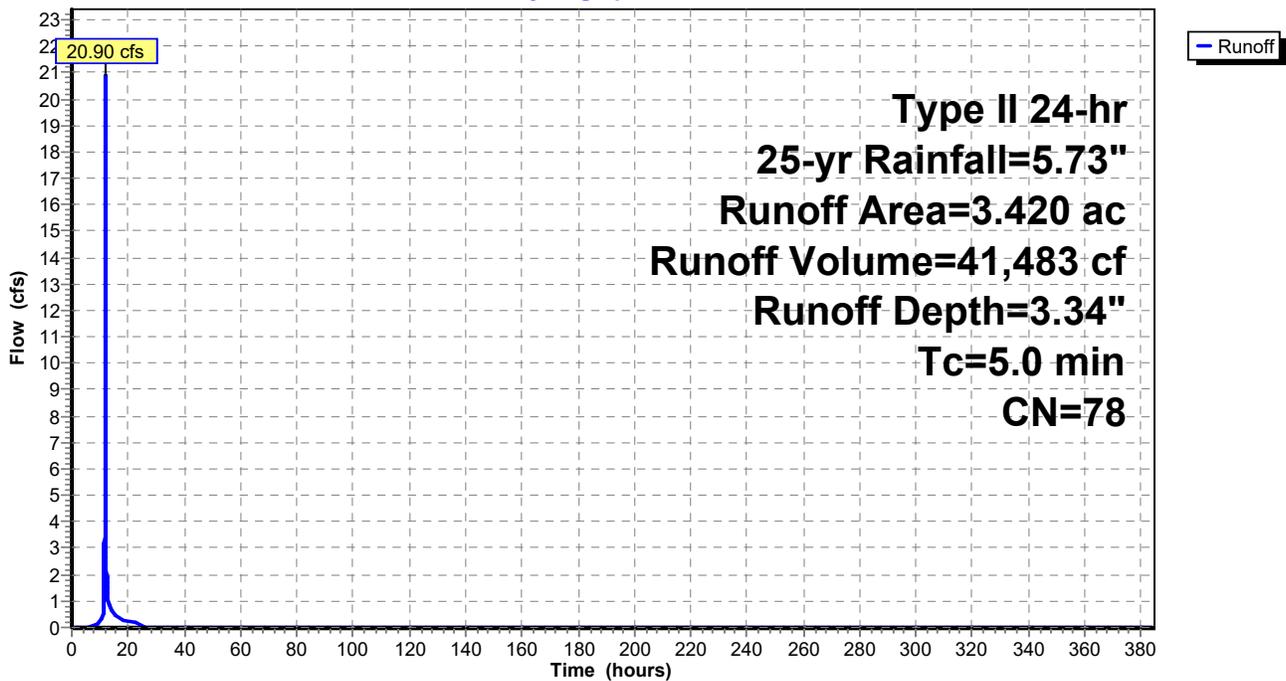
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-yr Rainfall=5.73"

Area (ac)	CN	Description
1.400	74	>75% Grass cover, Good, HSG C
2.020	80	>75% Grass cover, Good, HSG D
3.420	78	Weighted Average
3.420		100.00% Pervious Area

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

Subcatchment 2S: Dist_Lawn to Basin 1

Hydrograph



Summary for Subcatchment 20S: Onsite Dist_Lawn Bypass

Runoff = 10.88 cfs @ 12.02 hrs, Volume= 25,351 cf, Depth= 2.96"
 Routed to Link 12L : Post_DP-001 Trooper Rd

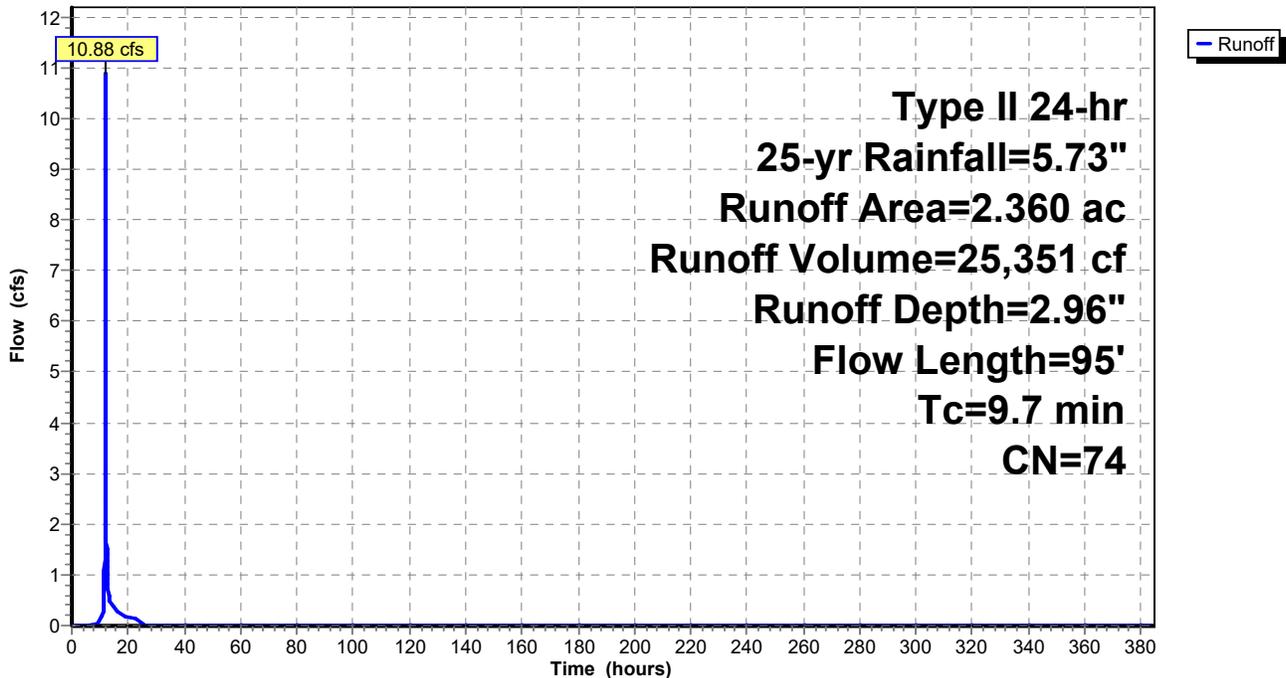
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-yr Rainfall=5.73"

Area (ac)	CN	Description
2.360	74	>75% Grass cover, Good, HSG C
2.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	35	0.2500	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
5.7	60	0.3000	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
9.7	95	Total			

Subcatchment 20S: Onsite Dist_Lawn Bypass

Hydrograph



Summary for Subcatchment 21S: Onsite Dist_Impervious Bypass

Runoff = 1.60 cfs @ 11.96 hrs, Volume= 3,788 cf, Depth= 5.49"
 Routed to Link 12L : Post_DP-001 Trooper Rd

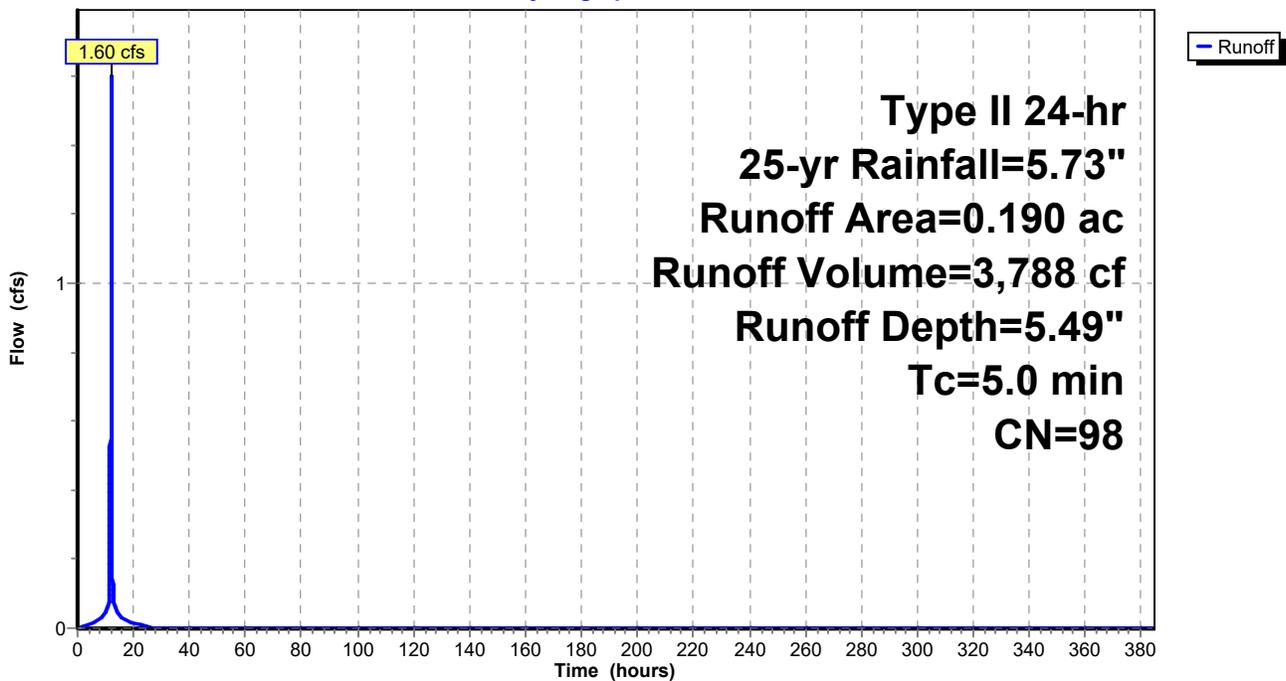
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-yr Rainfall=5.73"

Area (ac)	CN	Description
* 0.190	98	
0.190		100.00% Impervious Area

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

Subcatchment 21S: Onsite Dist_Impervious Bypass

Hydrograph



Summary for Subcatchment 47S: Dist_Lawn

Runoff = 1.42 cfs @ 12.04 hrs, Volume= 3,652 cf, Depth= 2.96"
 Routed to Link 55L : Post_DP-002 Germantown Pike

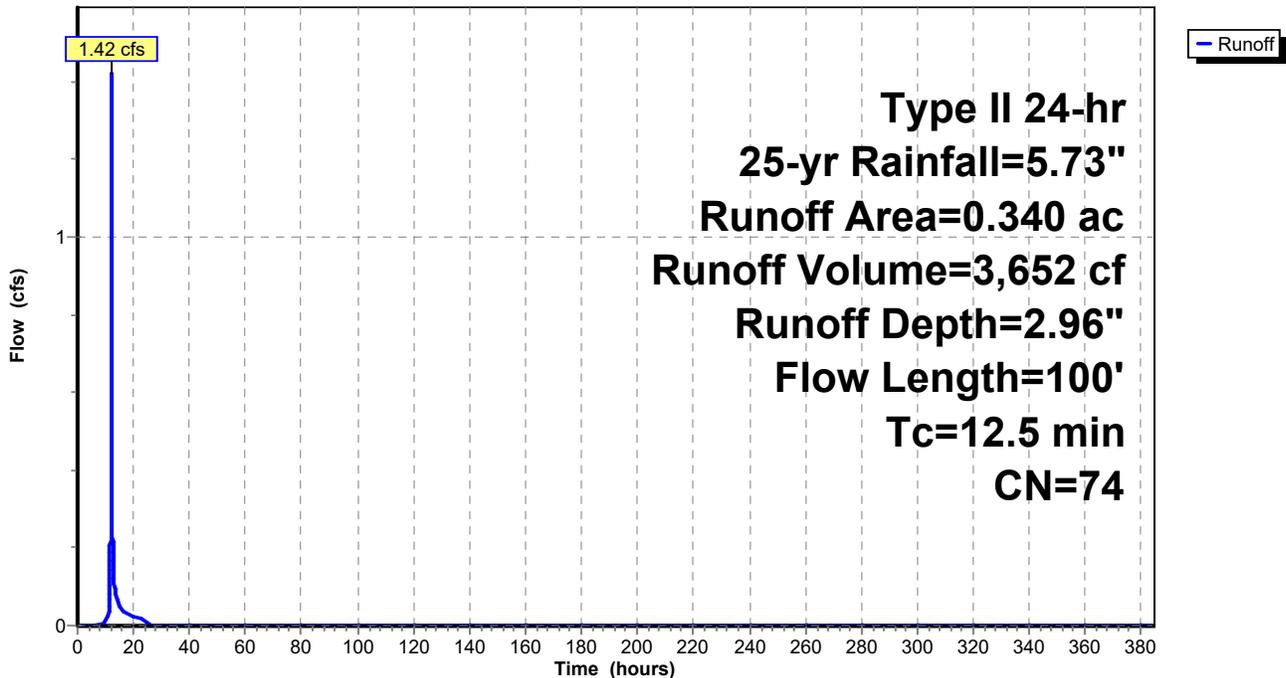
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-yr Rainfall=5.73"

Area (ac)	CN	Description
0.340	74	>75% Grass cover, Good, HSG C
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.3300	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
7.7	50	0.1000	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
12.5	100	Total			

Subcatchment 47S: Dist_Lawn

Hydrograph



Summary for Subcatchment 54S: Dist_Impervious

Runoff = 1.77 cfs @ 11.96 hrs, Volume= 4,187 cf, Depth= 5.49"
 Routed to Link 55L : Post_DP-002 Germantown Pike

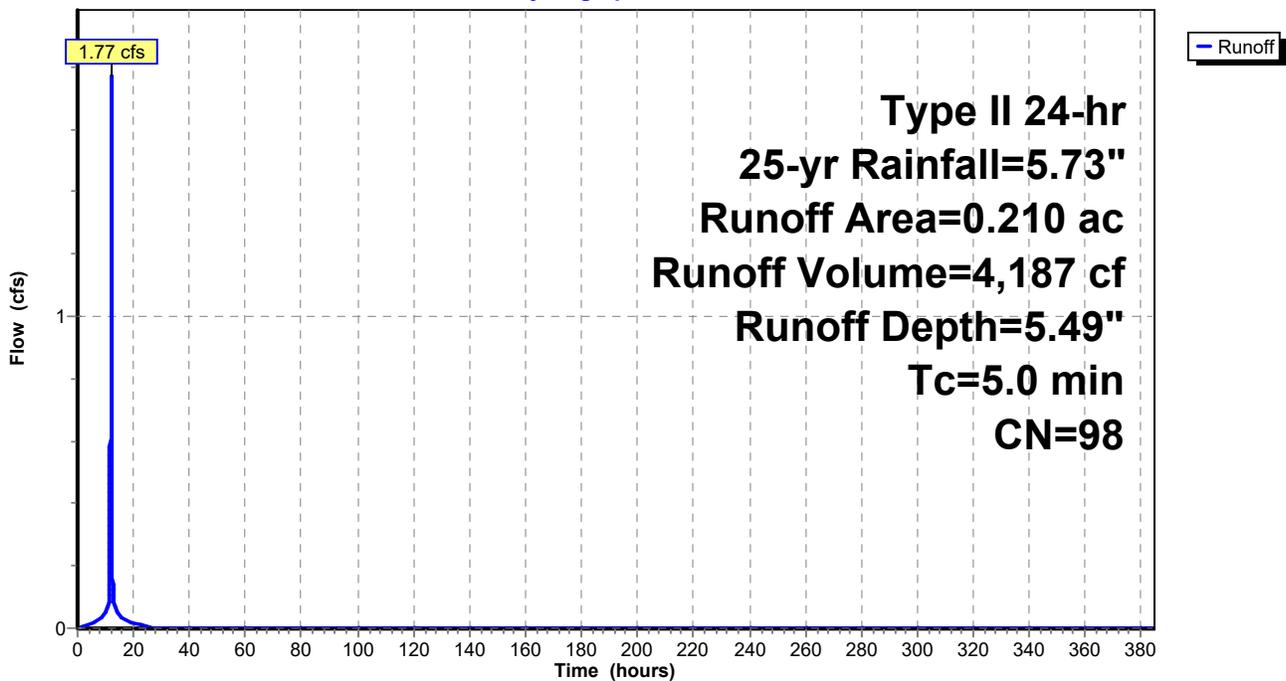
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-yr Rainfall=5.73"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.210		100.00% Impervious Area

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

Subcatchment 54S: Dist_Impervious

Hydrograph



Summary for Pond 3P: Basin 1_Above Ground

Inflow Area = 307,969 sf, 51.63% Impervious, Inflow Depth = 4.45" for 25-yr event
 Inflow = 51.63 cfs @ 11.96 hrs, Volume= 114,252 cf
 Outflow = 36.28 cfs @ 12.02 hrs, Volume= 112,280 cf, Atten= 30%, Lag= 3.6 min
 Primary = 0.05 cfs @ 12.02 hrs, Volume= 16,984 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd
 Secondary = 36.23 cfs @ 12.02 hrs, Volume= 95,296 cf
 Routed to Pond 15P : Basin 1_Underground
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 363.25' @ 12.02 hrs Surf.Area= 20,106 sf Storage= 51,039 cf

Plug-Flow detention time= 772.3 min calculated for 112,277 cf (98% of inflow)
 Center-of-Mass det. time= 761.5 min (1,530.0 - 768.5)

Volume	Invert	Avail.Storage	Storage Description
#1	357.00'	67,002 cf	Raingarden Custom Stage Data (Prismatic) , listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	1,962	0	0
357.99	1,962	1,942	1,942
358.00	3,925	29	1,972
359.00	3,925	3,925	5,897
360.00	3,925	3,925	9,822
360.99	3,925	3,886	13,708
361.00	13,086	85	13,793
362.00	16,104	14,595	28,388
363.00	19,270	17,687	46,075
364.00	22,584	20,927	67,002

Device	Routing	Invert	Outlet Devices
#1	Primary	358.00'	0.9" Vert. MRC Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Secondary	362.25'	12.0" W x 4.0" H Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Secondary	362.70'	24.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	361.05'	0.5' long OCS_Sharp-Crested Rectangular Weir 2 End Contraction(s)
#5	Tertiary	363.75'	90.0' long + 5.0 ' SideZ x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

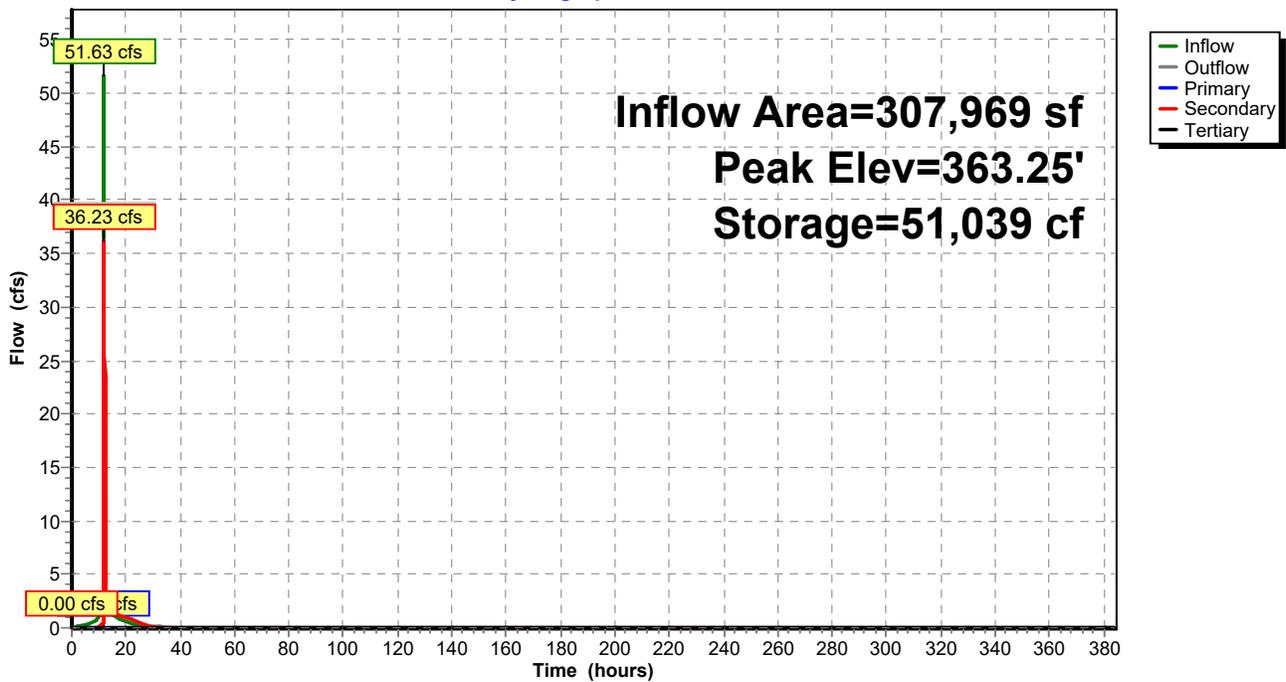
Primary OutFlow Max=0.05 cfs @ 12.02 hrs HW=363.25' (Free Discharge)
 ↳1=MRC Orifice/Grate (Orifice Controls 0.05 cfs @ 10.99 fps)

Secondary OutFlow Max=36.13 cfs @ 12.02 hrs HW=363.25' (Free Discharge)
 ↳2=Orifice (Orifice Controls 1.46 cfs @ 4.39 fps)
 ↳3=Sharp-Crested Rectangular Weir (Weir Controls 31.99 cfs @ 2.43 fps)
 ↳4=OCS_Shape-Crested Rectangular Weir (Weir Controls 2.67 cfs @ 4.85 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=357.00' (Free Discharge)
 ↳5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: Basin 1_Above Ground

Hydrograph



Summary for Pond 15P: Basin 1_Underground

Inflow = 36.23 cfs @ 12.02 hrs, Volume= 95,296 cf
 Outflow = 4.86 cfs @ 12.53 hrs, Volume= 95,296 cf, Atten= 87%, Lag= 31.0 min
 Primary = 4.86 cfs @ 12.53 hrs, Volume= 95,296 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 354.84' @ 12.53 hrs Surf.Area= 11,564 sf Storage= 25,554 cf

Plug-Flow detention time= 62.4 min calculated for 95,293 cf (100% of inflow)
 Center-of-Mass det. time= 62.4 min (1,008.2 - 945.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	351.00'	17,650 cf	54.29'W x 213.00'L x 6.00'H Field A 69,387 cf Overall - 25,263 cf Embedded = 44,124 cf x 40.0% Voids
#2A	352.00'	21,087 cf	ADS N-12 48" x 80 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 80 Chambers in 8 Rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3	357.00'	108 cf	ocs (Prismatic) Listed below (Recalc)
		38,845 cf	Total Available Storage

Storage Group A created with Chamber Wizard

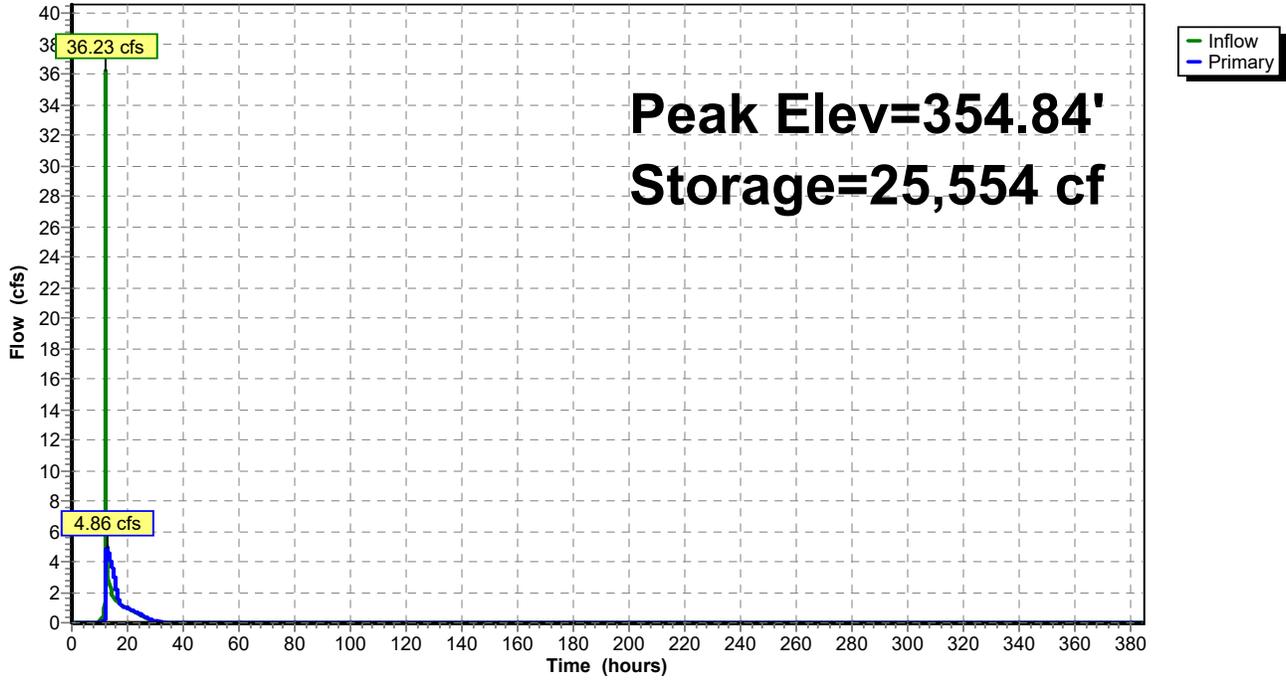
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	36	0	0
358.00	36	36	36
359.00	36	36	72
360.00	36	36	108

Device	Routing	Invert	Outlet Devices
#1	Primary	351.00'	24.0" Round Culvert Outlet Pipe from OCS L= 230.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 351.00' / 346.50' S= 0.0196 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	351.00'	10.0" Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	356.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=4.86 cfs @ 12.53 hrs HW=354.84' (Free Discharge)
 1=Culvert Outlet Pipe from OCS (Passes 4.86 cfs of 25.51 cfs potential flow)
 2=Orifice (Orifice Controls 4.86 cfs @ 8.91 fps)
 3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 15P: Basin 1_Underground

Hydrograph



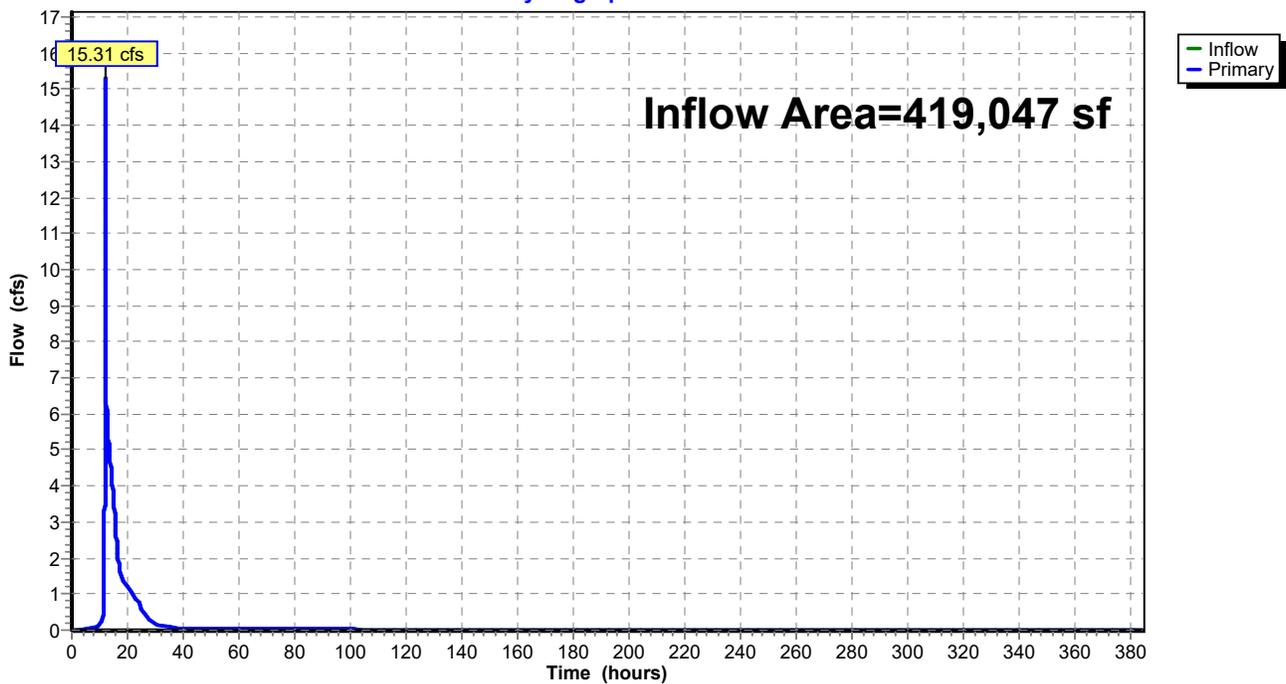
Summary for Link 12L: Post_DP-001 Trooper Rd

Inflow Area = 419,047 sf, 39.92% Impervious, Inflow Depth = 4.05" for 25-yr event
Inflow = 15.31 cfs @ 12.02 hrs, Volume= 141,418 cf
Primary = 15.31 cfs @ 12.02 hrs, Volume= 141,418 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 12L: Post_DP-001 Trooper Rd

Hydrograph



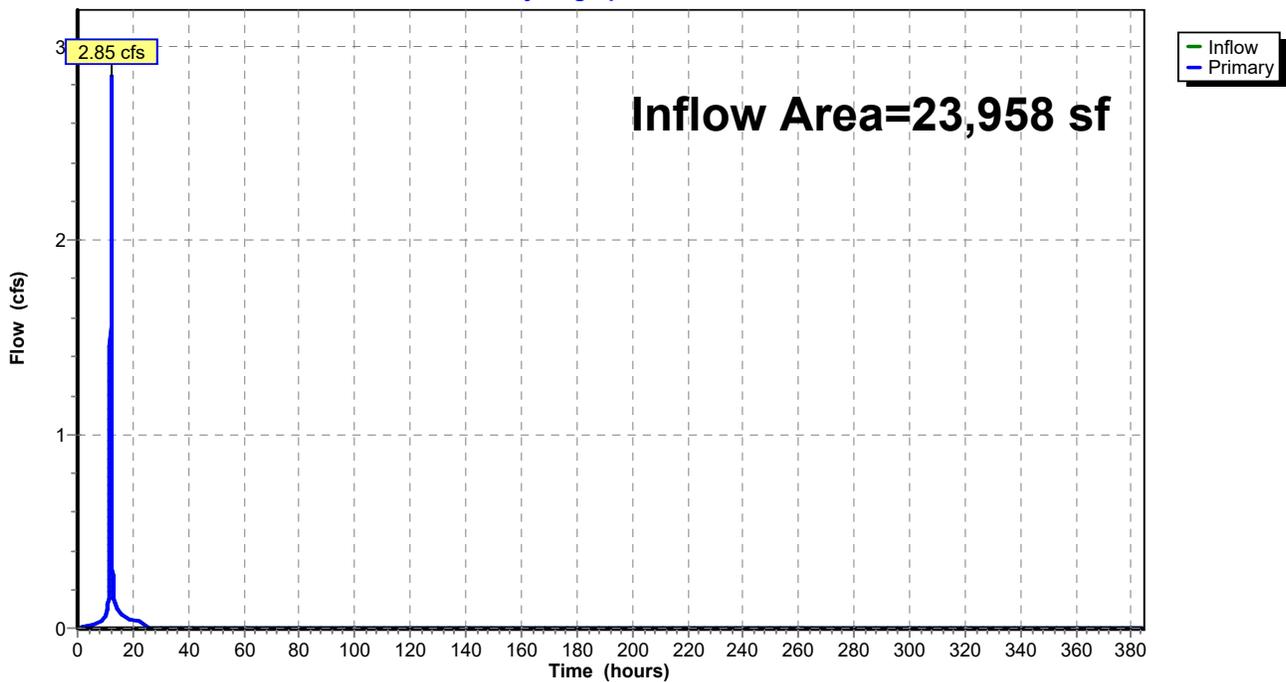
Summary for Link 55L: Post_DP-002 Germantown Pike

Inflow Area = 23,958 sf, 38.18% Impervious, Inflow Depth = 3.93" for 25-yr event
Inflow = 2.85 cfs @ 11.98 hrs, Volume= 7,839 cf
Primary = 2.85 cfs @ 11.98 hrs, Volume= 7,839 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 55L: Post_DP-002 Germantown Pike

Hydrograph



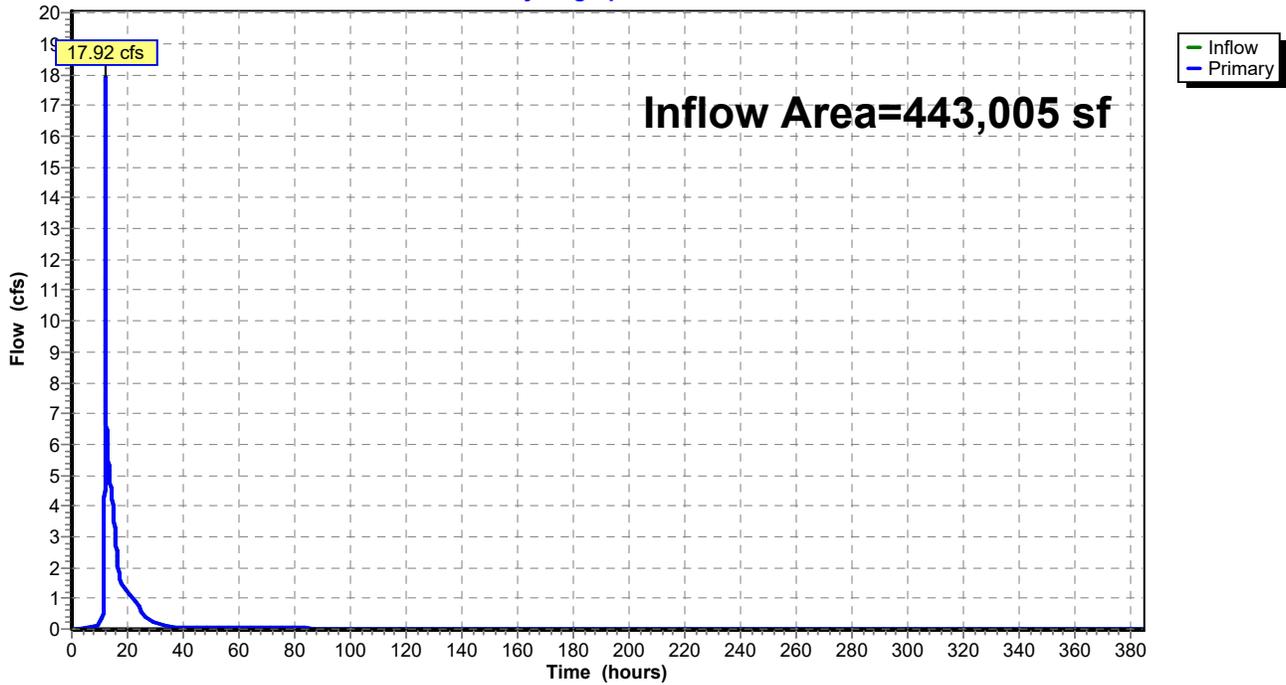
Summary for Link 66L: POST TOTAL

Inflow Area = 443,005 sf, 39.82% Impervious, Inflow Depth = 4.04" for 25-yr event
Inflow = 17.92 cfs @ 12.01 hrs, Volume= 149,257 cf
Primary = 17.92 cfs @ 12.01 hrs, Volume= 149,257 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 66L: POST TOTAL

Hydrograph



Summary for Subcatchment 1S: Dist_Impervious to Basin 1

Runoff = 35.25 cfs @ 11.96 hrs, Volume= 83,754 cf, Depth= 6.32"
 Routed to Pond 3P : Basin 1_Above Ground

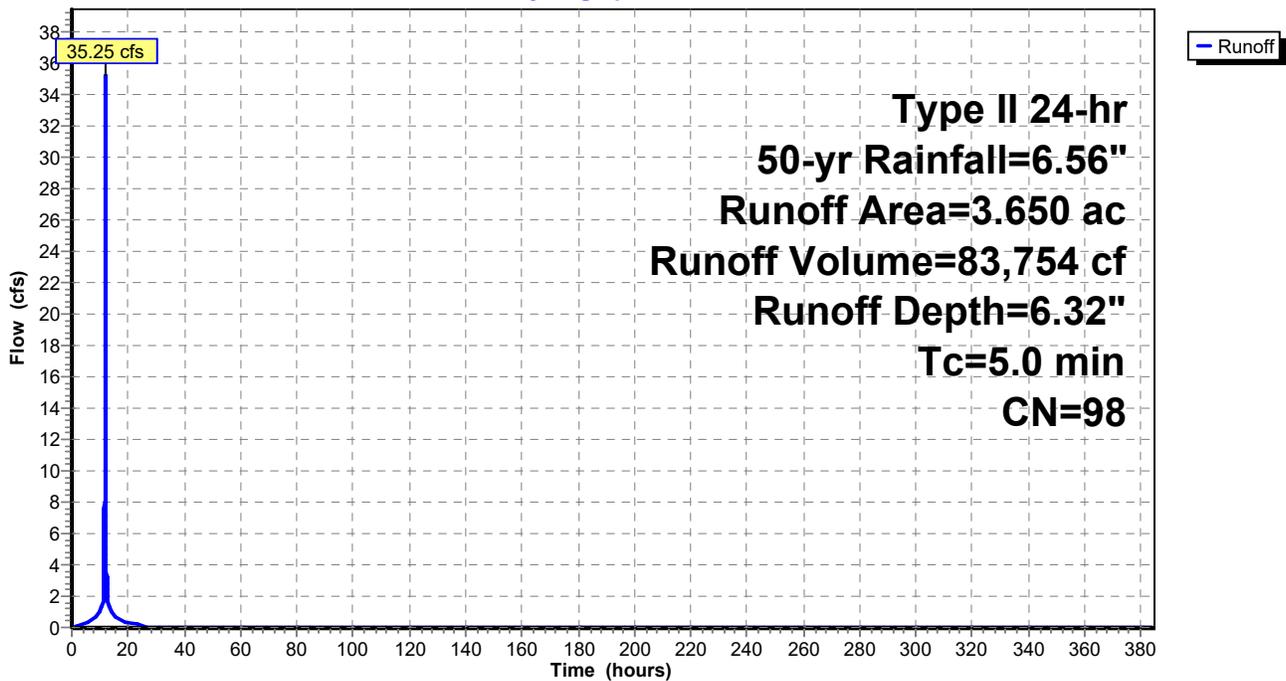
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-yr Rainfall=6.56"

Area (ac)	CN	Description
* 1.370	98	impervious - roadway, sidewalk
* 2.280	98	impervious - 40 total units
3.650	98	Weighted Average
3.650		100.00% Impervious Area

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

Subcatchment 1S: Dist_Impervious to Basin 1

Hydrograph



Summary for Subcatchment 2S: Dist_Lawn to Basin 1

Runoff = 25.28 cfs @ 11.96 hrs, Volume= 50,623 cf, Depth= 4.08"
 Routed to Pond 3P : Basin 1_Above Ground

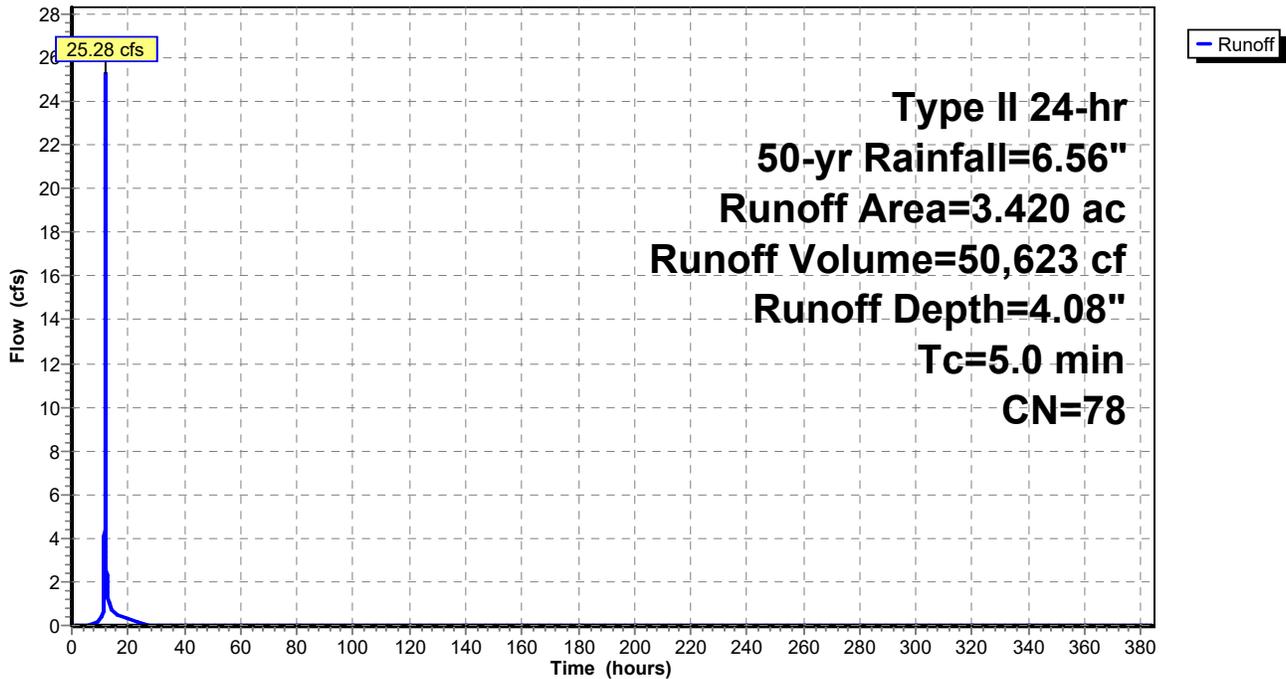
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-yr Rainfall=6.56"

Area (ac)	CN	Description
1.400	74	>75% Grass cover, Good, HSG C
2.020	80	>75% Grass cover, Good, HSG D
3.420	78	Weighted Average
3.420		100.00% Pervious Area

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

Subcatchment 2S: Dist_Lawn to Basin 1

Hydrograph



Summary for Subcatchment 20S: Onsite Dist_Lawn Bypass

Runoff = 13.41 cfs @ 12.01 hrs, Volume= 31,364 cf, Depth= 3.66"
 Routed to Link 12L : Post_DP-001 Trooper Rd

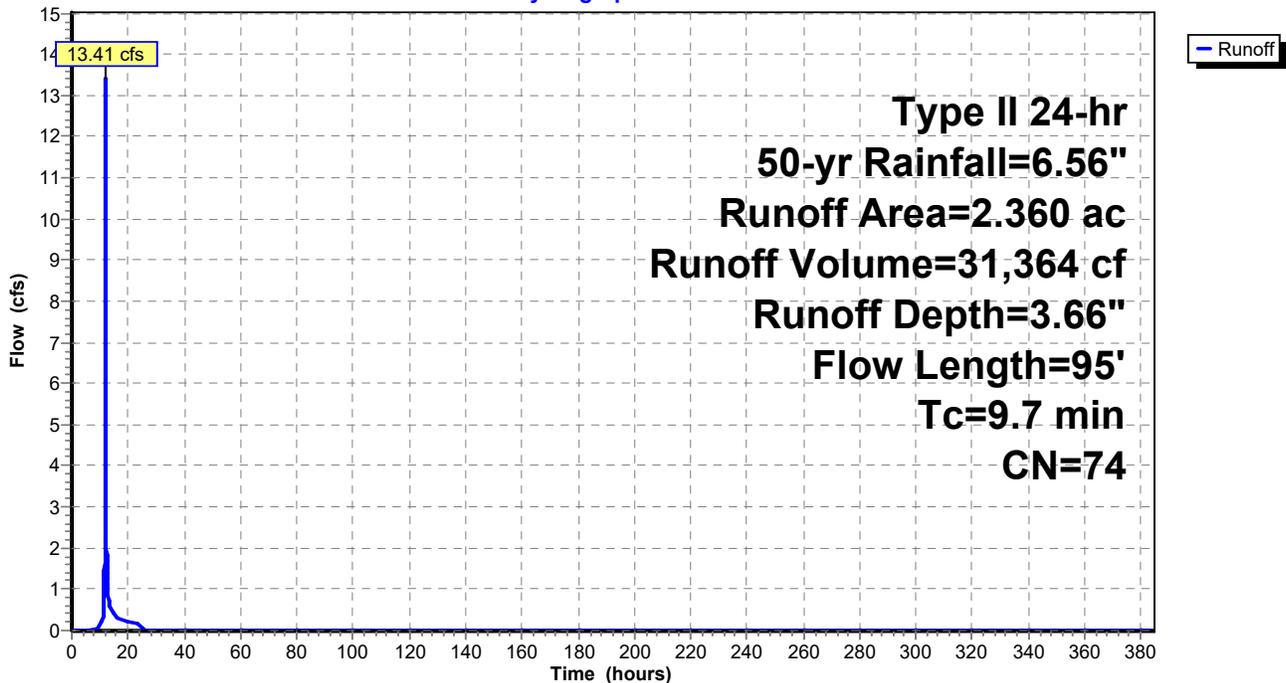
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-yr Rainfall=6.56"

Area (ac)	CN	Description
2.360	74	>75% Grass cover, Good, HSG C
2.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	35	0.2500	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
5.7	60	0.3000	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
9.7	95	Total			

Subcatchment 20S: Onsite Dist_Lawn Bypass

Hydrograph



Summary for Subcatchment 21S: Onsite Dist_Impervious Bypass

Runoff = 1.83 cfs @ 11.96 hrs, Volume= 4,360 cf, Depth= 6.32"
 Routed to Link 12L : Post_DP-001 Trooper Rd

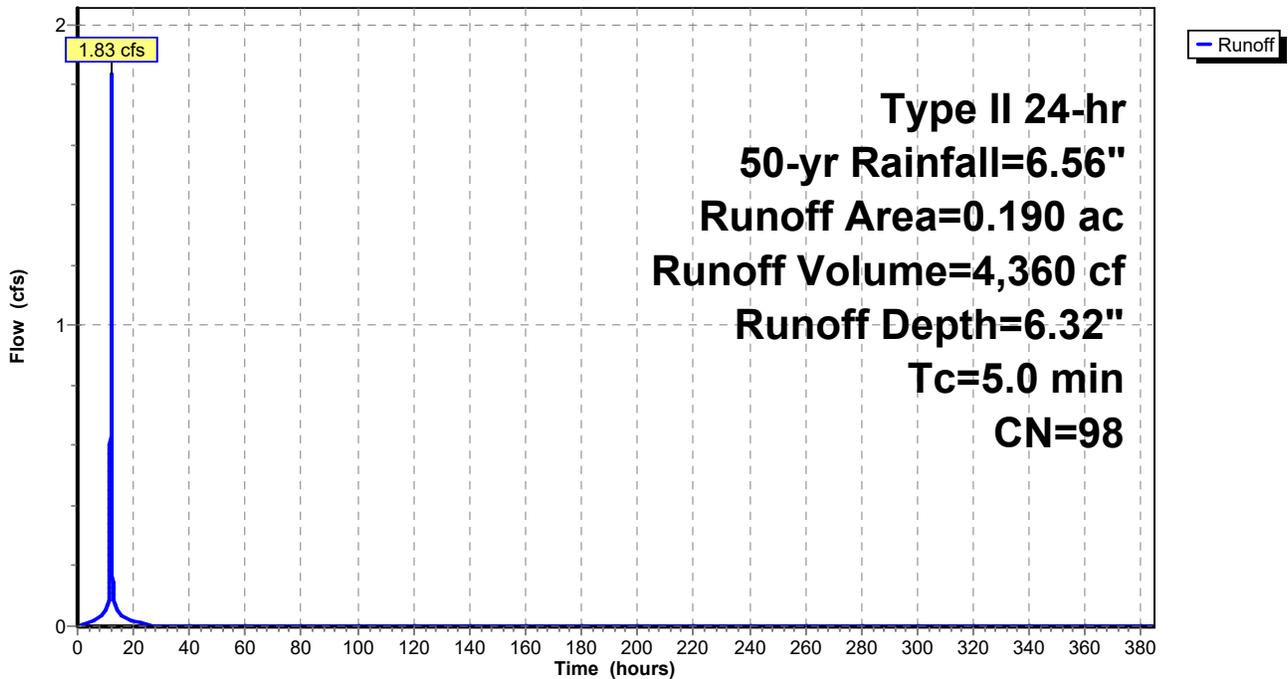
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-yr Rainfall=6.56"

Area (ac)	CN	Description
* 0.190	98	
0.190		100.00% Impervious Area

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

Subcatchment 21S: Onsite Dist_Impervious Bypass

Hydrograph



Summary for Subcatchment 47S: Dist_Lawn

Runoff = 1.75 cfs @ 12.04 hrs, Volume= 4,519 cf, Depth= 3.66"
 Routed to Link 55L : Post_DP-002 Germantown Pike

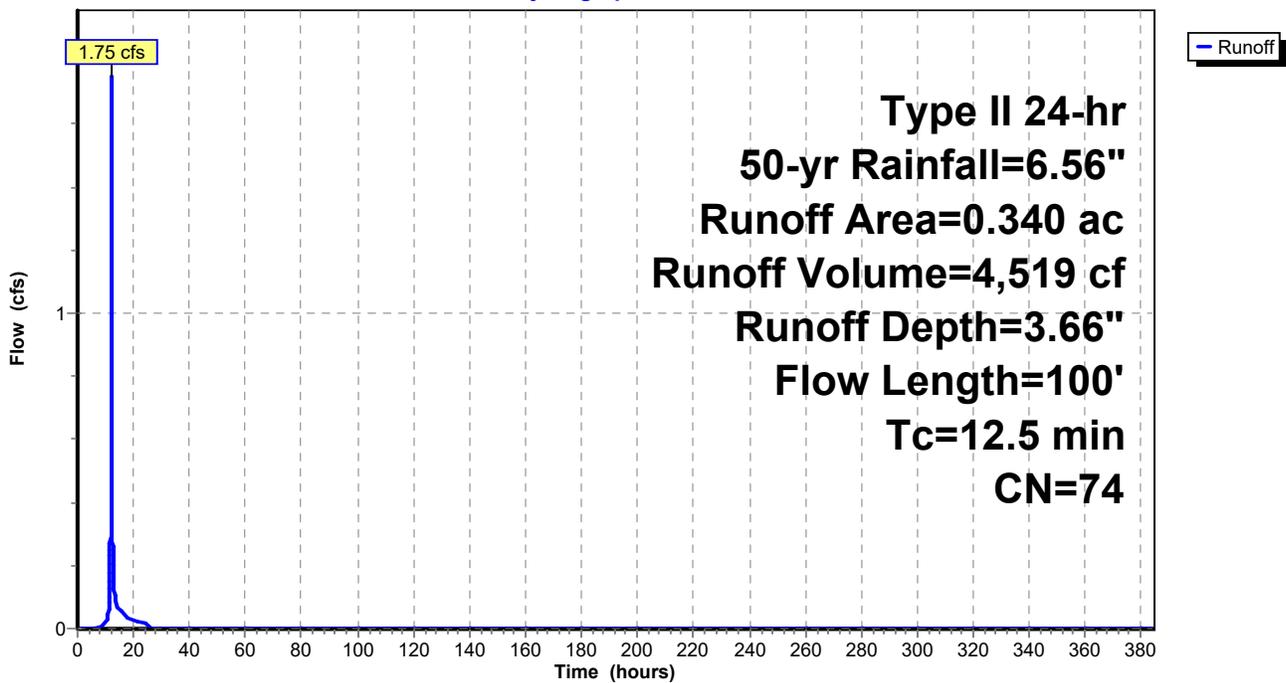
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-yr Rainfall=6.56"

Area (ac)	CN	Description
0.340	74	>75% Grass cover, Good, HSG C
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.3300	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
7.7	50	0.1000	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
12.5	100	Total			

Subcatchment 47S: Dist_Lawn

Hydrograph



Summary for Subcatchment 54S: Dist_Impervious

Runoff = 2.03 cfs @ 11.96 hrs, Volume= 4,819 cf, Depth= 6.32"
 Routed to Link 55L : Post_DP-002 Germantown Pike

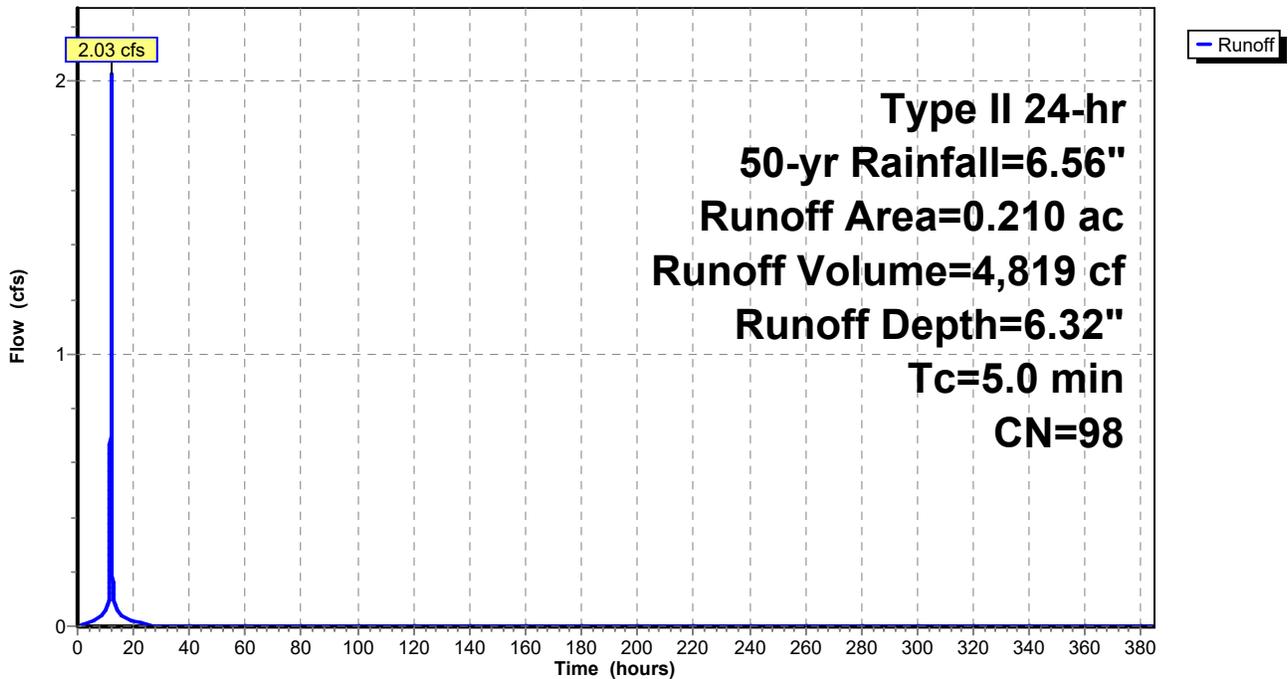
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-yr Rainfall=6.56"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.210		100.00% Impervious Area

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

Subcatchment 54S: Dist_Impervious

Hydrograph



Summary for Pond 3P: Basin 1_Above Ground

Inflow Area = 307,969 sf, 51.63% Impervious, Inflow Depth = 5.24" for 50-yr event
 Inflow = 60.51 cfs @ 11.96 hrs, Volume= 134,377 cf
 Outflow = 48.60 cfs @ 12.00 hrs, Volume= 132,405 cf, Atten= 20%, Lag= 2.8 min
 Primary = 0.05 cfs @ 12.00 hrs, Volume= 17,157 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd
 Secondary = 48.55 cfs @ 12.00 hrs, Volume= 115,248 cf
 Routed to Pond 15P : Basin 1_Underground
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 363.38' @ 12.00 hrs Surf.Area= 20,539 sf Storage= 53,696 cf

Plug-Flow detention time= 671.6 min calculated for 132,402 cf (99% of inflow)
 Center-of-Mass det. time= 662.5 min (1,428.6 - 766.1)

Volume	Invert	Avail.Storage	Storage Description
#1	357.00'	67,002 cf	Raingarden Custom Stage Data (Prismatic) , listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	1,962	0	0
357.99	1,962	1,942	1,942
358.00	3,925	29	1,972
359.00	3,925	3,925	5,897
360.00	3,925	3,925	9,822
360.99	3,925	3,886	13,708
361.00	13,086	85	13,793
362.00	16,104	14,595	28,388
363.00	19,270	17,687	46,075
364.00	22,584	20,927	67,002

Device	Routing	Invert	Outlet Devices
#1	Primary	358.00'	0.9" Vert. MRC Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Secondary	362.25'	12.0" W x 4.0" H Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Secondary	362.70'	24.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	361.05'	0.5' long OCS_Sharp-Crested Rectangular Weir 2 End Contraction(s)
#5	Tertiary	363.75'	90.0' long + 5.0 ' SideZ x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

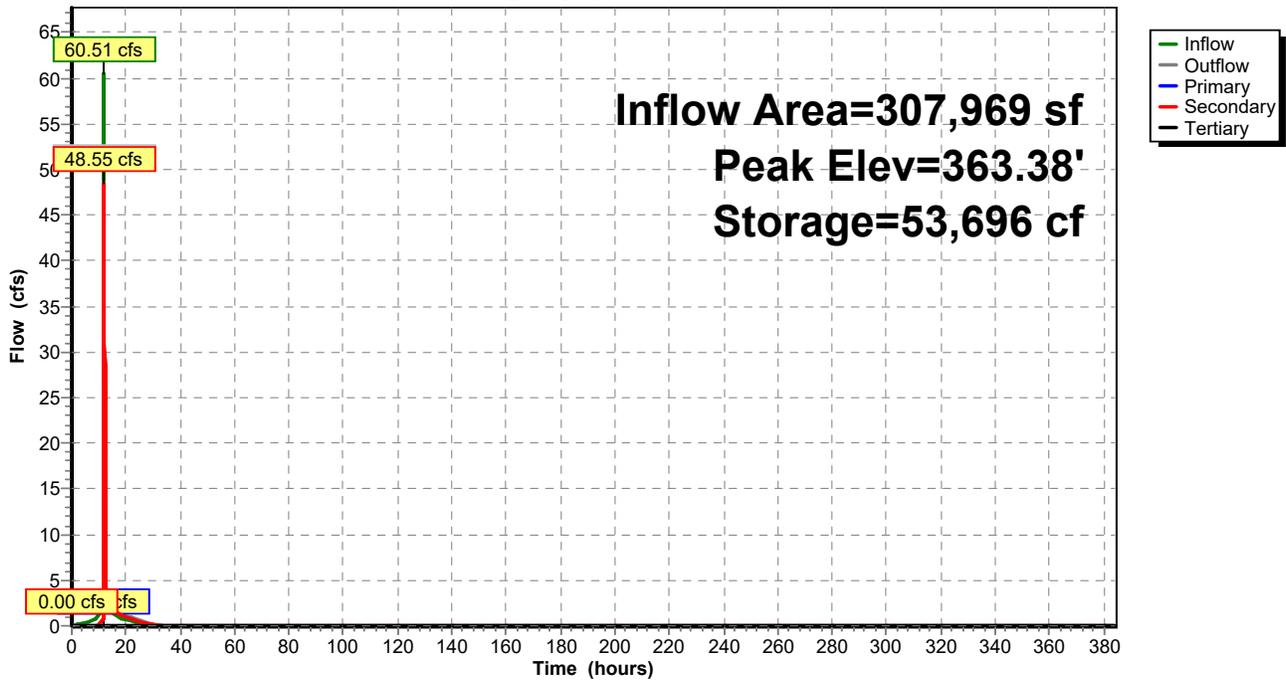
Primary OutFlow Max=0.05 cfs @ 12.00 hrs HW=363.38' (Free Discharge)
 ↳1=MRC Orifice/Grate (Orifice Controls 0.05 cfs @ 11.13 fps)

Secondary OutFlow Max=48.43 cfs @ 12.00 hrs HW=363.38' (Free Discharge)
 ↳2=Orifice (Orifice Controls 1.57 cfs @ 4.72 fps)
 ↳3=Sharp-Crested Rectangular Weir (Weir Controls 43.94 cfs @ 2.70 fps)
 ↳4=OCS_Sharp-Crested Rectangular Weir (Weir Controls 2.91 cfs @ 4.99 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=357.00' (Free Discharge)
 ↳5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: Basin 1_Above Ground

Hydrograph



Summary for Pond 15P: Basin 1_Underground

Inflow = 48.55 cfs @ 12.00 hrs, Volume= 115,248 cf
 Outflow = 7.93 cfs @ 12.36 hrs, Volume= 115,248 cf, Atten= 84%, Lag= 21.2 min
 Primary = 7.93 cfs @ 12.36 hrs, Volume= 115,248 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 356.23' @ 12.36 hrs Surf.Area= 11,564 sf Storage= 35,425 cf

Plug-Flow detention time= 69.0 min calculated for 115,245 cf (100% of inflow)
 Center-of-Mass det. time= 69.1 min (996.8 - 927.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	351.00'	17,650 cf	54.29'W x 213.00'L x 6.00'H Field A 69,387 cf Overall - 25,263 cf Embedded = 44,124 cf x 40.0% Voids
#2A	352.00'	21,087 cf	ADS N-12 48" x 80 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 80 Chambers in 8 Rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3	357.00'	108 cf	ocs (Prismatic) Listed below (Recalc)
		38,845 cf	Total Available Storage

Storage Group A created with Chamber Wizard

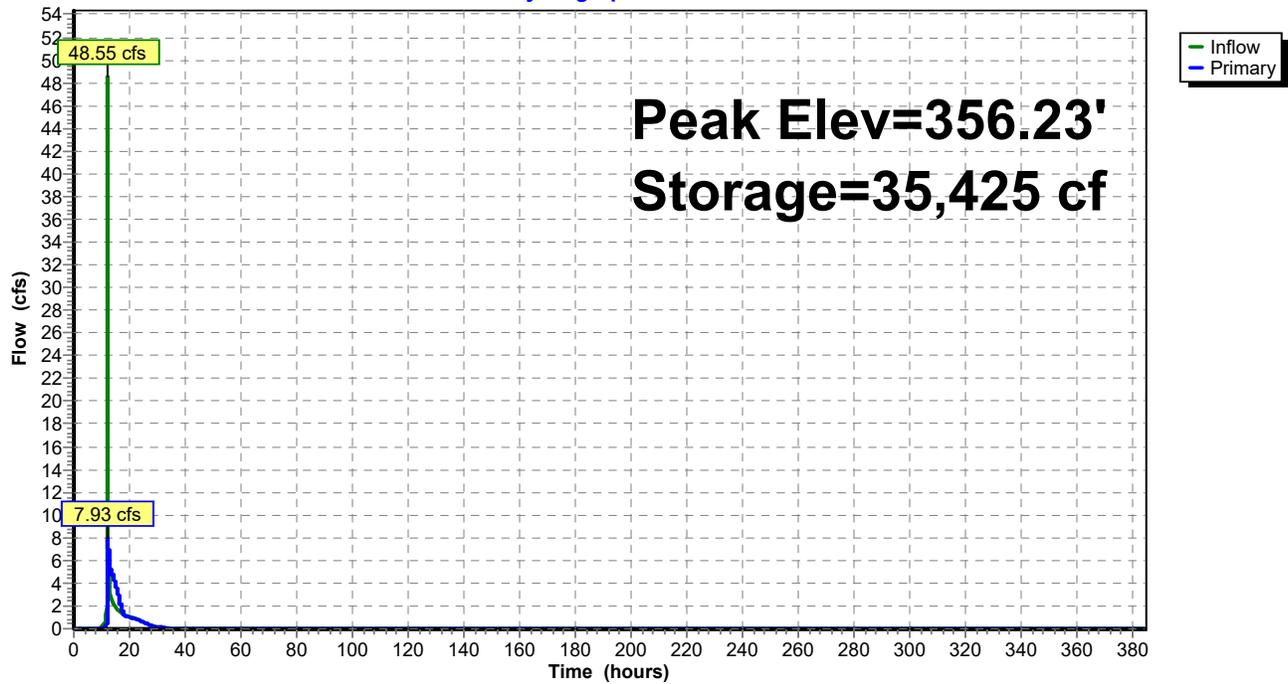
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	36	0	0
358.00	36	36	36
359.00	36	36	72
360.00	36	36	108

Device	Routing	Invert	Outlet Devices
#1	Primary	351.00'	24.0" Round Culvert Outlet Pipe from OCS L= 230.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 351.00' / 346.50' S= 0.0196 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	351.00'	10.0" Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	356.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=7.92 cfs @ 12.36 hrs HW=356.23' (Free Discharge)
 1=Culvert Outlet Pipe from OCS (Passes 7.92 cfs of 31.11 cfs potential flow)
 2=Orifice (Orifice Controls 5.76 cfs @ 10.56 fps)
 3=Sharp-Crested Rectangular Weir (Weir Controls 2.16 cfs @ 1.57 fps)

Pond 15P: Basin 1_Underground

Hydrograph



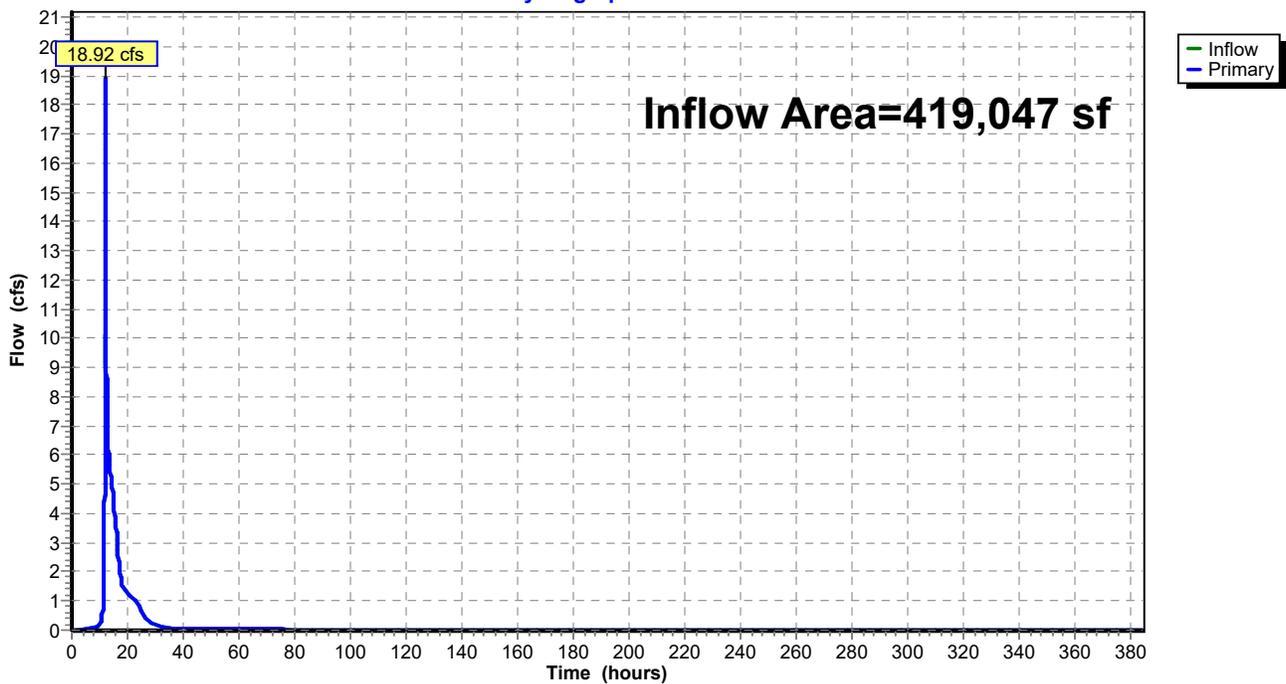
Summary for Link 12L: Post_DP-001 Trooper Rd

Inflow Area = 419,047 sf, 39.92% Impervious, Inflow Depth = 4.81" for 50-yr event
Inflow = 18.92 cfs @ 12.01 hrs, Volume= 168,129 cf
Primary = 18.92 cfs @ 12.01 hrs, Volume= 168,129 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 12L: Post_DP-001 Trooper Rd

Hydrograph

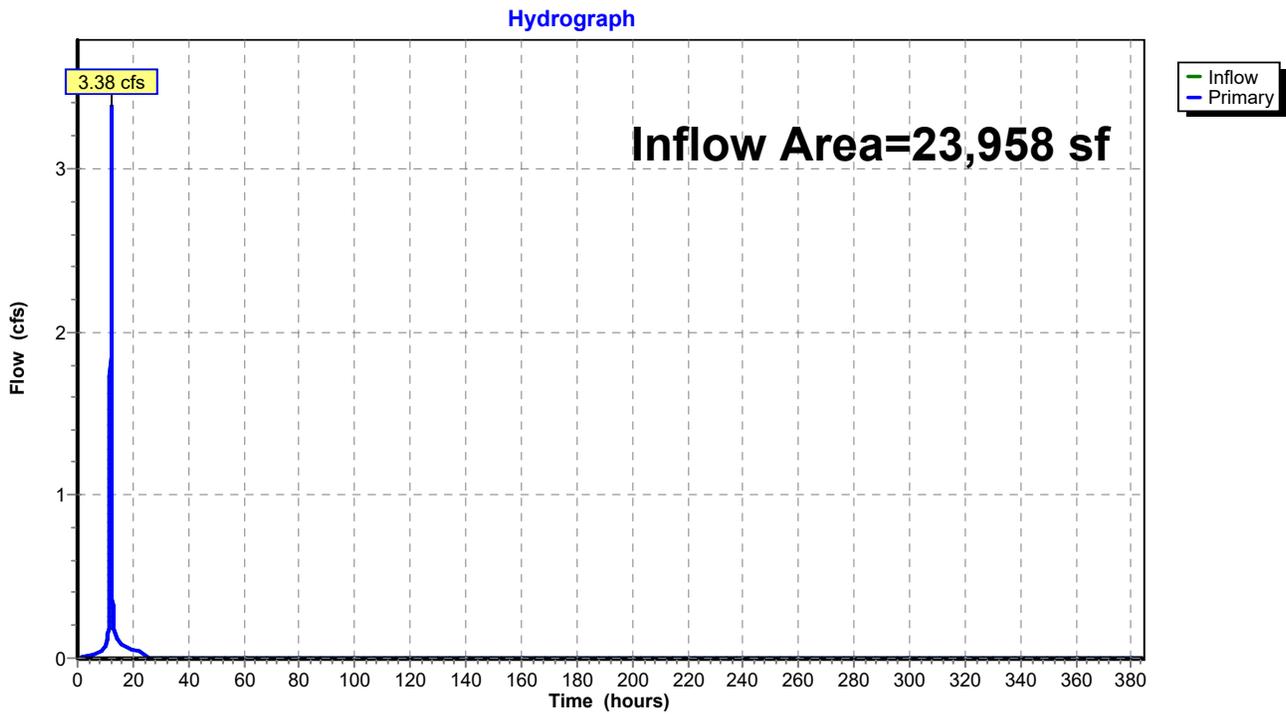


Summary for Link 55L: Post_DP-002 Germantown Pike

Inflow Area = 23,958 sf, 38.18% Impervious, Inflow Depth = 4.68" for 50-yr event
Inflow = 3.38 cfs @ 11.98 hrs, Volume= 9,337 cf
Primary = 3.38 cfs @ 11.98 hrs, Volume= 9,337 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 55L: Post_DP-002 Germantown Pike



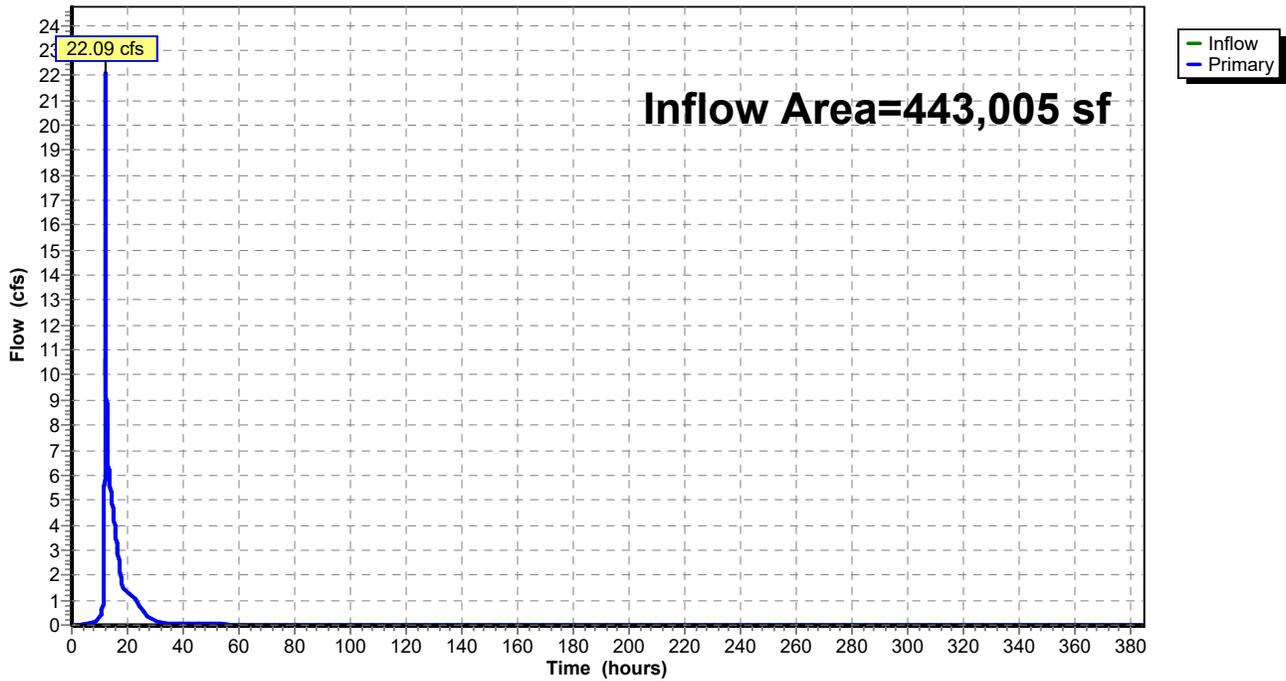
Summary for Link 66L: POST TOTAL

Inflow Area = 443,005 sf, 39.82% Impervious, Inflow Depth = 4.81" for 50-yr event
Inflow = 22.09 cfs @ 12.01 hrs, Volume= 177,467 cf
Primary = 22.09 cfs @ 12.01 hrs, Volume= 177,467 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 66L: POST TOTAL

Hydrograph



Summary for Subcatchment 1S: Dist_Impervious to Basin 1

Runoff = 40.06 cfs @ 11.96 hrs, Volume= 95,536 cf, Depth= 7.21"
 Routed to Pond 3P : Basin 1_Above Ground

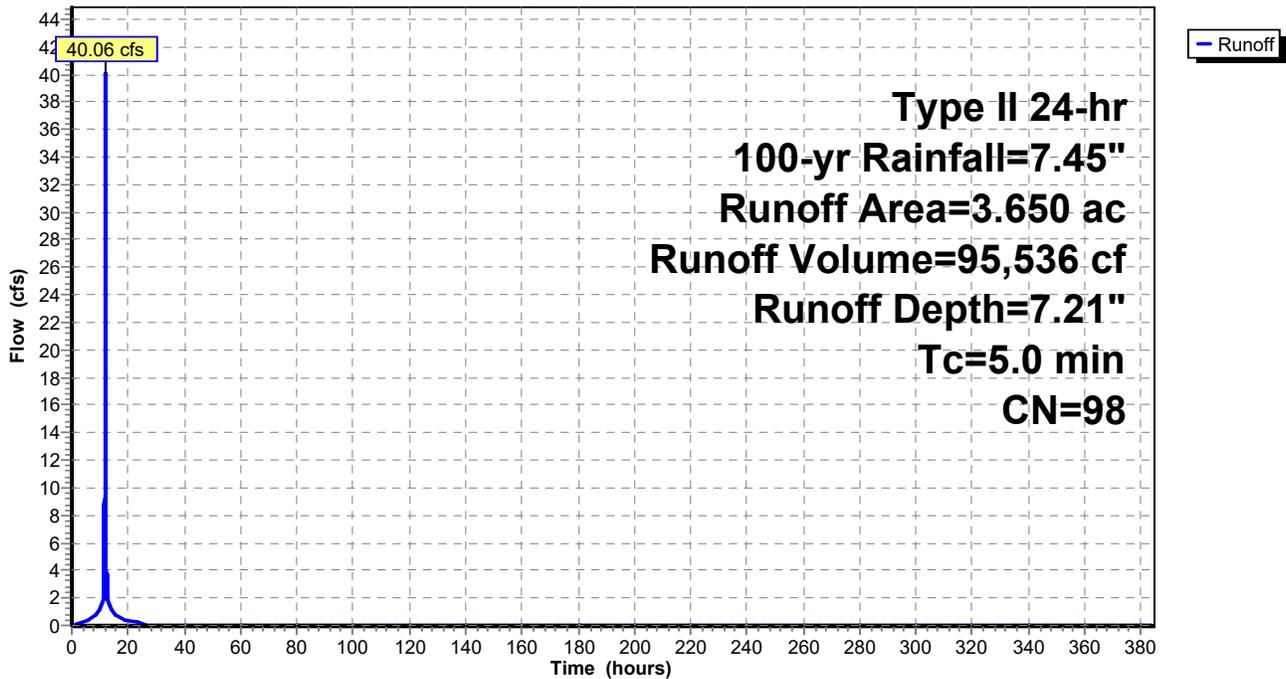
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
* 1.370	98	impervious - roadway, sidewalk
* 2.280	98	impervious - 40 total units
3.650	98	Weighted Average
3.650		100.00% Impervious Area

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

Subcatchment 1S: Dist_Impervious to Basin 1

Hydrograph



Summary for Subcatchment 2S: Dist_Lawn to Basin 1

Runoff = 30.01 cfs @ 11.96 hrs, Volume= 60,645 cf, Depth= 4.88"
 Routed to Pond 3P : Basin 1_Above Ground

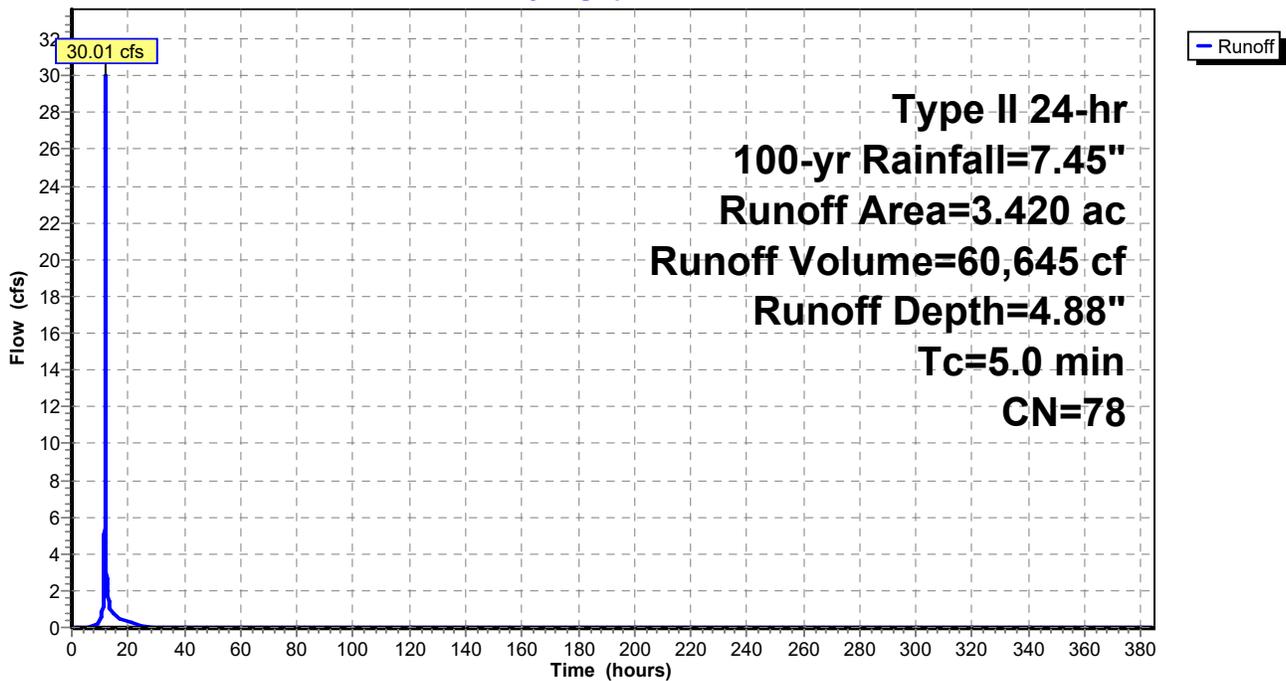
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
1.400	74	>75% Grass cover, Good, HSG C
2.020	80	>75% Grass cover, Good, HSG D
3.420	78	Weighted Average
3.420		100.00% Pervious Area

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

Subcatchment 2S: Dist_Lawn to Basin 1

Hydrograph



Summary for Subcatchment 20S: Onsite Dist_Lawn Bypass

Runoff = 16.17 cfs @ 12.01 hrs, Volume= 38,010 cf, Depth= 4.44"
 Routed to Link 12L : Post_DP-001 Trooper Rd

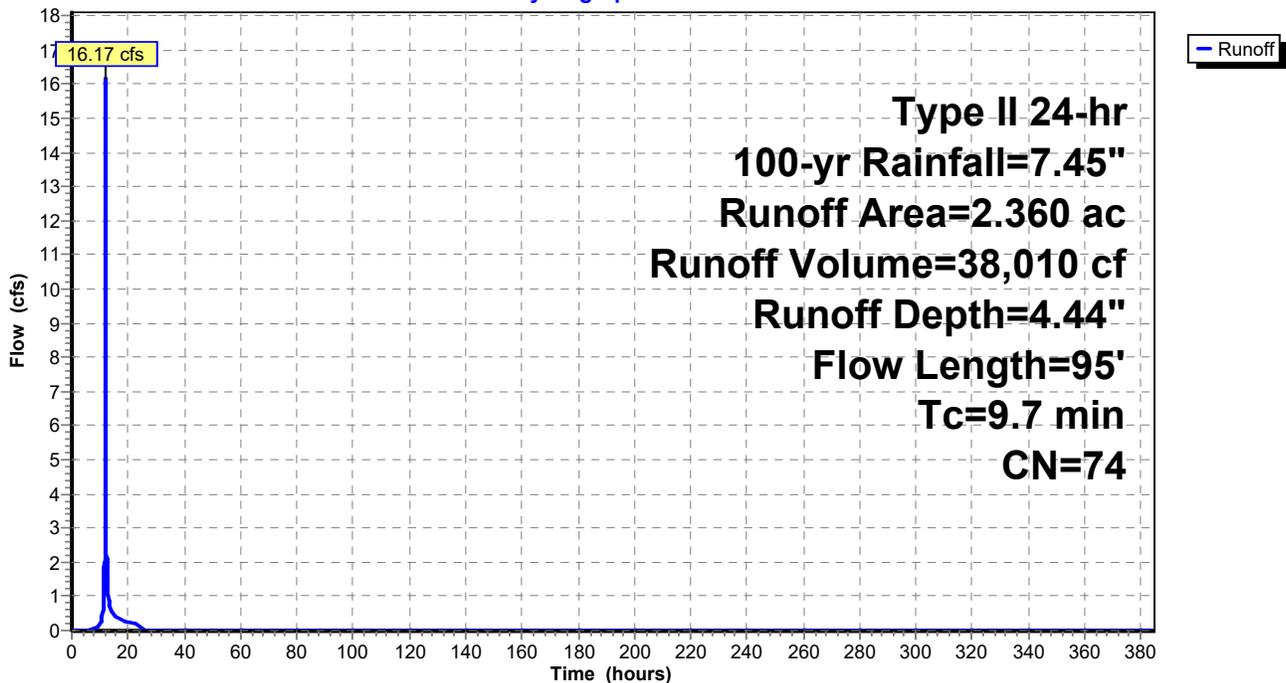
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
2.360	74	>75% Grass cover, Good, HSG C
2.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	35	0.2500	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
5.7	60	0.3000	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
9.7	95	Total			

Subcatchment 20S: Onsite Dist_Lawn Bypass

Hydrograph



Summary for Subcatchment 21S: Onsite Dist_Impervious Bypass

Runoff = 2.09 cfs @ 11.96 hrs, Volume= 4,973 cf, Depth= 7.21"
 Routed to Link 12L : Post_DP-001 Trooper Rd

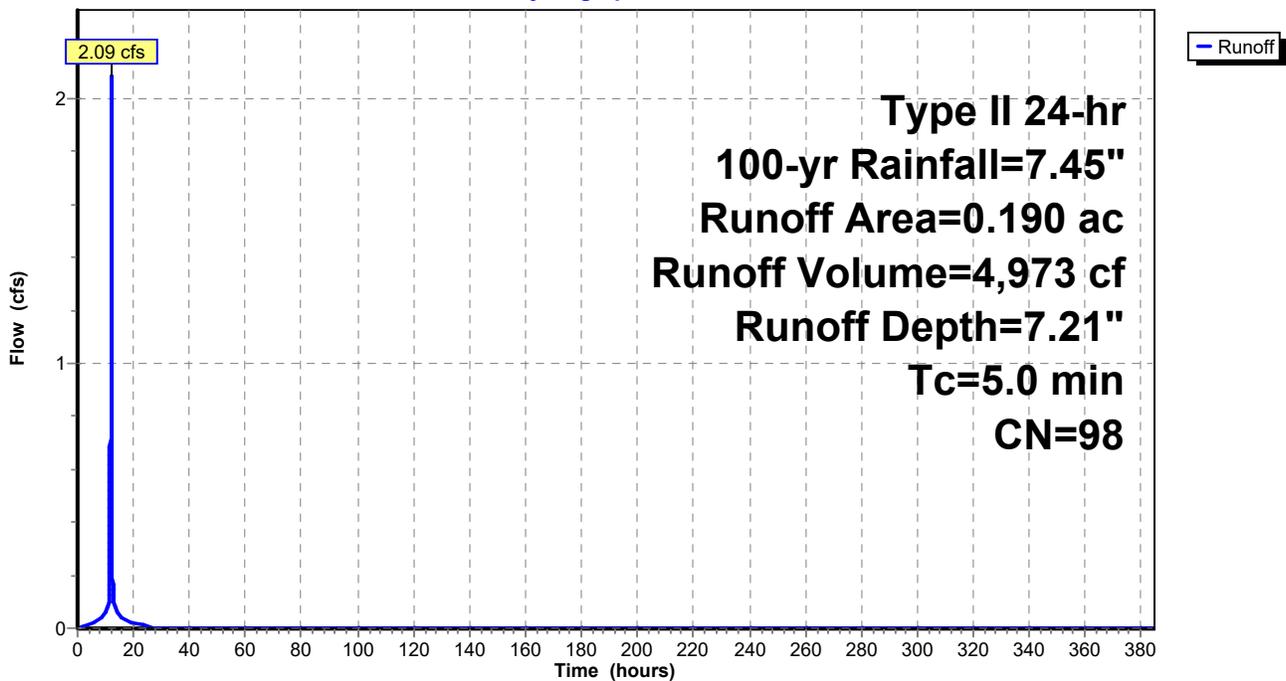
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
* 0.190	98	
0.190		100.00% Impervious Area

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

Subcatchment 21S: Onsite Dist_Impervious Bypass

Hydrograph



Summary for Subcatchment 47S: Dist_Lawn

Runoff = 2.12 cfs @ 12.04 hrs, Volume= 5,476 cf, Depth= 4.44"
 Routed to Link 55L : Post_DP-002 Germantown Pike

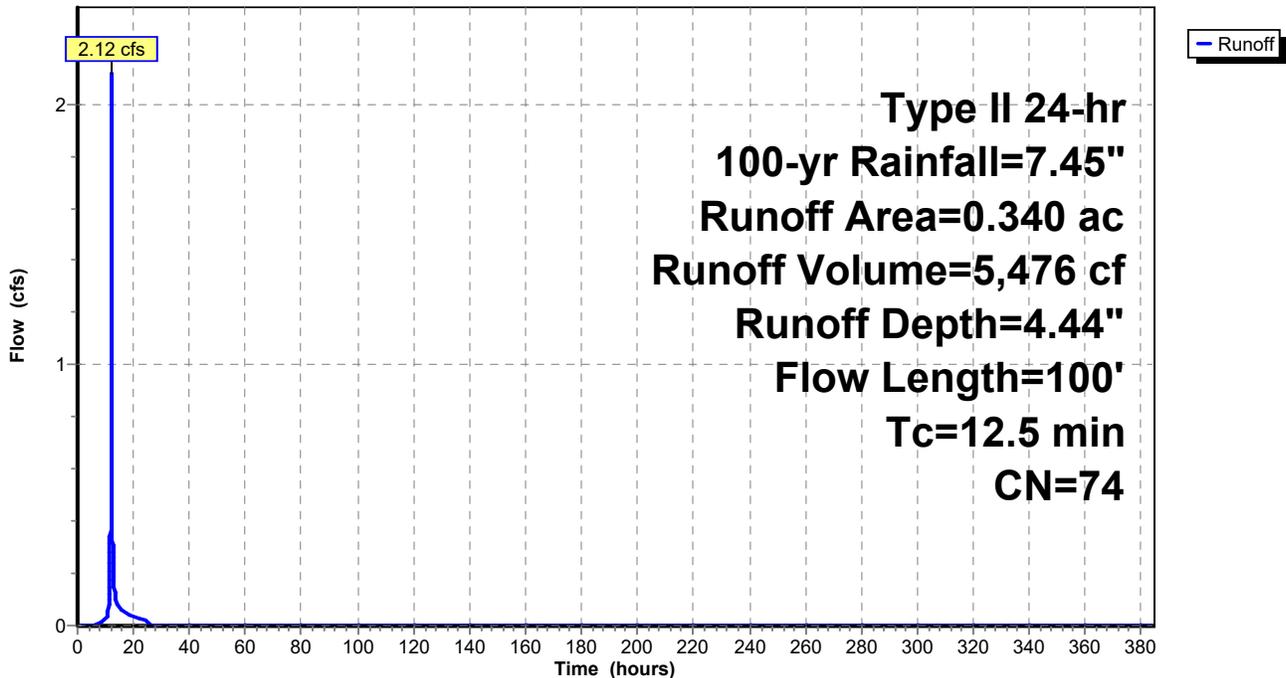
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.340	74	>75% Grass cover, Good, HSG C
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.3300	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
7.7	50	0.1000	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
12.5	100	Total			

Subcatchment 47S: Dist_Lawn

Hydrograph



Summary for Subcatchment 54S: Dist_Impervious

Runoff = 2.30 cfs @ 11.96 hrs, Volume= 5,497 cf, Depth= 7.21"
 Routed to Link 55L : Post_DP-002 Germantown Pike

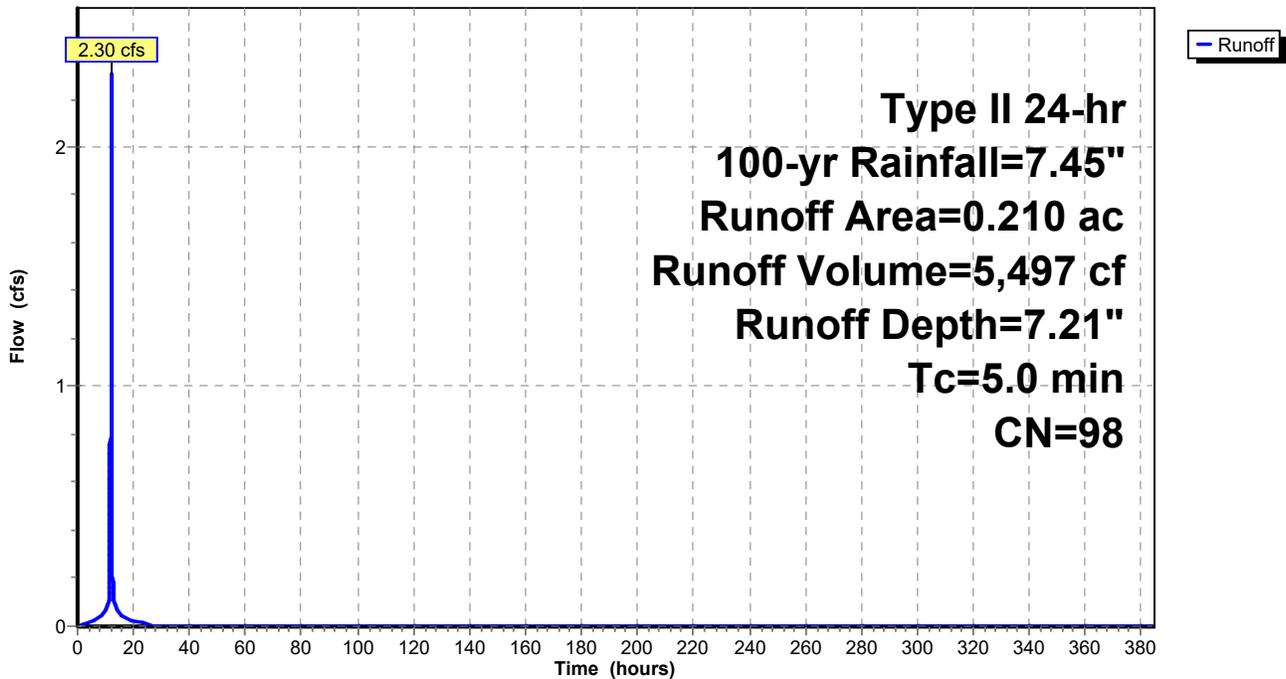
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.210		100.00% Impervious Area

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

Subcatchment 54S: Dist_Impervious

Hydrograph



Summary for Pond 3P: Basin 1_Above Ground

Inflow Area = 307,969 sf, 51.63% Impervious, Inflow Depth = 6.09" for 100-yr event
 Inflow = 70.05 cfs @ 11.96 hrs, Volume= 156,182 cf
 Outflow = 59.60 cfs @ 12.00 hrs, Volume= 154,210 cf, Atten= 15%, Lag= 2.4 min
 Primary = 0.05 cfs @ 12.00 hrs, Volume= 17,321 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd
 Secondary = 59.55 cfs @ 12.00 hrs, Volume= 136,888 cf
 Routed to Pond 15P : Basin 1_Underground
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 363.49' @ 12.00 hrs Surf.Area= 20,894 sf Storage= 55,914 cf

Plug-Flow detention time= 591.6 min calculated for 154,210 cf (99% of inflow)
 Center-of-Mass det. time= 583.3 min (1,347.2 - 763.9)

Volume	Invert	Avail.Storage	Storage Description
#1	357.00'	67,002 cf	Raingarden Custom Stage Data (Prismatic) , listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	1,962	0	0
357.99	1,962	1,942	1,942
358.00	3,925	29	1,972
359.00	3,925	3,925	5,897
360.00	3,925	3,925	9,822
360.99	3,925	3,886	13,708
361.00	13,086	85	13,793
362.00	16,104	14,595	28,388
363.00	19,270	17,687	46,075
364.00	22,584	20,927	67,002

Device	Routing	Invert	Outlet Devices
#1	Primary	358.00'	0.9" Vert. MRC Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Secondary	362.25'	12.0" W x 4.0" H Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Secondary	362.70'	24.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	361.05'	0.5' long OCS_Sharp-Crested Rectangular Weir 2 End Contraction(s)
#5	Tertiary	363.75'	90.0' long + 5.0 ' SideZ x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

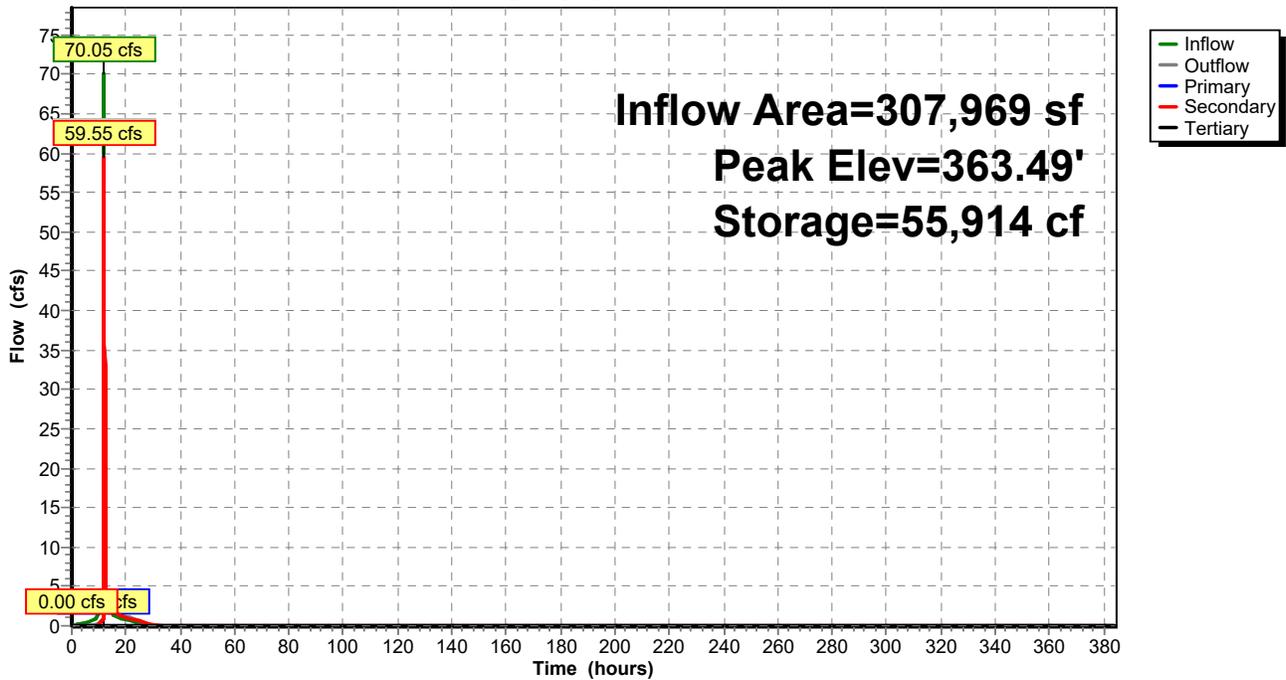
Primary OutFlow Max=0.05 cfs @ 12.00 hrs HW=363.49' (Free Discharge)
 ↳1=MRC Orifice/Grate (Orifice Controls 0.05 cfs @ 11.24 fps)

Secondary OutFlow Max=59.44 cfs @ 12.00 hrs HW=363.49' (Free Discharge)
 ↳2=Orifice (Orifice Controls 1.66 cfs @ 4.98 fps)
 ↳3=Sharp-Crested Rectangular Weir (Weir Controls 54.66 cfs @ 2.90 fps)
 ↳4=OCS_Sharp-Crested Rectangular Weir (Weir Controls 3.11 cfs @ 5.11 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=357.00' (Free Discharge)
 ↳5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: Basin 1_Above Ground

Hydrograph



Summary for Pond 15P: Basin 1_Underground

Inflow = 59.55 cfs @ 12.00 hrs, Volume= 136,888 cf
 Outflow = 24.77 cfs @ 12.13 hrs, Volume= 136,888 cf, Atten= 58%, Lag= 8.2 min
 Primary = 24.77 cfs @ 12.13 hrs, Volume= 136,888 cf
 Routed to Link 12L : Post_DP-001 Trooper Rd

Routing by Stor-Ind method, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Peak Elev= 356.99' @ 12.13 hrs Surf.Area= 11,564 sf Storage= 38,670 cf

Plug-Flow detention time= 63.1 min calculated for 136,885 cf (100% of inflow)
 Center-of-Mass det. time= 63.1 min (976.0 - 912.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	351.00'	17,650 cf	54.29'W x 213.00'L x 6.00'H Field A 69,387 cf Overall - 25,263 cf Embedded = 44,124 cf x 40.0% Voids
#2A	352.00'	21,087 cf	ADS N-12 48" x 80 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 80 Chambers in 8 Rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3	357.00'	108 cf	ocs (Prismatic) Listed below (Recalc)
		38,845 cf	Total Available Storage

Storage Group A created with Chamber Wizard

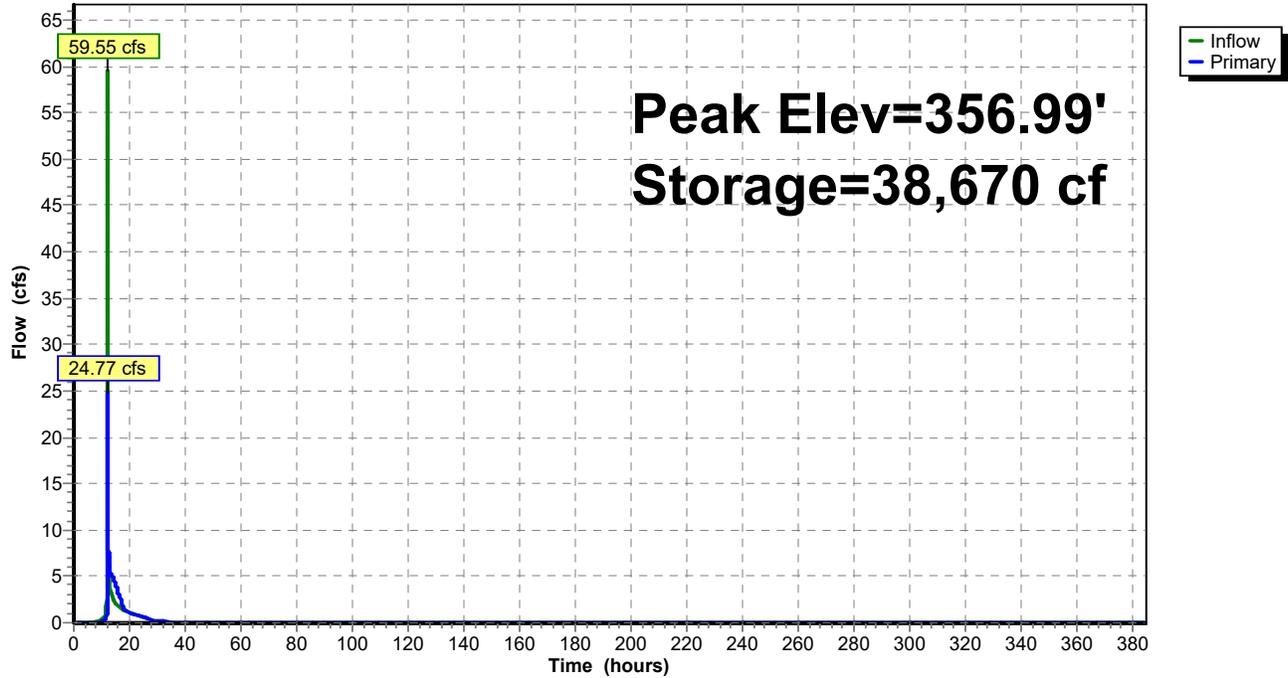
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	36	0	0
358.00	36	36	36
359.00	36	36	72
360.00	36	36	108

Device	Routing	Invert	Outlet Devices
#1	Primary	351.00'	24.0" Round Culvert Outlet Pipe from OCS L= 230.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 351.00' / 346.50' S= 0.0196 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	351.00'	10.0" Vert. Orifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	356.00'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=24.70 cfs @ 12.13 hrs HW=356.98' (Free Discharge)
 1=Culvert Outlet Pipe from OCS (Passes 24.70 cfs of 33.77 cfs potential flow)
 2=Orifice (Orifice Controls 6.20 cfs @ 11.36 fps)
 3=Sharp-Crested Rectangular Weir (Weir Controls 18.51 cfs @ 3.24 fps)

Pond 15P: Basin 1_Underground

Hydrograph



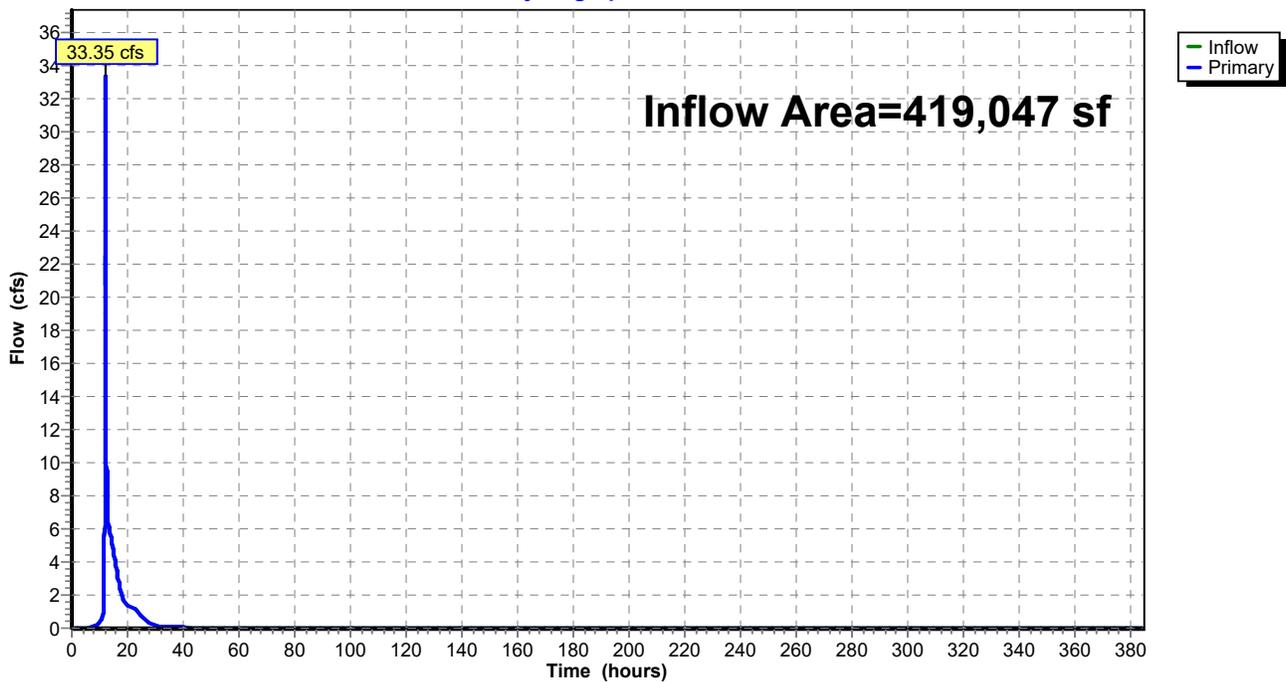
Summary for Link 12L: Post_DP-001 Trooper Rd

Inflow Area = 419,047 sf, 39.92% Impervious, Inflow Depth = 5.65" for 100-yr event
Inflow = 33.35 cfs @ 12.12 hrs, Volume= 197,193 cf
Primary = 33.35 cfs @ 12.12 hrs, Volume= 197,193 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 12L: Post_DP-001 Trooper Rd

Hydrograph



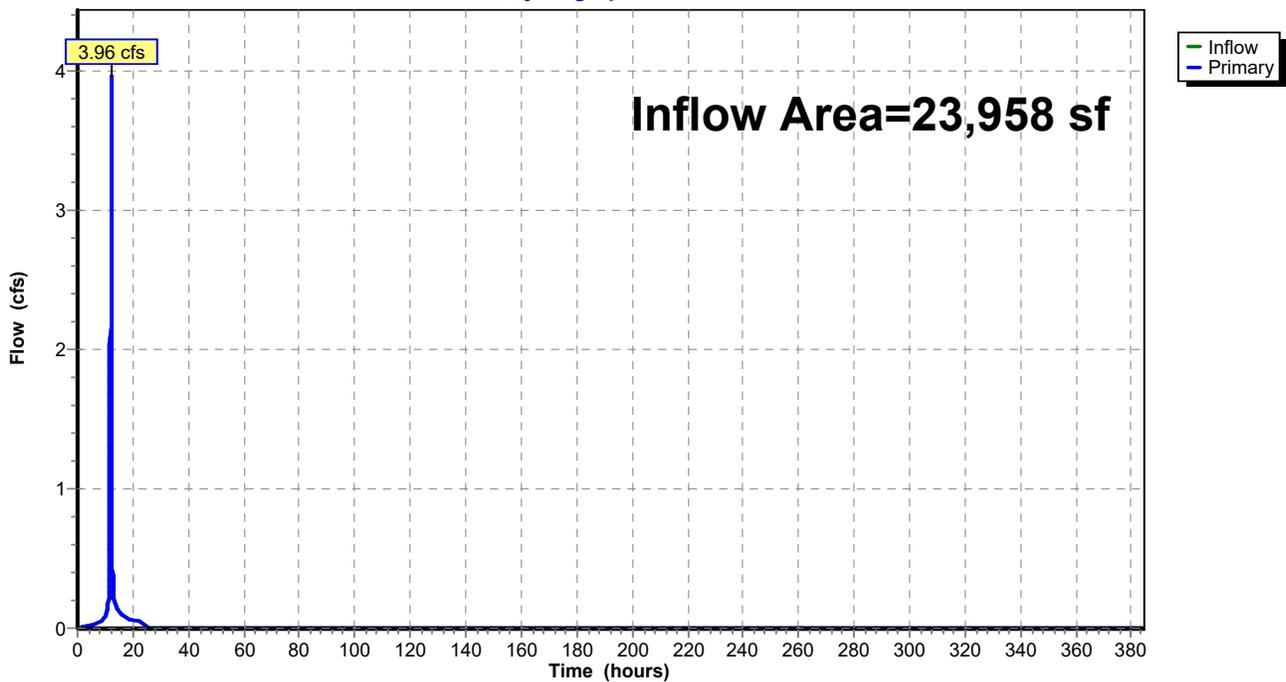
Summary for Link 55L: Post_DP-002 Germantown Pike

Inflow Area = 23,958 sf, 38.18% Impervious, Inflow Depth = 5.50" for 100-yr event
Inflow = 3.96 cfs @ 11.98 hrs, Volume= 10,973 cf
Primary = 3.96 cfs @ 11.98 hrs, Volume= 10,973 cf, Atten= 0%, Lag= 0.0 min
Routed to Link 66L : POST TOTAL

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 55L: Post_DP-002 Germantown Pike

Hydrograph



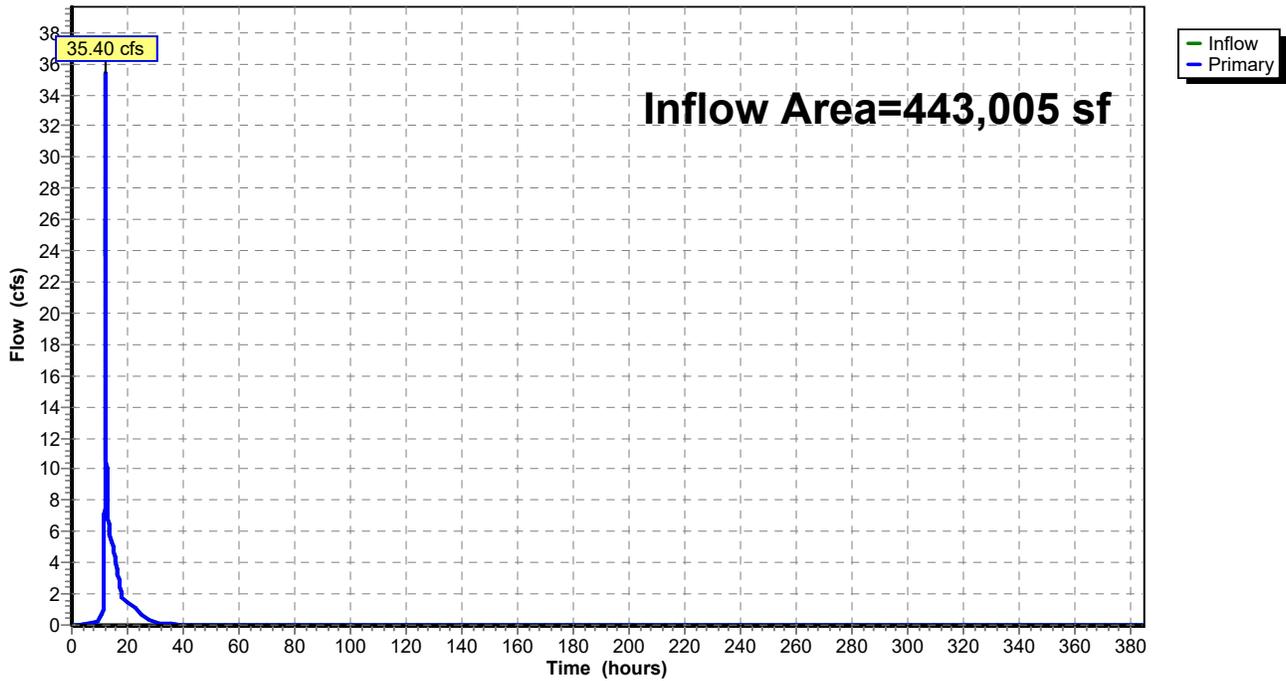
Summary for Link 66L: POST TOTAL

Inflow Area = 443,005 sf, 39.82% Impervious, Inflow Depth = 5.64" for 100-yr event
Inflow = 35.40 cfs @ 12.12 hrs, Volume= 208,165 cf
Primary = 35.40 cfs @ 12.12 hrs, Volume= 208,165 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs

Link 66L: POST TOTAL

Hydrograph



WDEV0004		TROOPER RIDGE SUBDIVISION			Worcester Township Water Quality Calcs													
					12/17/2024													
<u>Basin 1</u>																		
P	1.6	inches																
A	7.07	acres																
I	52	%																
Rv	0.51																	
WQv	0.49	acre-feet																
	21132	cf																
<input type="checkbox"/> § 129-16 Water quality requirements.																		
<p>A. In addition to the performance standards and design criteria requirements of Article III of this chapter, adequate treatment and storage facilities must be provided to capture and treat stormwater runoff from developed or disturbed areas, unless otherwise exempted by provisions of this chapter. The recharge volume computed under § 129-15 may be a component of the water quality volume if the applicant chooses to manage both components in a single facility. Only if the recharge volume is less than the water quality volume may the remaining water quality volume be captured and treated by methods other than recharge/infiltration BMPs. The required water quality volume (WQ_v) is the storage capacity needed to capture and to treat a portion of stormwater runoff from the developed areas of the site produced from 90% of the average annual rainfall (P). The following calculation formula is to be used to determine the required water quality storage volume, (WQ_v), in acre-feet of storage:</p>																		
Equation 129-16.1																		
$WQ_v = [(P)(R_v)(A)]/12 \text{ (inches/foot),}$																		
<p>Where:</p>																		
<p>P = Rainfall amount equal to 90% of events producing this rainfall (in) - the volume of rainfall for 90% of the storm events which produce runoff in the watershed annually.</p>																		
<p>A = Area of the project contributing to the water quality BMP (acres).</p>																		
<p>R_v = Volume runoff coefficient 0.05 + 0.009(I) where I is the percent of the area that is impervious surface (impervious area ÷ total project study area) x 100%.</p>																		
<p>B. Provisions shall be made (such as adding a small orifice at the bottom of the BMP facility outflow control structure) so that the proposed condition, one-year-frequency design storm takes a minimum of 24 hours to drain from the facility from a point where the maximum volume of water from the one-year storm is captured (i.e., the maximum water surface elevation is achieved in the facility). The design of the facility shall minimize clogging and sedimentation. Orifices smaller than three inches in diameter are not recommended. However, if the design engineer can verify that the smaller orifice is protected from clogging by use of trash racks, etc., smaller orifices may be permitted. Trash racks are required for any primary orifice.</p>																		
<p>Due to site limitations, the Managed Release Concept (MRC) is utilized in lieu of infiltration. The total MRC water quality credit for the 2 year storm is 32,565 cf (see Appendix A of the stormwater narrative)</p>																		
<p>Basin 1 1yr/24hr Storm Outflow</p>																		
Hydrograph for Pond 3P: Basin 1_Above Ground																		
	Time (hours)	Inflow (cfs)	Storage (cubic feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)	Tertiary (cfs)										
	0.00	0.00	0	357.00	0.00	0.00	0.00	0.00										
	10.00	0.34	3,893	358.49	0.04	0.04	0.00	0.00										
	20.00	0.29	20,442	361.48	0.42	0.04	0.38	0.00										
	30.00	0.00	15,437	361.12	0.07	0.04	0.03	0.00										
	40.00	0.00	13,858	361.00	0.04	0.04	0.00	0.00										
	50.00	0.00	12,564	360.70	0.03	0.03	0.00	0.00										
	60.00	0.00	11,352	360.39	0.03	0.03	0.00	0.00										

WDEV0004		TROOPER RIDGE SUBDIVISION		Emergency Spillway Calculations						3/25/2025	
Basin 1											
Spillway 1											
	Q100 Inflow =	70.05	cfs								
	Max. Basin WSEL =	363.49	ft								
	Spillway 1 Elev =	363.50	ft								
	Spilway Length =	20	ft								
	Spillway Flow Depth =	0.50	ft								
	C =	2.68									
	Spillway Capacity =	18.95	cfs			$Q=CLH^{1.5}$					
	Top of Berm Elevation	365.00									
	Freeboard Provided =	1.00									
Spillway 2											
	Q100 Inflow =	70.05	cfs								
	Max. Basin WSEL =	363.49	ft								
	Spillway 1 Elev =	363.75	ft								
	Spilway Length =	155	ft								
	Spillway Flow Depth =	0.25	ft								
	C =	2.68									
	Spillway Capacity =	51.93	cfs			$Q=CLH^{1.5}$					
	Top of Berm Elevation	365.00									
	Freeboard Provided =	1.00									
Total Spillway Capacity =		70.88	cfs								



Trooper Ridge

3/25/2025

Project #: WDEV00004

Inlet Drainage Area Breakdown Chart

Drainage Area	Total Area (Acres)	Impervious (C= 0.95) (Acres)	Lawn (C=0.35) (Acres)	Woods (C=0.20) (Acres)
A13	0.225	0.148	0.077	0.000
A12	0.017	0.001	0.016	0.000
A11	0.002	0.002	0.000	0.000
A10	0.019	0.018	0.001	0.000
A9.2	0.188	0.000	0.188	0.000
A9.1	0.061	0.000	0.061	0.000
A8.1	0.235	0.217	0.019	0.000
A8	0.307	0.163	0.144	0.000
A6.7	0.184	0.000	0.184	0.000
A6.5	0.130	0.000	0.130	0.000
A6.4	0.051	0.047	0.004	0.000
A6.2	0.156	0.129	0.027	0.000
A6.1	0.219	0.182	0.037	0.000
A6	0.032	0.025	0.006	0.000
B10	0.046	0.046	0.000	0.000
B8.1	0.524	0.000	0.524	0.000
B8	0.184	0.155	0.030	0.000
B7	0.123	0.098	0.025	0.000
B6.1	0.180	0.067	0.113	0.000
B6	0.100	0.090	0.009	0.000
B5.7	0.062	0.033	0.030	0.000
B5.4	0.184	0.000	0.184	0.000
B5.3	0.096	0.083	0.013	0.000
B5.2	0.113	0.092	0.021	0.000
B5.1	0.024	0.024	0.000	0.000
B3.1	0.387	0.110	0.277	0.000
B3	0.134	0.110	0.024	0.000
B2	0.060	0.027	0.033	0.000
S9	2.238	0.212	1.947	0.079
S8	1.808	0.188	1.346	0.273
S7	0.922	0.090	0.548	0.284



Trooper Ridge

3/25/2025

Project #: WDEV00004

Inlet Drainage Area Breakdown Chart

Drainage Area	Total Area (Acres)	Impervious (C= 0.95) (Acres)	Lawn (C=0.35) (Acres)	Woods (C=0.20) (Acres)
S6	1.065	0.127	0.586	0.352
S5	1.213	0.092	0.699	0.422
S4	0.676	0.089	0.274	0.313
S3.1	0.088	0.000	0.075	0.013
T12	1.836	0.023	0.831	0.982
T10	0.033	0.000	0.033	0.000
T9	2.467	0.073	1.064	1.330
T8	1.856	0.270	0.574	1.012
T7	0.231	0.043	0.188	0.000
T6	0.238	0.026	0.212	0.000
T5.2	0.051	0.023	0.028	0.000
T5.1	0.017	0.017	0.000	0.000
T4	0.541	0.145	0.396	0.000
T3	0.322	0.108	0.215	0.000
T2	0.262	0.101	0.161	0.000
T1.1	0.296	0.000	0.296	0.000
G8	0.108	0.103	0.005	0.000
G6	0.324	0.219	0.105	0.000
G4	0.222	0.155	0.067	0.000
G2	0.296	0.000	0.296	0.000
BLDG1	0.231	0.231	0.000	0.000
BLDG2	0.077	0.077	0.000	0.000
BLDG3	0.077	0.077	0.000	0.000
BLDG4	0.115	0.115	0.000	0.000
BLDG5	0.077	0.077	0.000	0.000
BLDG6	0.077	0.077	0.000	0.000
BLDG7	0.154	0.154	0.000	0.000
BLDG8	0.155	0.155	0.000	0.000
BLDG9	0.155	0.155	0.000	0.000
BLDG10	0.194	0.194	0.000	0.000



Trooper Ridge

3/25/2025

Project #: WDEV00004

Inlet Drainage Area Breakdown Chart

Drainage Area	Total Area (Acres)	Impervious (C= 0.95) (Acres)	Lawn (C=0.35) (Acres)	Woods (C=0.20) (Acres)
BLDG11	0.078	0.078	0.000	0.000
BLDG12	0.116	0.116	0.000	0.000
BLDG13	0.233	0.233	0.000	0.000
TOTAL	22.893	5.707	12.124	5.062



Trooper Ridge

12/16/2024

Project #: WDEV00004

Inlet Drainage Area Breakdown Chart

Drainage Area	Total Area (Acres)	Impervious (C= 0.95) (Acres)	Lawn (C=0.35) (Acres)	Woods (C=0.20) (Acres)
B2	0.004	0.004	0.000	0.000
S9	2.238	0.212	1.947	0.079
S8	1.808	0.188	1.346	0.273
S7	0.922	0.090	0.548	0.284
S6	1.065	0.127	0.586	0.352
S5	1.213	0.092	0.699	0.422
S4	0.676	0.089	0.274	0.313
S3.1	0.088	0.000	0.075	0.013
T12	1.836	0.023	0.831	0.982
T10	0.033	0.000	0.033	0.000
T9	2.467	0.073	1.064	1.330
T8	1.856	0.270	0.574	1.012
T7	0.231	0.043	0.188	0.000
T6	0.238	0.026	0.212	0.000
T5.2	0.051	0.023	0.028	0.000
T5.1	0.017	0.017	0.000	0.000
T4	0.541	0.145	0.396	0.000
T3	0.322	0.108	0.215	0.000
T2	0.262	0.101	0.161	0.000
T1.1	0.296	0.000	0.296	0.000
G8	0.108	0.103	0.005	0.000
G6	0.324	0.219	0.105	0.000
G4	0.222	0.155	0.067	0.000
G2	0.296	0.000	0.296	0.000
BLDG1	0.231	0.231	0.000	0.000
BLDG2	0.077	0.077	0.000	0.000
BLDG3	0.077	0.077	0.000	0.000
BLDG4	0.115	0.115	0.000	0.000
BLDG5	0.077	0.077	0.000	0.000
BLDG6	0.077	0.077	0.000	0.000



Trooper Ridge

12/16/2024

Project #: WDEV00004

Inlet Drainage Area Breakdown Chart

Drainage Area	Total Area (Acres)	Impervious (C= 0.95) (Acres)	Lawn (C=0.35) (Acres)	Woods (C=0.20) (Acres)
BLDG7	0.154	0.154	0.000	0.000
BLDG8	0.155	0.155	0.000	0.000
BLDG9	0.155	0.155	0.000	0.000
BLDG10	0.194	0.194	0.000	0.000
BLDG11	0.078	0.078	0.000	0.000
BLDG12	0.116	0.116	0.000	0.000
BLDG13	0.233	0.233	0.000	0.000
TOTAL	22.893	5.711	12.120	5.062

Project Name: WDEV00004 Trooper Ridge
Location: Worcester Township, Montgomery County
Date: 12/16/2024

Rainfall Total (inches)

Time (hr)	Time (min)	Storm Frequency (yrs)						
		1-year	2-year	5-year	10-year	25-year	50-year	100-year
0.083	5	0.35	0.42	0.49	0.55	0.59	0.65	0.71
0.167	10	0.54	0.65	0.76	0.85	0.97	1.07	1.16
0.250	15	0.71	0.85	1.00	1.11	1.21	1.32	1.44
0.500	30	0.94	1.14	1.37	1.56	1.82	1.90	2.09
1	60	1.17	1.42	1.76	2.03	2.39	2.51	2.80
2	120	1.39	1.69	2.12	2.46	2.93	3.34	3.90
3	180	1.53	1.86	2.33	2.71	3.25	3.75	4.34
6	360	1.91	2.31	2.91	3.40	4.12	4.70	5.34
12	720	2.20	2.65	3.29	3.87	4.74	5.46	6.26
24	1440	2.64	3.16	3.91	4.57	5.60	6.53	7.63

Rainfall Intensity (inches/hr)

Time (hr)	Time (min)	Storm Frequency (yrs)						
		1-year	2-year	5-year	10-year	25-year	50-year	100-year
0.083	5	4.20	5.04	5.88	6.60	7.08	7.80	8.52
0.167	10	3.24	3.90	4.56	5.10	5.82	6.42	6.96
0.250	15	2.84	3.40	4.00	4.44	4.84	5.28	5.76
0.500	30	1.88	2.28	2.74	3.12	3.64	3.80	4.18
1	60	1.17	1.42	1.76	2.03	2.39	2.51	2.80
2	120	0.70	0.85	1.06	1.23	1.47	1.67	1.95
3	180	0.51	0.62	0.78	0.90	1.08	1.25	1.45
6	360	0.32	0.39	0.49	0.57	0.69	0.78	0.89
12	720	0.18	0.22	0.27	0.32	0.40	0.46	0.52
24	1440	0.11	0.13	0.16	0.19	0.23	0.27	0.32

Trooper Ridge_Swale TCs

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Type II 24-hr 100-yr Rainfall=7.45"

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Page 1

Summary for Subcatchment 4S: S9

Runoff = 9.24 cfs @ 12.23 hrs, Volume= 37,892 cf, Depth= 4.66"
 Routed to nonexistent node 68L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG D
1.150	74	>75% Grass cover, Good, HSG C
0.520	80	>75% Grass cover, Good, HSG D
0.280	61	>75% Grass cover, Good, HSG B
0.080	77	Woods, Good, HSG D
2.240	76	Weighted Average
2.030		90.63% Pervious Area
0.210		9.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.5	100	0.0200	0.07		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
3.7	950	0.0700	4.26		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
29.2	1,050	Total			

Trooper Ridge_Swale TCs

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Type II 24-hr 100-yr Rainfall=7.45"

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Page 2

Summary for Subcatchment 6S: S8

Runoff = 9.57 cfs @ 12.09 hrs, Volume= 28,422 cf, Depth= 4.33"
Routed to nonexistent node 68L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.190	98	Paved parking, HSG D
0.450	61	>75% Grass cover, Good, HSG B
0.900	74	>75% Grass cover, Good, HSG C
0.270	70	Woods, Good, HSG C
1.810	73	Weighted Average
1.620		89.50% Pervious Area
0.190		10.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	100	0.0700	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
1.3	409	0.1000	5.09		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
16.8	509	Total			

Trooper Ridge_Swale TCs

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Type II 24-hr 100-yr Rainfall=7.45"

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Page 3

Summary for Subcatchment 7S: S7

Runoff = 5.29 cfs @ 12.05 hrs, Volume= 14,078 cf, Depth= 4.22"
 Routed to nonexistent node 68L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.090	98	Paved parking, HSG D
0.350	74	>75% Grass cover, Good, HSG C
0.200	61	>75% Grass cover, Good, HSG B
0.280	70	Woods, Good, HSG C
0.920	72	Weighted Average
0.830		90.22% Pervious Area
0.090		9.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.1400	0.14		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
1.7	437	0.0700	4.26		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
13.4	537	Total			

Trooper Ridge_Swale TCs

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Type II 24-hr 100-yr Rainfall=7.45"

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Page 4

Summary for Subcatchment 8S: S6

Runoff = 5.51 cfs @ 12.10 hrs, Volume= 16,802 cf, Depth= 4.33"
Routed to nonexistent node 68L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG D
0.400	74	>75% Grass cover, Good, HSG C
0.190	61	>75% Grass cover, Good, HSG B
0.350	70	Woods, Good, HSG C
1.070	73	Weighted Average
0.940		87.85% Pervious Area
0.130		12.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.4	100	0.0600	0.10		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
1.3	437	0.1160	5.48		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
17.7	537	Total			

Trooper Ridge_Swale TCs

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Summary for Subcatchment 9S: S5

Runoff = 6.67 cfs @ 12.07 hrs, Volume= 19,001 cf, Depth= 4.33"
Routed to nonexistent node 68L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.090	98	Paved parking, HSG D
0.560	74	>75% Grass cover, Good, HSG C
0.140	61	>75% Grass cover, Good, HSG B
0.420	70	Woods, Good, HSG C
1.210	73	Weighted Average
1.120		92.56% Pervious Area
0.090		7.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0900	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
1.5	482	0.1090	5.32		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
15.5	582	Total			

Trooper Ridge_Swale TCs

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Type II 24-hr 100-yr Rainfall=7.45"

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Page 6

Summary for Subcatchment 10S: S4

Runoff = 3.69 cfs @ 12.09 hrs, Volume= 11,062 cf, Depth= 4.55"
 Routed to nonexistent node 68L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.090	98	Paved parking, HSG D
0.230	74	>75% Grass cover, Good, HSG C
0.040	61	>75% Grass cover, Good, HSG B
0.310	70	Woods, Good, HSG C
0.670	75	Weighted Average
0.580		86.57% Pervious Area
0.090		13.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	100	0.0700	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
1.5	476	0.1150	5.46		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
17.0	576	Total			

Trooper Ridge_Swale TCs

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Type II 24-hr 100-yr Rainfall=7.45"

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Summary for Subcatchment 11S: S3.1

Runoff = 0.54 cfs @ 12.06 hrs, Volume= 1,450 cf, Depth= 4.44"
Routed to nonexistent node 68L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.080	74	>75% Grass cover, Good, HSG C
0.010	70	Woods, Good, HSG C
0.090	74	Weighted Average
0.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.1000	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
0.3	100	0.1000	5.09		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
13.7	200	Total			

Trooper Ridge_Swale TCs

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Type II 24-hr 100-yr Rainfall=7.45"

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Page 8

Summary for Subcatchment 13S: T12

Runoff = 8.54 cfs @ 12.18 hrs, Volume= 31,126 cf, Depth= 4.66"
Routed to nonexistent node 68L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.030	98	Paved parking, HSG D
0.830	74	>75% Grass cover, Good, HSG C
0.980	77	Woods, Good, HSG D
1.840	76	Weighted Average
1.810		98.37% Pervious Area
0.030		1.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.1	100	0.0800	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
2.0	638	0.1050	5.22		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
24.1	738	Total			

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Type II 24-hr 100-yr Rainfall=7.45"

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Summary for Subcatchment 14S: T10

Runoff = 0.24 cfs @ 11.96 hrs, Volume= 483 cf, Depth= 4.44"
Routed to nonexistent node 68L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.030	74	>75% Grass cover, Good, HSG C
0.030		100.00% Pervious Area

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

Trooper Ridge_Swale TCs

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Type II 24-hr 100-yr Rainfall=7.45"

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Summary for Subcatchment 16S: T9

Runoff = 9.52 cfs @ 12.25 hrs, Volume= 39,782 cf, Depth= 4.44"
 Routed to nonexistent node 68L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.070	98	Paved parking, HSG D
1.070	74	>75% Grass cover, Good, HSG C
0.480	77	Woods, Good, HSG D
0.850	70	Woods, Good, HSG C
2.470	74	Weighted Average
2.400		97.17% Pervious Area
0.070		2.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.5	100	0.0200	0.07		Sheet Flow, Grass: Dense n= 0.240 P2= 1.00"
4.4	1,229	0.0830	4.64		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
29.9	1,329	Total			

Trooper Ridge_Swale TCs

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Type II 24-hr 100-yr Rainfall=7.45"

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Summary for Subcatchment 17S: T8

Runoff = 8.66 cfs @ 12.16 hrs, Volume= 30,544 cf, Depth= 4.55"
Routed to nonexistent node 68L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-384.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=7.45"

Area (ac)	CN	Description
0.270	98	Paved parking, HSG D
0.570	74	>75% Grass cover, Good, HSG C
1.010	70	Woods, Good, HSG C
1.850	75	Weighted Average
1.580		85.41% Pervious Area
0.270		14.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.0	100	0.0900	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 1.00"
1.8	589	0.1100	5.34		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
22.8	689	Total			

Project Description

File Name 100 Yr Pipe Conveyance.SPF

Project Options

Flow Units CFS
Elevation Type Elevation
Hydrology Method Rational
Time of Concentration (TOC) Method User-Defined
Link Routing Method Hydrodynamic
Enable Overflow Ponding at Nodes YES
Skip Steady State Analysis Time Periods NO

Analysis Options

Start Analysis On 00:00:00 0:00:00
End Analysis On 00:00:00 0:00:00
Start Reporting On 00:00:00 0:00:00
Antecedent Dry Days 0 days
Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
Runoff (Wet Weather) Time Step 0 00:05:00 days hh:mm:ss
Reporting Time Step 0 00:05:00 days hh:mm:ss
Routing Time Step 30 seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins.....	62
Nodes.....	71
<i>Junctions</i>	12
<i>Outfalls</i>	10
<i>Flow Diversions</i>	0
<i>Inlets</i>	49
<i>Storage Nodes</i>	0
Links.....	61
<i>Channels</i>	0
<i>Pipes</i>	61
<i>Pumps</i>	0
<i>Orifices</i>	0
<i>Weirs</i>	0
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period..... 100 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-A10	0.02	0.9200	0.71	0.65	0.01	0.15	0 00:05:00
2	Sub-A11	0.00	0.9500	0.71	0.67	0.00	0.02	0 00:05:00
3	Sub-A12	0.02	0.4000	0.71	0.28	0.00	0.06	0 00:05:00
4	Sub-A13	0.23	0.7400	0.71	0.53	0.12	1.42	0 00:05:00
5	Sub-A6	0.03	0.8300	0.71	0.59	0.02	0.23	0 00:05:00
6	Sub-A6.1	0.22	0.8500	0.71	0.60	0.13	1.59	0 00:05:00
7	Sub-A6.2	0.16	0.8500	0.71	0.60	0.09	1.13	0 00:05:00
8	Sub-A6.4	0.05	0.9100	0.71	0.65	0.03	0.40	0 00:05:00
9	Sub-A6.5	0.13	0.3500	0.71	0.25	0.03	0.39	0 00:05:00
10	Sub-A6.7	0.18	0.3500	0.71	0.25	0.05	0.55	0 00:05:00
11	Sub-A8	0.31	0.6700	0.71	0.48	0.15	1.75	0 00:05:00
12	Sub-A8.1	0.24	0.9000	0.71	0.64	0.15	1.80	0 00:05:00
13	Sub-A9.1	0.06	0.3500	0.71	0.25	0.02	0.18	0 00:05:00
14	Sub-A9.2	0.19	0.3500	0.71	0.25	0.05	0.56	0 00:05:00
15	Sub-B10	0.05	0.9500	0.71	0.67	0.03	0.37	0 00:05:00
16	Sub-B2	0.06	0.6200	0.71	0.44	0.03	0.32	0 00:05:00
17	Sub-B3	0.13	0.8400	0.71	0.60	0.08	0.96	0 00:05:00
18	Sub-B3.1	0.39	0.5200	0.71	0.37	0.14	1.72	0 00:05:00
19	Sub-B5.1	0.02	0.9500	0.71	0.67	0.02	0.19	0 00:05:00
20	Sub-B5.2	0.11	0.8400	0.71	0.60	0.07	0.81	0 00:05:00
21	Sub-B5.3	0.10	0.8700	0.71	0.62	0.06	0.71	0 00:05:00
22	Sub-B5.4	0.18	0.3500	0.71	0.25	0.05	0.55	0 00:05:00
23	Sub-B5.7	0.06	0.6600	0.71	0.47	0.03	0.35	0 00:05:00
24	Sub-B6	0.10	0.8900	0.71	0.63	0.06	0.76	0 00:05:00
25	Sub-B6.1	0.18	0.5700	0.71	0.41	0.07	0.87	0 00:05:00
26	Sub-B7	0.12	0.8300	0.71	0.59	0.07	0.87	0 00:05:00
27	Sub-B8	0.18	0.8500	0.71	0.60	0.11	1.33	0 00:05:00
28	Sub-B8.1	0.52	0.3500	0.71	0.25	0.13	1.56	0 00:05:00
29	Sub-BLDG1	0.23	0.9500	0.71	0.67	0.16	1.87	0 00:05:00
30	Sub-BLDG10	0.19	0.9500	0.71	0.67	0.13	1.57	0 00:05:00
31	Sub-BLDG11	0.08	0.9500	0.71	0.67	0.05	0.63	0 00:05:00
32	Sub-BLDG12	0.12	0.9500	0.71	0.67	0.08	0.94	0 00:05:00
33	Sub-BLDG13	0.23	0.9500	0.71	0.67	0.16	1.89	0 00:05:00
34	Sub-BLDG2	0.08	0.9500	0.71	0.67	0.05	0.62	0 00:05:00
35	Sub-BLDG3	0.08	0.9500	0.71	0.67	0.05	0.62	0 00:05:00
36	Sub-BLDG4	0.12	0.9500	0.71	0.67	0.08	0.93	0 00:05:00
37	Sub-BLDG5	0.08	0.9500	0.71	0.67	0.05	0.62	0 00:05:00
38	Sub-BLDG6	0.08	0.9500	0.71	0.67	0.05	0.62	0 00:05:00
39	Sub-BLDG7	0.15	0.9500	0.71	0.67	0.10	1.25	0 00:05:00
40	Sub-BLDG8	0.16	0.9500	0.71	0.67	0.10	1.26	0 00:05:00
41	Sub-BLDG9	0.16	0.9500	0.71	0.67	0.10	1.26	0 00:05:00
42	Sub-G4	0.22	0.7700	0.71	0.55	0.12	1.46	0 00:05:00
43	Sub-G6	0.32	0.7600	0.71	0.54	0.17	2.10	0 00:05:00
44	Sub-G8	0.11	0.9200	0.71	0.65	0.07	0.85	0 00:05:00
45	Sub-S3.1	0.09	0.3300	1.36	0.45	0.04	0.17	0 00:13:42
46	Sub-S4	0.68	0.3600	1.54	0.55	0.37	1.32	0 00:17:00
47	Sub-S5	1.21	0.3400	1.47	0.50	0.60	2.34	0 00:15:30
48	Sub-S6	1.07	0.3700	1.57	0.58	0.62	2.10	0 00:17:42
49	Sub-S7	0.92	0.3600	1.33	0.48	0.44	1.99	0 00:13:24
50	Sub-S8	1.81	0.3900	1.53	0.60	1.08	3.85	0 00:16:48
51	Sub-S9	2.24	0.4000	2.06	0.82	1.84	3.79	0 00:29:12
52	Sub-T10	0.03	0.3500	0.71	0.25	0.01	0.10	0 00:05:00
53	Sub-T12	1.84	0.2800	1.86	0.52	0.96	2.38	0 00:24:06
54	Sub-T2	0.26	0.5800	0.71	0.41	0.11	1.30	0 00:05:00
55	Sub-T3	0.32	0.5500	0.71	0.39	0.13	1.51	0 00:05:00
56	Sub-T4	0.54	0.5100	0.71	0.36	0.20	2.35	0 00:05:00
57	Sub-T5.1	0.02	0.9500	0.71	0.67	0.01	0.14	0 00:05:00
58	Sub-T5.2	0.05	0.6200	0.71	0.44	0.02	0.27	0 00:05:00
59	Sub-T6	0.24	0.4100	0.71	0.29	0.07	0.83	0 00:05:00
60	Sub-T7	0.23	0.4600	0.71	0.33	0.08	0.91	0 00:05:00
61	Sub-T8	1.86	0.3600	1.81	0.65	1.21	3.17	0 00:22:48
62	Sub-T9	2.47	0.2900	2.08	0.60	1.49	3.00	0 00:29:54

Node Summary

SN Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft ²)	Peak Inflow (cfs)	Max HGL Elevation (ft)	Max Surcharge Depth (ft)	Min Freeboard (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1 A1.1	Junction	361.10	365.00	361.40	363.80	0.00	22.06	364.27	0.00	0.73	0 00:00	0.00	0.00
2 A2	Junction	349.90	360.27	356.19	360.27	0.00	25.92	360.27	0.00	0.00	0 00:00	0.01	0.00
3 A7	Junction	367.35	374.73	367.35	374.73	0.00	7.33	368.36	0.00	6.36	0 00:00	0.00	0.00
4 A9	Junction	368.07	377.43	368.07	377.43	0.00	4.11	368.96	0.00	8.47	0 00:00	0.00	0.00
5 B5	Junction	373.05	376.30	373.05	376.30	0.00	10.44	375.56	0.00	0.74	0 00:00	0.00	0.00
6 G2	Junction	346.50	348.66	346.50	348.66	0.00	0.00	346.50	0.00	2.16	0 00:00	0.00	0.00
7 MH T5	Junction	354.75	358.00	354.75	358.00	0.00	7.75	355.84	0.00	2.16	0 00:00	0.00	0.00
8 OCS A3	Junction	351.00	362.70	351.00	361.52	0.00	29.55	362.70	0.00	0.00	0 00:00	0.01	0.00
9 S2	Junction	346.70	362.42	355.48	362.42	0.00	21.67	355.31	0.00	7.11	0 00:00	0.00	0.00
10 S3	Junction	367.58	374.83	367.58	374.83	0.00	12.94	368.22	0.00	6.61	0 00:00	0.00	0.00
11 T1.1	Junction	346.50	348.66	346.50	351.00	0.00	0.00	346.50	0.00	2.16	0 00:00	0.00	0.00
12 T11	Junction	376.50	380.01	376.50	380.01	0.00	2.38	376.79	0.00	3.22	0 00:00	0.00	0.00
13 A2-Outfall	Outfall	346.50					26.56	351.00					
14 Out-A1	Outfall	361.00					22.06	363.49					
15 Out-B1	Outfall	361.00					17.45	363.49					
16 Out-G2 TO EXISTING INLET	Outfall	346.08					0.00	346.08					
17 Out-G4 TO EXISTING INLET	Outfall	348.15					1.45	348.55					
18 Out-G6 TO EXISTING INLET	Outfall	359.25					2.09	359.74					
19 Out-G8 TO EXISTING INLET	Outfall	370.34					0.84	370.65					
20 Out-T1.1 TO EXISTING INLET	Outfall	345.82					0.00	345.82					
21 Out-T2 TO EXISTING INLET	Outfall	346.07					7.78	346.96					
22 S2-Outfall	Outfall	346.50					41.89	351.00					

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Reported (min)	Surcharged Condition
1	3	Pipe	B8.1	B8	77.71	376.90	376.51	0.5000	18.000	0.0130	3.98	7.44	0.53	4.20	0.80	0.53	0.00	Calculated
2	A1.1 TO A1	Pipe	A1.1	Out-A1	20.00	361.10	361.00	0.5000	24.000	0.0130	22.06	16.00	1.38	7.04	2.00	1.00	1440.00	SURCHARGED
3	A10 TO A9	Pipe	A10	A9	66.63	368.50	368.17	0.5000	15.000	0.0130	1.58	4.57	0.34	2.35	0.68	0.54	0.00	Calculated
4	A11 TO A10	Pipe	A11	A10	8.68	368.64	368.60	0.5000	15.000	0.0130	1.47	4.57	0.32	3.14	0.51	0.41	0.00	Calculated
5	A12 TO A11	Pipe	A12	A11	20.02	368.84	368.74	0.5000	15.000	0.0130	1.46	4.57	0.32	3.18	0.50	0.40	0.00	Calculated
6	A13 TO A12	Pipe	A13	A12	7.87	368.95	368.84	1.4000	15.000	0.0130	1.41	7.64	0.18	3.03	0.51	0.41	0.00	Calculated
7	A2 TO A2-Outfall	Pipe	A2	A2-Outfall	176.96	349.90	346.50	1.9200	24.000	0.0130	26.56	31.36	0.85	8.46	2.00	1.00	1440.00	SURCHARGED
8	A3 TO A2	Pipe	OCS A3	A2	55.27	351.00	349.90	1.9900	24.000	0.0130	25.92	31.92	0.81	8.25	2.00	1.00	1440.00	SURCHARGED
9	A6 TO A1.1	Pipe	A6	A1.1	67.20	366.54	362.30	6.3100	24.000	0.0130	13.23	56.82	0.23	7.87	1.06	0.53	0.00	Calculated
10	A6.1 TO A6	Pipe	A6.1	A6	52.94	375.78	373.89	3.5700	15.000	0.0130	5.78	12.21	0.47	9.22	0.64	0.51	0.00	Calculated
11	A6.2 TO A6.1	Pipe	A6.2	A6.1	57.33	377.41	376.03	2.4100	15.000	0.0130	4.34	10.02	0.43	7.47	0.60	0.48	0.00	Calculated
12	A6.4-A6.2	Pipe	A6.4	A6.2	152.72	379.91	378.06	1.2100	15.000	0.0130	2.22	7.11	0.31	5.03	0.49	0.39	0.00	Calculated
13	A6.5 TO A6.4	Pipe	A6.5	A6.4	98.81	381.15	380.16	1.0000	15.000	0.0130	1.89	6.46	0.29	4.47	0.47	0.38	0.00	Calculated
14	A6.7 TO A6.2	Pipe	A6.7	A6.2	98.86	378.15	377.66	0.5000	15.000	0.0130	1.12	4.57	0.24	3.05	0.43	0.34	0.00	Calculated
15	A7 TO A6	Pipe	A7	A6	112.00	367.35	366.79	0.5000	24.000	0.0130	7.34	16.00	0.46	4.81	0.98	0.49	0.00	Calculated
16	A8 TO A7	Pipe	A8	A7	32.22	367.61	367.45	0.5000	24.000	0.0130	7.33	16.00	0.46	4.66	1.00	0.50	0.00	Calculated
17	A8.1 TO A8	Pipe	A8.1	A8	33.96	370.83	368.95	5.5500	15.000	0.0130	1.79	15.21	0.12	7.94	0.30	0.24	0.00	Calculated
18	A9 TO A8	Pipe	A9	A8	71.86	368.07	367.71	0.5000	18.000	0.0130	4.07	7.43	0.55	3.61	0.92	0.62	0.00	Calculated
19	A9.1 TO A9	Pipe	A9.1	A9	49.06	372.75	368.42	8.8300	15.000	0.0130	2.57	19.19	0.13	8.92	0.42	0.34	0.00	Calculated
20	A9.2 TO A9.1	Pipe	A9.2	A9.1	77.99	375.60	373.00	3.3300	15.000	0.0130	2.40	11.79	0.20	7.34	0.39	0.31	0.00	Calculated
21	B10 TO B6.1	Pipe	B10	B6.1	41.62	378.50	374.94	8.5500	15.000	0.0130	0.37	18.89	0.02	5.03	0.51	0.41	0.00	Calculated
22	B2 TO B1	Pipe	B2	Out-B1	65.86	361.33	361.00	0.5000	24.000	0.0130	17.45	16.00	1.09	5.58	2.00	1.00	1440.00	SURCHARGED
23	B3 TO B2	Pipe	B3	B2	23.85	361.90	361.50	1.6800	24.000	0.0130	15.42	29.30	0.53	5.66	2.00	1.00	4.00	SURCHARGED
24	B3.1 TO B3	Pipe	B3.1	B3	91.00	363.10	362.60	0.5500	18.000	0.0130	2.91	7.79	0.37	3.33	1.35	0.90	0.00	Calculated
25	B5.1 TO B5	Pipe	B5.1	B5	52.88	378.52	373.35	9.7700	15.000	0.0130	3.38	20.19	0.17	4.26	0.80	0.64	0.00	Calculated
26	B5.2 TO B5.1	Pipe	B5.2	B5.1	70.20	379.12	378.77	0.5000	15.000	0.0130	3.21	4.57	0.70	4.07	0.77	0.61	0.00	Calculated
27	B5.3 TO B5.2	Pipe	B5.3	B5.2	31.54	381.00	380.00	3.1700	15.000	0.0130	0.70	11.50	0.06	5.01	0.21	0.17	0.00	Calculated
28	B5.4 TO B5.2	Pipe	B5.4	B5.2	91.84	380.75	379.76	1.0800	15.000	0.0130	1.75	6.71	0.26	4.49	0.44	0.36	0.00	Calculated
29	B5.7 TO B5	Pipe	B5.7	B5	27.77	373.32	373.18	0.5000	15.000	0.0130	10.45	4.57	2.29	10.21	0.97	0.78	0.00	> CAPACITY
30	B5.7-B3	Pipe	B5.7	B3	106.81	373.05	362.91	9.4900	15.000	0.0130	11.96	20.17	0.59	11.69	0.97	0.78	0.00	Calculated
31	B6 TO B5	Pipe	B6	B5	34.52	374.23	373.20	2.9800	18.000	0.0130	7.40	18.14	0.41	4.19	1.50	1.00	1.00	SURCHARGED
32	B6.1 TO B6	Pipe	B6.1	B6	41.96	374.69	374.48	0.5000	15.000	0.0130	1.50	4.57	0.33	2.79	1.21	0.97	0.00	Calculated
33	B7 TO B6	Pipe	B7	B6	106.24	375.55	374.79	0.7200	18.000	0.0130	5.98	8.88	0.67	5.10	1.00	0.67	0.00	Calculated
34	B8 TO B7	Pipe	B8	B7	91.97	376.26	375.80	0.5000	18.000	0.0130	5.21	7.43	0.70	4.55	0.93	0.62	0.00	Calculated
35	G2 TO EXISTING_INLET	Pipe	G2	Out-G2 TO EXISTING INLET	74.10	346.50	346.08	0.5700	24.000	0.0130	0.00	17.03	0.00	0.00	0.00	0.00	0.00	Calculated
36	G4 TO EXISTING_INLET	Pipe	G4	Out-G4 TO EXISTING INLET	9.85	348.25	348.15	1.0000	15.000	0.0130	1.45	6.46	0.22	3.89	0.43	0.34	0.00	Calculated
37	G6 TO EXISTING_INLET	Pipe	G6	Out-G6 TO EXISTING INLET	10.23	359.35	359.25	1.0000	15.000	0.0130	2.09	6.46	0.32	4.28	0.52	0.42	0.00	Calculated
38	G8 TO EXISTING_INLET	Pipe	G8	Out-G8 TO EXISTING INLET	10.46	370.39	370.34	0.5000	24.000	0.0130	0.84	16.00	0.05	2.53	0.32	0.16	0.00	Calculated
39	S2 TO S2-Outfall	Pipe	S2	S2-Outfall	20.91	346.70	346.50	0.9600	30.000	0.0130	41.89	40.12	1.04	8.53	2.50	1.00	1440.00	SURCHARGED
40	S3 TO S2	Pipe	S3	S2	225.88	367.58	355.73	5.2400	30.000	0.0130	12.94	93.91	0.14	13.16	0.64	0.25	0.00	Calculated
41	S3.1 TO S3	Pipe	S3.1	S3	16.36	374.00	368.00	36.6800	36.000	0.0130	0.17	403.94	0.00	5.99	0.13	0.04	0.00	Calculated
42	S4 TO S3	Pipe	S4	S3	110.46	376.26	368.00	7.4800	30.000	0.0130	12.82	112.18	0.11	14.64	0.59	0.23	0.00	Calculated
43	S5 TO S4	Pipe	S5	S4	56.60	379.20	376.51	4.7500	30.000	0.0130	11.52	89.39	0.13	11.69	0.64	0.25	0.00	Calculated
44	S6 TO S5	Pipe	S6	S5	153.09	386.34	379.45	4.5000	30.000	0.0130	9.47	87.01	0.11	11.32	0.57	0.23	0.00	Calculated
45	S7 TO S6	Pipe	S7	S6	152.27	391.22	386.84	2.8800	24.000	0.0130	7.42	38.38	0.19	9.21	0.61	0.30	0.00	Calculated
46	S8 TO S7	Pipe	S8	S7	88.33	394.12	391.47	3.0000	24.000	0.0130	5.99	39.18	0.15	8.68	0.54	0.27	0.00	Calculated
47	S9 TO S8	Pipe	S9	S8	183.02	399.86	394.37	3.0000	18.000	0.0130	3.77	18.19	0.21	7.99	0.47	0.31	0.00	Calculated
48	T1.1 TO EXISTING_INLET	Pipe	T1.1	Out-T1.1 TO EXISTING INLET	72.42	346.50	345.82	0.9400	24.000	0.0130	0.00	21.92	0.00	0.00	0.00	0.00	0.00	Calculated
49	T10 TO T9	Pipe	T10	T9	100.05	372.21	365.72	6.4900	18.000	0.0130	2.37	26.76	0.09	9.19	0.31	0.20	0.00	Calculated
50	T11 TO T10	Pipe	T11	T10	42.66	376.50	372.46	9.4700	18.000	0.0130	2.38	32.33	0.07	10.31	0.28	0.19	0.00	Calculated
51	T12 TO T11	Pipe	T12	T11	17.45	378.50	376.75	10.0300	18.000	0.0130	2.38	33.27	0.07	10.04	0.29	0.19	0.00	Calculated
52	T2 TO EXIST_INLET	Pipe	T2	Out-T2 TO EXISTING INLET	72.23	346.97	346.07	1.2500	18.000	0.0130	7.78	11.73	0.66	6.71	0.94	0.62	0.00	Calculated
53	T3 TO T2	Pipe	T3	T2	192.12	349.50	346.97	1.3200	18.000	0.0130	7.74	12.05	0.64	6.64	0.94	0.63	0.00	Calculated
54	T4 TO T3	Pipe	T4	T3	209.60	353.25	349.75	1.6700	18.000	0.0130	7.73	13.57	0.57	7.74	0.83	0.55	0.00	Calculated
55	T5 TO T4	Pipe	MH T5	T4	151.89	354.75	353.50	0.8200	18.000	0.0130	7.74	9.53	0.81	5.81	1.06	0.71	0.00	Calculated
56	T5.1 TO T5	Pipe	T5.1	MH T5	43.15	356.89	355.00	4.3800	15.000	0.0130	0.39	13.52	0.03	3.96	0.42	0.34	0.00	Calculated
57	T5.2 TO T5.1	Pipe	T5.2	T5.1	24.13	357.26	357.14	0.5000	15.000	0.0130	0.26	4.57	0.06	2.01	0.20	0.16	0.00	Calculated
58	T6 TO T5	Pipe	T6	MH T5	66.19	356.37	355.00	2.0700	18.000	0.0130	7.75	15.10	0.51	7.71	0.84	0.56	0.00	Calculated
59	T7 TO T6	Pipe	T7	T6	97.74	357.60	356.62	1.0000	18.000	0.0130	7.75	10.50	0.74	6.22	1.00	0.66	0.00	Calculated
60	T8 TO T7	Pipe	T8	T7	166.53	363.64	357.85	3.4800	18.000	0.0130	7.76	19.59	0.40	9.28	0.72	0.48	0.00	Calculated
61	T9 TO T8	Pipe	T9	T8	45.30	364.34	363.89	1.0000	18.000	0.0130	4.84	10.50	0.46	5.47	0.75	0.50	0.00	Calculated

Inlet Summary

SN Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Initial Water Elevation (ft)	Ponded Area (ft ²)	Peak Flow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Allowable Spread (ft)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)
1 A10	FHWA HEC-22 GENERIC	N/A	On Sag	1	368.50	372.40	368.50	0.00	0.15	N/A	N/A	N/A	7.00	1.59	372.54
2 A11	FHWA HEC-22 GENERIC	N/A	On Sag	1	368.64	371.59	368.64	0.00	0.02	N/A	N/A	N/A	7.00	1.14	371.72
3 A12	FHWA HEC-22 GENERIC	N/A	On Sag	1	368.84	371.10	368.84	0.00	0.06	N/A	N/A	N/A	7.00	1.32	371.23
4 A13	FHWA HEC-22 GENERIC	N/A	On Sag	1	368.95	372.00	368.58	0.00	1.42	N/A	N/A	N/A	7.00	7.18	372.25
5 A6	FHWA HEC-22 GENERIC	N/A	On Sag	1	366.54	376.89	366.54	0.00	0.23	N/A	N/A	N/A	7.00	1.79	377.03
6 A6.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	375.78	379.03	375.78	0.00	1.58	N/A	N/A	N/A	7.00	7.82	379.29
7 A6.2	FHWA HEC-22 GENERIC	N/A	On Sag	1	377.41	381.06	377.41	0.00	1.13	N/A	N/A	N/A	7.00	6.01	381.28
8 A6.4	FHWA HEC-22 GENERIC	N/A	On Sag	1	379.91	384.11	379.91	0.00	0.40	N/A	N/A	N/A	7.00	2.14	384.26
9 A6.5	FHWA HEC-22 GENERIC	N/A	On Sag	1	381.15	383.65	381.15	0.00	1.94	N/A	N/A	N/A	7.00	9.11	383.94
10 A6.7	FHWA HEC-22 GENERIC	N/A	On Sag	1	378.15	380.65	378.15	0.00	1.17	N/A	N/A	N/A	7.00	6.19	380.88
11 A8	FHWA HEC-22 GENERIC	N/A	On Sag	1	367.61	373.81	367.61	0.00	1.75	N/A	N/A	N/A	7.00	8.43	374.08
12 A8.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	370.83	373.58	370.83	0.00	1.80	N/A	N/A	N/A	7.00	8.61	373.86
13 A9.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	372.75	376.86	372.75	0.00	0.18	N/A	N/A	N/A	7.00	1.68	377.00
14 A9.2	FHWA HEC-22 GENERIC	N/A	On Sag	1	375.60	377.92	375.60	0.00	2.43	N/A	N/A	N/A	7.00	10.76	378.24
15 B10	FHWA HEC-22 GENERIC	N/A	On Sag	1	378.50	381.13	378.50	0.00	0.37	N/A	N/A	N/A	7.00	2.09	381.28
16 B2	FHWA HEC-22 GENERIC	N/A	On Sag	1	361.33	365.65	361.33	0.00	0.32	N/A	N/A	N/A	7.00	1.98	365.79
17 B3	FHWA HEC-22 GENERIC	N/A	On Sag	1	361.90	365.66	362.66	0.00	0.96	N/A	N/A	N/A	7.00	5.28	365.87
18 B3.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	363.10	365.80	363.37	0.00	2.97	N/A	N/A	N/A	7.00	12.45	366.15
19 B5.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	378.52	381.52	378.52	0.00	0.19	N/A	N/A	N/A	7.00	1.71	381.66
20 B5.2	FHWA HEC-22 GENERIC	N/A	On Sag	1	379.12	383.71	379.12	0.00	0.81	N/A	N/A	N/A	7.00	2.84	383.87
21 B5.3	FHWA HEC-22 GENERIC	N/A	On Sag	1	381.00	384.00	381.00	0.00	0.71	N/A	N/A	N/A	7.00	2.69	384.16
22 B5.4	FHWA HEC-22 GENERIC	N/A	On Sag	1	380.75	383.50	380.75	0.00	1.79	N/A	N/A	N/A	7.00	8.59	383.78
23 B5.7	FHWA HEC-22 GENERIC	N/A	On Sag	1	373.32	376.32	373.32	0.00	1.92	N/A	N/A	N/A	7.00	9.03	376.60
24 B6	FHWA HEC-22 GENERIC	N/A	On Sag	1	374.23	377.79	374.23	0.00	0.76	N/A	N/A	N/A	7.00	2.76	377.95
25 B6.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	374.69	377.42	374.69	0.00	0.87	N/A	N/A	N/A	7.00	2.93	377.58
26 B7	FHWA HEC-22 GENERIC	N/A	On Sag	1	375.55	379.34	375.55	0.00	0.87	N/A	N/A	N/A	7.00	2.93	379.51
27 B8	FHWA HEC-22 GENERIC	N/A	On Sag	1	376.26	380.61	376.26	0.00	1.33	N/A	N/A	N/A	7.00	6.84	380.85
28 B8.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	376.90	379.15	376.90	0.00	4.06	N/A	N/A	N/A	7.00	15.61	379.57
29 G4	FHWA HEC-22 GENERIC	N/A	On Sag	1	348.25	352.69	348.25	0.00	1.45	N/A	N/A	N/A	7.00	7.33	352.94
30 G6	FHWA HEC-22 GENERIC	N/A	On Sag	1	359.35	363.00	359.35	0.00	2.10	N/A	N/A	N/A	7.00	9.65	363.30
31 G8	FHWA HEC-22 GENERIC	N/A	On Sag	1	370.39	374.00	370.39	0.00	0.85	N/A	N/A	N/A	7.00	2.89	374.16
32 S3.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	374.00	377.09	374.00	0.00	0.17	N/A	N/A	N/A	7.00	1.66	377.23
33 S4	FHWA HEC-22 GENERIC	N/A	On Sag	1	376.26	380.85	376.26	0.00	1.32	N/A	N/A	N/A	7.00	6.81	381.10
34 S5	FHWA HEC-22 GENERIC	N/A	On Sag	1	379.20	385.89	379.20	0.00	2.34	N/A	N/A	N/A	7.00	10.47	386.21
35 S6	FHWA HEC-22 GENERIC	N/A	On Sag	1	386.34	391.95	386.34	0.00	2.10	N/A	N/A	N/A	7.00	9.67	392.25
36 S7	FHWA HEC-22 GENERIC	N/A	On Sag	1	391.22	395.95	391.22	0.00	1.99	N/A	N/A	N/A	7.00	9.28	396.24
37 S8	FHWA HEC-22 GENERIC	N/A	On Sag	1	394.12	398.92	394.12	0.00	3.85	N/A	N/A	N/A	7.00	15.03	399.33
38 S9	FHWA HEC-22 GENERIC	N/A	On Sag	1	399.86	404.97	399.86	0.00	3.79	N/A	N/A	N/A	7.00	14.85	405.37
39 T10	FHWA HEC-22 GENERIC	N/A	On Sag	1	372.21	375.96	372.21	0.00	0.10	N/A	N/A	N/A	7.00	1.45	376.10
40 T12	FHWA HEC-22 GENERIC	N/A	On Sag	1	378.50	382.05	378.50	0.00	2.38	N/A	N/A	N/A	7.00	10.59	382.37
41 T2	FHWA HEC-22 GENERIC	N/A	On Sag	1	346.97	351.44	346.97	0.00	1.29	N/A	N/A	N/A	7.00	6.69	351.68
42 T3	FHWA HEC-22 GENERIC	N/A	On Sag	1	349.50	354.28	349.50	0.00	1.51	N/A	N/A	N/A	7.00	7.53	354.53
43 T4	FHWA HEC-22 GENERIC	N/A	On Sag	1	353.25	356.92	353.25	0.00	2.35	N/A	N/A	N/A	7.00	10.50	357.24
44 T5.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	356.89	360.14	356.89	0.00	0.14	N/A	N/A	N/A	7.00	1.56	360.28
45 T5.2	FHWA HEC-22 GENERIC	N/A	On Sag	1	357.26	360.64	357.26	0.00	0.27	N/A	N/A	N/A	7.00	1.88	360.78
46 T6	FHWA HEC-22 GENERIC	N/A	On Sag	1	356.37	359.98	356.37	0.00	0.83	N/A	N/A	N/A	7.00	2.87	360.14
47 T7	FHWA HEC-22 GENERIC	N/A	On Sag	1	357.60	362.12	357.60	0.00	0.90	N/A	N/A	N/A	7.00	2.98	362.28
48 T8	FHWA HEC-22 GENERIC	N/A	On Sag	1	363.64	366.97	363.64	0.00	3.17	N/A	N/A	N/A	7.00	13.07	367.34
49 T9	FHWA HEC-22 GENERIC	N/A	On Sag	1	364.34	370.00	364.34	0.00	2.99	N/A	N/A	N/A	7.00	12.54	370.36

Junction Input

SN Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft ²)	Minimum Pipe Cover (in)
1 A1.1	361.10	365.00	3.90	361.40	0.30	363.80	-1.20	0.00	0.00
2 A2	349.90	360.27	10.37	356.19	6.29	360.27	0.00	0.00	0.00
3 A7	367.35	374.73	7.38	367.35	0.00	374.73	0.00	0.00	0.00
4 A9	368.07	377.43	9.36	368.07	0.00	377.43	0.00	0.00	0.00
5 B5	373.05	376.30	3.25	373.05	0.00	376.30	0.00	0.00	0.00
6 G2	346.50	348.66	2.16	346.50	0.00	348.66	0.00	0.00	0.00
7 MHT5	354.75	358.00	3.25	354.75	0.00	358.00	0.00	0.00	0.00
8 OCS A3	351.00	362.70	11.70	351.00	0.00	361.52	-1.18	0.00	0.00
9 S2	346.70	362.42	15.72	355.48	8.78	362.42	0.00	0.00	0.00
10 S3	367.58	374.83	7.25	367.58	0.00	374.83	0.00	0.00	0.00
11 T1.1	346.50	348.66	2.16	346.50	0.00	351.00	2.34	0.00	0.00
12 T11	376.50	380.01	3.51	376.50	0.00	380.01	0.00	0.00	0.00

Junction Results

SN Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1 A1.1	22.06	3.45	364.27	3.17	0.00	0.73	363.49	2.39	0 00:00	0 00:00	0.00	0.00
2 A2	25.92	0.00	360.27	10.37	0.00	0.00	353.55	3.65	0 00:00	0 00:00	0.01	0.00
3 A7	7.33	0.00	368.36	1.01	0.00	6.36	367.36	0.01	0 00:05	0 00:00	0.00	0.00
4 A9	4.11	0.00	368.96	0.89	0.00	8.47	368.08	0.01	0 00:05	0 00:00	0.00	0.00
5 B5	10.44	0.00	375.56	2.51	0.00	0.74	373.33	0.28	0 00:06	0 00:00	0.00	0.00
6 G2	0.00	0.00	346.50	0.00	0.00	2.16	346.50	0.00	0 00:00	0 00:00	0.00	0.00
7 MH T5	7.75	0.00	355.84	1.09	0.00	2.16	354.78	0.03	0 00:25	0 00:00	0.00	0.00
8 OCS A3	29.55	25.00	362.70	11.70	0.00	0.00	354.62	3.62	0 00:00	0 00:00	0.01	0.00
9 S2	21.67	0.00	355.31	8.61	0.00	7.11	351.00	4.30	0 00:00	0 00:00	0.00	0.00
10 S3	12.94	0.00	368.22	0.64	0.00	6.61	367.59	0.01	0 00:17	0 00:00	0.00	0.00
11 T1.1	0.00	0.00	346.50	0.00	0.00	2.16	346.50	0.00	0 00:00	0 00:00	0.00	0.00
12 T11	2.38	0.00	376.79	0.29	0.00	3.22	376.51	0.01	0 00:24	0 00:00	0.00	0.00

Pipe Input

SN Element ID	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Total Drop	Average Slope	Pipe Shape	Pipe Diameter or Height	Pipe Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow	Flap Gate	No. of Barrels
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(%)		(in)	(in)					(cfs)		
1 3	77.71	376.90	0.00	376.51	0.25	0.39	0.5000	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
2 A1.1 TO A1	20.00	361.10	0.00	361.00	0.00	0.10	0.5000	CIRCULAR	24.000	24.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
3 A10 TO A9	66.63	368.50	0.00	368.17	0.10	0.33	0.5000	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
4 A11 TO A10	8.68	368.64	0.00	368.60	0.10	0.04	0.5000	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
5 A12 TO A11	20.02	368.84	0.00	368.74	0.10	0.10	0.5000	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
6 A13 TO A12	7.87	368.95	0.00	368.84	0.00	0.11	1.4000	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
7 A2 TO A2-Outfall	176.96	349.90	0.00	346.50	0.00	3.40	1.9200	CIRCULAR	24.000	24.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
8 A3 TO A2	55.27	351.00	0.00	349.90	0.00	1.10	1.9900	CIRCULAR	24.000	24.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
9 A6 TO A1.1	67.20	366.54	0.00	362.30	1.20	4.24	6.3100	CIRCULAR	24.000	24.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
10 A6.1 TO A6	52.94	375.78	0.00	373.89	7.35	1.89	3.5700	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
11 A6.2 TO A6.1	57.33	377.41	0.00	376.03	0.25	1.38	2.4100	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
12 A6.4--A6.2	152.72	379.91	0.00	378.06	0.65	1.85	1.2100	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
13 A6.5 TO A6.4	98.81	381.15	0.00	380.16	0.25	0.99	1.0000	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
14 A6.7 TO A6.2	98.86	378.15	0.00	377.66	0.25	0.49	0.5000	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
15 A7 TO A6	112.00	367.35	0.00	366.79	0.25	0.56	0.5000	CIRCULAR	24.000	24.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
16 A8 TO A7	32.22	367.61	0.00	367.45	0.10	0.16	0.5000	CIRCULAR	24.000	24.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
17 A8.1 TO A8	33.96	370.83	0.00	368.95	1.34	1.88	5.5500	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
18 A9 TO A8	71.86	368.07	0.00	367.71	0.10	0.36	0.5000	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
19 A9.1 TO A9	49.06	372.75	0.00	368.42	0.35	4.33	8.8300	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
20 A9.2 TO A9.1	77.99	375.60	0.00	373.00	0.25	2.60	3.3300	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
21 B10 TO B6.1	41.62	378.50	0.00	374.94	0.25	3.56	8.5500	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
22 B2 TO B1	65.86	361.33	0.00	361.00	0.00	0.33	0.5000	CIRCULAR	24.000	24.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
23 B3 TO B2	23.85	361.90	0.00	361.50	0.17	0.40	1.6800	CIRCULAR	24.000	24.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
24 B3.1 TO B3	91.00	363.10	0.00	362.60	0.70	0.50	0.5500	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
25 B5.1 TO B5	52.88	378.52	0.00	373.35	0.30	5.17	9.7700	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
26 B5.2 TO B5.1	70.20	379.12	0.00	378.77	0.25	0.35	0.5000	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
27 B5.3 TO B5.2	31.54	381.00	0.00	380.00	0.88	1.00	3.1700	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
28 B5.4 TO B5.2	91.84	380.75	0.00	379.76	0.64	0.99	1.0800	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
29 B5.7 TO B5	27.77	373.32	0.00	373.18	0.13	0.14	0.5000	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
30 B5.7-B3	106.81	373.05	-0.27	362.91	1.01	10.14	9.4900	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
31 B6 TO B5	34.52	374.23	0.00	373.20	0.15	1.03	2.9800	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
32 B6.1 TO B6	41.96	374.69	0.00	374.48	0.25	0.21	0.5000	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
33 B7 TO B6	106.24	375.55	0.00	374.79	0.56	0.76	0.7200	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
34 B8 TO B7	91.97	376.26	0.00	375.80	0.25	0.46	0.5000	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
35 G2 TO EXISTING_INLET	74.10	346.50	0.00	346.08	0.00	0.42	0.5700	CIRCULAR	24.000	24.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
36 G4 TO EXISTING_INLET	9.85	348.25	0.00	348.15	0.00	0.10	1.0000	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
37 G6 TO EXISTING_INLET	10.23	359.35	0.00	359.25	0.00	0.10	1.0000	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
38 G8 TO EXISTING_INLET	10.46	370.39	0.00	370.34	0.00	0.05	0.5000	CIRCULAR	24.000	24.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
39 S2 TO S2-Outfall	20.91	346.70	0.00	346.50	0.00	0.20	0.9600	CIRCULAR	30.000	30.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
40 S3 TO S2	225.88	367.58	0.00	355.73	9.03	11.84	5.2400	CIRCULAR	30.000	30.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
41 S3.1 TO S3	16.36	374.00	0.00	368.00	0.42	6.00	36.6800	CIRCULAR	36.000	36.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
42 S4 TO S3	110.46	376.26	0.00	368.00	0.42	8.26	7.4800	CIRCULAR	30.000	30.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
43 S5 TO S4	56.60	379.20	0.00	376.51	0.25	2.69	4.7500	CIRCULAR	30.000	30.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
44 S6 TO S5	153.09	386.34	0.00	379.45	0.25	6.89	4.5000	CIRCULAR	30.000	30.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
45 S7 TO S6	152.27	391.22	0.00	386.84	0.50	4.38	2.8800	CIRCULAR	24.000	24.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
46 S8 TO S7	88.33	394.12	0.00	391.47	0.25	2.65	3.0000	CIRCULAR	24.000	24.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
47 S9 TO S8	183.02	399.86	0.00	394.37	0.25	5.49	3.0000	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
48 T1.1 TO EXISTING_INLET	72.42	346.50	0.00	345.82	0.00	0.68	0.9400	CIRCULAR	24.000	24.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
49 T10 TO T9	100.05	372.21	0.00	365.72	1.37	6.49	6.4900	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
50 T11 TO T10	42.66	376.50	0.00	372.46	0.25	4.04	9.4700	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
51 T12 TO T11	17.45	378.50	0.00	376.75	0.25	1.75	10.0300	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
52 T2 TO EXIST_INLET	72.23	346.97	0.00	346.07	0.00	0.90	1.2500	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
53 T3 TO T2	192.12	349.50	0.00	346.97	0.00	2.53	1.3200	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
54 T4 TO T3	209.60	353.25	0.00	349.75	0.25	3.50	1.6700	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
55 T5 TO T4	151.89	354.75	0.00	353.50	0.25	1.25	0.8200	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
56 T5.1 TO T5	43.15	356.89	0.00	355.00	0.25	1.89	4.3800	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
57 T5.2 TO T5.1	24.13	357.26	0.00	357.14	0.25	0.12	0.5000	CIRCULAR	15.000	15.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
58 T6 TO T5	66.19	356.37	0.00	355.00	0.25	1.37	2.0700	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
59 T7 TO T6	97.74	357.60	0.00	356.62	0.25	0.98	1.0000	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
60 T8 TO T7	166.53	363.64	0.00	357.85	0.25	5.79	3.4800	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1
61 T9 TO T8	45.30	364.34	0.00	363.89	0.25	0.45	1.0000	CIRCULAR	18.000	18.000	0.0130	0.2000	0.2000	0.0000	0.00	No	1

Pipe Results

SN Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1 3	3.98	0 00:05	7.44	0.53	4.20	0.31	0.80	0.53	0.00		Calculated
2 A1.1 TO A1	22.06	0 00:00	16.00	1.38	7.04	0.05	2.00	1.00	1440.00		SURCHARGED
3 A10 TO A9	1.58	0 00:05	4.57	0.34	2.35	0.47	0.68	0.54	0.00		Calculated
4 A11 TO A10	1.47	0 00:05	4.57	0.32	3.14	0.05	0.51	0.41	0.00		Calculated
5 A12 TO A11	1.46	0 00:05	4.57	0.32	3.18	0.10	0.50	0.40	0.00		Calculated
6 A13 TO A12	1.41	0 00:05	7.64	0.18	3.03	0.04	0.51	0.41	0.00		Calculated
7 A2 TO A2-Outfall	26.56	0 00:00	31.36	0.85	8.46	0.35	2.00	1.00	1440.00		SURCHARGED
8 A3 TO A2	25.92	0 00:00	31.92	0.81	8.25	0.11	2.00	1.00	1440.00		SURCHARGED
9 A6 TO A1.1	13.23	0 00:05	56.82	0.23	7.87	0.14	1.06	0.53	0.00		Calculated
10 A6.1 TO A6	5.78	0 00:05	12.21	0.47	9.22	0.10	0.64	0.51	0.00		Calculated
11 A6.2 TO A6.1	4.34	0 00:05	10.02	0.43	7.47	0.13	0.60	0.48	0.00		Calculated
12 A6.4--A6.2	2.22	0 00:05	7.11	0.31	5.03	0.51	0.49	0.39	0.00		Calculated
13 A6.5 TO A6.4	1.89	0 00:05	6.46	0.29	4.47	0.37	0.47	0.38	0.00		Calculated
14 A6.7 TO A6.2	1.12	0 00:05	4.57	0.24	3.05	0.54	0.43	0.34	0.00		Calculated
15 A7 TO A6	7.34	0 00:06	16.00	0.46	4.81	0.39	0.98	0.49	0.00		Calculated
16 A8 TO A7	7.33	0 00:05	16.00	0.46	4.66	0.12	1.00	0.50	0.00		Calculated
17 A8.1 TO A8	1.79	0 00:05	15.21	0.12	7.94	0.07	0.30	0.24	0.00		Calculated
18 A9 TO A8	4.07	0 00:05	7.43	0.55	3.61	0.33	0.92	0.62	0.00		Calculated
19 A9.1 TO A9	2.57	0 00:05	19.19	0.13	8.92	0.09	0.42	0.34	0.00		Calculated
20 A9.2 TO A9.1	2.40	0 00:05	11.79	0.20	7.34	0.18	0.39	0.31	0.00		Calculated
21 B10 TO B6.1	0.37	0 00:05	18.89	0.02	5.03	0.14	0.51	0.41	0.00		Calculated
22 B2 TO B1	17.45	0 00:00	16.00	1.09	5.58	0.20	2.00	1.00	1440.00		SURCHARGED
23 B3 TO B2	15.42	0 00:05	29.30	0.53	5.66	0.07	2.00	1.00	4.00		SURCHARGED
24 B3.1 TO B3	2.91	0 00:01	7.79	0.37	3.33	0.46	1.35	0.90	0.00		Calculated
25 B5.1 TO B5	3.38	0 00:05	20.19	0.17	4.26	0.21	0.80	0.64	0.00		Calculated
26 B5.2 TO B5.1	3.21	0 00:05	4.57	0.70	4.07	0.29	0.77	0.61	0.00		Calculated
27 B5.3 TO B5.2	0.70	0 00:05	11.50	0.06	5.01	0.10	0.21	0.17	0.00		Calculated
28 B5.4 TO B5.2	1.75	0 00:05	6.71	0.26	4.49	0.34	0.44	0.36	0.00		Calculated
29 B5.7 TO B5	10.45	0 00:06	4.57	2.29	10.21	0.05	0.97	0.78	0.00		> CAPACITY
30 B5.7-B3	11.96	0 00:06	20.17	0.59	11.69	0.15	0.97	0.78	0.00		Calculated
31 B6 TO B5	7.40	0 00:06	18.14	0.41	4.19	0.14	1.50	1.00	1.00		SURCHARGED
32 B6.1 TO B6	1.50	0 00:07	4.57	0.33	2.79	0.25	1.21	0.97	0.00		Calculated
33 B7 TO B6	5.98	0 00:05	8.88	0.67	5.10	0.35	1.00	0.67	0.00		Calculated
34 B8 TO B7	5.21	0 00:05	7.43	0.70	4.55	0.34	0.93	0.62	0.00		Calculated
35 G2 TO EXISTING_INLET	0.00	0 00:00	17.03	0.00	0.00		0.00	0.00	0.00		Calculated
36 G4 TO EXISTING_INLET	1.45	0 00:05	6.46	0.22	3.89	0.04	0.43	0.34	0.00		Calculated
37 G6 TO EXISTING_INLET	2.09	0 00:05	6.46	0.32	4.28	0.04	0.52	0.42	0.00		Calculated
38 G8 TO EXISTING_INLET	0.84	0 00:05	16.00	0.05	2.53	0.07	0.32	0.16	0.00		Calculated
39 S2 TO S2-Outfall	41.89	0 00:00	40.12	1.04	8.53	0.04	2.50	1.00	1440.00		SURCHARGED
40 S3 TO S2	12.94	0 00:17	93.91	0.14	13.16	0.29	0.64	0.25	0.00		Calculated
41 S3.1 TO S3	0.17	0 00:13	403.94	0.00	5.99	0.05	0.13	0.04	0.00		Calculated
42 S4 TO S3	12.82	0 00:17	112.18	0.11	14.64	0.13	0.59	0.23	0.00		Calculated
43 S5 TO S4	11.52	0 00:17	89.39	0.13	11.69	0.08	0.64	0.25	0.00		Calculated
44 S6 TO S5	9.47	0 00:17	87.01	0.11	11.32	0.23	0.57	0.23	0.00		Calculated
45 S7 TO S6	7.42	0 00:17	38.38	0.19	9.21	0.28	0.61	0.30	0.00		Calculated
46 S8 TO S7	5.99	0 00:17	39.18	0.15	8.68	0.17	0.54	0.27	0.00		Calculated
47 S9 TO S8	3.77	0 00:29	18.19	0.21	7.99	0.38	0.47	0.31	0.00		Calculated
48 T1.1 TO EXISTING_INLET	0.00	0 00:00	21.92	0.00	0.00		0.00	0.00	0.00		Calculated
49 T10 TO T9	2.37	0 00:24	26.76	0.09	9.19	0.18	0.31	0.20	0.00		Calculated
50 T11 TO T10	2.38	0 00:24	32.33	0.07	10.31	0.07	0.28	0.19	0.00		Calculated
51 T12 TO T11	2.38	0 00:24	33.27	0.07	10.04	0.03	0.29	0.19	0.00		Calculated
52 T2 TO EXIST_INLET	7.78	0 00:06	11.73	0.66	6.71	0.18	0.94	0.62	0.00		Calculated
53 T3 TO T2	7.74	0 00:26	12.05	0.64	6.64	0.48	0.94	0.63	0.00		Calculated
54 T4 TO T3	7.73	0 00:25	13.57	0.57	7.74	0.45	0.83	0.55	0.00		Calculated
55 T5 TO T4	7.74	0 00:25	9.53	0.81	5.81	0.44	1.06	0.71	0.00		Calculated
56 T5.1 TO T5	0.39	0 00:05	13.52	0.03	3.96	0.18	0.42	0.34	0.00		Calculated
57 T5.2 TO T5.1	0.26	0 00:05	4.57	0.06	2.01	0.20	0.20	0.16	0.00		Calculated
58 T6 TO T5	7.75	0 00:25	15.10	0.51	7.71	0.14	0.84	0.56	0.00		Calculated
59 T7 TO T6	7.75	0 00:25	10.50	0.74	6.22	0.26	1.00	0.66	0.00		Calculated
60 T8 TO T7	7.76	0 00:24	19.59	0.40	9.28	0.30	0.72	0.48	0.00		Calculated
61 T9 TO T8	4.84	0 00:30	10.50	0.46	5.47	0.14	0.75	0.50	0.00		Calculated

Inlet Input

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Inlet Depth (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Ponded Area (ft ²)	Grate Clogging Factor (%)
1	A10	FHWA HEC-22 GENERIC	N/A	On Sag	1	368.50	372.40	3.90	368.50	0.00	0.00	0.00
2	A11	FHWA HEC-22 GENERIC	N/A	On Sag	1	368.64	371.59	2.95	368.64	0.00	0.00	0.00
3	A12	FHWA HEC-22 GENERIC	N/A	On Sag	1	368.84	371.10	2.26	368.84	0.00	0.00	0.00
4	A13	FHWA HEC-22 GENERIC	N/A	On Sag	1	368.95	372.00	3.05	368.58	-0.37	0.00	0.00
5	A6	FHWA HEC-22 GENERIC	N/A	On Sag	1	366.54	376.89	10.35	366.54	0.00	0.00	0.00
6	A6.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	375.78	379.03	3.25	375.78	0.00	0.00	0.00
7	A6.2	FHWA HEC-22 GENERIC	N/A	On Sag	1	377.41	381.06	3.65	377.41	0.00	0.00	0.00
8	A6.4	FHWA HEC-22 GENERIC	N/A	On Sag	1	379.91	384.11	4.20	379.91	0.00	0.00	0.00
9	A6.5	FHWA HEC-22 GENERIC	N/A	On Sag	1	381.15	383.65	2.50	381.15	0.00	0.00	0.00
10	A6.7	FHWA HEC-22 GENERIC	N/A	On Sag	1	378.15	380.65	2.50	378.15	0.00	0.00	0.00
11	A8	FHWA HEC-22 GENERIC	N/A	On Sag	1	367.61	373.81	6.20	367.61	0.00	0.00	0.00
12	A8.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	370.83	373.58	2.75	370.83	0.00	0.00	0.00
13	A9.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	372.75	376.86	4.11	372.75	0.00	0.00	0.00
14	A9.2	FHWA HEC-22 GENERIC	N/A	On Sag	1	375.60	377.92	2.32	375.60	0.00	0.00	0.00
15	B10	FHWA HEC-22 GENERIC	N/A	On Sag	1	378.50	381.13	2.63	378.50	0.00	0.00	0.00
16	B2	FHWA HEC-22 GENERIC	N/A	On Sag	1	361.33	365.65	4.32	361.33	0.00	0.00	0.00
17	B3	FHWA HEC-22 GENERIC	N/A	On Sag	1	361.90	365.66	3.76	362.66	0.76	0.00	0.00
18	B3.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	363.10	365.80	2.70	363.37	0.27	0.00	0.00
19	B5.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	378.52	381.52	3.00	378.52	0.00	0.00	0.00
20	B5.2	FHWA HEC-22 GENERIC	N/A	On Sag	1	379.12	383.71	4.59	379.12	0.00	0.00	0.00
21	B5.3	FHWA HEC-22 GENERIC	N/A	On Sag	1	381.00	384.00	3.00	381.00	0.00	0.00	0.00
22	B5.4	FHWA HEC-22 GENERIC	N/A	On Sag	1	380.75	383.50	2.75	380.75	0.00	0.00	0.00
23	B5.7	FHWA HEC-22 GENERIC	N/A	On Sag	1	373.32	376.32	3.00	373.32	0.00	0.00	0.00
24	B6	FHWA HEC-22 GENERIC	N/A	On Sag	1	374.23	377.79	3.56	374.23	0.00	0.00	0.00
25	B6.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	374.69	377.42	2.73	374.69	0.00	0.00	0.00
26	B7	FHWA HEC-22 GENERIC	N/A	On Sag	1	375.55	379.34	3.79	375.55	0.00	0.00	0.00
27	B8	FHWA HEC-22 GENERIC	N/A	On Sag	1	376.26	380.61	4.35	376.26	0.00	0.00	0.00
28	B8.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	376.90	379.15	2.25	376.90	0.00	0.00	0.00
29	G4	FHWA HEC-22 GENERIC	N/A	On Sag	1	348.25	352.69	4.44	348.25	0.00	0.00	0.00
30	G6	FHWA HEC-22 GENERIC	N/A	On Sag	1	359.35	363.00	3.65	359.35	0.00	0.00	0.00
31	G8	FHWA HEC-22 GENERIC	N/A	On Sag	1	370.39	374.00	3.61	370.39	0.00	0.00	0.00
32	S3.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	374.00	377.09	3.09	374.00	0.00	0.00	0.00
33	S4	FHWA HEC-22 GENERIC	N/A	On Sag	1	376.26	380.85	4.59	376.26	0.00	0.00	0.00
34	S5	FHWA HEC-22 GENERIC	N/A	On Sag	1	379.20	385.89	6.69	379.20	0.00	0.00	0.00
35	S6	FHWA HEC-22 GENERIC	N/A	On Sag	1	386.34	391.95	5.61	386.34	0.00	0.00	0.00
36	S7	FHWA HEC-22 GENERIC	N/A	On Sag	1	391.22	395.95	4.73	391.22	0.00	0.00	0.00
37	S8	FHWA HEC-22 GENERIC	N/A	On Sag	1	394.12	398.92	4.80	394.12	0.00	0.00	0.00
38	S9	FHWA HEC-22 GENERIC	N/A	On Sag	1	399.86	404.97	5.11	399.86	0.00	0.00	0.00
39	T10	FHWA HEC-22 GENERIC	N/A	On Sag	1	372.21	375.96	3.75	372.21	0.00	0.00	0.00
40	T12	FHWA HEC-22 GENERIC	N/A	On Sag	1	378.50	382.05	3.55	378.50	0.00	0.00	0.00
41	T2	FHWA HEC-22 GENERIC	N/A	On Sag	1	346.97	351.44	4.47	346.97	0.00	0.00	0.00
42	T3	FHWA HEC-22 GENERIC	N/A	On Sag	1	349.50	354.28	4.78	349.50	0.00	0.00	0.00
43	T4	FHWA HEC-22 GENERIC	N/A	On Sag	1	353.25	356.92	3.67	353.25	0.00	0.00	0.00
44	T5.1	FHWA HEC-22 GENERIC	N/A	On Sag	1	356.89	360.14	3.25	356.89	0.00	0.00	0.00
45	T5.2	FHWA HEC-22 GENERIC	N/A	On Sag	1	357.26	360.64	3.38	357.26	0.00	0.00	0.00
46	T6	FHWA HEC-22 GENERIC	N/A	On Sag	1	356.37	359.98	3.61	356.37	0.00	0.00	0.00
47	T7	FHWA HEC-22 GENERIC	N/A	On Sag	1	357.60	362.12	4.52	357.60	0.00	0.00	0.00
48	T8	FHWA HEC-22 GENERIC	N/A	On Sag	1	363.64	366.97	3.33	363.64	0.00	0.00	0.00
49	T9	FHWA HEC-22 GENERIC	N/A	On Sag	1	364.34	370.00	5.66	364.34	0.00	0.00	0.00

Inlet Results

SN Element ID	Peak Flow	Peak Lateral Inflow	Peak Flow Intercepted	Peak Flow Bypassing	Inlet Efficiency during Peak	Max Gutter Spread during Peak	Max Gutter Water Elev. during Peak	Max Gutter Water Depth during Peak	Time of Max Depth Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(cfs)	(cfs)	(%)	(ft)	(ft)	(ft)	(days hh:mm)	(ac-in)	(min)
1 A10	0.15	0.15	N/A	N/A	N/A	1.59	372.54	0.14	0 00:05	0.00	0.00
2 A11	0.02	0.02	N/A	N/A	N/A	1.14	371.72	0.13	0 00:05	0.00	0.00
3 A12	0.06	0.06	N/A	N/A	N/A	1.32	371.23	0.13	0 00:05	0.00	0.00
4 A13	1.42	1.42	N/A	N/A	N/A	7.18	372.25	0.25	0 00:05	0.00	0.00
5 A6	0.23	0.23	N/A	N/A	N/A	1.79	377.03	0.14	0 00:05	0.00	0.00
6 A6.1	1.58	1.58	N/A	N/A	N/A	7.82	379.29	0.26	0 00:05	0.00	0.00
7 A6.2	1.13	1.13	N/A	N/A	N/A	6.01	381.28	0.23	0 00:05	0.00	0.00
8 A6.4	0.40	0.40	N/A	N/A	N/A	2.14	384.26	0.15	0 00:05	0.00	0.00
9 A6.5	1.94	1.94	N/A	N/A	N/A	9.11	383.94	0.29	0 00:05	0.00	0.00
10 A6.7	1.17	1.17	N/A	N/A	N/A	6.19	380.88	0.23	0 00:05	0.00	0.00
11 A8	1.75	1.75	N/A	N/A	N/A	8.43	374.08	0.27	0 00:05	0.00	0.00
12 A8.1	1.80	1.80	N/A	N/A	N/A	8.61	373.86	0.28	0 00:05	0.00	0.00
13 A9.1	0.18	0.18	N/A	N/A	N/A	1.68	377.00	0.14	0 00:05	0.00	0.00
14 A9.2	2.43	2.43	N/A	N/A	N/A	10.76	378.24	0.32	0 00:05	0.00	0.00
15 B10	0.37	0.37	N/A	N/A	N/A	2.09	381.28	0.15	0 00:05	0.00	0.00
16 B2	0.32	0.32	N/A	N/A	N/A	1.98	365.79	0.14	0 00:00	0.00	0.00
17 B3	0.96	0.96	N/A	N/A	N/A	5.28	365.87	0.21	0 00:05	0.00	0.00
18 B3.1	2.97	2.97	N/A	N/A	N/A	12.45	366.15	0.35	0 00:05	0.00	0.00
19 B5.1	0.19	0.19	N/A	N/A	N/A	1.71	381.66	0.14	0 00:05	0.00	0.00
20 B5.2	0.81	0.81	N/A	N/A	N/A	2.84	383.87	0.16	0 00:05	0.00	0.00
21 B5.3	0.71	0.71	N/A	N/A	N/A	2.69	384.16	0.16	0 00:05	0.00	0.00
22 B5.4	1.79	1.79	N/A	N/A	N/A	8.59	383.78	0.28	0 00:05	0.00	0.00
23 B5.7	1.92	1.92	N/A	N/A	N/A	9.03	376.60	0.29	0 00:06	0.00	0.00
24 B6	0.76	0.76	N/A	N/A	N/A	2.76	377.95	0.16	0 00:06	0.00	0.00
25 B6.1	0.87	0.87	N/A	N/A	N/A	2.93	377.58	0.16	0 00:06	0.00	0.00
26 B7	0.87	0.87	N/A	N/A	N/A	2.93	379.51	0.16	0 00:05	0.00	0.00
27 B8	1.33	1.33	N/A	N/A	N/A	6.84	380.85	0.24	0 00:05	0.00	0.00
28 B8.1	4.06	4.06	N/A	N/A	N/A	15.61	379.57	0.42	0 00:05	0.00	0.00
29 G4	1.45	1.45	N/A	N/A	N/A	7.33	352.94	0.25	0 00:05	0.00	0.00
30 G6	2.10	2.10	N/A	N/A	N/A	9.65	363.30	0.30	0 00:05	0.00	0.00
31 G8	0.85	0.85	N/A	N/A	N/A	2.89	374.16	0.16	0 00:05	0.00	0.00
32 S3.1	0.17	0.17	N/A	N/A	N/A	1.66	377.23	0.14	0 00:13	0.00	0.00
33 S4	1.32	1.32	N/A	N/A	N/A	6.81	381.10	0.24	0 00:17	0.00	0.00
34 S5	2.34	2.34	N/A	N/A	N/A	10.47	386.21	0.31	0 00:17	0.00	0.00
35 S6	2.10	2.10	N/A	N/A	N/A	9.67	392.25	0.30	0 00:17	0.00	0.00
36 S7	1.99	1.99	N/A	N/A	N/A	9.28	396.24	0.29	0 00:17	0.00	0.00
37 S8	3.85	3.85	N/A	N/A	N/A	15.03	399.33	0.41	0 00:17	0.00	0.00
38 S9	3.79	3.79	N/A	N/A	N/A	14.85	405.37	0.40	0 00:29	0.00	0.00
39 T10	0.10	0.10	N/A	N/A	N/A	1.45	376.10	0.13	0 00:24	0.00	0.00
40 T12	2.38	2.38	N/A	N/A	N/A	10.59	382.37	0.32	0 00:24	0.00	0.00
41 T2	1.29	1.29	N/A	N/A	N/A	6.69	351.68	0.24	0 00:06	0.00	0.00
42 T3	1.51	1.51	N/A	N/A	N/A	7.53	354.53	0.26	0 00:26	0.00	0.00
43 T4	2.35	2.35	N/A	N/A	N/A	10.50	357.24	0.32	0 00:25	0.00	0.00
44 T5.1	0.14	0.14	N/A	N/A	N/A	1.56	360.28	0.14	0 00:05	0.00	0.00
45 T5.2	0.27	0.27	N/A	N/A	N/A	1.88	360.78	0.14	0 00:05	0.00	0.00
46 T6	0.83	0.83	N/A	N/A	N/A	2.87	360.14	0.16	0 00:25	0.00	0.00
47 T7	0.90	0.90	N/A	N/A	N/A	2.98	362.28	0.17	0 00:25	0.00	0.00
48 T8	3.17	3.17	N/A	N/A	N/A	13.07	367.34	0.37	0 00:24	0.00	0.00
49 T9	2.99	2.99	N/A	N/A	N/A	12.54	370.36	0.36	0 00:30	0.00	0.00

APPENDIX C

COMPOST SOCK WORKSHEET

RIPRAP APRON WORKSHEET

SWALE WORKSHEETS

100-YR SSA FLOWS TO SWALES

SKIMMER SIZING

GEOTECHNICAL REPORT

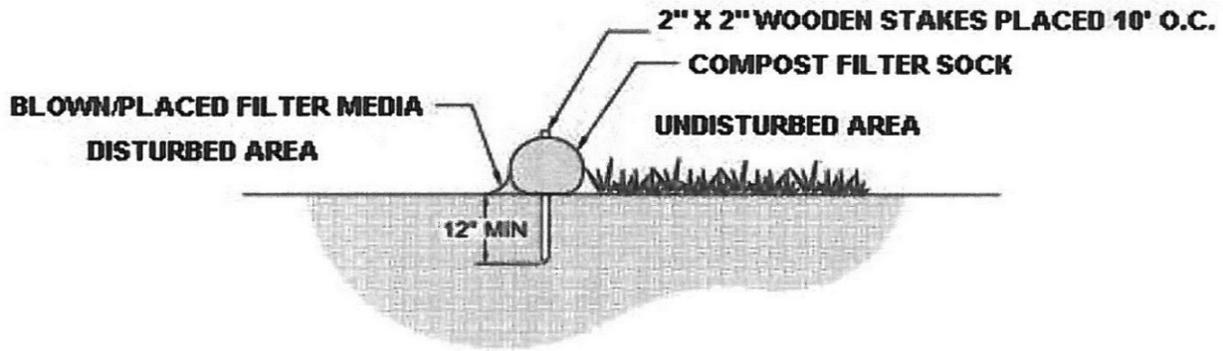
NRCS SOILS REPORT

CUT/FILL REPORT

STANDARD E&SC WORKSHEET #1

Compost Filter Socks

PROJECT NAME:	Trooper Ridge		
LOCATION:	Worcester Township		
PREPARED BY:	T&M	DATE:	1/23/2025
CHECKED BY:	T&M	DATE:	1/23/2025



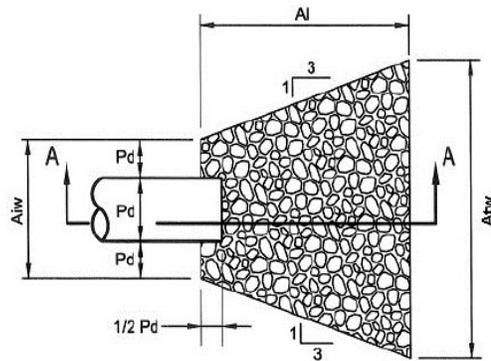
SOCK NO.	DIAMETER (in.)	LOCATION	SLOPE (%)	SLOPE LENGTH ABOVE BARRIER (ft.)
GP1	24	SEE ESC PLANS	8.0	415
GP2	24		8.0	400
GP3	24		8.0	375
GP4	18		8.0	350
GP5	18		8.0	325
GP6	18		8.0	300
GP7	18		8.0	275
GP8	18		8.0	250
GP9	18		8.0	250
GP10	18		8.0	250
SC1	12		33.0	25
SC2	12		33.0	25
SC3	18		8.0	50
SC4	18		8.0	50
SC5	18		8.0	50
TR1	32		8.0	450
TR2	32		8.0	450
TR3	32		8.0	450
TR4	32		8.0	450
TR5	32		8.0	450
TR6	32		8.0	450
TR7	32		8.0	420
TR8	24		8.0	320
TR9	24		8.0	300
TR10	24		8.0	280
TR11	18		8.0	255

STANDARD E&S WORKSHEET # 20

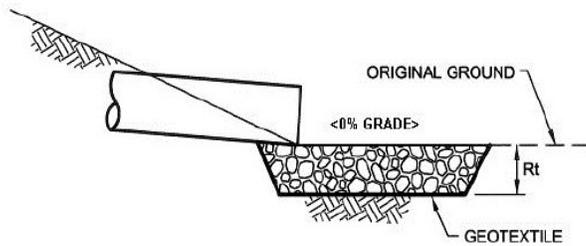
Riprap Apron Outlet Protection

PROJECT NAME: Trooper Ridge
 LOCATION: Worcester Township, Montgomery County PA
 PREPARED BY: T&M 12/18/2024
 CHECKED BY: T&M 12/18/2024

***:The anticipated velocity (V) should not exceed the maximum permissible shown in Table 6.6 for the proposed riprap protection. Adjust for less than full pipe flow. Use Manning’s equation to calculate velocity for pipe slopes ≥ 0.05 ft/ft.**



PLAN VIEW



SECTION A - A

NO.	PIPE DIA. Do (in.)	TAIL WATER COND. (Max or Min)	MAN. "n" FOR PIPE	PIPE SLOPE (FT/FT)	Q (CFS)	V* (FPS)	RIPRAP SIZE	Rt (in)	Al (ft)	Aiw (ft)	Atw (ft)
A1	24	MAX	0.013	0.005	22.00	7.04	R-5	27	16	6	13
B1	24	MAX	0.013	0.005	17.44	5.60	R-5	27	8	6	10
S2	30	MAX	0.013	0.0096	41.89	8.53	R-5	27	12	8	13
A2	24	MAX	0.013	0.0053	26.56	8.46	R-5	27	8	6	10

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Trooper Ridge
 LOCATION: Worcester Township, Montgomery County PA
 PREPARED BY: T&M DATE: 12/18/24
 CHECKED BY: T&M DATE: 12/18/24

CHANNEL OR CHANNEL SECTION		S3.1		
TEMPORARY OR PERMANENT? (T OR P)		P		
DESIGN STORM (2, 5, OR 10 YR)		100		
ACRES (AC)				
MULTIPLIER (1.6, 2.25, or 2.75) ¹		N/A		
Q _r (REQUIRED CAPACITY) (CFS)		0.45		
Q (CALCULATED AT FLOW DEPTH d) (CFS)		0.58		
PROTECTIVE LINING ²		R-5 Rip-Rap		
n (MANNING'S COEFFICIENT) ²		0.3114		
V _a (ALLOWABLE VELOCITY) (FPS)		11.00		
V (CALCULATED AT FLOW DEPTH d) (FPS)		0.46		
T _a (MAX ALLOWABLE SHEAR STRESS) (LB/FT ²)		N/A		
T _d (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT ²)		N/A		
CHANNEL BOTTOM WIDTH (FT)		5.00		
CHANNEL SIDE SLOPES (H:V)		3.00		
D (TOTAL DEPTH) (FT)		1.00		
CHANNEL TOP WIDTH @ D (FT)		11.0		
d (CALCULATED FLOW DEPTH) (FT)		0.22		
CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)		6.32		
BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)		6.35:1		
d ₅₀ STONE SIZE (IN)		0		
A (CROSS-SECTIONAL AREA) (SQ. FT.)		1.25		
R (HYDRAULIC RADIUS)		0.195		
S (BED SLOPE) ³ (FT/FT)		0.00		
S _c (CRITICAL SLOPE) (FT/FT)		246.31		
.7S _c (FT/FT)		172.42		
1.3S _c (FT/FT)		320.21		
STABLE FLOW? (Y/N)		Y		
FREEBOARD BASED ON UNSTABLE FLOW (FT)				
FREEBOARD BASED ON STABLE FLOW (FT)		0.06		
MINIMUM REQUIRED FREEBOARD ⁴ (FT)		0.50		
DESIGN METHOD FOR PROTECTIVE LINING ⁵				
PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V		

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater.
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Trooper Ridge
 LOCATION: Worcester Township, Montgomery County PA
 PREPARED BY: T&M DATE: 12/18/24
 CHECKED BY: T&M DATE: 12/18/24

CHANNEL OR CHANNEL SECTION		S4		
TEMPORARY OR PERMANENT? (T OR P)		P		
DESIGN STORM (2, 5, OR 10 YR)		100		
ACRES (AC)				
MULTIPLIER (1.6, 2.25, or 2.75) ¹		N/A		
Q _r (REQUIRED CAPACITY) (CFS)		1.32		
Q (CALCULATED AT FLOW DEPTH d) (CFS)		1.51		
PROTECTIVE LINING ²		R-5 Rip-Rap		
n (MANNING'S COEFFICIENT) ²		0.1820		
V _a (ALLOWABLE VELOCITY) (FPS)		11.00		
V (CALCULATED AT FLOW DEPTH d) (FPS)		0.96		
T _a (MAX ALLOWABLE SHEAR STRESS) (LB/FT ²)		N/A		
T _d (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT ²)		N/A		
CHANNEL BOTTOM WIDTH (FT)		5.00		
CHANNEL SIDE SLOPES (H:V)		3.00		
D (TOTAL DEPTH) (FT)		1.00		
CHANNEL TOP WIDTH @ D (FT)		11.0		
d (CALCULATED FLOW DEPTH) (FT)		0.27		
CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)		6.62		
BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)		6.35:1		
d ₅₀ STONE SIZE (IN)		0		
A (CROSS-SECTIONAL AREA) (SQ. FT.)		1.57		
R (HYDRAULIC RADIUS)		0.234		
S (BED SLOPE) ³ (FT/FT)		0.00		
S _c (CRITICAL SLOPE) (FT/FT)		79.36		
.7S _c (FT/FT)		55.55		
1.3S _c (FT/FT)		103.16		
STABLE FLOW? (Y/N)		Y		
FREEBOARD BASED ON UNSTABLE FLOW (FT)				
FREEBOARD BASED ON STABLE FLOW (FT)		0.07		
MINIMUM REQUIRED FREEBOARD ⁴ (FT)		0.50		
DESIGN METHOD FOR PROTECTIVE LINING ⁵				
PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V		

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater.
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Trooper Ridge
 LOCATION: Worcester Township, Montgomery County PA
 PREPARED BY: T&M DATE: 12/18/24
 CHECKED BY: T&M DATE: 12/18/24

CHANNEL OR CHANNEL SECTION		S5		
TEMPORARY OR PERMANENT? (T OR P)		P		
DESIGN STORM (2, 5, OR 10 YR)		100		
ACRES (AC)				
MULTIPLIER (1.6, 2.25, or 2.75) ¹		N/A		
Q _r (REQUIRED CAPACITY) (CFS)		2.34		
Q (CALCULATED AT FLOW DEPTH d) (CFS)		2.44		
PROTECTIVE LINING ²		R-5 Rip-Rap		
n (MANNING'S COEFFICIENT) ²		0.1185		
V _a (ALLOWABLE VELOCITY) (FPS)		11.00		
V (CALCULATED AT FLOW DEPTH d) (FPS)		1.11		
T _a (MAX ALLOWABLE SHEAR STRESS) (LB/FT ²)		N/A		
T _d (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT ²)		N/A		
CHANNEL BOTTOM WIDTH (FT)		5.00		
CHANNEL SIDE SLOPES (H:V)		3.00		
D (TOTAL DEPTH) (FT)		1.00		
CHANNEL TOP WIDTH @ D (FT)		11.0		
d (CALCULATED FLOW DEPTH) (FT)		0.36		
CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)		7.16		
BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)		6.35:1		
d ₅₀ STONE SIZE (IN)		0		
A (CROSS-SECTIONAL AREA) (SQ. FT.)		2.19		
R (HYDRAULIC RADIUS)		0.301		
S (BED SLOPE) ³ (FT/FT)		0.00		
S _c (CRITICAL SLOPE) (FT/FT)		31.04		
.7S _c (FT/FT)		21.73		
1.3S _c (FT/FT)		40.35		
STABLE FLOW? (Y/N)		Y		
FREEBOARD BASED ON UNSTABLE FLOW (FT)				
FREEBOARD BASED ON STABLE FLOW (FT)		0.09		
MINIMUM REQUIRED FREEBOARD ⁴ (FT)		0.50		
DESIGN METHOD FOR PROTECTIVE LINING ⁵				
PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V		

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater.
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Trooper Ridge
 LOCATION: Worcester Township, Montgomery County PA
 PREPARED BY: T&M DATE: 12/18/24
 CHECKED BY: T&M DATE: 12/18/24

CHANNEL OR CHANNEL SECTION		S6		
TEMPORARY OR PERMANENT? (T OR P)		P		
DESIGN STORM (2, 5, OR 10 YR)		100		
ACRES (AC)				
MULTIPLIER (1.6, 2.25, or 2.75) ¹		N/A		
Q _r (REQUIRED CAPACITY) (CFS)		2.10		
Q (CALCULATED AT FLOW DEPTH d) (CFS)		2.15		
PROTECTIVE LINING ²		R-5 Rip-Rap		
n (MANNING'S COEFFICIENT) ²		0.1149		
V _a (ALLOWABLE VELOCITY) (FPS)		11.00		
V (CALCULATED AT FLOW DEPTH d) (FPS)		0.95		
T _a (MAX ALLOWABLE SHEAR STRESS) (LB/FT ²)		N/A		
T _d (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT ²)		N/A		
CHANNEL BOTTOM WIDTH (FT)		5.00		
CHANNEL SIDE SLOPES (H:V)		3.00		
D (TOTAL DEPTH) (FT)		1.00		
CHANNEL TOP WIDTH @ D (FT)		11.0		
d (CALCULATED FLOW DEPTH) (FT)		0.37		
CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)		7.22		
BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)		6.35:1		
d ₅₀ STONE SIZE (IN)		0		
A (CROSS-SECTIONAL AREA) (SQ. FT.)		2.26		
R (HYDRAULIC RADIUS)		0.308		
S (BED SLOPE) ³ (FT/FT)		0.00		
S _c (CRITICAL SLOPE) (FT/FT)		28.96		
.7S _c (FT/FT)		20.27		
1.3S _c (FT/FT)		37.64		
STABLE FLOW? (Y/N)		Y		
FREEBOARD BASED ON UNSTABLE FLOW (FT)				
FREEBOARD BASED ON STABLE FLOW (FT)		0.09		
MINIMUM REQUIRED FREEBOARD ⁴ (FT)		0.50		
DESIGN METHOD FOR PROTECTIVE LINING ⁵				
PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V		

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater.
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Trooper Ridge
 LOCATION: Worcester Township, Montgomery County PA
 PREPARED BY: T&M DATE: 12/18/24
 CHECKED BY: T&M DATE: 12/18/24

CHANNEL OR CHANNEL SECTION		S7		
TEMPORARY OR PERMANENT? (T OR P)		P		
DESIGN STORM (2, 5, OR 10 YR)		100		
ACRES (AC)				
MULTIPLIER (1.6, 2.25, or 2.75) ¹		N/A		
Q _r (REQUIRED CAPACITY) (CFS)		1.99		
Q (CALCULATED AT FLOW DEPTH d) (CFS)		2.09		
PROTECTIVE LINING ²		R-5 Rip-Rap		
n (MANNING'S COEFFICIENT) ²		0.1225		
V _a (ALLOWABLE VELOCITY) (FPS)		11.00		
V (CALCULATED AT FLOW DEPTH d) (FPS)		0.99		
T _a (MAX ALLOWABLE SHEAR STRESS) (LB/FT ²)		N/A		
T _d (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT ²)		N/A		
CHANNEL BOTTOM WIDTH (FT)		5.00		
CHANNEL SIDE SLOPES (H:V)		3.00		
D (TOTAL DEPTH) (FT)		1.00		
CHANNEL TOP WIDTH @ D (FT)		11.0		
d (CALCULATED FLOW DEPTH) (FT)		0.35		
CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)		7.1		
BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)		6.35:1		
d ₅₀ STONE SIZE (IN)		0		
A (CROSS-SECTIONAL AREA) (SQ. FT.)		2.12		
R (HYDRAULIC RADIUS)		0.294		
S (BED SLOPE) ³ (FT/FT)		0.00		
S _c (CRITICAL SLOPE) (FT/FT)		33.42		
.7S _c (FT/FT)		23.40		
1.3S _c (FT/FT)		43.45		
STABLE FLOW? (Y/N)		Y		
FREEBOARD BASED ON UNSTABLE FLOW (FT)				
FREEBOARD BASED ON STABLE FLOW (FT)		0.09		
MINIMUM REQUIRED FREEBOARD ⁴ (FT)		0.50		
DESIGN METHOD FOR PROTECTIVE LINING ⁵				
PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V		

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater.
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Trooper Ridge
 LOCATION: Worcester Township, Montgomery County PA
 PREPARED BY: T&M DATE: 12/18/24
 CHECKED BY: T&M DATE: 12/18/24

CHANNEL OR CHANNEL SECTION		S8		
TEMPORARY OR PERMANENT? (T OR P)		P		
DESIGN STORM (2, 5, OR 10 YR)		100		
ACRES (AC)				
MULTIPLIER (1.6, 2.25, or 2.75) ¹		N/A		
Q _r (REQUIRED CAPACITY) (CFS)		3.85		
Q (CALCULATED AT FLOW DEPTH d) (CFS)		4.00		
PROTECTIVE LINING ²		R-5 Rip-Rap		
n (MANNING'S COEFFICIENT) ²		0.1011		
V _a (ALLOWABLE VELOCITY) (FPS)		11.00		
V (CALCULATED AT FLOW DEPTH d) (FPS)		1.52		
T _a (MAX ALLOWABLE SHEAR STRESS) (LB/FT ²)		N/A		
T _d (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT ²)		N/A		
CHANNEL BOTTOM WIDTH (FT)		5.00		
CHANNEL SIDE SLOPES (H:V)		3.00		
D (TOTAL DEPTH) (FT)		1.00		
CHANNEL TOP WIDTH @ D (FT)		11.0		
d (CALCULATED FLOW DEPTH) (FT)		0.42		
CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)		7.52		
BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)		6.35:1		
d ₅₀ STONE SIZE (IN)		0		
A (CROSS-SECTIONAL AREA) (SQ. FT.)		2.63		
R (HYDRAULIC RADIUS)		0.343		
S (BED SLOPE) ³ (FT/FT)		0.00		
S _c (CRITICAL SLOPE) (FT/FT)		21.63		
.7S _c (FT/FT)		15.14		
1.3S _c (FT/FT)		28.12		
STABLE FLOW? (Y/N)		Y		
FREEBOARD BASED ON UNSTABLE FLOW (FT)				
FREEBOARD BASED ON STABLE FLOW (FT)		0.11		
MINIMUM REQUIRED FREEBOARD ⁴ (FT)		0.50		
DESIGN METHOD FOR PROTECTIVE LINING ⁵				
PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V		

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater.
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Trooper Ridge
 LOCATION: Worcester Township, Montgomery County PA
 PREPARED BY: T&M DATE: 12/18/24
 CHECKED BY: T&M DATE: 12/18/24

CHANNEL OR CHANNEL SECTION		S9		
TEMPORARY OR PERMANENT? (T OR P)		P		
DESIGN STORM (2, 5, OR 10 YR)		100		
ACRES (AC)				
MULTIPLIER (1.6, 2.25, or 2.75) ¹		N/A		
Q _r (REQUIRED CAPACITY) (CFS)		3.80		
Q (CALCULATED AT FLOW DEPTH d) (CFS)		3.95		
PROTECTIVE LINING ²		R-5 Rip-Rap		
n (MANNING'S COEFFICIENT) ²		0.0849		
V _a (ALLOWABLE VELOCITY) (FPS)		11.00		
V (CALCULATED AT FLOW DEPTH d) (FPS)		1.16		
T _a (MAX ALLOWABLE SHEAR STRESS) (LB/FT ²)		N/A		
T _d (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT ²)		N/A		
CHANNEL BOTTOM WIDTH (FT)		5.00		
CHANNEL SIDE SLOPES (H:V)		3.00		
D (TOTAL DEPTH) (FT)		1.25		
CHANNEL TOP WIDTH @ D (FT)		12.5		
d (CALCULATED FLOW DEPTH) (FT)		0.52		
CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)		8.12		
BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)		6.35:1		
d ₅₀ STONE SIZE (IN)		0		
A (CROSS-SECTIONAL AREA) (SQ. FT.)		3.41		
R (HYDRAULIC RADIUS)		0.412		
S (BED SLOPE) ³ (FT/FT)		0.00		
S _c (CRITICAL SLOPE) (FT/FT)		14.40		
.7S _c (FT/FT)		10.08		
1.3S _c (FT/FT)		18.72		
STABLE FLOW? (Y/N)		Y		
FREEBOARD BASED ON UNSTABLE FLOW (FT)				
FREEBOARD BASED ON STABLE FLOW (FT)		0.13		
MINIMUM REQUIRED FREEBOARD ⁴ (FT)		0.50		
DESIGN METHOD FOR PROTECTIVE LINING ⁵				
PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V		

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater.
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-A10	0.02	0.9200	0.71	0.65	0.01	0.15	0 00:05:00
2	Sub-A11	0.00	0.9500	0.71	0.67	0.00	0.02	0 00:05:00
3	Sub-A12	0.02	0.4000	0.71	0.28	0.00	0.06	0 00:05:00
4	Sub-A13	0.23	0.7400	0.71	0.53	0.12	1.42	0 00:05:00
5	Sub-A6	0.03	0.8300	0.71	0.59	0.02	0.23	0 00:05:00
6	Sub-A6.1	0.06	0.8500	0.71	0.60	0.04	0.44	0 00:05:00
7	Sub-A6.2	0.16	0.8500	0.71	0.60	0.09	1.13	0 00:05:00
8	Sub-A6.3	0.16	0.8500	0.71	0.60	0.10	1.15	0 00:05:00
9	Sub-A6.4	0.05	0.9100	0.71	0.65	0.03	0.40	0 00:05:00
10	Sub-A6.5	0.13	0.3500	0.71	0.25	0.03	0.39	0 00:05:00
11	Sub-A6.7	0.18	0.3500	0.71	0.25	0.05	0.55	0 00:05:00
12	Sub-A7.1	0.17	0.5800	0.71	0.41	0.07	0.86	0 00:05:00
13	Sub-A7.2	0.04	0.9500	0.71	0.67	0.03	0.34	0 00:05:00
14	Sub-A8	0.09	0.7100	0.71	0.50	0.05	0.56	0 00:05:00
15	Sub-A8.1	0.24	0.9000	0.71	0.64	0.15	1.80	0 00:05:00
16	Sub-A9.1	0.06	0.3500	0.71	0.25	0.02	0.18	0 00:05:00
17	Sub-A9.2	0.19	0.3500	0.71	0.25	0.05	0.56	0 00:05:00
18	Sub-B10	0.05	0.9500	0.71	0.67	0.03	0.37	0 00:05:00
19	Sub-B2	0.00	0.9500	0.71	0.67	0.00	0.03	0 00:05:00
20	Sub-B3	0.01	0.4900	0.71	0.35	0.00	0.04	0 00:05:00
21	Sub-B3.1	0.39	0.5200	0.71	0.37	0.14	1.72	0 00:05:00
22	Sub-B4	0.06	0.6400	0.71	0.45	0.03	0.31	0 00:05:00
23	Sub-B4.1	0.13	0.8700	0.71	0.62	0.08	0.93	0 00:05:00
24	Sub-B5.1	0.02	0.9500	0.71	0.67	0.02	0.19	0 00:05:00
25	Sub-B5.2	0.11	0.8400	0.71	0.60	0.07	0.81	0 00:05:00
26	Sub-B5.3	0.10	0.8700	0.71	0.62	0.06	0.71	0 00:05:00
27	Sub-B5.4	0.18	0.3500	0.71	0.25	0.05	0.55	0 00:05:00
28	Sub-B5.7	0.06	0.6600	0.71	0.47	0.03	0.35	0 00:05:00
29	Sub-B6	0.10	0.8900	0.71	0.63	0.06	0.76	0 00:05:00
30	Sub-B6.1	0.18	0.5700	0.71	0.41	0.07	0.87	0 00:05:00
31	Sub-B7	0.12	0.8300	0.71	0.59	0.07	0.87	0 00:05:00
32	Sub-B8	0.05	0.8900	0.71	0.63	0.03	0.40	0 00:05:00
33	Sub-B8.1	0.52	0.3500	0.71	0.25	0.13	1.56	0 00:05:00
34	Sub-B9	0.13	0.8400	0.71	0.60	0.08	0.94	0 00:05:00
35	Sub-BLDG1	0.23	0.9500	0.71	0.67	0.16	1.87	0 00:05:00
36	Sub-BLDG10	0.19	0.9500	0.71	0.67	0.13	1.57	0 00:05:00
37	Sub-BLDG11	0.08	0.9500	0.71	0.67	0.05	0.63	0 00:05:00
38	Sub-BLDG12	0.12	0.9500	0.71	0.67	0.08	0.94	0 00:05:00
39	Sub-BLDG13	0.23	0.9500	0.71	0.67	0.16	1.89	0 00:05:00
40	Sub-BLDG2	0.08	0.9500	0.71	0.67	0.05	0.62	0 00:05:00
41	Sub-BLDG3	0.08	0.9500	0.71	0.67	0.05	0.62	0 00:05:00
42	Sub-BLDG4	0.12	0.9500	0.71	0.67	0.08	0.93	0 00:05:00
43	Sub-BLDG5	0.08	0.9500	0.71	0.67	0.05	0.62	0 00:05:00
44	Sub-BLDG6	0.08	0.9500	0.71	0.67	0.05	0.62	0 00:05:00
45	Sub-BLDG7	0.15	0.9500	0.71	0.67	0.10	1.25	0 00:05:00
46	Sub-BLDG8	0.16	0.9500	0.71	0.67	0.10	1.26	0 00:05:00
47	Sub-BLDG9	0.16	0.9500	0.71	0.67	0.10	1.26	0 00:05:00
48	Sub-G4	0.22	0.7700	0.71	0.55	0.12	1.46	0 00:05:00
49	Sub-G6	0.32	0.7600	0.71	0.54	0.17	2.10	0 00:05:00
50	Sub-G8	0.11	0.9200	0.71	0.65	0.07	0.85	0 00:05:00
51	Sub-S3.1	0.09	0.3300	1.36	0.45	0.04	0.17	0 00:13:42
52	Sub-S4	0.68	0.3600	1.54	0.55	0.37	1.32	0 00:17:00
53	Sub-S5	1.21	0.3400	1.47	0.50	0.60	2.34	0 00:15:30
54	Sub-S6	1.07	0.3700	1.57	0.58	0.62	2.10	0 00:17:42
55	Sub-S7	0.92	0.3600	1.33	0.48	0.44	1.99	0 00:13:24
56	Sub-S8	1.81	0.3900	1.53	0.60	1.08	3.85	0 00:16:48
57	Sub-S9	2.24	0.4000	2.06	0.82	1.84	3.79	0 00:29:12
58	Sub-T10	0.03	0.3500	0.71	0.25	0.01	0.10	0 00:05:00
59	Sub-T12	1.84	0.2800	1.86	0.52	0.96	2.38	0 00:24:06
60	Sub-T2	0.26	0.5800	0.71	0.41	0.11	1.30	0 00:05:00
61	Sub-T3	0.32	0.5500	0.71	0.39	0.13	1.51	0 00:05:00
62	Sub-T4	0.54	0.5100	0.71	0.36	0.20	2.35	0 00:05:00
63	Sub-T5.1	0.02	0.9500	0.71	0.67	0.01	0.14	0 00:05:00
64	Sub-T5.2	0.05	0.6200	0.71	0.44	0.02	0.27	0 00:05:00
65	Sub-T6	0.24	0.4100	0.71	0.29	0.07	0.83	0 00:05:00
66	Sub-T7	0.23	0.4600	0.71	0.33	0.08	0.91	0 00:05:00
67	Sub-T8	1.86	0.3600	1.81	0.65	1.21	3.17	0 00:22:48
68	Sub-T9	2.47	0.2900	2.08	0.60	1.49	3.00	0 00:29:54

STANDARD E&S WORKSHEET # 12

12/18/24

PROJECT NAME:
 LOCATION:
 PREPARED BY:
 CHECKED BY:

Trooper Ridge
 Montgomery
 ZHR
 ZHR

BASIN NUMBER		1	
PERMANENT OR TEMPORARY BASIN? (P or T)		P	
SPECIAL PROTECTION WATERSHED? (YES OR NO)		N	
Karst soils? (YES OR NO)		N	
(A) MAXIMUM TOTAL DRAINAGE AREA (AC)		7.1	
IS DRAINAGE AREA (A) MORE THAN 10% LARGER THAN THE PRECONSTRUCTION CONDITION? (YES OR NO)		No	
(A ₁) DISTURBED ACRES IN DRAINAGE AREA (AC)		7.07	
(I) INITIAL REQ'D DEWATERING ZONE (5,000 X A) (CF)		35500	
(T) REDUCTION FOR TOP DEWATERING (-700 X A) (CF)		0	
(P) REDUCTION FOR PERMANENT POOL (-700 X A) (CF)		0	
(L) REDUCTION FOR 4:1 FLOW LENGTH:WIDTH (-350 X A) (CF)		2485	
(D) REDUCTION FOR 4 TO 7 DAY DEWATERING (- 350 X A) (CF)		2485	
(S _v) REQUIRED DEWATERING ZONE [(I - (T+P+L+D))] ₁ (CF)		30530	
(S _d) REQUIRED SEDIMENT STORAGE VOLUME (1000 X A ₁) (CF)		7070	
(S _t) TOTAL REQUIRED STORAGE VOLUME (S _v + S _d) (CF)		37600	
TOTAL STORAGE VOLUME PROVIDED (@ ELEV 3) ₂ (CF)		37600	
DEWATERING TIME FOR DEWATERING ZONE (DAYS)		7.0	
REQUIRED DISCHARGE CAPACITY (2 X A) (CFS) ₃		14.2	
PRINCIPAL SPILLWAY TYPE (PERFORATED RISER, SKIMMER, etc.)		Skimmer	
PEAK FLOW FROM 10 YR/24 HR STORM FOR DRAINAGE AREA (A)		n/a	
PRINCIPAL SPILLWAY CAPACITY (@ ELEV 5) (CFS) ₄		16.0	
EMERGENCY SPILLWAY CAPACITY (@ ELEV 5) (CFS) ₄		19.8	
TOTAL BASIN DISCHARGE CAPACITY (@ ELEV 5) (CFS)		35.80	
EMERGENCY SPILLWAY PROTECTIVE LINING ₅		Yes	
OUTLET TO A SURFACE WATER? (YES OR NO) ₆		No	
PEAK FLOW FROM A 100 YR/24 HR STORM FOR DRG. AREA (A)		n/a	

1 The minimum dewatering zone capacity for sediment basins is (3,600 X A). No reduction is permitted in Special Protection (HQ and EV) Watersheds.

2 Total Storage Volume provided at riser crest.

3 Or provide calculations to show peak flow from 25 yr./24 hr. storm for area (A) is routed through the basin.

4 Provide supporting computations.

5 If grass lining is proposed, spillway should be constructed in original ground unless a suitable TRM lining is used. Wherever a TRM is used, riprap should be placed at the bottom of the embankment to prevent scour.

6 If no, and basin is permanent or drainage area is more than 10% larger than pre-construction, provide supporting calculations to show accelerated erosion will not result from the proposed discharge.

For discharges increasing volume or rate of flow onto a neighboring property prior to entering a surface water, an easement should be obtained prior to plan submittal.

STANDARD E&S WORKSHEET # 13

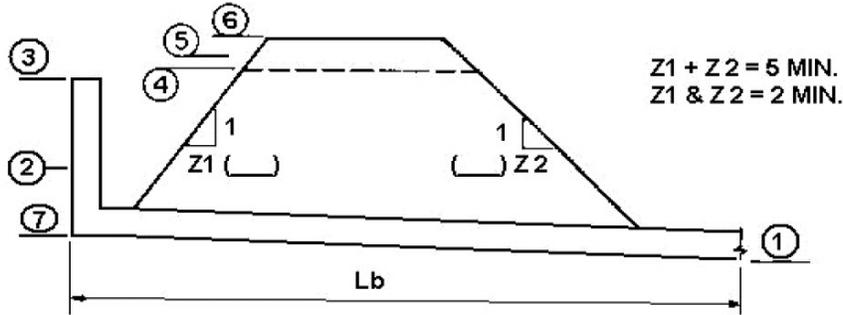
Sediment Basin Dimensions and Elevations

PROJECT NAME:
 LOCATION:
 PREPARED BY:
 CHECKED BY:

Trooper Ridge
 Montgomery
 ZHR
 ZHR

12/18/24

For irregular shaped traps, provide stage storage data



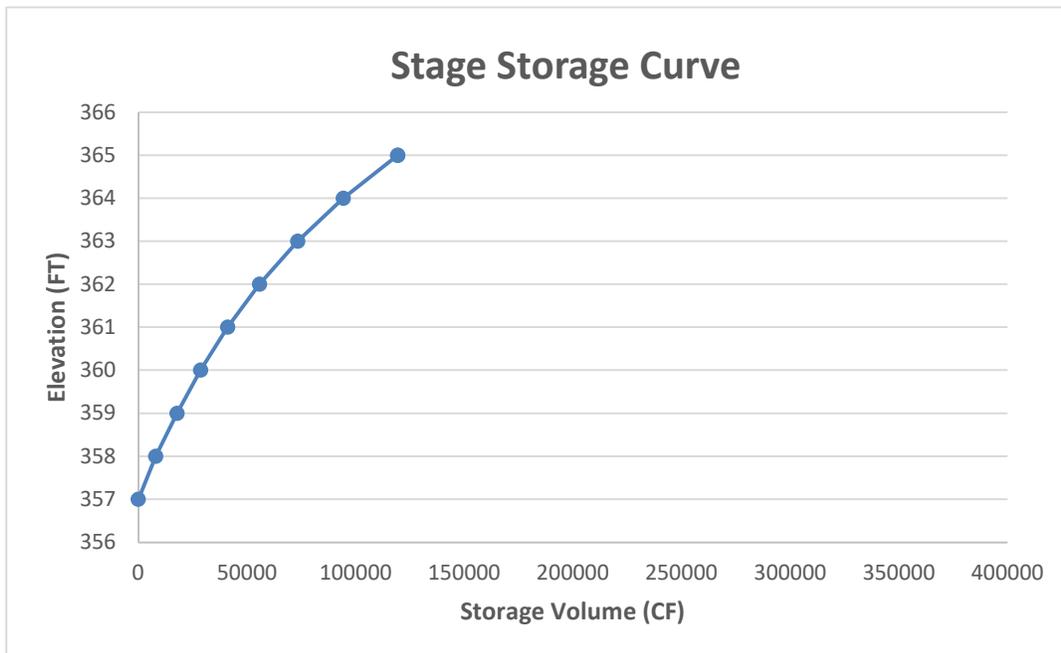
BASIN NUMBER		1
1. DISCHARGE PIPE ELEVATION	(FT)	346.50
2. ELEVATION AT TOP OF SEDIMENT STORAGE ZONE (@ Sd)	(FT) (MIN. 1.0' ABOVE ELEVATION 7)	357.90
3. ELEVATION AT TOP OF DEWATERING ZONE (St)	(FT) (CREST OF PRINCIPAL SPILLWAY)	360.80
4. EMERGENCY SPILLWAY CREST ELEVATION	(FT) (MIN. 0.5' ABOVE ELEVATION 3)	362.50
5. 2 CFS/ACRE OR 25-YR/24-HR FLOW ELEVATION	(FT)	363.00
6. TOP OF EMBANKMENT ELEVATION	(FT) (MIN. 24" ABOVE ELEVATION 5 OR 12" WITH ROUTED 100-YR/24-HR STORM)	365.00
7. BASIN BOTTOM ELEVATION	(FT)	357.00
AVERAGE BOTTOM WIDTH	(FT)	28
AVERAGE BOTTOM LENGTH	(FT)	235
(S _{min}) REQUIRED SURFACE AREA AT ELEVATION 2	(SQ. FT.)	7253
SURFACE AREA PROVIDED AT ELEVATION 2	(SQ. FT.)	9400
AVERAGE BASIN WIDTH (W) AT ELEVATION 3	(FT)	40
FLOW LENGTH (L) AT ELEVATION 3	(FT)	250
FLOW LENGTH:WIDTH RATIO AT ELEVATION 3	(L/W)	6.3
SILT CURTAIN OR FOREBAY?	(IF YES, INDICATE WHICH)	
EMBANKMENT TOP WIDTH	(FT, 8' MIN.)	10
EMBANKMENT SOIL TYPE(S)		Silt Loam
KEY TRENCH DEPTH	(FT, 2' MIN.)	2
KEY TRENCH WIDTH	(FT, 4' MIN.)	4
RISER DIAMETER/TYPE	(15" MIN.)	6x6 Conc Box
BARREL DIAMETER/TYPE	(12" MIN.)	36" HDPE
Lb (BARREL LENGTH)	(FT)	230
EMERGENCY SPILLWAY WIDTH	(FT)	20
EMERGENCY SPILLWAY SIDE SLOPES	(H:V)	3
EMERGENCY SPILLWAY DEPTH	(FT)	0.5

STANDARD E&S WORKSHEET #14
Sediment Basin/Sediment Trap Storage Data

12/18/24

PROJECT NAME: Trooper Ridge
 LOCATION: Montgomery
 PREPARED BY: ZHR
 CHECKED BY: ZHR
 SEDIMENT BASIN 1

WATER SURFACE ELEVATION (FT)	AREA (FT ²)	AVERAGE AREA (FT ²)	DIFFERENCE IN ELEVATION (FT)	STORAGE VOLUME (FT ³)	
				INCREMENTAL	TOTAL
357	6800				0
		8100	1	8065	8065
358	9400				8065
		9700	1	9698	17763
359	10000				17763
		10950	1	10936	28700
360	11900				28700
		12493	1	12488	41188
361	13086				41188
		14595	1	14569	55757
362	16104				55757
		17687	1	17663	73420
363	19270				73420
		20927	1	20905	94325
364	22584				94325
		25042	1	25002	119327
365	27500				119327
		13750	0	0	119327
365	0				119327



STANDARD E&S WORKSHEET # 17
Sediment Basin Discharge Capacity

12/18/24

PROJECT NAME: Trooper Ridge
 LOCATION: Montgomery
 PREPARED BY: ZHR
 CHECKED BY: ZHR

PRINCIPAL SPILLWAY DISCHARGE CAPACITY

BASIN NO: 1

WATER SURFACE ELEVATION ₄ (FT)	Flow into Top of TEMPORARY RISER			Flow into Top of PERMANENT RISER			BARREL PIPE FLOW		PRINCIPAL SPILLWAY CAPACITY ₃ (CFS)
	HEAD (FT)	ORIFICE FLOW ₁ Q(CFS)	WEIR FLOW Q(CFS)	HEAD (FT)	ORIFICE FLOW ₁ Q(CFS)	WEIR FLOW Q(CFS)	HEAD ₂ (FT)	Q (CFS)	
362.50	1.70	0.00	0.00	0.50	40.00	16.00	11.50	106.03	16.00

EMERGENCY SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION ₄ (FT)	EMERGENCY SPILLWAY BOTTOM WIDTH ₅ (FT)	TABLE OR C VALUE USED ₆	EMERGENCY SPILLWAY CAPACITY (CFS)	REQUIRED DISCHARGE CAPACITY (CFS)	TOTAL DISCHARGE CAPACITY PROVIDED (CFS) ₇
363.00	20	2.8	19.8	14.2	35.8

1. Flow into top of riser only (Flow through perforations not included)
2. Water surface elevation minus elevation at centerline of pipe outlet
3. Least of orifice, weir, or pipe flow (Peak flow from 10 yr/24 hr storm Min.)
4. 24" below top of embankment (12" if 100-year storm routed through basin)
5. 8 Ft. minimum
6. Use Tables 7.5 through 7.8 or equation for broad-crested weir [$Q = CLH^{1.5}$, where $C \leq 2.8$ (MAX)]; for Riprap larger than R-3 or flows less than 1.5' deep adjust C downward]
7. Principal Spillway Capacity + Emergency Spillway Capacity

363-2134-008 / March 31, 2012 / Page 388

Calculate Skimmer SizeBasin Volume in Cubic Feet Cu.FtDays to Drain* DaysSkimmer Size InchOrifice Radius Inch[es]Orifice Diameter Inch[es]

*In NC assume 3 days to drain

Estimate Volume of BasinTop of water surface in feet

Length	Width
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>

 FeetBottom dimensions in feet

Length	Width
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>

 FeetDepth in feet FeetVOLUME Cu. Ft.



STORMWATER INFILTRATION REPORT

Trooper Ridge

Worchester Township, Montgomery County, Pennsylvania

September 12, 2024

Prepared for:

Pulte Homes

750 US Highway 202, Suite 500
Bridgewater, New Jersey 08807

Attn: Mr. Sam Carlo

Prepared by:

Geo-Technology Associates, Inc.

*Geotechnical and Environmental Consultants
Construction Observation and Testing*

2405 John Fries Highway
Quakertown, Pennsylvania 18951
(215) 536-8363
www.gtaeng.com

GTA Project No: 31241616

GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS

A Practicing Geoprofessional Business Association Member Firm



September 12, 2024

Pulte Homes

750 US Highway 202, Suite 500
Bridgewater, New Jersey 08807

Attn: Mr. Sam Carlo

Re: Stormwater Infiltration Report
Trooper Ridge
Worchester Township, Montgomery County, Pennsylvania

Dear Mr. Carlo:

In accordance with our agreement, Geo-Technology Associates, Inc. (GTA) has conducted subsurface explorations and infiltration testing at the above-referenced property in Worchester Township, Montgomery County, Pennsylvania. The purpose of the exploration and testing was to evaluate the on-site soils for infiltration feasibility within the proposed stormwater management (SWM) facilities. This report and the attachments are instruments of service. The subject matter of this report is limited to the facts and matters stated herein. Absence of a reference to any other conditions or subject matter shall not be construed by the reader to imply approval by the writer.

GTA appreciates the opportunity to have been of assistance to you on this project. Please contact our office if you have questions regarding this report.

Sincerely,

GEO-TECHNOLOGY ASSOCIATES, INC.

Maxwell J. Coniglio, CPSS, SEO
Project Scientist



Certified Professional
Soil Scientist
MAXWELL J. CONIGLIO
515861

Michael W. Derr, P.E.
Vice President



ELG/MJC/mwd
31241616

Attachments:

- Site Location Map
- Site Web Soil Survey Map
- Site Geology Map
- Exploration Location Plan
- Stormwater Summary Table
- Test Pit Logs

2405 John Fries Highway, Bldg. 3, Quakertown, PA 18951

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1.0 INTRODUCTION

GTA conducted preliminary and supplemental stormwater test pits and infiltration testing in support of the proposed residential development in August 2024. The preliminary fieldwork consisted of excavating a total of 13 test pits and conducting 28 *in-situ* infiltration tests utilizing double-ring infiltrometer methodology. The stormwater testing was conducted in general accordance with the *Pennsylvania Stormwater Best Management Practices Manual* (BMP Manual) prepared by the Pennsylvania Department of Environmental Protection (PADEP).

For our use in preparation of this report, GTA was provided with the June 10, 2024 *Concept Grading Plan*, prepared by T & M Associates Inc. (T&M). The plan depicts the existing site features, topography, property boundaries, proposed SWM facilities, and the layout of the residential subdivision. This report summarizes the results of the field explorations, infiltration testing, and provides recommendations regarding design and construction of the SWM facilities.

2.0 PROJECT DESCRIPTION

2.1 Site Location

The approximate 13.5-acre subject site is located north of the intersection of Trooper Road and Germantown Pike in Worchester Township, Montgomery County, Pennsylvania. Specifically, the subject site is bound by Trooper Road to the south; by Germantown Pike to the west; and by residential properties to the north and east.

2.2 Existing Site Conditions

At the time of GTA's subsurface exploration, the site consisted of an overgrown agricultural field in the southern corner of the site, an existing residential dwelling located in the eastern corner of the site, and the remaining portions of the site were moderately-wooded. The topography of the site is moderately-sloping south toward the intersection of Trooper Road and Germantown Pike. Approximate ground surface elevations range from a high elevation (EL) of 431 feet within the northeastern corner of the site, to a low of EL 351 within the southwestern corner of the site. Refer to the attached *Site Location Map*, included herein as Figure 1 for additional information.

2.3 Proposed Construction

Based on the aforementioned *Concept Grading Plan*, the site will be redeveloped and subdivided into 45 residential lots with associated new pavements and utilities. Pertinent to this report, the post-construction stormwater management (PCSM) design includes a aboveground centrally located



infiltration basin. It is GTA's understanding that the final site layout and grading may be subject to change.

2.4 Mapped Site Soils

Based on a review of the *United States Department of Agriculture and Natural Resources Conservation Service (USDA NRCS) Web Soil Survey*, the soils on the site are mapped as belonging to the Reaville, Readington, and Abbottstown silt loam series. The soils observed during the field exploration generally confirmed the mapped soil. However, based on GTA's review of the *Web Soil Survey* and hand-texturing soil classifications during the subsurface explorations, the site is also underlain by the Penn and Croton silt loam series. Refer to the above-referenced soil map and *Site Web Soil Survey Map*, included herein as Figure 2 for additional information.

2.5 Geologic Review

According to *Pennsylvania Department of Conservation and Natural Resources (DCNR) Pennsylvania GEOlogic Data Exploration* mapping tool and the *DCNR Map 13 Physiographic Provinces of Pennsylvania*, the site is located within the Gettysburg-Newark Lowland Section of the Piedmont Physiographic Province of Pennsylvania. Specifically, the site is indicated to be underlain by the Triassic-Aged Lockatong Formation. The Lockatong Formation consists of dark-grey to black, thick-bedded argillite containing a few zones of thin-bedded black shale; locally has thin layers of impure limestone and some calcareous shale. Refer to the attached *Site Geology Map*, included herein as Figure 3 for additional information.

3.0 SUBSURFACE EXPLORATION

A total of eight preliminary test pits and six supplemental test pits were excavated at locations proposed T&M. The preliminary and supplemental test locations were field-located by a GTA scientist utilizing a hand-held GPS unit as well as measuring from existing features. The test locations extended to approximate depths of 40 inches and 64 inches below the existing ground surface (bgs). Existing ground surface elevations were interpolated from the aforementioned *Concept Grading Plan* and should be considered approximate. The approximate test locations are indicated on the attached *Exploration Location Plan* identified as Figure 4.

3.1 Subsurface Conditions

During the stormwater explorations, the test locations encountered surficial topsoil, underlain by residual soils, and apparent bedrock. Topsoil thicknesses ranged from four inches to 12 inches. Below the surficial cover, the test locations encountered residual soils visually-classified as USDA silt loam and



loam. Varying amounts of gravels and channers were encountered within the soil matrix, generally increasing with depth. Indication of the seasonal high-water table and groundwater seeps were not encountered within any of the test locations explored.

Apparent bedrock, inferred by excavator refusal, was encountered within ten of the 14 test locations at approximate depths ranging between 40 inches and 64 inches bgs. For the purpose of this report, the top of bedrock is defined as the point at which the excavator bucket is unable to advance in a safe or timely manner. This is not a definite indicator of bedrock, as several factors can limit the ability of the excavator bucket to advance. Refer to the attached *Test Pit Logs* for a more detailed description of the soil profile at each location.

3.2 Infiltration Testing

The preliminary and supplemental fieldwork consisted of 28 *in-situ* infiltration tests utilizing double-ring infiltrometer methodology within the proposed SWM facilities and across the site. The infiltration tests were conducted at depths ranging between 26 inches and 72 inches bgs. Raw infiltration rates ranged between 0.0 inches per hour and 0.75 inches per hour. Slower infiltration rates are likely due to the presence of firm consistency soils and higher silt content within the soil matrix. Refer to the attached *Stormwater Summary Table* for specific infiltration rates yielded at each test location.

4.0 STORMWATER CONSIDERATIONS AND RECOMMENDATIONS

4.1 General Conclusions

Based on the results of the preliminary and supplemental subsurface testing, GTA considers stormwater infiltration within proposed aboveground infiltration basin to not be feasible. Issues related to on-lot stormwater infiltration include the relatively shallow bedrock observed in the central and eastern portions of the site. General stormwater recommendations related to the design and construction of the aboveground stormwater infiltration basins are included in the following paragraphs.

4.2 General Stormwater Infiltration Recommendations

When more than two infiltration tests are employed for design purposes within the SWM facilities, the highest rate of the test results should be discarded, and the geometric mean should be used to determine the average rate of the remaining test results. A safety factor of at least 2.0 should be applied to the raw infiltration rates for design purposes. *Only infiltration rates obtained within the individual SWM facilities within one foot of the proposed subgrade elevations should be used for design. Averaging of all tests across the site is not recommended.*



According to the BMP Manual it is desirable to maintain a two-foot clearance above limiting zones such as bedrock, groundwater, and seasonal high-water table. Where possible, GTA recommends setting infiltration bed elevations a minimum of two feet above the observed bedrock. Indications of the season high-water table and groundwater were not observed within any of the test locations to the maximum depth explored.

In open infiltration basins or bioretention basins, the permeability of the surficial topsoil, planting soil, or amended soil may limit the performance of the system depending on design rates. Blended amended soils may be required to increase the permeability of the surface soils. GTA recommends the amended soils have a permeability of at least twice the design rate.

Infiltration areas should not be exposed to unstabilized runoff and construction disturbance that may decrease infiltration rates. It will be important to limit disturbance and compaction of the infiltration surface during construction. The operation of heavy and rubber-tire equipment directly on the infiltration subgrades should be avoided. Fencing and erosion control should be set around the individual on-lot SWM facilities to reduce clogging from sediment runoff during construction. Construction oversight by competent engineering personnel during installation of the SWM detention facilities is critical to successful functioning of the system. Ideally, construction oversight should be provided by the geotechnical engineer, or qualified representative, retained by the project owner to document construction operations and assure that project specifications and special construction requirements are met.

5.0 LIMITATIONS

This report has been prepared in accordance with generally accepted engineering practice. The analysis and conclusions contained in this report are based on the data obtained from limited observations and testing. The observations do not necessarily reflect variations in geologic or hydrogeologic conditions that may exist beneath the site.

In the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report are verified in writing. GTA is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analysis without the expressed written authorization of GTA.

At completion, the test locations were backfilled with the excavated material and leveled off with the surrounding grades. No additional compaction effort or site restoration was conducted. Future settlement and consolidation of the soil replaced in the test locations may occur, resulting in a depression or hole that may require maintenance or restoration. GTA is not responsible for additional maintenance and restoration of the test locations.



Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual site-wide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may

perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

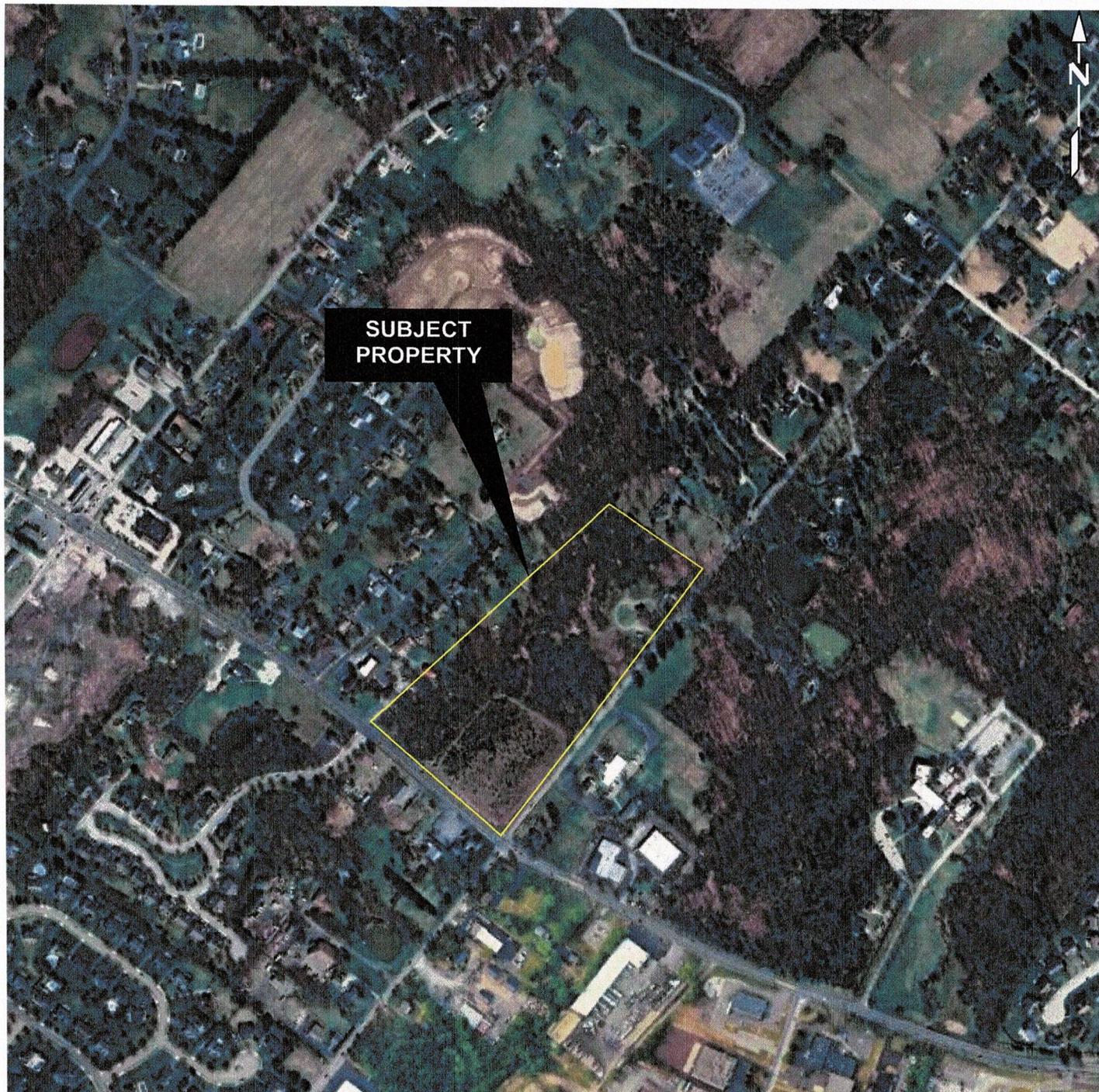
Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration*. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists*.



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Notes:

- 1) Base map obtained from *Google Earth Pro*. *Google LLC, Version 7.3.6.9345, Mar 23, 2024.



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 2405 John Fries Highway
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SITE LOCATION MAP

Trooper Ridge
 Montgomery County, Pennsylvania

SCALE
 NTS

DATE
 SEPT 2024

DRAWN BY
 ELG

REVIEW BY
 MWD

JOB NO.
 31241616

FIGURE NO.
 1



Notes:

- 1) AbB: Abbottstown silt loam, 3 to 8 percent slopes
- 2) PIC: Penn-Lansdale complex, 8 to 15 percent slopes
- 3) ReB: Readington silt loam, 3 to 8 percent slopes
- 4) RhC: Reaville silt loam, 8 to 15 percent slopes
 - a. Base map obtained from *USDA NRCS Web Soil Survey* online mapping tool.



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SITE WEB SOIL SURVEY MAP

Trooper Ridge
 Montgomery County, Pennsylvania

SCALE
 NTS

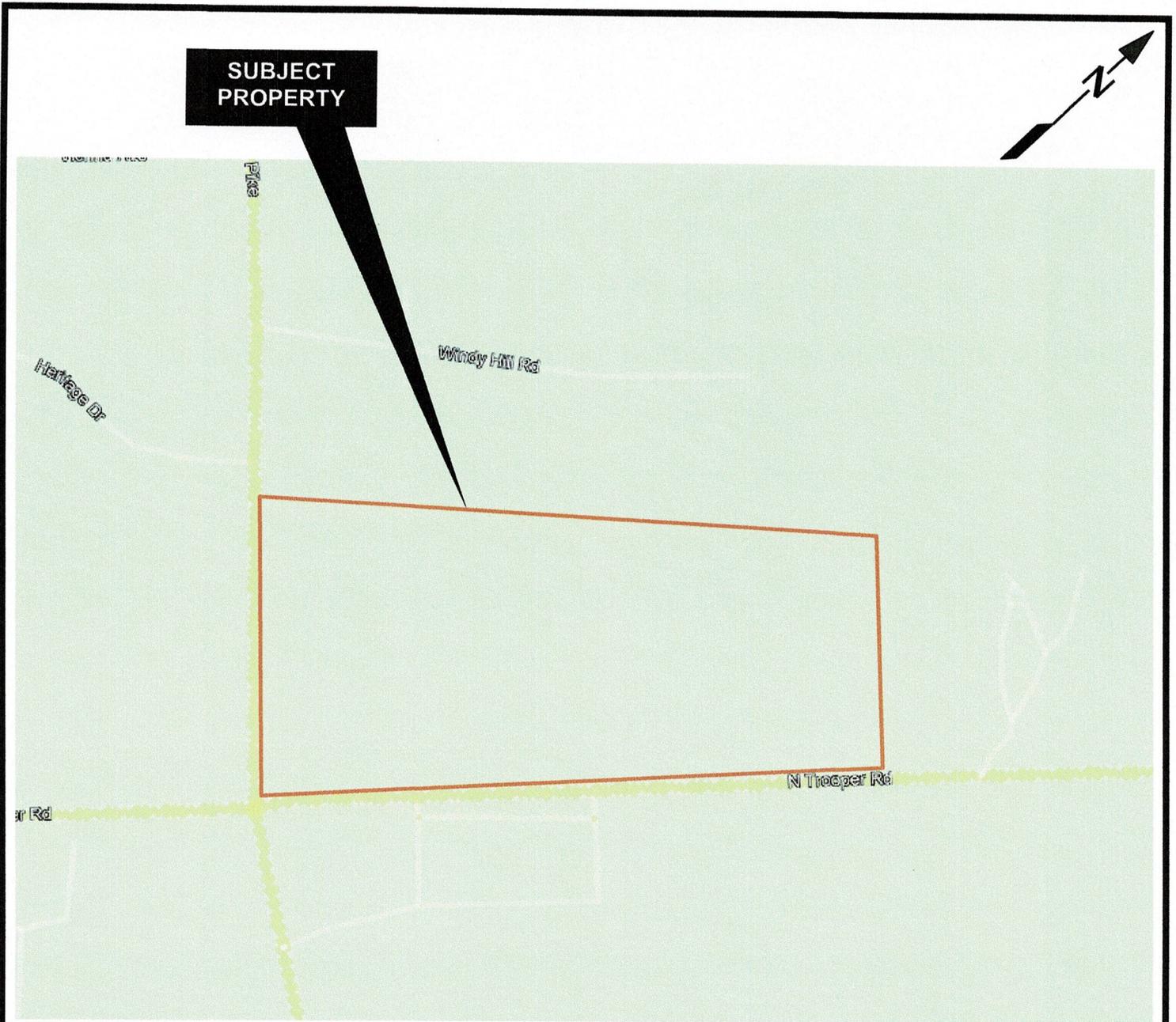
DATE
 SEPT 2024

DRAWN BY
 ELG

REVIEW BY
 MWD

JOB NO.
 31241616

FIGURE NO.
 2



Notes:

- 1) **Green Shading:** Consists of Lockatong Formation, dark-gray to black, thick-bedded argillite containing a few zones of thin-bedded black shale; locally has thin layers of impure limestone and calcareous shale.
 - a. Base map obtained from the Pennsylvania *Department of Conservation and Natural Resources* online *GeoLogic* mapping tool.



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SITE GEOLOGY MAP

Trooper Ridge
 Montgomery County, Pennsylvania

SCALE
 NTS

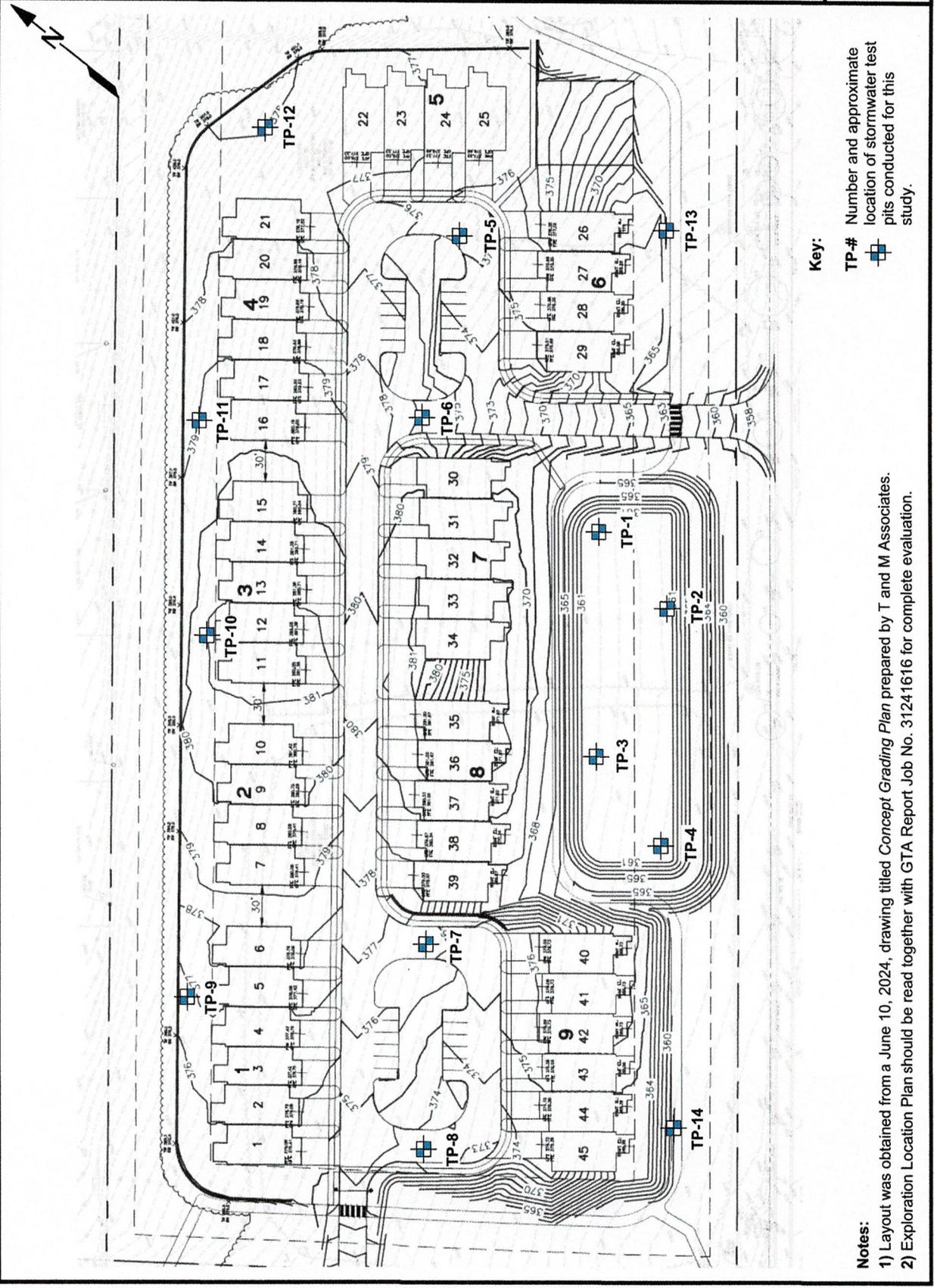
DATE
 SEPT 2024

DRAWN BY
 MJC

REVIEW BY
 MWD

JOB NO.
 31241616

FIGURE NO.
 3



Key:
 TP-# Number and approximate location of stormwater test pits conducted for this study.

Notes:
 1) Layout was obtained from a June 10, 2024, drawing titled *Concept Grading Plan* prepared by T and M Associates.
 2) Exploration Location Plan should be read together with GTA Report Job No. 31241616 for complete evaluation.



GEO-TECHNOLOGY ASSOCIATES, INC.
 GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Project: Trooper Ridge
 Project Number: 31241616
 Project Location: Worcester Township, Montgomery County, Pennsylvania
 Client: Pulte Homes

Legend
 N/E = Not Encountered
 N/A = Not Applicable
 EGS = Existing Ground Surface Elevation
 SHGWT = Seasonal High Groundwater Table

Test Pit Location	Existing Ground Surface Elevation (ft)	Proposed Elevation (ft)	Cut/Fill (ft)	Limiting Zone Type / Encountered	Limiting Zone Depth (ft)	Limiting Zone Elevation (ft)	Infiltration Test Location	Infiltration Test Depth (ft)	Final Raw Infiltration Rate (in/hr)	Stormwater Facility Location
TP-1	365	361	4	N/E to 5.17	N/A	N/A	IT-A	3.00	0.00	Proposed Infiltration Basin
							IT-B	3.00	0.00	
TP-2	362	361	1	Bedrock	4.58	357.42	IT-A	1.00	0.00	Proposed Infiltration Basin
							IT-B	3.00	0.50	
TP-3	365	361	4	Bedrock	5.08	359.92	IT-A	1.00	0.00	Proposed Infiltration Basin
							IT-B	1.00	0.75	
TP-4	361	361	0	N/E to 5.0	N/A	N/A	IT-A	1.00	0.00	Proposed Infiltration Basin
							IT-B	1.00	0.00	
TP-5	379	375	4	Bedrock	5.33	373.67	IT-A	2.00	0.00	Northeastern Parking Lot
							IT-B	2.50	0.00	
TP-6	378	377	1	Bedrock	5.17	372.83	IT-A	1.75	0.00	Northeastern Parking Lot
							IT-B	2.00	0.25	
TP-7	374	376	-2	Bedrock	4.17	369.83	IT-A	1.00	0.50	Southwestern Parking Lot
							IT-B	2.00	0.00	
TP-8	372	374	-2	Bedrock	5.00	367.00	IT-A	1.00	0.25	Southwestern Parking Lot
							IT-B	2.00	0.00	
TP-9	387	377	10	Bedrock	3.33	363.67	IT-A	0.50	0.00	Northwestern Retaining Wall
							IT-B	0.50	0.00	
TP-10	393	381	12	Bedrock	4.00	389.00	IT-A	2.00	0.00	Northwestern Retaining Wall
							IT-B	2.00	0.25	
TP-11	397	379	18	Bedrock	3.42	393.58	IT-A	2.00	0.00	Northwestern Retaining Wall
							IT-B	2.00	0.25	
TP-12	401	378	23	N/E to 4.33	N/A	N/A	IT-A	2.00	0.00	Northern Retaining Wall
							IT-B	2.00	0.00	
TP-13	367	367	0	N/E to 4.67	N/A	N/A	IT-A	1.00	0.50	Open Space
							IT-B	1.00	0.25	
TP-14	358	360	-2	Bedrock	4.42	353.58	IT-A	0.50	0.00	Open Space
							IT-B	0.50	0.00	



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 GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

2405 John Fries Highway, Quakertown, PA 18951
 A Practicing Geoprofessional Business Association Member Firm

TEST PIT LOG: TP-1

PROJECT NAME: Trooper Ridge
 PROJECT NUMBER: 31241616
 PROJECT LOCATION: Worcester Township,
 Montgomery County, Pennsylvania
 CLIENT: Pulte Homes
 LOGGED BY: E. Gingrich
 CHECKED BY: M. Derr

CONTRACTOR: Neighbors Property Management
 EQUIPMENT: Bobcat E60
 DATE STARTED: 8/1/2024

TEST LOCATION: Proposed Infiltration Basin
 SLOPE: 3-8%
 LANDSCAPE POSITION: Backslope
 COVER: Meadow
 DATUM: Topo
 ELEVATION: 365

HORIZON	DEPTH (in.)	COLOR	TEXTURE	STRUCTURE	CONSISTENCE	REDOX FEATURES	COMMENTS
A p	0-7	10YR 5/2	Silt Loam	Granular	Friable		Topsoil
B t	7-14	10YR 5/3	Silt Loam	Subangular Blocky	Firm	CF	Residual
B tx	14-28	10YR 5/3	Silt Loam	Angular Blocky	Very Firm	MD	Residual
B C	28-38	10YR 5/4	V Gravelly Loam	Subangular Blocky	Firm		Residual
C	38-62	10YR 5/4	V Channery Loam	Angular Blocky	Friable	CF	Residual
<p>NOTES: The ground surface elevation should be considered approximate. The test pit was terminated at a depth of about 62 inches below the existing ground surface. Two double-ring infiltrometer tests were performed.</p> <p>Soil Features: Bedrock Depth: NE Water Seeps: NE Seasonal High Water Table Depth: NE Perched Water: NE</p> <p>Redoximorphic Features: Quantity: Contrast F/: <2% /F: Faint C/: 2-20% /D: Distinct M/: >20% /P: Prominent Clay Depletion: Loss of clay due to prolonged eluviation processes</p> <p>Coarse Fragments by Volume No modifier: >15% Gravelly (ex.): 15-35% V: Very: 36-65% X: Extremely 65-90% Gravel (ex.) >90%</p> <p>Infiltration Results: Proposed Infiltration Elevation: 361 Performed Infiltration Depth: A: 3.0 B: 3.0 Final Raw Infiltration Rates (in/hr): A: 0.0 B: 0.0</p>							



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TEST PIT LOG: TP-2

PROJECT NAME: Trooper Ridge
 PROJECT NUMBER: 31241616
 PROJECT LOCATION: Worcester Township,
 Montgomery County, Pennsylvania
 CLIENT: Pulte Homes
 LOGGED BY: E. Gingrich
 CHECKED BY: M. Derr

CONTRACTOR: Neighbors Property Management
 EQUIPMENT: Bobcat E60
 DATE STARTED: 8/1/2024

TEST LOCATION: Proposed Infiltration Basin
 SLOPE: 3-8%
 LANDSCAPE POSITION: Toeslope
 COVER: Meadow
 DATUM: Topo
 ELEVATION: 362

HORIZON	DEPTH (in.)	COLOR	TEXTURE	STRUCTURE	CONSISTENCE	REDOX FEATURES	COMMENTS
A p	0-7	10YR 4/3	Silt Loam	Granular	Fritable		Topsoil
B t	7-25	10YR 6/3	V Gravelly Silt Loam	Subangular Blocky	Firm	CD	Residual
B Cx	25-46	10YR 5/6	X Channery Silt Loam	Subangular Blocky	Very Firm	CD	Residual
C r	46-55	10YR 5/4		Channers			Weathered Rock
R	55+						Bedrock
Soil Features: Bedrock Depth: 55 inches Water Seeps: NE Seasonal High Water Table Depth: NE Perched Water: NE							Infiltration Results: Proposed Infiltration Elevation: 361 Performed Infiltration Depth: A: 1.0 B: 3.0 Final Raw Infiltration Rates (in/hr): A: 0.0 B: 0.5

NOTES: The ground surface elevation should be considered approximate. The test pit was terminated at a depth of about 55 inches below the existing ground surface. Two double-ring infiltrometer tests were performed.

Coarse Fragments by Volume
 No modifier: >15%
 Gravelly (ex.): 15-35%
 V: Very: 36-65%
 X: Extremely 65-90%
 Gravel (ex.) >90%

Redoximorphic Features:
 Quantity: Contrast:
 F/: <2% /F: Faint
 C/: 2-20% /D: Distinct
 M/: >20% /P: Prominent
 Clay Films: Illuviation of clay particles
 Clay Depletion: Loss of clay due to prolonged eluviation processes
 Redoximorphic Concentration: accumulation of Iron-Mn Oxides due to water cycling
 Redoximorphic Depletions: loss of Iron-Mn Oxides due to prolonged aquic conditions



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TEST PIT LOG: TP-4

PROJECT NAME: Trooper Ridge
PROJECT NUMBER: 31241616
PROJECT LOCATION: Worcester Township, Montgomery County, Pennsylvania
CLIENT: Pulte Homes
LOGGED BY: E. Gingrich
CHECKED BY: M. Derr

CONTRACTOR: Neighbors Property Management
EQUIPMENT: Bobcat E60
DATE STARTED: 8/1/2024

TEST LOCATION: Proposed Infiltration Basin
SLOPE: 3-8%
LANDSCAPE POSITION: Toeslope
COVER: Meadow
DATUM: Topo
ELEVATION: 361

HORIZON	DEPTH (in.)	COLOR	TEXTURE	STRUCTURE	CONSISTENCE	REDOX FEATURES	COMMENTS
A p	0-11	10YR 4/3	Silt Loam	Granular	Friable		Topsoil
B t	11-16	10YR 6/3	Silt Loam	Subangular Blocky	Firm	CD Redox Concentrations	Residual
B gx	16-22	10YR 5/2	Silt Loam	Angular Blocky	Very Firm	CP Redox Conc/Depl	Residual
B C	22-38	10YR 5/4	V Gravelly	Subangular Blocky	Firm	CF Redox Conc/Depl	Residual
C	38-60	10YR 5/4	V Channery Loam	Subangular Blocky	Friable		Residual
NOTES: The ground surface elevation should be considered approximate. The test pit was terminated at a depth of about 60 inches below the existing ground surface. Two double-ring infiltrometer tests were performed.							
Soil Features: Bedrock Depth: NE Water Seeps: NE Seasonal High Water Table Depth: NE Perched Water: NE							
Infiltration Results: Proposed Infiltration Elevation: 361 Performed Infiltration Depth: A: 1.0 B: 1.0 Final Raw Infiltration Rates (in/hr): A: 0.0 B: 0.0							

Coarse Fragments by Volume
 No modifier: >15%
 Gravelly (ex.): 15-35%
 V: Very: 36-65%
 X: Extremely 65-90%
 Gravel (ex.) >90%

Redoximorphic Features:
 Quantity: Contrast
 F/: <2% /F: Faint
 C/: 2-20% /D: Distinct
 M/: >20% /P: Prominent
 Clay Depletion: Loss of clay due to prolonged illuviation processes

Redoximorphic Concentration: accumulation of Iron-Mn Oxides due to water cycling
Redoximorphic Depletions: loss of Iron-Mn Oxides due to prolonged aquic conditions
Clay Films: illuviation of clay particles



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TEST PIT LOG: TP-5

PROJECT NAME: Trooper Ridge
 PROJECT NUMBER: 31241616
 PROJECT LOCATION: Worcester Township,
 Montgomery County, Pennsylvania
 CLIENT: Pulte Homes
 LOGGED BY: E. Gingrich
 CHECKED BY: M. Derr

CONTRACTOR: Neighbors Property Management
 EQUIPMENT: Bobcat E60
 DATE STARTED: 8/2/2024

TEST LOCATION: Northeastern Parking Lot
 SLOPE: 3-8%
 LANDSCAPE POSITION: Backslope
 COVER: Forested
 DATUM: Topo
 ELEVATION: 379

HORIZON	DEPTH (in.)	COLOR	TEXTURE	STRUCTURE	CONSISTENCE	REDOX FEATURES	COMMENTS
A	0-6	10YR 4/3	Silt Loam	Granular	Friable		Topsoil
B 11	6-18	10YR 6/3	Silt Loam	Subangular Blocky	Friable	CP	Residual
B 12	18-24	10YR 5/3	Gravelly Silt Loam	Subangular Blocky	Friable/Firm	CD	Residual
B 13	24-36	10YR 5/4	Gravelly Silt Loam	Angular Blocky	Firm	CP	Residual
B C	36-64	10YR 5/4	Gravelly Silt Loam	Angular Blocky	Friable/Firm	CD	Residual
R	64+						Bedrock

NOTES: The ground surface elevation should be considered approximate. The test pit was terminated at a depth of about 64 inches below the existing ground surface. Two double-ring infiltrometer tests were performed.

Soil Features:
 Bedrock Depth: 64 inches
 Water Seeps: NE
 Seasonal High Water Table Depth: NE
 Perched Water: NE

Infiltration Results:
 Proposed Infiltration Elevation: 375
 Performed Infiltration Depth: A: 2.0 B: 2.5
 Final Raw Infiltration Rates (in/hr): A: 0.0 B: 0.0

Coarse Fragments by Volume
 No modifier: >15%
 Gravelly (ex.): 15-35%
 V: Very 36-65%
 X: Extremely 65-90%
 Gravel (ex.) >90%

Redoximorphic Features:
 Quantity: Contrast
 F/: <2% /F: Faint
 C/: 2-20% /D: Distinct
 M/: >20% /P: Prominent
 Clay Depletion: Loss of clay due to prolonged illuviation processes

Redoximorphic Concentration: accumulation of Iron-Mn Oxides due to water cycling
 Redoximorphic Depletions: loss of Iron-Mn Oxides due to prolonged aquic conditions
 Clay Films: Illuviation of clay particles



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TEST PIT LOG: TP-6

PROJECT NAME: Trooper Ridge
 PROJECT NUMBER: 31241616
 PROJECT LOCATION: Worcester Township,
 Montgomery County, Pennsylvania
 CLIENT: Pulte Homes
 LOGGED BY: E. Gingrich
 CHECKED BY: M. Derr

CONTRACTOR: Neighbors Property Management
 EQUIPMENT: Bobcat E60
 DATE STARTED: 8/2/2024

TEST LOCATION: Northeastern Parking Lot
 SLOPE: 3-8%
 LANDSCAPE POSITION: Backslope
 COVER: Forested
 DATUM: Topo
 ELEVATION: 378

HORIZON	DEPTH (in.)	COLOR	TEXTURE	STRUCTURE	CONSISTENCE	REDOX FEATURES	COMMENTS
A	0-8	10YR 4/2	Silt Loam	Granular	Friable		Topsoil
B t1	8-30	10YR 5/3	Silt Loam	Subangular Blocky	Friable	CD	Residual
B t2	30-50	10YR 5/2	Gravelly Silt Loam	Angular Blocky	Firm	CP	Residual
B C	50-62	10YR 5/4	V Gravelly Silt Loam	Angular Blocky	Firm		Residual
R	62+						Bedrock

NOTES: The ground surface elevation should be considered approximate. The test pit was terminated at a depth of about 62 inches below the existing ground surface. Two double-ring infiltrometer tests were performed.

Soil Features:
 Bedrock Depth: 62 inches
 Water Seeps: NE
 Seasonal High Water Table Depth: NE
 Perched Water: NE

Infiltration Results:
 Proposed Infiltration Elevation: 377
 Performed Infiltration Depth: A: 1.75 B: 2.0
 Final Raw Infiltration Rates (in/hr): A: 0.0 B: 0.25

Coarse Fragments by Volume
 No modifier: >15%
 Gravelly (ex.): 15-35%
 V: Very: 36-65%
 X: Extremely 65-90%
 Gravel (ex.) >90%

Redoximorphic Features:
 Quantity: Contrast:
 F/: <2% /F: Faint
 C/: 2-20% /D: Distinct
 M/: >20% /P: Prominent
 Clay Depletion: Loss of clay due to prolonged eluviation processes

Redoximorphic Concentration: accumulation of Iron-Mn Oxides due to water cycling
 Redoximorphic Depletions: loss of Iron-Mn Oxides due to prolonged aquatic conditions
 Clay Films: Illuviation of clay particles



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TEST PIT LOG: TP-7

PROJECT NAME: Trooper Ridge
PROJECT NUMBER: 31241616
PROJECT LOCATION: Worcester Township, Montgomery County, Pennsylvania
CLIENT: Pulte Homes
CHECKED BY: M. Derr

CONTRACTOR: Neighbors Property Management
EQUIPMENT: Bobcat E60
DATE STARTED: 8/2/2024

TEST LOCATION: Southwestern Parking Lot
SLOPE: 3-8%
LANDSCAPE POSITION: Backslope
COVER: Meadow
DATUM: Topo
ELEVATION: 374

HORIZON	DEPTH (in.)	COLOR	TEXTURE	STRUCTURE	CONSISTENCE	REDOX FEATURES	COMMENTS
A p	0-8	10YR 5/2	Silt Loam	Granular	Friable		Topsoil
B t	8-20	10YR 6/3	Silt Loam	Subangular Blocky	Firm	CD	Residual
B tx	20-36	10YR 6/4	V Channery Silt Loam	Angular Blocky	Very Firm	MP	Residual
C r	36-50	10YR 5/4	X Channery Silt Loam	Subangular Blocky	Friable		Residual
R	50+						Bedrock

NOTES: The ground surface elevation should be considered approximate. The test pit was terminated at a depth of about 50 inches below the existing ground surface. Two double-ring infiltrometer tests were performed.

Soil Features:
 Bedrock Depth: 50 inches
 Water Seeps: NE
 Seasonal High Water Table Depth: NE
 Perched Water: NE

Infiltration Results:
 Proposed Infiltration Elevation: 376
 Performed Infiltration Depth: A: 1.0 B: 2.0
 Final Raw Infiltration Rates (in/hr): A: 0.5 B: 0.0

Coarse Fractions by Volume
 No modifier: >15%
 Gravelly (ex.): 15-35%
 V: Very: 36-65%
 X: Extremely 65-90%
 Gravel (ex.) >90%

Redoximorphic Features:
 Quantity: Contrast
 F/: <2% /F: Faint
 C/: 2-20% /D: Distinct
 M/: >20% /P: Prominent
 Clay Depletion: Loss of clay due to prolonged eluviation processes
 Redoximorphic Concentration: accumulation of Iron-Mn Oxides due to water cycling
 Redoximorphic Depletions: loss of Iron-Mn Oxides due to prolonged aquic conditions
 Clay Films: Illuviation of clay particles



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TEST PIT LOG: TP-8

PROJECT NAME: Trooper Ridge
 PROJECT NUMBER: 31241616
 PROJECT LOCATION: Worcester Township,
 Montgomery County, Pennsylvania
 CLIENT: Pulte Homes
 LOGGED BY: E. Gingrich
 CHECKED BY: M. Derr

CONTRACTOR: Neighbors Property Management
 EQUIPMENT: Bobcat E60
 DATE STARTED: 8/2/2024

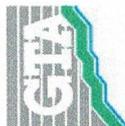
TEST LOCATION: Southwestern Parking Lot
 SLOPE: 3-8%
 LANDSCAPE POSITION: Backslope
 COVER: Meadow
 DATUM: Topo
 ELEVATION: 372

HORIZON	DEPTH (in.)	COLOR	TEXTURE	STRUCTURE	CONSISTENCE	REDOX FEATURES	COMMENTS
A p	0-12	10YR 5/2	Silt Loam	Granular	Friable		Topsoil
B A	12-17	10YR 5/3	Silt Loam	Subangular Blocky	Firm	CF	Residual
B t	17-26	10YR 6/4	Silt Loam	Subangular Blocky	Firm	MD	Residual
B tx	26-39	10YR 5/4	V Gravelly	Angular Blocky	Very Firm	MP	Residual
C r	39-60	10YR 5/6	X Channery Loam	Subangular Blocky	Friable		Residual
R	60+						Bedrock
<p>NOTES: The ground surface elevation should be considered approximate. The test pit was terminated at a depth of about 60 inches below the existing ground surface. Two double-ring infiltrometer tests were performed.</p> <p>Soil Features: Bedrock Depth: 60 inches Water Seeps: NE Seasonal High Water Table Depth: NE Perched Water: NE</p> <p>Infiltration Results: Proposed Infiltration Elevation: 374 Performed Infiltration Depth: A: 1.0 B: 2.0 Final Raw Infiltration Rates (in/hr): A: 0.25 B: 0.0</p>							

Coarse Fragments by Volume
 No modifier: >15%
 Gravelly (ex.): 15-35%
 V: Very: 36-65%
 X: Extremely 65-90%
 Gravel (ex.) >90%

Redoxomorphic Features:
 Quantity: Contrast
 F/: <2% /F: Faint
 C/: 2-20% /D: Distinct
 M/: >20% /P: Prominent
 Clay Depletion: Loss of clay due to prolonged illuviation processes

Redoxomorphic Concentration: accumulation of Iron-Mn Oxides due to water cycling
Redoxomorphic Depletions: loss of Iron-Mn Oxides due to prolonged aquic conditions
Clay Films: illuviation of clay particles



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TEST PIT LOG: TP-9

PROJECT NAME: Trooper Ridge
 PROJECT NUMBER: 31241616
 PROJECT LOCATION: Worcester Township,
 Montgomery County, Pennsylvania
 CLIENT: Pulte Homes
 LOGGED BY: E. Gingrich
 CHECKED BY: M. Derr

CONTRACTOR: Neighbors Property Management
 EQUIPMENT: Bobcat E60
 DATE STARTED: 8/26/2024

TEST LOCATION: Northwestern Retaining Wall
 SLOPE: 3-8%
 LANDSCAPE POSITION: Backslope
 COVER: Meadow
 DATUM: Topo
 ELEVATION: 387

HORIZON	DEPTH (in.)	COLOR	TEXTURE	STRUCTURE	CONSISTENCE	REDOX FEATURES	COMMENTS
A p	0-5	10YR 4/2	Silt Loam	Granular	Friable		Topsoil
B t	5-14	10YR 5/4	Channery Silt Loam	Subangular Blocky	Firm	FD	Residual
B tx	14-19	10YR 5/2	Silt Loam	Angular Blocky	Very Firm	MP	Residual
B C	19-40	10YR 5/3	V Channery Silt Loam	Subangular Blocky	Firm		Residual
R	40+						Bedrock
<p>NOTES: The ground surface elevation should be considered approximate. The test pit was terminated at a depth of about 40 inches below the existing ground surface. Two double-ring infiltrometer tests were performed.</p> <p>Soil Features: Bedrock Depth: 40 inches Water Seeps: NE Seasonal High Water Table Depth: NE Perched Water: NE</p> <p>Redoxomorphic Features: Quantity: Contrast F/: <2% /F: Faint C/: 2-20% /D: Distinct M/: >20% /P: Prominent Clay Depletion: Loss of clay due to prolonged eluviation processes</p> <p>Infiltration Results: Performed Infiltration Depth: A: 0.5 B: 0.5 Final Raw Infiltration Rates (in/hr): A: 0.0 B: 0.0</p>							

Coarse Fragments by Volume
 No modifier: >15%
 Gravelly (ex.): 15-35%
 V: Very: 36-65%
 X: Extremely 65-90%
 Gravel (ex.) >90%

Redoxomorphic Features:
 Redoximorphic Concentration: accumulation of Iron-Mn Oxides due to water cycling
 Redoximorphic Depletions: loss of Iron-Mn Oxides due to prolonged aquic conditions
 Clay Films: Illuviation of clay particles
 Clay Depletion: Loss of clay due to prolonged eluviation processes



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TEST PIT LOG: TP-10

PROJECT NAME: Trooper Ridge
 PROJECT NUMBER: 31241616
 PROJECT LOCATION: Worcester Township,
 Montgomery County, Pennsylvania
 CLIENT: Pulte Homes
 LOGGED BY: E. Gingrich
 CHECKED BY: M. Derr

CONTRACTOR: Neighbors Property Management
 EQUIPMENT: Bobcat E60
 DATE STARTED: 8/26/2024

TEST LOCATION: Northwestern Retaining Wall
 SLOPE: 3-8%
 LANDSCAPE POSITION: Backslope
 COVER: Meadow
 DATUM: Topo
 ELEVATION: 393

HORIZON	DEPTH (in.)	COLOR	TEXTURE	STRUCTURE	CONSISTENCE	REDOX FEATURES	COMMENTS	
A p	0-9	10YR 4/3	Gravelly Silt Loam	Granular	Friable		Topsoil	
B t	9-26	10YR 5/3	Gravelly Silt Loam	Subangular Blocky	Friable		Residual	
B C	26-48	10YR 5/3	Channery Silt Loam	Subangular Blocky	Firm	CD	Residual	
R	48+						Bedrock	
NOTES: The ground surface elevation should be considered approximate. The test pit was terminated at a depth of about 48 inches below the existing ground surface. Two double-ring infiltrometer tests were performed.								
Coarse Fragments by Volume No modifier: >15% Gravelly (ex.): 15-35% V: Very: 36-65% X: Extremely 65-90% Gravel (ex.) >90%			Soil Features: Bedrock Depth: 48 inches Water Seeps: NE Seasonal High Water Table Depth: NE Perched Water: NE				Infiltration Results: Performed Infiltration Depth: A: 2.0 B: 2.0 Final Raw Infiltration Rates (in/hr): A: 0.0 B: 0.25	
Redoxomorphic Features: Quantity: Contrast: F/: <2% /F: Faint C/: 2-20% /D: Distinct M/: >20% /P: Prominent			Redoxomorphic Concentration: accumulation of Iron-Mn Oxides due to water cycling Redoxomorphic Depletions: loss of Iron-Mn Oxides due to prolonged aquic conditions Clay Films: illuviation of clay particles Clay Depletion: Loss of clay due to prolonged illuviation processes					



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TEST PIT LOG: TP-12

PROJECT NAME: Trooper Ridge
 PROJECT NUMBER: 31241616
 PROJECT LOCATION: Worcester Township,
 Montgomery County, Pennsylvania
 CLIENT: Pulte Homes
 LOGGED BY: E. Gingrich
 CHECKED BY: M. Derr

CONTRACTOR: Neighbors Property Management
 EQUIPMENT: Bobcat E60
 DATE STARTED: 8/26/2024

TEST LOCATION: Northern Retaining Wall
 SLOPE: 3-8%
 LANDSCAPE POSITION: Backslope
 COVER: Forested
 DATUM: Topo
 ELEVATION: 401

HORIZON	DEPTH (in.)	COLOR	TEXTURE	STRUCTURE	CONSISTENCE	REDOX FEATURES	COMMENTS
A	0-4	10YR 4/1	Silt Loam	Granular	Friable		Topsoil
A B	4-9	10YR 4/1	Silt Loam	Angular Blocky	Friable		Residual
B t	9-32	10YR 5/3	Gravelly Silt Loam	Subangular Blocky	Firm	CD	Residual
B C	32-52	10YR 5/3	V Gravelly Silt Loam	Subangular Blocky	Firm		Residual

NOTES: The ground surface elevation should be considered approximate. The test pit was terminated at a depth of about 52 inches below the existing ground surface. Two double-ring infiltrometer tests were performed.

Soil Features:
 Bedrock Depth: NE
 Water Seeps: NE
 Seasonal High Water Table Depth: NE
 Perched Water: NE

Infiltration Results:
 Performed Infiltration Depth: A: 2.0 B: 2.0
 Final Raw Infiltration Rates (in/hr): A: 0.0 B: 0.0

Coarse Fragments by Volume
 No modifier: >15%
 Gravelly (ex.): 15-35%
 V: Very: 36-65%
 X: Extremely 65-90%
 Gravel (ex.) >90%

Redoxomorphic Features:
 Quantity: Contrast
 F: <2% /F: Faint
 C: 2-20% /C: Distinct
 M: >20% /P: Prominent
 Redoximorphic Concentration: accumulation of Iron-Mn Oxides due to water cycling
 Redoximorphic Depletions: loss of Iron-Mn Oxides due to prolonged aquic conditions
 Clay Films: Illuviation of clay particles
 Clay Depletion: Loss of clay due to prolonged eluviation processes



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TEST PIT LOG: TP-13

PROJECT NAME: Trooper Ridge
 PROJECT NUMBER: 31241616
 PROJECT LOCATION: Worcester Township,
 Montgomery County, Pennsylvania
 CLIENT: Pulte Homes
 LOGGED BY: E. Gingrich
 CHECKED BY: M. Derr

CONTRACTOR: Neighbors Property Management
 EQUIPMENT: Bobcat E60
 DATE STARTED: 8/26/2024

TEST LOCATION: Open Space
 SLOPE: 3-8%
 LANDSCAPE POSITION: Backslope
 COVER: Forested
 DATUM: Topo
 ELEVATION: 367

HORIZON	DEPTH (in.)	COLOR	TEXTURE	STRUCTURE	CONSISTENCE	REDOX FEATURES	COMMENTS
A p	0-6	10YR 4/3	Silt Loam	Granular	Friable		Topsoil
A B	6-26	10YR 4/2	Gravelly Silt Loam	Subangular Blocky	Firm		Residual
B t	26-46	10YR 5/2	Channery Silt Loam	Subangular Blocky	Firm	CD	Residual
B C	46-56	10YR 5/3	V Channery Silt Loam	Massive	Friable	CD	Residual
Soil Features: Bedrock Depth: NE Water Seeps: NE Seasonal High Water Table Depth: NE Perched Water: NE							Infiltration Results: Performed Infiltration Depth: A: 1.0 B: 1.0 Final Raw Infiltration Rates (in/hr): A: 0.5 B: 0.5

NOTES: The ground surface elevation should be considered approximate. The test pit was terminated at a depth of about 56 inches below the existing ground surface. Two double-ring infiltrometer tests were performed.

Coarse Fragments by Volume
 No modifier: >15%
 Gravelly (ex.): 15-35%
 V: Very: 36-65%
 X: Extremely 65-90%
 Gravel (ex.) >90%

Redoxomorphic Features:
 Quantity: Contrast:
 F/: <2% /F: Faint
 C/: 2-20% /D: Distinct
 M/: >20% /P: Prominent
 Clay Depletion: Loss of clay due to prolonged eluviation processes

Redoximorphic Concentration: accumulation of Iron-Mn Oxides due to water cycling
 Redoximorphic Depletions: loss of Iron-Mn Oxides due to prolonged aquic conditions
 Clay Films: Illuviation of clay particles



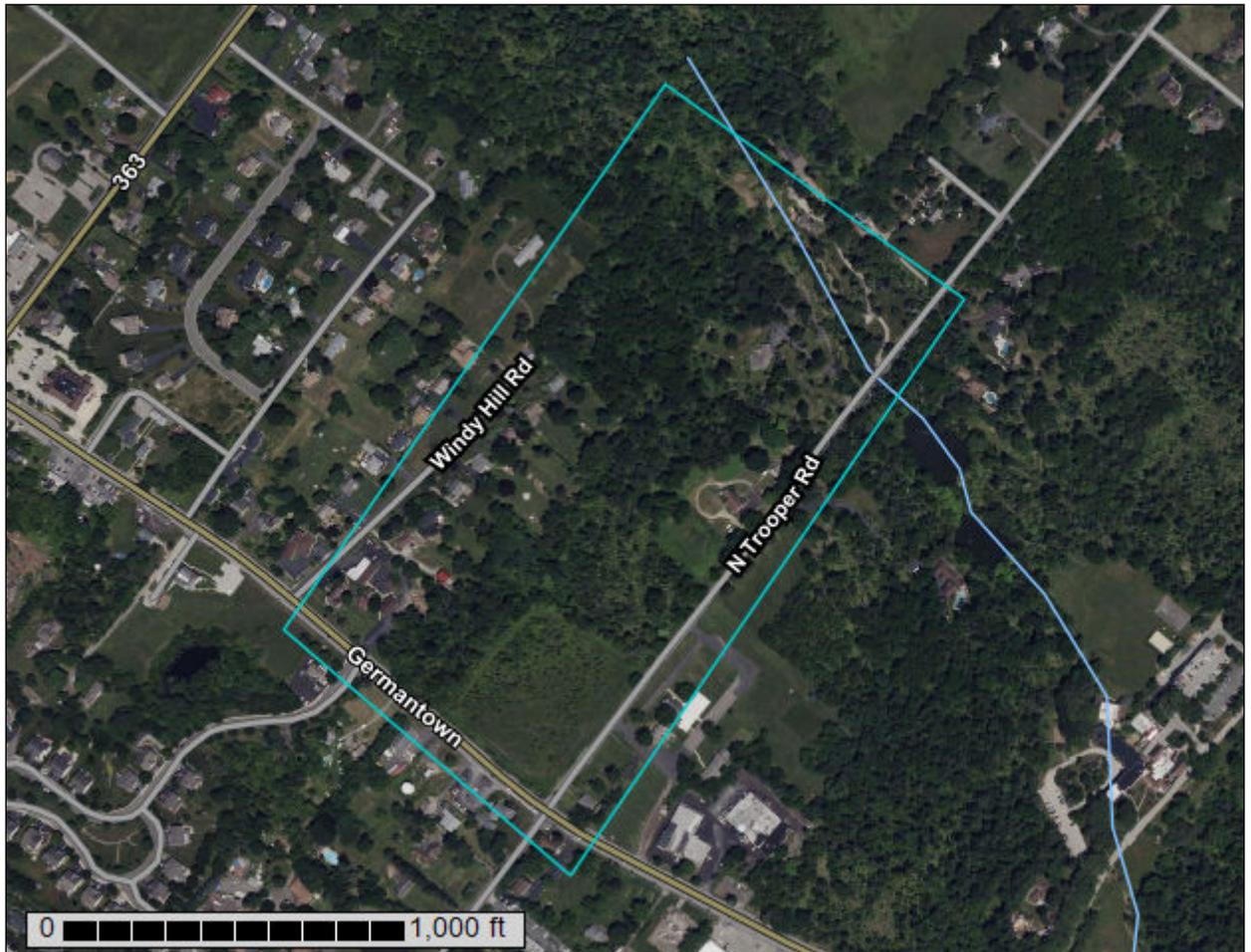
United States
Department of
Agriculture

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 Montgomery County, Pennsylvania



Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

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

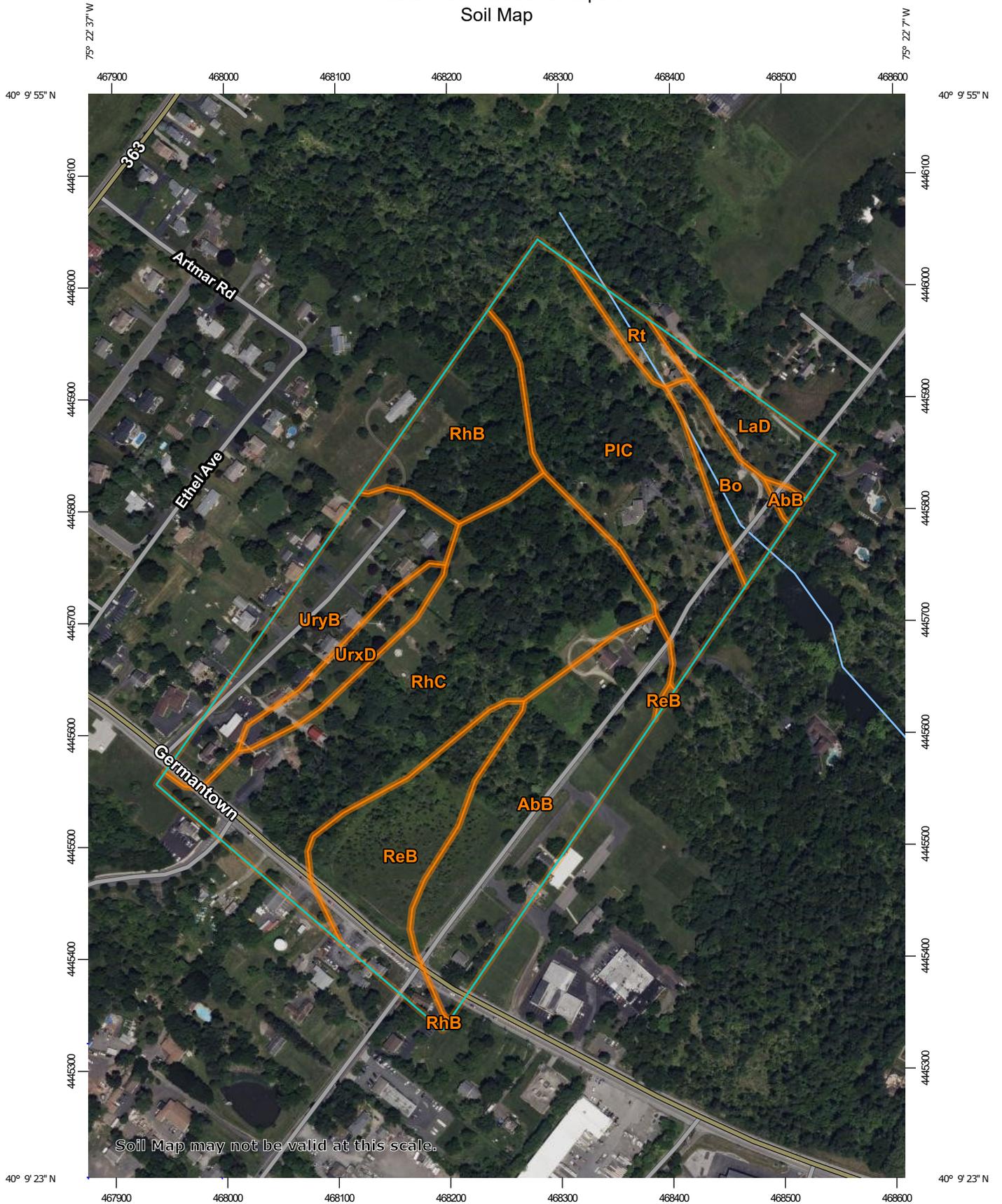
Custom Soil Resource Report

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

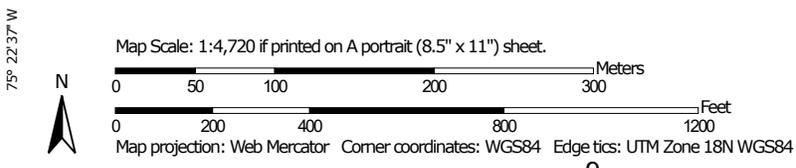
Soil Map

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

Custom Soil Resource Report Soil Map



Soil Map may not be valid at this scale.



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 1:12,000.

Warning: Soil Map may not be valid at this scale.

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

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

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

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

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

Soil Survey Area: Montgomery County, Pennsylvania
 Survey Area Data: Version 19, Sep 5, 2024

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

Date(s) aerial images were photographed: Jun 3, 2022—Jul 20, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AbB	Abbottstown silt loam, 3 to 8 percent slopes	8.3	16.6%
Bo	Bowmansville-Knauers silt loams	1.7	3.4%
LaD	Lansdale loam, 15 to 25 percent slopes	1.8	3.5%
PIC	Penn-Lansdale complex, 8 to 15 percent slopes	9.1	18.1%
ReB	Readington silt loam, 3 to 8 percent slopes	4.9	9.8%
RhB	Reaville silt loam, 3 to 8 percent slopes	3.9	7.8%
RhC	Reaville silt loam, 8 to 15 percent slopes	13.3	26.5%
Rt	Rowland silt loam, terrace	0.7	1.5%
UrxD	Urban land-Penn complex, 8 to 25 percent slopes	1.5	3.0%
UryB	Urban land-Readington complex, 0 to 8 percent slopes	5.0	9.9%
Totals for Area of Interest		50.3	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.

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

Montgomery County, Pennsylvania

AbB—Abbottstown silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2v7gd

Elevation: 130 to 660 feet

Mean annual precipitation: 40 to 48 inches

Mean annual air temperature: 52 to 57 degrees F

Frost-free period: 190 to 210 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Abbottstown and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Abbottstown

Setting

Landform: Hillslopes

Landform position (two-dimensional): Toeslope, footslope

Landform position (three-dimensional): Base slope, head slope

Down-slope shape: Concave, linear

Across-slope shape: Linear, concave

Parent material: Acid reddish brown residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 10 inches: silt loam

Bt - 10 to 20 inches: silt loam

Bx - 20 to 39 inches: channery silt loam

BCg - 39 to 48 inches: channery silt loam

R - 48 to 58 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent

Depth to restrictive feature: 18 to 22 inches to fragipan; 40 to 60 inches to lithic bedrock

Drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 6 to 18 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: D

Ecological site: F148XY025PA - Moist, Triassic, Upland, Mixed Oak - Hardwood - Conifer Forest

Hydric soil rating: No

Minor Components

Klinesville

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Croton

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Penn

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Bo—Bowmansville-Knauers silt loams

Map Unit Setting

National map unit symbol: 2lh87
Elevation: 150 to 900 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 150 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Bowmansville and similar soils: 41 percent
Knauers and similar soils: 39 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bowmansville

Setting

Landform: Flood plains
Landform position (two-dimensional): Footslope, toeslope

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Landform position (three-dimensional): Head slope

Down-slope shape: Concave, linear

Across-slope shape: Linear, concave

Parent material: Recent alluvial deposits weathered from sandstone and siltstone

Typical profile

Ap - 0 to 7 inches: silt loam

Bg - 7 to 26 inches: silty clay loam

Cg - 26 to 43 inches: fine sandy loam

2Cg - 43 to 65 inches: stratified gravel to sand

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: 72 to 99 inches to lithic bedrock

Drainage class: Somewhat poorly drained

Runoff class: Very high

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 18 inches

Frequency of flooding: Occasional

Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: C/D

Ecological site: F148XY028PA - Moist, Triassic, Riparian Zone, Ecotonal Meadow-Shrub-Forest

Hydric soil rating: No

Description of Knauers

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope, footslope

Landform position (three-dimensional): Tread

Down-slope shape: Concave, linear

Across-slope shape: Linear, concave

Parent material: Recent alluvium derived from sandstone and shale

Typical profile

A - 0 to 8 inches: silt loam

Bg1 - 8 to 17 inches: silt loam

Bg2 - 17 to 24 inches: gravelly sandy loam

2Cg - 24 to 60 inches: stratified sand to gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: 72 to 99 inches to lithic bedrock

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 inches

Frequency of flooding: Occasional

Frequency of ponding: Frequent

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Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: C/D

Ecological site: F148XY031PA - Hydric, Triassic, Riparian Zone, Swamp Meadow-Shrub-Forest

Hydric soil rating: Yes

Minor Components

Rowland

Percent of map unit: 20 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope, footslope

Landform position (three-dimensional): Base slope, head slope

Down-slope shape: Concave, linear

Across-slope shape: Concave, linear

Hydric soil rating: No

LaD—Lansdale loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2fgfp

Elevation: 70 to 1,000 feet

Mean annual precipitation: 40 to 55 inches

Mean annual air temperature: 48 to 55 degrees F

Frost-free period: 160 to 200 days

Farmland classification: Not prime farmland

Map Unit Composition

Lansdale and similar soils: 92 percent

Minor components: 8 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lansdale

Setting

Landform: Hillsides

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from sandstone and/or residuum weathered from conglomerate

Typical profile

Ap - 0 to 8 inches: loam

Bt - 8 to 34 inches: channery sandy loam

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C - 34 to 46 inches: channery sandy loam

R - 46 to 50 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent

Depth to restrictive feature: 42 to 60 inches to lithic bedrock

Drainage class: Well drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: F148XY025PA - Moist, Triassic, Upland, Mixed Oak - Hardwood - Conifer Forest

Hydric soil rating: No

Minor Components

Reaville

Percent of map unit: 8 percent

Landform: Hillslopes

Landform position (two-dimensional): Footslope, summit

Landform position (three-dimensional): Base slope, interfluvium

Down-slope shape: Concave, linear

Across-slope shape: Concave, linear

Hydric soil rating: No

PIC—Penn-Lansdale complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2dzby

Elevation: 70 to 1,300 feet

Mean annual precipitation: 36 to 55 inches

Mean annual air temperature: 46 to 57 degrees F

Frost-free period: 130 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Penn and similar soils: 50 percent

Lansdale and similar soils: 40 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Penn

Setting

Landform: Hillslopes

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope, nose slope

Down-slope shape: Convex, linear

Across-slope shape: Linear, convex

Parent material: Residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 10 inches: channery silt loam

Bt - 10 to 22 inches: channery silt loam

C - 22 to 28 inches: very channery silt loam

R - 28 to 48 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B

Ecological site: F148XY022PA - Dry, Triassic, Upland, Mixed Oak Heath / Oak-Pine Woodland

Hydric soil rating: No

Description of Lansdale

Setting

Landform: Hillsides

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from sandstone and/or residuum weathered from conglomerate

Typical profile

Ap - 0 to 10 inches: channery loam

Bt - 10 to 30 inches: sandy loam

C - 30 to 47 inches: channery loamy sand

R - 47 to 57 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent

Depth to restrictive feature: 42 to 60 inches to lithic bedrock

Drainage class: Well drained

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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: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B

Ecological site: F148XY025PA - Moist, Triassic, Upland, Mixed Oak - Hardwood - Conifer Forest

Hydric soil rating: No

Minor Components

Klinesville

Percent of map unit: 6 percent

Landform: Hillslopes

Landform position (two-dimensional): Shoulder, summit

Landform position (three-dimensional): Interfluve, nose slope

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Reaville

Percent of map unit: 4 percent

Landform: Hillslopes

Landform position (two-dimensional): Footslope, summit

Landform position (three-dimensional): Base slope, interfluve

Down-slope shape: Concave, linear

Across-slope shape: Concave, linear

Hydric soil rating: No

ReB—Readington silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w05x

Elevation: 70 to 950 feet

Mean annual precipitation: 38 to 55 inches

Mean annual air temperature: 43 to 57 degrees F

Frost-free period: 170 to 240 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Readington and similar soils: 85 percent

Minor components: 15 percent

Custom Soil Resource Report

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Readington

Setting

Landform: Hills

Landform position (two-dimensional): Footslope, backslope

Landform position (three-dimensional): Side slope, head slope, base slope

Down-slope shape: Concave, linear

Across-slope shape: Concave, linear

Parent material: Triassic colluvium derived from shale and siltstone and/or triassic residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 10 inches: silt loam

Bt1 - 10 to 17 inches: silt loam

Bt2 - 17 to 34 inches: silty clay loam

Btx - 34 to 48 inches: clay loam

C - 48 to 58 inches: channery silt loam

R - 58 to 68 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent

Surface area covered with cobbles, stones or boulders: 0.0 percent

Depth to restrictive feature: 20 to 36 inches to fragipan; 40 to 60 inches to lithic bedrock

Drainage class: Moderately well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)

Depth to water table: About 18 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: C

Ecological site: F148XY025PA - Moist, Triassic, Upland, Mixed Oak - Hardwood - Conifer Forest

Hydric soil rating: No

Minor Components

Penn

Percent of map unit: 5 percent

Landform: Ridges

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Interfluvium, side slope

Down-slope shape: Convex

Across-slope shape: Linear

Hydric soil rating: No

Reaville

Percent of map unit: 5 percent

Landform: Depressions

Landform position (two-dimensional): Footslope

Custom Soil Resource Report

Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Abbottstown

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

RhB—Reaville silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2dy7c
Elevation: 200 to 1,300 feet
Mean annual precipitation: 36 to 55 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 130 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Reaville and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Reaville

Setting

Landform: Hillslopes, hills
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Red triassic residuum weathered from sandstone and shale

Typical profile

Ap - 0 to 8 inches: silt loam
Bt - 8 to 19 inches: channery silty clay loam
C - 19 to 32 inches: very channery silt loam
R - 32 to 42 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Moderately well drained
Runoff class: Very high

Custom Soil Resource Report

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 6 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: D

Ecological site: F148XY025PA - Moist, Triassic, Upland, Mixed Oak - Hardwood - Conifer Forest

Hydric soil rating: No

Minor Components

Klinesville

Percent of map unit: 5 percent

Landform: Hillslopes

Landform position (two-dimensional): Shoulder, summit

Landform position (three-dimensional): Interfluve, nose slope

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Penn

Percent of map unit: 5 percent

Landform: Hillslopes

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope, nose slope

Down-slope shape: Convex, linear

Across-slope shape: Linear, convex

Hydric soil rating: No

Readington

Percent of map unit: 3 percent

Landform: Hillslopes

Landform position (two-dimensional): Footslope, backslope

Landform position (three-dimensional): Side slope, head slope, base slope

Down-slope shape: Concave, linear

Across-slope shape: Concave, linear

Hydric soil rating: No

Croton

Percent of map unit: 2 percent

Landform: Depressions

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope

Down-slope shape: Concave, linear

Across-slope shape: Linear, concave

Hydric soil rating: Yes

RhC—Reaville silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2dy7h

Elevation: 250 to 1,300 feet

Mean annual precipitation: 36 to 55 inches

Mean annual air temperature: 46 to 57 degrees F

Frost-free period: 130 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Reaville and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Reaville

Setting

Landform: Hillslopes, hills

Landform position (two-dimensional): Footslope, summit

Landform position (three-dimensional): Interfluve, base slope

Down-slope shape: Concave, linear

Across-slope shape: Concave, linear

Parent material: Red triassic residuum weathered from sandstone and shale

Typical profile

Ap - 0 to 8 inches: silt loam

Bt - 8 to 20 inches: channery silty clay loam

C - 20 to 33 inches: very channery silt loam

R - 33 to 42 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Drainage class: Moderately well drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 6 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: D

Ecological site: F148XY025PA - Moist, Triassic, Upland, Mixed Oak - Hardwood - Conifer Forest

Hydric soil rating: No

Minor Components

Readington

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Base slope, head slope, side slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Penn

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Klinesville

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve, nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Croton

Percent of map unit: 3 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Rt—Rowland silt loam, terrace

Map Unit Setting

National map unit symbol: I56t
Elevation: 150 to 1,000 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 150 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Rowland and similar soils: 82 percent

Custom Soil Resource Report

Minor components: 14 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rowland

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

A - 0 to 12 inches: silt loam
B - 12 to 34 inches: silty clay loam
Cg - 34 to 46 inches: silty clay loam
2Cg - 46 to 61 inches: stratified gravel to sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 60 to 99 inches to lithic bedrock
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 2.00 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Ecological site: F148XY028PA - Moist, Triassic, Riparian Zone, Ecotonal
Meadow-Shrub-Forest
Hydric soil rating: No

Minor Components

Knauers

Percent of map unit: 8 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Abbottstown

Percent of map unit: 6 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave

Hydric soil rating: No

UrxD—Urban land-Penn complex, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2dtz4
Elevation: 200 to 1,000 feet
Mean annual precipitation: 36 to 55 inches
Mean annual air temperature: 44 to 57 degrees F
Frost-free period: 130 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 65 percent
Penn and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Pavement, buildings and other artificially covered areas

Typical profile

C - 0 to 6 inches: variable

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 10 to 79 inches to lithic bedrock
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Penn

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 8 inches: channery silt loam
Bt - 8 to 21 inches: channery silt loam

Custom Soil Resource Report

C - 21 to 34 inches: very channery silt loam

R - 34 to 44 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Drainage class: Well drained

Runoff class: Low

*Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 6.00 in/hr)*

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: F148XY022PA - Dry, Triassic, Upland, Mixed Oak Heath / Oak-Pine Woodland

Hydric soil rating: No

Minor Components

Croton

Percent of map unit: 4 percent

Landform: Depressions

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope

Down-slope shape: Concave, linear

Across-slope shape: Linear, concave

Hydric soil rating: Yes

Readington

Percent of map unit: 4 percent

Landform: Hillslopes

Landform position (two-dimensional): Footslope, backslope

Landform position (three-dimensional): Base slope, head slope, side slope

Down-slope shape: Concave, linear

Across-slope shape: Concave, linear

Hydric soil rating: No

Reaville

Percent of map unit: 2 percent

Landform: Hillslopes

Landform position (two-dimensional): Footslope, summit

Landform position (three-dimensional): Interfluve, base slope

Down-slope shape: Concave, linear

Across-slope shape: Concave, linear

Hydric soil rating: No

UryB—Urban land-Readington complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2dtzd
Elevation: 200 to 900 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 160 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 65 percent
Readington and similar soils: 25 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Pavement, buildings and other artificially covered areas

Typical profile

C - 0 to 6 inches: variable

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 to 100 inches to lithic bedrock
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Readington

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Base slope, head slope, side slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 8 inches: silt loam
Bt - 8 to 29 inches: silt loam

Custom Soil Resource Report

Btx - 29 to 58 inches: channery silt loam

R - 58 to 68 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent

Depth to restrictive feature: 20 to 36 inches to fragipan; 40 to 70 inches to lithic bedrock

Drainage class: Moderately well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: About 18 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: C

Ecological site: F148XY025PA - Moist, Triassic, Upland, Mixed Oak - Hardwood - Conifer Forest

Hydric soil rating: No

Minor Components

Croton

Percent of map unit: 5 percent

Landform: Depressions

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope

Down-slope shape: Concave, linear

Across-slope shape: Linear, concave

Hydric soil rating: Yes

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Cut/Fill Report

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By user: JKelley

Drawing: G:\Projects\WDEV\00004\Plans\Civil3D\G:\Projects\WDEV\00004\Plans\Civil3D\WDEV00004_C3D_GRD.dwg

Volume Summary							
Name	Type	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Surface_EX vs PROP	full	1.00	1.00	381255.09	31695.32	24692.17	7003.15<Cut>

Totals							
				2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Total				381255.09	31695.32	24692.17	7003.15<Cut>

* Value adjusted by cut or fill factor other than 1.0

APPENDIX D

EXISTING DRAINAGE AREA PLAN

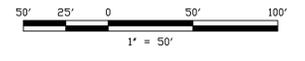
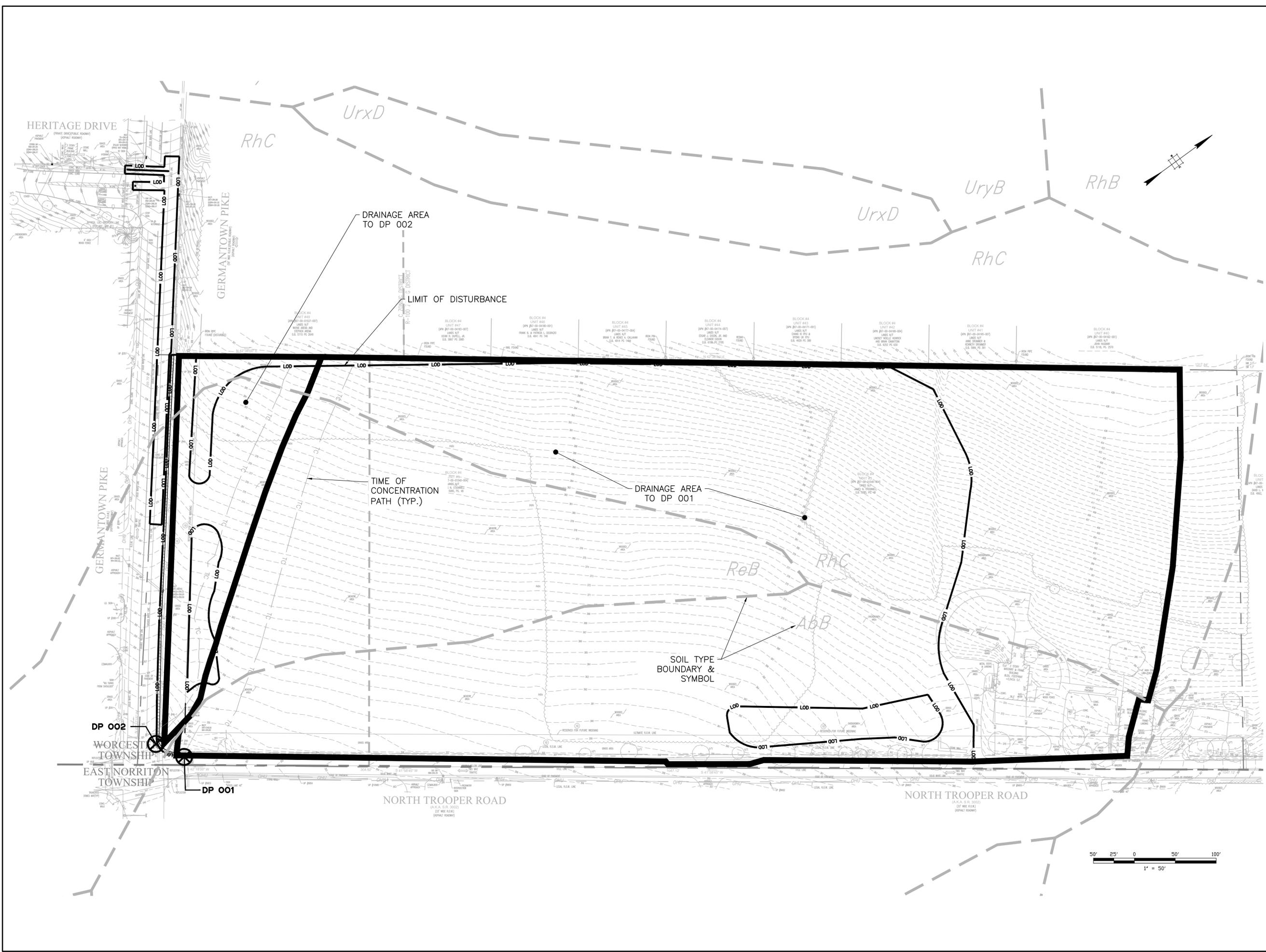
PROPOSED DRAINAGE AREA PLAN

INLET DRAINAGE AREA PLAN

OFF-SITE DRAINAGE AREA PLAN

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 DATE: 12/19/2024 2:25PM
 LAST SAVE BY: J. Kelly

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ATTENTION: ALL CONTRACTORS LOCATIONS OF ALL EXISTING UTILITIES
 SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANIES
 RECORDS AND/OR AERIAL PHOTOGRAPHS. CONTRACTORS OF THE SITE
 COMPLETION OR ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL
 LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES CANNOT BE
 GUARANTEED. CONTRACTORS SHALL VERIFY THE LOCATION AND DEPTH OF ALL
 UNDERGROUND UTILITIES AND FACILITIES PRIOR TO START OF WORK.
 DATE: 12/19/2024

NO.	DATE	REVISIONS	BY	CHKD
1	01/24/25	UPDATES FOR NOTES PRE-SUBMISSION MTG	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE NO. PE076464

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
EXISTING DRAINAGE AREA PLAN

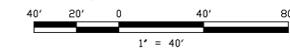
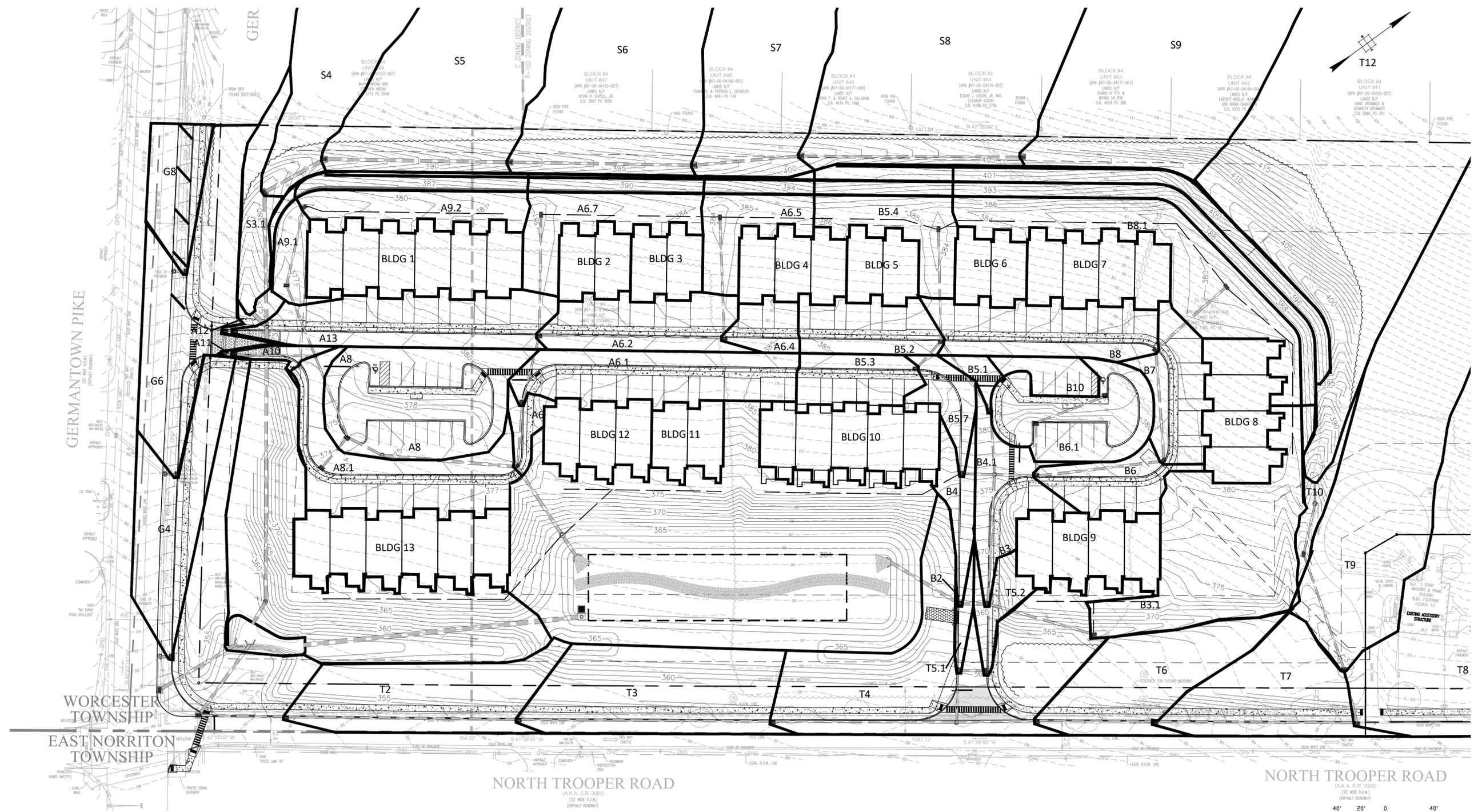


OFFICES LOCATED IN:
 CALIFORNIA, INDIANA, KENTUCKY,
 MASSACHUSETTS, MICHIGAN, NEW JERSEY,
 OHIO AND PENNSYLVANIA

DESIGNED BY JPK/ZHR/CMR/ROP	DRAWING E-DA
CHECKED BY BJS/ZHR	SHEET 1
DRAWN BY SCR/CKS/RAM	OF 4
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDEV00004	

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 TIME: 25 Mar 2025, 3:33PM
 LAST SAVE BY: craison

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NOTE: REFER TO P-DA PLAN FOR EXTENT OF OFFSITE DRAINAGE AREAS TO INLETS IN SWALES

ATTENTION: ALL CONTROLS, LOCATIONS OF ALL EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANIES RECORDS AND/OR ABOVE-GROUND LOCATIONS OF THE SITE. COMPLETENESS OR ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES CANNOT BE GUARANTEED. PURSUANT TO REGULATIONS OF PENNSYLVANIA LEGISLATIVE ACT NUMBER 287 OF 1974 AS AMENDED BY ACT 121 OF 2008, CONTRACTORS MUST VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES AND FACILITIES PRIOR TO START OF WORK. DATE: 12/19/2024

NO.	DATE	REVISIONS	BY	CHKD
1	01/24/25	UPDATES FOR NOTES PRE-SUBMISSION MITG	JPK	ZHR

CHRISTOPHER W. JENSEN, P.E.
 LICENSED PROFESSIONAL ENGINEER



12/19/2024
 LICENSED PROFESSIONAL ENGINEER
 STATE OF PA LICENSE NO. PE076464

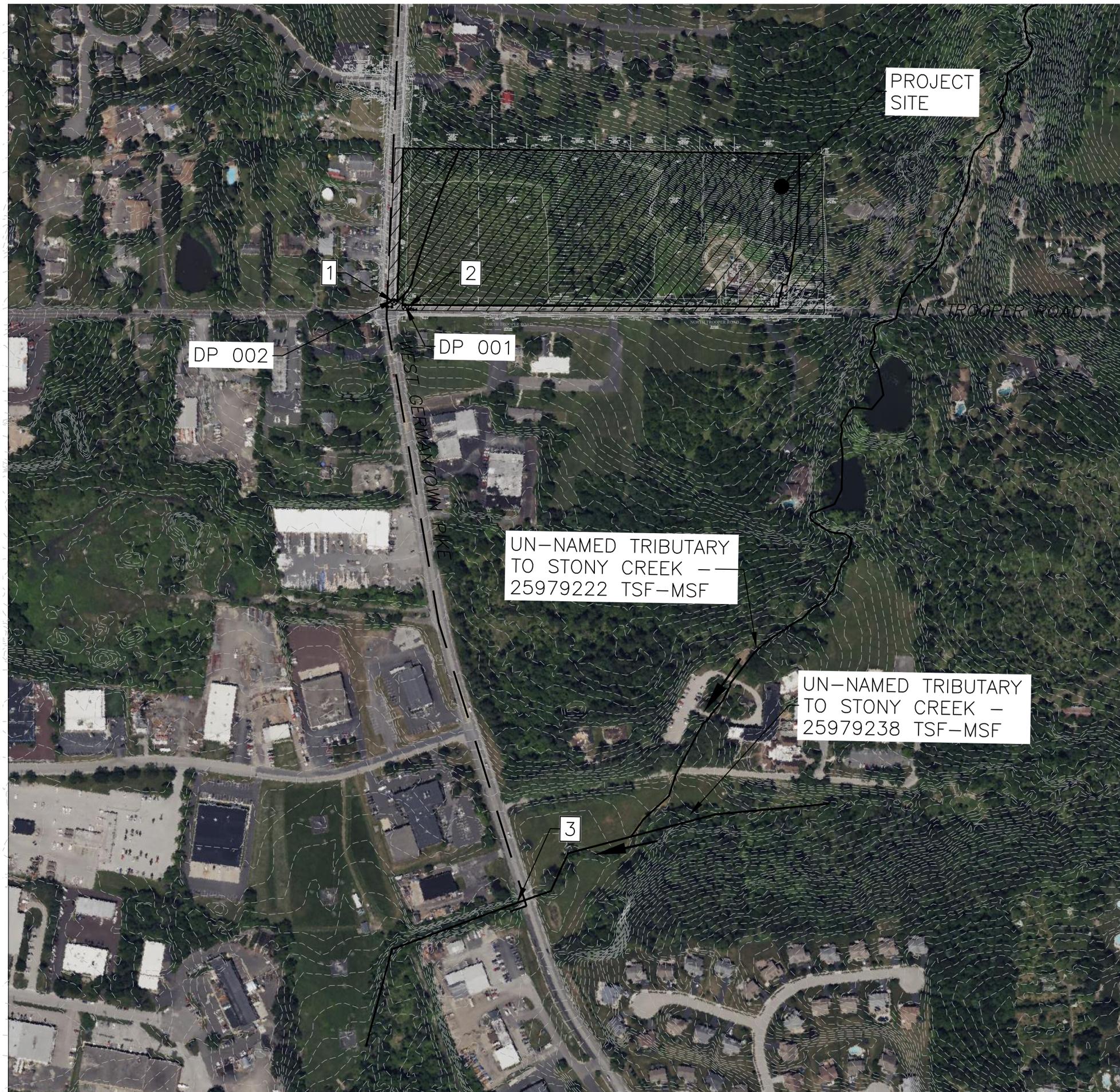
COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA
INLET DRAINAGE AREA PLAN

AND
 YOUR GOALS. OUR MISSION.
 1700 MARKET STREET, SUITE 3110
 PHILADELPHIA, PA 19103
 TEL 215-282-7850
 FAX 215-627-3499

DESIGNED BY JPK/ZHR/CMR/ROP	DRAWING I-DA
CHECKED BY BJS/ZHR	SHEET 3
DRAWN BY SCR/CKS/RAM	OF 4
DATE 12/19/2024	
SCALE AS NOTED	
PROJ. NO. WDEV00004	

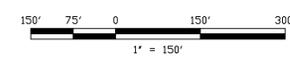
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LEGEND

- STREAM W/ FLOW DIRECTION
- OFFSITE FLOW PATH
- IMAGE CALLOUT (REFER TO IMAGE LOG INCLUDED IN PCSM REPORT)
- ONSITE DRAINAGE DIVIDE



ATTENTION: ALL CONTRACTORS LOCATIONS OF ALL EXISTING UTILITIES SHOWN HEREON HAVE BEEN DEVELOPED FROM UTILITY COMPANIES RECORDS AND/OR AERIAL PHOTOGRAPHS OF THE SITE. COMPLETENESS OR ACCURACY OF THE SIZE, DEPTH OR HORIZONTAL LOCATION OF UNDERGROUND FACILITIES OR STRUCTURES CANNOT BE GUARANTEED. IN ACCORDANCE WITH PENNSYLVANIA LEGISLATIVE ACT NUMBER 287 OF 1974 AS AMENDED BY ACT 121 OF 2004, CONTRACTORS MUST VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES AND FACILITIES PRIOR TO START OF WORK. SEE PLAN.

20243371817

NO.	DATE	REVISIONS	BY	CHKD

COMMERCE PURSUIT CAPITAL
TROOPER RIDGE SUBDIVISION
 1025 NORTH TROOPER ROAD, WORCESTER TOWNSHIP,
 MONTGOMERY COUNTY, COMMONWEALTH OF PENNSYLVANIA

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CHECKED BY BJS/ZHR	SHEET 4
DRAWN BY SCR/CKS/RAM	OF 4
DATE 12/19/2024	PROJ. NO. WDEV00004
SCALE AS NOTED	



| YOUR GOALS. OUR MISSION.

April 4, 2025

Mr. Dan DeMeno, Township Manager
Township of Worcester
1721 Valley Forge Road, PO Box 767
Worcester, PA 19490-0767

**RE: 1035 Trooper Road
Parcel No. 67-00-01540-004
Westrum Development Company
CKS – Preliminary Land Development Plan Review Response**

Dear Mr. DeMeno:

We are in receipt of the CKS Engineers review letter dated February 20, 2025 regarding the above referenced Preliminary Plan. On behalf of the applicant, Westrum Development Company, T&M offers the following responses to the above-mentioned review letter. Our responses are in bold-standard font for clarity.

1. Ordinance No. 285 adopted June 16, 2021 made the MR Multi-Residential Overlay District applicable to this property with underlying zoning districts to remain. The existing 15.12- acre lot consists of two zoning districts, approximately 21% C-Commercial and 79% R-100 Residential. Once subdivided, Lot 1 will be entirely R-100 and Lot 2 will be approximately 29% C-Commercial, with the remainder being zoned R-100 Residential.
2. The proposed use of Lot 1, single-family detached dwelling with a detached barn for storage and workshop use incidental to the principal dwelling use of the lot garage, is permitted by-right in the R-100 Zoning District and Multi-Residential Overlay. (150-67.B, 150-67.C and 150-83.A)
3. While a Zoning Data table is supplied on Sheet 2, compliance of Lot 1 cannot be verified as the plan does not depict the entirety of proposed Lot 1. The plan must be revised to show the full extents of Lot 1. Additional zoning comments may apply upon future submission of Lot 1 details. (150-68, 150-84 and 130-33.B.4)

T&M Response: The plans have been revised to show the entire property including Lot 1, see sheets 4 and 8.

4. The proposed use of Lot 2, multi-family dwellings consisting of 45 townhouses, is permitted in the Multi-Residential District at a density of four units per developable acre. The plan notes a lot area of 11.82 net acres; therefore, 45 townhouses results in a permissible density of 3.8 du/acre. (150-83.B and 150-89.E.1)
5. The plan shows compliance with the 50% impervious coverage limit for townhouses in the MR Zoning District and 40% requirement for single-family dwelling in the R-100/MR Overlay. A tabulation of impervious surface types must be provided with their respective areas so our office may confirm the proposed impervious coverage areas on each lot. (150-86.B)

T&M Response: A tabulation of existing and proposed impervious surfaces by type and area has been added to Sheet 2.

6. The twenty units with rears oriented towards Trooper Road will have basements with floor slabs approximately 10 feet below the finished floor elevation at the street side. While the Zoning Data table on Sheet 2 notes a 30-foot proposed height for all structures, we question the asterisk which states, “units will have basements with a majority of the basement wall area below finished grade.” The ordinance definition of basement requires the basement floor to be below subgrade on all sides.



Additionally, the ordinance defines building height as the vertical distance measured from the average elevation of the existing grade at the location of the building or its highest point of a flat or multi-level roof. A height variance may be required for the units in question if any are to exceed 35 feet or two stories. If any other units will have basements, the proposed floor elevation(s) must be added to Sheet 7. (150-9 and 150-87.A.1)

T&M Response: The height of the buildings will comply with the 2-story/35-foot height requirement.

7. The lighting plan must include a compliance table and show light distribution patterns and intensities. (150-89.E.4 and 150-200)

T&M Response: A lighting plan showing compliance to the ordinance has been added as Sheet 12.

8. The plans show a stormwater management basin located in the front yard setback of Trooper Road. For multi-family residential districts, no part of any detention basin shall occupy more than 35% of the required yard area of any district yard. A calculation must be provided indicating what percentage of the setback is occupied by the basin. Additionally, no detention basin shall be located closer to any building containing two or more multi-family dwelling units than the minimum distance required between buildings. We note that a required 30-ft. separation is required between the stormwater facility and the townhomes and appears to be provided from adjacent building clusters, but a setback dimension should be shown on the plan. (150-89.D and 150-203)

T&M Response: The required yard area and area of the detention basin within it have been added to the Site Plan, Sheet 7, showing compliance with this section. A 30 foot setback from the basin has also been shown on Sheet 7.

9. A 20-foot-wide screen planting buffer shall be provided in the exterior 50 feet of the 75- foot buffer area. (150-89.E.6.b)

T&M Response: A 20-foot-wide screen planting area has been provided. Existing trees to remain fulfill the requirement in some area as shown on the landscape plan, Sheet 12.

10. If the townhouses are to be operated under a homeowners association, the future association declaration and by-laws may need to include language prohibiting the keeping of recreational vehicles and travel trailers. (150-160)

T&M Response: Acknowledged; the HOA documents will include this restriction.

11. The type and location of mail delivery must be indicated on the plan. The applicant must provide a mail collection area at a central location(s) if cluster boxes are mandated by the Postmaster. We recommend placement in the landscaped islands for overflow parking, near pedestrian crossings for ease of access. A level approach and concrete pad for a standing area should be also provided in front of each cluster so residents and the postal carrier may access mailboxes without standing in the cartway. (150-177.A.7)

T&M Response: Centralized cluster mailbox locations have been provided in each of the two islands. See the Site Plan, Sheet 7.

12. All structures, buildings, parking areas, regraded slopes, and substantial improvements (with the exception of driveway and utility crossings when no other location is feasible) are prohibited on slopes of 25% or greater. A tabulation of steep slope disturbance must be added to the plan. A variance may be necessary if slopes over 25% are disturbed. (150- 146.4.B.1)

T&M Response: Steep slope area are shown on the Existing Conditions Plan and the Grading Plan. No slopes over 25% are proposed to be disturbed.

13. All buildings shall be designed as a single architectural scheme. The applicant must provide the Township with renderings of the intended building design scheme for the townhouses to ensure the continued character of the Township. Additionally, elevation views shall be provided of the townhomes backing up to Trooper Road. (150-89.E.2)



T&M Response: The applicant will comply with this request under separate cover letter.

14. The applicant must provide further details of the proposed amenity area at the southeast corner of Lot 2. We note that the Township's Open Space Preservation Plan contains an "implementation item" for the consideration of recreational space in the Fairview Village area. We recommend an inclusive facility with elements for all ages and abilities be considered, such as accessible play equipment, benches or similar seating areas, tables, and weather-protected gathering space. At the Board of Supervisors' discretion, the Township may require a fee-in-lieu of outdoor recreational facilities. (150-89.E.7)

T&M Response: The applicant has determined that a fee-in-lieu of an amenity space would be preferable and will request this option from the Board of Supervisors.

15. The use of the accessory structure on Lot 1 must be discussed with the Township. The Zoning Table should be updated to reflect any applicable zoning data related to accessory structures. (150-177.A)

T&M Response: Current owner of Lot 1 to continue to use the accessory structure for a habitable recreation space and storage.

SUBDIVISION AND LAND DEVELOPMENT

The following comments are based upon the Worcester Township Subdivision and Land Development Ordinance:

1. The plan must include a calculation of the net lot area. Sheet 2 and Sheet 4 note a 15.12- acre gross tract area and Sheet 4 lists a tract area of 14.30 acres to the legal right-of-way line. For reference, constrained land areas must be separately tabulated per the Zoning Ordinance. (130-33.C.5)

T&M Response: A table for the net lot area calculation for each lot has been added to Sheet 2.

2. The location and size of any existing sanitary sewer, storm drains, and water supplies must be noted on the plans. (130-33.C.4.c)

T&M Response: All existing storm drains within the adjacent public ROWs and the septic location and water well for the existing house are shown on the Existing Conditions Plan, Sheets 6 and 7.

3. General ERSA Note No. 3 on Sheet 12 indicates the site does have verified wetlands and that the wetlands are delineated on the plans. The wetlands are unfounded and must be clearly shown, if applicable. An investigation report which determined the presence of wetlands must be furnished for review. If no wetlands are present, the note must be revised. (130-33.C.3.e)

T&M Response: The site has been field investigated for wetlands and none were found to exist. The note has been revised accordingly.

4. Based on General ERSA Note No. 1 on Sheet 12, a Pennsylvania Natural Diversity Index (PNDI) search was conducted. We recommend the Township apply restrictions on tree removal timeframes consistent with the habitat protection guidelines (i.e. avoid removals from May 15th to August 15th). (130-33.C.3.j)

T&M Response: Acknowledged and agreed.

5. Whenever possible, the applicant shall preserve trees, groves, and/or waterways. If more than 25% of the existing trees on site with six-inch DBH or more are destroyed because of development, then all trees over the 25% threshold shall be replaced in addition to other landscaping requirements. (130-14.C)(130-28.F.7.b)

T&M Response: Tree removal and replacement calculations have been included on the Landscape Schedule on Sheet 33.



6. The applicant must determine if there are any deed restrictions, covenants, easements, and/or other encumbrances which may preclude the development as proposed. (130- 33.C.4.e)

T&M Response: There are no encumbrances on the property which would preclude the development of the property as proposed.

7. Existing cartway widths must be labeled on the plans. (130.C.2.a)

T&M Response: The existing cartway widths have been labeled, see Sheets 3 and 4.

8. Subdivisions and land developments should be laid out so as to avoid the necessity for excessive cut or fill unless specifically warranted by terrain or location. Dwellings located along the northern side of the tract result in excessive cut and those closer to Trooper Road will require fill. The applicant should demonstrate to the Township that no alternative layout is feasible that would minimize cut and fill operations. (130-14.D)

T&M Response: Given the existing grades throughout the site, there is no alternative development layout that would reduce the amount of cut and fill. The applicant is requesting a waiver on street grades for the driveway off Trooper Road to reduce the amount of cut and fill that would otherwise be required to reasonably develop the site. The use of walk-out basements for the units backing to Trooper Road is another strategy used to reduce the amount of cut and fill that would otherwise be required.

9. A portion of the retaining walls are proposed in steep slope areas. Retaining walls are not permitted unless the applicant can demonstrate that steeper slopes or retaining walls can be stabilized and maintained adequately and that they more effectively preserve the landscape in its scenic and/or natural state. (130-32.1.C.4)

T&M Response: Calculations for the construction of the retaining walls will be submitted under separate cover.

10. Street names must be proposed for consideration by the Township Planning Commission and Board of Supervisors. Proposed names shall not closely resemble any other existing streets. (130-16.A.8)

T&M Response: The applicant will provide this information to the Township when it is available.

11. The plans must demonstrate that a 200-foot sight distance is provided along the proposed streets along the centerline, measured at the driver's eye height of five feet. (130-16.B.1)

T&M Response: Site distances have been added to the Landscape Plan on Sheet 12.

12. The radius of horizontal curves shall not exceed 150 feet for residential streets. Curves through the north and south loops do not comply and will require a waiver unless reconfigured. (130-16.B.2.a)

T&M Response: Internal access drives for multi-family developments do not appear to have a horizontal curve requirement. However, in the event the Township would still require a waiver, one is being requested for Section 130-16.B.2.a. No reasonable design can be completed to meet this requirement given the long and narrow shape of the property. In addition, the small radii permit the creation of small, landscaped courts that create endpoints at either end of the internal access drive that are more in keeping with a cohesive community than a "J" or "T" turn-around would be.

13. Even if to be a private street, a 50-foot-wide right-of-way must be proposed for the internal roads. The plans must be revised to show the limits of the proposed right(s)-of-way. (130- 16.C.1.a.4)

T&M Response: Internal access drives for multi-family developments do not appear to have a right-of-way requirement. However, in the event the Township would still require a waiver, one is being requested for Section 130-16.C.1.a.4.

14. The paved cartway width of residential street shall be 32 feet or a reduced 28- to 30-foot width where such width is unreasonable. The proposed paved cartway is shown to be 24 feet wide and will require



a waiver. If a waiver is requested and granted, we recommend it be contingent upon an on-street parking prohibition along the curb lines on both sides of all streets. (130-16.C.1.a.4).

T&M Response: Internal access drives for multi-family developments are permitted to have a paving width of 24 feet for two-way traffic per SLDO Section 130-17.B.3. However, in the event the Township would still require a waiver, one has been requested from Section 130-16.C.1.a.4.

15. The area between an existing title line and the ultimate right-of-way line should be offered for dedication to the authority having jurisdiction over the road when land is subdivided or developed along an existing right-of-way. This offer should be noted on a plan to be recorded and metes and bounds provided on the plan for such strips of land. (130- 16.C.2.c)

T&M Response: An offer of dedication for the ultimate right-of-way area has been noted on Sheet 7. A metes and bounds plan shall be provided with the submission of the Final Plan.

16. Sheet 24 provides the following paving section details:

- a. Right-of-Way Pavement Section detail
- b. Parking Lot Paving Section detail (light duty)
- c. Heavy-Light Duty Pavement Match detail

The plan must graphically depict the limits of where each of these pavement sections will be installed. While proposed as a private roadway, the internal road system should be constructed to Township standards. (130-16.D)

T&M Response: The paving sections appropriate for each type have been identified on Sheet 7.

17. The intersection approach to Trooper Road from the main access road and to the cross street northwest of the north loop has a slope of 4% per the Sheet 20 profile. This must be reduced to 3% for a minimum distance of 50 feet at both locations, or a waiver requested. We defer to the Township Traffic Engineer for further comment. (130-16.E.7)

T&M Response: A waiver is being requested to allow a steeper slope in order to reduce cuts and fills on the site.

18. Driveways shall be a minimum of 40 feet from street intersections. Some unit driveways do not comply and those two which are within the main access drive intersection with the loop street are of greatest concern. The applicant should reconfigure the units as necessary to minimize the number of driveways occurring at street intersections. (130- 17.B.2)

T&M Response: There does not appear to be a minimum distance between unit parking spaces and the intersections of internal access drives for multi-family developments. However, in the event the Township would still require a waiver, one has been requested from Section 130-17.B.2.

19. Perpendicular parking as proposed for the 24 overflow guest parking spaces is prohibited along private roadways unless separated by barrier curbing and located a minimum of seven feet from the cartway. (130-17.D.2)

T&M Response: There does not appear to be a prohibition for parking spaces along internal access drives for multi-family developments. However, in the event the Township would still require a waiver, one has been requested from Section 130-17.D.2.

20. Guest parking spaces must be a minimum of 10 feet wide by 20 feet deep. The detail on Sheet 24 states "see plans" for dimensions, but none are provided on Sheet 6. (130-17.D.7 and 130-17.D.11)

T&M Response: Dimensions for the guest parking spaces has been added to Sheet 7.

21. At least one van-accessible ADA parking space must be provided for guests since the parking will be for public use. We recommend placement in the parking row closest to the amenity space. The quantity of overflow spaces must still satisfy zoning ordinance requirements based on the number of dwellings proposed if this item requires changes to proposed striping. (130-17.D.11 and 150-158)



T&M Response: One ADA parking space has been shown in each island, one of which is van-accessible, as shown on Sheet 7.

22. An emergency access is being provided off of Germantown Pike into the proposed development. We question the design of the emergency access and have concerns that it will appear to drivers as a second local access into the development. The access proposes a locking gate and “Knox Box” to limit vehicular access. We recommend that sufficient signage be added to the plans to post the access for Emergency Vehicles Only from the Germantown Pike and internal road approaches. A detail of the sign panel and post-mount should be provided on the plans. Further, additional measures may be necessary such as knock-down bollards or similar barriers to prevent motorists from attempting to enter the site from Germantown Pike.

T&M Response: The emergency access has been reconfigured to make it appear less like an access for the general public. This includes using grass pavers for the portion of the drive outside the ultimate ROW, moving the gate closer to W Germantown Pike, and adding “Do Not Enter” signs on both sides of the gate location. The Fire Marshal’s review of the plan found the configuration of the emergency access to be adequate.

23. Sidewalks shall be provided along all streets, unless the Township Supervisors deem it unnecessary for public safety. East of the proposed access drive at Trooper Road, no sidewalks are provided on the plan. A partial waiver may be required for this portion of the Lot 2 frontage and the entire Lot 1 frontage. (130-18.A.1)

T&M Response: The sidewalk along Trooper Road has been extended to the existing asphalt driveway at the existing house on Lot 1. A partial waiver is being requested to not construct the sidewalk to the northern property boundary due to large existing trees and sloped areas.

24. The minimum required width of sidewalks, 4 feet, must be noted on Sheet 23 details. Where sidewalk is less than five feet wide, ADA compliant passing zones must be provided and may not be contained within dwelling driveways or aprons. (130-18.A0)

T&M Response: The sidewalk width has been noted on the details, Sheet 26. ADA compliant passing zones have been added to the sidewalk on Sheet 7.

25. The location of the sidewalk relative to the right-of-way line could not be reviewed for the private road system. The right-of-way line must be added and sidewalks must be five feet from the curb line, within the right-of-way. (130-18.A.3)

T&M Response: Sidewalks are four feet from the curblines; a waiver is being requested to allow four feet instead of five feet. No ROW for the internal access drive is proposed. Please see #13 above.

26. Curbing is shown to be Belgian Block material interior to the site at the threshold of the ultimate rights-of-way. A waiver will be required as curbing must be constructed of concrete. (130-18.B.1.a)

T&M Response: A waiver is being requested to provide Belgian Block curb instead of concrete.

27. The Township may wish to comment on the appropriateness of the amenity space and consider if its placement effectively preserves the site’s natural features. We note the northern end of the site, where it is proposed to be located, contains steep slopes and medium-aged trees, whereas other portions of the site are presently meadow with fewer trees. The applicant may wish to consider a more central location to all proposed dwellings; however, proximity to overflow parking is preferred. (130-21)

T&M Response: The applicant has determined a fee-in-lieu-of request is better suited to this community and the amenity space has been removed from the plan.

28. A blanket stormwater easement is proposed per General Note 31 on Sheet 2. This note should indicate if the easement applies only to Lot 2 as it appears no stormwater facilities will be constructed upon Lot 1. (130-22.D.3)



T&M Response: The stormwater easement note on Sheet 2 has been revised under General Notes #31 to refer to only Lot 2.

29. The location of all trash receptacle areas must be shown. If curbside collection is to be provided, it must be noted on a plan to be recorded. We recommend at least one permanent receptacle be provided at the amenity space and the party responsible for maintenance of the receptacle be listed. If the requested receptacle is added, a detail should be provided. (130-28.E.2)

T&M Response: Acknowledged. Homeowners will store their trash receptacles in their garages and a note has been added to Sheet 7 stating this.

30. The plan should show the entire tract boundary with bearings and distances. Lot 1 is only partially shown. The extent of the subdivision line is not clear due to the partial plan presentation. (130-33.B.4)

T&M Response: The plans have been revised to show the entire perimeter boundary, see Sheets 7 and 8.

31. Existing and proposed monumentation must be shown on the plans. Additional monuments are required to differentiate Lot 1 from Lot 2. Monuments shall be stone or concrete and located on the right-of-way lines at corners, angle points, beginning and end of curves, and otherwise required. (130-23)

T&M Response: Existing and proposed monumentation has been shown on the plans, see sheets 7 and 8

32. A note should be added to a plan that will be recorded indicating that all proposed utilities are to be installed underground. (130-27)

T&M Response: Note 35 has been added to Sheet 2 stating all proposed utilities are to be installed underground.

33. Further quantification is required to evaluate compliance regarding steep slopes. The grayscale rendering on Sheets 5 and 12 and 1' = 100' plan scale of Sheet 12 are difficult to evaluate. The plan scale must be increased and the steep slope areas tabulated on both sheets. (130-32.1)

T&M Response: The steep slope areas have been revised to be more clear. A tabulation of the steep slope areas has been added to the Existing Conditions Plan, Sheets 3 and 4.

34. Unit numbers for each townhouse must be added to all plans.

T&M Response: Unit numbers have been added to each townhouse on Sheet 7.

35. A "Tree Survey Plan" was not included with the submission. Relative information is depicted on Sheet 5, Demolition Plan, and Sheet 12, Natural Resources Protection Plan, which is acceptable. Tree counts of sample areas and tree removal calculations are outlined on Sheet 12, Natural Resources Protection Plan. We request that the applicant or their consultant contact this office to arrange a site visit to verify the information provided. Furthermore, the sampling methodology must be submitted to Worcester Township for approval. (130-28.E.1)

T&M Response: Acknowledged. We will contact the Township Engineer's office to arrange a site visit and will submit the sampling methodology to the Township following the site visit.

36. A location map showing zoning district designations for the site and adjacent properties is to be shown on the Landscape Plan. (130-28.E.2.a.)

T&M Response: A location map showing zoning district designations has been added to the Landscape Plan on Sheet 12.

37. The plant list is to be revised and expanded to include planting height and spread for trees and height and spread for shrubs at installation. (130-28.E.2.g.)



T&M Response: The requested additional information has been added to the plan schedule on Sheet 34.

38. Existing and proposed contours shall be clearly labeled and areas with slopes in excess of 10% shall be indicated on the Landscape Plan. (130-28.E.2.i.)

T&M Response: The Landscape Plan has been revised to show existing and proposed contours. Slopes over 10% have also been added on Sheet 12.

39. We offer the following comments and recommendations relative to the Plant Schedule and Landscape Planting Notes and Specifications: (130-28.E.2.g & .j)

- a. We recommend for clarity that Landscape Details (Sheet 30) and Landscape Schedule (Sheet 31) plan sheets are referenced on the Landscape Plan (Sheet 10).
- b. We recommend that an installation detail is provided for trees to be installed on steep slopes.
- c. Provide the intended spacing of shrubs. Designed spacing for each shrub species proposed should be reviewed based on the mature size of the species and intent of the design.
- d. We recommend shrubs be included in a continuous mulch bed for ease of ongoing maintenance. A note should be added accordingly.
- e. We recommend that a note be added to the Plant Schedule indicating the quantity of male Winterberry shrubs to be provided as pollinators to the female shrubs.
- f. Note No. 7 on Sheet 30 should be expanded to include the Township Engineer for review of species substitution requests.

T&M Response: The recommended notes and details have been added or revised accordingly

40. We offer the following comments relative to tree preservation and removal (130-28.F.):

- a. In cases where natural features that exist and will be retained on site duplicate the planting requirements of Subsection G, any and all of such requirements may be waived by the Township. Notes in the Landscape Requirements Chart indicate that existing woods to remain along the rear and side yard to the north to count toward meeting perimeter buffer requirements. The extent of existing perimeter vegetation should be clearly indicated in plan view for further review.

T&M Response: A callout indicating areas of existing vegetation to remain has been added to the Landscape Plan on Sheet 12.

- b. Since vegetation to remain is intended by the Applicant to count toward Landscaping requirements, it is recommended that the following note, or similar, be added to the Landscape Plan: The Township reserves the right to require additional landscape buffer plantings, following substantial completion of construction, should vegetation to be preserved not be preserved or not otherwise be as represented on the Final Landscape Plan(s).

T&M Response: The recommended note has been added, see note 30 of the Landscape Planting Notes and Specifications, Sheet 33.

- c. A tree protection fence installation detail has been provided. The limits of the protection fencing are to be depicted on the Erosion and Sediment Control Plan (Sheet 11).

T&M Response: Tree protection fence has been added to the E&S Control Plan on Sheet 14.

- d. Planting is proposed within an area of vegetation shown to remain. The planting design should be adjusted to eliminate this conflict.



T&M Response: The proposed buffer planting has been adjusted to eliminate the conflict. Proposed buffer plantings are to be planted up to the edge of existing vegetation to remain as shown on Sheet 12.

- e. The Township encourages native species for replacement trees, and these shall not be all the same size.

T&M Response: Native species have been substituted in for replacement trees – Zelkova have been replaced with American Beech. The proposed sizes specified for replacement trees have been adjusted to provide greater variety. See the plant schedule on Sheet 34.

- f. Pignut Hickory, used toward meeting replacement tree requirements, is not included in the Recommended Plant List. While the species is native, it is not widely available at nurseries. Another option should be considered.

T&M Response: Pignut Hickory has been replaced with Swamp White Oak (Sheet 34).

- g. Minimum 2-1/2" caliper River Birch trees are proposed, yet are specified as multi-stem trees. It is acceptable to specify these trees as multi-stem trees, as long as the minimum height specified is the same as a minimum 2-1/2" caliper single-stem shade tree.

T&M Response: Proposed Multi-Stem River Birches have had min. caliper size removed in lieu of height and spread recommended sizes, both of which are within the same expected sizes of other single leader 2-1/2" shade trees (Sheet 34).

- 41. Plantings should be selected and located where they will not create or contribute to conditions hazardous to the public's safety. We offer the following comments and recommendations relative to tree placement: (130-28.G.2)

- a. Location of all existing and proposed above and underground utilities are to be added to the Landscape & Lighting Plan, Sheet 10, to ensure landscaping and utilities will not be in conflict with one another. Except where precluded altogether by an easement or right-of-way, it is recommended that new trees be installed no closer than 5 feet measured horizontally from any underground utility.
- b. Street trees shall not be located within the street right-of-way of Trooper Road.
- c. Trees and shrubs shall not be planted within swales. Proposed plantings must be relocated elsewhere.
- d. Clear sight triangles are to be labeled on the Landscape & Lighting Plan, Sheet 10.
- e. The proposed tree layout and lighting design should be coordinated and adjusted as appropriate to reduce conflict between trees and proposed lighting.

T&M Response: Proposed plantings have been relocated to avoid the above-mentioned utility and site conflicts (Sheet 12).

- 42. Street trees are required along existing streets where missing and along access driveways to residential developments having more than four dwelling units. We note that trees along Lot 1's Trooper Road frontage could not be reviewed and the main access driveway to Lot 2 is deficient. (130-28.G.4.a.3.&4.)

T&M Response: There are no proposed improvements on Lot 1; please refer to the EXC-2 Sheet 4 of 39 where 8 existing trees along Trooper Ridge are to remain along Lot 1's frontage. Additional street trees have been provided along the access driveways into Lot 2 as shown on Sheet 12.

- 43. The planting design provides for Softening buffers. However, Perimeter screen buffer planting shall be provided. (150-89.E.6. and 130-28.G.5.f.)



T&M Response: The softening buffer has been replaced with a screening buffer, see Sheet 12.

44. Off-street parking landscape plantings shall be provided. (130-28.G.6.)

T&M Response: Parking lot landscaping has been added to the plan and calculations added to the landscape requirements chart, Sheets 12 and 34.

45. Individual lot landscape plantings shall be provided in addition to all other required plantings. (130-28.G.9.b.)

T&M Response: Individual lot landscaping has been added to the plan and calculations added to the landscape requirements chart, see sheets 12 and 34.

46. We offer the following comments relative to detention basin perimeter plantings: (129-18.24.c. and 130-28.G.7.f)

- a. The ordinance reference for Drainage Area and Detention Basin Landscaping within the Landscape Requirements chart should be corrected.

T&M Response: The ordinance reference has been revised in the landscape requirements chart, Sheet 34.

- b. The extent of Detention Basin perimeter should be verified and additional plantings provided accordingly. The Landscape Requirements chart lists 707 linear feet. However, our measurements result in approximately 770 linear feet.

T&M Response: Detention basin perimeter has been revised to 770 LF and provided planting quantities revised accordingly, Sheet 12.

- c. The overall intent of the landscaping requirements should be considered with relation to the design and layout of the basin area plantings, in particular, 130-28.A.2.b. which reads, "Reduce stormwater runoff velocity and quantity by ... providing planting areas where runoff velocities are reduced and stormwater can infiltrate, ultimately recharging local groundwater supplies."

T&M Response: Basin area plantings are provided in accordance with §130-28G(7) and 129-18(24)(c)[1]. Additional plug plantings have been provided to the basin bottom for faster and more robust vegetative establishment, see Sheets 12 and 34.

- d. We recommend plantings proposed in association with detention basins are native species.

T&M Response: Plantings have been revised to provide a majority of native species, however, several proposed evergreens are non-native, but well-established, non-invasive species provided for greater biodiversity, see sheets 12 and 34.

- e. Sawtooth Oak tree is not recommended as it is currently on the PA DCNR Invasive Plant Watch List.

T&M Response: Sawtooth Oak has been replaced with Swamp White Oak, see Sheet 34.

47. We offer the following comments relative to the proposed species: (130-28.H.)

- a. Due to Serviceberry being a cohost for Cedar Apple Rust, these should not be planted in close proximity to Eastern Red Cedars. One of the species should be switched out.

T&M Response: Downy Serviceberry has been replaced with Flowering Dogwood, see Sheet 34.

- b. Downy Serviceberry and Flowering Cherry trees are not in the Recommended Plant List. With exception as noted above, both species are acceptable as proposed, between townhome units and between buildings.



T&M Response: Acknowledged. Downy Serviceberry has been replaced with Flowering Dogwood per comment 47.a above, see Sheet 34.

- c. White Spruce evergreen trees are not on the Recommended Plant List. We believe the use and placement of these trees as proposed is acceptable.

T&M Response: Acknowledged, it has been retained on the plan.

- d. Dwarf Fothergilla, Sweetspire, Alleghany Viburnum and Snow Queen Oakleaf Hydrangea shrubs are not on the Recommended Plant List. We believe the use and placement of these shrubs as proposed is acceptable. However, availability of Dwarf Fothergilla and Sweetspire at the sizes specified should be verified. Furthermore, Common Name for Alleghany Viburnum should be corrected for clarification.

T&M Response: Shrub sizes have been adjusted to more appropriate standard nursery stock sizes as generally available. Alleghany Viburnum common name has been revised in the plant schedule, see Sheet 34.

- e. Parson's Juniper is not on the Recommended Plant List. We do not believe a ground cover is appropriate as proposed.

T&M Response: Parson's Juniper has been replaced with Red Twig Dogwood, see sheet 34.

48. The applicant must provide a written summary of waivers from the Subdivision and Land Development Ordinance with any future submissions. Sheet 1 only identifies one waiver request from the Stormwater Ordinance as follows:

- a. From Section 129-18, to allow for High Density Polyethelene (HDPE) pipe in lieu of the required reinforced concrete pipe material. We take no exception to this request given the drainage piping will be contained upon a private tract with private roadways.

T&M Response: Acknowledged, the waiver request letter included with this submission has been updated.

SANITARY SEWER

1. A pressure sanitary sewer extension will be constructed to serve the proposed townhouse development. This pressure sewer extension will be constructed within the development and continue into W. Germantown Pike. The flow from this project will flow through the system to Township MH HD1.1A and flow by gravity to the Heritage Village Pumping Station. This pumping station has been evaluated and determined to have adequate capacity. We note that sewer treatment from this development will be treated at the Berwick Place WWTP. Currently, this plant is projected to have an organic overload within five years. A Corrective Action Plan (CAP) is currently under review by PADEP. No new connections will be allowed until the CAP is approved by PADEP.

T&M Response: The applicant is aware and understands that until the CAP is approved, no new connections will be permitted.

2. The applicant will be required to prepare a Planning Module for this project for sanitary sewer service. This module will need to be submitted to the Pennsylvania Department of Environmental Protection (PADEP) for review and approval in order to revise the Township's current Act 537 Plan. The Township will need to review the planning module prior to submission and execution for PADEP.

T&M Response: The applicant's sewer engineer is preparing a Planning Module that will be submitted to the Township for review under separate cover letter.

3. Manhole HD1.1A must be core drilled for the new lateral connection. Additionally, MH HD1.1A and HD1.1 must be lined with an epoxy coating. Both of these requirements must be noted on the plans.



T&M Response: A note has been added to the Utility Plan, Sheet 10, stating that the existing manholes will be core-drilled for the new lateral connection and that it must be lined with an epoxy coating.

4. The design of pressure sanitary system, including calculations, must be submitted to the Township for review.

T&M Response: The applicant's sewer engineer will provide the requested information to the Township under separate cover.

5. Please identify all new sanitary sewer force main piping as SDR-21 pipe. All pipe size and material must be included on the utility plan and profile sheet.

T&M Response: The sanitary sewer force main has been identified as SDR-21 pipe and pipe sizing has been noted on Sheet 10.

6. The Applicant should contact Worcester Township Code Enforcement Officer to determine if residential fire suppression systems will be required in the proposed townhouse buildings.

T&M Response: Sprinklers are proposed for the townhouse units.

7. The Applicant should confirm with the Pennsylvania American Water Company the type of meter pits (if any) that will be required for this project.

T&M Response: PAWC-approved water meter cut sheets have been added to the plan set, Sheet 32.

8. The Worcester Fire Marshal should review the plans to verify that he is satisfied with the number and location of fire hydrants shown on the plans.

T&M Response: The Fire Marshal has approved the number of and location of the fire hydrants.

9. The Applicant will be required to purchase sanitary sewer tapping fees from the Township. The Township will determine the adequate number of EDUs required for this project and convey that information to the Applicant.

T&M Response: The applicant acknowledges that the required number of EDUs must be purchased from the Township.

10. Capped sanitary and water laterals from Lot 2 to Lot 1 are capped off at the proposed property boundary. When capped sewers are provided, on-site disposal facilities shall also be provided until connection to Lot 1 is made. (130-26.5)

T&M Response: Lot 1 has an existing septic system and well that will remain until connection is made to public water and sanitary sewer.

11. We recommend the stubbed utilities which will extend to Lot 1's property line be reoriented to not pass below the amenity space. Regardless of their location, a utility easement will be required in favor of the Lot 1 property owner.

T&M Response: The amenity space has been removed from the plan and an easement for the stubbed utility lines has been shown on Lot 2 (Sheet 7).

STORMWATER MANAGEMENT, GRADING, EROSION AND SEDIMENT CONTROL

The following comments are based upon the Worcester Township Stormwater Management Ordinance:



1. An NPDES permit and erosion and sedimentation adequacy letter will be required from the Montgomery County Conservation District and PADEP. (130-32 and 129-20)

T&M Response: The NPDES permit application for this project is currently under review by Montgomery County Conservation District.

2. The plan should note if the stormwater basin will be owned/maintained by a HOA or if it is to be offered for dedication. If a stormwater management facility is accepted by the Township for dedication, the applicant shall pay a specified amount to the Township Maintenance Fund for periodic inspections and maintenance. (129-42.A)

T&M Response: A note has been added to Sheet 7 stating that all Stormwater Management Facilities on Lot 2 shall be owned and maintained by the homeowners' association.

3. An O&M agreement will be required for all stormwater facilities, in a form acceptable to the Township Solicitor. (129-39.A)

T&M Response: The applicant will execute an O&M agreement with the Township for the stormwater facilities.

4. West of the basin, contour 377 is intersecting with an unlabeled contour. Contours should be verified and may not intersect.

T&M Response: The 377 contour has been revised and additional contour labels have been added to the plan for clarity (Sheet 9).

5. The following storm structures and pipe segments have varying elevations on the Sheet 9 table relative to the storm sewer profiles on Sheets 14 through 17:

- a. A1.1 – Top of grate on profiles is 365.05.
- b. A2 – The invert listed does not match profiles.
- c. B3.1 – The invert listed does not match profiles.
- d. B5 - The invert listed does not match profiles.
- e. MH T5 - The invert listed does not match profiles.
- f. OCS A3 – The TG/rim listed does not match profiles
- g. S3 - The invert listed does not match profiles.
- h. T2 – The TG/rim listed does not match profiles.
- i. The following pipe segments have HDPE as the proposed material listed on the table; however, the profiles show RCP: G2 to G1, S2-S9, T1.1 to T1, and T8 to T11).

T&M Response: The drainage plan and profiles have been revised as enumerated in comment a through i above (Sheet 9, Sheets 14-17).

6. While a typical detail is provided on Sheet 25, the applicant must confirm that all headwalls /endwalls will be of reinforced concrete. If any alternative materials are proposed, a waiver will be required. (129-18.C.5)

T&M Response: The detail has been revised to confirm that headwalls/enwalls will be of reinforced concrete, Sheet 28.

7. Anti-seep collars shall be cast-in-place. Storm Sewer Note No. 4 on Sheet 2 must be revised and a typical detail provided reflecting the same. (129-18.H.16)

T&M Response: The note has been revised and a detail has been provided, Sheet 28.



8. We note that infiltration testing encountered bedrock at TP-2 and TP-4, at elevations 357.42 and 359.92. The proposed basin floor is shown to be at elevation 361.00 and the subsurface stone bed will extend to 351.00. The limiting zone must be considered in the basin design.

T&M Response: The basin is designed with an impermeable liner to separate the media/stone from groundwater that may be present below the bedrock elevation. A buoyancy calculation is also provided with this submission that accounts for groundwater present at elevation 360.

9. If bedrock cannot be ripped, blasting may be required. General Demolition Note 6 should be revised to explicitly include approval from Worcester Township is required for any blasting.

T&M Response: The note has been revised accordingly, Sheet 2.

10. We note that flow to inlets S8 and S9 atop the northernmost retaining wall and inlet B8.1 in the yard between Buildings 7 and 8 are approaching or exceed 4.0 cfs of inflow. We recommend the inlets be upsized to a Type 6 top and box. Further, the drainage area to inlets S8 and S9 are 1.8 and 2.2 acres, respectively. While this is capturing off-site flow, this is a significant contributing drainage area. Inlets T8, T9 and T12 are also shown to have drainage areas ranging from 1.8 to 2.4 acres and may benefit from providing additional structures upgradient to reduce the contributing drainage areas. (129-18.C.10)

T&M Response: The drainage plan has been revised to show the inlets in question as Type Ms with a Type 4 box. Additionally, a trash rack is proposed for each inlet, Sheet 11.

11. Slopes for the basin sides behind buildings 10 through 12 are shown to be steeper than 5V:1H; a waiver will be required. (129-18.H.9)

T&M Response: Labels have been added to the plan for interior and exterior side slopes for the basin. The interior side slopes are 5:1 to the top of berm elevation, Sheet 11.

12. All proposed slopes steeper than 3:1 must be labeled on the plans. It appears that there are proposed slopes greater than 3:1 upstream of the basin. (SMO 129.G(4) and 129.G(5))

T&M Response: Labels have been added to the plan for slopes greater than 3:1, Sheet 9.

13. All proposed grading must be located five feet from a property boundary. (SMO 129.G(6))

T&M Response: The grading has been revised accordingly, Sheet 9.

14. The basin bottom slope must be 2% unless landscaped and provided with a design which encourages infiltration. We acknowledge the placement of the gabion wall to increase the flow path travel time through the basin floor; however, we recommend some plantings beyond the ERNMX-181 seeding be proposed. (129-18.H.10)

T&M Response: The basin bottom must be flat to meet PADEP guidance for MRC. Basin plantings have been revised to meet the MRC design requirements, Sheets 10 and 12.

15. The spillway lining material is noted to be "SC-150" or "NAG-75" erosion control blanket. If not to be of concrete checkerblocks, a waiver may be required. (129.-18.H.12)

T&M Response: A waiver has been requested from this requirement.

16. A section drawing of the proposed basin is required showing the configuration above and below grade. The profile must also dimension the top of berm width as 10 feet. (129.18.H.14)

T&M Response: The section view is provided on the plans showing the basin configuration and top of berm width, Sheet 40.

17. A stabilized access drive will be required for Basin 1 and an access gate must be provided in the split rail fence surrounding the basin. The basin must be reachable by the service drive with a depressed curb and concrete apron at the right-of-way. An easement must be established for access by



Worcester Township or its designee. The split rail fence is proposed to contain wire mesh within its voids. The mesh specification must be included on the plans to ensure emergency spillway operation is not encumbered as the fence extends across the spillway. (129-18.H.22 and 129-18.H.23)

T&M Response: An access path to the basin is provided from the road to the east. A blanket easement (note 31, Sheet 2) is provided for the basin and all stormwater facilities to allow the Township or its designee access for inspection or other action as deemed appropriate by the Township. The detail for the split rail fence with mesh specifications has been added to the plan, Sheet 26.

18. We note that the maximum allowable water depth for basins is 2 ft. for the 2- and 10-year storms and 3 ft for 100-year storm. The basin 2-year and 100-year water surface elevations are noted to be 362.36' and 363.49', respectively, per the PCSM report; however, there is conflicting information regarding the bottom of bed elevation. If to be 357.00, the water depth exceeds the allowable limits for these storms. (129-18.H.3)

T&M Response: The standing water depth for design storms would be measured from the floor/top of media for the surface basin (elevation 361.00').

19. While supported by this office, the gabion wall within 100-year water surface through spillway will require a waiver. A typical construction detail for the gabion wall must be added to the plans. (129-18.H.21)

T&M Response: The plan has been revised to show a riprap berm within the basin. A detail is provided on Sheet 41.

20. Skewed or angled storm pipe crossings above or below utilities are not allowed unless approved by the authorities having jurisdiction of the facilities being crossed. There are multiple angled crossings throughout the storm network. While this cannot be entirely avoided, we recommend the applicant confirm all other utility providers are agreeable to the storm pipe configurations as shown. (129-18.C.16)

T&M Response: The applicant will confirm with the applicable utility providers are in agreement with the storm pipe crossing points

21. Numerous inlets are proposed directly in front of depressed curbs serving unit driveways. We recommend these inlets be relocated elsewhere or the driveway spacing adjusted to minimize travel over the grates.

T&M Response: The plan has been revised to reduce the number of inlets located in front of unit driveways. Please note that the inlets that are still located in front of unit driveways will have a Type S top that will match the elevation of the depressed curb (refer to belgian curb detail).

22. A minimum of 6 inches is required between the emergency spillway elevation and the top of grade elevation of the outlet structure. Six inches is also required between the 100-year water surface elevation and the top of grade of the outlet structure. The basin outlet configuration must be adjusted accordingly. (SMO 129-18.H(19))

T&M Response: A waiver has been requested from this requirement.

23. Basin 1 outlet piping must be watertight O-ring RCP. (SMO 129-18.H(18)).

T&M Response: The plan has been revised to note watertight O-ring RCP, see Sheet 40.

24. A Stormwater Management Agreement will be required. The Agreement shall be reviewed and approved by the Township Solicitor prior to plan approval. (SMO 129-138)

T&M Response: The applicant acknowledges the requirement for a Stormwater Management Agreement with the Township.

25. Roof drain and sump pump discharge locations must be indicated on the plan. (SMO 129- 18(C)(20))



T&M Response: Units 11-16 and 42-45 will have manifolds that pick up roof drains for those units. All other units' roof drains will flow to inlets or the basin (Sheet 11).

GENERAL ENGINEERING & DRAFTING

The following are general comments and considerations generated during the course of our review:

1. The portion of the existing driveway that Lot 1 utilizes will now be located on Lot 2. The applicant must indicate if the driveway is to remain. If this section of driveway is to remain, an access easement may be required.

T&M Response: The portion of the driveway on Lot 2 will be removed, Sheet 6.

2. Legend(s) should be added to the plan sheets throughout the plan set, as applicable.

T&M Response: Legends have been added to the plan sheets.

3. On all the sheets, the northern lot line appears to be cut off, not showing the total of the lot subdivision.

T&M Response: The plan sheets have been revised to show all lot lines.

4. Sheet 37 illustrates truck turning movements for the aerial fire apparatus only. We offer the following comments on the provided template:

- a. At the access driveway, egress movements are shown in the opposing lane.
- b. Access into the site must be depicted from Trooper Road as well.
- c. The approach through the emergency access is shown to have a 9% grade. We recommend the designer confirm the apparatus can successfully traverse this slope.
- d. Movements of a waste hauling vehicle must also be modeled.
- e. The locations of any on-street parking located outside of the 24 guest spaces must be considered in these templates, if applicable.

T&M Response: The turning templates have been revised to address above comments a through e (Sheets 43-46).

5. The project proposes several retaining walls. Notes on Sheet 2 and 24 are acceptable, however; all walls must be reviewed and approved before construction commences.

T&M Response: The engineered design for the retaining walls will be submitted to the Township for review prior to the issuance of building permits.

6. Methacton School District should comment on any potential bus stop location if to be a private road network. There may be a need for a waiting area on Trooper for student pick-up/drop-off. If necessary, a bench for seating and weather protection are recommended for students and guardians.

T&M Response: The applicant has contacted the school district who recommended a gathering location for students at the Trooper Road access point. This gather location has been noted on the Site Plan, Sheet 7.

7. Sheet No. 1 includes a list of utility users. There are other utilities (East Norriton) listed which may or may not be impacted by this project and the Applicant should review those and provide an accurate listing of only utilities impacted.



T&M Response: Acknowledged.

8. The title sheet must indicate which sheets are to be recorded. Additionally, on each sheet to be recorded, an 'xx' of 'xx' must be added to the title block.

T&M Response: The notations for sheets to be recorded has been added to the sheet list, Sheet 1.

9. The plans must be submitted for review and comment to the following agencies:
- a. Montgomery County Planning Commission
 - b. Montgomery County Conservation District
 - c. PennDOT – Trooper Road
 - d. Montgomery County Roads and Bridges Department W. Germantown Pike
 - e. PADEP
 - f. PA American Water
 - g. Township Traffic Engineer
 - h. Fire Marshal

T&M Response: Plans have been submitted to MCPC, MCCD, and the Township Traffic Engineer. We acknowledge the requirement that PennDOT, Montgomery County Roads and Bridges, PADEP, and the Fire Marshal must also receive plans for comment.

If you have any questions or need any clarification or additional information, please contact me.

Very truly yours,
T&M Associates

A handwritten signature in black ink that reads "Barry G. Stingel".

Barry G. Stingel, PLA
Supervising Landscape Architect



YOUR GOALS. OUR MISSION.

April 4, 2025

Mr. Dan DeMeno, Township Manager
Township of Worcester
1721 Valley Forge Road, PO Box 767
Worcester, PA 19490-0767

**RE: 1035 Trooper Road
BowmanTraffic Review #3 Response
Parcel No. 67-00-01540-004
Westrum Development Company**

Dear Mr. DeMeno:

We are in receipt of the Bowman Engineers review letter dated February 5, 2025 regarding the above referenced Preliminary Plan. On behalf of the applicant, Westrum Development Company, T&M offers the following responses to the above-mentioned review letter. Our responses are in bold-standard font for clarity.

General

1. A response letter must be provided with the resubmission detailing how each comment below has been addressed, and where each can be found in the resubmission materials (i.e., page number(s)) to assist in the re-review process. Additional comments may follow upon review of any resubmitted during the land development process.

Horner & Canter Associates (HCA) response: A response letter has been provided with this resubmission.

2. According to the Township's Roadway Sufficiency Analysis, the proposed development is located in Transportation Service Area South, which has a corresponding impact fee of \$3,125 per "new" weekday afternoon peak hour trip and the applicant will be required to pay a Transportation Impact Fee in accordance with the Township's Transportation Impact Fee Ordinance. Based on information provided in Table 1 of the study, the proposed 45 townhouse units are expected to generate 26 "new" trips during the weekday afternoon peak hour resulting in a transportation impact fee of \$81,250.

HCA response: The applicant acknowledges the Transportation Impact Fee calculation to be paid at plan recordation.

3. A Highway Occupancy Permit (HOP) is required for this project from both PennDOT and Montgomery County for the proposed site accesses and work that may be completed within the legal right of way on North Trooper Road (S.R. 3002) and West Germantown Pike since North Trooper Road (S.R. 3002) is a State Roadway and West Germantown Pike is a County roadway. Furthermore, since the site borders the adjacent municipality of East Norriton Township, and the site adjacent traffic signal at the intersection of West Germantown Pike and North Trooper Road (S.R. 3002) is owned and maintained by East Norriton Township, any roadway/signal improvements at the intersection or along North Trooper Road (S.R. 3002) extending into that jurisdiction will require the review and approval of that municipality, as well. The Township and our office must be copied on all TIA and HOP submissions, as well as correspondence between the applicant, PennDOT, and Montgomery County, and invited to any and all meetings among these parties.

HCA Response: HOP permits will be applied for to both PennDOT and Montgomery County Roads and Bridges.



4. Upon resubmission, our office will evaluate the information in concert with PennDOT and Montgomery County and will provide additional reviews of engineering and supplemental submission details as we receive them.

HCA Response: The applicant acknowledges that additional reviews will be forthcoming.

Transportation Impact Assessment

5. Since the site is situated along North Trooper Road (S.R. 3002), which is a state road, and West Germantown Pike, which is a County road, the transportation impact assessment (TIA) is recommended to be concurrently reviewed by PennDOT and Montgomery County. In addition, since the site is located immediately adjacent to East Norriton Township, the TIA should be shared and reviewed by East Norriton Township for their knowledge of the site access and associated roadway/signal improvements concluded from the study. Any comments from PennDOT, Montgomery County, and East Norriton Township should also be coordinated with our office and the Township and evaluated and addressed accordingly.

HCA Response: The applicant has submitted a transportation impact assessment to all parties referenced above.

6. The TIA submitted by the applicant's traffic engineer was prepared using the industry's generally accepted transportation impact study practices. The TIA was jointly scoped with PennDOT and the Township (via our office) in preparation of the study included for review. It is unclear if the study was scoped with Montgomery County.

HCA Response: It is noted that the study was also scoped with Montgomery County.

7. The study presents the following recommendations/conclusions, that should minimally be required of the applicant. There may be additional or modified improvements, or driveway design considerations based on the comments in this letter and responses to them, as well as those from PennDOT and

Montgomery County, as the applicant must obtain their concurrence and approvals since North Trooper Road (S.R. 3002) is a state highway and West Germantown Pike is a county highway:

West Germantown Pike and North Trooper Road (S.R. 3002)

- Widen West Germantown Pike approximately 12 feet along the site frontage in order to restripe the western leg of this intersection to provide a separate left-turn lane and a shared through/right-turn lane on the eastbound West Germantown Pike approach. Note: This widening is also intended to provide for a minimum 14-foot curb lane in the westbound direction of West Germantown Pike in the future. Note: The frontage widening along West Germantown Pike and improvement of the northwest radius of the West Germantown Pike/North Trooper Road (S.R. 3002) intersection will require replacement of the existing signal pole at this corner to accommodate the improvements.
- Traffic signal timing modifications.

HCA Response: Acknowledged and requested improvements are reflected on the revised plan. We understand the existing signal pole at the corner will need to be replaced and this will be reflected on our future HOP plans.

8. With the proposed improvements noted above to widen the West Germantown Pike site frontage and to provide for roadway restriping and a designated eastbound left-turn lane at the intersection, the applicant is helping to mitigate their impact and working towards the larger long-term solution to alleviate the congestion experienced by vehicles along West Germantown Pike in the vicinity of the site. These are improvements that were identified in the West Germantown Pike Corridor Study completed for Montgomery County in the early 2000's as well as the capital improvement plan completed for the adjacent signalized intersection in the Worcester Township Act 209 study., Under the County review, however, they may comment on their desire to provide for a shoulder or designated bike lane between a future westbound travel lane and the currently proposed new curb line along the



West Germantown Pike site frontage to accommodate two westbound through lanes and a 5-lane cross-section (plus bike lanes/pedestrian ways).

HCA Response: Acknowledged.

9. The widened lane closest to the site should be striped to provide gore pavement markings in the interim and allow for the conversion into an additional westbound through lane (plus shoulder if the County requires) in the future.

HCA Response: Gore striping has been provided, see Sheet 7.

10. The analysis worksheets should be revised to show all analysis inputs (i.e., saturated flow rate, lane widths, grades, heavy vehicles percentages, etc.), in order to confirm the inputs used in the analysis.

HCA Response: An updated Traffic Impact Assessment has been completed and includes the printouts showing the analysis inputs. The updated TIS is included with this submission.

11. The base critical headway and follow up headway factors for all unsignalized intersections should be adjusted to be consistent with PennDOT Publication 46, Chapter 10 parameters.

HCA Response: The base critical headway and follow-up headway factors are consistent with PennDOT's parameters.

12. The applicant's traffic engineer should verify the traffic signal timings/phasing used in the analysis conditions at the intersection West Germantown Pike and Park Avenue/Valley Forge Road (S.R. 0363) during both peak hours to confirm they match the traffic signal permit plan.

HCA Response: The traffic signal timings/phasing in the updated study have been confirmed to match the traffic signal permit plan.

13. The study utilizes a background growth rate of 0.21 percent per year which is consistent with data contained in PennDOT table entitled, Growth Factors for August 2023 to July 2024 for urban non-interstates in Montgomery County. It should be noted that the study should have used a background growth rate is 0.17 percent per year as contained in PennDOT table entitled, Growth Factors for August 2024 to July 2025, for urban non-interstates in Montgomery County. The analyses do not need to be revised specifically for this growth factor as the growth rate used in the study is higher, and therefore considered more conservative. However, to address other capacity/LOS items the applicant's engineer may re-run analyses with the lower rate.

HCA Response: The updated study applies a 0.17% per year growth factor.

14. Please provide volume development spreadsheets in the appendices that clearly indicate the existing volumes, baseline traffic growth volumes, traffic generated by planned or approved projects in the study area, and the proposed site volumes.

HCA Response: The updated study includes the volume development spreadsheets in Appendix H.

15. The applicant's traffic engineer should verify if they contacted East Norriton Township to determine if there are any proposed/planned nearby developments in that Township that should have been included in the future conditions traffic volume projections. If this was not done, please do so.

HCA Response: East Norriton Township has been contacted and confirmed that no proposed/planned developments are to be included in the study.

16. The traffic signal timings at the intersection of West Germantown Pike and North Trooper Road (S.R. 3002) should be optimized under 2029 future base conditions as required by current PennDOT TIS guidelines.

HCA Response: The updated study optimizes the future base conditions for this intersection.



17. The HCM worksheets for the unsignalized study intersections during both the weekday morning and weekday afternoon peak hours under all analysis conditions should be revised to include the overall levels-of-service/delay in order to confirm the overall levels-of-service/delay results shown in Table 3.

HCA Response: The HCS program does not include an overall LOS/delay. The information in Table 3 is calculated as a weighted average delay for all movements.

18. The 2029 future no-build and build queues at the following intersections exceed the available storage lengths on one or more of the turn lanes between no-build to build conditions according to the queue analysis provided in Table 4:

- West Germantown Pike and North Trooper Road (S.R. 3002) – westbound left-turn lane
- West Germantown Pike and Park Avenue/Valley Forge Road (S.R. 0363) – eastbound left-turn lane

Therefore, the applicant's engineer must evaluate feasible additional improvements required in order to reduce the queue lengths at these intersections during both peak hours or must provide an Alternative Transportation Plan (ATP) to provide necessary storage and/or infrastructure improvements in the study area that are feasible and will improve transportation (multi-modal) mobility.

HCA Response: The queue conditions referenced are due to No-Build traffic volumes. The development traffic has very little impact on these queue conditions and it is the applicant's position that no further mitigation is required.

19. Crash analysis for the most recent five years of available crash data (i.e., 2019-2023) must be included in the study for all study intersections.

HCA Response: Crash data has been requested and will be provided under separate cover.

20. The applicant's traffic engineer will likely be required by PennDOT to complete a comprehensive pedestrian study for the existing signalized intersection of West Germantown Pike and North Trooper Road (SR 3002). An inquiry should be made to the County and PennDOT to confirm before completing. This pedestrian study would include documentation of the existing pedestrian accommodations and generators at the intersection and improvements proposed as part of the site development. It should be noted that upgrades to the existing pedestrian signal equipment may result from the study with the other intersection improvements at this location, as well as provision of appropriate ADA facilities and crosswalks.

HCA Response: Acknowledged, a pedestrian study will be prepared in conjunction with the PennDOT HOP submission.

21. It is noted that the applicant is proposing to provide a dedicated left-turn lane for eastbound West Germantown Pike as part of the traffic study and project improvements. Due to curve in West Germantown Pike through the intersection and grades, the vehicles waiting to make the left-turn on the eastbound approach may impact the unobstructed view of oncoming through traffic for motorists turning left from westbound West Germantown Pike onto southbound North Trooper Road (SR 3002). Due to this, PennDOT may necessitate the implementation of protected-prohibited left-turn phasing for the westbound West Germantown Pike left-turn lane. Implementation of protected-prohibited phasing will likely impact the traffic analysis results and could potentially require additional mitigation measures. We request that the applicant's traffic engineer evaluate this potential sight-distance concern in the field, and then recommend that a technical meeting with PennDOT, County, and Township representatives be scheduled to confirm what, if anything, should be done with the signal timing/phasing for the left turn approaches. With the conclusions and guidance discussed, then revise the TIA accordingly.



HCA Response: The sight distance has been reviewed and it is our position that the sight lines will be acceptable to allow protected-permitted left-turn phasing on WB Germantown Pike. The timing/phasing can be further evaluated during the HOP review process with PennDOT and the County.

22. As noted in a prior comment, the radius improvements proposed on the northwest corner of the existing signalized intersection of West Germantown Pike and North Trooper Road (SR 3002) will impact the existing signal equipment and require it to be relocated and replaced.

HCA Response: Plans for the signal equipment relocation will be included in the HOP application.

23. The applicant's traffic engineer shall provide left-turn conflict analysis calculations to confirm the need for left-turn phases at the existing signalized intersection of West Germantown Pike and North Trooper Road (SR 3002). Additional signal equipment may need to be replaced to accommodate the phasing requirements determined by the analysis, and the structural integrity of the existing equipment must then be evaluated to discern if it needs to be upgraded.

HCA Response: A left-turn conflict analysis has been included in the updated study (Appendix K). The WB left turn is the only left turn movement that requires a protected phase which is present under existing conditions.

24. To reiterate an earlier point, East Norriton Township owns and maintains the traffic signal at the intersection of West Germantown Pike and North Trooper Road (SR 3002). All design plans and documents related to the traffic signal must be also submitted to East Norriton Township for review and approvals.

HCA Response: Acknowledged; all traffic signal related plans will be provided to East Norriton Township for review with the submission of the HOP applications.

Preliminary Land Development Plans

25. The cartway widths along the North Trooper Road (S.R. 3002) and West Germantown Pike site frontages should be clearly labeled on the plans and be in accordance with Section 130-16.C of the Subdivision and Land Development Ordinance. The applicant's traffic engineer indicates in its response that the cartway widths have been provided (labeled) on the preliminary land development plans, however, we are unable to locate them in this submission.

T&M Response: The cartway widths along North Trooper Road and West Germantown Pike have been labeled on Sheet 3.

26. A note must be added to the plan stating that the area between legal right-of-way line and ultimate right-of-way line along North Trooper Road (S.R. 3002) and West Germantown Pike should be offered for dedication to the authority having jurisdiction over the road as required by Section 130-16.C(2)(c) of the Subdivision and Land Development Ordinance. The applicant's traffic engineer indicates in its response that a note will be added to the land development plans.

T&M Response: A note has been added to the Site Plan for the area between the legal and ultimate ROW lines stating that the area is offered for dedication to PennDOT for North Trooper Road and Montgomery County for West Germantown Pike, Sheet 7.

27. According to Section 130-18.A of the Subdivision and Land Development Ordinance, sidewalk should be provided along the site frontages of North Trooper Road (S.R. 3002) and West Germantown Pike. The applicant's traffic engineer indicates in its response that sidewalk has been provided along the North Trooper Road (S.R. 3002) and West Germantown Pike site frontages, however, the plans currently show sidewalk along the West Germantown Pike site frontage and along only a portion of the North Trooper Road (S.R. 3002) site frontage from West Germantown Pike to the proposed site access, thereby satisfying the ordinance requirement for West Germantown Pike but not satisfying the ordinance requirement for North Trooper Road (S.R. 3002). The plans must either be revised to show



sidewalk along the entire North Trooper Road (S.R. 3002) site frontage, or a waiver/partial waiver must be requested from this ordinance requirement with a detailed explanation why it is being requested. We note to the Township that no sidewalk currently exists along either side of North Trooper Road (S.R. 3002) in the vicinity of the site. The Board of Supervisors may consider deferring this obligation that is required of the applicant until such a time as may be required by the PennDOT or the Township for this property, whether under present or future land ownership, and at no cost to Worcester Township, or may desire to consider a fee in lieu of sidewalk to be kept in escrow for future sidewalk installations in the Township and/or area of these properties.

T&M Response: The sidewalk along Trooper Road has been extended to the driveway for the existing house on proposed Lot 1. We are requesting a partial waiver from the requirement to provide sidewalk on Trooper Road beyond this point because there is no sidewalk to which a connection can be made. The existing topography in this location is not appropriate for a sidewalk.

28. The plans have been revised to show curbing along the West Germantown Pike site frontage and along the North Trooper Road (S.R. 3002) site frontage for Lot 2 from West Germantown Pike to a point to the north of the gravel driveway for the existing single-family home and garage on the northern end of the site, however, it is unclear if the applicant is proposing to install curbing entirely along the Lot 1 site frontage to the northern property line on North Trooper Road (S.R. 3002) as is required in Section 130-18.B of the Subdivision and Land Development Ordinance. The applicant's traffic engineer indicates in its response that curbing is provided along the West Germantown Pike and North Trooper Road (S.R. 3002) site frontages for the parcel (Lot 2). We recommend that the plans be revised to clearly show curbing along the entire site frontage (both Lots 1 and 2) of North Trooper Road (S.R. 3002), or a waiver/partial waiver must be requested from this ordinance section with a detailed explanation of why it is being requested. We do note to the Township that there is currently no curbing along either side of North Trooper Road (S.R. 3002) in the immediate vicinity of the site. Alternatively, the Board of Supervisors may also consider deferring this obligation that is required of the applicant until such a time as may be required by the PennDOT or the Township for this property, whether under present or future land ownership, and at no cost to Worcester Township, or may desire to consider a fee in lieu of curb to be kept in escrow for future curb installations in the Township and/or area of these properties.

T&M Response: The plans have been revised to show curb along the entire frontage on Trooper Road.

29. As previously commented upon in the prior review, adequate connectivity of the proposed sidewalk along the West Germantown Pike and North Trooper Road (S.R. 3002) site frontages to the signalized intersection of West Germantown Pike/North Trooper Road (S.R. 3002) must be provided. In addition, provision of ADA ramps and a crosswalk across North Trooper Road (S.R. 3002) from the site to the Norriton Presbyterian Cemetery should be incorporated into the plans.

The applicant's traffic engineer indicates in its response that ADA ramps and crosswalks are not shown on the plans at the intersection of West Germantown Pike and North Trooper Road (S.R. 3002) connecting the site and the Norriton Presbyterian Cemetery since there is no corresponding ADA ramp on the opposite side of North Trooper Road (S.R. 3002) for which to connect a crosswalk, and that further discussion will be required between the County, PennDOT, and the Township. We concur that this item should be discussed along with other items in this letter with the agencies involved.

T&M Response: As discussed with PennDOT and Montgomery County Roads and Bridges representatives, the plans have been revised to show an ADA ramp to the intersection of Trooper Road and West Germantown Pike and a crosswalk on Trooper Road. We have also shown ADA ramps for the crossings on the church property but have noted that an easement or ROW must be confirmed on the church property before the ADA ramps can be constructed.

30. According to Section 130-18.A(3) of the Subdivision and Land Development Ordinance, a minimum of five feet should be provided between the curb and sidewalk. There is currently approximately four feet of separation between the curb and sidewalk along the roadways throughout the site, and no separation provided between the curb and sidewalk in the island in the northern parking area, thereby



not satisfying the ordinance requirement. The plans should be revised to show a minimum of five feet between the curb and sidewalk along the roadways throughout the site and in the island in the northern parking area, or a waiver must be requested from this ordinance requirement with a detailed explanation of why it cannot be provided per ordinance.

T&M Response: A waiver is being requested to allow the distance between the curb and sidewalk to be four feet instead of five feet. The sidewalk on the northern island has been moved to be four feet back from the curb so that it is consistent with the other sidewalks.

31. According to Section 130-17.B(2) of the Subdivision and Land Development Ordinance, driveways shall be located no less than 40 feet from a street intersection. The plans currently show less than 40 feet between the intersections in the northern and southern parking areas and the driveways for the individual townhouses along the internal roads in the vicinity of these intersections. The plans should be revised to show a minimum of 40 feet between the driveways and intersections in the northern and southern parking areas, or waiver must be requested from this ordinance requirement.

T&M Response: The proposed internal access drive serving the townhouse units fits the description of a private driveway as described in SLDO Section 130-17.C. If the internal access drive is determined to be a private driveway, the requirement for sight distance from each, individual townhouse driveway would not apply as the individual townhouse driveways are performing the function of parking spaces instead of driveways. However, in the event the Township would still require a waiver, one has been requested from Section 130-17.B.2. for units 1, 10, and 45 to have their parking spaces less than 40 feet from an intersection. The edges of the units' parking spaces are approximately 38 feet from the centerline of the intersecting driveway and would constitute de minimis relief

32. The curb radii should be labeled on the plans at the proposed driveway intersections with North Trooper Road (S.R. 3002) and West Germantown Pike and be in accordance with Section 130-17.B(3) of the Subdivision and Land Development Ordinance. The applicant's traffic engineer indicates in its response that the curb radii at the West Germantown Pike and North Trooper Road (S.R. 3002) driveways are 35 feet and that they will be labeled on future plans.

T&M Response: The curb radii have been labeled on the plans at the intersections of Trooper Road and West Germantown Pike on Sheet 7.

33. The designer should ensure sufficient sight distance is provided for the proposed driveways along the internal road in accordance with Section 130-17.B(1) of the Subdivision and Land Development Ordinance. The applicant's traffic engineer indicates in its response that sight distance requirements for individual driveways along an internal road are not required in Section 130-17 and it will discuss this with the Township Traffic Engineer. Since this ordinance section pertains to driveway intersections with streets, the sight distance for the individual driveways along the internal road should be provided.

T&M Response: Sight lines have been added to the Landscape Plan to show reasonable sight distances at the internal accessway intersections on Sheet 7.

34. According to Section 130-17.D(2) of the Subdivision and Land Development Ordinance, at no time shall angle or perpendicular parking along the curbs of local, public, or private access roads or streets be permitted. All parking other than parallel parking shall be physically separated from the cartway by a minimum of seven feet and confined to barrier parking. The plans do not show any separation between the perpendicular parking and the cartway in the parking areas on the northern and southern ends of the site, thereby not satisfying the ordinance requirement. The plans should be revised to show a minimum of seven feet of separation between the perpendicular parking and cartways in these parking areas, or a waiver must be requested from this ordinance requirement.

T&M Response: Please see the response to #31. However, in the event the internal access driveway is reviewed as a street, a waiver is requested to allow perpendicular guest parking along the private driveway serving the multifamily townhouse units.



35. Horizontal curvature information should be provided on the plans for the internal roadway and be in accordance with Section 130-16.B(2) of the Subdivision and Land Development Ordinance.

T&M Response: Horizontal curvature information for the internal access driveway has been provided on the plans on Sheets 23-25.

36. The proposed profiles should be revised to include the points of intersecting streets and be in accordance with Section 130-16.E.7 of the Subdivision and Land Development Ordinance.

T&M Response: The points of intersecting streets have been added to the profile on Sheets 23-25.

37. The proposed profiles on Sheets 20-22 should be updated to provide the proposed elevations on the bottom informational band.

T&M Response: The profiles have been updated to provide the proposed elevations at the bottom on Sheets 23-25.

38. The proposed crosswalk areas must be shown on the proposed profiles and have ADA compliant slopes.

T&M Response: the proposed crosswalk areas have been provided on the profiles and are ADA compliant on Sheets 23-25.

39. Detailed ADA designs and CS-4401 forms must be submitted for review for all ADA ramps located within the Township right-of-way, along with any necessary TIF forms, for municipal concurrence. Crosswalks across the accesses should be designed to cross in front of the stop bar.

T&M Response: Acknowledged; this will be done as part of the HOP submissions.

40. The required and available sight distances must be provided and labeled on the plans for the intersections of the proposed roadway and North Trooper Road (SR 3002) and West Germantown Pike.

T&M Response: The required and available sight distances have been provided on Sheet 7.

41. The designer must evaluate the proposed pipe connection with existing inlet T1, as well as proposed Inlet A11. Based on the information provided, it does not appear that either inlet is constructible.

T&M Response: Inlet T1 will be replaced with a Type-4 box to accommodate the pipe connections, see Sheet 29. Inlet A11 and its adjacent inlets are located to maximize stormwater capture but if needed the C tops can be replaced with steel grates

42. The designer should clarify where the detail for concrete curb on Sheet 23 of the plan set will be used.

T&M Response: Curb detail has been labeled for use along public streets, Sheet 26.

43. The design ESALS for the proposed PennDOT pavement legend provided on Sheet 24 of the plan set should be verified.

T&M Response: The design is based on another project nearby on West Germantown Pike. This information will be verified as part of the HOP application.

44. The designer should consider placing the proposed sidewalk closer to the ultimate right-of-way line in order to better accommodate the future ultimate widening of West Germantown Pike.

T&M Response: Acknowledged; this will be discussed with Montgomery County Roads and Bridges.

45. Parking along the edges of both sides of the internal roadway based on the site design, road widths, and location of driveways will need to be prohibited by adequate signing. The Township Engineer and Fire Marshal may also comment on this design. The applicant's traffic engineer indicates in its response that "No Parking" signs will be added to the plan in future submissions.



T&M Response: No parking signs have been added to the plans, Sheet 7.

46. Turning templates must be provided demonstrating the ability of trash trucks and the largest expected delivery vehicle/moving trucks to maneuver into and out of the full-movement driveway along North Trooper Road (S.R. 3002), as well as entirely through the site's private street system.

The applicant's traffic engineer indicates in its response that these turning templates have been provided in this submission, however, we are unable to locate them in the submission.

T&M Response: Turning templates have been provided with this submission, Sheets 43-46.

47. The Township Fire Marshal should review the emergency vehicle turning templates for accessibility and circulation needs of emergency apparatus. Ensure that any correspondence, including any review comments and/or approvals, is included in subsequent submissions. The applicant's traffic engineer indicates in its response that no correspondence from the Fire Marshal has been received to date and any correspondence will be included in future submissions.

T&M Response: The Township Fire Marshal commented on the application in a memo dated 3/6/2024. With the exception of adding no parking signs, there were no other items to address from the review memo. No parking signs have since been added to the plan, see Sheet 7.

48. All proposed signs should be clearly labeled on the plans in subsequent submissions. The applicant's traffic engineer indicates in its response that all proposed signs have been labeled on the plans, however, several signs throughout the proposed development are not clearly labeled on the plans.

T&M Response: All signs have been labeled on the Site Plans, Sheet 7.

49. We recommend that the proposed Knox Box gate should likely be moved closer to the southern side of the emergency-only access along West Germantown Pike just inside the ultimate right-of-way line so that vehicles from West Germantown Pike see it and do not improperly use it to access the site. In addition, both ends of the emergency-only access should be signed to clearly indicate it is for emergency use only with special "Do Not Enter" signs for emergency vehicles only. If this is going to remain an emergency-only access, the County can weigh in on the provision of smaller radii or perhaps a depressed curb driveway, so it is less likely to be mistaken for an access roadway to/from the property for everyday vehicles to use. The pavement section between the curbline and internal roadway should also be discussed and potentially be designed with pavers capable of carrying an emergency vehicle.

The applicant's traffic engineer indicates in its response that the location of the Knox Box gate currently shown on the plans was chosen to allow emergency vehicles to pull off of West Germantown Pike to unlock the gate and that its ultimate location will be discussed with the Fire Marshal. The Fire Marshal should comment on this.

T&M Response: "Do not enter" signs have been added at both ends of the emergency access lane and the gate has been moved closer to W Germantown Pike, see Sheet 7. The Fire Marshal stated in his review that the configuration of the emergency access is acceptable.

50. A total of 24 guest parking spaces (12 at each end of the development) are proposed. With the provision of narrower roads and parking to be prohibited except in driveways (approximately 20' to 22' deep and 20' wide, allowing up to two driveway cars not in garage) and in the guest parking spaces, the adequacy of parking should be evaluated and provided by the applicant and their team. Depending on the demographic of residents to live in this community, holiday and special gatherings may require more overflow parking than available in this community, and the roadways and site layout are not designed to allow for on-street parking and two-way travel for other vehicles to circulate. No parking is to be provided along West Germantown Pike or North Trooper Road (S.R. 3002).

The applicant's traffic engineer indicates in its response that the proposed number of guest parking spaces complies with Township requirements and that additional guest parking spaces can be added if determined to be necessary. Since the Township Ordinance does not specify any requirements for



guest space parking, we recommend that the applicant try to provide as many guest parking spaces as possible throughout the site to accommodate for the potential for additional overflow parking needs throughout the development.

T&M Response: The number of guest parking spaces has been increased from 24 to 27.

51. Retaining wall design documents, including reports and specifications, must be submitted to the Township Engineer for review and concurrence. The applicant's traffic engineer indicates in its response that the retaining wall design documents will be submitted to the Township under separate cover.

T&M Response: Upon their completion, design plans for the retaining walls will be submitted to the Township under separate cover letter.

If you have any questions or need any clarification or additional information, please contact me.

Very truly yours,
T&M Associates

A handwritten signature in black ink that reads "Barry G. Stingel".

Barry G. Stingel, PLA
Supervising Landscape Architect



YOUR GOALS. OUR MISSION.

April 4, 2025

Mr. Dan DeMeno, Township Manager
Township of Worcester
1721 Valley Forge Road, PO Box 767
Worcester, PA 19490-0767

**RE: 1035 Trooper Road
Parcel No. 67-00-01540-004
Westrum Development Company
Fire Marshal – Preliminary Land Development Plan Review Response**

Dear Mr. DeMeno:

We are in receipt of the Fire Marshal review memo dated March 6, 2025 regarding the above referenced Preliminary Plan. On behalf of the applicant, Westrum Development Company, T&M offers the following responses to the above-mentioned review letter. Our responses are in bold-standard font for clarity.

1) Fire Truck Turning Template

- a) The provided plan, Sheet 37 of 37, provides for a twenty-four foot cartway concurrent with §130-16 C.1 (a) [1][b]. Township of Worcester Code. This will be acceptable pending the installation, or identification, of “No Parking” Signage or markings along the entire curb length where the cartway is less than twenty-eight feet in width.

T&M Response: No Parking signs have been added along the internal access drive, shown on Sheet 7.

2) Fire Hydrant(s)

- a. The spacing and locations of the fire hydrants are acceptable as proposed. The hydrants are proposed, Sheet 8 of 37, in accordance with §130-31 G, with 600 feet of all existing and proposed structures.

T&M Response: Fire hydrant locations are unchanged from the first Preliminary Plan submission.

- 3) Emergency Access Lane – is acceptable. The gate lock shall be a Knox Lock and locked on the end, opposite additional locks, if non-motorized. This lane shall be always maintained, including during inclement weather.

T&M Response: We acknowledge the requirement for year-round maintenance. Note that some minor changes have been made to the emergency access on the current submission (Sheet 7). Those changes include:

- A portion of the lane outside of the public ROW will have a grass paver surface instead of asphalt
- The gate has been moved closer to W Germantown Pike.
- “Do Not Enter” signs have been shown at both ends of the emergency access lane.

If you have any questions or need any clarification or additional information, please contact me.

Very truly yours,
T&M Associates

Barry G. Stingel, PLA
Supervising Landscape Architect



CKS Engineers
4259 West Swamp Road, Suite 410
Doylestown, PA 18902
P: 215.340.0600
www.cksenineers.com

May 15, 2025
Ref: #C0005084

Township of Worcester
1721 Valley Forge Road
PO Box 767
Worcester, PA 19490-0767

Attention: Dan DeMeno, Township Manager

Reference: 1035 Trooper Road
Parcel No. 67-00-01540-00-4
"Trooper Ridge" Minor Subdivision and Residential Land Development
Preliminary Review (2nd Review)

Dear Dan:

Our office is in receipt of your request for review of a Preliminary Plan for the above-referenced site. The submission consists of a 46-sheet plan dated December 19, 2024, last revised March 26, 2025, and a Post Construction Stormwater Management and Erosion and Sediment Control Report dated December 18, 2024, and last revised March 26, 2025, both prepared by T&M Associates.

The applicant proposes subdivision of an existing 15.12-acre (gross) 13.32±-acre (net) parcel to create two lots. Lot 1 will be a 1.45-acre (gross) 0.94-acre (net) lot to contain an existing single-family detached dwelling with a detached garage located entirely in the R-100 Residential Zoning District and Multi-Residential Use Overlay district. Lot 2 will be a 13.66-acre (gross) 11.27-acre (net) lot to contain 45 townhouses in nine building clusters ranging from four to six units each, all with a two-car garage and driveway accessed by a 24-ft.-wide private roadway, with 24 perpendicular overflow parking spaces in two separate parking areas, an aboveground stormwater basin, and an amenity space. The existing parcel is a split-zoned lot in both the R-100 Residential, C-Commercial Zoning Districts, as well as the MR - Multi-Residential Use Overlay District. Access to Lot 2 will be provided via one full-movement access at the southeasterly frontage along Trooper Road (State Route 3002) with one emergency access to Germantown Pike (Montgomery County Route) at the southwesterly frontage. The three existing driveway accesses serving Lot 1 will remain unchanged. All townhouses are proposed to be connected to public water and sewer service and stubs to Lot 1 will be provided for future connection.

We offer the following comments for consideration by the Township:

ZONING:

The following comments are based upon the Worcester Township Zoning Ordinance:

1. Ordinance No. 285 adopted June 16, 2021 made the MR Multi-Residential Overlay District applicable to this property with underlying zoning districts to remain. The existing 15.12-acre lot consists of two zoning districts, approximately 21% C-Commercial and 79% R-100 Residential. Once subdivided, Lot 1 will be entirely R-100 and Lot 2 will be approximately 29% C-Commercial, with the remainder being zoned R-100 Residential.
2. The proposed use of Lot 1, single-family detached dwelling with a detached barn for storage and workshop use incidental to the principal dwelling use, is permitted by right in the R-100 Zoning District and Multi-Residential Overlay. (150-67.B, 150-67.C and 150-83.A)
3. The use of the accessory structure on Lot 1 must be discussed with the Township. The Zoning Table should be updated to reflect any applicable zoning data related to accessory structures. (150-177.A)
4. Per our previous comments, the plans have been revised to show Lot 2 in its entirety. Due to the proposed lot line of the subdivision, non-conforming yard setbacks may be created at the west and rear of the accessory structure. Dimensions from the proposed lot line to the structure must be added to the plans to evaluate compliance with the zoning ordinance. (150-69)
5. The proposed use of Lot 2, multi-family dwellings consisting of 45 townhouses, is permitted in the Multi-Residential District at a density of four units per developable acre. The plan notes a lot area of 11.27 net acres; therefore, 45 townhouses results in a permissible density of 3.99 d.u./acre. (150-83.B and 150-89.E.1)
6. The twenty units with rears oriented towards Trooper Road will have basements with floor slabs approximately 10 feet below the finished floor elevation at the street side. While the Zoning Data table on Sheet 2 notes a 30-foot proposed height for all structures, we question the asterisk which states, "units will have basements with a majority of the basement wall area below finished grade." The ordinance definition of basement requires the basement floor to be below subgrade on all sides. Additionally, the ordinance defines building height as the vertical distance measured from the average elevation of the existing grade at the location of the building or its highest point of a flat or multi-level roof. A height variance may be required for the units in question if any are to exceed 35 feet or two stories. If any other units will have basements, the proposed floor elevation(s) must be added to Sheet 7. (150-9 and 150-87.A.1)

The applicant's engineer's response states that all buildings will comply with the Township's height requirements.

7. A 20-foot-wide screen planting buffer has been provided in the exterior 50 feet of the 75-foot buffer area. The plan proposes to use existing vegetation towards the buffer. The Township must determine if the existing vegetation is sufficient as a buffer. (150-89.E.6.b)
8. If the townhouses are to be operated under a homeowners association, the future association declaration and by-laws may need to include language prohibiting the keeping of recreational vehicles and travel trailers. (150-160)
9. All buildings shall be designed as a single architectural scheme. The applicant must provide the Township with renderings of the intended building design scheme for the

townhouses to ensure the continued character of the Township. Additionally, elevation views shall be provided of the townhomes backing up to Trooper Road. (150-89.E.2)

The applicant states that architectural drawings will be provided under separate cover. At the time of issuance of this letter, the Township has not received architectural plans.

10. The applicant must propose an amenity area. We note that the Township's Open Space Preservation Plan contains an "implementation item" for the consideration of recreational space in the Fairview Village area. We recommend an inclusive facility with elements for all ages and abilities be considered, such as accessible play equipment, benches or similar seating areas, tables, and weather-protected gathering space. At the Board of Supervisors' discretion, the Township may require a fee-in-lieu of outdoor recreational facilities. The applicant proposes a fee-in-lieu for the amenity space. (150-89.E.7)

SUBDIVISION AND LAND DEVELOPMENT

The following comments are based upon the Worcester Township Subdivision and Land Development Ordinance:

1. The location and water supply must be noted on the plans. (130-33.C.4.c)
2. General ERSA Note No. 3 on Sheet 12 has been revised to indicate that the site does not have wetlands. The consultant that performed the wetland investigation and the date of the investigation must be added to this note. (130-33.C.3.e)
3. Whenever possible, the applicant shall preserve trees, groves, and/or waterways. If more than 25% of the existing trees on site with six-inch DBH or more are destroyed because of development, then all trees over the 25% threshold shall be replaced in addition to other landscaping requirements. The location of the existing trees to be removed must be shown on the plans. (130-14.C) & (130-28.F.7.b)
4. A portion of the retaining walls are proposed in steep slope areas. Retaining walls are not permitted unless the applicant can demonstrate that steeper slopes or retaining walls can be stabilized and maintained adequately and that they more effectively preserve the landscape in its scenic and/or natural state. The applicant indicates that retaining wall design will be under separate cover. (130-32.1.C.4)
5. Street names must be proposed for consideration by the Township Planning Commission and Board of Supervisors. Proposed names shall not closely resemble any other existing streets. (130-16.A.8)
6. The plans must demonstrate that a 200-foot sight distance is provided along the proposed streets along the centerline, measured at the driver's eye height of five feet. The plans were revised to show 150 ft. of sight distance which must be revised to 200 ft. (130-16.B.1)
7. It is noted that the area between the title line and ultimate right-of-way is being offered to the Township for dedication. A legal description providing metes and bounds for this area shall be provided. We recommend the portion of the existing dwelling at proposed Lot 1, which encroaches this area, be excluded from the overall area to be offered.

8. If the Township requires an amenity area and not a fee-in-lieu of, the Township shall comment on the appropriateness of the amenity space and consider if its placement effectively preserves the site's natural features. We note the northern end of the site, where it is proposed to be located, contains steep slopes and medium-aged trees, whereas other portions of the site are presently meadow with fewer trees. The applicant may wish to consider a more central location to all proposed dwellings; however, proximity to overflow parking is preferred. (130-21)
9. A "Tree Survey Plan" was not included with the submission. Relative information is depicted on Sheet 5, Demolition Plan, and Sheet 12, Natural Resources Protection Plan, which is acceptable. Tree counts of sample areas and tree removal calculations are outlined on Sheet 12, Natural Resources Protection Plan. We request that the applicant or their consultant contact this office to arrange a site visit to verify the information provided. Furthermore, the sampling methodology must be submitted to Worcester Township for approval. The applicant's response indicates a site meeting with the Township Engineer will be scheduled in the future once the site meeting has occurred and revised plans have been submitted. Additional comments regarding the "Tree Survey Plan" may be generated in future revisions. (130-28.E.1)
10. General Landscaping Note Number 1 shall be revised to reflect current plan sheet numbers.
11. The installation detail provided for trees to be installed on steep slopes is difficult to read. The detail must be revised.
12. We recommend that a note be added to the Plant Schedule indicating the quantity of male Winterberry shrubs to be provided as pollinators to the female shrubs.
13. Planting is proposed within an area of vegetation shown to remain. The planting design should be adjusted to eliminate this conflict.
14. Except where precluded altogether by an easement or right-of-way, it is recommended that new trees be installed no closer than 5 feet measured horizontally from any underground utility.
15. Trees and shrubs shall not be planted within swales. Proposed plantings located in the swale system of B3.1 must be relocated elsewhere.
16. Clear sight triangles are to be labeled on the Landscape & Lighting Plan, Sheet 12.
17. The planting design provides for Softening buffers. Perimeter *screen* buffer plantings are also required. The plans propose that the existing vegetation will be used towards this requirement. Landscape Requirement No. 2 must be broken out into screening and softening buffer requirements. (150-89.E.6. and 130-28.G.5.f.)
18. Due to Serviceberry being a cohost for Cedar Apple Rust, these should not be planted in close proximity to Eastern Red Cedars. One of the species should be switched out.
19. The following waivers have been requested by the applicant from the Worcester Township Subdivision and Land Development Ordinance as requested in a letter dated April 4, 2025 prepared by T and M Associates:

- a. From Section 129-18.C(2) - requiring all storm sewer piping to be Class III reinforced concrete pipe.

This partial waiver is to allow High Density Poly Ethylene (HDPE) for two storm runs. The storm runs are outside roadways. We take no exception to this waiver request.

- b. From Section 129-18.H(12) – requiring emergency spillways that discharge over embankments to be reinforced concrete checker block.

The plans propose the installation of vegetated spillway with a permanent liner. We take no exception to this waiver request.

- c. From Section 129-18.H(19) – requiring basins to have a minimum of 6 inches between the emergency spillway and the top of the outlet structure and 6 inches between the 100-year water surface elevation and the top of grade at the outlet structure.

Due to the lack of infiltration rates, the basin was designed as a Managed Release Concept (MRC) basin which makes meeting these ordinances difficult.

- d. From Section 130-16.B(2)(a) – requiring horizontal curves for streets to have a minimum radius of 150 ft. for residential streets.

The applicant proposes that the internal roads are to be private streets which will not be dedicated to the Township.

- e. From Section 130-16.C(1)(a)[4] – requiring 50-ft. right-of-way for residential streets.

The applicant is proposing a 40-ft.-wide private right-of-way which is the requirement for marginal access streets.

- f. From Section 130-16.C(1)(a)[4] – requiring that residential streets have a minimum paved width of 32 feet which may be reduced to 28 or 30 feet if the conditions are unreasonable.

The plans propose a 24-ft.-wide paving width. We note that the plans propose “No Parking Signs” along all streets.

- g. From Section 130-17.B(2) – requiring driveways to be located no closer than 40 feet from a street intersection.

We take no exception to this request.

- h. From Section 130-17.D.2 – requiring that no angle or perpendicular parking be allowed along local, public, or private streets.

We note four guest parking areas are located perpendicular to private roadways. Since this will be a private road, we take no exceptions to this request.

- i. From Section 130-18.A.1 – requiring sidewalks along all streets.

We note this is a partial waiver to not install sidewalk along a 240-ft. portion of Trooper Road at the easterly frontage of proposed Lot 1 only.

The Township may desire a fee-in-lieu of the required sidewalk or a deferral of this requirement until the installation of this sidewalk is warranted.

- j. From Section 130-18.A.3 – requiring sidewalks be located 5 feet from the curb line.

We note the plans propose the sidewalk to be 4 feet from the curb. We take no exception to this request.

- k. From Section 130-18.B(1)(a) – requiring all curbing to be concrete.

The plans propose Belgian Block curbing outside the public right-of-way. We note that the roads are proposed to be privately owned. We take no exception to this request.

All waivers must be included on a plan sheet that is to be recorded.

SANITARY SEWER

1. A pressure sanitary sewer extension will be constructed to serve the proposed townhouse development. This pressure sewer extension will be constructed within the development and continue into W. Germantown Pike. The flow from this project will flow through the system to Township MH HD1.1A and flow by gravity to the Heritage Village Pumping Station. This pumping station has been evaluated and determined to have adequate capacity. We note that sewer treatment from this development will be treated at the Berwick Place WWTP. Currently, this plant is projected to have an organic overload within five years. A Corrective Action Plan (CAP) is currently under review by PADEP. No new connections will be allowed until the CAP is approved by PADEP.
2. The applicant will be required to prepare a Planning Module for this project for sanitary sewer service. This module will need to be submitted to the Pennsylvania Department of Environmental Protection (PADEP) for review and approval in order to revise the Township's current Act 537 Plan. The Township will need to review the planning module prior to submission and execution for PADEP.
3. The design of pressure sanitary system, including calculations, must be submitted to the Township for review. The Engineer's response indicates this will be under separate cover.
4. The applicant will be required to purchase sanitary sewer tapping fees from the Township. The Township will determine the adequate number of EDUs required for this project and convey that information to the applicant.
5. Capped sanitary and water laterals from Lot 2 to Lot 1 are capped off at the proposed property boundary. When capped sewers are provided, on-site disposal facilities shall also be provided until connection to Lot 1 is made. A note must be added to the plans that if and when Lot 1 is to be connected to public sewer and water, approval must be obtained from the Township and PA American Water Company. Any additional fees, including the

appropriate tapping fees, must be paid prior to connection. Also, the ends of the lateral and water service must be permanently marked in the field to allow for location in the future. (130-26.5)

6. Metes and bounds must be added to the Utility Easement for Lot 1. A legal description must be provided for review.

STORMWATER MANAGEMENT, GRADING, EROSION AND SEDIMENT CONTROL

The following comments are based upon the Worcester Township Stormwater Management Ordinance:

1. An NPDES permit and erosion and sedimentation adequacy letter will be required from the Montgomery County Conservation District and PADEP. (130-32 and 129-20)
2. An O&M agreement will be required for all stormwater facilities, in a form acceptable to the Township Solicitor. (129-39.A)
3. A Stormwater Management Agreement will be required. The Agreement shall be reviewed and approved by the Township Solicitor prior to plan approval. (SMO 129-138)
4. The following storm structures and pipe segments have varying elevations on the Sheet 11 table relative to the storm sewer profiles on Sheets 17 through 25:
 - a. A2 - A profile of this pipe must be added to the plans.
 - b. MH T5 – T5 is missing from the storm structure table on Sheet 11.
5. Multiple inlets are noted to be surcharged within the storm sewer calculations. The calculations and/or plans must be revised to not surcharge inlets. Additionally, design capacity of the pipes must not be less than the calculated capacity to the surcharged pipes. (129-18.C(10))
6. All inlets in the storm sewer calculations are considered 'on-sag'. Inlets that are not sumped should be revised to be 'on grade' and the calculations updated accordingly. (129-18.C(10))
7. One foot of freeboard must be provided for all inlets and manholes (129-18.(13))
8. As requested, slope labels have been added to the plans. The slopes behind units 1-10 and 37 and 38 are indicated as 2:1. No excavation or fill may be greater than 4:1. (129-18.G(4) & (5))
9. Sump pump discharge locations must be indicated on the plan. (SMO 129-18(C)(20))
10. Multiple pipes enter inlet boxes into the corner of inlet boxes. Storm sewer pipes may not enter inlet boxes at the corner of the structure. The plans must be revised.

GENERAL ENGINEERING & DRAFTING

The following are general comments and considerations generated during the course of our review:

1. The portion of the existing driveway that Lot 1 utilizes will now be located on Lot 2. The applicant has indicated that the driveway is to be removed. We note that a portion of the driveway is still located on Lot 2 and an access easement will be required.
 - a. Sheet 37 illustrates truck turning movements for the aerial fire apparatus only. The approach through the emergency access is shown to have a 9% grade. We recommend the designer confirm the apparatus can successfully traverse this slope.
2. The project proposes several retaining walls. Notes on Sheet 2 and 24 are acceptable, however; all walls must be reviewed and approved before construction commences.
3. As requested, a bus stop location has been shown on the plans. The Township should discuss the need for a bench for seating and weather protection for students and guardians.
4. Sheet No. 1 includes a list of utility users. There are other utilities (East Norriton) listed which may or may not be impacted by this project and the applicant should review those and provide an accurate listing of only utilities impacted.
5. The proposed split rail fence must be shown on the Record Plan.
6. The plans must be submitted for review and comment to the following agencies:
 - a. Montgomery County Planning Commission
 - b. Montgomery County Conservation District
 - c. PennDOT – Trooper Road
 - d. Montgomery County Roads and Bridges Department W. Germantown Pike
 - e. PADEP
 - f. PA American Water
 - g. Township Traffic Engineer
 - h. Fire Marshal

The above represents our comments on this Preliminary Plan Submission. Please contact me if you have any questions or need additional assistance on this project.

Very truly yours,
CKS ENGINEERS
Township Engineers



John Evarts, P.E.

JWE/klk

cc: Christian Jones, Assistant Township Manager (via email)
Casey Moore, Township Traffic Engineer (via email)
James O'Donnell, Owner
Robert Gundlach, Esquire, Fox Rothschild (via email)
Michael Maier, Commerce Pursuit Capital, L.P. (via email)
Barry Stingel, P.E., T&M Associates (via email)
File

To: Dan DeMeno, Township Manager

From: Matthew T. McCloskey, Fire Marshal

RE: LD2025-01 Trooper Ridge Subdivision – Response (04-04-2025)
1035 North Trooper Road, Worcester Township, Montgomery County, Pennsylvania

Date: May 2, 2025

A review of the response letter dated April 4, 2025 was completed and all items in the original letter have been satisfactorily addressed.

Matthew T. McCloskey
Fire Marshal
Tredyffrin Township
Phone: 484-928-8133
Email: mmccloskey@barryisett.com



MEMORANDUM

TO: Worcester Township Planning Commission

FROM: Dan DeMeno, Township Manager

DATE: May 6, 2025

SUBJECT: Final Draft Ordinance – Accessory Structures and Associated Definitions

Attached for your review is the final draft ordinance amending regulations for accessory structures and associated definitions within Chapter 150 of the Worcester Township Zoning Ordinance. This draft reflects prior Planning Commission discussion as well as staff and Board input.

As I have not received any written feedback following the April Planning Commission meeting as requested, only one change has been made to the draft: the addition of a de minimis exemption for very small accessory structures. I have also included clarifying edits and explanatory comments within the document. Please refer to those comments regarding the rationale behind certain revisions and the decision to leave some provisions unchanged.

Key Features of the Final Draft Include:

- New and Revised Definitions (§150-9):
 - Adds definitions for *Accessory Structure, Barn, Greenhouse, Silo, and Agricultural Products*.
 - Revises *Building Height* to be measured from average finished grade at foundation corners to the highest point, excluding chimneys and similar projections.
 - Removes the height restriction for silos, reflecting their distinct functional and structural characteristics in agricultural settings.

- Updated Accessory Structure Regulations (§150-177):
 - Permits structures in rear and side yards only, subject to the following size-based standards:
 - ≤250 sq ft: 10-foot setbacks, 12-foot max height
 - 251–1,200 sq ft: 15-foot setbacks, 20-foot max height
 - 1,201–2,999 sq ft: 20-foot setbacks, 25-foot max height
 - ≥3,000 sq ft: 30-foot setbacks, height capped at principal structure maximum
 - Establishes an exemption for de minimis structures with a footprint of less than one foot in diameter and a maximum height of 25 feet. These structures, such as residential flagpoles, are exempt from permitting and setback regulations so long as they do not pose safety hazards or violate other code provisions. They also have a maximum height of 25 ft – the standard height for a residential type flagpole.
 - Prohibits dwelling units within accessory structures.
 - Maintains or updates requirements for pools, sports courts, barns and stables, utility structures, and school athletic facilities, including provisions for lighting, stormwater, and landscape screening.

- Code Clean-Up (Section III):
 - Deletes outdated accessory use language in 11 sections across the zoning code, consolidating all relevant standards into §150-177 for clarity and ease of enforcement.

This ordinance provides clarity, consistency, and flexibility while preserving the character of our neighborhoods and rural areas.

The Township's expectation is that the Planning Commission will take a formal vote on this draft—whether in favor or not—so that it may be appropriately advanced or revised for future consideration by the Board of Supervisors.

Please let me know if you have any questions or require additional materials in preparation for your meeting.

Sincerely,

A handwritten signature in cursive script, appearing to read "Dan DeMeno".

Dan DeMeno
Township Manager

**TOWNSHIP OF WORCESTER
MONTGOMERY COUNTY, PENNSYLVANIA**

ORDINANCE 2025-____

**AN ORDINANCE AMENDING SECTIONS OF THE TOWNSHIP CODE
REGARDING ACCESSORY STRUCTURES AND ASSOCIATED DEFINITIONS**

WHEREAS, from time to time, corrections and other revisions are required to be made to the Township Code of Worcester Township;

WHEREAS, the Commonwealth of Pennsylvania mandates that municipalities have published in a newspaper of general circulation all proposed ordinances that make such corrections and revisions, at a great expense to municipalities;

WHEREAS, Worcester Township consolidates such corrections and revisions into one proposed ordinance, in lieu of individual ordinances, so as to minimize the expense incurred by the taxpayers in meeting this unfunded advertisement mandate; and

WHEREAS, the Board of Supervisors of Worcester Township has determined that it is in the best interests of the Township to amend the Township Code as set forth herein below.

NOW, THEREFORE, the Board of Supervisors of Worcester Township, Montgomery County, Pennsylvania, hereby ordains and enacts as follows:

SECTION I

1. Chapter 150, Zoning, Section §150-9 shall be modified as follows:
 - a. Definition of Accessory Building shall be modified to read: See Accessory Structure
 - b. Definition of Accessory Structure shall be added and read: A structure that is accessory to and incidental to that of the principal structure(s) and that is located on the same lot.
 - c. Definition of Barn shall be added and read: a large farm building used for storing grain, hay or straw, or for housing livestock.
 - d. Definition of Greenhouse shall be added and read: A building in which plants are grown that need protection from cold weather.
 - e. Definition of Silo shall be added and read: A tall cylinder used for bulk storage of agricultural products.
 - f. Definition of Agricultural Products shall be added and read: Any commodity or product that comes from agriculture, whether raw or processed, and is intended for human or animal consumption.
 - a-g. Definition of Building Height shall be modified to read: The vertical distance measured from the average finished grade at the foundation corners to the highest point of the building or structure, excluding chimneys and similar projections.

Commented [DD1]: Adding multiple definitions. Primarily, removing accessory building and replacing with accessory structure as a catch all for all structures that are not the primary ones. Added definitions for the rest are there as they are mentioned multiple times in other areas of the zoning ordinance with no definitions at all.

SECTION II

1. Chapter 150, Zoning, Section §150-177 shall be deleted in its entirety, and replaced to read:

A. Accessory uses and structures to a single-family detached residential use shall be regulated as follows:

(1) ~~In the AGR, R-175, and R-AG-175 Districts, structures accessory to single-family residential uses, except those regulated in Subsection A(2) through (9) below, shall be located in the rear yard or side yard only, and no closer than 15 feet to a property line. In all other districts, and at all properties created pursuant to Option 1 or Option 2, as set forth in Article XVIIA, Conservation Subdivisions, structures accessory to single-family residential uses, except those regulated in Subsection A(2) through (9) below, accessory structures shall be located in the rear yard or side yard only; said accessory structures may be erected in the rear yard not closer than 10 feet to the rear property line subject to the following requirements:~~

i. Accessory structures 250 square feet or less in gross floor area have a minimum rear and side setback requirement of 10 feet and a maximum height of 12 feet

ii. Accessory structures between 250 square feet and 1200 square feet in gross floor area have a minimum rear and side setback requirement of 15 feet and a maximum height of 20 feet.

iii. Accessory structures 1200 square feet or greater and less than 3000 square feet in gross floor area have a minimum rear and side setback requirement of 20 feet and a maximum height of 25 feet.

iv. Accessory structures - 3000 square feet or greater in gross floor area have a minimum rear and side setback requirement of 30 feet and a maximum height of no greater than the maximum allowed principal building height in that location.

~~(2) Unless otherwise permitted below, accessory structures in any zoning district shall not be higher than 15 feet. [Amended 5-16-2018 by Ord. No. 277; 5-19-2021 by Ord. No. 284]~~

(2) Exemption for De Minimis Accessory Structures - Accessory structures with a footprint of one (1) foot or less in diameter shall be exempt from the requirements of this section. Such structures are considered de minimis in nature and shall not be subject to permitting or setback limitations set forth herein, provided they do not present a public safety hazard or violate other provisions of the Township Code. These structures shall not exceed 25 feet in height.

~~(3) Private garages (whether attached or detached) may not encroach on any yard setback and must be located entirely within the building envelope of the lot on which they are located. Attached garages shall not exceed the height restriction for principal buildings in the applicable zoning district, and detached~~

Commented [DD2]: This is a wholesale replacement of this section. It removes "private garages" as a specific thing with specific requirements and merges them into "accessory structures". The new setbacks and sizes are based off of lot size and the size of the proposed accessory structure. This will allow larger lots larger accessory buildings with appropriate setbacks and greater heights allowed with those larger setbacks.

Commented [DD3R2]: Response to feedback: Have eliminated size delineation to simplify. Now is self limiting.

Commented [DD4]: 10 foot is unchanged from the current ordinance for smaller structures with the exception of the larger lot districts - as many SFD are in these larger districts, a uniform 10 ft setback for these is best practice

Commented [DD5]: Removed this section as it will be at odds with newly revised Section A(1) as far as structure height. Heights are now addressed in that section.

Commented [DD6]: Added exemption for small pole type structures such as basketball poles or flag poles. This allows for poles up to 25 ft in height, the standard for flagpoles in residential areas

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~~garages shall not exceed 20 feet in height. such unoccupied and~~

~~(4)~~(3) Private swimming pools shall be constructed in accordance with the applicable Township ordinances and shall be located entirely within the rear yard of the lot on which the pool is located and at least 10 feet behind the closest part of the main building. However, in no case shall the distance from the pool to the side or rear property line be less than 25 feet. In the AGR, R-175, and R-AG-175 districts, excluding properties created pursuant to Option 1 or Option 2, as set forth in Article XVIA, Conservation Subdivisions, the distance from the pool to the side and rear property lines shall be not less than 50 feet. The water edge shall be the line for measurement of these setbacks. All filters, heaters and accessory structures incidental thereto shall meet the same setback criteria. Freestanding spas and hot tubs shall be exempt from the requirement to be located at least 10 feet behind the closest part of the main building. **[Amended 5-19-2021 by Ord. No. 284]**

~~(5)~~(4) Private tennis courts and private sports courts and all facilities incidental thereto shall be located on a lot 60,000 square feet or larger and in the rear yard only. Except as set forth below for lighted courts, a private tennis court shall not be less than 50 feet from the side and rear property lines, and a private sports court shall not be less than 75 feet from the side and rear property lines. A vegetative screening landscape buffer in accordance with the Worcester Township Landscape Ordinance requirements for rear and side yards as set forth in § 130-28 of the Worcester Township Subdivision and Land Development Ordinance shall be provided for all private tennis courts and private sports courts and all facilities incidental thereto. To the extent required by the Township Engineer, all tennis courts and sports courts shall have stormwater management facilities. All required stormwater management facilities shall be approved by the Township Engineer.

The lighting of a private tennis court or private sports court shall conform to § 150-200. Any lighted private tennis court or sports court shall not be less than 100 feet from the side and rear property lines. No tennis court or sports court shall be illuminated after 9:00 p.m. Sunday through Thursday, or after 10:00 p.m. on Friday and Saturday.

~~(6)~~(5) Private stables for the keeping of horses and livestock and barns shall be permitted on properties having a gross lot area of three acres or more. A gross lot area of three acres shall allow a maximum of two large animals (e.g., horses, cattle, llamas). Two small animals (e.g., goats, sheep, mini horses, ponies, yearling horses or cattle, donkeys) shall be the equivalent of one large animal. Each additional acre of gross lot area shall allow the keeping of one additional large animal or the equivalent. All grazing areas shall be suitably fenced to contain the animals at all times. All buildings and structures (including rings, but not including fencing) used for the housing, stabling, training, and recreational enjoyment of such animals shall be located within the building envelope and shall be no higher than 35 feet.

~~(7) Decorative structures such as garden trellises, arbors, statues, benches, and the like, but specifically not including storage units, sheds, greenhouses, or other work areas, may be located no closer than 15 feet to any property line, but not within the ultimate right-of-way of any road.~~

~~(8)~~(6) Private mailboxes shall be located as required by the United States Postal Service. Private newspaper boxes may be located adjacent to private mailboxes and no closer to the cartway than a private mailbox.

Commented [DD7]: Added barns to this. Barns with no electric, water, etc., are agricultural buildings, but with those features, they are accessory structures like any other. Adding this here I believe will fit the intent of this section while giving the zoning officer more clarity.

Commented [DD8R7]: To reiterate - this allows for barns (newly constructed) more flexibility in our AGR oriented township

Commented [DD9]: Removed this per PC Feedback - this is not regulated in ANY PA municipality I was able to find

Commented [DD10R9]: We can still regulate as general accessory structures if needed and nothing is allowed in the right of way already

~~(7)~~ Private driveways shall be regulated by § 150-155, and private parking spaces shall be regulated by § 150-153.

(8) Structures associated with public or private utilities (such as water, stormwater, sanitary waste, power, fuel, telephone, and cable) to serve permitted agricultural and single-family residential uses shall be exempt from the setbacks in this section.

~~(10)~~(9) Dwelling units are expressly prohibited within any permitted accessory structure.

Commented [DD11]: Per March feedback - adu's will need to be addressed soon - will prioritize

B. Accessory uses authorized by this chapter shall not be interpreted to include nonpermanent structures for the sale of goods, which are prohibited by Chapter 119,¹ except as otherwise set forth therein.

C. Private or public school uses. Accessory structures such as backstops, dugouts/team structures, retaining walls, scoreboards, bleachers (permanent or movable), benches, goals (permanent or movable), or similar accessory structures associated with outdoor sports and athletic facilities may be located or erected within 50 feet of a front lot line or 40 feet of any other property line subject to the following: **[Added 1-15-2014 by Ord. No. 248]**

(1) Backstops shall be permitted on any baseball or softball field but shall be limited to a maximum height of 40 feet;

(2) Scoreboards shall be permitted and shall not be considered signs so long as the scoreboard complies with the following:

(a) Scoreboards shall not contain any advertisement for any company, product, or service;

(b) Scoreboards shall be limited to a maximum size of 36 feet by 10 feet;

(c) Scoreboards shall be limited to one per field;

(d) Scoreboards shall be limited to a maximum height, when mounted, of 20 feet from average surrounding grade within a stadium and 15 feet when mounted at all other fields on a single property; and

(e) Scoreboards, if illuminated, shall:

[1] Be internally illuminated LED displaying only the score and necessary game information and shall be illuminated only during the time of play and for a maximum period of 30 minutes following the end of play; and

[2] Neither cast any illumination off of the subject property nor create a nuisance or intrusion to the privacy of adjacent residential property owners or the public;

(3) Dugouts or team shelters shall be limited to two per field, one for the home team and one for the visiting team;

(4) Dugouts or team shelters shall be a maximum size of 12 feet by 50 feet;

(5) No structure shall be located or erected so as to interfere with the sight triangle of any intersection; and

(6) Fences and walls shall be regulated by § 150-182.

Commented [DD12]: Change to meet new section number in pending fence section amendment.

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SECTION III

1. Chapter 150, Zoning, Section §150-15, Subsection A shall be deleted in its entirety.
2. Chapter 150, Zoning, Section §150-23, Subsection B shall be deleted in its entirety.
3. Chapter 150, Zoning, Section §150-25.4, Subsection B shall be deleted in its entirety.
4. Chapter 150, Zoning, Section §150-31, Subsection A shall be deleted in its entirety.
5. Chapter 150, Zoning, Section §150-39, Subsection A shall be deleted in its entirety.
6. Chapter 150, Zoning, Section §150-55, Subsection A shall be deleted in its entirety.
7. Chapter 150, Zoning, Section §150-71, Subsection B shall be deleted in its entirety.
8. Chapter 150, Zoning, Section §150-79, Subsection B shall be deleted in its entirety.
9. Chapter 150, Zoning, Section §150-87, Subsection A(3) shall be deleted in its entirety.
10. Chapter 150, Zoning, Section §150-95, Subsection B shall be deleted in its entirety.

(6)

Commented [DD13]: These sections are all to be removed as they are a per district height restriction that conflicts with the new changes

Commented [DD14R13]: This comment has been here since 2/28/25. Reiterating. Removing agricultural silo height limits is good law. Requiring a farmer to go to the ZHB for a legitimate silo use is at best unneeded bureaucracy and at worst a Right to Farm Act violation

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MEMORANDUM

To: Worcester Township Planning Commission
From: Dan DeMeno, Township Manager
Subject: Revised Draft – Childcare Zoning Text Amendment
Date: May 13, 2025

Attached for your review is a refined version of the zoning text amendment concerning childcare uses, which builds upon the draft created by the childcare center’s counsel and discussed by the Commission and Board of Supervisors. This updated draft addresses the concerns of the Board while aligning with regulatory best practices and community needs.

Summary of Key Changes in This Draft

- **New and Expanded Definitions:**
The revised draft includes clear definitions for various childcare-related terms, including “Childcare Center,” “Family Childcare Home,” “Group Childcare Home,” and “Childcare Facility in a Place of Worship.” These additions help distinguish between types of care based on size, location, and operational structure.
- **Reasonable Conditions for Approval:**
Conditions for approval have been added that reflect common zoning standards across Pennsylvania, including limits on signage, parking requirements, and outdoor play areas. These conditions aim to balance the need for accessible childcare with protections for surrounding residential areas.
- **Comprehensive Coverage of Childcare Types:**
This draft provides zoning guidance for both in-home and institutional childcare providers, making it applicable to operations in residential, commercial, and institutional settings.
- **Inclusion of Childcare Facilities in Places of Worship:**
Recognizing that many childcare programs operate out of churches and other religious institutions, the amendment includes specific language allowing such uses with reasonable guidelines applied.

Next Steps

This amendment is important not only for zoning consistency but also for supporting working families and broadening childcare access across the Township.

Please review the revised draft in advance of our next meeting. I welcome your feedback and respectfully request that the Commission be prepared to offer a recommendation—either to advance the draft to the Board of Supervisors or to return it with specific, actionable revisions.

Please feel free to contact me with any questions or comments in the meantime.

Respectfully,

A handwritten signature in cursive script, appearing to read "Dan DeMeno".

Dan DeMeno
Township Manager

**TOWNSHIP OF WORCESTER
MONTGOMERY COUNTY, PENNSYLVANIA**

ORDINANCE 2025-_____

**AN ORDINANCE AMENDING THE WORCESTER TOWNSHIP ZONING
ORDINANCE TO ESTABLISH REGULATIONS AND DEFINITIONS FOR CHILDCARE
CENTERS AND FAMILY CHILDCARE HOMES, AND TO CLARIFY PARKING
REQUIREMENTS FOR SUCH USES**

WHEREAS, the Board of Supervisors of Worcester Township recognizes the growing need for quality childcare services and the importance of providing regulatory clarity and flexibility to support such uses in appropriate zoning districts;

WHEREAS, the Board of Supervisors seeks to define and regulate Childcare Centers and Family Childcare Homes in a manner that ensures public safety, preserves neighborhood character, and aligns with applicable Commonwealth licensing standards;

WHEREAS, the Board of Supervisors finds it necessary to amend the Worcester Township Zoning Ordinance to permit Childcare Centers by right in the C Commercial District, allow Family Childcare Homes as a by-right use on residential properties, and establish appropriate definitions and parking standards for such uses;

NOW, THEREFORE, be it ordained and enacted by the Board of Supervisors of Worcester Township, Montgomery County, Pennsylvania, as follows:

Section 1. Amendment to Section 150-9, Definitions.

Childcare Center – A facility licensed or approved by the Pennsylvania Department of Human Services, providing supervised care, instruction, or developmental guidance to seven (7) or more children under the age of sixteen (16) who are not related by blood, marriage, or adoption to the operator, for fewer than twenty-four (24) hours per day.

Family Childcare Home – A residence where the operator resides and provides supervised care, instruction, or developmental guidance to three (3) to six (6) children under the age of sixteen (16) who are not related by blood, marriage, or adoption to the operator, for fewer than twenty-four (24) hours per day. The facility must be licensed by the Pennsylvania Department of Human Services if more than three children are served.

School – A facility or institution, public or private, that provides a structured curriculum of elementary, secondary, or higher education approved or licensed by the Pennsylvania Department of Education, including associated buildings, playgrounds, athletic fields, and accessory structures customarily incidental to educational uses. This term includes primary schools, secondary schools, vocational schools, colleges, universities, and similar educational facilities, but excludes childcare facilities, trade schools for adults, or private tutoring centers not offering a formal academic curriculum.

Section 2. Amendment to Section 150-112, Use Regulations in the C Commercial District.

Worcester Township Zoning Ordinance, Article XVII ('C Commercial District'), Section 150-112 ('Use regulations') is hereby amended to add a new subsection K as follows:

K. Childcare Center. Childcare centers are permitted by right within the C Commercial District, subject to compliance with the following standards:

- The facility shall provide a dedicated outdoor play area, located within the side or rear yard, fenced, secured, and landscaped to minimize impacts on adjoining properties.
- A traffic management plan shall be submitted demonstrating safe daily operations and event management, subject to review and approval by the Township. This plan shall be submitted during the land development or building permit review process.
- All childcare centers must maintain a current license issued by the Pennsylvania Department of Human Services.

Section 3. Childcare Centers Accessory to Places of Worship.

Childcare centers operated as an accessory use to a place of worship are permitted by right, provided that:

- The childcare center is located on the same lot or contiguous lots under common ownership with the place of worship;
- The childcare center is operated, sponsored, or directly overseen by the place of worship, and is not a third-party tenant or independent operator unrelated to the religious institution;
- The childcare center maintains a valid license from the Pennsylvania Department of Human Services;
- The childcare center complies with the outdoor play area, traffic management, and parking requirements set forth for Childcare Centers.

Section 4. Family Childcare Homes Permitted by Right in Residential Properties.

Family Childcare Homes shall be permitted by right on any property that is used for residential purposes subject to the following conditions:

1. The Family Childcare Home shall be located within the operator's primary residence.
2. No more than six (6) unrelated children may be cared for at any one time.
3. The operator shall submit a valid license issued by the Pennsylvania Department of Human Services prior to commencing operation.

4. The use shall not alter the residential character of the dwelling, and no exterior signage shall be permitted.

5. No non-resident employees or assistants shall be permitted. All childcare must be provided by residents of the home.

Section 5. Amendment to Section 150-153.B, Required Off-Street Parking Facilities.

Worcester Township Zoning Ordinance, Article XXII ('Off-Street Parking and Loading'), Section 150-153.B ('Required off-street parking facilities') is hereby amended to add a new subsection (13) as follows:

13) Childcare center: One (1) space per employee, plus one (1) space per fifteen (15) children enrolled, plus overflow parking equal to twenty-five percent (25%) of the total required parking.

Section 6. Savings Clause.

The provisions of this Ordinance are severable. If any section, sentence, clause, or phrase of this Ordinance is for any reason held to be invalid by a court of competent jurisdiction, such decision shall not affect the validity of the remaining provisions of this Ordinance.

Section 7. Repealer.

All ordinances or parts of ordinances inconsistent with the provisions of this Ordinance are hereby repealed to the extent of such inconsistency.

Section 8. Effective Date.

This Ordinance shall become effective as provided by law.

ORDAINED AND ENACTED this ____ day of _____, 2025.

BOARD OF SUPERVISORS
WORCESTER TOWNSHIP

By: _____

Rick DeLello, Chair

Attest: _____

Daniel DeMeno, Secretary