
Alteration of Terrain Application & Stormwater Drainage Analysis

Jennesstown Manor

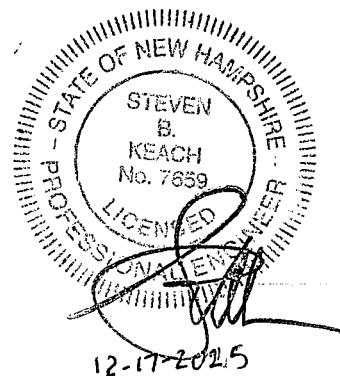
**Map 7, Lots 39
Route 103
Warner, New Hampshire**

**February 20, 2025
REVISED: DECEMBER 17, 2025**

KNA Project No. 24-0307-1

Prepared For: Peacock Hill Road, LLC
145 Old Town Road
Weare, NH 03281

Prepared By: Keach-Nordstrom Associates, Inc.
10 Commerce Park North, Suite 3
Bedford, New Hampshire 03110
(603) 627-2881
(603) 627-2915 (fax)



KNA KEACH-NORDSTROM ASSOCIATES, INC.

Table of Contents

- 1. SIGNED APPLICANT AFFIDAVIT**
- 2. AOT APPLICATION**
- 3. AOT APPLICATION CHECKLIST**
- 4. COPY OF AOT APPLICATION CHECK**
- 5. MUNICIPAL SUBMISSION: WARNER**
- 6. USGS LOCATION MAP**
- 7. PROJECT NARRATIVE**
- 8. SURFACE WATER IMPAIRMENTS**
- 9. WEB GIS FIGURES**
- 10. WARNER GROUNDWATER PROTECTION OVERLAY DISTRICT**
- 11. NEW HAMPSHIRE NATURAL HERITAGE INVENTORY DATABASE CHECK**
- 12. WEB SOIL SURVEY**
- 13. AERIAL PHOTOGRAPH**
- 14. SITE PHOTOGRAPHS**
- 15. GRV CALCULATION**
- 16. BMP WORKSHEETS**
- 17. EXTREME PRECIPITATION TABLES**
- 18. HYDROCAD DRAINAGE ANALYSIS**
- 19. RIP RAP APRON CALCULATIONS**
- 20. SWALE RIPRAP CALCULATIONS**
- 21. SITE SPECIFIC SOIL SURVEY REPORT**
- 22. INFILTRATION FEASIBILITY REPORT**
- 23. OPERATION and MAINTENANCE PLAN with CHECKLIST**
- 24. PLANS**
PRE-DEVELOPMENT DRAIN AREAS PLAN (11"x17" - COLORLESS)
POST-DEVELOPMENT DRAIN AREAS PLAN (11"x17" - COLORLESS)
PRE-DEVELOPMENT SOILS MAP (11"x17" - COLOR)
POST-DEVELOPMENT SOILS MAP (11"x17" - COLOR)
PRE-DEVELOPMENT DRAIN AREAS PLAN (22"x34" - COLORLESS)
POST-DEVELOPMENT DRAIN AREAS PLAN (22"x34" - COLORLESS)
NON-RESIDENTIAL SITE PLAN SET (22" x 34" - COLORLESS)

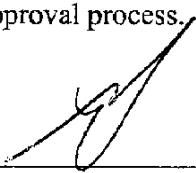
1. SIGNED APPLICANT AFFADAVIT

Owner Affidavit

I, Gary Fitzgerald, Member of Peacock Hill Road, LLC and owner of the property referenced on Tax Map 7 as Lot 39, located on Route 103 Warner, New Hampshire, hereby verify that I have authorized Keach-Nordstrom Associates, Inc. to submit on my behalf, any and all applicable State and local permit applications as they pertain to improvements on said property.

Additionally, I authorize Keach-Nordstrom Associates, Inc. to aid in the representation of these applications throughout the approval process.

Signature of Owner:



Printed Name of Owner:

Gary Fitzgerald, Member

Address of Owner:

145 Old Town Road

Weare, NH 03281

Date:

12) 10/24

2. AOT APPLICATION



**ALTERATION OF TERRAIN
PERMIT APPLICATION**
Water Division / Land Resources Management
[Check the status of your application](#)



RSA / Rule: RSA 485-A:17, Env-Wq 1500

Administrative Use Only	Administrative Use Only	Administrative Use Only	File Number:
			Check No.:
			Amount:
			Initials:

1. APPLICANT INFORMATION (INTENDED PERMIT HOLDER)

Applicant Name: Peacock Hill Road, LLC	Contact Name: Gary Fitzgerald	
Email: hotroddaa57@hotmail.com	Daytime Telephone: 603-325-3112	
Mailing Address: 145 Old Town Road		
Town/City: Weare	State: NH	ZIP Code: 03281

2. APPLICANT'S AGENT INFORMATION If none, check here:

Agent's Name:	Contact Name:	
Email:	Daytime Telephone:	
Address:		
Town/City:	State:	ZIP Code:

3. PROPERTY OWNER INFORMATION (IF DIFFERENT FROM APPLICANT) Check here if more than one property owner, and attach additional sheets as necessary:

Owner's Name:	Contact Name:	
Email:	Daytime Telephone:	
Mailing Address:		
Town/City:	State:	ZIP Code:

4. PROPERTY OWNER'S AGENT INFORMATION If none, check here:

Business Name:	Contact Name:	
Email:	Daytime Telephone:	
Address:		
Town/City:	State:	ZIP Code:

5. CONSULTANT INFORMATION If none, check here:

Engineering Firm: Keach-Nordstrom Associates, Inc.	Contact Name: Jason Lopez	
Email: jlopez@keachnordstrom.com	Daytime Telephone: 603-627-2881	
Address: 10 Commerce Park N Suite 3B		
Town/City: Bedford	State: NH	ZIP Code: 03110

6. PROJECT TYPE						
<input type="checkbox"/> Excavation Only		<input checked="" type="checkbox"/> Residential	<input type="checkbox"/> Commercial	<input type="checkbox"/> Golf Course	<input type="checkbox"/> School	<input type="checkbox"/> Municipal
<input type="checkbox"/> Agricultural		<input type="checkbox"/> Land Conversion	<input type="checkbox"/> Other:			
7. PROJECT LOCATION INFORMATION						
Project Name: Jennesstown Manor						
Street/Road Address: Route 103						
Town/City: Warner		County: Merrimack				
Tax Map: 7		Block:	Lot Number: 39 & 39-1		Unit:	
Post-development, will the proposed project withdraw from or directly discharge to any of the following? If yes, identify the purpose.						
1. Stream or Wetland Purpose:		<input type="checkbox"/> Yes	<input type="checkbox"/> Withdrawal	<input type="checkbox"/> Discharge		
<input checked="" type="checkbox"/> No						
2. Artificial pond created by impounding a stream or wetland Purpose:		<input type="checkbox"/> Yes	<input type="checkbox"/> Withdrawal	<input type="checkbox"/> Discharge		
<input checked="" type="checkbox"/> No						
3. Unlined pond dug into the water table Purpose: Pocket Pond		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> Withdrawal	<input type="checkbox"/> Discharge		
<input checked="" type="checkbox"/> No						
Post-development, will the proposed project discharge to:						
<ul style="list-style-type: none"> • Within one-quarter mile of a surface water impaired for phosphorus and/or nitrogen? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes • Within one-quarter mile of a Class A surface water or within the watershed area of an Outstanding Resource Water? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes • Within one-quarter mile of a lake or pond not covered previously? <input type="checkbox"/> No <input type="checkbox"/> Yes 						
Is the project a High Load area? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes, specify the type of high load land use or activity:						
Is the project within a Water Supply Intake Protection Area (WSIPA)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No						
Is the project within a Groundwater Protection Area (GPA)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No						
Will the well setbacks identified in Env-Wq 1508.02 be met? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No						
For more details on the restrictions in these areas, read Chapter 3.1 in Volume 2 of the NH Stormwater Manual.						
Is any part of the property within the 100-year floodplain? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes: Cut volume: cubic feet within the 100-year floodplain. Fill volume: cubic feet within the 100-year floodplain.						
<input checked="" type="checkbox"/> Project is within $\frac{1}{4}$ mile of a designated river Name of River: Warner River <input type="checkbox"/> Project is not within $\frac{1}{4}$ mile of a designated river.						
<input type="checkbox"/> Project is within a Coastal/Great Bay Region community. <input checked="" type="checkbox"/> Project is not within a Coastal/Great Bay Region community.						
8. BRIEF PROJECT DESCRIPTION (PLEASE DO NOT REPLY "SEE ATTACHED")						
Two four unit buildings each with shared driveway and a parking area to take place on Map 7 Lots 39 & 39-1.						

9. IF APPLICABLE, DESCRIBE ANY WORK STARTED PRIOR TO RECEIVING PERMIT.

Tree clearing per intent to cut filed with Town.

10. ADDITIONAL REQUIRED INFORMATION

A. Date a copy of the application was sent to the municipality, as required by Env-Wq 1503.05(e) (Env-Wq 1503.05(c)(6), requires proof that a completed application form, checklist, plans and specifications, and all other supporting materials have been sent or delivered to the governing body of each municipality in which the project is proposed):

(Attach proof of delivery)

B. Date a copy of the application was sent to the local river advisory committee, if required by Env-Wq 1503.05(e) (Env-Wq 1503.05(c)(6), requires proof that a completed application form, checklist, plans and specifications, and all other supporting materials have been sent or delivered to the Local River Advisory Committee, if the project is within ¼ mile of a designated river): N/A

(Attach proof of delivery)

C. Type of plan required: Land Conversion Detailed Development Excavation, Grading and Reclamation
 Steep Slope

D. Additional plans required: Stormwater Drainage and Hydrologic Soil Groups Source Control
 Chloride Management

E. Total area of disturbance, in square feet 275,000

F. Additional impervious cover as a result of the project, in square feet (use “-” to indicate a net reduction in impervious coverage).

Total final impervious cover, in square feet Total Cover: 37,244 SF Additional Cover: 25,352 SF

G. Total undisturbed cover, in square feet 1,317,247

H. Number of lots proposed: 2

I. Total length of roadway, in linear feet: 0

J. Name(s) of receiving water(s): Warner River

K. Identify all other NHDES permits required for the project. For each, indicate whether an application has been filed and is pending. If the required approval has been issued, provide the permit number, registration date, or approval letter number, as applicable.

Type of Approval	Application Filed?	Pending?	If Issued
1. Water Supply Approval	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	<input type="checkbox"/>	Permit number:
2. Wetlands Permit	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	<input type="checkbox"/>	Permit number:
3. Shoreland Permit	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	<input type="checkbox"/>	Registration date:
4. UIC Registration	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	<input type="checkbox"/>	Approval letter date:
5. Large/Small Community Well Approval	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	<input type="checkbox"/>	Permit number:
6. Large Groundwater Withdrawal Permit	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	<input type="checkbox"/>	Permit number:
7. Other:	<input type="checkbox"/> Yes <input type="checkbox"/> No		

L. List all species identified by the Natural Heritage Bureau as threatened or endangered or of concern:

Wood Turtle

M. Using the NHDES [OneStop Data Mapper](#) with the [Surface Water Impairment layer](#) turned on, list the impairments identified for each receiving water. If no pollutants are listed, enter "N/A."

N/A

N. Did the applicant or applicant's agent have a pre-application meeting with Alteration of Terrain Bureau staff?

Yes No

If yes, name of staff member:

O. Will blasting of bedrock be required? Yes No If yes, estimated quantity of blast rock in cubic yards:

If yes, [standard blasting Best Management Practices](#) notes must be placed on the plans.

NOTE: If greater than 5,000 cubic yards of blast rock will be generated, a groundwater monitoring program must be developed and submitted to NHDES. Contact Alteration of Terrain Bureau staff for additional detail.

11. CHECK ALL APPLICATION ATTACHMENTS THAT APPLY (SUBMIT WITH APPLICATION IN THE ORDER LISTED BELOW)**LOOSE:**

- Signed application form, with attached proof(s) of delivery.
- Check for the application fee, calculated using the [fee schedule](#) available on the NHDES [Land Development page](#).
- Color copy of a USGS map with the property boundaries outlined (1" = 2,000' scale).
- If the applicant is not the property owner, proof that the applicant will have a legal right to undertake the project on the property if a permit is issued to the applicant.

BOUND, IN A REPORT, IN THE FOLLOWING ORDER:

- Copy of the signed application form and application checklist.
- Copy of the check.
- Copy of the USGS map with the property boundaries outlined (1" = 2,000' scale).
- Narrative of the project with a summary table of the peak discharge rate for the off-site discharge points.
- Printout of NHDES [OneStop Mapper](#) with "Surface Water Impairments" layer turned on.
- Printout of NHDES [OneStop Mapper](#) with Alteration of Terrain screening layers turned on.
- Printout of Natural Heritage Bureau [DataCheck Tool](#) letter and any relevant correspondence with New Hampshire Fish and Game.
- USDA [Web Soil Survey Map](#) with project's watershed outlined.
- Aerial photograph (1" = 2,000' scale with the site boundaries outlined).
- Photographs representative of the site.
- Groundwater recharge volume calculations (include one [Best Management Practices worksheet](#) per permit application).
- Drainage analysis, stamped by a professional engineer (see "Application Checklist" at the end of this document).
- Riprap apron or other energy dissipation or stability calculations.
- Site Specific Soil Survey report, stamped and with a certification note prepared by the soil scientist that the survey was done in accordance with the [Site Specific Soil Mapping standards](#) of the Society of Soil Scientists of Northern New England.
- Infiltration Feasibility Report (example online) [Env-Wq 1503.08(f)(3)].
- [Registration and Notification Form for Stormwater Infiltration to Groundwater \(UIC Registration-for underground systems only, including drywells and trenches\)](#).
- Inspection and maintenance manual with, if applicable, long term maintenance agreements [Env-Wq 1503.08(g)].
- Source control plan.

PLANS:

- One set of design plans on 34 - 36" by 22 - 24" white paper (see Application Checklist for details).
- Pre- and post-development color-coded soil plans on 11" x 17" (see Application Checklist for details).
- Pre- and post-construction drainage area plans on 34 - 36" by 22 - 24" white paper (see Application Checklist for details).

100-YEAR FLOODPLAIN REPORT:

- All information required in Env-Wq 1503.09, submitted as a separate report.

ADDITIONAL INFORMATION RE: NUTRIENTS, CLIMATE

- See Application Checklist (Attachment A) for details.

- REVIEW APPLICATION FOR COMPLETENESS. CONFIRM INFORMATION LISTED ON THE APPLICATION IS INCLUDED WITH SUBMITTAL.**

12. REQUIRED SIGNATURES

By signing below, I certify that:

- The information contained in or otherwise submitted with this application is true, complete, and not misleading to the best of my knowledge and belief;
- I understand that the submission of false, incomplete, or misleading information constitutes grounds for the department to deny the application, revoke any permit that is granted based on the information, and/or refer the matter to the board of professional engineers established by RSA 310-A:3 if I am a professional engineer; and
- I understand that I am subject to the penalties specified in New Hampshire law for falsification in official matters, currently RSA 641:3.

APPLICANT

Signature: 

APPLICANT'S AGENT:

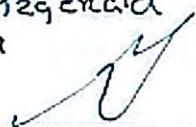
Date: 3/13/25

Title: Manager

Name (print or type):

GARY Fitzgerald

PROPERTY OWNER

Signature: 

PROPERTY OWNER'S AGENT:

Date: 3/13/25

Title:

Name (print or type):

GARY Fitzgerald

3. AOT APPLICATION CHECKLIST

ALTERATION OF TERRAIN PERMIT ATTACHMENT A: APPLICATION CHECKLIST

Check each box to indicate the item has been provided, or indicate why it does not apply.

DESIGN PLANS

- Plans printed on 34 - 36" by 22 - 24" white paper.
- Professional Engineer stamp.
- Wetland delineation.
- Temporary erosion control measures.
- Treatment for all stormwater runoff from impervious surfaces such as roadways (including gravel roadways), parking areas, and nonresidential roof runoff. Guidance on treatment BMPs can be found in Volume 2, Chapter 4 of the New Hampshire Stormwater Management Manual.
- Pre-existing 2-foot contours.
- Proposed 2-foot contours.
- Drainage easements protecting the drainage/treatment structures.
- Compliance with state statute governing fill and dredge in wetlands, RSA 482- A. Note that artificial detention in wetlands is prohibited.
- Compliance with the New Hampshire Shoreland Protection Act, RSA 483-B. Site not in Shoreland Zone.
- Benching – needed if you have more than 20 feet change in elevation on a 2:1 slope, 30 feet change in elevation on a 3:1 slope, 40 feet change in elevation on a 4:1 slope.
- Check to see if any proposed ponds require state dam permits. No state dam permits required.

DETAILS

- Typical roadway cross-section.
- Detention basin with inverts noted on the outlet structure.
- Stone berm level spreader.
- Outlet protection – riprap aprons.
- A general installation detail for an erosion control blanket.
- Silt fences or mulch berm.
- Storm drain inlet protection. Note that since hay bales must be embedded 4 inches into the ground, they are not to be used on hard surfaces such as pavement.
- Hay bale barriers. No hay bale barriers proposed.
- Stone check dams. No stone check dams proposed.
- Gravel construction exit.
- Temporary sediment trap.
- The treatment BMPs proposed.
- Any innovative BMPs proposed. No innovative BMPs proposed.

CONSTRUCTION SEQUENCE / EROSION CONTROL

- Note that the project must be managed to meet the requirements and intent of RSA 430:53 and Agr 3800 relative to invasive species.
- Note that perimeter controls shall be installed prior to earth moving operations.
- Note that temporary water diversion (swales, basins, etc.) must be used as necessary until areas are stabilized.
- Note that ponds and swales shall be installed early on in the construction sequence (before rough grading the site).
- Note that all ditches and swales shall be stabilized prior to directing runoff to them.
- Note that all roadways and parking lots shall be stabilized within 72 hours of achieving finished grade.
- Note that all cut and fill slopes shall be seeded or loamed within 72 hours of achieving finished grade
- Note that all erosion controls shall be inspected weekly AND after every half-inch of rainfall.
- Note the limits on the open area allowed, see Env-Wq 1505.02 for detailed information.

Example note: The smallest practical area shall be disturbed during construction, but in no case shall exceed 5 acres at any one time before disturbed areas are stabilized.

- Note the definition of the word "stable."

Example note: An area shall be considered stable if one of the following has occurred:

- Base course gravels have been installed in areas to be paved.
- A minimum of 85 percent vegetated growth has been established.
- A minimum of 3 inches of non-erosive material such stone or riprap has been installed.
- Or, erosion control blankets have been properly installed.

- Note the limit of time an area may be exposed.

Example note: All areas shall be stabilized within 45 days of initial disturbance.

- Provide temporary and permanent seeding specifications. Note that although reed canary grass is listed in the Green Book; it is a problematic species according to the Wetlands Bureau and therefore should not be specified.

- Provide winter construction notes that meet or exceed our standards.

Standard Winter Notes:

- All proposed vegetated areas that do not exhibit a minimum of 85 percent vegetative growth by October 15, or which are disturbed after October 15, shall be stabilized by seeding and installing erosion control blankets on slopes greater than 3:1, and seeding and placing 3 to 4 tons of mulch per acre, secured with anchored netting, elsewhere. The installation of erosion control blankets or mulch and netting shall not occur over accumulated snow or on frozen ground and shall be completed in advance of thaw or spring melt events.
- All ditches or swales which do not exhibit a minimum of 85 percent vegetative growth by October 15, or which are disturbed after October 15, shall be stabilized temporarily with stone or erosion control blankets appropriate for the design flow conditions.
- After October 15, incomplete road or parking surfaces where work has stopped for the winter season shall be protected with a minimum of 3 inches of crushed gravel per NHDOT item 304.3.

- Note at the end of the construction sequence that "Lot disturbance, other than that shown on the approved plans, shall not commence until after the roadway has the base course to design elevation and the associated drainage is complete and stable." – This note is applicable to single/duplex family subdivisions, when lot development is not part of the permit.

DRAINAGE ANALYSES

Please provide double-side 8 ½" x 11" sheets where possible but, **do not** reduce the text such that more than one page fits on one side.

- Professional Engineer stamp.
- Rainfall amount obtained from the [Northeast Regional Climate Center](#). Include extreme precipitation table as obtained from this source.
- Drainage analyses, in the following order:
 - Pre-development analysis: Drainage diagram.
 - Pre-development analysis: Area Listing and Soil Listing.
 - Pre-development analysis: Node listing 1-year (if applicable), 2-year, 10-year and 50-year.
 - Pre-development analysis: Full summary of the 10-year storm.
 - Post-development analysis: Drainage diagram.
 - Post-development analysis: Area Listing and Soil Listing.
 - Post-development analysis: Node listing for the 2-year, 10-year and 50-year.
 - Post-development analysis: Full summary of the 10-year storm.
- Review the Area Listing and Soil Listing reports
 - Hydrologic Soil Groups (HSG) match the HSGs on the soil maps provided.
 - There is the same or less HSG A soil area after development (check for each HSG).
 - There is the same or less "woods" cover in the post-development.
 - Undeveloped land was assumed to be in "good" condition.
 - The amount of impervious cover in the analyses is correct.

Note: A good check is to subtract the total impervious area used in the pre-analysis from the total impervious area used in the post-analysis. For residential projects without demolition occurring, a good check is to take this change in impervious area, subtract out the roadway and divide the remaining by the number of houses or units proposed. Do these numbers make sense?

- Check the storage input used to model the ponds.
- Check to see if the artificial berms pass the 50-year storm, i.e., make sure the constructed berms on ponds are not overtopped.
- Check the outlet structure proposed and make sure it matches that modeled.
- Check to see if the total areas in the pre and post analyses are same.
- Confirm the correct NRCS storm type was modeled (Coos, Carroll and Grafton counties are Type II, all others Type III).

PRE- AND POST-CONSTRUCTION DRAINAGE AREA PLANS

- Plans printed on 34 - 36" by 22 - 24" on white paper.
- Submit these plans separate from the soil plans.
- A north arrow.
- A scale.
- Labeled subcatchments, reaches and ponds.

- Tc lines.
- A clear delineation of the subcatchment boundaries.
- Roadway station numbers.
- Culverts and other conveyance structures.

PRE- AND POST-CONSTRUCTION COLOR-CODED SOIL PLANS

- 11" x 17" sheets suitable, as long as it is readable.
- Submit these plans separate from the drainage area plans.
- A north arrow.
- A scale.
- Name of the soil scientist who performed the survey and date the soil survey took place.
- 2-foot contours (5-foot contours if application is for a gravel pit) as well as other surveyed features.
- Delineation of the soil boundaries and wetland boundaries.
- Delineation of the subcatchment boundaries.
- Soil series symbols (e.g., 26).
- A key or legend identifying each soil series symbol and its associated soil series name (for example: 26 = Windsor).
- The hydrologic soil group color coding (A = Green, B = yellow, C= orange, D=red, Water=blue, and Impervious = gray).

Please note that excavation projects (including gravel pits) have similar requirements to those above, with the following common exceptions or additions:

- Drainage report is not needed if site does not have off-site flow.
- 5-foot contours are allowed rather than 2-foot.
- No Professional Engineer stamp is needed on the plans.
- Add a note to the plans that the applicant must provide NHDES a written update of the project and revised plans documenting the project status every five years from the date of the Alteration of Terrain permit.
- Add reclamation notes.
- A description of the subsurface conditions to the planned depth of excavation, including the elevation of the location of the Seasonal High Water Table (SHWT), as observed and described by a certified soil scientist, or an individual holding a valid permit as a permitted designer as issued by the department's Subsurface Systems Bureau.

For more resources, refer to the Natural Resources Conservation Service's [Vegetating New Hampshire Sand and Gravel Pits](#) publication.

4. COPY OF AOT APPLICATION CHECK

5. MUNICIPAL SUBMISSION: WARNER

Alteration of Terrain Application & Stormwater Drainage Analysis

Jennesstown Manor

RECEIVED CL
11/03/25
WARNER LAND USE

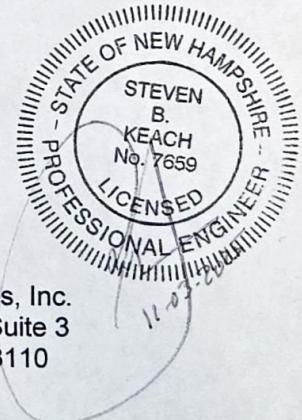
Map 7, Lots 39
Route 103
Warner, New Hampshire

February 20, 2025
REVISED: OCTOBER 2, 2025

KNA Project No. 24-0307-1

Prepared For: Peacock Hill Road, LLC
145 Old Town Road
Weare, NH 03281

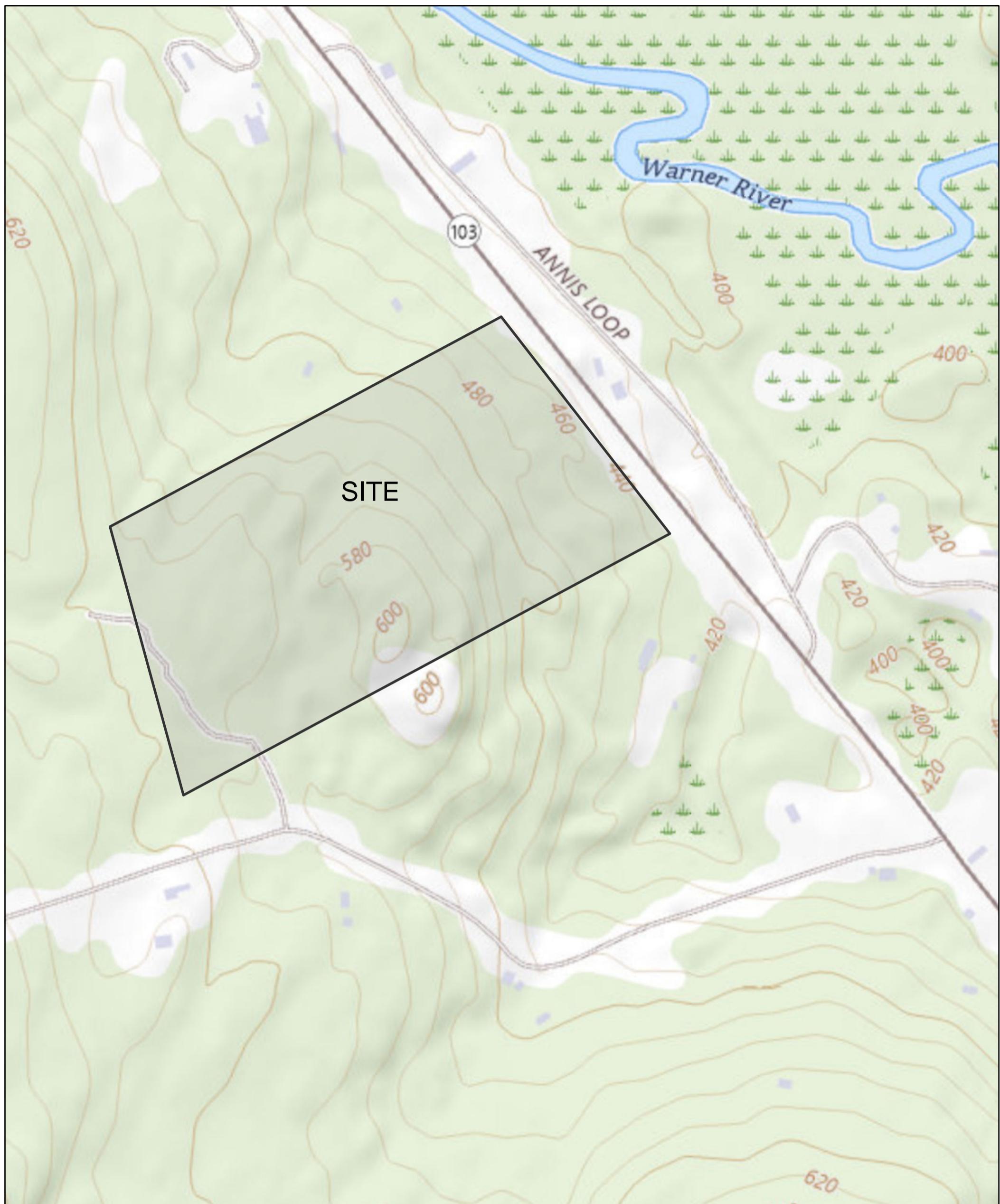
Prepared By: Keach-Nordstrom Associates, Inc.
10 Commerce Park North, Suite 3
Bedford, New Hampshire 03110
(603) 627-2881
(603) 627-2915 (fax)



KNA KEACH-NORDSTROM ASSOCIATES, INC.

6. USGS LOCATION MAP

USGS Map by NH DES OneStop Data Mapper



3/25/2025, 1:18:19 PM

City/Town

Layers

Red: Band_1

Green: Band_2

Blue: Band_3

1:5,000

0 0.04 0.08 0.16 mi
0 0.05 0.1 0.2 km



USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S.

7. PROJECT NARRATIVE

1. INTRODUCTION

A. Project Description

The project proposes the development of Warner Tax Map 7, Lots 39 and 39-1, on the west side of Route 103. The proposal seeks to develop two buildings for multi-family residence. Each building will have four units. The project will include associated parking and utilities.

The buildings will be served by on-site septic systems and wells. Access will be provided by connection to a proposed driveway off of Route 103. The buildings will share access to the driveway. The drainage system will have two pocket ponds and an infiltration basin. After treatment and mitigation of peak runoff, the water flows to the existing catch basins on Route 103 in front of the subject parcel.

B. Existing Site Conditions

The subject lot is 34.60 acres and is currently undeveloped in Warner's Residential 2 (R-2) and Residential 3 (R-3) Zoning Districts; however, the area of proposed work is entirely within the R-2 District. The abutting properties are residential or undeveloped uses. Previously, the subject lot was partially cleared. There are wetland pockets and many ledge outcroppings on site.

According to the Site-Specific Soil Survey soil mapping, the parcel consists of soils as shown below:

SSSM SYM.	SSS MAP NAME	HISI SYM.	HYDROLOGIC SOIL GRP.
55	Hermon Very Stony	121	B
442	Chichester	221	B
58	Waumbek	321	A
829	Waumbek-Hermon Association	321	B
414	Moosilauke Poorly Drained	521	C
399	Ledge Outcrop	228	D

II. STORM DRAINAGE ANALYSIS & DESIGN

A. Methodology

In accordance with the provisions of the Town of Warner, NHDES, and generally accepted engineering practice, the 2-year, 10-year, 25-year and 50-year frequency storms have each been used in the various aspects of analysis and design of stormwater management considerations for the subject residential development project. All proposed stormwater measures have been designed for the 10-year return frequency storms, in accordance with the State regulations and for the 25-year return frequency storms, in accordance with the Town regulations.

KNA utilizes HydroCAD version 10.2 to analyze both pre and post-development watershed characteristics. This computer software system is based largely on hydrology techniques (TR-20) developed by the Soil Conservation Service (now the Natural Resources Conservation Service). In addition, the software derives Time of Concentration values using the methodology contained within USDA-S.C.S. publication Urban Hydrology for Small Watersheds Technical Release No. 55 (TR 55).

Rainfall data utilized in the analysis is obtained from the "Extreme Precipitation in a Changing Climate for New York and the New England States", version 1.12, published by the USDA, NRCS and Cornell University's Northeast Regional Climate Center and can be found in Section 9.

All design and analysis calculations performed using the referenced methodologies are attached to this report. The minimum time of concentrations used for the analysis is 6 minutes. These calculations document each catchment area, a breakdown of surface type, time of concentration, rainfall intensity, peak discharge volume, Manning's "n" value, peak velocity, and other descriptive design data for each watershed and pipe segment evaluated. In addition, the "Pre/Post Development Drainage Area Plans" graphically define and illustrate the extent of each watershed or catchment area investigated.

B. Pre-Development Drainage Conditions

In the pre-development scenario, 6 points of analysis (POA) were identified as the appropriate points to compare pre vs. post development rates of stormwater discharge. These points of analysis reflect the main discharge points of the site and were analyzed to show the impact of the proposed improvements.

The pre-development drainage model's POA is further described as follows:

- 10P Flow to Existing CB
- 20P Flow to Existing CB
- 30P Flow to Existing CB
- 40P Flow to Existing CB

50L Flow to Abutters Map 7 Lots 36 & 36-1

An additional point of analysis has been added to monitor the flow and volume to the Map 7 Lot 36-1 due to increased area (~1 acre) directed towards this parcel in post-development design versus pre-development:

60L Flow to Abutter Map 7 Lot 36-1

In general, the site slopes in an easterly direction to the catch basins along Route 103.

For a more visual description of the information presented in this section, please refer to the attached “Pre-Development Drainage Areas Plan” attached in the appendix of this report. The pre-development drainage model recognizes five points of analysis to compare pre vs. post-development peak rates of stormwater discharge.

C. Post-Development Drainage Conditions:

The same POA's that were identified in the pre-development scenario have been analyzed in the post-development scenario.

The proposed stormwater management system utilizes closed and open drainage that incorporates various best management practices for the collection, storage, and treatment of runoff. Stormwater runoff generated from the proposed development will be collected in a series of closed structures (catch basins and drain manholes) and conveyed towards the pocket ponds and the infiltration basin. The proposed ponds discharge through outlet control structures to overland flow prior to entering the closed drainage system in the Route 103 Right-Of-Way. The areas flowing towards each point of analysis are equal to or less than in comparison to the pre-development conditions. The proposal has also been designed to convey runoff in a manner consistent with the pre-development conditions. The drainage system was properly sized to control runoff for the full build-out of the project.

The proposed pocket ponds are designed to intercept groundwater and maintain a permanent pool. The ponds have been designed to mitigate the increased runoff from the proposed parking areas and common driveway.

The proposed infiltration basin is designed to infiltrate the runoff from the proposed development.

The peak stormwater runoff rate for the specific storm frequencies is presented and analyzed in the subsequent summary section of this report (Table 1). For a more visual description of the information presented in this section, please refer to the attached “Post-Development Drainage Areas Plan” attached in the appendix of this report.

D. Summary:

Through the use of the stormwater management techniques described above, we were able to implement the proposed development goals while maintaining appropriate peak rates of runoff, providing volume control, and providing treatment of stormwater generated from the proposed development. As shown in the Tables below, through the use of the aforementioned stormwater management techniques, the peak rates of stormwater discharge and volume to the point of analysis was controlled within an acceptable limit.

Table 1: Peak Flow Discharge Rate

Site Pre-Development vs. Post-Development (cfs)								
Description	2-Year		10-Year		25-Year		50-Year	
24-hr Rainfall	2.78 in/hr		4.04 in/hr		5.01 in/hr		5.89 in/hr	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
10P (Lot 3-1)	0.85	0.84	1.93	1.93	3.00	2.99	4.07	4.05
20P (Lot 7-38)	2.01	1.84	4.94	4.13	8.10	7.97	11.29	10.99
30P (Lot 7-38)	0.63	0.49	1.36	0.87	2.08	1.19	2.80	1.48
40P (Lot 7-38)	1.06	0.66	2.46	1.30	4.11	2.09	5.82	3.67
50L (Lots 7-36 & 7-36-1)	0.04	0.04	0.13	0.13	0.25	0.25	0.39	0.39
Site Pre-Development vs. Post-Development Monitoring of Flow to Abutter Map 7 Lot 36-1 (cfs)								
60L (Lot 7-36-1)	0.19	0.18	0.79	0.63	1.55	1.29	2.37	2.26

Table 2: Channel Protection Requirements

Site Pre-Development vs. Post-Development Flow Volume (af)			
Description	2-Year		Comments
24- hr Rainfall	2.78 in/hr		
	Pre	Post	
10P	0.104	0.103	NHDES 1507.05,(b),(1), a
20P	0.255	0.247	NHDES 1507.05,(b),(1), a
30P	0.083	0.053	NHDES 1507.05,(b),(1), a
40P	0.148	0.133	NHDES 1507.05,(b),(1), a
50L	0.006	0.006	NHDES 1507.05,(b),(1), a
Site Pre-Development vs. Post-Development Monitoring of Flow to Abutter Map 7 Lot 36-1 (af)			
60L	0.041	0.032	

III. EROSION & SEDIMENTATION CONTROL PROVISIONS

A. Temporary Erosion Control Measures

As an integral part of the engineering design of this site, an erosion and sedimentation control plan has been developed with the intent of limiting the potential for soil loss and associated receiving water quality degradation, both during and after the construction period. As the project plans indicate, traditional temporary erosion and sedimentation control devices and practices, such as siltation fencing, block and gravel sediment filters, and seeding have been specified for use during the construction period. In preparation of these provisions, reference was made to the New Hampshire Stormwater Manual; Volume 3: Erosion and Sediment Temporary Controls During Construction. Construction details for each temporary erosion control measure and practice specified have been added to the project plans. These plans also contain a number of erosion control notes, which are offered to the selected contractor in order to supplement the specified measures and practices to the extent practical.

B. Construction Sequence

A site-specific construction sequence sensitive to limiting soil loss due to erosion and associated water quality degradation was prepared specifically for this project and is shown on the project plans. As pointed out in the erosion control notes, it is important for the contractor to recognize that proper judgment in the implementation of work will be essential if erosion is to be limited and protection of completed work is to be realized. Moreover, any specific changes in sequence and/or field conditions affecting the ability of specific erosion control measures to adequately serve their intended purpose should be reported to this office by the contractor. Furthermore, the contractor is encouraged to supplement specified erosion control measures during the construction period where and when in his/ her best judgment, additional protection is warranted.

C. Permanent Erosion Control Measures

In the design of this site, consideration was given to limiting the potential for long-term erosion of completed improvements. As a result, several permanent erosion control measures were incorporated into the site design. These provisions include:

- 1) Specification of a turf establishment schedule and seed mixture, utilizing materials and workmanship recognized as appropriate for the site conditions at hand;
- 2) The design has provided catch basins to capture runoff and reduce the overland flow, thereby reducing erosion.

8. SURFACE WATER IMPAIRMENTS

Surface Water Impairments



Legend

- Surface Waters with Impairment with Quarter Mile Buffer
- Parcels
- Additional Lines

Map Scale

1: 24,000



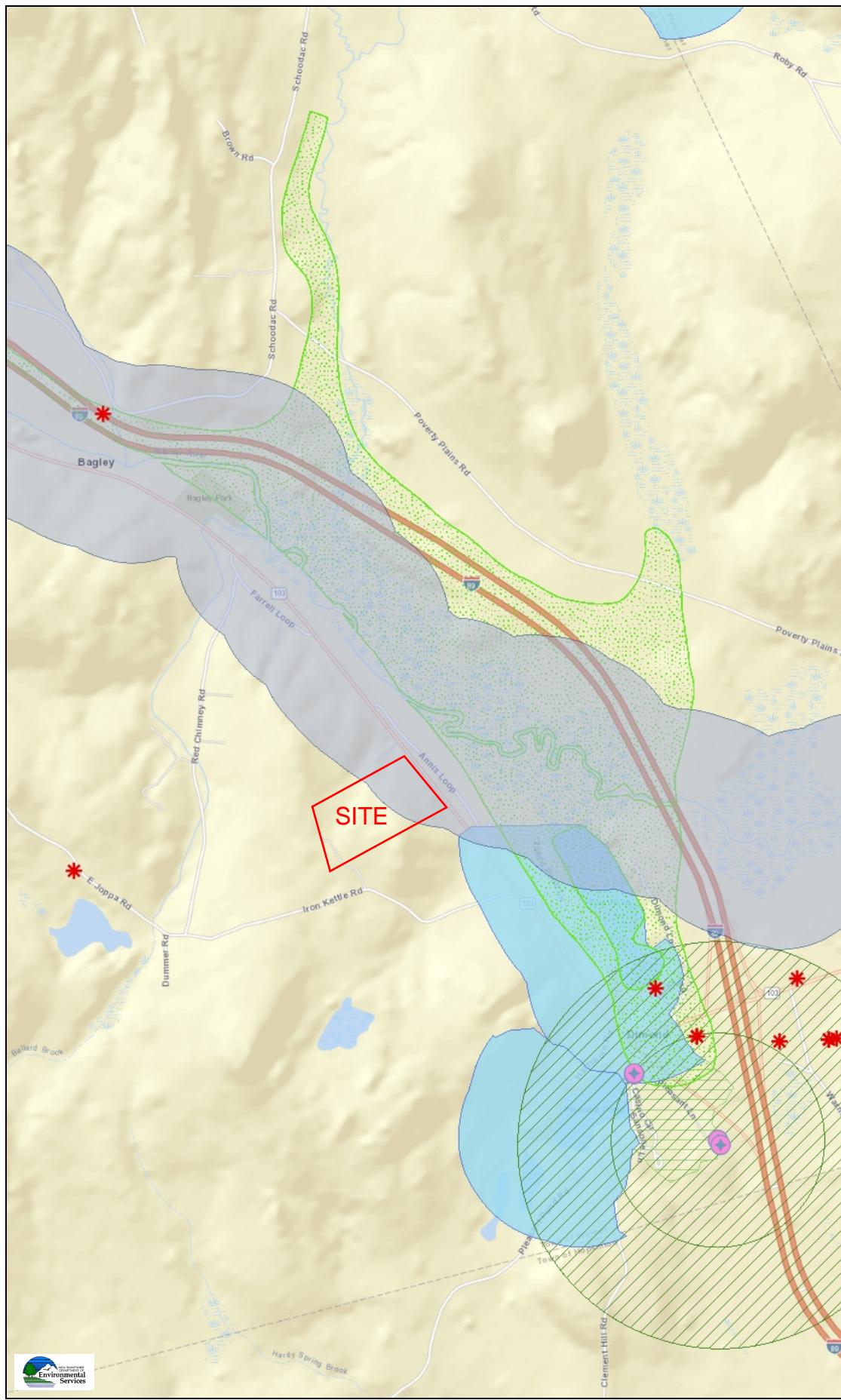
© NH DES, <http://des.nh.gov>

Map Generated: 11/27/2024

Notes

9. WEB GIS FIGURES

Web GIS Figure



Legend

- * Remediation Sites
- Coastal and Great Bay Regi Communities
- Designated Rivers Quartern Buffer
- Public Water Supply Wells
- Groundwater Classification / GA1
- Groundwater Classification / GA2
- Water Supply Intake Protect Areas
- Wellhead Protection Areas
- Class A Lakes with a Quarte Buffer
- Class A - All Features
- All Lakes, with a Quarter Mil Buffer
- Outstanding Resource Wate Watersheds
- Surface Waters with Impairn with Quarter Mile Buffer
- Watersheds with Chloride Impairments

Map Scale

1: 24,000



© NH DES, <http://des.nh.gov>

Map Generated: 12/2/2024

Notes

10. WARNER GROUNDWATER PROTECTION OVERLAY DISTRICT

Groundwater Protection Overlay District

TOWN OF WARNER, NH

Legend

Proposed Groundwater Protection Overlay District

Town Boundary

Village Water District

Aquifer Full Extent

Water Resources

Lakes and Ponds

Rivers and Streams

Intermittent Streams

Roads

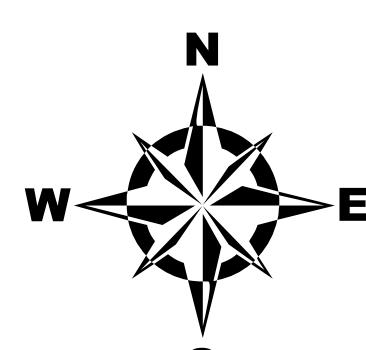
Interstates

Class I and II State Highways

Class V Town Maintained Roads

Class VI Unmaintained Roads

Other Roads/Private

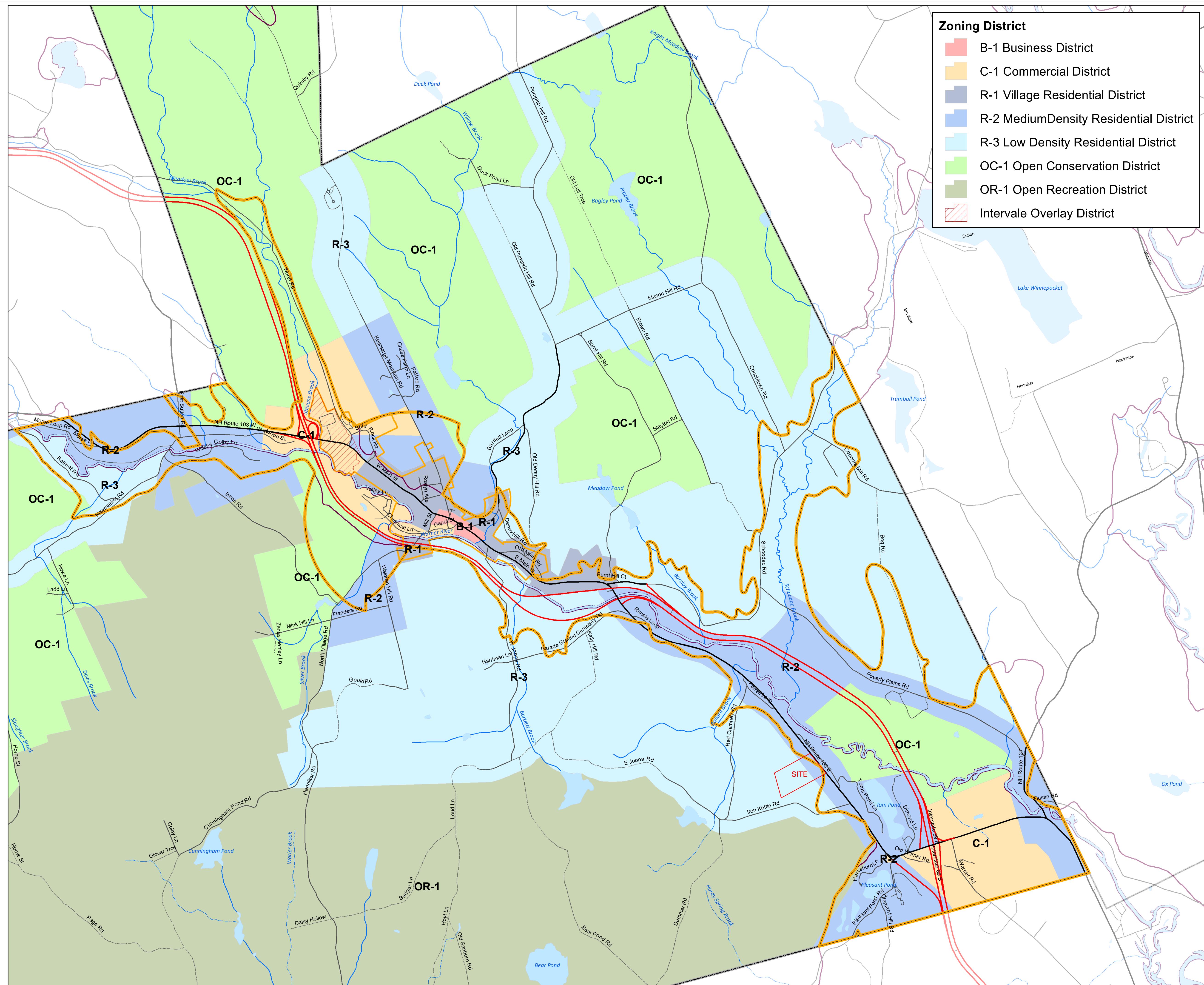


0 0.5 1 1.5 Miles

March 14, 2023

This map was produced by the Central NH Regional Planning Commission for the Town of Warner. It is intended for planning purposes only.

Data Sources: NH GRANIT, NH Dept. of Environmental Services, NH Dept. of Transportation, FEMA, CNHRPC, Town of Warner, US Geologic Survey, Hazard Mitigation Subcommittee input. Corrections should be provided to the Town of Warner and to CNHRPC.



**11. NEW HAMPSHIRE NATURAL HERITAGE INVENTORY DATABASE
CHECK**



NHB DataCheck Results Letter

NH Natural Heritage Bureau

Please note: maps and NHB record pages are **confidential** and shall be redacted from public documents.

To: Jason Lopez, Keach-Nordstrom Associates, Inc.
10 Commerce Park North Suite 3B
Bedford, NH 03110
jlopez@keachnordstrom.com

From: NHB Review
NH Natural Heritage Bureau
Main Contact: Ashley Litwinenko - nhbreview@dnrcr.nh.gov

cc: NHFG Review

Date: 06/13/2024 (valid until 06/13/2025)

Re: DataCheck Review by NH Natural Heritage Bureau and NH Fish & Game

Permits: MUNICIPAL POR - Warner, NHDES - Alteration of Terrain Permit, USEPA - Stormwater Pollution Prevention

NHB ID: **NHB24-0767**

Town: Warner
Location: NH Route 103

Project Description: Four lot subdivision with each lot containing a 4 unit building. All lots served by a common driveway.

Next Steps for Applicant:

NHB's database has been searched for records of rare species and exemplary natural communities. Please carefully read the comments and consultation requirements below.

NHB Comments: No comments at this time.

NHFG Comments: Please refer to NHFG consultation requirements below.

NHB Consultation

If this NHB DataCheck letter includes records of rare plants and/or natural communities/systems, please contact NHB and provide any requested supplementary materials by emailing nhbreview@dnrcr.nh.gov.

If this NHB DataCheck letter DOES NOT include any records of rare plants and/or natural communities/systems, no further consultation with NHB is required.

NH Fish and Game Department Consultation

If this NHB DataCheck letter DOES NOT include ANY wildlife species records, then, based on the information submitted, no further consultation with the NH Fish and Game Department pursuant to Fis 1004 is required.



NHB DataCheck Results Letter

NH Natural Heritage Bureau

Please note: maps and NHB record pages are **confidential** and shall be redacted from public documents.

If this NHB DataCheck letter includes a record for a threatened (T) or endangered (E) wildlife species, consultation with the New Hampshire Fish and Game Department under Fis 1004 may be required. To review the Fis 1000 rules (effective February 3, 2022), please go to <https://www.wildlife.nh.gov/wildlife-and-habitat/nongame-and-endangered-species/environmental-review>. All requests for consultation and submittals should be sent via email to NHFGreview@wildlife.nh.gov or can be sent by mail, and **must include the NHB DataCheck results letter number and “Fis 1004 consultation request” in the subject line.**

If the NHB DataCheck response letter does not include a threatened or endangered wildlife species but includes other wildlife species (e.g., Species of Special Concern), consultation under Fis 1004 is not required; however, some species are protected under other state laws or rules, so coordination with NH Fish & Game is highly recommended or may be required for certain permits. While some permitting processes are exempt from required consultation under Fis 1004 (e.g., *statutory permit by notification, permit by rule, permit by notification, routine roadway registration, docking structure registration, or conditional authorization by rule*), coordination with NH Fish & Game may still be required under the rules governing those specific permitting processes, and it is recommended you contact the applicable permitting agency. For projects not requiring consultation under Fis 1004, but where additional coordination with NH Fish and Game is requested, please email NHFGreview@wildlife.nh.gov, and include the NHB DataCheck results letter number and “review request” in the email subject line.

Contact NH Fish & Game at (603) 271-0467 with questions.



NHB DataCheck Results Letter

NH Natural Heritage Bureau

Please note: maps and NHB record pages are **confidential** and shall be redacted from public documents.

NHB Database Records:

The following record(s) have been documented in the vicinity of the proposed project.
Please see the map and detailed information about the record(s) on the following pages.

Vertebrate species	State ¹	Federal	Notes
Wood Turtle (<i>Glyptemys insculpta</i>)	SC	--	Contact the NH Fish & Game Dept (see below).

¹Codes: "E" = Endangered, "T" = Threatened, "SC" = Special Concern, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list.

An asterisk (*) indicates that the most recent report for that occurrence was 20 or more years ago.

For all animal reviews, refer to 'IMPORTANT: NHFG Consultation' section above.

Disclaimer: NHB's database can only tell you of known occurrences that have been reported to NHFG/NHB. Known occurrences are based on information gathered by qualified biologists or members of the public, reported to our offices, and verified by NHB/NHFG.

However, many areas have never been surveyed, or have only been surveyed for certain species.

NHB recommends surveys to determine what species/natural communities are present onsite.



NHB DataCheck Results Letter

NH Natural Heritage Bureau

Please note: maps and NHB record pages are confidential and shall be redacted from public documents.

NHB24-0767



NHB DataCheck Results Letter

NH Natural Heritage Bureau

Please note: maps and NHB record pages are **confidential** and shall be redacted from public documents.

NHB24-0767

EOCODE:

ARAAD02020*161*NH

New Hampshire Natural Heritage Bureau - Animal Record

Wood Turtle (*Glyptemys insculpta*)

Legal Status	Conservation Status
Federal: Not listed	Global: Imperiled due to rarity or vulnerability
State: Special Concern	State: Rare or uncommon

Description at this Location

Conservation Rank: Fair quality, condition and/or landscape context ('C' on a scale of A-D).

Comments on Rank: --

Detailed Description: 2022: Area 15062: 1 adult observed, sex unknown. 2011: Area 12918: 1 adult observed, dead on road. 2007: Area 12247: 1 observed. 2005: Area 12133: 1 observed.

General Area: 2022: Area 15062: Fallow field with clover, cinquefoil, dandelion, and other grasses and forbs. 2011: Area 12918: Roadside. 2007: Area 12247: This area contains a relatively large, open floodplain forest of white pine, maple, American hophornbeam, and various grasses and other herbaceous plants. 2005: Area 12133: Residential yard.

General Comments: --

Management --

Comments:

Location

Survey Site Name: West Branch of Hoyt River

Managed By: Bradford Pines Natural Area

County: Merrimack

Town(s): Bradford

Size: 40.9 acres

Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2022: Area 15062: Field next to Hoyt Brook on east side of Center Road in Bradford, just south of NH Route 103 and Warner River. 2011: Area 12918: On Warner Road (Rte. 103) near Bradford town line. 2007: Area 12247: In the West Branch Warner River, about 500 feet downstream from the large white pines of the Bradford Natural Pines area. 2005: Area 12133: 56 Fairgrounds Road, Bradford.

Dates documented

First reported: 2005-06-11

Last reported: 2022-05-21

NHB DataCheck Results Letter

NH Natural Heritage Bureau

Please note: maps and NHB record pages are **confidential** and shall be redacted from public documents.

NHB24-0767

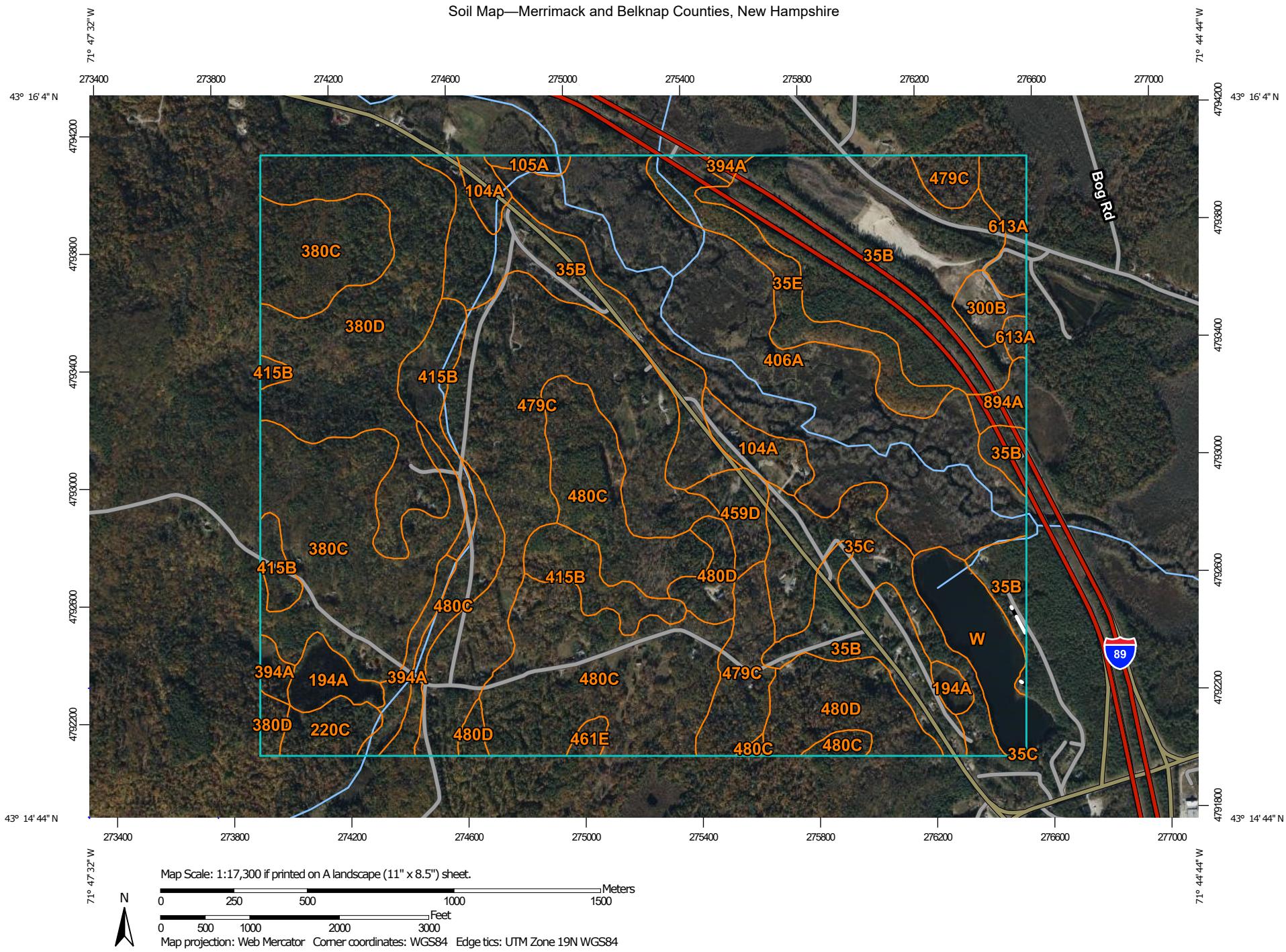
EOCODE:

ARAAD02020*161*NH

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

12. WEB SOIL SURVEY

Soil Map—Merrimack and Belknap Counties, New Hampshire



Map Scale: 1:17,300 if printed on A landscape (11" x 8.5") sheet.

A horizontal scale bar with a black line and white tick marks. The scale is labeled 'Meters' at the right end. Numerical labels are placed at 0, 250, 500, 1000, and 1500 meters.

0 250 500 1000 1500 Feet

N



Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

5/30/2024
Page 1 of 4

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
Water Features	
	Streams and Canals
Transportation	
	Rails
	Interstate Highways
	US Routes
	Major Roads
	Local Roads
Background	
	Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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: Merrimack and Belknap Counties, New Hampshire

Survey Area Data: Version 29, Aug 22, 2023

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

Date(s) aerial images were photographed: Oct 6, 2022—Oct 22, 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.

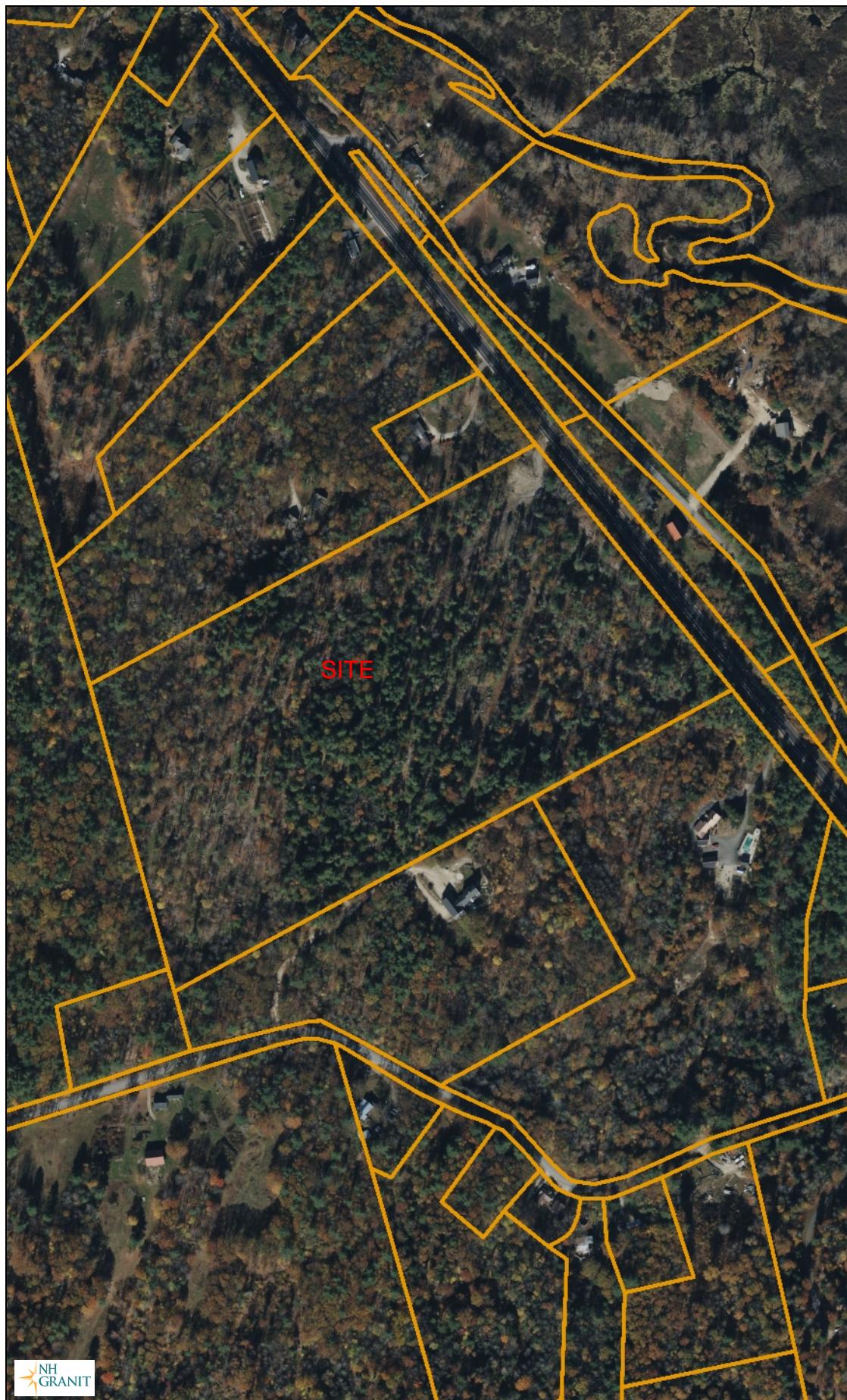
Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
35B	Champlain loamy fine sand, 3 to 8 percent slopes	224.3	16.9%
35C	Champlain loamy fine sand, 8 to 15 percent slopes	50.2	3.8%
35E	Champlain loamy fine sand, 15 to 60 percent slopes	36.2	2.7%
104A	Podunk fine sandy loam, 0 to 3 percent slopes, frequently flooded	21.1	1.6%
105A	Rumney fine sandy loam, 0 to 3 percent slopes, frequently flooded	3.7	0.3%
194A	Catden mucky peat, 0 to 1 percent slopes, ponded	16.2	1.2%
220C	Boscawen fine sandy loam, 8 to 15 percent slopes	13.0	1.0%
300B	Udipsamments, 0 to 6 percent slopes	9.0	0.7%
380C	Tunbridge-Lyman-Becket complex, 8 to 15 percent slopes, very stony	132.3	10.0%
380D	Tunbridge-Lyman-Becket complex, 15 to 25 percent slopes, very stony	116.7	8.8%
394A	Chocorua mucky peat, 0 to 1 percent slopes	16.8	1.3%
406A	Medomak mucky silt loam, 0 to 2 percent slopes, frequently flooded	183.8	13.9%
415B	Moosilauke fine sandy loam, 3 to 8 percent slopes, very stony	48.2	3.6%
459D	Metacomet fine sandy loam, 15 to 25 percent slopes, very stony	13.4	1.0%
461E	Woodstock-Millsite-Rock outcrop complex, 35 to 60 percent slopes	3.2	0.2%
479C	Gilmanton fine sandy loam, 8 to 15 percent slopes, very stony	172.7	13.0%
480C	Millsite-Woodstock-Henniker complex, 8 to 15 percent slopes, very stony	158.9	12.0%
480D	Millsite-Woodstock-Henniker complex, 15 to 25 percent slopes, very stony	50.9	3.8%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
613A	Croghan loamy fine sand, 0 to 8 percent slopes, wooded	16.9	1.3%
894A	Meadowsedge peat, 0 to 1 percent slopes	7.3	0.5%
W	Water	31.0	2.3%
Totals for Area of Interest		1,325.7	100.0%

13. AERIAL PHOTOGRAPH

Aerial Map



Legend

- Parcels
- State
- County
- City/Town

Map Scale

1: 5,000



© NH GRANIT, www.granit.unh.edu

Map Generated: 2/25/2025

Notes



14. SITE PHOTOGRAPHS

Photo No. 1: Looking west on Map 7 Lot 39 (taken: 2/3/25)



Photo No. 2: Looking east on Map 7 Lot 39 (taken: 2/3/25)



Photo No. 3: Looking north to Route 103 from Map 7 Lot 39 (taken: 2/3/25)



Photo No. 4: Looking south on Map 7 Lot 39 (taken: 2/3/25)



15. GRV CALCULATIONS



GROUNDWATER RECHARGE VOLUME (GRV) CALCULATION (Env-Wq 1507.04)

0.44	ac	Area of HSG A soil that was replaced by impervious cover	0.40"
0.42	ac	Area of HSG B soil that was replaced by impervious cover	0.25"
	ac	Area of HSG C soil that was replaced by impervious cover	0.10"
-	ac	Area of HSG D soil or impervious cover that was replaced by impervious cover	0.0"
0.33	inches	Rd = Weighted groundwater recharge depth	
0.281	ac-in	GRV = AI * Rd	
1,020	cf	GRV conversion (ac-in x 43,560 sf/ac x 1ft/12")	

Provide calculations below showing that the project meets the groundwater recharge requirements (Env-Wq 1507.04):

16. BMP WORKSHEETS



INFILTRATION PRACTICE CRITERIA (Env-Wq 1508.06)

Type/Node Name: **Infiltration Practice 21P**

Enter the type of infiltration practice (e.g., basin, trench) and the node name in the drainage analysis, if applicable.

Yes	Have you reviewed Env-Wq 1508.06(a) to ensure that infiltration is allowed?	← yes
2.46 ac	A = Area draining to the practice	
0.64 ac	A_I = Impervious area draining to the practice	
0.26 decimal	I = Percent impervious area draining to the practice, in decimal form	
0.28 unitless	$Rv = \text{Runoff coefficient} = 0.05 + (0.9 \times I)$	
0.70 ac-in	$WQV = 1" \times Rv \times A$	
2,537 cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
634 cf	25% x WQV (check calc for sediment forebay volume)	
NA	Method of pretreatment? (not required for clean or roof runoff)	
- cf	$V_{SED} = \text{Sediment forebay volume, if used for pretreatment}$	$\geq 25\%WQV$
3,199 cf	$V = \text{Volume}^1$ (attach a stage-storage table)	$\geq WQV$
238 sf	$A_{SA} = \text{Surface area of the bottom of the pond}$	
3.00 iph	$Ksat_{DESIGN} = \text{Design infiltration rate}^2$	
42.6 hours	$I_{DRAIN} = \text{Drain time} = V / (A_{SA} \times I_{DESIGN})$	$\leq 72\text{-hrs}$
466.00 feet	$E_{BTM} = \text{Elevation of the bottom of the basin}$	
464.22 feet	$E_{SHWT} = \text{Elevation of SHWT (if none found, enter the lowest elevation of the test pit)}$	
456.89 feet	$E_{ROCK} = \text{Elevation of bedrock (if none found, enter the lowest elevation of the test pit)}$	
1.78 feet	$D_{SHWT} = \text{Separation from SHWT}$	$\geq *^3$
9.1 feet	$D_{ROCK} = \text{Separation from bedrock}$	$\geq *^3$
ft	$D_{amend} = \text{Depth of amended soil, if applicable due high infiltration rate}$	$\geq 24"$
ft	$D_T = \text{Depth of trench, if trench proposed}$	$4 - 10 \text{ ft}$
Yes/No	If a trench or underground system is proposed, has observation well been provided?	← yes
	If a trench is proposed, does material meet Env-Wq 1508.06(k)(2) requirements. ⁴	← yes
Yes Yes/No	If a basin is proposed, Is the perimeter curvilinear, and basin floor flat?	← yes
3.0 :1	If a basin is proposed, pond side slopes.	$\geq 3:1$
469.75 ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
469.82 ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
470.00 ft	Elevation of the top of the practice (if a basin, this is the elevation of the berm)	
YES	10 peak elevation \leq Elevation of the top of the trench? ⁵	← yes
YES	If a basin is proposed, 50-year peak elevation \leq Elevation of berm?	← yes

1. Volume below the lowest invert of the outlet structure and excludes forebay volume
2. $Ksat_{DESIGN}$ includes a factor of safety. See Env-Wq 1504.14 for requirements for determining the infiltr. rate
3. 1' separation if treatment not required; 4' for treatment in GPAs & WSIPAs; & 3' in all other areas.
4. Clean, washed well graded diameter of 1.5 to 3 inches above the in-situ soil.
5. If 50-year peak elevation exceeds top of trench, the overflow must be routed in HydroCAD as secondary discharge.

Designer's Notes: _____

Summary for Pond 21P: Infiltration Basin

Inflow Area = 2.455 ac, 25.89% Impervious, Inflow Depth > 1.68" for 10 yr event
 Inflow = 1.43 cfs @ 12.32 hrs, Volume= 0.343 af
 Outflow = 1.35 cfs @ 12.53 hrs, Volume= 0.281 af, Atten= 5%, Lag= 12.6 min
 Discarded = 0.13 cfs @ 12.53 hrs, Volume= 0.140 af
 Primary = 1.23 cfs @ 12.53 hrs, Volume= 0.141 af
 Routed to Reach 20R : Overland Flow to 20P
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Reach 20R : Overland Flow to 20P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Peak Elev= 469.75' @ 12.53 hrs Surf.Area= 1,822 sf Storage= 3,377 cf

Flood Elev= 470.00' Surf.Area= 1,983 sf Storage= 3,854 cf

Plug-Flow detention time= 140.8 min calculated for 0.281 af (82% of inflow)

Center-of-Mass det. time= 61.9 min (900.1 - 838.2)

Volume	Invert	Avail.Storage	Storage Description		
#1	466.00'	3,854 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
466.00	238	61.0	0	0	238
468.00	887	160.0	1,056	1,056	1,993
470.00	1,983	201.0	2,797	3,854	3,225

Device	Routing	Invert	Outlet Devices	
#1	Discarded	466.00'	3.000 in/hr Exfiltration over Surface area	
#2	Primary	465.00'	18.0" Round HDPE Culvert L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 465.00' / 464.75' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf	
#3	Device 2	469.65'	2.0" x 2.0" Horiz. Grate X 10.00 columns X 10 rows C= 0.600 in 36.0" x 36.0" Grate (31% open area) Limited to weir flow at low heads	
#4	Secondary	469.75'	4.0' long x 6.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83	

Discarded OutFlow Max=0.13 cfs @ 12.53 hrs HW=469.75' (Free Discharge)
 ↗ 1=Exfiltration (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=1.23 cfs @ 12.53 hrs HW=469.75' TW=453.59' (Dynamic Tailwater)
 ↗ 2=HDPE Culvert (Passes 1.23 cfs of 17.02 cfs potential flow)
 ↗ 3=Grate (Weir Controls 1.23 cfs @ 1.03 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=466.00' TW=453.50' (Dynamic Tailwater)
 ↗ 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Stage-Area-Storage for Pond 21P: Infiltration Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
466.00	238	0	468.60	1,170	1,671
466.05	249	12	468.65	1,195	1,731
466.10	261	25	468.70	1,221	1,791
466.15	272	38	468.75	1,247	1,853
466.20	284	52	468.80	1,273	1,916
466.25	297	67	468.85	1,300	1,980
466.30	309	82	468.90	1,326	2,046
466.35	322	98	468.95	1,353	2,113
466.40	335	114	469.00	1,381	2,181
466.45	348	131	469.05	1,408	2,251
466.50	362	149	469.10	1,436	2,322
466.55	375	167	469.15	1,464	2,394
466.60	389	186	469.20	1,492	2,468
466.65	404	206	469.25	1,521	2,544
466.70	418	227	469.30	1,550	2,620
466.75	433	248	469.35	1,579	2,699
466.80	448	270	469.40	1,609	2,778
466.85	463	293	469.45	1,638	2,859
466.90	479	316	469.50	1,668	2,942
466.95	495	341	469.55	1,698	3,026
467.00	511	366	469.60	1,729	3,112
467.05	527	392	469.65	1,760	3,199
467.10	544	419	469.70	1,791	3,288
467.15	561	446	469.75	1,822	3,378
467.20	578	475	469.80	1,854	3,470
467.25	595	504	469.85	1,886	3,564
467.30	613	534	469.90	1,918	3,659
467.35	631	565	469.95	1,950	3,755
467.40	649	597	470.00	1,983	3,854
467.45	667	630			
467.50	686	664			
467.55	705	699			
467.60	724	735			
467.65	744	771			
467.70	763	809			
467.75	783	848			
467.80	804	887			
467.85	824	928			
467.90	845	970			
467.95	866	1,012			
468.00	887	1,056			
468.05	909	1,101			
468.10	931	1,147			
468.15	954	1,194			
468.20	977	1,243			
468.25	1,000	1,292			
468.30	1,024	1,343			
468.35	1,047	1,394			
468.40	1,071	1,447			
468.45	1,096	1,502			
468.50	1,120	1,557			
468.55	1,145	1,614			

Summary for Pond 21P: Infiltration Basin

Inflow Area = 2.455 ac, 25.89% Impervious, Inflow Depth > 2.90" for 50 yr event
 Inflow = 3.01 cfs @ 12.39 hrs, Volume= 0.593 af
 Outflow = 3.00 cfs @ 12.41 hrs, Volume= 0.521 af, Atten= 0%, Lag= 1.2 min
 Discarded = 0.13 cfs @ 12.41 hrs, Volume= 0.154 af
 Primary = 2.70 cfs @ 12.41 hrs, Volume= 0.359 af
 Routed to Reach 20R : Overland Flow to 20P
 Secondary = 0.17 cfs @ 12.41 hrs, Volume= 0.008 af
 Routed to Reach 20R : Overland Flow to 20P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Peak Elev= 469.82' @ 12.41 hrs Surf.Area= 1,865 sf Storage= 3,504 cf

Flood Elev= 470.00' Surf.Area= 1,983 sf Storage= 3,854 cf

Plug-Flow detention time= 88.3 min calculated for 0.520 af (88% of inflow)
 Center-of-Mass det. time= 32.5 min (858.6 - 826.1)

Volume	Invert	Avail.Storage	Storage Description		
#1	466.00'	3,854 cf	Custom Stage Data (Irregular)	Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
466.00	238	61.0	0	0	238
468.00	887	160.0	1,056	1,056	1,993
470.00	1,983	201.0	2,797	3,854	3,225

Device	Routing	Invert	Outlet Devices	
#1	Discarded	466.00'	3.000 in/hr Exfiltration over Surface area	
#2	Primary	465.00'	18.0" Round HDPE Culvert L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 465.00' / 464.75' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf	
#3	Device 2	469.65'	2.0" x 2.0" Horiz. Grate X 10.00 columns X 10 rows C= 0.600 in 36.0" x 36.0" Grate (31% open area) Limited to weir flow at low heads	
#4	Secondary	469.75'	4.0' long x 6.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83	

Discarded OutFlow Max=0.13 cfs @ 12.41 hrs HW=469.82' (Free Discharge)
 ↗ 1=Exfiltration (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=2.70 cfs @ 12.41 hrs HW=469.82' TW=453.63' (Dynamic Tailwater)
 ↗ 2=HDPE Culvert (Passes 2.70 cfs of 17.16 cfs potential flow)
 ↗ 3=Grate (Weir Controls 2.70 cfs @ 1.34 fps)

Secondary OutFlow Max=0.17 cfs @ 12.41 hrs HW=469.82' TW=453.63' (Dynamic Tailwater)
 ↗ 4=Broad-Crested Rectangular Weir (Weir Controls 0.17 cfs @ 0.62 fps)

Stage-Area-Storage for Pond 21P: Infiltration Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
466.00	238	0	468.60	1,170	1,671
466.05	249	12	468.65	1,195	1,731
466.10	261	25	468.70	1,221	1,791
466.15	272	38	468.75	1,247	1,853
466.20	284	52	468.80	1,273	1,916
466.25	297	67	468.85	1,300	1,980
466.30	309	82	468.90	1,326	2,046
466.35	322	98	468.95	1,353	2,113
466.40	335	114	469.00	1,381	2,181
466.45	348	131	469.05	1,408	2,251
466.50	362	149	469.10	1,436	2,322
466.55	375	167	469.15	1,464	2,394
466.60	389	186	469.20	1,492	2,468
466.65	404	206	469.25	1,521	2,544
466.70	418	227	469.30	1,550	2,620
466.75	433	248	469.35	1,579	2,699
466.80	448	270	469.40	1,609	2,778
466.85	463	293	469.45	1,638	2,859
466.90	479	316	469.50	1,668	2,942
466.95	495	341	469.55	1,698	3,026
467.00	511	366	469.60	1,729	3,112
467.05	527	392	469.65	1,760	3,199
467.10	544	419	469.70	1,791	3,288
467.15	561	446	469.75	1,822	3,378
467.20	578	475	469.80	1,854	3,470
467.25	595	504	469.85	1,886	3,564
467.30	613	534	469.90	1,918	3,659
467.35	631	565	469.95	1,950	3,755
467.40	649	597	470.00	1,983	3,854
467.45	667	630			
467.50	686	664			
467.55	705	699			
467.60	724	735			
467.65	744	771			
467.70	763	809			
467.75	783	848			
467.80	804	887			
467.85	824	928			
467.90	845	970			
467.95	866	1,012			
468.00	887	1,056			
468.05	909	1,101			
468.10	931	1,147			
468.15	954	1,194			
468.20	977	1,243			
468.25	1,000	1,292			
468.30	1,024	1,343			
468.35	1,047	1,394			
468.40	1,071	1,447			
468.45	1,096	1,502			
468.50	1,120	1,557			
468.55	1,145	1,614			



STORMWATER POND DESIGN CRITERIA

Env-Wq 1508.03

Type/Node Name: **Pocket Pond 22P**

Enter the type of stormwater pond (e.g., Wet Pond) and the node name in the drainage analysis, if applicable.

2.46 ac	A = Area draining to the practice	
0.64 ac	A_I = Impervious area draining to the practice	
0.26 decimal	I = Percent impervious area draining to the practice, in decimal form	
0.28 unitless	Rv = Runoff coefficient = $0.05 + (0.9 \times I)$	
0.70 ac-in	$WQV = 1" \times Rv \times A$	
2,537 cf	WQV conversion ($ac-in \times 43,560 \text{ sf/ac} \times 1\text{ft}/12"$)	
254 cf	10% x WQV (check calc for sediment forebay and micropool volume)	
1,269 cf	50% x WQV (check calc for extended detention volume)	
292 cf	V_{SED} = Sediment forebay volume	$\geq 10\%WQV$
3,827 cf	V_{PP} = Permanent pool volume (volume below the lowest invert of the outlet structure) Attach stage-storage table.	
no cf	Extended Detention? ¹	$\leq 50\%WQV$
-	V_{ED} = Volume of extended detention (if "yes" is given in box above)	
- cfs	E_{ED} = Elevation of WQV if "yes" is given in box above ²	
- cfs	$2Q_{avg} = 2 * V_{ED} / 24 \text{ hrs} * (1\text{hr} / 3600 \text{ sec})$ (used to check against Q_{EDmax} below)	
- hours	Q_{EDmax} = Discharge at the E_{ED} (attach stage-discharge table)	$< 2Q_{avg}$
- hours	$T_{ED} = \text{Drawdown time of extended detention} = 2V_{ED}/Q_{EDmax}$	$\geq 24\text{-hrs}$
3.00 :1	Pond side slopes	$\geq 3:1$
468.63 ft	Elevation of seasonal high water table	
469.35 ft	Elevation of lowest pond outlet	
463.63 ft	Max floor = Maximum elevation of pond bottom (ft)	$\leq 8 \text{ ft}$
460.63 ft	Minimum floor (to maintain depth at less than 8')	$\leq \text{Max floor and } > \text{Min floor}$
466.00 ft	Elevation of pond floor ³	
80.00 ft	Length of the flow path between the inlet and outlet at mid-depth	
30.00 ft	Average width ([average of the top width + average bottom width]/2)	
2.67 :1	Length to average width ratio	$\geq 3:1$
No Yes/No	Is the perimeter curvilinear.	<input checked="" type="checkbox"/> Yes
Yes Yes/No	Are the inlet and outlet located as far apart as possible.	<input checked="" type="checkbox"/> Yes
No Yes/No	Is there a manually-controlled drain to dewater the pond over a 24hr period?	
If no state why: grades		What mechanism is proposed to prevent the outlet structure from clogging (applicable for orifices/weirs with a dimension of <6")?
471.52 ft	Peak elevation of the 50-year storm event	
472.00 ft	Berm elevation of the pond	
YES	50 peak elevation \leq the berm elevation?	<input checked="" type="checkbox"/> yes

1. If the entire WQV is stored in the perm. pool, there is no extended det., and the following five lines do not apply.

2. This is the elevation of WQV if the hydrologic analysis is set up to include the permanent pool storage in the node description.
3. If the pond floor elevation is above the max floor elev., a hydrologic budget must be submitted to demonstrate that a minimum depth of 3 feet can be maintained. (First check whether a revised "lowest pond outlet" elev. will resolve the issue.)

Designer's Notes:

NHDES Alteration of Terrain

Last Revised: December 2017

Summary for Pond 22P: Pocket Pond 22P

Inflow Area = 2.455 ac, 25.89% Impervious, Inflow Depth > 2.96" for 50 yr event
 Inflow = 6.81 cfs @ 12.12 hrs, Volume= 0.605 af
 Outflow = 3.01 cfs @ 12.39 hrs, Volume= 0.593 af, Atten= 56%, Lag= 16.3 min
 Primary = 3.01 cfs @ 12.39 hrs, Volume= 0.593 af
 Routed to Pond 21P : Infiltration Basin
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Pond 21P : Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Starting Elev= 469.35' Surf.Area= 1,930 sf Storage= 3,827 cf

Peak Elev= 471.52' @ 12.39 hrs Surf.Area= 4,514 sf Storage= 9,741 cf (5,915 cf above start)

Flood Elev= 472.00' Surf.Area= 5,229 sf Storage= 12,066 cf (8,239 cf above start)

Plug-Flow detention time= 144.6 min calculated for 0.505 af (83% of inflow)

Center-of-Mass det. time= 28.1 min (826.1 - 798.0)

Volume	Invert	Avail.Storage	Storage Description			
#1	466.00'	12,066 cf	Custom Stage Data (Irregular)	Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
466.00	492	103.6	0	0	492	
468.00	1,258	151.6	1,691	1,691	1,500	
470.00	2,304	194.4	3,510	5,201	2,728	
471.00	2,916	213.3	2,604	7,805	3,374	
471.50	4,482	493.2	1,836	9,640	19,111	
472.00	5,229	502.6	2,425	12,066	19,897	

Device	Routing	Invert	Outlet Devices	
#1	Primary	469.00'	12.0" Round HDPE Culvert L= 21.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 469.00' / 468.00' S= 0.0476 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf	
#2	Device 1	469.35'	5.0" Vert. 5" Orifices X 2.00 C= 0.600 Limited to weir flow at low heads	
#3	Device 1	470.80'	5.0" Vert. 5" Orifices X 2.00 C= 0.600 Limited to weir flow at low heads	
#4	Device 1	471.25'	Weir, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.40 Width (feet) 0.75 0.75	
#5	Device 1	471.65'	2.0" x 2.0" Horiz. Grate X 10.00 columns X 10 rows C= 0.600 in 36.0" x 36.0" Grate (31% open area) Limited to weir flow at low heads	
#6	Secondary	471.75'	4.0' long x 6.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83	

Post

Type III 24-hr 50 yr Rainfall=5.89"

Prepared by Keach-Nordstrom Associates, Inc

Printed 12/29/2025

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Primary OutFlow Max=3.00 cfs @ 12.39 hrs HW=471.52' TW=469.82' (Dynamic Tailwater)

↑
1=HDPE Culvert (Passes 3.00 cfs of 4.94 cfs potential flow)
 └─ 2=5" Orifices (Orifice Controls 1.71 cfs @ 6.29 fps)
 └─ 3=5" Orifices (Orifice Controls 0.94 cfs @ 3.45 fps)
 └─ 4=Weir (Weir Controls 0.35 cfs @ 1.71 fps)
 └─ 5=Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=469.35' TW=466.00' (Dynamic Tailwater)

↑
6=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Stage-Area-Storage for Pond 22P: Pocket Pond 22P

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
466.00	492	0	471.20	3,502	8,446
466.10	522	51	471.30	3,815	8,811
466.20	553	104	471.40	4,142	9,209
466.30	584	161	471.50	4,482	9,640
466.40	617	221	471.60	4,627	10,096
466.50	650	285	471.70	4,774	10,566
466.60	685	351	471.80	4,923	11,051
466.70	720	422	471.90	5,075	11,551
466.80	756	495	472.00	5,229	12,066
466.90	793	573			
467.00	831	654			
467.10	870	739			
467.20	909	828			
467.30	950	921			
467.40	991	1,018			
467.50	1,033	1,119			
467.60	1,077	1,225			
467.70	1,121	1,335			
467.80	1,166	1,449			
467.90	1,211	1,568			
468.00	1,258	1,691			
468.10	1,303	1,819			
468.20	1,348	1,952			
468.30	1,395	2,089			
468.40	1,442	2,231			
468.50	1,490	2,377			
468.60	1,539	2,529			
468.70	1,588	2,685			
468.80	1,639	2,846			
468.90	1,690	3,013			
469.00	1,742	3,184			
469.10	1,794	3,361			
469.20	1,848	3,543			
469.30	1,902	3,731			
469.40	1,957	3,924			
469.50	2,013	4,122			
469.60	2,070	4,326			
469.70	2,127	4,536			
469.80	2,185	4,752			
469.90	2,244	4,973			
470.00	2,304	5,201			
470.10	2,362	5,434			
470.20	2,421	5,673			
470.30	2,480	5,918			
470.40	2,540	6,169			
470.50	2,601	6,426			
470.60	2,663	6,689			
470.70	2,725	6,959			
470.80	2,788	7,234			
470.90	2,852	7,516			
471.00	2,916	7,805			
471.10	3,202	8,111			

Summary for Pond 23P: Sediment Forebay 23P

Inflow Area = 2.455 ac, 25.89% Impervious, Inflow Depth > 2.96" for 50 yr event

Inflow = 6.85 cfs @ 12.11 hrs, Volume= 0.606 af

Outflow = 6.81 cfs @ 12.12 hrs, Volume= 0.605 af, Atten= 1%, Lag= 0.5 min

Primary = 6.81 cfs @ 12.12 hrs, Volume= 0.605 af

Routed to Pond 22P : Pocket Pond 22P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Starting Elev= 471.00' Surf.Area= 363 sf Storage= 292 cf

Peak Elev= 471.74' @ 12.13 hrs Surf.Area= 568 sf Storage= 634 cf (342 cf above start)

Flood Elev= 472.00' Surf.Area= 650 sf Storage= 792 cf (500 cf above start)

Plug-Flow detention time= 15.5 min calculated for 0.598 af (99% of inflow)

Center-of-Mass det. time= 1.4 min (798.0 - 796.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	469.00'	792 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
469.00	3	16.6	0	0	3
470.00	135	65.6	53	53	326
471.00	363	86.1	240	292	585
472.00	650	105.0	500	792	888

Device	Routing	Invert	Outlet Devices
#1	Primary	471.00'	4.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=6.81 cfs @ 12.12 hrs HW=471.74' TW=471.01' (Dynamic Tailwater)

↑ 1=Broad-Crested Rectangular Weir (Weir Controls 6.81 cfs @ 2.31 fps)

Stage-Area-Storage for Pond 23P: Sediment Forebay 23P

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
469.00	3	0	471.60	525	557
469.05	5	0	471.65	540	584
469.10	7	1	471.70	555	611
469.15	10	1	471.75	570	640
469.20	14	2	471.80	586	669
469.25	18	2	471.85	602	698
469.30	22	3	471.90	618	729
469.35	27	5	471.95	634	760
469.40	32	6	472.00	650	792
469.45	38	8			
469.50	45	10			
469.55	51	12			
469.60	59	15			
469.65	67	18			
469.70	75	22			
469.75	84	26			
469.80	93	30			
469.85	103	35			
469.90	113	40			
469.95	124	46			
470.00	135	53			
470.05	144	60			
470.10	153	67			
470.15	162	75			
470.20	172	83			
470.25	182	92			
470.30	192	101			
470.35	202	111			
470.40	213	122			
470.45	224	133			
470.50	235	144			
470.55	247	156			
470.60	259	169			
470.65	271	182			
470.70	283	196			
470.75	296	210			
470.80	309	225			
470.85	322	241			
470.90	335	258			
470.95	349	275			
471.00	363	292			
471.05	375	311			
471.10	388	330			
471.15	401	350			
471.20	414	370			
471.25	427	391			
471.30	440	413			
471.35	454	435			
471.40	468	458			
471.45	482	482			
471.50	496	506			
471.55	511	532			



STORMWATER POND DESIGN CRITERIA

Env-Wq 1508.03

Type/Node Name: **Pocket Pond 41P**

Enter the type of stormwater pond (e.g., Wet Pond) and the node name in the drainage analysis, if applicable.

1.68 ac	A = Area draining to the practice	
0.14 ac	A_I = Impervious area draining to the practice	
0.09 decimal	I = Percent impervious area draining to the practice, in decimal form	
0.13 unitless	Rv = Runoff coefficient = $0.05 + (0.9 \times I)$	
0.21 ac-in	$WQV = 1" \times Rv \times A$	
775 cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
77 cf	10% x WQV (check calc for sediment forebay and micropool volume)	
387 cf	50% x WQV (check calc for extended detention volume)	
245 cf	V_{SED} = Sediment forebay volume	$\geq 10\%WQV$
5,532 cf	V_{PP} = Permanent pool volume (volume below the lowest invert of the outlet structure) Attach stage-storage table.	
no cf	Extended Detention? ¹	$\leq 50\%WQV$
-	V_{ED} = Volume of extended detention (if "yes" is given in box above)	
- cfs	E_{ED} = Elevation of WQV if "yes" is given in box above ²	
- cfs	$2Q_{avg} = 2 * V_{ED} / 24 \text{ hrs} * (1\text{hr} / 3600 \text{ sec})$ (used to check against Q_{EDmax} below)	
- hours	Q_{EDmax} = Discharge at the E_{ED} (attach stage-discharge table)	$< 2Q_{avg}$
- hours	$T_{ED} = \text{Drawdown time of extended detention} = 2V_{ED}/Q_{EDmax}$	$\geq 24\text{-hrs}$
3.00 :1	Pond side slopes	$\geq 3:1$
437.00 ft	Elevation of seasonal high water table	
440.10 ft	Elevation of lowest pond outlet	
432.00 ft	Max floor = Maximum elevation of pond bottom (ft)	
429.00 ft	Minimum floor (to maintain depth at less than 8')	$\leq 8 \text{ ft}$
434.00 ft	Elevation of pond floor ³	$\leq \text{Max floor and} > \text{Min floor}$
51.00 ft	Length of the flow path between the inlet and outlet at mid-depth	
67.00 ft	Average width ([average of the top width + average bottom width]/2)	
0.76 :1	Length to average width ratio	$\geq 3:1$
Yes	Yes/No Is the perimeter curvilinear.	<input checked="" type="checkbox"/> Yes
Yes	Yes/No Are the inlet and outlet located as far apart as possible.	<input checked="" type="checkbox"/> Yes
No	Yes/No Is there a manually-controlled drain to dewater the pond over a 24hr period?	
If no state why: grades		
What mechanism is proposed to prevent the outlet structure from clogging (applicable for orifices/weirs with a dimension of <6")?		
441.67 ft	Peak elevation of the 50-year storm event	
442.00 ft	Berm elevation of the pond	
YES	50 peak elevation \leq the berm elevation?	<input checked="" type="checkbox"/> yes

1. If the entire WQV is stored in the perm. pool, there is no extended det., and the following five lines do not apply.

2. This is the elevation of WQV if the hydrologic analysis is set up to include the permanent pool storage in the node description.
3. If the pond floor elevation is above the max floor elev., a hydrologic budget must be submitted to demonstrate that a minimum depth of 3 feet can be maintained. (First check whether a revised "lowest pond outlet" elev. will resolve the issue.)

Designer's Notes:

NHDES Alteration of Terrain

Last Revised: December 2017

Summary for Pond 41P: Pocket Pond 41P

Inflow Area = 1.631 ac, 10.12% Impervious, Inflow Depth > 1.95" for 50 yr event
 Inflow = 2.88 cfs @ 12.12 hrs, Volume= 0.266 af
 Outflow = 1.04 cfs @ 12.49 hrs, Volume= 0.251 af, Atten= 64%, Lag= 22.6 min
 Primary = 1.04 cfs @ 12.49 hrs, Volume= 0.251 af
 Routed to Pond 40P : Existing CB

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Starting Elev= 440.10' Surf.Area= 2,197 sf Storage= 5,532 cf

Peak Elev= 441.67' @ 12.49 hrs Surf.Area= 3,100 sf Storage= 9,713 cf (4,181 cf above start)

Flood Elev= 442.00' Surf.Area= 3,207 sf Storage= 10,747 cf (5,215 cf above start)

Plug-Flow detention time= 462.4 min calculated for 0.124 af (47% of inflow)

Center-of-Mass det. time= 139.4 min (967.9 - 828.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	434.00'	10,747 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
434.00	64	44.5	0	0	64
436.00	472	91.7	473	473	593
438.00	1,164	139.2	1,585	2,058	1,496
440.00	2,142	186.2	3,257	5,315	2,756
441.50	3,044	214.5	3,870	9,184	3,707
442.00	3,207	219.2	1,563	10,747	3,902

Device	Routing	Invert	Outlet Devices
#1	Primary	437.00'	18.0" Round HDPE Culvert L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 437.00' / 435.00' S= 0.0833 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	440.10'	3.0" Vert. 3" Orifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	441.60'	2.0" x 2.0" Horiz. Grate X 10.00 columns X 10 rows C= 0.600 in 36.0" x 36.0" Grate (31% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.03 cfs @ 12.49 hrs HW=441.67' TW=0.00' (Dynamic Tailwater)

↑ 1=HDPE Culvert (Passes 1.03 cfs of 16.85 cfs potential flow)

 └ 2=3" Orifice (Orifice Controls 0.28 cfs @ 5.79 fps)

 └ 3=Grate (Weir Controls 0.75 cfs @ 0.87 fps)

Stage-Area-Storage for Pond 41P: Pocket Pond 41P

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
434.00	64	0	439.20	1,715	3,775
434.10	75	7	439.30	1,766	3,949
434.20	88	15	439.40	1,818	4,128
434.30	101	25	439.50	1,870	4,313
434.40	115	35	439.60	1,923	4,502
434.50	131	48	439.70	1,976	4,697
434.60	147	62	439.80	2,031	4,897
434.70	164	77	439.90	2,086	5,103
434.80	182	94	440.00	2,142	5,315
434.90	201	114	440.10	2,197	5,532
435.00	221	135	440.20	2,253	5,754
435.10	242	158	440.30	2,310	5,982
435.20	264	183	440.40	2,367	6,216
435.30	286	210	440.50	2,425	6,456
435.40	310	240	440.60	2,484	6,701
435.50	335	273	440.70	2,543	6,953
435.60	360	307	440.80	2,603	7,210
435.70	387	345	440.90	2,664	7,473
435.80	414	385	441.00	2,726	7,743
435.90	443	427	441.10	2,788	8,018
436.00	472	473	441.20	2,851	8,300
436.10	499	522	441.30	2,915	8,589
436.20	527	573	441.40	2,979	8,883
436.30	556	627	441.50	3,044	9,184
436.40	586	684	441.60	3,076	9,490
436.50	616	744	441.70	3,109	9,800
436.60	647	808	441.80	3,141	10,112
436.70	679	874	441.90	3,174	10,428
436.80	712	944	442.00	3,207	10,747
436.90	745	1,016			
437.00	780	1,093			
437.10	815	1,172			
437.20	850	1,256			
437.30	887	1,342			
437.40	924	1,433			
437.50	962	1,527			
437.60	1,001	1,625			
437.70	1,041	1,727			
437.80	1,081	1,834			
437.90	1,122	1,944			
438.00	1,164	2,058			
438.10	1,206	2,177			
438.20	1,248	2,299			
438.30	1,292	2,426			
438.40	1,336	2,558			
438.50	1,381	2,693			
438.60	1,426	2,834			
438.70	1,473	2,979			
438.80	1,520	3,128			
438.90	1,567	3,283			
439.00	1,616	3,442			
439.10	1,665	3,606			

Summary for Pond 415P: Sediment Forebay 415P

Inflow Area = 0.974 ac, 15.98% Impervious, Inflow Depth > 2.29" for 50 yr event

Inflow = 2.01 cfs @ 12.11 hrs, Volume= 0.186 af

Outflow = 2.00 cfs @ 12.13 hrs, Volume= 0.186 af, Atten= 0%, Lag= 0.8 min

Primary = 2.00 cfs @ 12.13 hrs, Volume= 0.186 af

Routed to Pond 41P : Pocket Pond 41P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Starting Elev= 441.50' Surf.Area= 313 sf Storage= 245 cf

Peak Elev= 441.84' @ 12.13 hrs Surf.Area= 407 sf Storage= 368 cf (123 cf above start)

Flood Elev= 442.00' Surf.Area= 454 sf Storage= 435 cf (191 cf above start)

Plug-Flow detention time= 35.2 min calculated for 0.180 af (97% of inflow)

Center-of-Mass det. time= 1.8 min (819.7 - 817.9)

Volume	Invert	Avail.Storage	Storage Description
#1	439.50'	435 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
439.50	7	13.1	0	0	7
441.50	313	89.1	245	245	633
442.00	454	98.5	191	435	781

Device	Routing	Invert	Outlet Devices
#1	Primary	441.50'	4.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=1.99 cfs @ 12.13 hrs HW=441.84' TW=441.08' (Dynamic Tailwater)

↑=Broad-Crested Rectangular Weir (Weir Controls 1.99 cfs @ 1.46 fps)

Stage-Area-Storage for Pond 415P: Sediment Forebay 415P

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
439.50	7	0
439.55	9	0
439.60	12	1
439.65	14	2
439.70	17	2
439.75	20	3
439.80	24	4
439.85	28	6
439.90	32	7
439.95	36	9
440.00	41	11
440.05	46	13
440.10	51	15
440.15	57	18
440.20	63	21
440.25	69	24
440.30	75	28
440.35	82	32
440.40	89	36
440.45	96	41
440.50	103	46
440.55	111	51
440.60	119	57
440.65	128	63
440.70	136	70
440.75	145	77
440.80	154	84
440.85	164	92
440.90	174	101
440.95	184	110
441.00	194	119
441.05	205	129
441.10	216	139
441.15	227	150
441.20	238	162
441.25	250	174
441.30	262	187
441.35	274	201
441.40	287	215
441.45	300	229
441.50	313	245
441.55	326	261
441.60	339	277
441.65	353	294
441.70	366	312
441.75	380	331
441.80	394	350
441.85	409	371
441.90	424	391
441.95	439	413
442.00	454	435

17. EXTREME PRECIPITATION TABLES

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Metadata for Point												
Smoothing	Yes											
State	New Hampshire											
Location	New Hampshire, United States											
Latitude	43.255 degrees North											
Longitude	71.765 degrees West											
Elevation	140 feet											
Date/Time	Wed Jun 05 2024 12:33:03 GMT-0400 (Eastern Daylight Time)											

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.40	0.50	0.65	0.81	1.02	1yr	0.70	0.97	1.18	1.48	1.87	2.35	2.55	1yr	2.08	2.45	2.90	3.60	4.12	1yr
2yr	0.31	0.48	0.60	0.79	0.99	1.25	2yr	0.86	1.14	1.44	1.80	2.23	2.78	3.11	2yr	2.46	2.99	3.48	4.16	4.75	2yr
5yr	0.37	0.58	0.72	0.97	1.24	1.57	5yr	1.07	1.44	1.81	2.26	2.79	3.44	3.93	5yr	3.04	3.78	4.38	5.15	5.84	5yr
10yr	0.42	0.66	0.83	1.13	1.47	1.87	10yr	1.27	1.72	2.17	2.69	3.31	4.04	4.70	10yr	3.58	4.52	5.21	6.05	6.83	10yr
25yr	0.49	0.79	1.00	1.38	1.83	2.35	25yr	1.58	2.16	2.73	3.38	4.14	5.01	5.94	25yr	4.43	5.71	6.56	7.50	8.40	25yr
50yr	0.56	0.90	1.15	1.61	2.17	2.80	50yr	1.87	2.58	3.25	4.03	4.90	5.89	7.11	50yr	5.22	6.83	7.81	8.82	9.82	50yr
100yr	0.64	1.03	1.33	1.89	2.58	3.34	100yr	2.22	3.07	3.89	4.80	5.81	6.94	8.50	100yr	6.14	8.17	9.31	10.38	11.49	100yr
200yr	0.73	1.20	1.55	2.22	3.06	3.98	200yr	2.64	3.67	4.63	5.70	6.88	8.17	10.17	200yr	7.23	9.78	11.09	12.22	13.45	200yr
500yr	0.88	1.45	1.88	2.73	3.83	5.01	500yr	3.30	4.64	5.84	7.17	8.61	10.16	12.90	500yr	8.99	12.41	14.00	15.18	16.57	500yr

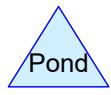
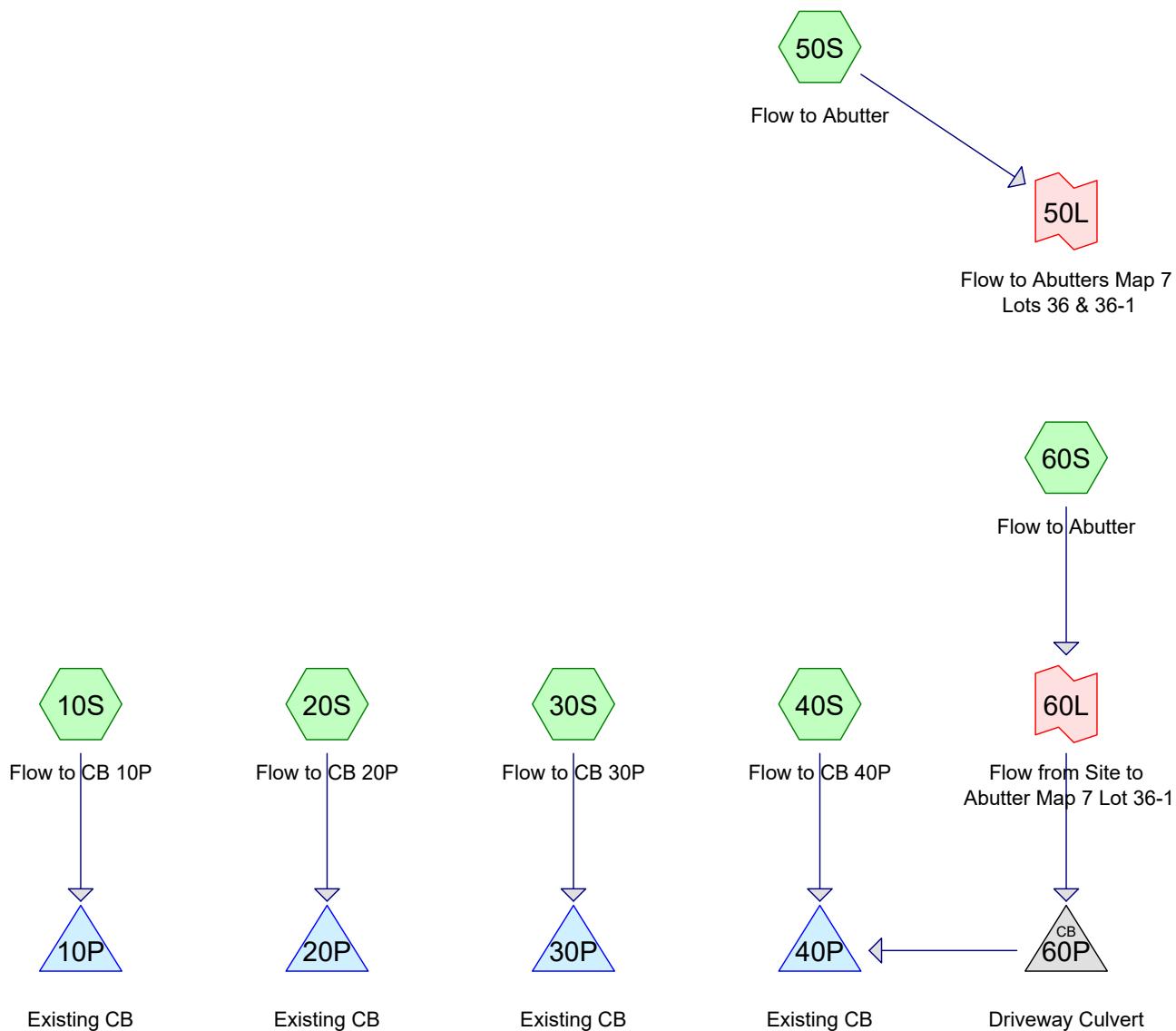
Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.24	0.37	0.45	0.61	0.75	0.88	1yr	0.64	0.86	0.95	1.28	1.57	1.90	2.28	1yr	1.68	2.19	2.58	3.07	3.62	1yr
2yr	0.30	0.46	0.57	0.77	0.95	1.13	2yr	0.82	1.10	1.29	1.71	2.21	2.69	3.00	2yr	2.38	2.88	3.35	4.02	4.60	2yr
5yr	0.34	0.52	0.65	0.89	1.13	1.33	5yr	0.97	1.30	1.50	1.96	2.54	3.17	3.59	5yr	2.81	3.45	3.98	4.74	5.42	5yr
10yr	0.38	0.58	0.72	1.01	1.30	1.52	10yr	1.12	1.48	1.68	2.17	2.82	3.60	4.10	10yr	3.19	3.95	4.52	5.36	6.09	10yr
25yr	0.43	0.65	0.81	1.16	1.53	1.78	25yr	1.32	1.74	1.96	2.48	3.23	4.25	4.89	25yr	3.76	4.70	5.35	6.33	7.11	25yr
50yr	0.47	0.72	0.89	1.29	1.73	1.99	50yr	1.49	1.95	2.18	2.76	3.57	4.83	5.57	50yr	4.28	5.36	6.07	7.19	8.03	50yr
100yr	0.52	0.79	0.99	1.42	1.95	2.24	100yr	1.68	2.19	2.43	3.07	3.96	5.50	6.37	100yr	4.87	6.12	6.89	8.18	9.07	100yr
200yr	0.57	0.86	1.09	1.57	2.20	2.52	200yr	1.90	2.46	2.71	3.42	4.39	6.28	7.27	200yr	5.55	6.99	7.83	9.33	10.24	200yr
500yr	0.65	0.97	1.25	1.81	2.58	2.92	500yr	2.23	2.85	3.13	3.95	5.03	7.48	8.67	500yr	6.62	8.34	9.25	11.12	12.05	500yr

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.29	0.45	0.55	0.73	0.90	1.11	1yr	0.78	1.09	1.21	1.59	1.96	2.61	2.80	1yr	2.31	2.69	3.21	3.94	4.48	1yr
2yr	0.33	0.51	0.63	0.85	1.05	1.24	2yr	0.91	1.21	1.41	1.85	2.37	2.89	3.25	2yr	2.56	3.12	3.64	4.31	4.99	2yr
5yr	0.41	0.63	0.78	1.07	1.36	1.63	5yr	1.18	1.59	1.85	2.36	3.00	3.73	4.32	5yr	3.30	4.16	4.81	5.55	6.30	5yr
10yr	0.49	0.76	0.94	1.31	1.69	2.02	10yr	1.46	1.98	2.27	2.86	3.60	4.53	5.38	10yr	4.01	5.18	5.97	6.70	7.57	10yr
25yr	0.63	0.96	1.19	1.70	2.24	2.69	25yr	1.93	2.63	3.01	3.66	4.58	5.85	7.18	25yr	5.18	6.90	7.94	8.61	9.69	25yr
50yr	0.76	1.15	1.43	2.06	2.77	3.36	50yr	2.39	3.28	3.70	4.43	5.51	7.09	8.95	50yr	6.28	8.61	9.86	10.42	11.67	50yr
100yr	0.92	1.39	1.74	2.51	3.44	4.19	100yr	2.97	4.10	4.57	5.34	6.63	8.62	11.17	100yr	7.63	10.74	12.25	12.60	14.06	100yr
200yr	1.11	1.67	2.11	3.06	4.27	5.23	200yr	3.68	5.12	5.66	6.46	7.96	10.44	13.93	200yr	9.24	13.39	15.23	15.22	16.93	200yr
500yr	1.44	2.14	2.75	4.00	5.68	7.03	500yr	4.90	6.87	7.50	8.30	10.19	13.50	18.67	500yr	11.95	17.96	20.33	19.55	21.65	500yr

18. HYDROCAD DRAINAGE ANALYSIS



Routing Diagram for Pre

Prepared by Keach-Nordstrom Associates, Inc, Printed 12/31/2025
 HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.464	39	>75% Grass cover, Good, HSG A (30S, 40S, 60S)
0.355	61	>75% Grass cover, Good, HSG B (10S, 30S, 40S)
0.263	80	>75% Grass cover, Good, HSG D (20S, 30S, 40S, 60S)
0.028	85	Gravel roads, HSG B (60S)
0.209	96	Gravel surface, HSG A (40S)
0.083	96	Gravel surface, HSG B (30S, 40S, 50S)
0.227	98	Paved parking, HSG A (30S, 40S, 60S)
0.242	98	Paved parking, HSG B (10S, 20S, 30S, 40S)
0.011	98	Paved parking, HSG D (40S)
0.183	98	Water Surface, HSG C (10S, 20S)
2.812	30	Woods, Good, HSG A (10S, 20S, 30S, 60S)
8.875	55	Woods, Good, HSG B (10S, 20S, 30S, 40S, 50S, 60S)
3.392	77	Woods, Good, HSG D (10S, 20S, 30S, 40S, 50S, 60S)
17.143	58	TOTAL AREA

Pre

Prepared by Keach-Nordstrom Associates, Inc
HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Printed 12/31/2025
Page 3

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
3.712	HSG A	10S, 20S, 30S, 40S, 60S
9.582	HSG B	10S, 20S, 30S, 40S, 50S, 60S
0.183	HSG C	10S, 20S
3.666	HSG D	10S, 20S, 30S, 40S, 50S, 60S
0.000	Other	
17.143		TOTAL AREA

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points x 3
 Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Flow to CB 10P

Runoff Area=138,949 sf 3.22% Impervious Runoff Depth>0.39"
 Flow Length=1,135' Tc=17.9 min CN=WQ Runoff=0.85 cfs 0.104 af

Subcatchment 20S: Flow to CB 20P

Runoff Area=314,828 sf 3.69% Impervious Runoff Depth>0.42"
 Flow Length=1,000' Tc=16.1 min CN=WQ Runoff=2.01 cfs 0.255 af

Subcatchment 30S: Flow to CB 30P

Runoff Area=85,116 sf 6.62% Impervious Runoff Depth>0.51"
 Flow Length=905' Tc=21.0 min CN=WQ Runoff=0.63 cfs 0.083 af

Subcatchment 40S: Flow to CB 40P

Runoff Area=87,968 sf 5.34% Impervious Runoff Depth>0.63"
 Flow Length=1,073' Tc=17.4 min CN=WQ Runoff=0.86 cfs 0.106 af

Subcatchment 50S: Flow to Abutter

Runoff Area=11,007 sf 0.00% Impervious Runoff Depth>0.27"
 Flow Length=213' Tc=10.6 min CN=WQ Runoff=0.04 cfs 0.006 af

Subcatchment 60S: Flow to Abutter

Runoff Area=108,896 sf 2.23% Impervious Runoff Depth>0.20"
 Flow Length=1,171' Tc=18.2 min CN=WQ Runoff=0.19 cfs 0.041 af

Pond 10P: Existing CB

Inflow=0.85 cfs 0.104 af
 Primary=0.85 cfs 0.104 af

Pond 20P: Existing CB

Inflow=2.01 cfs 0.255 af
 Primary=2.01 cfs 0.255 af

Pond 30P: Existing CB

Inflow=0.63 cfs 0.083 af
 Primary=0.63 cfs 0.083 af

Pond 40P: Existing CB

Inflow=1.06 cfs 0.148 af
 Primary=1.06 cfs 0.148 af

Pond 60P: Driveway Culvert

Peak Elev=431.57' Inflow=0.19 cfs 0.041 af
 12.0" Round Culvert n=0.013 L=39.0' S=0.0169 '/' Outflow=0.19 cfs 0.041 af

Link 50L: Flow to Abutters Map 7 Lots 36 & 36-1

Inflow=0.04 cfs 0.006 af
 Primary=0.04 cfs 0.006 af

Link 60L: Flow from Site to Abutter Map 7 Lot 36-1

Inflow=0.19 cfs 0.041 af
 Primary=0.19 cfs 0.041 af

Total Runoff Area = 17.143 ac Runoff Volume = 0.595 af Average Runoff Depth = 0.42"
96.13% Pervious = 16.481 ac 3.87% Impervious = 0.663 ac

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Flow to CB 10P

Runoff Area=138,949 sf 3.22% Impervious Runoff Depth>0.83"
Flow Length=1,135' Tc=17.9 min CN=WQ Runoff=1.93 cfs 0.220 af

Subcatchment 20S: Flow to CB 20P

Runoff Area=314,828 sf 3.69% Impervious Runoff Depth>0.95"
Flow Length=1,000' Tc=16.1 min CN=WQ Runoff=4.94 cfs 0.571 af

Subcatchment 30S: Flow to CB 30P

Runoff Area=85,116 sf 6.62% Impervious Runoff Depth>1.03"
Flow Length=905' Tc=21.0 min CN=WQ Runoff=1.36 cfs 0.168 af

Subcatchment 40S: Flow to CB 40P

Runoff Area=87,968 sf 5.34% Impervious Runoff Depth>1.22"
Flow Length=1,073' Tc=17.4 min CN=WQ Runoff=1.71 cfs 0.205 af

Subcatchment 50S: Flow to Abutter

Runoff Area=11,007 sf 0.00% Impervious Runoff Depth>0.74"
Flow Length=213' Tc=10.6 min CN=WQ Runoff=0.13 cfs 0.016 af

Subcatchment 60S: Flow to Abutter

Runoff Area=108,896 sf 2.23% Impervious Runoff Depth>0.55"
Flow Length=1,171' Tc=18.2 min CN=WQ Runoff=0.79 cfs 0.115 af

Pond 10P: Existing CB

Inflow=1.93 cfs 0.220 af
Primary=1.93 cfs 0.220 af

Pond 20P: Existing CB

Inflow=4.94 cfs 0.571 af
Primary=4.94 cfs 0.571 af

Pond 30P: Existing CB

Inflow=1.36 cfs 0.168 af
Primary=1.36 cfs 0.168 af

Pond 40P: Existing CB

Inflow=2.46 cfs 0.320 af
Primary=2.46 cfs 0.320 af

Pond 60P: Driveway Culvert

Peak Elev=431.81' Inflow=0.79 cfs 0.115 af
12.0" Round Culvert n=0.013 L=39.0' S=0.0169 '/' Outflow=0.79 cfs 0.115 af

Link 50L: Flow to Abutters Map 7 Lots 36 & 36-1

Inflow=0.13 cfs 0.016 af
Primary=0.13 cfs 0.016 af

Link 60L: Flow from Site to Abutter Map 7 Lot 36-1

Inflow=0.79 cfs 0.115 af
Primary=0.79 cfs 0.115 af

Total Runoff Area = 17.143 ac Runoff Volume = 1.294 af Average Runoff Depth = 0.91"
96.13% Pervious = 16.481 ac 3.87% Impervious = 0.663 ac

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Flow to CB 10P

Runoff Area=138,949 sf 3.22% Impervious Runoff Depth>1.23"
Flow Length=1,135' Tc=17.9 min CN=WQ Runoff=3.00 cfs 0.326 af

Subcatchment 20S: Flow to CB 20P

Runoff Area=314,828 sf 3.69% Impervious Runoff Depth>1.45"
Flow Length=1,000' Tc=16.1 min CN=WQ Runoff=8.10 cfs 0.871 af

Subcatchment 30S: Flow to CB 30P

Runoff Area=85,116 sf 6.62% Impervious Runoff Depth>1.52"
Flow Length=905' Tc=21.0 min CN=WQ Runoff=2.08 cfs 0.247 af

Subcatchment 40S: Flow to CB 40P

Runoff Area=87,968 sf 5.34% Impervious Runoff Depth>1.76"
Flow Length=1,073' Tc=17.4 min CN=WQ Runoff=2.59 cfs 0.297 af

Subcatchment 50S: Flow to Abutter

Runoff Area=11,007 sf 0.00% Impervious Runoff Depth>1.22"
Flow Length=213' Tc=10.6 min CN=WQ Runoff=0.25 cfs 0.026 af

Subcatchment 60S: Flow to Abutter

Runoff Area=108,896 sf 2.23% Impervious Runoff Depth>0.92"
Flow Length=1,171' Tc=18.2 min CN=WQ Runoff=1.55 cfs 0.192 af

Pond 10P: Existing CB

Inflow=3.00 cfs 0.326 af
Primary=3.00 cfs 0.326 af

Pond 20P: Existing CB

Inflow=8.10 cfs 0.871 af
Primary=8.10 cfs 0.871 af

Pond 30P: Existing CB

Inflow=2.08 cfs 0.247 af
Primary=2.08 cfs 0.247 af

Pond 40P: Existing CB

Inflow=4.11 cfs 0.489 af
Primary=4.11 cfs 0.489 af

Pond 60P: Driveway Culvert

Peak Elev=432.03' Inflow=1.55 cfs 0.192 af
12.0" Round Culvert n=0.013 L=39.0' S=0.0169 '/' Outflow=1.55 cfs 0.192 af

Link 50L: Flow to Abutters Map 7 Lots 36 & 36-1

Inflow=0.25 cfs 0.026 af
Primary=0.25 cfs 0.026 af

Link 60L: Flow from Site to Abutter Map 7 Lot 36-1

Inflow=1.55 cfs 0.192 af
Primary=1.55 cfs 0.192 af

Total Runoff Area = 17.143 ac Runoff Volume = 1.959 af Average Runoff Depth = 1.37"
96.13% Pervious = 16.481 ac 3.87% Impervious = 0.663 ac

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Flow to CB 10P

Runoff Area=138,949 sf 3.22% Impervious Runoff Depth>1.64"
Flow Length=1,135' Tc=17.9 min CN=WQ Runoff=4.07 cfs 0.437 af

Subcatchment 20S: Flow to CB 20P

Runoff Area=314,828 sf 3.69% Impervious Runoff Depth>1.95"
Flow Length=1,000' Tc=16.1 min CN=WQ Runoff=11.29 cfs 1.177 af

Subcatchment 30S: Flow to CB 30P

Runoff Area=85,116 sf 6.62% Impervious Runoff Depth>2.01"
Flow Length=905' Tc=21.0 min CN=WQ Runoff=2.80 cfs 0.328 af

Subcatchment 40S: Flow to CB 40P

Runoff Area=87,968 sf 5.34% Impervious Runoff Depth>2.32"
Flow Length=1,073' Tc=17.4 min CN=WQ Runoff=3.48 cfs 0.390 af

Subcatchment 50S: Flow to Abutter

Runoff Area=11,007 sf 0.00% Impervious Runoff Depth>1.72"
Flow Length=213' Tc=10.6 min CN=WQ Runoff=0.39 cfs 0.036 af

Subcatchment 60S: Flow to Abutter

Runoff Area=108,896 sf 2.23% Impervious Runoff Depth>1.32"
Flow Length=1,171' Tc=18.2 min CN=WQ Runoff=2.37 cfs 0.276 af

Pond 10P: Existing CB

Inflow=4.07 cfs 0.437 af
Primary=4.07 cfs 0.437 af

Pond 20P: Existing CB

Inflow=11.29 cfs 1.177 af
Primary=11.29 cfs 1.177 af

Pond 30P: Existing CB

Inflow=2.80 cfs 0.328 af
Primary=2.80 cfs 0.328 af

Pond 40P: Existing CB

Inflow=5.82 cfs 0.666 af
Primary=5.82 cfs 0.666 af

Pond 60P: Driveway Culvert

Peak Elev=432.25' Inflow=2.37 cfs 0.276 af
12.0" Round Culvert n=0.013 L=39.0' S=0.0169 '/' Outflow=2.37 cfs 0.276 af

Link 50L: Flow to Abutters Map 7 Lots 36 & 36-1

Inflow=0.39 cfs 0.036 af
Primary=0.39 cfs 0.036 af

Link 60L: Flow from Site to Abutter Map 7 Lot 36-1

Inflow=2.37 cfs 0.276 af
Primary=2.37 cfs 0.276 af

Total Runoff Area = 17.143 ac Runoff Volume = 2.644 af Average Runoff Depth = 1.85"
96.13% Pervious = 16.481 ac 3.87% Impervious = 0.663 ac

Pre

Prepared by Keach-Nordstrom Associates, Inc

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Type III 24-hr 10 yr Rainfall=4.04"

Printed 12/31/2025

Page 2

Summary for Subcatchment 10S: Flow to CB 10P

Runoff = 1.93 cfs @ 12.26 hrs, Volume= 0.220 af, Depth> 0.83"
 Routed to Pond 10P : Existing CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
3,674	98	Paved parking, HSG B
6,224	61	>75% Grass cover, Good, HSG B
801	98	Water Surface, HSG C
49,768	30	Woods, Good, HSG A
39,726	55	Woods, Good, HSG B
38,756	77	Woods, Good, HSG D
138,949		Weighted Average
134,474		96.78% Pervious Area
4,475		3.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.2100	0.19		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
8.9	1,035	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
17.9	1,135	Total			

Summary for Subcatchment 20S: Flow to CB 20P

Runoff = 4.94 cfs @ 12.24 hrs, Volume= 0.571 af, Depth> 0.95"
 Routed to Pond 20P : Existing CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
4,461	98	Paved parking, HSG B
5,323	80	>75% Grass cover, Good, HSG D
7,166	98	Water Surface, HSG C
39,209	30	Woods, Good, HSG A
179,013	55	Woods, Good, HSG B
79,656	77	Woods, Good, HSG D
314,828		Weighted Average
303,201		96.31% Pervious Area
11,627		3.69% Impervious Area

Pre**Type III 24-hr 10 yr Rainfall=4.04"**

Prepared by Keach-Nordstrom Associates, Inc

Printed 12/31/2025

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Page 3

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.2100	0.19		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
7.1	900	0.1800	2.12		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
16.1	1,000	Total			

Summary for Subcatchment 30S: Flow to CB 30P

Runoff = 1.36 cfs @ 12.31 hrs, Volume= 0.168 af, Depth> 1.03"
 Routed to Pond 30P : Existing CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
5,038	98	Paved parking, HSG A
3,542	80	>75% Grass cover, Good, HSG D
6,809	39	>75% Grass cover, Good, HSG A
3,061	61	>75% Grass cover, Good, HSG B
595	98	Paved parking, HSG B
790	96	Gravel surface, HSG B
12,810	30	Woods, Good, HSG A
19,284	77	Woods, Good, HSG D
33,187	55	Woods, Good, HSG B
85,116		Weighted Average
79,483		93.38% Pervious Area
5,633		6.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1400	0.16		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
4.3	500	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.1	55	0.3600	9.66		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
6.0	250	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
21.0	905	Total			

Summary for Subcatchment 40S: Flow to CB 40P

Runoff = 1.71 cfs @ 12.25 hrs, Volume= 0.205 af, Depth> 1.22"
 Routed to Pond 40P : Existing CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Pre**Type III 24-hr 10 yr Rainfall=4.04"**

Prepared by Keach-Nordstrom Associates, Inc

Printed 12/31/2025

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Page 4

Area (sf)	CN	Description			
2,433	98	Paved parking, HSG A			
474	98	Paved parking, HSG D			
1,792	98	Paved parking, HSG B			
9,352	39	>75% Grass cover, Good, HSG A			
6,161	61	>75% Grass cover, Good, HSG B			
2,588	80	>75% Grass cover, Good, HSG D			
47,279	55	Woods, Good, HSG B			
2,326	96	Gravel surface, HSG B			
9,098	96	Gravel surface, HSG A			
6,465	77	Woods, Good, HSG D			
87,968		Weighted Average			
83,269		94.66% Pervious Area			
4,699		5.34% Impervious Area			
Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
9.0	100	0.2100	0.19		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
8.4	973	0.1500	1.94		Shallow Concentrated Flow, Shallow Woodland Kv= 5.0 fps
17.4	1,073	Total			

Summary for Subcatchment 50S: Flow to Abutter

Runoff = 0.13 cfs @ 12.18 hrs, Volume= 0.016 af, Depth> 0.74"
 Routed to Link 50L : Flow to Abutters Map 7 Lots 36 & 36-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description			
506	96	Gravel surface, HSG B			
485	77	Woods, Good, HSG D			
10,016	55	Woods, Good, HSG B			
11,007		Weighted Average			
11,007		100.00% Pervious Area			
Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
9.6	100	0.1800	0.17		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
1.0	113	0.1400	1.87		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.6	213	Total			

Summary for Subcatchment 60S: Flow to Abutter

Runoff = 0.79 cfs @ 12.32 hrs, Volume= 0.115 af, Depth> 0.55"
 Routed to Link 60L : Flow from Site to Abutter Map 7 Lot 36-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
3,110	77	Woods, Good, HSG D
16	80	>75% Grass cover, Good, HSG D
20,716	30	Woods, Good, HSG A
4,044	39	>75% Grass cover, Good, HSG A
1,214	85	Gravel roads, HSG B
77,363	55	Woods, Good, HSG B
2,433	98	Paved parking, HSG A
108,896		Weighted Average
106,463		97.77% Pervious Area
2,433		2.23% Impervious Area
Tc (min)	Length (feet)	Slope (ft/ft)
9.0	100	0.2100
9.2	1,071	0.1500
18.2	1,171	Total
Velocity (ft/sec)	Capacity (cfs)	Description
0.19		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 fps

Summary for Pond 10P: Existing CB

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.190 ac, 3.22% Impervious, Inflow Depth > 0.83" for 10 yr event
 Inflow = 1.93 cfs @ 12.26 hrs, Volume= 0.220 af
 Primary = 1.93 cfs @ 12.26 hrs, Volume= 0.220 af, Atten= 0%, Lag= 0.0 min
 Routed to nonexistent node 1L

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Summary for Pond 20P: Existing CB

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 7.227 ac, 3.69% Impervious, Inflow Depth > 0.95" for 10 yr event
 Inflow = 4.94 cfs @ 12.24 hrs, Volume= 0.571 af
 Primary = 4.94 cfs @ 12.24 hrs, Volume= 0.571 af, Atten= 0%, Lag= 0.0 min
 Routed to nonexistent node 1L

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Summary for Pond 30P: Existing CB

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.954 ac, 6.62% Impervious, Inflow Depth > 1.03" for 10 yr event
 Inflow = 1.36 cfs @ 12.31 hrs, Volume= 0.168 af
 Primary = 1.36 cfs @ 12.31 hrs, Volume= 0.168 af, Atten= 0%, Lag= 0.0 min
 Routed to nonexistent node 1L

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Summary for Pond 40P: Existing CB

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.519 ac, 3.62% Impervious, Inflow Depth > 0.85" for 10 yr event
 Inflow = 2.46 cfs @ 12.27 hrs, Volume= 0.320 af
 Primary = 2.46 cfs @ 12.27 hrs, Volume= 0.320 af, Atten= 0%, Lag= 0.0 min
 Routed to nonexistent node 1L

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Summary for Pond 60P: Driveway Culvert

[57] Hint: Peaked at 431.81' (Flood elevation advised)

Inflow Area = 2.500 ac, 2.23% Impervious, Inflow Depth > 0.55" for 10 yr event
 Inflow = 0.79 cfs @ 12.32 hrs, Volume= 0.115 af
 Outflow = 0.79 cfs @ 12.32 hrs, Volume= 0.115 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.79 cfs @ 12.32 hrs, Volume= 0.115 af
 Routed to Pond 40P : Existing CB

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Peak Elev= 431.81' @ 12.32 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	431.36'	12.0" Round Culvert L= 39.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 431.36' / 430.70' S= 0.0169 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.79 cfs @ 12.32 hrs HW=431.81' TW=0.00' (Dynamic Tailwater)
 ↑1=Culvert (Inlet Controls 0.79 cfs @ 2.29 fps)

Summary for Link 50L: Flow to Abutters Map 7 Lots 36 & 36-1

Inflow Area = 0.253 ac, 0.00% Impervious, Inflow Depth > 0.74" for 10 yr event
 Inflow = 0.13 cfs @ 12.18 hrs, Volume= 0.016 af
 Primary = 0.13 cfs @ 12.18 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs

Pre

Prepared by Keach-Nordstrom Associates, Inc

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Type III 24-hr 10 yr Rainfall=4.04"

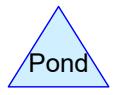
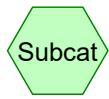
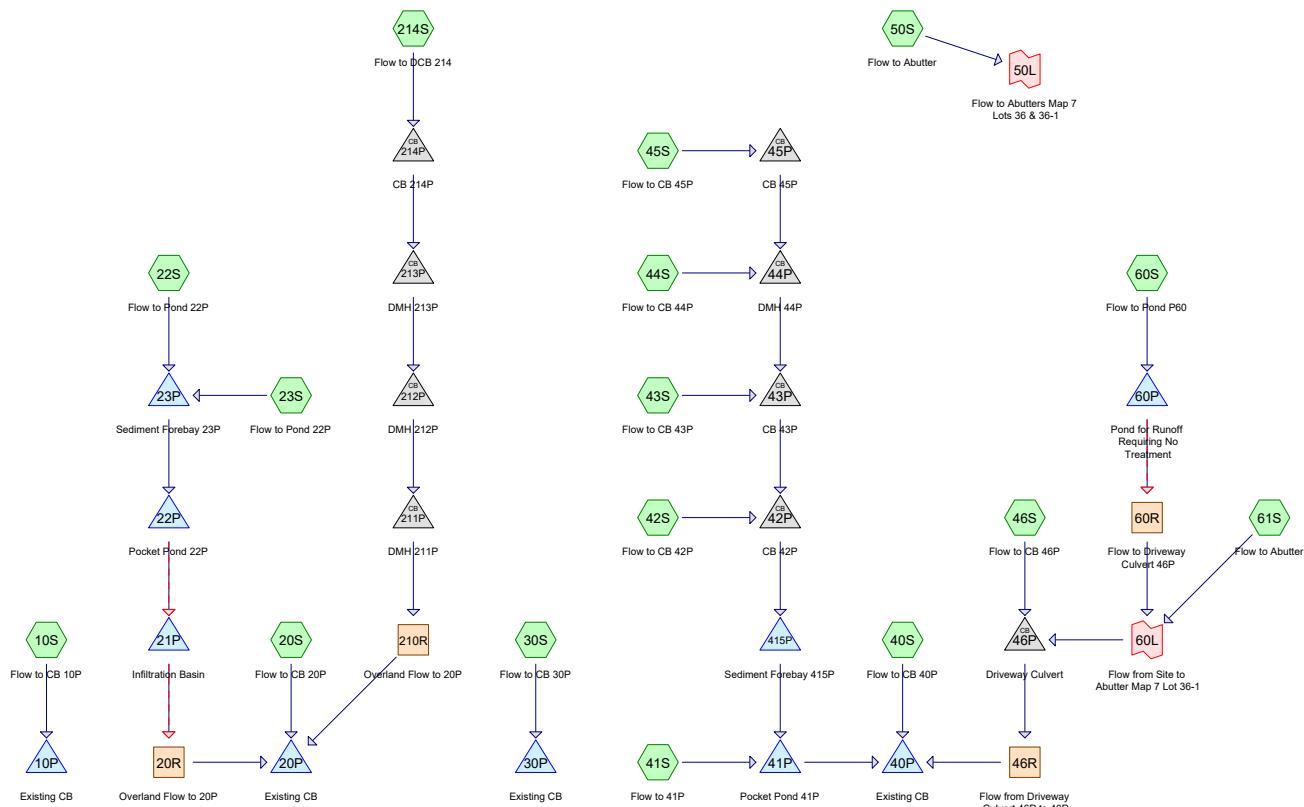
Printed 12/31/2025

Page 7

Summary for Link 60L: Flow from Site to Abutter Map 7 Lot 36-1

Inflow Area = 2.500 ac, 2.23% Impervious, Inflow Depth > 0.55" for 10 yr event
Inflow = 0.79 cfs @ 12.32 hrs, Volume= 0.115 af
Primary = 0.79 cfs @ 12.32 hrs, Volume= 0.115 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 60P : Driveway Culvert

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs



Routing Diagram for Post

Prepared by Keach-Nordstrom Associates, Inc. Printed 12/31/2025
HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Post

Prepared by Keach-Nordstrom Associates, Inc

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Printed 12/31/2025

Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.294	39	>75% Grass cover, Good, HSG A (20S, 22S, 23S, 40S, 41S, 42S, 43S, 44S, 46S, 61S)
2.729	61	>75% Grass cover, Good, HSG B (10S, 20S, 22S, 23S, 30S, 41S, 42S, 43S, 44S, 45S, 60S, 61S, 214S)
1.023	80	>75% Grass cover, Good, HSG D (20S, 22S, 30S, 40S, 41S, 42S, 43S, 45S, 46S, 61S, 214S)
0.047	85	Gravel roads, HSG B (60S, 61S)
0.012	96	Gravel surface, HSG B (50S)
0.615	98	Paved parking, HSG A (22S, 23S, 30S, 40S, 41S, 42S, 43S, 44S, 46S, 61S)
0.514	98	Paved parking, HSG B (10S, 20S, 22S, 23S, 42S, 43S, 44S, 45S)
0.008	98	Paved parking, HSG D (40S, 46S)
0.066	98	Roofs, HSG A (22S, 23S)
0.161	98	Roofs, HSG B (22S, 23S)
0.001	98	Roofs, HSG D (22S)
0.183	98	Water Surface, HSG C (10S, 20S)
1.737	30	Woods, Good, HSG A (10S, 20S, 22S, 30S, 46S, 61S)
6.121	55	Woods, Good, HSG B (10S, 20S, 22S, 43S, 46S, 50S, 60S, 61S, 214S)
2.634	77	Woods, Good, HSG D (10S, 20S, 22S, 30S, 43S, 46S, 50S, 60S, 61S, 214S)
17.143	61	TOTAL AREA

Post**Soil Listing (all nodes)**

Area (acres)	Soil Group	Subcatchment Numbers
3.712	HSG A	10S, 20S, 22S, 23S, 30S, 40S, 41S, 42S, 43S, 44S, 46S, 61S
9.582	HSG B	10S, 20S, 22S, 23S, 30S, 41S, 42S, 43S, 44S, 45S, 46S, 50S, 60S, 61S, 214S
0.183	HSG C	10S, 20S
3.666	HSG D	10S, 20S, 22S, 30S, 40S, 41S, 42S, 43S, 45S, 46S, 50S, 60S, 61S, 214S
0.000	Other	
17.143		TOTAL AREA

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Flow to CB 10P

Runoff Area=138,730 sf 3.23% Impervious Runoff Depth>0.39"
Flow Length=1,135' Tc=17.9 min CN=WQ Runoff=0.84 cfs 0.103 af

Subcatchment 20S: Flow to CB 20P

Runoff Area=102,298 sf 14.98% Impervious Runoff Depth>0.78"
Flow Length=578' Tc=16.9 min CN=WQ Runoff=1.30 cfs 0.153 af

Subcatchment 22S: Flow to Pond 22P

Runoff Area=75,133 sf 6.41% Impervious Runoff Depth>0.60"
Flow Length=363' Tc=9.5 min CN=WQ Runoff=0.86 cfs 0.086 af

Subcatchment 23S: Flow to Pond 22P

Runoff Area=31,796 sf 71.93% Impervious Runoff Depth>1.85"
Flow Length=412' Tc=6.0 min CN=WQ Runoff=1.41 cfs 0.113 af

Subcatchment 30S: Flow to CB 30P

Runoff Area=21,407 sf 23.53% Impervious Runoff Depth>1.29"
Flow Length=310' Slope=0.0100 '/' Tc=17.8 min CN=WQ Runoff=0.49 cfs 0.053 af

Subcatchment 40S: Flow to CB 40P

Runoff Area=6,946 sf 32.42% Impervious Runoff Depth>1.44"
Flow Length=126' Tc=6.3 min CN=WQ Runoff=0.25 cfs 0.019 af

Subcatchment 41S: Flow to 41P

Runoff Area=28,634 sf 1.45% Impervious Runoff Depth>0.30"
Flow Length=142' Tc=6.0 min CN=WQ Runoff=0.19 cfs 0.017 af

Subcatchment 42S: Flow to CB 42P

Runoff Area=6,835 sf 27.53% Impervious Runoff Depth>0.80"
Flow Length=128' Tc=8.1 min CN=WQ Runoff=0.12 cfs 0.010 af

Subcatchment 43S: Flow to CB 43P

Runoff Area=18,609 sf 12.79% Impervious Runoff Depth>0.52"
Flow Length=358' Tc=11.6 min CN=WQ Runoff=0.16 cfs 0.018 af

Subcatchment 44S: Flow to CB 44P

Runoff Area=2,206 sf 60.20% Impervious Runoff Depth>1.62"
Flow Length=54' Slope=0.1400 '/' Tc=6.0 min CN=WQ Runoff=0.08 cfs 0.007 af

Subcatchment 45S: Flow to CB 45P

Runoff Area=14,764 sf 8.05% Impervious Runoff Depth>0.51"
Flow Length=134' Tc=6.0 min CN=WQ Runoff=0.13 cfs 0.014 af

Subcatchment 46S: Flow to CB 46P

Runoff Area=12,239 sf 23.60% Impervious Runoff Depth>0.83"
Flow Length=258' Tc=10.0 min CN=WQ Runoff=0.22 cfs 0.019 af

Subcatchment 50S: Flow to Abutter

Runoff Area=11,007 sf 0.00% Impervious Runoff Depth>0.27"
Flow Length=213' Tc=10.6 min CN=WQ Runoff=0.04 cfs 0.006 af

Subcatchment 60S: Flow to Pond P60

Runoff Area=110,256 sf 0.00% Impervious Runoff Depth>0.21"
Flow Length=684' Tc=14.6 min CN=WQ Runoff=0.18 cfs 0.045 af

Subcatchment 61S: Flow to Abutter

Runoff Area=81,036 sf 3.10% Impervious Runoff Depth>0.21"
Flow Length=734' Tc=14.5 min CN=WQ Runoff=0.18 cfs 0.032 af

Subcatchment 214S: Flow to DCB 214

Runoff Area=84,870 sf 0.00% Impervious Runoff Depth>0.43"
Flow Length=816' Tc=15.2 min CN=WQ Runoff=0.55 cfs 0.069 af

Reach 20R: Overland Flow to 20P Avg. Flow Depth=0.05' Max Vel=3.75 fps Inflow=0.41 cfs 0.025 af
n=0.013 L=244.0' S=0.0922 '/' Capacity=1,102.26 cfs Outflow=0.41 cfs 0.025 af

Reach 46R: Flow from Driveway Culvert Avg. Flow Depth=0.45' Max Vel=0.36 fps Inflow=0.39 cfs 0.052 af
n=0.150 L=50.0' S=0.0074 '/' Capacity=12.13 cfs Outflow=0.38 cfs 0.052 af

Reach 60R: Flow to Driveway Culvert Avg. Flow Depth=0.01' Max Vel=0.64 fps Inflow=0.01 cfs 0.001 af
n=0.035 L=467.0' S=0.1499 '/' Capacity=166.52 cfs Outflow=0.01 cfs 0.000 af

Reach 210R: Overland Flow to 20P Avg. Flow Depth=0.06' Max Vel=3.93 fps Inflow=0.55 cfs 0.069 af
n=0.013 L=486.0' S=0.0874 '/' Capacity=1,073.41 cfs Outflow=0.54 cfs 0.069 af

Pond 10P: Existing CB Inflow=0.84 cfs 0.103 af
Primary=0.84 cfs 0.103 af

Pond 20P: Existing CB Inflow=1.84 cfs 0.247 af
Primary=1.84 cfs 0.247 af

Pond 21P: Infiltration Basin Peak Elev=469.70' Storage=3,284 cf Inflow=1.00 cfs 0.195 af
Discarded=0.12 cfs 0.125 af Primary=0.41 cfs 0.025 af Secondary=0.00 cfs 0.000 af Outflow=0.54 cfs 0.150 af

Pond 22P: Pocket Pond 22P Peak Elev=470.14' Storage=5,534 cf Inflow=2.14 cfs 0.199 af
Primary=1.00 cfs 0.195 af Secondary=0.00 cfs 0.000 af Outflow=1.00 cfs 0.195 af

Pond 23P: Sediment Forebay 23P Peak Elev=471.36' Storage=439 cf Inflow=2.16 cfs 0.199 af
Outflow=2.14 cfs 0.199 af

Pond 30P: Existing CB Inflow=0.49 cfs 0.053 af
Primary=0.49 cfs 0.053 af

Pond 40P: Existing CB Inflow=0.66 cfs 0.133 af
Primary=0.66 cfs 0.133 af

Pond 41P: Pocket Pond 41P Peak Elev=440.55' Storage=6,589 cf Inflow=0.64 cfs 0.067 af
Outflow=0.14 cfs 0.062 af

Pond 42P: CB 42P Peak Elev=443.63' Inflow=0.47 cfs 0.050 af
18.0" Round Culvert n=0.013 L=17.0' S=0.0782 '/' Outflow=0.47 cfs 0.050 af

Pond 43P: CB 43P Peak Elev=445.92' Inflow=0.36 cfs 0.040 af
18.0" Round Culvert n=0.013 L=38.0' S=0.0526 '/' Outflow=0.36 cfs 0.040 af

Pond 44P: DMH 44P Peak Elev=453.21' Inflow=0.21 cfs 0.021 af
15.0" Round Culvert n=0.013 L=79.0' S=0.0886 '/' Outflow=0.21 cfs 0.021 af

Pond 45P: CB 45P Peak Elev=465.96' Inflow=0.13 cfs 0.014 af
15.0" Round Culvert n=0.013 L=64.0' S=0.1219 '/' Outflow=0.13 cfs 0.014 af

Pond 46P: Driveway Culvert Peak Elev=431.32' Inflow=0.39 cfs 0.052 af
12.0" Round Culvert n=0.013 L=31.0' S=0.0161 '/' Outflow=0.39 cfs 0.052 af

Pond 60P: Pond for Runoff Requiring No Peak Elev=502.05' Storage=1,922 cf Inflow=0.18 cfs 0.045 af
Primary=0.01 cfs 0.001 af Secondary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.001 af

Post

Prepared by Keach-Nordstrom Associates, Inc

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Type III 24-hr 2 yr Rainfall=2.78"

Printed 12/31/2025

Page 6

Pond 211P: DMH 211P

Peak Elev=473.56' Inflow=0.55 cfs 0.069 af
18.0" Round Culvert n=0.013 L=128.0' S=0.0078 '/' Outflow=0.55 cfs 0.069 af

Pond 212P: DMH 212P

Peak Elev=479.57' Inflow=0.55 cfs 0.069 af
18.0" Round Culvert n=0.013 L=43.0' S=0.0988 '/' Outflow=0.55 cfs 0.069 af

Pond 213P: DMH 213P

Peak Elev=488.37' Inflow=0.55 cfs 0.069 af
18.0" Round Culvert n=0.013 L=38.0' S=0.1066 '/' Outflow=0.55 cfs 0.069 af

Pond 214P: CB 214P

Peak Elev=497.82' Inflow=0.55 cfs 0.069 af
18.0" Round Culvert n=0.013 L=45.0' S=0.0989 '/' Outflow=0.55 cfs 0.069 af

Pond 415P: Sediment Forebay 415P

Peak Elev=441.63' Storage=289 cf Inflow=0.47 cfs 0.050 af
Outflow=0.46 cfs 0.050 af

Link 50L: Flow to Abutters Map 7 Lots 36 & 36-1

Inflow=0.04 cfs 0.006 af
Primary=0.04 cfs 0.006 af

Link 60L: Flow from Site to Abutter Map 7 Lot 36-1

Inflow=0.18 cfs 0.032 af
Primary=0.18 cfs 0.032 af

Total Runoff Area = 17.143 ac Runoff Volume = 0.765 af Average Runoff Depth = 0.54"
90.98% Pervious = 15.597 ac 9.02% Impervious = 1.546 ac

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Flow to CB 10P

Runoff Area=138,730 sf 3.23% Impervious Runoff Depth>0.82"
Flow Length=1,135' Tc=17.9 min CN=WQ Runoff=1.93 cfs 0.219 af

Subcatchment 20S: Flow to CB 20P

Runoff Area=102,298 sf 14.98% Impervious Runoff Depth>1.49"
Flow Length=578' Tc=16.9 min CN=WQ Runoff=2.65 cfs 0.291 af

Subcatchment 22S: Flow to Pond 22P

Runoff Area=75,133 sf 6.41% Impervious Runoff Depth>1.24"
Flow Length=363' Tc=9.5 min CN=WQ Runoff=1.99 cfs 0.178 af

Subcatchment 23S: Flow to Pond 22P

Runoff Area=31,796 sf 71.93% Impervious Runoff Depth>2.80"
Flow Length=412' Tc=6.0 min CN=WQ Runoff=2.10 cfs 0.171 af

Subcatchment 30S: Flow to CB 30P

Runoff Area=21,407 sf 23.53% Impervious Runoff Depth>2.25"
Flow Length=310' Slope=0.0100 '/' Tc=17.8 min CN=WQ Runoff=0.87 cfs 0.092 af

Subcatchment 40S: Flow to CB 40P

Runoff Area=6,946 sf 32.42% Impervious Runoff Depth>2.42"
Flow Length=126' Tc=6.3 min CN=WQ Runoff=0.42 cfs 0.032 af

Subcatchment 41S: Flow to 41P

Runoff Area=28,634 sf 1.45% Impervious Runoff Depth>0.67"
Flow Length=142' Tc=6.0 min CN=WQ Runoff=0.45 cfs 0.036 af

Subcatchment 42S: Flow to CB 42P

Runoff Area=6,835 sf 27.53% Impervious Runoff Depth>1.31"
Flow Length=128' Tc=8.1 min CN=WQ Runoff=0.19 cfs 0.017 af

Subcatchment 43S: Flow to CB 43P

Runoff Area=18,609 sf 12.79% Impervious Runoff Depth>1.04"
Flow Length=358' Tc=11.6 min CN=WQ Runoff=0.34 cfs 0.037 af

Subcatchment 44S: Flow to CB 44P

Runoff Area=2,206 sf 60.20% Impervious Runoff Depth>2.55"
Flow Length=54' Slope=0.1400 '/' Tc=6.0 min CN=WQ Runoff=0.13 cfs 0.011 af

Subcatchment 45S: Flow to CB 45P

Runoff Area=14,764 sf 8.05% Impervious Runoff Depth>1.14"
Flow Length=134' Tc=6.0 min CN=WQ Runoff=0.38 cfs 0.032 af

Subcatchment 46S: Flow to CB 46P

Runoff Area=12,239 sf 23.60% Impervious Runoff Depth>1.36"
Flow Length=258' Tc=10.0 min CN=WQ Runoff=0.35 cfs 0.032 af

Subcatchment 50S: Flow to Abutter

Runoff Area=11,007 sf 0.00% Impervious Runoff Depth>0.74"
Flow Length=213' Tc=10.6 min CN=WQ Runoff=0.13 cfs 0.016 af

Subcatchment 60S: Flow to Pond P60

Runoff Area=110,256 sf 0.00% Impervious Runoff Depth>0.67"
Flow Length=684' Tc=14.6 min CN=WQ Runoff=1.05 cfs 0.140 af

Subcatchment 61S: Flow to Abutter

Runoff Area=81,036 sf 3.10% Impervious Runoff Depth>0.54"
Flow Length=734' Tc=14.5 min CN=WQ Runoff=0.63 cfs 0.084 af

Subcatchment 214S: Flow to DCB 214

Runoff Area=84,870 sf 0.00% Impervious Runoff Depth>1.02"
Flow Length=816' Tc=15.2 min CN=WQ Runoff=1.49 cfs 0.166 af

Reach 20R: Overland Flow to 20P Avg. Flow Depth=0.09' Max Vel=5.19 fps Inflow=1.23 cfs 0.141 af
n=0.013 L=244.0' S=0.0922 '/' Capacity=1,102.26 cfs Outflow=1.23 cfs 0.141 af

Reach 46R: Flow from Driveway Culvert Avg. Flow Depth=0.67' Max Vel=0.45 fps Inflow=0.91 cfs 0.210 af
n=0.150 L=50.0' S=0.0074 '/' Capacity=12.13 cfs Outflow=0.90 cfs 0.209 af

Reach 60R: Flow to Driveway Culvert Avg. Flow Depth=0.05' Max Vel=1.69 fps Inflow=0.25 cfs 0.095 af
n=0.035 L=467.0' S=0.1499 '/' Capacity=166.52 cfs Outflow=0.25 cfs 0.094 af

Reach 210R: Overland Flow to 20P Avg. Flow Depth=0.09' Max Vel=5.38 fps Inflow=1.50 cfs 0.166 af
n=0.013 L=486.0' S=0.0874 '/' Capacity=1,073.41 cfs Outflow=1.48 cfs 0.166 af

Pond 10P: Existing CB Inflow=1.93 cfs 0.219 af
Primary=1.93 cfs 0.219 af

Pond 20P: Existing CB Inflow=4.13 cfs 0.598 af
Primary=4.13 cfs 0.598 af

Pond 21P: Infiltration Basin Peak Elev=469.75' Storage=3,377 cf Inflow=1.43 cfs 0.343 af
Discarded=0.13 cfs 0.140 af Primary=1.23 cfs 0.141 af Secondary=0.00 cfs 0.000 af Outflow=1.35 cfs 0.281 af

Pond 22P: Pocket Pond 22P Peak Elev=470.82' Storage=7,279 cf Inflow=3.87 cfs 0.348 af
Primary=1.43 cfs 0.343 af Secondary=0.00 cfs 0.000 af Outflow=1.43 cfs 0.343 af

Pond 23P: Sediment Forebay 23P Peak Elev=471.51' Storage=514 cf Inflow=3.89 cfs 0.348 af
Outflow=3.87 cfs 0.348 af

Pond 30P: Existing CB Inflow=0.87 cfs 0.092 af
Primary=0.87 cfs 0.092 af

Pond 40P: Existing CB Inflow=1.30 cfs 0.368 af
Primary=1.30 cfs 0.368 af

Pond 41P: Pocket Pond 41P Peak Elev=441.01' Storage=7,780 cf Inflow=1.41 cfs 0.133 af
Outflow=0.21 cfs 0.127 af

Pond 42P: CB 42P Peak Elev=443.77' Inflow=0.99 cfs 0.097 af
18.0" Round Culvert n=0.013 L=17.0' S=0.0782 '/' Outflow=0.99 cfs 0.097 af

Pond 43P: CB 43P Peak Elev=446.06' Inflow=0.80 cfs 0.080 af
18.0" Round Culvert n=0.013 L=38.0' S=0.0526 '/' Outflow=0.80 cfs 0.080 af

Pond 44P: DMH 44P Peak Elev=453.33' Inflow=0.51 cfs 0.043 af
15.0" Round Culvert n=0.013 L=79.0' S=0.0886 '/' Outflow=0.51 cfs 0.043 af

Pond 45P: CB 45P Peak Elev=466.08' Inflow=0.38 cfs 0.032 af
15.0" Round Culvert n=0.013 L=64.0' S=0.1219 '/' Outflow=0.38 cfs 0.032 af

Pond 46P: Driveway Culvert Peak Elev=431.54' Inflow=0.91 cfs 0.210 af
12.0" Round Culvert n=0.013 L=31.0' S=0.0161 '/' Outflow=0.91 cfs 0.210 af

Pond 60P: Pond for Runoff Requiring No Peak Elev=502.26' Storage=2,242 cf Inflow=1.05 cfs 0.140 af
Primary=0.25 cfs 0.095 af Secondary=0.00 cfs 0.000 af Outflow=0.25 cfs 0.095 af

Pond 211P: DMH 211P

Peak Elev=473.64' Inflow=1.49 cfs 0.166 af
18.0" Round Culvert n=0.013 L=128.0' S=0.0078 '/' Outflow=1.50 cfs 0.166 af

Pond 212P: DMH 212P

Peak Elev=479.80' Inflow=1.49 cfs 0.166 af
18.0" Round Culvert n=0.013 L=43.0' S=0.0988 '/' Outflow=1.49 cfs 0.166 af

Pond 213P: DMH 213P

Peak Elev=488.60' Inflow=1.49 cfs 0.166 af
18.0" Round Culvert n=0.013 L=38.0' S=0.1066 '/' Outflow=1.49 cfs 0.166 af

Pond 214P: CB 214P

Peak Elev=498.05' Inflow=1.49 cfs 0.166 af
18.0" Round Culvert n=0.013 L=45.0' S=0.0989 '/' Outflow=1.49 cfs 0.166 af

Pond 415P: Sediment Forebay 415P

Peak Elev=441.72' Storage=319 cf Inflow=0.99 cfs 0.097 af
Outflow=0.98 cfs 0.097 af

Link 50L: Flow to Abutters Map 7 Lots 36 & 36-1

Inflow=0.13 cfs 0.016 af
Primary=0.13 cfs 0.016 af

Link 60L: Flow from Site to Abutter Map 7 Lot 36-1

Inflow=0.63 cfs 0.178 af
Primary=0.63 cfs 0.178 af

Total Runoff Area = 17.143 ac Runoff Volume = 1.553 af Average Runoff Depth = 1.09"
90.98% Pervious = 15.597 ac 9.02% Impervious = 1.546 ac

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Flow to CB 10P

Runoff Area=138,730 sf 3.23% Impervious Runoff Depth>1.23"
Flow Length=1,135' Tc=17.9 min CN=WQ Runoff=2.99 cfs 0.325 af

Subcatchment 20S: Flow to CB 20P

Runoff Area=102,298 sf 14.98% Impervious Runoff Depth>2.12"
Flow Length=578' Tc=16.9 min CN=WQ Runoff=3.87 cfs 0.414 af

Subcatchment 22S: Flow to Pond 22P

Runoff Area=75,133 sf 6.41% Impervious Runoff Depth>1.82"
Flow Length=363' Tc=9.5 min CN=WQ Runoff=3.01 cfs 0.262 af

Subcatchment 23S: Flow to Pond 22P

Runoff Area=31,796 sf 71.93% Impervious Runoff Depth>3.57"
Flow Length=412' Tc=6.0 min CN=WQ Runoff=2.63 cfs 0.217 af

Subcatchment 30S: Flow to CB 30P

Runoff Area=21,407 sf 23.53% Impervious Runoff Depth>3.05"
Flow Length=310' Slope=0.0100 '/' Tc=17.8 min CN=WQ Runoff=1.19 cfs 0.125 af

Subcatchment 40S: Flow to CB 40P

Runoff Area=6,946 sf 32.42% Impervious Runoff Depth>3.22"
Flow Length=126' Tc=6.3 min CN=WQ Runoff=0.55 cfs 0.043 af

Subcatchment 41S: Flow to 41P

Runoff Area=28,634 sf 1.45% Impervious Runoff Depth>1.05"
Flow Length=142' Tc=6.0 min CN=WQ Runoff=0.69 cfs 0.057 af

Subcatchment 42S: Flow to CB 42P

Runoff Area=6,835 sf 27.53% Impervious Runoff Depth>1.78"
Flow Length=128' Tc=8.1 min CN=WQ Runoff=0.25 cfs 0.023 af

Subcatchment 43S: Flow to CB 43P

Runoff Area=18,609 sf 12.79% Impervious Runoff Depth>1.55"
Flow Length=358' Tc=11.6 min CN=WQ Runoff=0.54 cfs 0.055 af

Subcatchment 44S: Flow to CB 44P

Runoff Area=2,206 sf 60.20% Impervious Runoff Depth>3.31"
Flow Length=54' Slope=0.1400 '/' Tc=6.0 min CN=WQ Runoff=0.17 cfs 0.014 af

Subcatchment 45S: Flow to CB 45P

Runoff Area=14,764 sf 8.05% Impervious Runoff Depth>1.73"
Flow Length=134' Tc=6.0 min CN=WQ Runoff=0.62 cfs 0.049 af

Subcatchment 46S: Flow to CB 46P

Runoff Area=12,239 sf 23.60% Impervious Runoff Depth>1.84"
Flow Length=258' Tc=10.0 min CN=WQ Runoff=0.46 cfs 0.043 af

Subcatchment 50S: Flow to Abutter

Runoff Area=11,007 sf 0.00% Impervious Runoff Depth>1.22"
Flow Length=213' Tc=10.6 min CN=WQ Runoff=0.25 cfs 0.026 af

Subcatchment 60S: Flow to Pond P60

Runoff Area=110,256 sf 0.00% Impervious Runoff Depth>1.14"
Flow Length=684' Tc=14.6 min CN=WQ Runoff=2.15 cfs 0.240 af

Subcatchment 61S: Flow to Abutter

Runoff Area=81,036 sf 3.10% Impervious Runoff Depth>0.89"
Flow Length=734' Tc=14.5 min CN=WQ Runoff=1.21 cfs 0.137 af

Subcatchment 214S: Flow to DCB 214

Runoff Area=84,870 sf 0.00% Impervious Runoff Depth>1.59"
Flow Length=816' Tc=15.2 min CN=WQ Runoff=2.50 cfs 0.258 af

Reach 20R: Overland Flow to 20P Avg. Flow Depth=0.11' Max Vel=6.09 fps Inflow=2.08 cfs 0.252 af
n=0.013 L=244.0' S=0.0922 '/' Capacity=1,102.26 cfs Outflow=2.08 cfs 0.252 af

Reach 46R: Flow from Driveway Culvert Avg. Flow Depth=0.85' Max Vel=0.52 fps Inflow=1.58 cfs 0.373 af
n=0.150 L=50.0' S=0.0074 '/' Capacity=12.13 cfs Outflow=1.57 cfs 0.373 af

Reach 60R: Flow to Driveway Culvert Avg. Flow Depth=0.08' Max Vel=2.32 fps Inflow=0.69 cfs 0.194 af
n=0.035 L=467.0' S=0.1499 '/' Capacity=166.52 cfs Outflow=0.69 cfs 0.193 af

Reach 210R: Overland Flow to 20P Avg. Flow Depth=0.12' Max Vel=6.29 fps Inflow=2.52 cfs 0.258 af
n=0.013 L=486.0' S=0.0874 '/' Capacity=1,073.41 cfs Outflow=2.48 cfs 0.258 af

Pond 10P: Existing CB Inflow=2.99 cfs 0.325 af
Primary=2.99 cfs 0.325 af

Pond 20P: Existing CB Inflow=7.97 cfs 0.924 af
Primary=7.97 cfs 0.924 af

Pond 21P: Infiltration Basin Peak Elev=469.79' Storage=3,448 cf Inflow=2.21 cfs 0.469 af
Discarded=0.13 cfs 0.148 af Primary=2.01 cfs 0.250 af Secondary=0.07 cfs 0.002 af Outflow=2.21 cfs 0.400 af

Pond 22P: Pocket Pond 22P Peak Elev=471.24' Storage=8,575 cf Inflow=5.37 cfs 0.478 af
Primary=2.21 cfs 0.469 af Secondary=0.00 cfs 0.000 af Outflow=2.21 cfs 0.469 af

Pond 23P: Sediment Forebay 23P Peak Elev=471.63' Storage=573 cf Inflow=5.40 cfs 0.479 af
Outflow=5.37 cfs 0.478 af

Pond 30P: Existing CB Inflow=1.19 cfs 0.125 af
Primary=1.19 cfs 0.125 af

Pond 40P: Existing CB Inflow=2.09 cfs 0.605 af
Primary=2.09 cfs 0.605 af

Pond 41P: Pocket Pond 41P Peak Elev=441.46' Storage=9,058 cf Inflow=2.14 cfs 0.199 af
Outflow=0.26 cfs 0.189 af

Pond 42P: CB 42P Peak Elev=443.88' Inflow=1.50 cfs 0.141 af
18.0" Round Culvert n=0.013 L=17.0' S=0.0782 '/' Outflow=1.50 cfs 0.141 af

Pond 43P: CB 43P Peak Elev=446.16' Inflow=1.25 cfs 0.118 af
18.0" Round Culvert n=0.013 L=38.0' S=0.0526 '/' Outflow=1.25 cfs 0.118 af

Pond 44P: DMH 44P Peak Elev=453.42' Inflow=0.79 cfs 0.063 af
15.0" Round Culvert n=0.013 L=79.0' S=0.0886 '/' Outflow=0.79 cfs 0.063 af

Pond 45P: CB 45P Peak Elev=466.17' Inflow=0.62 cfs 0.049 af
15.0" Round Culvert n=0.013 L=64.0' S=0.1219 '/' Outflow=0.62 cfs 0.049 af

Pond 46P: Driveway Culvert Peak Elev=431.77' Inflow=1.58 cfs 0.373 af
12.0" Round Culvert n=0.013 L=31.0' S=0.0161 '/' Outflow=1.58 cfs 0.373 af

Pond 60P: Pond for Runoff Requiring No Peak Elev=502.84' Storage=3,267 cf Inflow=2.15 cfs 0.240 af
Primary=0.69 cfs 0.194 af Secondary=0.00 cfs 0.000 af Outflow=0.69 cfs 0.194 af

Post

Prepared by Keach-Nordstrom Associates, Inc

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Type III 24-hr 25 yr Rainfall=5.01"

Printed 12/31/2025

Page 12

Pond 211P: DMH 211P

Peak Elev=473.74' Inflow=2.50 cfs 0.258 af
18.0" Round Culvert n=0.013 L=128.0' S=0.0078 '/' Outflow=2.52 cfs 0.258 af

Pond 212P: DMH 212P

Peak Elev=479.98' Inflow=2.50 cfs 0.258 af
18.0" Round Culvert n=0.013 L=43.0' S=0.0988 '/' Outflow=2.50 cfs 0.258 af

Pond 213P: DMH 213P

Peak Elev=488.78' Inflow=2.50 cfs 0.258 af
18.0" Round Culvert n=0.013 L=38.0' S=0.1066 '/' Outflow=2.50 cfs 0.258 af

Pond 214P: CB 214P

Peak Elev=498.23' Inflow=2.50 cfs 0.258 af
18.0" Round Culvert n=0.013 L=45.0' S=0.0989 '/' Outflow=2.50 cfs 0.258 af

Pond 415P: Sediment Forebay 415P

Peak Elev=441.79' Storage=345 cf Inflow=1.50 cfs 0.141 af
Outflow=1.49 cfs 0.141 af

Link 50L: Flow to Abutters Map 7 Lots 36 & 36-1

Inflow=0.25 cfs 0.026 af
Primary=0.25 cfs 0.026 af

Link 60L: Flow from Site to Abutter Map 7 Lot 36-1

Inflow=1.29 cfs 0.330 af
Primary=1.29 cfs 0.330 af

Total Runoff Area = 17.143 ac Runoff Volume = 2.288 af Average Runoff Depth = 1.60"
90.98% Pervious = 15.597 ac 9.02% Impervious = 1.546 ac

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Flow to CB 10P

Runoff Area=138,730 sf 3.23% Impervious Runoff Depth>1.64"
Flow Length=1,135' Tc=17.9 min CN=WQ Runoff=4.05 cfs 0.435 af

Subcatchment 20S: Flow to CB 20P

Runoff Area=102,298 sf 14.98% Impervious Runoff Depth>2.73"
Flow Length=578' Tc=16.9 min CN=WQ Runoff=5.06 cfs 0.535 af

Subcatchment 22S: Flow to Pond 22P

Runoff Area=75,133 sf 6.41% Impervious Runoff Depth>2.40"
Flow Length=363' Tc=9.5 min CN=WQ Runoff=4.02 cfs 0.345 af

Subcatchment 23S: Flow to Pond 22P

Runoff Area=31,796 sf 71.93% Impervious Runoff Depth>4.28"
Flow Length=412' Tc=6.0 min CN=WQ Runoff=3.12 cfs 0.261 af

Subcatchment 30S: Flow to CB 30P

Runoff Area=21,407 sf 23.53% Impervious Runoff Depth>3.80"
Flow Length=310' Slope=0.0100 '/' Tc=17.8 min CN=WQ Runoff=1.48 cfs 0.156 af

Subcatchment 40S: Flow to CB 40P

Runoff Area=6,946 sf 32.42% Impervious Runoff Depth>3.97"
Flow Length=126' Tc=6.3 min CN=WQ Runoff=0.68 cfs 0.053 af

Subcatchment 41S: Flow to 41P

Runoff Area=28,634 sf 1.45% Impervious Runoff Depth>1.46"
Flow Length=142' Tc=6.0 min CN=WQ Runoff=0.92 cfs 0.080 af

Subcatchment 42S: Flow to CB 42P

Runoff Area=6,835 sf 27.53% Impervious Runoff Depth>2.26"
Flow Length=128' Tc=8.1 min CN=WQ Runoff=0.31 cfs 0.030 af

Subcatchment 43S: Flow to CB 43P

Runoff Area=18,609 sf 12.79% Impervious Runoff Depth>2.07"
Flow Length=358' Tc=11.6 min CN=WQ Runoff=0.75 cfs 0.074 af

Subcatchment 44S: Flow to CB 44P

Runoff Area=2,206 sf 60.20% Impervious Runoff Depth>4.03"
Flow Length=54' Slope=0.1400 '/' Tc=6.0 min CN=WQ Runoff=0.21 cfs 0.017 af

Subcatchment 45S: Flow to CB 45P

Runoff Area=14,764 sf 8.05% Impervious Runoff Depth>2.32"
Flow Length=134' Tc=6.0 min CN=WQ Runoff=0.86 cfs 0.066 af

Subcatchment 46S: Flow to CB 46P

Runoff Area=12,239 sf 23.60% Impervious Runoff Depth>2.32"
Flow Length=258' Tc=10.0 min CN=WQ Runoff=0.56 cfs 0.054 af

Subcatchment 50S: Flow to Abutter

Runoff Area=11,007 sf 0.00% Impervious Runoff Depth>1.72"
Flow Length=213' Tc=10.6 min CN=WQ Runoff=0.39 cfs 0.036 af

Subcatchment 60S: Flow to Pond P60

Runoff Area=110,256 sf 0.00% Impervious Runoff Depth>1.63"
Flow Length=684' Tc=14.6 min CN=WQ Runoff=3.33 cfs 0.345 af

Subcatchment 61S: Flow to Abutter

Runoff Area=81,036 sf 3.10% Impervious Runoff Depth>1.26"
Flow Length=734' Tc=14.5 min CN=WQ Runoff=1.82 cfs 0.196 af

Subcatchment 214S: Flow to DCB 214

Runoff Area=84,870 sf 0.00% Impervious Runoff Depth>2.16"
Flow Length=816' Tc=15.2 min CN=WQ Runoff=3.51 cfs 0.351 af

Reach 20R: Overland Flow to 20P Avg. Flow Depth=0.13' Max Vel=6.72 fps Inflow=2.87 cfs 0.366 af
n=0.013 L=244.0' S=0.0922 '/' Capacity=1,102.26 cfs Outflow=2.87 cfs 0.366 af

Reach 46R: Flow from Driveway Culvert Avg. Flow Depth=1.04' Max Vel=0.58 fps Inflow=2.49 cfs 0.547 af
n=0.150 L=50.0' S=0.0074 '/' Capacity=12.13 cfs Outflow=2.48 cfs 0.547 af

Reach 60R: Flow to Driveway Culvert Avg. Flow Depth=0.11' Max Vel=2.88 fps Inflow=1.40 cfs 0.298 af
n=0.035 L=467.0' S=0.1499 '/' Capacity=166.52 cfs Outflow=1.40 cfs 0.297 af

Reach 210R: Overland Flow to 20P Avg. Flow Depth=0.14' Max Vel=6.99 fps Inflow=3.53 cfs 0.351 af
n=0.013 L=486.0' S=0.0874 '/' Capacity=1,073.41 cfs Outflow=3.50 cfs 0.351 af

Pond 10P: Existing CB Inflow=4.05 cfs 0.435 af
Primary=4.05 cfs 0.435 af

Pond 20P: Existing CB Inflow=10.99 cfs 1.252 af
Primary=10.99 cfs 1.252 af

Pond 21P: Infiltration Basin Peak Elev=469.82' Storage=3,504 cf Inflow=3.01 cfs 0.593 af
Discarded=0.13 cfs 0.154 af Primary=2.70 cfs 0.359 af Secondary=0.17 cfs 0.008 af Outflow=3.00 cfs 0.521 af

Pond 22P: Pocket Pond 22P Peak Elev=471.52' Storage=9,741 cf Inflow=6.81 cfs 0.605 af
Primary=3.01 cfs 0.593 af Secondary=0.00 cfs 0.000 af Outflow=3.01 cfs 0.593 af

Pond 23P: Sediment Forebay 23P Peak Elev=471.74' Storage=634 cf Inflow=6.85 cfs 0.606 af
Outflow=6.81 cfs 0.605 af

Pond 30P: Existing CB Inflow=1.48 cfs 0.156 af
Primary=1.48 cfs 0.156 af

Pond 40P: Existing CB Inflow=3.67 cfs 0.851 af
Primary=3.67 cfs 0.851 af

Pond 41P: Pocket Pond 41P Peak Elev=441.67' Storage=9,713 cf Inflow=2.88 cfs 0.266 af
Outflow=1.04 cfs 0.251 af

Pond 42P: CB 42P Peak Elev=443.98' Inflow=2.01 cfs 0.186 af
18.0" Round Culvert n=0.013 L=17.0' S=0.0782 '/' Outflow=2.01 cfs 0.186 af

Pond 43P: CB 43P Peak Elev=446.25' Inflow=1.70 cfs 0.156 af
18.0" Round Culvert n=0.013 L=38.0' S=0.0526 '/' Outflow=1.70 cfs 0.156 af

Pond 44P: DMH 44P Peak Elev=453.49' Inflow=1.07 cfs 0.083 af
15.0" Round Culvert n=0.013 L=79.0' S=0.0886 '/' Outflow=1.07 cfs 0.083 af

Pond 45P: CB 45P Peak Elev=466.24' Inflow=0.86 cfs 0.066 af
15.0" Round Culvert n=0.013 L=64.0' S=0.1219 '/' Outflow=0.86 cfs 0.066 af

Pond 46P: Driveway Culvert Peak Elev=432.04' Inflow=2.49 cfs 0.547 af
12.0" Round Culvert n=0.013 L=31.0' S=0.0161 '/' Outflow=2.49 cfs 0.547 af

Pond 60P: Pond for Runoff Requiring No Peak Elev=503.43' Storage=4,498 cf Inflow=3.33 cfs 0.345 af
Primary=1.40 cfs 0.298 af Secondary=0.00 cfs 0.000 af Outflow=1.40 cfs 0.298 af

Post

Prepared by Keach-Nordstrom Associates, Inc

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Type III 24-hr 50 yr Rainfall=5.89"

Printed 12/31/2025

Page 15

Pond 211P: DMH 211P

Peak Elev=473.88' Inflow=3.51 cfs 0.351 af
18.0" Round Culvert n=0.013 L=128.0' S=0.0078 '/' Outflow=3.53 cfs 0.351 af

Pond 212P: DMH 212P

Peak Elev=480.14' Inflow=3.51 cfs 0.351 af
18.0" Round Culvert n=0.013 L=43.0' S=0.0988 '/' Outflow=3.51 cfs 0.351 af

Pond 213P: DMH 213P

Peak Elev=488.94' Inflow=3.51 cfs 0.351 af
18.0" Round Culvert n=0.013 L=38.0' S=0.1066 '/' Outflow=3.51 cfs 0.351 af

Pond 214P: CB 214P

Peak Elev=498.39' Inflow=3.51 cfs 0.351 af
18.0" Round Culvert n=0.013 L=45.0' S=0.0989 '/' Outflow=3.51 cfs 0.351 af

Pond 415P: Sediment Forebay 415P

Peak Elev=441.84' Storage=368 cf Inflow=2.01 cfs 0.186 af
Outflow=2.00 cfs 0.186 af

Link 50L: Flow to Abutters Map 7 Lots 36 & 36-1

Inflow=0.39 cfs 0.036 af
Primary=0.39 cfs 0.036 af

Link 60L: Flow from Site to Abutter Map 7 Lot 36-1

Inflow=2.26 cfs 0.493 af
Primary=2.26 cfs 0.493 af

Total Runoff Area = 17.143 ac Runoff Volume = 3.033 af Average Runoff Depth = 2.12"
90.98% Pervious = 15.597 ac 9.02% Impervious = 1.546 ac

Summary for Subcatchment 10S: Flow to CB 10P

Runoff = 1.93 cfs @ 12.26 hrs, Volume= 0.219 af, Depth> 0.82"
 Routed to Pond 10P : Existing CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description			
3,674	98	Paved parking, HSG B			
6,224	61	>75% Grass cover, Good, HSG B			
801	98	Water Surface, HSG C			
49,768	30	Woods, Good, HSG A			
39,726	55	Woods, Good, HSG B			
38,537	77	Woods, Good, HSG D			
138,730		Weighted Average			
134,255		96.77% Pervious Area			
4,475		3.23% Impervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.2100	0.19		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
8.9	1,035	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
17.9	1,135	Total			

Summary for Subcatchment 20S: Flow to CB 20P

Runoff = 2.65 cfs @ 12.24 hrs, Volume= 0.291 af, Depth> 1.49"
 Routed to Pond 20P : Existing CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description			
8,155	98	Paved parking, HSG B			
7,166	98	Water Surface, HSG C			
7,214	39	>75% Grass cover, Good, HSG A			
39,175	61	>75% Grass cover, Good, HSG B			
12,295	80	>75% Grass cover, Good, HSG D			
2,837	30	Woods, Good, HSG A			
8,405	55	Woods, Good, HSG B			
17,051	77	Woods, Good, HSG D			
102,298		Weighted Average			
86,977		85.02% Pervious Area			
15,321		14.98% Impervious Area			

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	60	0.0600	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 2.78"
6.0	32	0.0600	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
0.9	8	0.0600	0.15		Sheet Flow, Grass: Short n= 0.150 P2= 2.78"
5.5	478	0.0840	1.45		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
16.9	578	Total			

Summary for Subcatchment 22S: Flow to Pond 22P

Runoff = 1.99 cfs @ 12.14 hrs, Volume= 0.178 af, Depth> 1.24"
 Routed to Pond 23P : Sediment Forebay 23P

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
29	98	Paved parking, HSG A
169	98	Paved parking, HSG B
9,272	39	>75% Grass cover, Good, HSG A
32,594	61	>75% Grass cover, Good, HSG B
13,821	80	>75% Grass cover, Good, HSG D
1,564	30	Woods, Good, HSG A
4,368	55	Woods, Good, HSG B
8,700	77	Woods, Good, HSG D
1,328	98	Roofs, HSG A
3,258	98	Roofs, HSG B
30	98	Roofs, HSG D
75,133		Weighted Average
70,319		93.59% Pervious Area
4,814		6.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.3400	0.22		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
2.1	263	0.1790	2.12		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
9.5	363	Total			

Summary for Subcatchment 23S: Flow to Pond 22P

Runoff = 2.10 cfs @ 12.08 hrs, Volume= 0.171 af, Depth> 2.80"
 Routed to Pond 23P : Sediment Forebay 23P

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
6,715	39	>75% Grass cover, Good, HSG A
2,210	61	>75% Grass cover, Good, HSG B
1,562	98	Roofs, HSG A
3,736	98	Roofs, HSG B
10,663	98	Paved parking, HSG A
6,910	98	Paved parking, HSG B

31,796	Weighted Average
8,925	28.07% Pervious Area
22,871	71.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	100	0.0100	0.97		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.78"
2.1	312	0.0150	2.49		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.8	412	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 30S: Flow to CB 30P

Runoff = 0.87 cfs @ 12.24 hrs, Volume= 0.092 af, Depth> 2.25"
Routed to Pond 30P : Existing CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
5,038	98	Paved parking, HSG A
214	61	>75% Grass cover, Good, HSG B
4,495	80	>75% Grass cover, Good, HSG D
995	30	Woods, Good, HSG A
10,665	77	Woods, Good, HSG D

21,407	Weighted Average
16,369	76.47% Pervious Area
5,038	23.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0100	0.07		Sheet Flow, Grass: Dense n= 0.240 P2= 2.78"
6.2	260	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
17.8	310	Total			

Summary for Subcatchment 40S: Flow to CB 40P

Runoff = 0.42 cfs @ 12.09 hrs, Volume= 0.032 af, Depth> 2.42"
 Routed to Pond 40P : Existing CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
739	39	>75% Grass cover, Good, HSG A
3,955	80	>75% Grass cover, Good, HSG D
320	98	Paved parking, HSG D
1,932	98	Paved parking, HSG A
6,946		Weighted Average
4,694		67.58% Pervious Area
2,252		32.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	100	0.0800	0.28		Sheet Flow, Grass: Short n= 0.150 P2= 2.78"
0.3	26	0.0100	1.50		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
6.3	126	Total			

Summary for Subcatchment 41S: Flow to 41P

Runoff = 0.45 cfs @ 12.09 hrs, Volume= 0.036 af, Depth> 0.67"
 Routed to Pond 41P : Pocket Pond 41P

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
414	98	Paved parking, HSG A
15,817	39	>75% Grass cover, Good, HSG A
7,268	61	>75% Grass cover, Good, HSG B
5,135	80	>75% Grass cover, Good, HSG D
28,634		Weighted Average
28,220		98.55% Pervious Area
414		1.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	91	0.2200	0.41		Sheet Flow, Grass: Short n= 0.150 P2= 2.78"
0.2	51	0.5000	4.95		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.9	142	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 42S: Flow to CB 42P

Runoff = 0.19 cfs @ 12.11 hrs, Volume= 0.017 af, Depth> 1.31"
 Routed to Pond 42P : CB 42P

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
1,038	98	Paved parking, HSG A
844	98	Paved parking, HSG B
3,444	39	>75% Grass cover, Good, HSG A
1,216	61	>75% Grass cover, Good, HSG B
293	80	>75% Grass cover, Good, HSG D
6,835		Weighted Average
4,953		72.47% Pervious Area
1,882		27.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.2800	0.21		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
0.1	28	0.1070	4.91		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
8.1	128	Total			

Summary for Subcatchment 43S: Flow to CB 43P

Runoff = 0.34 cfs @ 12.17 hrs, Volume= 0.037 af, Depth> 1.04"
 Routed to Pond 43P : CB 43P

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
2,222	98	Paved parking, HSG A
158	98	Paved parking, HSG B
2,678	39	>75% Grass cover, Good, HSG A
1,972	61	>75% Grass cover, Good, HSG B
1,094	80	>75% Grass cover, Good, HSG D
10,023	55	Woods, Good, HSG B
462	77	Woods, Good, HSG D
18,609		Weighted Average
16,229		87.21% Pervious Area
2,380		12.79% Impervious Area

Post

Type III 24-hr 10 yr Rainfall=4.04"

Prepared by Keach-Nordstrom Associates, Inc

Printed 12/31/2025

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Page 7

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.1500	0.16		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
0.9	126	0.2220	2.36		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.4	132	0.1212	5.22		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
11.6	358	Total			

Summary for Subcatchment 44S: Flow to CB 44P

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af, Depth> 2.55"
 Routed to Pond 44P : DMH 44P

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
200	39	>75% Grass cover, Good, HSG A
55	98	Paved parking, HSG A
1,273	98	Paved parking, HSG B
678	61	>75% Grass cover, Good, HSG B
2,206		Weighted Average
878		39.80% Pervious Area
1,328		60.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	54	0.1400	0.31		Sheet Flow, Grass: Short n= 0.150 P2= 2.78"
2.9	54	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 45S: Flow to CB 45P

Runoff = 0.38 cfs @ 12.10 hrs, Volume= 0.032 af, Depth> 1.14"
 Routed to Pond 45P : CB 45P

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
1,189	98	Paved parking, HSG B
7,924	61	>75% Grass cover, Good, HSG B
621	80	>75% Grass cover, Good, HSG D
4,853	61	>75% Grass cover, Good, HSG B
177	80	>75% Grass cover, Good, HSG D
14,764		Weighted Average
13,575		91.95% Pervious Area
1,189		8.05% Impervious Area

Post

Type III 24-hr 10 yr Rainfall=4.04"

Prepared by Keach-Nordstrom Associates, Inc

Printed 12/31/2025

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Page 8

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	100	0.1800	0.38		Sheet Flow, Grass: Short n= 0.150 P2= 2.78"
0.2	34	0.2540	3.53		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.6	134	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 46S: Flow to CB 46P

Runoff = 0.35 cfs @ 12.14 hrs, Volume= 0.032 af, Depth> 1.36"
 Routed to Pond 46P : Driveway Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
2,876	98	Paved parking, HSG A
13	98	Paved parking, HSG D
6,407	39	>75% Grass cover, Good, HSG A
2,290	80	>75% Grass cover, Good, HSG D
276	30	Woods, Good, HSG A
114	55	Woods, Good, HSG B
263	77	Woods, Good, HSG D
12,239		Weighted Average
9,350		76.40% Pervious Area
2,889		23.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.2100	0.19		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
1.0	158	0.1500	2.71		Shallow Concentrated Flow, Shallow Short Grass Pasture Kv= 7.0 fps
10.0	258	Total			

Summary for Subcatchment 50S: Flow to Abutter

Runoff = 0.13 cfs @ 12.18 hrs, Volume= 0.016 af, Depth> 0.74"
 Routed to Link 50L : Flow to Abutters Map 7 Lots 36 & 36-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
506	96	Gravel surface, HSG B
485	77	Woods, Good, HSG D
10,016	55	Woods, Good, HSG B
11,007		Weighted Average
11,007		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.1800	0.17		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
1.0	113	0.1400	1.87		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.6	213	Total			

Summary for Subcatchment 60S: Flow to Pond P60

Runoff = 1.05 cfs @ 12.26 hrs, Volume= 0.140 af, Depth> 0.67"
Routed to Pond 60P : Pond for Runoff Requiring No Treatment

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description
6,618	77	Woods, Good, HSG D
1,214	85	Gravel roads, HSG B
93,143	55	Woods, Good, HSG B
9,281	61	>75% Grass cover, Good, HSG B
110,256		Weighted Average
110,256		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.2100	0.19		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
3.3	379	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
2.3	205	0.0100	1.50		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
14.6	684	Total			

Summary for Subcatchment 61S: Flow to Abutter

Runoff = 0.63 cfs @ 12.24 hrs, Volume= 0.084 af, Depth> 0.54"
Routed to Link 60L : Flow from Site to Abutter Map 7 Lot 36-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description			
20,216	30	Woods, Good, HSG A			
2,509	98	Paved parking, HSG A			
3,902	39	>75% Grass cover, Good, HSG A			
163	80	>75% Grass cover, Good, HSG D			
1,773	77	Woods, Good, HSG D			
826	85	Gravel roads, HSG B			
50,477	55	Woods, Good, HSG B			
1,170	61	>75% Grass cover, Good, HSG B			
81,036		Weighted Average			
78,527		96.90% Pervious Area			
2,509		3.10% Impervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.2100	0.19		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
5.5	634	0.1500	1.94		Shallow Concentrated Flow, Shallow Woodland Kv= 5.0 fps
14.5	734	Total			

Summary for Subcatchment 214S: Flow to DCB 214

Runoff = 1.49 cfs @ 12.23 hrs, Volume= 0.166 af, Depth> 1.02"
Routed to Pond 214P : CB 214P

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 yr Rainfall=4.04"

Area (sf)	CN	Description			
4,107	61	>75% Grass cover, Good, HSG B			
235	80	>75% Grass cover, Good, HSG D			
50,341	55	Woods, Good, HSG B			
30,187	77	Woods, Good, HSG D			
84,870		Weighted Average			
84,870		100.00% Pervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.2100	0.19		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.78"
6.2	716	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.2	816	Total			

Summary for Reach 20R: Overland Flow to 20P

Inflow Area = 2.455 ac, 25.89% Impervious, Inflow Depth = 0.69" for 10 yr event
Inflow = 1.23 cfs @ 12.53 hrs, Volume= 0.141 af
Outflow = 1.23 cfs @ 12.54 hrs, Volume= 0.141 af, Atten= 0%, Lag= 0.7 min
Routed to Pond 20P : Existing CB

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 5.19 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 3.03 fps, Avg. Travel Time= 1.3 min

Peak Storage= 58 cf @ 12.54 hrs
Average Depth at Peak Storage= 0.09', Surface Width= 4.13'
Defined Flood Depth= 2.25' Flow Area= 31.7 sf, Capacity= 1,396.82 cfs
Bank-Full Depth= 2.00' Flow Area= 26.7 sf, Capacity= 1,102.26 cfs

20.00' x 2.00' deep Parabolic Channel, n= 0.013 Corrugated PE, smooth interior
Length= 244.0' Slope= 0.0922 '/'
Inlet Invert= 453.50', Outlet Invert= 431.00'

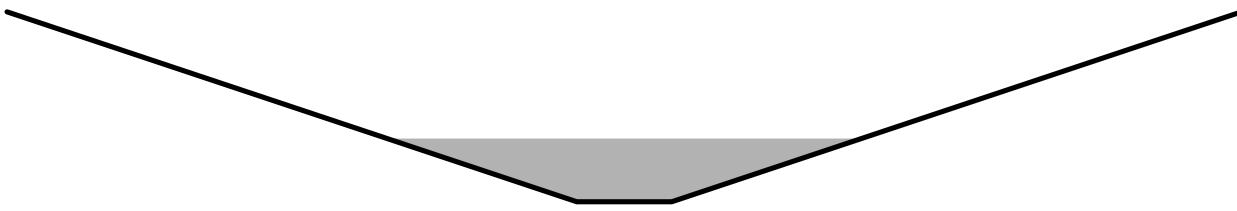
**Summary for Reach 46R: Flow from Driveway Culvert 46P to 40P**

Inflow Area = 4.672 ac, 2.65% Impervious, Inflow Depth > 0.54" for 10 yr event
Inflow = 0.91 cfs @ 12.20 hrs, Volume= 0.210 af
Outflow = 0.90 cfs @ 12.23 hrs, Volume= 0.209 af, Atten= 1%, Lag= 1.6 min
Routed to Pond 40P : Existing CB

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 0.45 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.21 fps, Avg. Travel Time= 4.0 min

Peak Storage= 100 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.67', Surface Width= 5.00'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 12.13 cfs

1.00' x 2.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 3.0 '/' Top Width= 13.00'
Length= 50.0' Slope= 0.0074 '/'
Inlet Invert= 430.50', Outlet Invert= 430.13'

**Summary for Reach 60R: Flow to Driveway Culvert 46P**

Inflow Area = 2.531 ac, 0.00% Impervious, Inflow Depth > 0.45" for 10 yr event
Inflow = 0.25 cfs @ 13.19 hrs, Volume= 0.095 af
Outflow = 0.25 cfs @ 13.27 hrs, Volume= 0.094 af, Atten= 0%, Lag= 4.4 min
Routed to Link 60L : Flow from Site to Abutter Map 7 Lot 36-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 1.69 fps, Min. Travel Time= 4.6 min
Avg. Velocity = 1.25 fps, Avg. Travel Time= 6.2 min

Peak Storage= 68 cf @ 13.27 hrs
Average Depth at Peak Storage= 0.05', Surface Width= 4.44'
Bank-Full Depth= 1.00' Flow Area= 13.3 sf, Capacity= 166.52 cfs

20.00' x 1.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 467.0' Slope= 0.1499 '/'
Inlet Invert= 502.00', Outlet Invert= 432.00'



‡

Summary for Reach 210R: Overland Flow to 20P

[80] Warning: Exceeded Pond 211P by 2.09' @ 0.00 hrs (9.57 cfs 1.719 af)

Inflow Area = 1.948 ac, 0.00% Impervious, Inflow Depth > 1.02" for 10 yr event
Inflow = 1.50 cfs @ 12.22 hrs, Volume= 0.166 af
Outflow = 1.48 cfs @ 12.25 hrs, Volume= 0.166 af, Atten= 1%, Lag= 1.9 min
Routed to Pond 20P : Existing CB

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 5.38 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 2.40 fps, Avg. Travel Time= 3.4 min

Peak Storage= 134 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.09', Surface Width= 4.35'
Defined Flood Depth= 2.25' Flow Area= 31.7 sf, Capacity= 1,360.25 cfs
Bank-Full Depth= 2.00' Flow Area= 26.7 sf, Capacity= 1,073.41 cfs

20.00' x 2.00' deep Parabolic Channel, n= 0.013 Corrugated PE, smooth interior
Length= 486.0' Slope= 0.0874 '/'
Inlet Invert= 473.50', Outlet Invert= 431.00'



Summary for Pond 10P: Existing CB

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.185 ac, 3.23% Impervious, Inflow Depth > 0.82" for 10 yr event
Inflow = 1.93 cfs @ 12.26 hrs, Volume= 0.219 af
Primary = 1.93 cfs @ 12.26 hrs, Volume= 0.219 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Summary for Pond 20P: Existing CB

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.752 ac, 14.62% Impervious, Inflow Depth > 1.06" for 10 yr event
Inflow = 4.13 cfs @ 12.25 hrs, Volume= 0.598 af
Primary = 4.13 cfs @ 12.25 hrs, Volume= 0.598 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Summary for Pond 21P: Infiltration Basin

Inflow Area = 2.455 ac, 25.89% Impervious, Inflow Depth > 1.68" for 10 yr event
Inflow = 1.43 cfs @ 12.32 hrs, Volume= 0.343 af
Outflow = 1.35 cfs @ 12.53 hrs, Volume= 0.281 af, Atten= 5%, Lag= 12.6 min
Discarded = 0.13 cfs @ 12.53 hrs, Volume= 0.140 af
Primary = 1.23 cfs @ 12.53 hrs, Volume= 0.141 af
Routed to Reach 20R : Overland Flow to 20P
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 20R : Overland Flow to 20P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 469.75' @ 12.53 hrs Surf.Area= 1,822 sf Storage= 3,377 cf
Flood Elev= 470.00' Surf.Area= 1,983 sf Storage= 3,854 cf

Plug-Flow detention time= 140.8 min calculated for 0.281 af (82% of inflow)
Center-of-Mass det. time= 61.9 min (900.1 - 838.2)

Post

Type III 24-hr 10 yr Rainfall=4.04"

Prepared by Keach-Nordstrom Associates, Inc

Printed 12/31/2025

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Page 14

Volume	Invert	Avail.Storage	Storage Description		
#1	466.00'	3,854 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
466.00	238	61.0	0	0	238
468.00	887	160.0	1,056	1,056	1,993
470.00	1,983	201.0	2,797	3,854	3,225

Device	Routing	Invert	Outlet Devices
#1	Discarded	466.00'	3.000 in/hr Exfiltration over Surface area
#2	Primary	465.00'	18.0" Round HDPE Culvert L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 465.00' / 464.75' S= 0.0100 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	469.65'	2.0" x 2.0" Horiz. Grate X 10.00 columns X 10 rows C= 0.600 in 36.0" x 36.0" Grate (31% open area) Limited to weir flow at low heads
#4	Secondary	469.75'	4.0' long x 6.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Discarded OutFlow Max=0.13 cfs @ 12.53 hrs HW=469.75' (Free Discharge)

↑ 1=Exfiltration (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=1.23 cfs @ 12.53 hrs HW=469.75' TW=453.59' (Dynamic Tailwater)

↑ 2=HDPE Culvert (Passes 1.23 cfs of 17.02 cfs potential flow)

↑ 3=Grate (Weir Controls 1.23 cfs @ 1.03 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=466.00' TW=453.50' (Dynamic Tailwater)

↑ 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 22P: Pocket Pond 22P

Inflow Area = 2.455 ac, 25.89% Impervious, Inflow Depth > 1.70" for 10 yr event
 Inflow = 3.87 cfs @ 12.12 hrs, Volume= 0.348 af
 Outflow = 1.43 cfs @ 12.32 hrs, Volume= 0.343 af, Atten= 63%, Lag= 11.7 min
 Primary = 1.43 cfs @ 12.32 hrs, Volume= 0.343 af
 Routed to Pond 21P : Infiltration Basin
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Pond 21P : Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Starting Elev= 469.35' Surf.Area= 1,930 sf Storage= 3,827 cf

Peak Elev= 470.82' @ 12.48 hrs Surf.Area= 2,798 sf Storage= 7,279 cf (3,452 cf above start)

Flood Elev= 472.00' Surf.Area= 5,229 sf Storage= 12,066 cf (8,239 cf above start)

Plug-Flow detention time= 202.3 min calculated for 0.255 af (73% of inflow)

Center-of-Mass det. time= 38.2 min (838.2 - 800.0)

Post

Type III 24-hr 10 yr Rainfall=4.04"

Prepared by Keach-Nordstrom Associates, Inc

Printed 12/31/2025

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Page 15

Volume	Invert	Avail.Storage	Storage Description		
#1	466.00'	12,066 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
466.00	492	103.6	0	0	492
468.00	1,258	151.6	1,691	1,691	1,500
470.00	2,304	194.4	3,510	5,201	2,728
471.00	2,916	213.3	2,604	7,805	3,374
471.50	4,482	493.2	1,836	9,640	19,111
472.00	5,229	502.6	2,425	12,066	19,897

Device	Routing	Invert	Outlet Devices
#1	Primary	469.00'	12.0" Round HDPE Culvert L= 21.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 469.00' / 468.00' S= 0.0476 ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	469.35'	5.0" Vert. 5" Orifices X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	470.80'	5.0" Vert. 5" Orifices X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 1	471.25'	Weir, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.40 Width (feet) 0.75 0.75
#5	Device 1	471.65'	2.0" x 2.0" Horiz. Grate X 10.00 columns X 10 rows C= 0.600 in 36.0" x 36.0" Grate (31% open area) Limited to weir flow at low heads
#6	Secondary	471.75'	4.0' long x 6.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.66 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.72 2.76 2.83

Primary OutFlow Max=1.43 cfs @ 12.32 hrs HW=470.74' TW=469.54' (Dynamic Tailwater)

1=HDPE Culvert (Passes 1.43 cfs of 4.14 cfs potential flow)

2=5" Orifices (Orifice Controls 1.43 cfs @ 5.25 fps)

3=5" Orifices (Controls 0.00 cfs)

4=Weir (Controls 0.00 cfs)

5=Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=469.35' TW=466.00' (Dynamic Tailwater)

6=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 23P: Sediment Forebay 23P

Inflow Area = 2.455 ac, 25.89% Impervious, Inflow Depth > 1.70" for 10 yr event
 Inflow = 3.89 cfs @ 12.11 hrs, Volume= 0.348 af
 Outflow = 3.87 cfs @ 12.12 hrs, Volume= 0.348 af, Atten= 0%, Lag= 0.8 min
 Primary = 3.87 cfs @ 12.12 hrs, Volume= 0.348 af

Routed to Pond 22P : Pocket Pond 22P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Post

Type III 24-hr 10 yr Rainfall=4.04"

Prepared by Keach-Nordstrom Associates, Inc

Printed 12/31/2025

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Page 16

Starting Elev= 471.00' Surf.Area= 363 sf Storage= 292 cf

Peak Elev= 471.51' @ 12.12 hrs Surf.Area= 500 sf Storage= 514 cf (221 cf above start)

Flood Elev= 472.00' Surf.Area= 650 sf Storage= 792 cf (500 cf above start)

Plug-Flow detention time= 24.4 min calculated for 0.341 af (98% of inflow)

Center-of-Mass det. time= 1.5 min (800.0 - 798.5)

Volume	Invert	Avail.Storage	Storage Description		
#1	469.00'	792 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
469.00	3	16.6	0	0	3
470.00	135	65.6	53	53	326
471.00	363	86.1	240	292	585
472.00	650	105.0	500	792	888

Device	Routing	Invert	Outlet Devices
#1	Primary	471.00'	4.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=3.87 cfs @ 12.12 hrs HW=471.51' TW=470.31' (Dynamic Tailwater)

↑1=Broad-Crested Rectangular Weir (Weir Controls 3.87 cfs @ 1.88 fps)

Summary for Pond 30P: Existing CB

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.491 ac, 23.53% Impervious, Inflow Depth > 2.25" for 10 yr event

Inflow = 0.87 cfs @ 12.24 hrs, Volume= 0.092 af

Primary = 0.87 cfs @ 12.24 hrs, Volume= 0.092 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Summary for Pond 40P: Existing CB

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.463 ac, 5.27% Impervious, Inflow Depth > 0.68" for 10 yr event

Inflow = 1.30 cfs @ 12.20 hrs, Volume= 0.368 af

Primary = 1.30 cfs @ 12.20 hrs, Volume= 0.368 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Summary for Pond 41P: Pocket Pond 41P

Inflow Area = 1.631 ac, 10.12% Impervious, Inflow Depth > 0.98" for 10 yr event
 Inflow = 1.41 cfs @ 12.12 hrs, Volume= 0.133 af
 Outflow = 0.21 cfs @ 12.94 hrs, Volume= 0.127 af, Atten= 85%, Lag= 49.0 min
 Primary = 0.21 cfs @ 12.94 hrs, Volume= 0.127 af
 Routed to Pond 40P : Existing CB

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3
 Starting Elev= 440.10' Surf.Area= 2,197 sf Storage= 5,532 cf
 Peak Elev= 441.01' @ 12.94 hrs Surf.Area= 2,734 sf Storage= 7,780 cf (2,249 cf above start)
 Flood Elev= 442.00' Surf.Area= 3,207 sf Storage= 10,747 cf (5,215 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= 119.4 min (949.5 - 830.1)

Volume	Invert	Avail.Storage	Storage Description			
#1	434.00'	10,747 cf	Custom Stage Data (Irregular)	Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
434.00	64	44.5	0	0	64	
436.00	472	91.7	473	473	593	
438.00	1,164	139.2	1,585	2,058	1,496	
440.00	2,142	186.2	3,257	5,315	2,756	
441.50	3,044	214.5	3,870	9,184	3,707	
442.00	3,207	219.2	1,563	10,747	3,902	

Device	Routing	Invert	Outlet Devices	
#1	Primary	437.00'	18.0" Round HDPE Culvert L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 437.00' / 435.00' S= 0.0833 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf	
#2	Device 1	440.10'	3.0" Vert. 3" Orifice C= 0.600 Limited to weir flow at low heads	
#3	Device 1	441.60'	2.0" x 2.0" Horiz. Grate X 10.00 columns X 10 rows C= 0.600 in 36.0" x 36.0" Grate (31% open area) Limited to weir flow at low heads	

Primary OutFlow Max=0.21 cfs @ 12.94 hrs HW=441.01' TW=0.00' (Dynamic Tailwater)

↑ 1=HDPE Culvert (Passes 0.21 cfs of 15.37 cfs potential flow)

 └ 2=3" Orifice (Orifice Controls 0.21 cfs @ 4.28 fps)

 └ 3=Grate (Controls 0.00 cfs)

Summary for Pond 42P: CB 42P

Inflow Area = 0.974 ac, 15.98% Impervious, Inflow Depth > 1.20" for 10 yr event
 Inflow = 0.99 cfs @ 12.12 hrs, Volume= 0.097 af
 Outflow = 0.99 cfs @ 12.12 hrs, Volume= 0.097 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.99 cfs @ 12.12 hrs, Volume= 0.097 af
 Routed to Pond 415P : Sediment Forebay 415P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Post

Prepared by Keach-Nordstrom Associates, Inc

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Type III 24-hr 10 yr Rainfall=4.04"

Printed 12/31/2025

Page 18

Peak Elev= 443.77' @ 12.12 hrs

Flood Elev= 447.18'

Device	Routing	Invert	Outlet Devices
#1	Primary	443.33'	18.0" Round Culvert L= 17.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 443.33' / 442.00' S= 0.0782 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.99 cfs @ 12.12 hrs HW=443.77' TW=441.72' (Dynamic Tailwater)

↑1=Culvert (Inlet Controls 0.99 cfs @ 2.27 fps)

Summary for Pond 43P: CB 43P

Inflow Area = 0.817 ac, 13.76% Impervious, Inflow Depth > 1.17" for 10 yr event
 Inflow = 0.80 cfs @ 12.12 hrs, Volume= 0.080 af
 Outflow = 0.80 cfs @ 12.12 hrs, Volume= 0.080 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.80 cfs @ 12.12 hrs, Volume= 0.080 af
 Routed to Pond 42P : CB 42P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Peak Elev= 446.06' @ 12.12 hrs

Flood Elev= 449.41'

Device	Routing	Invert	Outlet Devices
#1	Primary	445.66'	18.0" Round Culvert L= 38.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 445.66' / 443.66' S= 0.0526 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.80 cfs @ 12.12 hrs HW=446.06' TW=443.77' (Dynamic Tailwater)

↑1=Culvert (Inlet Controls 0.80 cfs @ 2.14 fps)

Summary for Pond 44P: DMH 44P

Inflow Area = 0.390 ac, 14.83% Impervious, Inflow Depth > 1.32" for 10 yr event
 Inflow = 0.51 cfs @ 12.10 hrs, Volume= 0.043 af
 Outflow = 0.51 cfs @ 12.10 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.51 cfs @ 12.10 hrs, Volume= 0.043 af
 Routed to Pond 43P : CB 43P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Peak Elev= 453.33' @ 12.10 hrs

Flood Elev= 462.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	453.00'	15.0" Round Culvert L= 79.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 453.00' / 446.00' S= 0.0886 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.51 cfs @ 12.10 hrs HW=453.33' TW=446.05' (Dynamic Tailwater)
 ↗ 1=Culvert (Inlet Controls 0.51 cfs @ 1.96 fps)

Summary for Pond 45P: CB 45P

Inflow Area = 0.339 ac, 8.05% Impervious, Inflow Depth > 1.14" for 10 yr event
 Inflow = 0.38 cfs @ 12.10 hrs, Volume= 0.032 af
 Outflow = 0.38 cfs @ 12.10 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.38 cfs @ 12.10 hrs, Volume= 0.032 af
 Routed to Pond 44P : DMH 44P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3
 Peak Elev= 466.08' @ 12.10 hrs
 Flood Elev= 471.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	465.80'	15.0" Round Culvert L= 64.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 465.80' / 458.00' S= 0.1219 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.38 cfs @ 12.10 hrs HW=466.08' TW=453.33' (Dynamic Tailwater)
 ↗ 1=Culvert (Inlet Controls 0.38 cfs @ 1.81 fps)

Summary for Pond 46P: Driveway Culvert

Inflow Area = 4.672 ac, 2.65% Impervious, Inflow Depth > 0.54" for 10 yr event
 Inflow = 0.91 cfs @ 12.20 hrs, Volume= 0.210 af
 Outflow = 0.91 cfs @ 12.20 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.91 cfs @ 12.20 hrs, Volume= 0.210 af
 Routed to Reach 46R : Flow from Driveway Culvert 46P to 40P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3
 Peak Elev= 431.54' @ 12.21 hrs
 Flood Elev= 432.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	431.00'	12.0" Round Culvert L= 31.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 431.00' / 430.50' S= 0.0161 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.91 cfs @ 12.20 hrs HW=431.54' TW=431.16' (Dynamic Tailwater)
 ↗ 1=Culvert (Outlet Controls 0.91 cfs @ 3.03 fps)

Summary for Pond 60P: Pond for Runoff Requiring No Treatment

Inflow Area = 2.531 ac, 0.00% Impervious, Inflow Depth > 0.67" for 10 yr event
 Inflow = 1.05 cfs @ 12.26 hrs, Volume= 0.140 af
 Outflow = 0.25 cfs @ 13.19 hrs, Volume= 0.095 af, Atten= 76%, Lag= 56.1 min
 Primary = 0.25 cfs @ 13.19 hrs, Volume= 0.095 af
 Routed to Reach 60R : Flow to Driveway Culvert 46P
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Reach 60R : Flow to Driveway Culvert 46P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3
 Peak Elev= 502.26' @ 13.19 hrs Surf.Area= 1,584 sf Storage= 2,242 cf
 Flood Elev= 504.00' Surf.Area= 2,640 sf Storage= 5,886 cf

Plug-Flow detention time= 208.7 min calculated for 0.095 af (67% of inflow)
 Center-of-Mass det. time= 93.2 min (995.5 - 902.3)

Volume	Invert	Avail.Storage	Storage Description		
#1	500.00'	5,886 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
500.00	488	141.6	0	0	488
502.00	1,451	179.3	1,854	1,854	1,503
504.00	2,640	217.0	4,032	5,886	2,756
Device	Routing	Invert	Outlet Devices		
#1	Primary	501.00'	12.0" Round Culvert L= 44.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 501.00' / 500.00' S= 0.0227 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf		
#2	Device 1	502.00'	4.0" Vert. Two 4" Orifices X 2.00 C= 0.600 Limited to weir flow at low heads		
#3	Device 1	503.00'	6.0" W x 6.0" H Vert. 6" Weir C= 0.600 Limited to weir flow at low heads		
#4	Device 1	503.50'	2.0" x 2.0" Horiz. Grate X 10.00 columns X 10 rows C= 0.600 in 36.0" x 36.0" Grate (31% open area) Limited to weir flow at low heads		
#5	Secondary	503.75'	4.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32		

Primary OutFlow Max=0.25 cfs @ 13.19 hrs HW=502.26' TW=502.05' (Dynamic Tailwater)

↑ 1=Culvert (Passes 0.25 cfs of 1.72 cfs potential flow)

↑ 2=Two 4" Orifices (Orifice Controls 0.25 cfs @ 1.72 fps)

↑ 3=6" Weir (Controls 0.00 cfs)

↑ 4=Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=500.00' TW=502.00' (Dynamic Tailwater)

↑ 5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 211P: DMH 211P

[90] Warning: Qout>Qin may require smaller dt or Finer Routing

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=195)

Inflow Area = 1.948 ac, 0.00% Impervious, Inflow Depth > 1.02" for 10 yr event
 Inflow = 1.49 cfs @ 12.23 hrs, Volume= 0.166 af
 Outflow = 1.50 cfs @ 12.22 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.50 cfs @ 12.22 hrs, Volume= 0.166 af

Routed to Reach 210R : Overland Flow to 20P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Peak Elev= 473.64' @ 12.25 hrs

Flood Elev= 479.08'

Device	Routing	Invert	Outlet Devices
#1	Primary	471.25'	18.0" Round Culvert L= 128.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 471.25' / 470.25' S= 0.0078 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.48 cfs @ 12.22 hrs HW=473.64' TW=473.59' (Dynamic Tailwater)

↑ 1=Culvert (Outlet Controls 1.48 cfs @ 0.84 fps)

Summary for Pond 212P: DMH 212P

Inflow Area = 1.948 ac, 0.00% Impervious, Inflow Depth > 1.02" for 10 yr event
 Inflow = 1.49 cfs @ 12.23 hrs, Volume= 0.166 af
 Outflow = 1.49 cfs @ 12.23 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.49 cfs @ 12.23 hrs, Volume= 0.166 af

Routed to Pond 211P : DMH 211P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Peak Elev= 479.80' @ 12.23 hrs

Flood Elev= 487.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	479.25'	18.0" Round Culvert L= 43.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.25' / 475.00' S= 0.0988 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.49 cfs @ 12.23 hrs HW=479.80' TW=473.64' (Dynamic Tailwater)

↑ 1=Culvert (Inlet Controls 1.49 cfs @ 2.53 fps)

Summary for Pond 213P: DMH 213P

Post

Type III 24-hr 10 yr Rainfall=4.04"

Prepared by Keach-Nordstrom Associates, Inc

Printed 12/31/2025

HydroCAD® 10.20-8a s/n 01045 © 2025 HydroCAD Software Solutions LLC

Page 22

Inflow Area = 1.948 ac, 0.00% Impervious, Inflow Depth > 1.02" for 10 yr event
 Inflow = 1.49 cfs @ 12.23 hrs, Volume= 0.166 af
 Outflow = 1.49 cfs @ 12.23 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.49 cfs @ 12.23 hrs, Volume= 0.166 af

Routed to Pond 212P : DMH 212P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Peak Elev= 488.60' @ 12.23 hrs

Flood Elev= 497.69'

Device	Routing	Invert	Outlet Devices
#1	Primary	488.05'	18.0" Round Culvert L= 38.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 488.05' / 484.00' S= 0.1066 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.49 cfs @ 12.23 hrs HW=488.60' TW=479.80' (Dynamic Tailwater)
 ↑ 1=Culvert (Inlet Controls 1.49 cfs @ 2.53 fps)

Summary for Pond 214P: CB 214P

Inflow Area = 1.948 ac, 0.00% Impervious, Inflow Depth > 1.02" for 10 yr event
 Inflow = 1.49 cfs @ 12.23 hrs, Volume= 0.166 af
 Outflow = 1.49 cfs @ 12.23 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.49 cfs @ 12.23 hrs, Volume= 0.166 af

Routed to Pond 213P : DMH 213P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Peak Elev= 498.05' @ 12.23 hrs

Flood Elev= 504.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	497.50'	18.0" Round Culvert L= 45.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 497.50' / 493.05' S= 0.0989 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.49 cfs @ 12.23 hrs HW=498.05' TW=488.60' (Dynamic Tailwater)
 ↑ 1=Culvert (Inlet Controls 1.49 cfs @ 2.53 fps)

Summary for Pond 415P: Sediment Forebay 415P

Inflow Area = 0.974 ac, 15.98% Impervious, Inflow Depth > 1.20" for 10 yr event
 Inflow = 0.99 cfs @ 12.12 hrs, Volume= 0.097 af
 Outflow = 0.98 cfs @ 12.13 hrs, Volume= 0.097 af, Atten= 1%, Lag= 0.9 min
 Primary = 0.98 cfs @ 12.13 hrs, Volume= 0.097 af

Routed to Pond 41P : Pocket Pond 41P

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 3

Starting Elev= 441.50' Surf.Area= 313 sf Storage= 245 cf

Peak Elev= 441.72' @ 12.13 hrs Surf.Area= 372 sf Storage= 319 cf (75 cf above start)

Flood Elev= 442.00' Surf.Area= 454 sf Storage= 435 cf (191 cf above start)

Plug-Flow detention time= 59.3 min calculated for 0.091 af (94% of inflow)
 Center-of-Mass det. time= 1.9 min (821.1 - 819.1)

Volume	Invert	Avail.Storage	Storage Description		
#1	439.50'	435 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
439.50	7	13.1	0	0	7
441.50	313	89.1	245	245	633
442.00	454	98.5	191	435	781

Device	Routing	Invert	Outlet Devices
#1	Primary	441.50'	4.0' long x 4.0' breadth Broad-Crested Rectangular Weir
		Head (feet)	0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
		2.50	3.00 3.50 4.00 4.50 5.00 5.50
		Coef. (English)	2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.97 cfs @ 12.13 hrs HW=441.72' TW=440.61' (Dynamic Tailwater)
 ↪=Broad-Crested Rectangular Weir (Weir Controls 0.97 cfs @ 1.12 fps)

Summary for Link 50L: Flow to Abutters Map 7 Lots 36 & 36-1

Inflow Area = 0.253 ac, 0.00% Impervious, Inflow Depth > 0.74" for 10 yr event
 Inflow = 0.13 cfs @ 12.18 hrs, Volume= 0.016 af
 Primary = 0.13 cfs @ 12.18 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs

Summary for Link 60L: Flow from Site to Abutter Map 7 Lot 36-1

Inflow Area = 4.391 ac, 1.31% Impervious, Inflow Depth > 0.49" for 10 yr event
 Inflow = 0.63 cfs @ 12.24 hrs, Volume= 0.178 af
 Primary = 0.63 cfs @ 12.24 hrs, Volume= 0.178 af, Atten= 0%, Lag= 0.0 min
 Routed to Pond 46P : Driveway Culvert

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs

19. RIPRAP APRON CALCULATIONS

RIP RAP OUTLET PROTECTION APRON CALCULATIONS

Project: **Jennesstown Manor** Date: **12/17/2025**
 KNA #: **24-0307-1**

The purpose of this spreadsheet is to calculate the dimensions of Inlet/Outlet Protection apron (riprap) required during the SCS/NRCS 50-year type III 24-hr storm event. The spillway weir(s) inlet/outlet apron protection will be sized for the SCS/NRCS 50-year type III 24-hr storm event.

Required Input:

Q	peak flow in CFS
Do	diameter in feet of outlet or width of channel
Tw	tail water at end of apron

Depending on the tail water conditions, either **column 1** or **column 2** is used for calculations

	Column One where $Tw < 1/2Do$	Column Two where $Tw > 1/2Do$
Length of Apron	$La = (1.8Q/Do^{3/2}) + 7Do$	$La = 3*Q/Do^{3/2} + 7Do$
Width of Apron at outfall	$W1 = 3*Do$ $W2 = 3*Do + La$	$W1 = 3*Do$ $W2 = 3*Do + 0.4*La$

If defined channel, then use channel width for W1 and W2

Rock Rip Rap Size:
 $d50 = (0.02*Q^{4/3})/(Tw*Do)$

RIRAP GRADATION ENVELOPE

Input to Chart Description (Optional)		Q-25** (cfs)	Do (ft)	Tw (ft)	Calculated Output		W2 no channel	d50, ft	d50 in	USE d50 in.	d100		d85		d50		d15		USE				
					La	W1					FROM in	TO in	FROM in	TO in	FROM in	TO in	depth in	Depth in.	Length ft.	W1 ft.	W2 ft.		
41P	Pond Outlet	0.26	1.50	0.75	11	5	15	0.0	0.04	4	6	8	5	7	4	6	1	2	10	10	11	5	15
21P	Infiltration Pond Outlet	2.22	1.50	0.75	13	5	17	0.1	0.62	5	8	10	7	9	5	8	2	3	12.5	13	13	5	17
22P	Pocket Pond Outlet	2.22	1.00	0.50	11	3	14	0.1	1.39	6	9	12	8	11	6	9	2	3	15	15	11	3	14
211P	Outlet Head Wall #210	2.52	1.50	0.75	13	5	17	0.1	0.73	3	5	6	4	5	3	5	1	2	7.5	8	13	5	17
60P	Outlet FES #60	0.69	1.00	0.75	9	3	7	0.0	0.20	3	5	6	4	5	3	5	1	2	7.5	8	9	3	7

* Center Apron with Headwall and Outlet Pipe (All Cases)

* Line Apron with 6.0 oz. Geotextile Fabric (All Cases)

**Q-100 Used When no Flow is Present in the Q-10

20. SWALE RIPRAP CALCULATIONS

OPEN CHANNEL FLOW DESIGN/ANALYSIS		
D₅₀ RIPRAP SIZING-FLOW REGIME-FILTER GRADATION CHECK		
PROJECT NAME :	Jennesstown Manor, Warner, NH	
PROJECT # :	23S Swale to Pond 22	
BY :	JL	CHECKED BY :
DATE :	11/20/2025	STORM: 25-Yr DATE :
UNIFORM STEADY CHANNEL FLOW:		
PEAK DISCHARGE REQUIRED =	2.7	CFS
CHANNEL BOTTOM WIDTH =	0.0	FT (USE 0 IF SECTION IS A "V" DITCH)
HYDRAULIC GRADIENT =	0.01000	FT/FT
LEFT SIDE SLOPE =	3.0	:1
RIGHT SIDE SLOPE =	3.0	:1
DEPTH OF FLOW =	0.320	FT
MANNINGS "n" =	0.0230	(CHECK RIPRAP SIZING "n" BELOW)
AREA =	0.31	SQ FT
WETTED PERIMETER =	2.02	FT
HYDRAULIC RADIUS =	0.15	FT
TOP WIDTH =	1.92	FT
VELOCITY =	1.84	FT/SEC
PEAK DISC. DETERMINED =	0.6	CFS
RIPRAP SIZING, TRAPEZOIDAL SECTION:		
D ₅₀ =	0.0352	FT
NEW "n" =	0.0238	(ADJUST DESIGN/ANALYSIS "n" ABOVE)
RIPRAP SIZING, "V" DITCH:		
D ₅₀ =	0.0481	FT
NEW "n" =	0.0230	(ADJUST DESIGN/ANALYSIS "n" ABOVE)
FLOW REGIME:		
Nf =	0.810	Nf <=0.7, SUB CRITICAL FLOW Nf >0.7 BUT <1.3, CRITICAL FLOW ZONE Nf >1.3, SUPER CRITICAL FLOW
IF Nf>=0.7 A HYDRAULIC JUMP WILL PROBABLY OCCUR, DESIGN ACCORDINGLY		
TO AVOID MOVEMENT OF PARTICLES:		
Filter fabric required beneath the rock		
FORMULAS USED:		
UNIFORM CHANNEL FLOW, Q = (A X 1.486 X R^(2/3) X S^(1/2))/"n"		
FLOW REGIME, Nf= (Q X T^(1/2))/(A^(3/2) X g^(1/2))		
RIPRAP SIZING, TRAPEZDL., ((118 X Q X S^(13/6) X R/P)^(2/5))		
RIPRAP SIZING, "V", ((64.4 X Q X S^(13/6) X (Z/(Z^2 + 1))^(2/5))		
NEW RIPRAP "n", (D. OF F.^(1/6))/(21.6 X LOG(D. OF F./D50)+14)		
REFERENCES: KING'S HANDBOOK OF HYDRAULICS AND NCHRP-REPORT 108		

OPEN CHANNEL FLOW DESIGN/ANALYSIS		
D₅₀ RIPRAP SIZING-FLOW REGIME-FILTER GRADATION CHECK		
PROJECT NAME :	Jennesstown Manor, Warner, NH	
PROJECT # :	22S Swale to Pond 22	
BY :	JL	CHECKED BY :
DATE :	11/20/2025	STORM: 25-Yr DATE :
UNIFORM STEADY CHANNEL FLOW:		
PEAK DISCHARGE REQUIRED =	3.0	CFS
CHANNEL BOTTOM WIDTH =	0.0	FT (USE 0 IF SECTION IS A "V" DITCH)
HYDRAULIC GRADIENT =	0.01000	FT/FT
LEFT SIDE SLOPE =	3.0	:1
RIGHT SIDE SLOPE =	3.0	:1
DEPTH OF FLOW =	0.150	FT
MANNINGS "n" =	0.0203	(CHECK RIPRAP SIZING "n" BELOW)
AREA =	0.07	SQ FT
WETTED PERIMETER =	0.95	FT
HYDRAULIC RADIUS =	0.07	FT
TOP WIDTH =	0.90	FT
VELOCITY =	1.26	FT/SEC
PEAK DISC. DETERMINED =	0.1	CFS
RIPRAP SIZING, TRAPEZOIDAL SECTION:		
D ₅₀ =	0.0165	FT
NEW "n" =	0.0210	(ADJUST DESIGN/ANALYSIS "n" ABOVE)
RIPRAP SIZING, "V" DITCH:		
D ₅₀ =	0.0225	FT
NEW "n" =	0.0203	(ADJUST DESIGN/ANALYSIS "n" ABOVE)
FLOW REGIME:		
Nf =	0.811	Nf <=0.7, SUB CRITICAL FLOW Nf >0.7 BUT <1.3, CRITICAL FLOW ZONE Nf >1.3, SUPER CRITICAL FLOW
IF Nf>=0.7 A HYDRAULIC JUMP WILL PROBABLY OCCUR, DESIGN ACCORDINGLY		
TO AVOID MOVEMENT OF PARTICLES:		
Filter fabric required beneath the rock		
FORMULAS USED:		
UNIFORM CHANNEL FLOW, Q = (A X 1.486 X R^(2/3) X S^(1/2))/"n"		
FLOW REGIME, Nf= (Q X T^(1/2))/(A^(3/2) X g^(1/2))		
RIPRAP SIZING, TRAPEZDL., ((118 X Q X S^(13/6) X R/P)^(2/5))		
RIPRAP SIZING, "V", ((64.4 X Q X S^(13/6) X (Z/(Z^2 + 1))^(2/5))		
NEW RIPRAP "n", (D. OF F.^(1/6))/(21.6 X LOG(D. OF F./D50)+14)		
REFERENCES: KING'S HANDBOOK OF HYDRAULICS AND NCHRP-REPORT 108		

OPEN CHANNEL FLOW DESIGN/ANALYSIS		
D₅₀ RIPRAP SIZING-FLOW REGIME-FILTER GRADATION CHECK		
PROJECT NAME :	Jennesstown Manor, Warner, NH	
PROJECT # :	42S Swale to Pond 41	
BY :	JL	CHECKED BY :
DATE :	11/20/2025	STORM: 25-Yr DATE :
UNIFORM STEADY CHANNEL FLOW:		
PEAK DISCHARGE REQUIRED =	0.3	CFS
CHANNEL BOTTOM WIDTH =	0.0	FT (USE 0 IF SECTION IS A "V" DITCH)
HYDRAULIC GRADIENT =	0.15000	FT/FT
LEFT SIDE SLOPE =	3.0	:1
RIGHT SIDE SLOPE =	3.0	:1
DEPTH OF FLOW =	0.150	FT
MANNINGS "n" =	0.0693	(CHECK RIPRAP SIZING "n" BELOW)
AREA =	0.07	SQ FT
WETTED PERIMETER =	0.95	FT
HYDRAULIC RADIUS =	0.07	FT
TOP WIDTH =	0.90	FT
VELOCITY =	1.43	FT/SEC
PEAK DISC. DETERMINED =	0.1	CFS
RIPRAP SIZING, TRAPEZOIDAL SECTION:		
D ₅₀ =	0.1812	FT
NEW "n" =	0.0596	(ADJUST DESIGN/ANALYSIS "n" ABOVE)
RIPRAP SIZING, "V" DITCH:		
D ₅₀ =	0.2477	FT
NEW "n" =	0.0692	(ADJUST DESIGN/ANALYSIS "n" ABOVE)
FLOW REGIME:		
Nf =	0.919	Nf <=0.7, SUB CRITICAL FLOW Nf >0.7 BUT <1.3, CRITICAL FLOW ZONE Nf >1.3, SUPER CRITICAL FLOW
IF Nf>=0.7 A HYDRAULIC JUMP WILL PROBABLY OCCUR, DESIGN ACCORDINGLY		
TO AVOID MOVEMENT OF PARTICLES:		
Filter fabric required beneath the rock		
FORMULAS USED:		
UNIFORM CHANNEL FLOW, Q = (A X 1.486 X R^(2/3) X S^(1/2))/"n"		
FLOW REGIME, Nf= (Q X T^(1/2))/(A^(3/2) X g^(1/2))		
RIPRAP SIZING, TRAPEZDL., ((118 X Q X S^(13/6) X R/P)^(2/5))		
RIPRAP SIZING, "V", ((64.4 X Q X S^(13/6) X (Z/(Z^2 + 1))^(2/5))		
NEW RIPRAP "n", (D. OF F.^(1/6))/(21.6 X LOG(D. OF F./D50)+14)		
REFERENCES: KING'S HANDBOOK OF HYDRAULICS AND NCHRP-REPORT 108		

OPEN CHANNEL FLOW DESIGN/ANALYSIS		
D₅₀ RIPRAP SIZING-FLOW REGIME-FILTER GRADATION CHECK		
PROJECT NAME :	Jennesstown Manor, Warner, NH	
PROJECT # :	43S Swale to CB 43	
BY :	JL	CHECKED BY :
DATE :	11/20/2025	STORM: 25-Yr DATE :
UNIFORM STEADY CHANNEL FLOW:		
PEAK DISCHARGE REQUIRED =	0.6	CFS
CHANNEL BOTTOM WIDTH =	0.0	FT (USE 0 IF SECTION IS A "V" DITCH)
HYDRAULIC GRADIENT =	0.15000	FT/FT
LEFT SIDE SLOPE =	3.0	:1
RIGHT SIDE SLOPE =	3.0	:1
DEPTH OF FLOW =	0.130	FT
MANNINGS "n" =	0.0676	(CHECK RIPRAP SIZING "n" BELOW)
AREA =	0.05	SQ FT
WETTED PERIMETER =	0.82	FT
HYDRAULIC RADIUS =	0.06	FT
TOP WIDTH =	0.78	FT
VELOCITY =	1.33	FT/SEC
PEAK DISC. DETERMINED =	0.1	CFS
RIPRAP SIZING, TRAPEZOIDAL SECTION:		
D ₅₀ =	0.1571	FT
NEW "n" =	0.0582	(ADJUST DESIGN/ANALYSIS "n" ABOVE)
RIPRAP SIZING, "V" DITCH:		
D ₅₀ =	0.2147	FT
NEW "n" =	0.0676	(ADJUST DESIGN/ANALYSIS "n" ABOVE)
FLOW REGIME:		
Nf =	0.919	Nf <=0.7, SUB CRITICAL FLOW Nf >0.7 BUT <1.3, CRITICAL FLOW ZONE Nf >1.3, SUPER CRITICAL FLOW
IF Nf>=0.7 A HYDRAULIC JUMP WILL PROBABLY OCCUR, DESIGN ACCORDINGLY		
TO AVOID MOVEMENT OF PARTICLES:		
Filter fabric required beneath the rock		
FORMULAS USED:		
UNIFORM CHANNEL FLOW, Q = (A X 1.486 X R^(2/3) X S^(1/2))/"n"		
FLOW REGIME, Nf= (Q X T^(1/2))/(A^(3/2) X g^(1/2))		
RIPRAP SIZING, TRAPEZDL., ((118 X Q X S^(13/6) X R/P)^(2/5))		
RIPRAP SIZING, "V", ((64.4 X Q X S^(13/6) X (Z/(Z^2 + 1))^(2/5))		
NEW RIPRAP "n", (D. OF F.^(1/6))/(21.6 X LOG(D. OF F./D50)+14)		
REFERENCES: KING'S HANDBOOK OF HYDRAULICS AND NCHRP-REPORT 108		

OPEN CHANNEL FLOW DESIGN/ANALYSIS		
D₅₀ RIPRAP SIZING-FLOW REGIME-FILTER GRADATION CHECK		
PROJECT NAME :	Jennesstown Manor, Warner, NH	
PROJECT # :	44S Swale to CB 44	
BY :	JL	CHECKED BY :
DATE :	11/20/2025	STORM: 25-Yr DATE :
UNIFORM STEADY CHANNEL FLOW:		
PEAK DISCHARGE REQUIRED =	0.1	CFS
CHANNEL BOTTOM WIDTH =	0.0	FT (USE 0 IF SECTION IS A "V" DITCH)
HYDRAULIC GRADIENT =	0.15000	FT/FT
LEFT SIDE SLOPE =	3.0	:1
RIGHT SIDE SLOPE =	3.0	:1
DEPTH OF FLOW =	0.164	FT
MANNINGS "n" =	0.0703	(CHECK RIPRAP SIZING "n" BELOW)
AREA =	0.08	SQ FT
WETTED PERIMETER =	1.04	FT
HYDRAULIC RADIUS =	0.08	FT
TOP WIDTH =	0.98	FT
VELOCITY =	1.49	FT/SEC
PEAK DISC. DETERMINED =	0.1	CFS
RIPRAP SIZING, TRAPEZOIDAL SECTION:		
D ₅₀ =	0.1981	FT
NEW "n" =	0.0605	(ADJUST DESIGN/ANALYSIS "n" ABOVE)
RIPRAP SIZING, "V" DITCH:		
D ₅₀ =	0.2707	FT
NEW "n" =	0.0703	(ADJUST DESIGN/ANALYSIS "n" ABOVE)
FLOW REGIME:		
Nf =	0.919	Nf <=0.7, SUB CRITICAL FLOW Nf >0.7 BUT <1.3, CRITICAL FLOW ZONE Nf >1.3, SUPER CRITICAL FLOW
IF Nf>=0.7 A HYDRAULIC JUMP WILL PROBABLY OCCUR, DESIGN ACCORDINGLY		
TO AVOID MOVEMENT OF PARTICLES:		
Filter fabric required beneath the rock		
FORMULAS USED:		
UNIFORM CHANNEL FLOW, Q = (A X 1.486 X R^(2/3) X S^(1/2))/"n"		
FLOW REGIME, Nf= (Q X T^(1/2))/(A^(3/2) X g^(1/2))		
RIPRAP SIZING, TRAPEZDL., ((118 X Q X S^(13/6) X R/P)^(2/5))		
RIPRAP SIZING, "V", ((64.4 X Q X S^(13/6) X (Z/(Z^2 + 1))^(2/5))		
NEW RIPRAP "n", (D. OF F.^(1/6))/(21.6 X LOG(D. OF F./D50)+14)		
REFERENCES: KING'S HANDBOOK OF HYDRAULICS AND NCHRP-REPORT 108		

OPEN CHANNEL FLOW DESIGN/ANALYSIS		
D₅₀ RIPRAP SIZING-FLOW REGIME-FILTER GRADATION CHECK		
PROJECT NAME :	Jennesstown Manor, Warner, NH	
PROJECT # :	45S Swale to CB 45	
BY :	JL	CHECKED BY :
DATE :	11/20/2025	STORM: 25-Yr DATE :
UNIFORM STEADY CHANNEL FLOW:		
PEAK DISCHARGE REQUIRED =	0.7	CFS
CHANNEL BOTTOM WIDTH =	0.0	FT (USE 0 IF SECTION IS A "V" DITCH)
HYDRAULIC GRADIENT =	0.15000	FT/FT
LEFT SIDE SLOPE =	3.0	:1
RIGHT SIDE SLOPE =	3.0	:1
DEPTH OF FLOW =	0.140	FT
MANNINGS "n" =	0.0685	(CHECK RIPRAP SIZING "n" BELOW)
AREA =	0.06	SQ FT
WETTED PERIMETER =	0.89	FT
HYDRAULIC RADIUS =	0.07	FT
TOP WIDTH =	0.84	FT
VELOCITY =	1.38	FT/SEC
PEAK DISC. DETERMINED =	0.1	CFS
RIPRAP SIZING, TRAPEZOIDAL SECTION:		
D ₅₀ =	0.1692	FT
NEW "n" =	0.0589	(ADJUST DESIGN/ANALYSIS "n" ABOVE)
RIPRAP SIZING, "V" DITCH:		
D ₅₀ =	0.2312	FT
NEW "n" =	0.0685	(ADJUST DESIGN/ANALYSIS "n" ABOVE)
FLOW REGIME:		
Nf =	0.919	Nf <=0.7, SUB CRITICAL FLOW Nf >0.7 BUT <1.3, CRITICAL FLOW ZONE Nf >1.3, SUPER CRITICAL FLOW
IF Nf>=0.7 A HYDRAULIC JUMP WILL PROBABLY OCCUR, DESIGN ACCORDINGLY		
TO AVOID MOVEMENT OF PARTICLES:		
Filter fabric required beneath the rock		
FORMULAS USED:		
UNIFORM CHANNEL FLOW, Q = (A X 1.486 X R^(2/3) X S^(1/2))/"n"		
FLOW REGIME, Nf= (Q X T^(1/2))/(A^(3/2) X g^(1/2))		
RIPRAP SIZING, TRAPEZDL., ((118 X Q X S^(13/6) X R/P)^(2/5))		
RIPRAP SIZING, "V", ((64.4 X Q X S^(13/6) X (Z/(Z^2 + 1))^(2/5))		
NEW RIPRAP "n", (D. OF F.^(1/6))/(21.6 X LOG(D. OF F./D50)+14)		
REFERENCES: KING'S HANDBOOK OF HYDRAULICS AND NCHRP-REPORT 108		

21. SITE SPECIFIC SOIL SURVEY REPORT

SITE-SPECIFIC SOIL SURVEY REPORT

Route 103
Warner

1. MAPPING STANDARDS

Site-Specific Soil Mapping Standards for New Hampshire and Vermont. SSSNNE Special Publication No. 3, Version 7.0, July 2021. This map product is within the technical standards of the National Cooperative Soil Survey. It is a special product, intended for the submission to NH DES Alteration of Terrain. It was produced by a professional soil scientist and is not a product of the USDA Natural Resource Conservation Service.

Hydrologic Soil Group was determined using SSSNNE Special Publication No. 5.

Scale of soil map:

Approximately 1" equals 40'

Contours:

Intervals of 2 feet

2. DATE SOIL MAP PRODUCED

Date(s) of on-site field work: 11/23/24

Date(s) of test pits: 2/3/25

Test pits recorded by: Gifford Colburn, Keach Nordstrom

3. GEOGRAPHIC LOCATION AND SIZE OF SITE

City or town where soil mapping was conducted: Warner

Location: Route 103, Map 7, Lot 39

Size of area: approximately 10 acres

Was the map for the entire lot? No

The area where the map was created is for the front, 10 acres of the lot. This portion of the lot has been recently cleared. Several areas of open rock outcrops and steep hillsides are present as, well as low areas within the topography. The site slopes steeply from the road up to the west. Several small wetlands are present.

4. PURPOSE OF THE SOIL MAP

Was the map prepared to meet the requirement of Alteration of Terrain? Yes

If no, what was the purpose of the map?

Who was the map prepared for? Keach Nordstrom.

5. SOIL IDENTIFICATION LEGEND

SSSM SYM.	SSS MAP NAME	HISI SYM.	HYDROLOGIC SOIL GRP.
55	Hermon Very Stony	121	B
442	Chichester	221	B
58	Waumbek	321	A
829	Waumbek-Hermon Association	321	B
399	Ledge Outcrop	228	D
414	Moosilauke Poorly Drained	521	C

SLOPE PHASE:

0-8% B 8-15% C 15-25% D 25%+ E

55 Hermon Very Stony 121 B

The Hermon series consists of very deep, somewhat excessively drained soils on upland till plains, hills and ridges. These soils formed in glacial till. Estimated saturated hydraulic conductivity is high or very high throughout the mineral soil. Slopes ranges from 0 through 60 percent. These soils are dominated by sandy loam over loamy sand and sand. Some profiles have single grain sand to gravel and some cobble. No ESHWT was encountered within 60 inches and no significant ledge was encountered. These soils are found in a few isolated areas on the site.

Typical Profile

0-10" 10YR3/2, FSL, GR, FR

10-24" 7.5YR4/6, LS, GR, FR

24-72" 10YR4/3, FSL, GR, FR

72-108" 2.5Y5/3, S, GR, FR, Redox 20%

ESHWT 72

Observed Water None

Refusal None

442 Chichester 221 B

The Chichester series consists of very deep, well drained soils that formed in a loamy mantle overlying sandy till on glaciated hills, valley sides and till plains. Saturated hydraulic conductivity is moderately high or high in the solum and high or very high in the substratum. Slope ranges from 3 through 50 percent. These soils are found within the central portion of the site. No ESHWT was encountered within 40 inches and no significant ledge was encountered.

Typical Profile

0-12" 10YR3/2, FSL, GR, FR

12-16" 7.5YR4/6, LS, GR, FR

16-55" 10YR5/3, FSL, GR, FR

55-90" 10YR4/2, S, GR, FR, Redox 20%

ESHWT 55

Observed Water None

Refusal None

58 Waumbek 321 A

The Waumbek series consists of very deep, moderately well drained soils formed in stony, sandy till. They are on glaciated uplands. Permeability is moderately rapid or rapid in the solum and rapid in the substratum. These soils are found in the higher elevations on the site. They are dominated by sandy loam in the upper layers and underlain by loamy sand and sand. They have ESHWT between 15-40 inches and no significant ledge was encountered. These soils are found in the mid-slope areas of the site in the southern portion of the site.

Typical Profile

0-10" 10YR3/2, FSL, GR, FR

10-32" 7.5YR4/6, LS, GR, FR

32-108" 10YR6/23, FSL, GR, FR, Redox 20%

ESHWT 32

Observed Water None

Refusal None

829 Waumbek-Hermon Association 321 B

The Waumbek-Hermon Association is an overlapping soil type where the two individual series cannot be separated out into sizeable individual units. This series has an ESHWT between 15-40 inches and no significant ledge.

The Waumbek series consists of very deep, moderately well drained soils formed in stony, sandy till. They are on glaciated uplands. Permeability is moderately rapid or rapid in the solum and rapid in the substratum.

The Hermon series consists of very deep, somewhat excessively drained soils on upland till plains, hills and ridges. These soils formed in glacial till. Estimated saturated hydraulic conductivity is high or very high throughout the mineral soil.

399 Ledge Outcrop 228 D

Several areas of the site have steep rock slopes of either exposed ledge or ledge very close to the surface.

414 Moosilauke Poorly Drained 521 C

The Moosilauke series consists of very deep, poorly and somewhat poorly drained soils that formed in glacial outwash or drift in low depressions and shallow drainageway on uplands. Saturated hydraulic conductivity is high in the solum and high or very high in the substratum. Slope ranges from 0 to 15 percent. These are the small isolated wetlands found on the site.

6. RESPONSIBLE SOIL SCIENTIST

Name: Luke Hurley

Certified Soil Scientist Number: CSS #095

7. OTHER DISTINGUISHING FEATURES OF SITE

Is the site in a natural condition? The current mapping portion, yes.

8. Inclusions

No Inclusions were mapped.



22. INFILTRATION FEASIBILITY REPORT

INFILTRATION FEASIBILITY REPORT

Jenesstown Manor

**Map 7; Lots 39 & 39-1
Route 103
Warner, New Hampshire**

March 7, 2025

KNA Project No. 24-0307-1

KNA
KEACH-NORDSTROM ASSOCIATES, INC.

TABLE OF CONTENTS:

- I. Location of Infiltration Practices
- II. Existing Topography
- III. Test Pit Locations
- IV. Seasonal High Water Table Elevation Summaries
- V. Infiltration Rate Summary
- VI. Profile Descriptions

I. Location of Practice

One infiltration practice is proposed for this project. An above ground infiltration pond (21P) is proposed on Map 7 Lot 39-1, but will handle runoff from Map 7 Lot 39 as well as Map 7 lot 39-1. There will a drainage and grading easement between these two lots.

II. Existing Topography

The existing grades on the site are primarily moderately steep (15-25%) or steep slopes (25%+) that slope northeasterly to Route 103.

III. Test Pit Locations

There were nine test pits performed for the area of development. Test Pit 2 was used for the design of the infiltration pond 21P.

IV. Seasonal High Water Table Elevation Summaries

The results from the Test Pit 2 performed is as follows:

Test Pit #2

The existing elevation of the ground in the area of the practice

= 468.89 (approx. original grade)

Distance to SHWT

= 32"

Elevation of SHWT

= 464.22

Lowest Elevation of Test Pit

= 456.89

Elevation of SHWT

= 464.22

Required separation

= 1.0 (prior treatment)

Bottom of infiltration practice

= 466.00

The results from the test pit performed is as follows:

V. Infiltration Rate Summary

The infiltration rate for the Infiltration Pond 21P was calculated by the default method, as described in Env-Wq 1504.14. The practice is located in an area primarily identified in the Site-Specific Soil Survey as 58D – Waumbek. The area for the proposed infiltration system is natural undisturbed woodland, therefore the soil used to determine the infiltration was Waumbek.

The Ksat Values for New Hampshire Soils by USDA Natural for New Hampshire Soils, Society of Soil Scientists for Northern New England, Special Publication No. 5, September 2009, provides a value of the Waumbek soil type of 6.00 inches per hour. Using an applicable factor of safety of 2 at a conservative rate of 6 inches per hour, the infiltration rate utilized in the drainage analysis is 3.0 inches per hour.

VI. Profile Descriptions

Profile descriptions are provided as follows.

TP #2	
LOGGED BY GPC	
PERC TEST @ 20"	
DATE: 2-3-2024	
0"	PERC RATE: 8 MIN./INCH
	IMPERVIOUS LAYER: NONE
	WATER ENCOUNTERED: NONE
10"	FOREST MAT
32"	7.5YR 4/6, GRANULAR, FRIABLE LOAMY SAND, COBBLES, ROOTS
ESHW.T.	10YR 6/2, SAND, STONES
84"	10 YR 4/2, FIRM, SILTY FINE SAND, W/ REDOX FEATURES
12" BOTTOM OF HOLE	

23. OPERATIONS AND MAINTENANCE PLAN WITH CHECKLIST

STORMWATER

OPERATION & MAINTENANCE PLAN

**Jennesstown Manor
Route 103
Warner, New Hampshire**
Map 7 / Lots 39 & 39-1

March 7, 2024

REVISED: NOVEMBER 18, 2025

KNA
KEACH-NORDSTROM ASSOCIATES, INC.

TABLE OF CONTENTS:

I. General

- Introduction
- General Maintenance Requirements

II. Supporting Documents

- Annual Inspection & Maintenance Reporting Form
- Long-Term Inspection & Maintenance Plan Checklist
- Long-Term Inspection & Maintenance Log
- Anti-Icing Route Data Form

III. Control of Invasive Plants

- Invasive Plant Guide

IV. Stormwater Practice Location Plan

- 11"x17" "Grading, Drainage & Utility Plan"

I. General

Introduction

The project owner or their assigned heirs will maintain the stormwater treatment facilities after construction is completed. The Applicant of the project is Peacock Hill Road, LLC located at 145 Old Town Road Weare, NH. The Applicant will maintain the stormwater system.

The subject property is referenced on Map 7; Lots 39 and 39-1 in Warner, New Hampshire. Any transfer of responsibility for inspection and maintenance activities or transfer of ownership shall be documented to Warner in writing. The contract documents will require the contractor to designate a person responsible for maintenance of the sedimentation control features during construction. Long-term operation and maintenance for the stormwater management facilities are presented below.

Maintenance will be performed as described unless and until the system is formally accepted by a municipality or quasi-municipal district or is placed under the jurisdiction of a legally created association that will be responsible for the maintenance of the system.

Post Construction:

The following standards will be met after construction is complete:

Documentation:

A maintenance log will be kept summarizing inspections, maintenance, and any corrective actions taken. The log will include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean out of any sediments or debris, the location where the sediment and debris was disposed after removal will be indicated. The log will be made accessible to department and/or Warner staff and a copy provided upon request.

Maintenance Requirements

Pocket Ponds:

- Systems should be inspected at least twice annually and following any rainfall event exceeding 2.5 inches in a 24-hour period, with maintenance or rehabilitation conducted as warranted by such inspection.
- System embankments should be mowed periodically to maintain grass cover and any other vegetation found on the embankment should be removed at each inspection.
- Trash and debris found within the pond or in the outlet structure should be removed at each inspection.
- Removal of accumulated sediment.
- Inspection and repair of embankments, inlet and outlet structures, and appurtenances.

Infiltration Ponds:

- Systems should be inspected at least twice annually and following any rainfall event exceeding 2.5 inches in a 24-hour period, with maintenance or rehabilitation conducted as warranted by such inspection.
- Trash and debris should be removed at each inspection.
- Inspection of pre-treatment measures at least twice annually and removal of accumulated sediment as warranted by inspection, but no less than once annually.
- At least once annually, the system should be inspected for drawdown time. If the pond does not drain within 72-hours following a rainfall event, a qualified professional should assess the condition of the facility to determine measures required to restore filtration function or infiltration function (as applicable), including but not limited to the removal of accumulated sediments or reconstruction of the basin bottom.

Catch Basins and Closed Drainage Network:

- Catch basins may require frequent maintenance. This may require several cleanings of the sums each year. At a minimum, it is recommended that catch basins be inspected at least twice annually.
- Sediment should be removed when it approaches half of the sump depth.
- If floating hydrocarbons are observed during an inspection, the material should be removed immediately by skimming, absorbent materials, or other methos and disposed in conformance with the applicable state and federal regulations.

Outlet Protection:

- Inspect the outlet protection annually for damage and deterioration. Repair damages immediately.

General:

- If any invasive species begin to grow in the stormwater management practices the species shall be disposed of in an appropriate manner that will not allow the pest to survive or spread. The disposal of such species shall be witnessed or approved by a state inspector. Methods for disposal may include, but not be limited to:
 - Encapsulating the plant(s) in plastic bags and disposing of the plant material in one of the following ways:
 - Trash pickup;
 - Discarding;
 - Open burning;
 - Incineration; or
 - Burial of infested nursery.

II. Supporting Documents

Annual Inspection and Maintenance Reporting Form
for
Jennesstown Manor
Warner, New Hampshire

Date: _____

To: **Peacock Hill Road, LLC**

Re: **Certification of Inspection and Maintenance; Submittal of Forms**

Property Name: _____

Property Address: _____

Contact Name: _____

Contact Phone #: _____

Contact Email Address: _____

I verify that the required stormwater facility inspections and required maintenance have been completed in accordance with the Operation & Maintenance Plan associated with the above referenced property.

The required Long-Term Inspection & Maintenance Plan Checklist is attached to this form.

Name of Party Responsible for Inspection
& Maintenance

Property Owner

Authorized Signature

Signature

Long-Term Inspection & Maintenance Plan Checklist

Jennesstown Manor – Warner, NH

Current Owner Name:	Date:		
Business Address:	Inspector:		
Weather:			
Date of Last Rainfall:	Amount:		Inches:
Best Management Practice			
Pocket Pond #22P	Reason for Inspection		
	Spring <input type="checkbox"/>	Fall/Yearly <input type="checkbox"/>	After Major Storm <input type="checkbox"/>
Maintenance Required?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Corrective Action Needed & Notes:			
Sideslopes & berms need repair?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Clean inlet & outlet structures?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Pocket Pond #41P	Reason for Inspection		
	Spring <input type="checkbox"/>	Fall/Yearly <input type="checkbox"/>	After Major Storm <input type="checkbox"/>
Maintenance Required?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Corrective Action Needed & Notes:			
Sideslopes & berms need repair?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Clean inlet & outlet structures?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Infiltration Pond #21P	Reason for Inspection		
	Spring <input type="checkbox"/>	Fall/Yearly <input type="checkbox"/>	After Major Storm <input type="checkbox"/>
Maintenance Required?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Corrective Action Needed & Notes:			
Visual Inspection of vegetation?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Maintenance Required?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Corrective Action Needed & Notes:			
Visual inspection of drawdown time?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Drawdown time less than 72 hours?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	

(if no, call a qualified professional for inspection)

Pond #60P		Reason for Inspection		
		Spring <input type="checkbox"/>	Fall/Yearly <input type="checkbox"/>	After Major Storm <input type="checkbox"/>
Maintenance Required?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Corrective Action Needed & Notes:				
Visual Inspection of vegetation?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Maintenance Required?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Corrective Action Needed & Notes:				
Visual inspection of drawdown time?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Drawdown time less than 72 hours?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	
(if no, call a qualified professional for inspection)				
Catch Basins & Closed Drainage Network		Reason for Inspection		
		Spring <input type="checkbox"/>	Fall/Yearly <input type="checkbox"/>	After Major Storm <input type="checkbox"/>
Maintenance Required?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Corrective Action Needed & Notes:				
Photo:				
Outlet Protection		Reason for Inspection		
		Spring <input type="checkbox"/>	Fall/Yearly <input type="checkbox"/>	After Major Storm <input type="checkbox"/>
Maintenance Required?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Corrective Action Needed & Notes:				
General		Reason for Inspection		
		Spring <input type="checkbox"/>	Fall/Yearly <input type="checkbox"/>	After Major Storm <input type="checkbox"/>
Maintenance Required?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Corrective Action Needed & Notes:				

Long-Term Inspection & Maintenance Log

Jennesstown Manor - Warner, NH

III. Control of Invasive Plants

Invasive plants are introduced, alien, or non-native plants, which have been moved by people from their native habitat to a new area. Some Exotic plants are imported for human use such as landscaping, erosion control, or food crops. They also can arrive as “hitchhikers” among shipments of other plants, seeds, packing materials, or fresh produce. Some exotic plants become invasive and cause harm by:

- becoming weedy and overgrown;
- killing established shade trees;
- obstructing pipes and drainage systems;
- forming dense beds in water;
- lowering water levels in lakes, streams, and wetlands;
- destroying natural communities;
- promoting erosion on stream banks and hillsides; and
- resisting control except by hazardous chemical.

During maintenance activities, check for the presence of invasive plants and suitably remove according to the methods provided in the table below. The following table, based on the “Control of Invasive Plants” published by the New Hampshire Department of Agriculture, describes the most common invasive plants in this region and proper methods of disposal.

Name	Description	Invasive Qualities	Control Methods
Invasive Trees			
Norway Maple	<ul style="list-style-type: none"> - Large leaves - Will exude milky white sap when leaves are broken - Leaves turn color in Late October (fall foliage is yellow) 	<ul style="list-style-type: none"> - Suppresses growth of grass, garden plants, and forest understory - Wind-borne seeds can germinate and grow in deep shade 	<ul style="list-style-type: none"> - Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out plants, including the root systems. Use a forked spade or weed wrench. - Cut down the tree. Grind out the stump, or clip off re-growth. - Girdle¹ - Frill² - Cut stem/ cut stump with glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Foliar spray with glyphosate ^{3*} (mid-October to early November).
Tree of Heaven	<ul style="list-style-type: none"> - Long compound leaves with 11-25 lance shaped leaflets - Smell like peanut butter or burnt coffee when crushed 	<ul style="list-style-type: none"> - Tough, can grow in poor conditions - Produces large quantities of wind-borne seeds - Grows rapidly - Secretes a toxin that kills other plants - Cannot be removed by mechanical means alone 	<ul style="list-style-type: none"> - Pull seedlings when soil is moist. - Frill² (no more than 1" gap between cuts). Use Garlon 3a herbicide. - Cut stem/ cut stump with Garlon 3a. Follow label directions for cut stump application. Clip off sucker sprouts or paint with Garlon 3a.* - Foliar spray^{3*} (on regrowth) - Paint bottom 12" of bark with Garlon 4 Ultra (February/March). Use maximum strength specified on label for all herbicide applications.

Invasive Shrubs

Autumn Olive	<ul style="list-style-type: none"> - Formerly recommended for erosion control and wildlife value 	<ul style="list-style-type: none"> - Highly invasive, diminishes the overall quality of wildlife habitat 	<ul style="list-style-type: none"> - Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs (up to 4" diameter trunks). - Cut down the tree. Grind out the stump, or clip off re-growth. - Cut stem/ cut stump with glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Bury stump - Do not mow
--------------	---	---	--

Multiflora Rose	<ul style="list-style-type: none"> - Formerly recommended for erosion control, hedges, and wildlife habitat - Covered in white flowers in June - Very hard, curved thorns - Fringed edge to leaf stalk 	<ul style="list-style-type: none"> - Huge shrub that chokes out all other vegetation - Too dense for most birds to nest in - Grows up trees like a vine in Shade 	<ul style="list-style-type: none"> - Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems (at least 6" from the crown and 6" down). Use a forked spade or weed wrench for trees or shrubs. - Controlled burning⁴ (on extensive infestations) - Cut stem/ cut stump with glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Foliar spray^{3*} (mix Rodeo with extra sticker-spreader, or use Roundup Sure Shot Foam on small plants) - Herbicide may be applied in winter when other plants are dormant.
-----------------	--	---	---

<p>Bush Honeysuckles</p>	<ul style="list-style-type: none"> - Includes Belle, Amur, Morrow's, and Tatarian Honeysuckle 	<ul style="list-style-type: none"> - Creates dense shade reducing plant diversity and eliminating nest sites in forest interior spaces 	<ul style="list-style-type: none"> - Deadhead to prevent spread of seeds (on ornamentals). Cut off seeds or fruits before they ripen. Bag and burn, or send to a landfill. - Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs. - Mow or cutting at least 4 times a season to deplete plants' store of nutrients and carbohydrates, reduce seed formation, and kill or minimize spread of plants. If necessary, repeat each year (on shady sites only, brush cut in early spring and fall). - Controlled burning⁴ (during growing season) - Cut down the tree. Grind out the stump, or clip off re-growth. - Cut stem/ cut stump with Glyphosate (late in the growing season). Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.*
---------------------------------	--	---	--

Invasive Shrubs (continued)

<p>Blunt-Leaved Privet</p>	<ul style="list-style-type: none"> - Medium sized shrub - Simple, oblong, dark green leaves 1-2" in length - Fragrant white flowers (spring) - Blackish-purple fruit (late summer) 	<ul style="list-style-type: none"> - Toxic to mammals - Loss of valuable habitat 	<ul style="list-style-type: none"> - Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs. - Cut down the tree. Grind out the stump, or clip off re-growth. - Cut stem/ cut stump with Glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Trim off all flowers - Do not cut back or mow
-----------------------------------	--	--	---

Burning Bush, Winged Euonymus	<ul style="list-style-type: none"> - Wide, corky wings on the Branches - Brilliant red autumn leaves - Fruit 	<ul style="list-style-type: none"> - High seed production 	<ul style="list-style-type: none"> - Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs. - Cut down the tree. Grind out the stump, or clip off re-growth. - Cut stem/ cut stump with Glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Trim off all flowers
Japanese Barberry	<ul style="list-style-type: none"> - Spiny deciduous shrub - Small leaves 	<ul style="list-style-type: none"> - Very dense, displaces native plants - Can change chemistry of soil 	<ul style="list-style-type: none"> - Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs. - Cut down the tree. Grind out the stump, or clip off re-growth. - Cut stem/ cut stump with Glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Trim off all flowers

Invasive Woody Vines			
Japanese Honeysuckle	<ul style="list-style-type: none"> - Gold and White flowers - Heavy scent and sweet nectar in June 	<ul style="list-style-type: none"> - Shade shrubs and young trees of the forest understory, eventually killing them, and changing the open structure of the forest into a dense tangle - Rampant grower - Spirals around trees, often strangling them 	<ul style="list-style-type: none"> - Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs. - Mow or cutting at least 4 times a season to deplete plants' store of nutrients and carbohydrates, reduce seed formation, and kill or minimize spread of plants. If necessary, repeat each year. - Cut stem/ cut stump with Glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.*

			<ul style="list-style-type: none"> - Foliar spray^{3*} (fall or early spring when native vegetation is dormant) Plan to re-treat repeatedly
Oriental Bittersweet	<ul style="list-style-type: none"> - Bright orange seed capsules in clusters all along the stem - Flowers 	<ul style="list-style-type: none"> - Shade shrubs and young trees of the forest understory, eventually killing them, and changing the open structure of the forest into a dense tangle 	<ul style="list-style-type: none"> - Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs. - Keep ornamental plants cut back, remove all fruits as soon as they open, and bag or burn fruits. - Cut stem/ cut stump with Garlon 3a. Follow label directions for cut stump application. Clip off sucker sprouts or paint with Garlon 3a.*
Japanese Knotweed, Mexican Bamboo	<ul style="list-style-type: none"> - The stems have knotty joints, similar to bamboo - Grows 6-10' tall - Large, pointed oval or triangular leaves 	<ul style="list-style-type: none"> - Shade shrubs and young trees of the forest understory, eventually killing them, and changing the open structure of the forest into a dense tangle - Can grow in shade 	<ul style="list-style-type: none"> - Cut stem/ cut stump with Glyphosate (at least 3 times each during growing season). Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Foliar spray^{3*} - Treat with Rodeo - In gardens, heavy mulch or dense shade may kill it.

Invasive Herbaceous Plants

Garlic Mustard	<ul style="list-style-type: none"> - White-flowered biennial - Rough scalloped leaves (kidney, heart, or arrow shaped) - Garlic smell, mustard taste when its leaves are crushed 	<ul style="list-style-type: none"> - Shade shrubs and young trees of the forest understory, eventually killing them, and changing the open structure of the forest into a dense tangle - Rampant grower - Spirals around trees, often strangling them 	<ul style="list-style-type: none"> - Pull seedlings and small or shallow-rooted plants when soil is moist (before it flowers in spring). Dig out larger plants, including the crown and root systems. Use a forked spade or weed wrench for trees or shrubs. Tamp down soil afterwards. - Deadhead to prevent spread of seeds. Cut off seeds or fruits before they ripen. Bag and burn or send to a landfill. - Foliar spray^{3*} (may be appropriate in some settings)
Japanese Stilt Grass	<ul style="list-style-type: none"> - Lime green color - Line of silvery hairs down the middle of the 2-3" long blade 	<ul style="list-style-type: none"> - Tolerates sun or dense shade - Quickly invades areas left bare or disturbed by tilling or flooding - Builds a large seed bank in the soil 	<ul style="list-style-type: none"> - Pull seedlings and small or shallow-rooted plants when soil is moist (pulled easily in early to mid-summer). Dig out larger plants, including root systems. Use a forked spade or weed wrench for trees or shrubs. Be sure to pull before it goes to seed. If seeds have formed, bag and burn or send to a landfill. - Mow or cutting at least 4 times a season to deplete plants' store of nutrients and carbohydrates, reduce seed formation, and kill or minimize spread of plants. If necessary, repeat each year. Mowing weekly or when it has just begun to flower may prevent it from setting seed. - Foliar spray^{3*} (use glyphosate or herbicidal soap on large infestations). - Use a corn-based pre-emergence herbicide on annual weeds (spring). This product is also an organic fertilizer, i.e., it can stimulate growth of existing plants, including weeds, so it is appropriate for lawns and gardens but may not be appropriate in woodlands.

<p>Mile-A-Minute Vine, Devil's Tail Tearthumb</p>	<ul style="list-style-type: none"> - Triangular leaves - Barbed stems - Turquoise berries 	<ul style="list-style-type: none"> - Rapid growth - Quickly covers and shades out herbaceous plants 	<ul style="list-style-type: none"> - Pull seedlings and small or shallow-rooted plants when soil is moist (pulled easily in early to mid-summer). Dig out larger plants, including root systems. Use a forked spade or weed wrench for trees or shrubs. Be sure to pull before it goes to seed. If seeds have formed, bag and burn or send to a landfill. - Mow or cutting at least 4 times a season to deplete plants' store of nutrients and carbohydrates, reduce seed formation, and kill or minimize spread of plants. If necessary, repeat each year. Mowing weekly or when it has just begun to flower may prevent it from setting seed. - Foliar spray^{3*} (use glyphosate or herbicidal soap on large infestations). - Use a corn-based pre-emergence herbicide on annual weeds (spring). This product is also an organic fertilizer, i.e., it can stimulate growth of existing plants, including weeds, so it is appropriate for lawns and gardens but may not be appropriate in woodlands.
<p>Spotted Knapweed</p>	<ul style="list-style-type: none"> - Thistle-like flowers 	<ul style="list-style-type: none"> - Dense, crowds out native species 	<ul style="list-style-type: none"> - Do not pull unless the plant is young and the ground is very soft. The root will break and produce several new plants. - Wear sturdy gloves - Deadhead to prevent spread of seeds. Cut off seeds or fruits before they ripen. Bag and burn, or send to a landfill. - In lawns, spot treat with broad-leaf weed killer. Good lawn care practices (test soil; use lime and fertilizer only when soil test shows a need; mow high and frequently; leave clippings on lawn) reduce weed infestations. - Cut stem/ cut stump with Glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Foliar spray^{3*}

¹Girdle: Cut through the bark and growing layer all around the trunk, about 6" above the ground. Girdling is most effective in spring (when the sap is rising) & middle-late summer (when the tree is sending food to the roots). Clip off sucker sprouts.

²Frill: Using a machete, hatchet, or similar device, hack scars (several holes in larger trees) downward into the growing layer, and squirt in glyphosate (or triclopyr if specified in table). Follow label directions for injection and frill applications. This is most effective from middle to late summer. Clip off any sucker sprouts or treat with glyphosate.

³Foliar Spray: Use a backpack or garden sprayer or mist blower, following label directions. Avoid overspray and/or dripping onto non-target plants, because glyphosate kills most plants except moss. If it rolls off waxy or grass-like foliage, use additional sticker-spreader. Deciduous trees, shrubs, and perennials move nutrients down to the roots in late summer. Glyphosate is particularly effective at this time and when plants have just gone out of flowering. Several invasive species retain their foliage after native plants have lost theirs, and resume growth earlier in spring than most natives. This allows you to treat them without harming the natives. However, the plant must be actively growing for the herbicide to work. Retreatments may be necessary the following year if suckering occurs or the plant hasn't been entirely killed.

⁴Controlled Burning: Burning during the spring (repeated over several years) will allow native vegetation to compete more effectively with the invasive species. This requires a permit. Spot treatment with glyphosate in late fall can be used to make this method more effective

^{*}Herbicides: It is highly recommended that small populations try to be controlled using non-chemical methods where feasible. However, for large infestations, and for a few plants herbicide use is essential. Apply herbicides carefully to avoid non-target plants, glyphosate is the least environmentally damaging herbicide in most cases. Add food coloring for visibility, and a soap-based sticker such as Cide-Kick. Glyphosate is ineffective on some plants; for these, triclopyr or Garlon 3a may be indicated. When using herbicides read the entire label and observe all precautions listed, including proper disposal. If in doubt, call your local Cooperative Extension Service.

IV. Stormwater Practice Location Plan

24. PLANS

PRE-DEVELOPMENT DRAIN AREAS PLAN (11"x17" - COLORLESS)
POST-DEVELOPMENT DRAIN AREAS PLAN (11"x17" - COLORLESS)
PRE-DEVELOPMENT SOILS MAP (11"x17" - COLOR)
POST-DEVELOPMENT SOILS MAP (11"x17" - COLOR)
PRE-DEVELOPMENT DRAIN AREAS PLAN (22"x34" - COLORLESS)
POST-DEVELOPMENT DRAIN AREAS PLAN (22"x34" - COLORLESS)
NON-RESIDENTIAL SITE PLAN SET (22" x 34" - COLORLESS)