CAMPBELLO STREET EXTENSION CONDITIONAL USE PERMIT

CUP# 03-23

STAFF REPORT

April 24, 2024

SITE: 36 Campbello Street, Map 165 / Lot 049

ZONING: Town Residential (TR)

PURPOSE OF PLAN: to allow construction of a stormwater infiltration basin within approximately fifteen (15) feet of a wetland where fifty (50) feet is required by the Hudson Zoning Ordinance, Section 334-36. A permanent wetland buffer impact of approximately 4,500 square-feet is proposed where the majority of which will affect the wetland buffer along the easterly side of proposed limited common space associated with Unit 6.

PLANS UNDER REVIEW:

Site Plan Campbello Street CUP# 03-23, Map 165 Lot 049, 36 Campbello Street, Hudson, New Hampshire; prepared by: Greenman Pedersen, Inc., 44 Stiles Road Suite One, Salem, NH 03079; prepared for: Sousa Realty & Development Corporation, 46 Lowell Road, Hudson, NH 03051; consisting of sheets 1-16 and general notes 1-10 on Sheet 2; dated November 20, 2023; last revised April 15, 2024.

ATTACHMENTS:

1) Conditional Use Permit Application, date received November 21, 2023 – Attachment "**A**".
2) Department Comments – Attachment "**B**".
3) Notification of Shoreland Permit Application, Prepared by Greenman-Pedersen, Inc., dated March 20, 2024 – Attachment "**C**".
4) Shoreland Permit Application, prepared by Greenman-Pedersen, Inc., dated January 8, 2024 – Attachment "**D**".
5) Alteration of Terrain Permit Application, prepared by Greenman-Pedersen, Inc., dated January 8, 2024 – Attachment "**E**".
6) Request for More Information, issued by NHDES, dated February 22, 2024 – Attachment "**F**".
7) Recommendation to approve CUP 03-23, issued by Conservation Commission, dated January 8, 2024 – Attachment "**G**".
8) Site Plan, dated November 20, 2023, last revised April 15, 2024.

APPLICATION TRACKING:

- November 20, 2023 – Original Application received.
- January 4, 2023 – Revised/Updated application received.
- January 8, 2024 – Conservation Commission Motion to Recommend CUP Approval.
- April 15, 2024 – Revised Site Plan received.

- April 24, 2024 – Public hearing scheduled.

COMMENTS & RECOMMENDATIONS:

BACKGROUND

The site is a 4.74-acre lot in the Town Residential district with one single family home on the property. Access to the site is provided via a paved road on Campbello Street. The property is currently serviced by Town sewer, with water to be connected via extension of pre-existing lines on Federal and Merrimack Street. The site directly abuts the Merrimack River and is entirely within the 500-year flood plain, with an approximately 25 foot wide band of 100-year flood risk area spanning the direct riverfront.

The applicant has submitted forms to NHDES for two permits; a Shoreland permit (Attachment "**D**"), and an Alteration of Terrain permit (Attachment "**E**"). NHDES has yet to make a final determination related to either permit, however, they have requested additional information related to the Alteration of Terrain permit (Attachment "**F**").

The applicant brought the Conditional Use Permit Application before the Conservation Commission on December 11, 2023, and received a Motion to Recommend Conditional Use Permit Application Approval on January 8, 2024 (Vote: 4/0/0) to the Planning Board with the following stipulations (**Attachment G**):

1. During construction and restoration erosion control barriers shall be installed and maintained to the satisfaction of the Town Engineer.

2. It is recommended that the outflow from Outlet Apron noted as FES-1 shown on sheet 7 of 16 of the plan set be redirected into Infiltration Basin-3.

3. It is recommended that the applicant create and implement a wetland buffer restoration plan for the disturbed buffer areas existing on the easterly side of proposed Lot 5 and Lot 6 as part of site plan approval. The details and implementation of said Restoration Plan to be added to the General Notes and Legend found on sheet 2 of 16 of the plan set.
   Staff note: Lot 5 and Lot 6 have been relabeled Unit 5 and Unit 6 respectively as of rev. 3 dated April 15, 2024. These labels have been updated in the draft stipulations.

4. It is recommended to have the applicant install approved "Do not cut/Do Not Disturb town conservation markers along the conservation districts boundaries. Furthermore, Post and Rail fence sections could be erected and maintained to aid in delineating the wetland buffer boundary as is typical on other excepted residential developments. If this recommendation is accepted by the Planning Board details of the Do Not Cut/ Do Not Disturb Markers and Post and Rail Fencing shall be added to the General Notes and Legend found on sheet 2 of 16 of the plan set.

5. It is recommended that efforts be made to save three trees on the site. One Japanese Red Maple tree lies in the middle of the proposed roadway but could be relocated and incorporated into the landscaping of the Cul-de-Sac Island. The other two trees to be saved lie near Infiltration

Basin-1 and Infiltration Basin-2, careful excavation to minimize tree root damage could be implemented during their construction.

STAFF COMMENTS

As previously noted, this conditional use permit application has been submitted to and is recommended by the Conservation Commission. The project is ready for consideration by the Planning Board. The two outstanding permits in process with NHDES, those being an Alteration of Terrain permit and a Shoreland permit, are not required to be issued prior to planning board approval. Any approval granted by the board would not supersede NHDES issuance of permits.

DEPARTMENT COMMENTS

Engineering provided the following comment:

1. Applicant shall evaluate the possibility of an underground stormtech system at the cul-de-sac which would reduce the footprint of the detention basin, therefore reduce the wetland buffer impact.

Full comments are provided in **Attachment B.**

RECOMMENDATIONS

Staff recommends accepting the conditional use permit application and holding a public hearing, followed by deliberation and consideration of approval. The Applicant has addressed all comments issued by Town Staff.

DRAFT MOTIONS:

ACCEPT the Conditional Use Permit Application:

I move to accept the conditional use permit application for Campbello Street Extension Subdivision Plan at 36 Campbello Street, Hudson, NH, Map 165 Lot 049.

Motion by: _______________Second: _________________Carried/Failed: _______________

CONTINUE the public hearing to date certain:

I move to continue the public hearing for the Conditional Use Permit Application for Campbello Street Extension Site Plan at 36 Campbello Street, Hudson, NH, Map 165 / Lot 049, to date certain ____________________.

Motion by: _______________Second: _________________Carried/Failed: _______________

APPROVE the Conditional Use Permit Application:

I move to approve the Conditional Use Permit Application for the Site Plan Campbello Street CUP# 03-23, Map 165 Lot 049, 36 Campbello Street, Hudson, NH; prepared by: Greenman Pedersen, Inc. (GPI), 44 Stiles Road Suite One, Salem, NH 03079; prepared for: Sousa Realty &

Development Corporation, 46 Lowell Road, Hudson, NH 03051; consisting of sheets 1-16 and general notes 1-10 on Sheet 2; dated November 20, 2023; last revised April 15, 2024; subject to, and revised per, the following stipulations:

1. All stipulations of approval shall be incorporated into the Development Agreement, which shall be recorded at the HCRD, together with the Plan.
2. Prior to the Planning Board endorsement of the Plan, it shall be subject to final administrative review by the Interim Town Planner, Town Engineer, and Town Counsel.
3. Planning Board endorsement of the Plan shall be contingent upon proof of valid Alteration of Terrain (AOT) and Shoreland Permits issued by New Hampshire Department of Environmental Services (NHDES).
4. Construction activities involving the subject lot shall be limited to the hours between 7:00 A.M. and 7:00 P.M, Monday thru Saturday. No exterior construction activities shall be allowed on Sundays.

Conditions Recommended by the Conservation Commission:

6. During construction and restoration erosion control barriers shall be installed and maintained to the satisfaction of the Town Engineer.

7. The outflow from Outlet Apron noted as FES-1 shown on sheet 7 of 16 of the plan set shall be redirected into Infiltration Basin-3.

8. The applicant shall create and implement a wetland buffer restoration plan for the disturbed buffer areas existing on the easterly side of proposed Unit 5 and Unit 6 as part of site plan approval. The details and implementation of said Restoration Plan to be added to the General Notes and Legend found on sheet 2 of 16 of the plan set.

9. The applicant shall install approved "Do not cut/Do Not Disturb town conservation markers along the conservation districts boundaries. Furthermore, Post and Rail fence sections could be erected and maintained to aid in delineating the wetland buffer boundary as is typical on other excepted residential developments. Details of the Do Not Cut/ Do Not Disturb Markers and Post and Rail Fencing shall be added to the General Notes and Legend found on sheet 2 of 16 of the plan set.

10. The three trees identified by the Conservation Commission shall be preserved and relocated. One Japanese Red Maple tree lies in the middle of the proposed roadway but shall be relocated and incorporated into the landscaping of the Cul-de-Sac Island. The other two trees to be saved lie near Infiltration Basin-1 and Infiltration Basin-2.

Motion by: _______________Second: _________________Carried/Failed: ___________

Attachment "A"

Town of Hudson
12 School Street
Hudson, NH 03501

CONDITIONAL USE PERMIT APPLICATION

Revised July 24, 2023

The following information must be filed with the Planning Department ***at the time of filing a conditional use permit application, which shall be filed concurrently with application for subdivision and/or site plan approval***:

1. One (1) original completed application with original signatures, and one (1) copy.

2. One (1) copy of the project narrative shall be attached to each of the two submitted applications.

3. A list of direct abutters and a list of indirect abutters, and two (2) sets of mailing labels for abutter notifications.

4. All of the above application materials, including plans, shall also be submitted in electronic form as a PDF.

Note: Prior to filing an application, it is recommended to schedule an appointment with the Town Planner.

Attachment "A"

CONDITIONAL USE PERMIT APPLICATION

Date of Application: November 20, 2023 Tax Map #: 165 Lot #: 49

Site Address: 36 Campbello Street

Name of Project: Campbello Street Extension

Zoning District: Town Residence (TR) General SB#: ____________________

(For Town Use Only)

Z.B.A. Action: ____________________

	PROPERTY OWNER:	DEVELOPER:
Name:	A. Jack Atkinson, Trustee	Sousa Realty & Development Corp.
Address:	36 Campbello Street	46 Lowell Road
Address:	Hudson, NH 03051	Hudson, NH 03051
Telephone #		(603) 880-7799
Email:		msousa@sousarealtynh.com
	PROJECT ENGINEER:	SURVEYOR:
Name:	Greenman-Pedersen, Inc.	Greenman-Pedersen, Inc.
Address:	44 Stiles Road, Suite One	44 Stiles Road, Suite One
Address:	Salem, NH 03079	Salem, NH 03079
Telephone #	(603) 893-0720	(603) 893-0720
Email:	djordan@gpinet.com	djordan@gpinet.com

PURPOSE OF PLAN:

A subdivision of land at 36 Campbello Street to create 11 single family house lots.

(For Town Use Only)

Routing Date: ____________ Deadline Date: ____________ Meeting Date: ____________

________ I have no comments ________ I have comments (attach to form)

__________ Title: ______________________ Date: ____________

(Initials)

Department:

Zoning: ___ Engineering: ___ Assessor: ___ Police: ___Fire: ___ DPW: ___ Consultant: ___

Attachment "A"

SUBDIVISION PLAN APPLICATION AUTHORIZATION

I hereby apply for *Subdivision Plan* Review and acknowledge I will comply with all of the Ordinances of the Town of Hudson, New Hampshire State Laws, as well as any stipulations of the Planning Board, in development and construction of this project. I understand that if any of the items listed under the *Subdivision Plan* specifications or application form are incomplete, the application will be considered rejected.

Pursuant to RSA 674:1-IV, the owner(s) by the filing of this application as indicated above, hereby given permission for any member of the Hudson Planning Board, the Town Planner, the Town Engineer, and such agents or employees of the Town or other persons as the Planning Board may authorize, to enter upon the property which is the subject of this application at all reasonable times for the purpose of such examinations, surveys, tests and inspections as may be appropriate. The owner(s) release(s) any claim to or right he/she (they) may now or hereafter possess against any of the above individuals as a result of any examinations, surveys, tests and/or inspections conducted on his/her (their) property in connection with this applications.

Signature of Owner: ______________ Date: 11/21/23

Print Name of Owner: James Bernard

- ❖ If other than an individual, indicate name of organization and its principal owner, partners, or corporate officers.

Signature of Developer: Manuel D Sousa Date: 11/21/23

Print Name of Developer: Manuel D Sousa Jr

- ❖ The developer/individual in charge must have control over all project work and be available to the Code Enforcement Officer/Building Inspector during the construction phase of the project. The individual in charge of the project must notify the Code Enforcement Officer/Building Inspector within two (2) working days of any change.

Attachment "A"

SCHEDULE OF FEES

A. REVIEW FEES:

1. Conditional Use Permit $100 Flat Fee	$_ 100.00____

CONSULTANT REVIEW FEE: (If Applicable - Separate Check)

Total __________ acres @ $600.00 per acre, or $1,250.00, whichever is greater.	$ TBD

This is an estimate for cost of consultant review. The fee is expected to cover the amount. A complex project may require additional funds. A simple project may result in a refund.

LEGAL FEE:

The applicant shall be charged attorney costs billed to the Town for the Town's attorney review of any application plan set documents.

B. POSTAGE:

______ Direct Abutters Applicant, Professionals, etc. as required by RSA 676:4.1.d @$5.01 **(or Current Certified Mail Rate)**	$ 0*
______ Indirect Abutters (property owners within 200 feet) @$0.66 **(or Current First Class Rate)**	$ 0*
TOTAL	$ 100

* Paid for under Subdivision Application

SCHEDULE OF FEES
(Continued)

(For Town Use)

AMOUNT RECEIVED: $________________		DATE RECEIVED:	________________
RECEIPT NO.:	________________	RECEIVED BY:	________________

NOTE: fees below apply only upon plan approval, not collected at time of application.

F. RECORDING:

*****The applicant shall be responsible for the recording of the approved plan, and all documents as required by an approval, at the Hillsborough County Registry of Deeds (HCRD), located at 19 Temple Street, Nashua, NH 03061. Additional fees associated with recording can be found at HCRD.*****

G. COST ALLOCATION PROCEDURE AMOUNT CONTRIBUTION AND OTHER IMPACT FEE PAYMENTS:

To be determined by the Planning Board at time of plan approval and shall be paid by the applicant at the time of submittal of the Certificate of Occupancy Permit requests.

*****The applicant shall be responsible for all fees incurred by the town for processing and review of the applicant's application, plan and related materials.*****

GPI
Greenman-Pedersen, Inc.
Engineering | Design | Planning | Construction Inspection

November 21, 2023

Hudson Planning Board
12 School Street
Hudson, NH 03051

RE: Conditional Use Permit Application
Campbello Road Extension
Map 165, Lot 49
Sousa Realty & Development Corp.

Dear Members of the Hudson Planning Board:

Greenman-Pedersen, Inc. (GPI), on behalf of the project applicant, Sousa Realty & Development Corp., is requesting a Conditional Use Permit from the Hudson Planning Board to allow construction of stormwater infiltration basin within approximately 15 feet of a wetland where 50 feet is required by the Hudson Zoning Ordinance, Section 334-36. This request is made as provided for in Section 334-37 of the Hudson Zoning Ordinance. GPI is providing the following information in support of the criteria listed in Section 334-37 A.:

(1) ***The proposed activity minimizes degradation of land situated within the District and offsets potential adverse impacts to functions and values of wetlands, surface waters, and vernal pools including but not limited to their capacity to:***

(a) Support fish and wildlife;

The stormwater infiltration basin will provide stormwater treatment and groundwater recharge, which will support fish and wildlife.

(b) Attenuate flooding;

The stormwater infiltration basin will provide peak runoff rate reduction and runoff volume attenuation, which will attenuate flooding.

(c) Supply and protect surface and groundwater resources;

The stormwater infiltration basin will provide stormwater treatment and groundwater recharge, which will supply and protect surface and groundwater resources.

(d) Remove sediments;

The stormwater BMP’s that are incorporated into the design will provide stormwater treatment to remove sediments.

(e) Remove pollutants;

The stormwater BMP’s that are incorporated into the design will provide stormwater treatment to remove pollutants.

(f) Support wetland vegetation;

The stormwater infiltration basin will provide stormwater treatment and groundwater recharge, which will support wetland vegetation.

(g) Promote public health and safety; and

A shallow (2’ deep) infiltration basin that is dry between storm events does promote public health and safety.

(h) Moderate fluctuations in surface water levels.

The stormwater infiltration basin will provide stormwater treatment and groundwater recharge, which will moderate fluctuations in surface water levels.

(2) ***The proposed activity will have no significant negative environmental impact to abutting or downstream properties and/or hydrologically connected water and/or wetland resources, including:***

(a) Increased potential for erosion, siltation, and turbidity of surface waters;

The stormwater BMP's that are incorporated into the design will protect abutting and downstream properties from potential for erosion, siltation, and turbidity of surface waters.

(b) Loss of fish and wildlife habitat;

The stormwater BMP's that are incorporated into the design will protect abutting and downstream properties from loss of fish and wildlife habitat.

(c) Loss of unique habitat having demonstrable natural, scientific, or educational value;

The stormwater BMP's that are incorporated into the design will protect abutting and downstream properties from loss of unique habitat having demonstrable natural, scientific, or educational value.

(d) Loss or decrease of beneficial aquatic organisms and wetland plants and their habitat;

The stormwater BMP's that are incorporated into the design will protect abutting and downstream properties from loss or decrease of beneficial aquatic organisms and wetland plants and their habitat.

(e) Increased danger of flooding and/or transport of pollutants; and

The stormwater BMP's that are incorporated into the design will protect abutting and downstream properties from increased danger of flooding and/or transport of pollutants.

(f) Destruction of the economic, aesthetic, recreational, and other public and private uses and values of the wetland to the community.

The stormwater BMP's that are incorporated into the design will protect abutting and downstream properties from destruction of the economic, aesthetic, recreational, and other public and private uses and values of the wetland to the community.

(3) The proposed activity or use cannot practicably be located otherwise on the site to eliminate or reduce impact to the Wetland Conservation Overlay District.

By necessity, the stormwater infiltration basin has to be located at the lowest point of the property, which due to the relatively flat topography throughout the property, is only at this location.

(4) The proposed activity incorporates the use of those Best Management Practices recommended by the New Hampshire Department of Environmental Services and/or other state agencies having jurisdiction.

The stormwater BMPs for this project have been designed in full compliance with the New Hampshire Stormwater handbook and the requirements of the NH DES Alteration of Terrain Program.

(5) All applicable federal and/or state permit(s) have been received for the proposed activity in accordance with New Hampshire Code of Administrative Rules, Part Env-Wt 100-800 and Section 404 of the Federal Clean Water Act, as amended.

An Alteration of Terrain Permit application will be filed with the NH DES for this project. All construction activities will be performed in accordance with the requirements of the US EPA 2022 Construction General Permit.

(6) Where applicable, proof of application to all required state and/or federal permits.

Proof of application to the NH DES Alteration of Terrain program will be provided.

(7) Prior to making a decision on any Conditional Use Permit pursuant to the Wetland Conservation Overlay District, the Planning Board shall receive a written comment from the Conservation Commission. The Conservation Commission may recommend the Planning Board impose conditions of approval is deemed necessary to mitigate the potential for adverse effects of the proposed activity or use.

Written comment from the Conservation Commission will be forwarded once they have reviewed the project.

If you have any questions or need additional information, please feel free to contact me at (603) 374-7912 or by email to djordan@gpinet.com.

Sincerely,
Greenman-Pedersen, Inc.

David R. Jordan, P.E., L.L.S., LEED AP
Vice President
Director of Project Delivery – Land Development

F:\Projects\NEX-2300191 - Hudson, NH - Sousa Realty\Applications\Conditonal Use Permit Narrative.docx

Attachment "**B**"

Dubowik, Brooke

From:	Dhima, Elvis
Sent:	Tuesday, November 28, 2023 8:20 AM
To:	Dubowik, Brooke; Groth, Brian
Subject:	RE: DEPT SIGN OFF - CUP# 03-23 Campbello St Extension CUP

I just have one comment

1. Applicant shall evaluate the possibility of an underground stormtech system at the culdesac which would reduce the footprint of the detention basin , therefore reduce the wetland buffer inpact

E

Elvis Dhima, P.E.
Town Engineer

12 School Street
Hudson, NH 03051
Phone: (603) 886-6008
Mobile: (603) 318-8286
Town of Hudson
NEW HAMPSHIRE 03051

CONDITIONAL USE PERMIT APPLICATION

Date of Application: November 20, 2023 Tax Map #: 165 Lot #: 49

Site Address: 36 Campbello Street

Name of Project: Campbello Street Extension

Zoning District: Town Residence (TR) General SB#: 03-23 (For Town Use Only)

Z.B.A. Action:

PROPERTY OWNER:	DEVELOPER:
Name: A. Jack Atkinson, Trustee	Sousa Realty & Development Corp.
Address: 36 Campbello Street	46 Lowell Road
Address: Hudson, NH 03051	Hudson, NH 03051
Telephone #	(603) 880-7799
Email:	msousa@sousarealtynh.com
PROJECT ENGINEER:	SURVEYOR:
Name: Greenman-Pedersen, Inc.	Greenman-Pedersen, Inc.
Address: 44 Stiles Road, Suite One	44 Stiles Road, Suite One
Address: Salem, NH 03079	Salem, NH 03079
Telephone # (603) 893-0720	(603) 893-0720
Email: djordan@gpinet.com	djordan@gpinet.com

PURPOSE OF PLAN:
A subdivision of land at 36 Campbello Street to create 11 single family house lots.

(For Town Use Only)

Routing Date: 11/27/23 Deadline Date: 12/4/23 Meeting Date: TBD

X I have no comments ________ I have comments (attach to form)

GS Title: Zoning Administrator Date: 11/28/23
(Initials)

Department: Zoning

Zoning: X Engineering: ___ Assessor: ___ Police: ___ Fire: ___ DPW: ___ Consultant: ___

Attachment "B"

CONDITIONAL USE PERMIT APPLICATION

Date of Application: November 20, 2023 Tax Map #: 165 Lot #: 49

Site Address: 36 Campbello Street

Name of Project: Campbello Street Extension

Zoning District: Town Residence (TR) General SB#: 03-23
(For Town Use Only)

Z.B.A. Action:

PROPERTY OWNER:	DEVELOPER:
Name: A. Jack Atkinson, Trustee	Sousa Realty & Development Corp.
Address: 36 Campbello Street	46 Lowell Road
Address: Hudson, NH 03051	Hudson, NH 03051
Telephone #	(603) 880-7799
Email:	msousa@sousarealtynh.com

PROJECT ENGINEER:	SURVEYOR:
Name: Greenman-Pedersen, Inc.	Greenman-Pedersen, Inc.
Address: 44 Stiles Road, Suite One	44 Stiles Road, Suite One
Address: Salem, NH 03079	Salem, NH 03079
Telephone # (603) 893-0720	(603) 893-0720
Email: djordan@gpinet.com	djordan@gpinet.com

PURPOSE OF PLAN:
A subdivision of land at 36 Campbello Street to create 11 single family house lots.

(For Town Use Only)

Routing Date: 11/27/23 Deadline Date: 12/4/23 Meeting Date: TBD

✓ I have no comments ____ I have comments (attach to form)

DRH Title: Fire Marshal Date: 11/28/23
(Initials)

Department:

Zoning: ___ Engineering: ___ Assessor: ___ Police: ___ Fire: ✓ DPW: ___ Consultant: ___

Attachment "B"

CONDITIONAL USE PERMIT APPLICATION

Date of Application: November 20, 2023 Tax Map #: 165 Lot #: 49

Site Address: 36 Campbello Street

Name of Project: Campbello Street Extension

Zoning District: Town Residence (TR) General SB#: 03-23
(For Town Use Only)

Z.B.A. Action: ______

	PROPERTY OWNER:	DEVELOPER:
Name:	A. Jack Atkinson, Trustee	Sousa Realty & Development Corp.
Address:	36 Campbello Street	46 Lowell Road
Address:	Hudson, NH 03051	Hudson, NH 03051
Telephone #		(603) 880-7799
Email:		msousa@sousarealtynh.com

	PROJECT ENGINEER:	SURVEYOR:
Name:	Greenman-Pedersen, Inc.	Greenman-Pedersen, Inc.
Address:	44 Stiles Road, Suite One	44 Stiles Road, Suite One
Address:	Salem, NH 03079	Salem, NH 03079
Telephone #	(603) 893-0720	(603) 893-0720
Email:	djordan@gpinet.com	djordan@gpinet.com

PURPOSE OF PLAN:

A subdivision of land at 36 Campbello Street to create 11 single family house lots.

(For Town Use Only)

Routing Date: 11/27/23 Deadline Date: 12/4/23 Meeting Date: TBD

______ I have no comments ______ I have comments (attach to form)

______ Title: Chief Assessor Date: 11-28-23
(Initials)

Department:

Zoning: ___ Engineering: ___ Assessor: ___ Police: ___ Fire: ___ DPW: ___ Consultant: ___

Attachment "C"

GPI
Greenman-Pedersen, Inc.
Engineering | Design | Planning | Construction Inspection

RECEIVED
MAR 20 2024
TOWN OF HUDSON
PLANNING DEPARTMENT

MUNICIPALITY NOTIFICATION FOR SHORELAND PERMIT APPLICATION

VIA CERTIFIED MAIL

March 12, 2024

RE: **Shoreland Permit Application**
Proposed Residential Subdivision
36 Campbello Street
Hudson, NH 03051
Assessors Map 165 Lot 49

Dear Hudson Planning Department:

This letter is to inform you that a permit application has be filed with the NH Department of Environmental Services for a shoreland impact permit associated with the above referenced project. Under state law RSA 483-B:5-b, iv-a and Env-Wq 1406.12, I am required to notify you via certified mail about the application, which proposes work in the Town of Hudson.

Sincerely,

GREENMAN-PEDERSEN, INC.

Cory Mason

Cory Mason, P.E.
Project Engineer

Attachment "D"

SHORELAND PERMIT APPLICATION

PROPOSED RESIDENTIAL SUBDIVISION
ASSESSORS MAP 165 LOT 49
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

GPI

44 Stiles Road, Suite One
Salem, NH 03079
(603) 893-0720

Prepared For:

Sousa Realty & Development Corp.
46 Lowell Road
Hudson, NH 03051

January 8, 2024

(GPI Project No.: NEX-2300191)

Sousa Realty & Development Corp.
Proposed Residential Subdivision
Shoreland Permit Application

Attachment "D"

Shoreland Permit Application

36 Campbello Street
Hudson, New Hampshire
January 8, 2024

TABLE OF CONTENTS

Included Separately

Attachment "D"

NHDES-W-06-037

SHORELAND PERMIT APPLICATION

Water Division/ Land Resources Management
Shoreland Program

[Check the Status of your Application]

RSA/Rule: RSA 483-B, Env-Wq 1400

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

This is an application for a permit to excavate, fill, construct new structures, or remove structures within the protected shoreland as regulated under RSA 483-B.

SECTION 1 - PROJECT DESCRIPTION (Env-Wq 1406.07)

Provide a concise description of the proposed project: The project proposes to subdivide Map 165 Lot 49 to create 10 additional residential lots and construct a new 24' wide subdivision road with cul-de-sac and associated stormwater management improvements and utility services.

SECTION 2 - PROJECT LOCATION (Env-Wq 1406.07)

ADDRESS: 36 Campbello Street	TOWN/CITY: Hudson	STATE: NH	ZIP CODE: 03051
WATERBODY NAME: Merrimack River	TAX MAP/ BLOCK/LOT NUMBER : Map 165, Lot 49		

SECTION 3 - PROPERTY OWNER & DEED INFORMATION (Env-Wq 1406.07)

The legal name of each property owner must be as it appears on the deed of record. If the owner is a trust or a company, then the name of the trust or company should be written as the owner's name.

LAST NAME, FIRST NAME, M.I: A. Jack Atkinson, Trustee of the A. Jack Atkinson Revocable Trust Agreement of February 25, 1983

MAILING ADDRESS: 36 Campbello Street	TOWN/CITY: Hudson	STATE: NH	ZIP CODE: 03051
PHONE:	EMAIL (if available): msousa@sousarealtynh.com		

REGISTRY OF DEED COUNTY Hillsborough, BOOK NUMBER 9180, PAGE NUMBER 1549

SECTION 4 - APPLICANT (DESIRED PERMIT HOLDER), IF DIFFERENT THAN OWNER (Env-Wq 1406.07)

If the applicant is a trust or a company, then the name of the trust or company should be written as the applicant's name. If the applicant is the owner, leave blank and check the following box: ☐.

LAST NAME, FIRST NAME, M.I: Sousa Realty & Development Corp

MAILING ADDRESS: 46 Lowell Road	TOWN/CITY: Hudson	STATE: NH	ZIP CODE: 03051

Attachment "D"

NHDES-W-06-037

PHONE: | EMAIL (if available): msousa@sousarealtynh.com

SECTION 5 - CONTRACTOR OR AGENT (OPTIONAL)

LAST NAME, FIRST NAME, M.I: Greenman-Pedersen, Inc. c/o Mason, Cory

ADDRESS: 44 Stiles Road, Suite One | TOWN/CITY: Salem | STATE: NH | ZIP CODE: 03079

PHONE: 603-827-4527 | EMAIL (if available): cmason@gpinet.com

SECTION 6 - CRITERIA (Env-Wq 1406.07)

Please check at least one of the following criteria:

☒ This shoreland permit application requires neither a proposal to make the property more nearly conforming nor a request for a waiver of a minimum standard.

☐ This shoreland permit application includes a proposal to make the structures and/or the property more nearly conforming in accordance with RSA 483-B:11.

☐ This shoreland permit application includes a request for a waiver of the following minimum standard(s): RSA 483-B:9, V .

SECTION 7 - RELATED NHDES LAND RESOURCES MANAGEMENT PERMIT APPLICATIONS ASSOCIATED WITH THIS PROJECT (Env-Wq 1406.14)

Please indicate if any of the following permits are required and, if required, the status of the application.

Permit Type	Permit Required	File Number	Permit Application Status
Alteration of Terrain Permit per RSA 485-A:17	☒ YES ☐ NO		☐ APPROVED ☒ PENDING ☐ DENIED
Individual Sewerage Disposal per RSA 485-A:29	☐ YES ☒ NO		☐ APPROVED ☐ PENDING ☐ DENIED
Subdivision Approval per RSA 485-A:29	☐ YES ☒ NO		☐ APPROVED ☐ PENDING ☐ DENIED
Wetlands Permit per RSA 482-A	☐ YES ☒ NO		☐ APPROVED ☐ PENDING ☐ DENIED

SECTION 8 - REFERENCE LINE ELEVATION (Env-Wq 1406.07)

Required for projects located on the protected shoreland of lakes or ponds. The reference line elevations for most lakes, ponds, and artificial impoundments greater than 10 acres in size are listed in the Consolidated List of Waterbodies Subject to the Shoreland Water Quality Protection Act. Please see RSA 483-B:4, XVII for the definition of reference line.

REFERENCE LINE ELEVATION: feet above sea level.

SECTION 9 - APPLICATION FEE & SUBMITTAL (RSA 483-B:5-b, I(b); RSA 483-B:5-b, X)

A non-refundable permit application fee of $200 plus $0.20 per total square feet of impact for restoration of water quality improvement projects, or $400 plus $0.20 per total square feet of impact for all other projects is required at the time the application is submitted. **Applications for projects solely funded by municipal, county, state, or federal entities shall incur a permitting fee no greater than $3,750.**

Please mail or hand deliver this application and all required attachments to the NHDES Wetlands Bureau, PO Box 95, Concord, NH 03302-0095. Missing information will delay processing your application and may result in denial of a shoreland permit application. **Please make checks payable to the Treasurer, State of NH.**

SECTION 10 - CALCULATING TOTAL IMPACT AREA/ PERMIT APPLICATION FEE (RSA 483-B:5-b, I(b); RSA 483-B:5-b, X)

Total impact area is calculated by determining the sum of all areas disturbed by regrading, excavating, filling, construction, or structure removal. Impacts often include, but are not limited to: constructing new driveways, constructing new structures, areas disturbed when installing septic systems and foundations, creating temporary access roads to drill a new well, and regrading associated with landscaping activities.

TOTAL AREA IMPACTED WITHIN THE PROTECTED SHORELAND = 40,050 **(A) square feet**

- **For restoration of water quality improvement projects:**
  Multiply line (A) by $0.20 **and** add $200. **[(A) × $0.20 + $200]** = $ ______ **Permit fee**[1]
- **For all other projects:**
  Multiply line (A) by $0.20 **and** add $400. **[(A) × $0.20 + $400]** = $ 8,410 **Permit fee**[1]

SECTION 11 - REQUIRED CERTIFICATIONS (Env-Wq 1406.08; Env-Wq 1406.10(a))

By initialing within the blank before each of the following statements, and signing below, you are certifying that:

Initials: CMN	The information provided is true, complete, and not misleading to the knowledge and belief of the signer.
Initials: CMN	I understand that: • Any permit or waiver granted based on false, incomplete, or misleading information shall be subject to revocation. • I am subject to the applicable penalties in RSA 641, Falsification in Official Matters. And • Obtaining a shoreland permit shall not exempt the work proposed from other state, local, or federal approvals.
Initials: CMN	I have notified the governing body of the municipality or municipalities in which the property is located by certified mail, in accordance with Env-Wq 1406.13.
Initials: CMN	I have notified all abutters[2] of the proposed impacts via certified mail, in accordance with Env-Wq 1406.13.
Initials: CMN	☒ This project is within ¼ mile of a designated river and I have notified the Local River Management Advisory Committee (LAC) by providing the LAC with a copy of the complete application, including all supporting materials, via certified mail, in accordance with Env-Wq 1406.13. ☐ This project is **not** within ¼ mile of a designated river.
Initials: CNM	For any project proposing that the impervious area be at least 15% but not more than 20% within the protected shoreland, I certify that the impervious area is not more than 20%. ☐ N/A

SECTION 12 - REQUIRED SIGNATURES (Env-Wq 1406.08)

Both the property owner and applicant must sign the application.

SIGNATURE (OWNER): Joseph W Kenney Exec	PRINT NAME LEGIBLY: JOSEPH·W KENNEY Exec	DATE: 1/26/23
SIGNATURE (APPLICANT, IF DIFFERENT FROM OWNER): Manuel D Sousa	PRINT NAME LEGIBLY: Manuel D Sousa Jr	DATE: 1/16/23

---

[1] Applications for projects solely funded by municipal, county, state, or federal entities shall incur a permitting fee no greater than $3,750.

[2] "Abutter" means any person who owns property that is immediately contiguous to the property on which the proposed work will take place, or who owns flowage rights on such property. The term does not include those properties separated by a public road or more than ¼ mile from the limits of the proposed work. If contiguous properties are owned by the person who is proposing the work, then the term includes the person owning the next contiguous property, subject to the ¼ mile limitation.

Attachment "D"

SHOREland APPLICATION WORKSHEET

This worksheet *must* be submitted to the NHDES Wetlands Bureau with every Shoreland Permit Application. **A separate shoreland application worksheet must be submitted for each individual lot of record where impacts are proposed.**

For the purposes of this worksheet, “**pre-construction**” impervious surface area[3] means all human made impervious surfaces[4] currently present within the protected shoreland of a lot, whether to be removed or to remain after the project is completed. “**Post-construction**” impervious area means all impervious surfaces that will exist within the protected shoreland of a lot upon completion of the project, including both new and any remaining pre-construction impervious surfaces. All answers shall be given in square feet.

Calculating the Impervious Area of a Lot

CALCULATING THE IMPERVIOUS AREA OF A LOT WITHIN 250 FEET OF THE REFERENCE LINE (Env-Wq 1406.12)			
	STRUCTURE DESCRIPTION	**PRE-CONSTRUCTION IMPERVIOUS AREAS**	**POST-CONSTRUCTION IMPERVIOUS AREAS**
PRIMARY STRUCTURE(S) House and all **attached** decks and porches.	House and Deck Area	2,820 FT^2	4,220 FT^2
ACCESSORY STRUCTURES All other impervious surfaces excluding lawn furniture, well heads, and fences. Common accessory structures include, but are not limited to: driveways, walkways, patios, and sheds.	Driveways/Roadway	3143 FT^2	8710 FT^2
	Shed	200 FT^2	200 FT^2
	Stairs	140 FT^2	140 FT^2
		FT^2	FT^2
		FT^2	FT^2
		FT^2	FT^2
	TOTAL:	**(A)** 6303 FT^2	**(B)** 13270 FT^2
Area of the lot located within 250 feet of reference line:			**(C)** 67223 FT^2
Percentage of lot covered by pre-construction impervious area within 250 feet of the reference line: *[divide (A) by (C) x 100]*			**(D)** 9 **%**
Percentage of lot to be covered by post-construction impervious area within 250 feet of the reference line upon completion of the project: *[divide (B) by (C) x 100]*			**(E)** 20 **%**

---

[3] **“Impervious surface area”** as defined in Env-Wq 1402.13 means, for purposes of the impervious surface limitation specified in RSA 483-B:9, V(g), the sum total of the footprint of each impervious surface that is located within the protected shoreland.

[4] **“Impervious Surface”** as defined in RSA 483-B:4, VII-b means any modified surface that cannot effectively absorb or infiltrate water. Examples of impervious surfaces include, but are not limited to, roofs, and unless designed to effectively absorb or infiltrate water, decks, patios, and paved, gravel, or crushed stone driveways, parking areas, and walkways.

Attachment "D"

Stormwater Management Requirements

THE IMPERVIOUS AREA THRESHOLDS (RSA 483-B:9, V(g))
☐ A net decrease or no net increase in impervious area is proposed (If **line E** is less than or equal to **line D**).
☒ The percentage of post-construction impervious area **(line E)** is less than or equal to 20%. This project **does not** require a stormwater management plan and **does not** require a plan demonstrating that each waterfront buffer grid segment at least meets the minimum required tree and sapling point score.
☐ A net increase in impervious area is proposed and the percentage of post-construction impervious area **(line E)** is greater than 20%, but less than 30%. This project **requires** a stormwater management but, **does not** require a plan demonstrating that each waterfront buffer grid segment at least meets the minimum required tree and sapling point score. *See details on the Application Checklist*
☐ A net increase in impervious area is proposed and the percentage of post-construction impervious area **(line E)** is greater than 30%. This project **requires** a stormwater management plan designed and certified by a professional engineer **and requires** plans demonstrating that each waterfront buffer grid segment meets at least the minimum required tree and sapling point score. *See details on the Application Checklist*

Natural Woodland Area Requirement

DETERMINING THE AREA TO REMAIN AS NATURAL WOODLAND		
Total area of the lot between 50 feet and 150 feet of the reference line within which the vegetation currently exists as natural woodland[5] **(see definition below)**.	**(F)**	0 FT²
Total area of the lot between 50 feet and 150 feet from the reference line.	**(G)**	25464 FT²
At least 25% of area **(G)** must remain in as natural woodland. *[0.25 x G]*	**(H)**	6,366 FT²
Place the lesser of area **(F)** and calculation **(H)** on this line. In order to remain compliant with the **natural woodland area requirement**, this is the minimum area that must remain as natural woodland between 50 feet and 150 feet from the reference line. This area **must** be represented on all plans and this area, exclusive of existing lawn, must remain in an unaltered state[6].	**(I)**	0 FT²

Name of person who prepared this worksheet: Sarah M. Simon

Name and date of the plan this worksheet is based upon: Existing Conditions dated November 20, 2023

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[5] **"Natural Woodland"** means a forested area consisting of various species of trees, saplings, shrubs, and ground covers in any combination and at any stage of growth (483-B:4, XI).

[6] **"Unaltered State"** means native vegetation allowed to grow without cutting, limbing, trimming, pruning, mowing, or other similar activities except as needed for renewal or to maintain or improve plant health (483-B:4, XXIV-b).

Attachment "D"

Doc # 9025147 Jun 21, 2019 3:29 PM
Book 9180 Page [illegible] Page 1 of 2
Register of Deeds, Hillsborough County

C/H
L-CHIP
HIA491705

Hamblett & Kerrigan, PA
20 Trafalgar Square, Ste. 505
Nashua, NH 03063
#535

FIDUCIARY DEED

A. JACK ATKINSON, TRUSTEE OF THE LUCILLE M. ATKINSON REVOCABLE TRUST AGREEMENT OF FEBRUARY 25, 1983 of Hudson, Hillsborough, County and State of New Hampshire, for consideration paid, grants to **A. JACK ATKINSON, TRUSTEE OF THE A. JACK ATKINSON REVOCABLE TRUST AGREEMENT OF FEBRUARY 25, 1983,** having a mailing address of 36 Campbello Street, Hudson, County of Hillsborough and State of New Hampshire with FIDUCIARY COVENANTS, the following described premises:

A certain tract or parcel of land with the buildings thereon situate on the southerly side of Campbello Street in Hudson, Hillsborough County, State of New Hampshire, being shown as Lot 17 on a plan entitled, "Subdivision Plan in HUDSON, N.H. for A. Jack & Lucille M. Atkinson Scale 1" = 50' Date January 1980," drawn by Hamilton Engineering Associates, Inc. and being recorded at Hillsborough County Registry of Deeds as Plan No. 13132.

Containing 4.69 Acres, plus or minus, according to said Plan.

Subject to flowage rights recorded in said Registry, Volume 470, Page 394.

Subject also to a sewer easement conveyed to Town of Hudson in Volume 2683, Page 136, in said Registry, as shown on said Plan, and to restrictions shown on said Plan: "Future subdivision of this parcel will require construction of cul-de-sac to Town of Hudson specifications."

Subjects to rights, reservations, restrictions, easements and mortgages of record, if any.

This deed was prepared from information provided by the Grantor herein and no independent title examination has been conducted.

Meaning and intending to describe and convey the same premises conveyed by deed to Lucille M. Atkinson dated August 28, 1981 and recorded in the Hillsborough County Registry of Deeds at Book 2870, Page 321. Lucille M. Atkinson died on January 8, 2017. See State of New Hampshire 9th Circuit Court Probate Division Docket Number: 316-2018-ET-01247.

This transfer is exempt from taxation pursuant to N.H.R.S.A. 78-B:2, XI.

Attachment "D"

Witness my hand this 18th of June, 2019.

LUCILLE M. ATKINSON
REVOCABLE TRUST AGREEMENT
OF FEBRUARY 25, 1983

A. Jack Atkinson, Trustee

CERTIFICATE OF TRUSTEE

Pursuant to New Hampshire RSA 564-A:7 II, the undersigned Trustee under the **LUCILLE M. ATKINSON REVOCABLE TRUST AGREEMENT OF FEBRUARY 25, 1983**, created by Lucille M. Atkinson as Grantor, and any amendments thereto, hereby certifies that he has full and absolute power in said trust to convey any interest in real estate and improvements thereon held in said trust and no purchaser or third party shall be bound to inquire whether the Trustee has said power or is properly exercising said power or to see the application of any trust assets paid or delivered to the Trustee for a conveyance thereof.

LUCILLE M. ATKINSON
REVOCABLE TRUST AGREEMENT
OF FEBRUARY 25, 1983

A. Jack Atkinson, Trustee

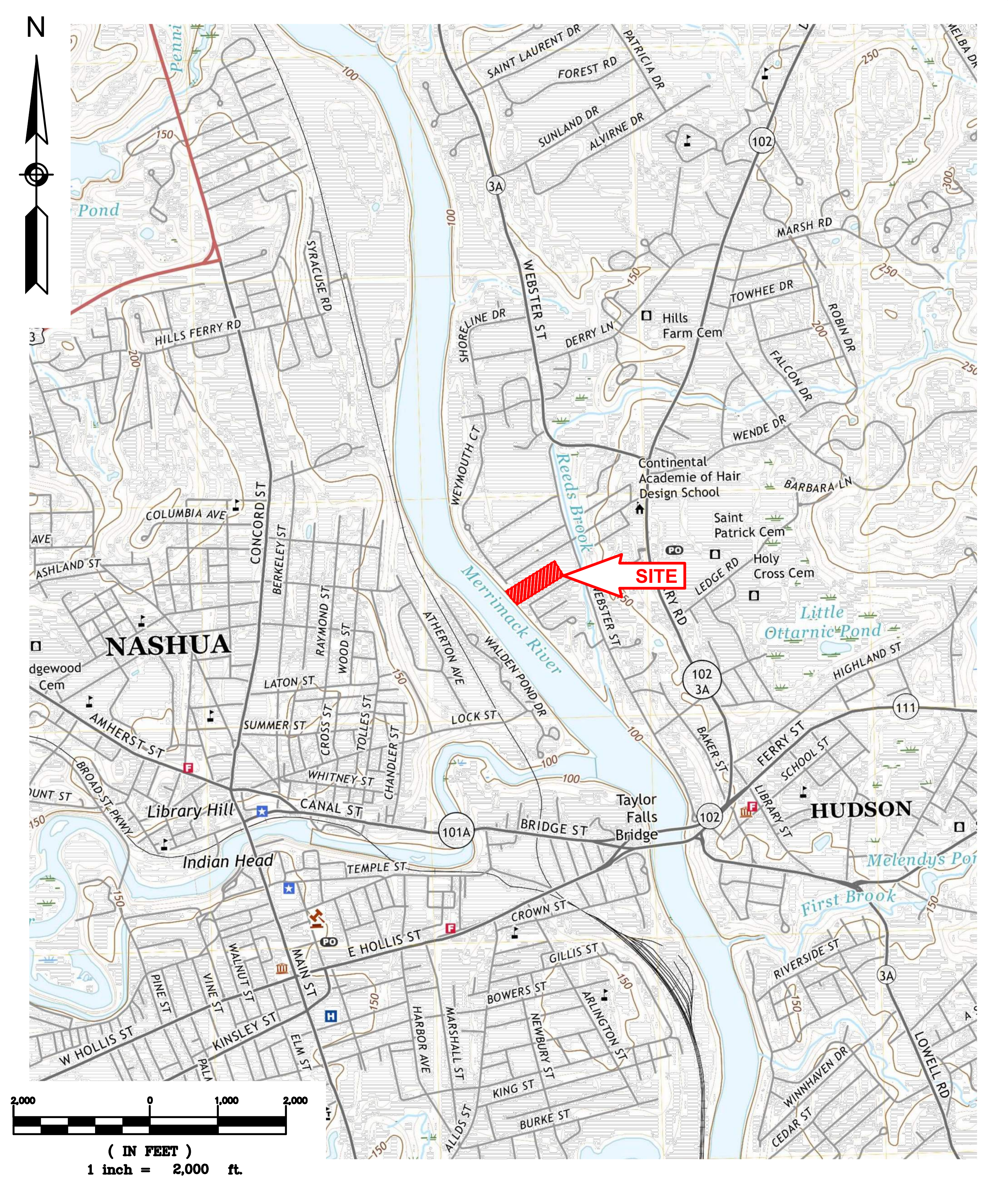
STATE OF NEW HAMPSHIRE
COUNTY OF HILLSBOROUGH

On this the 18th day of June, 2019 before me, appeared A. Jack Atkinson, in his capacity as Trustee of the LUCILLE M. ATKINSON REVOCABLE TRUST AGREEMENT OF FEBRUARY 25, 1983, personally known to me, who being by me duly sworn (or affirmed), and acknowledged that he executed the foregoing instrument and Certificate of Trustee as his free and voluntary act and deed in the capacity therein and for the purposes contained therein on behalf of the Trust.

Pamela A. Hart
Notary Public

PAMELA A. HART
MY COMMISSION EXPIRES AUGUST 2, 2022

Attachment "D"



USGS MAP

36 CAMPBELLO STREET
HUDSON, NH

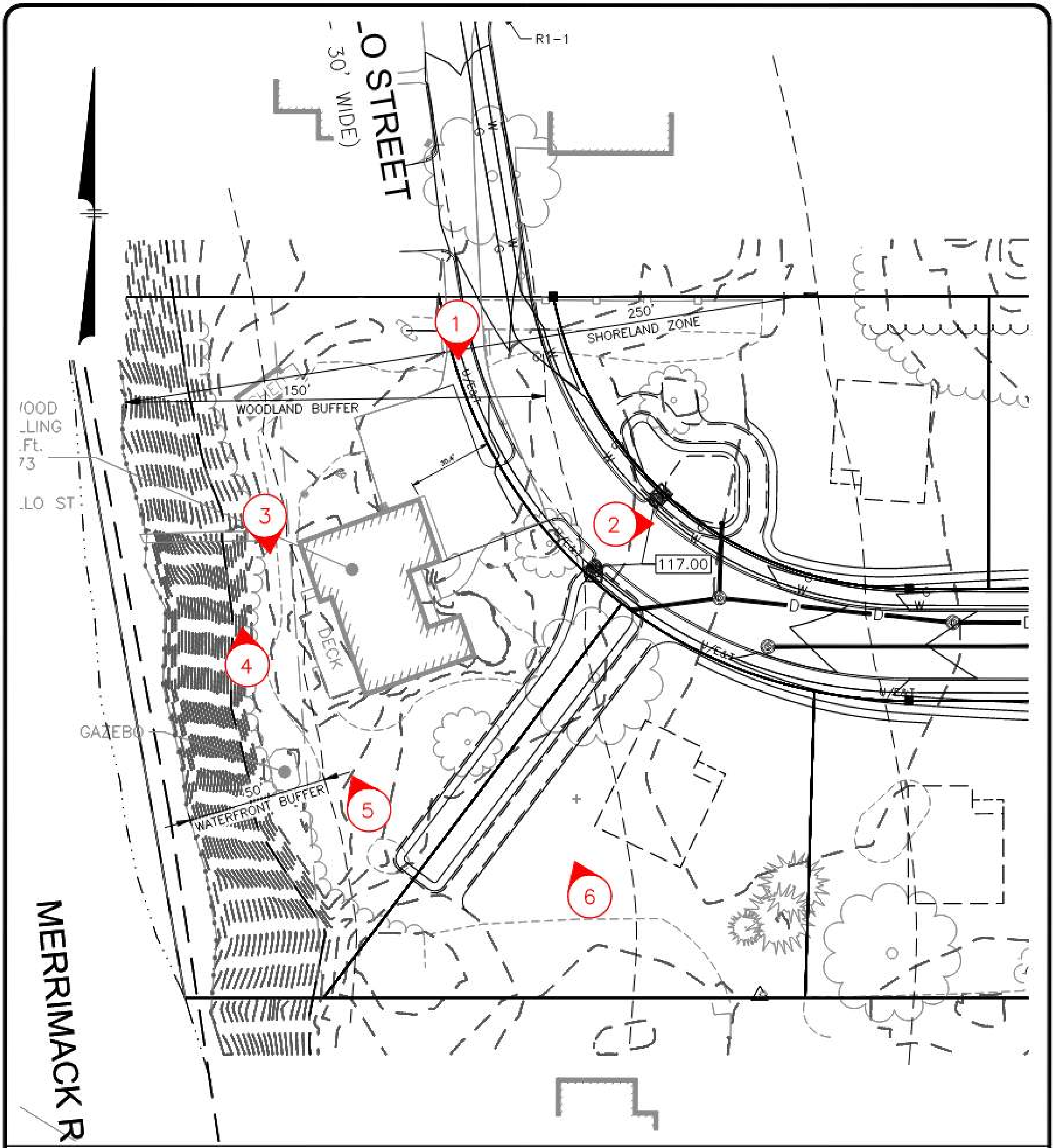
GPI
Engineering
Design
Planning
Construction Management
603.893.0720 GPINET.COM

Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

DRAWN BY: CNM
PROJECT #: NEX-2300191
DATE: 11/20/2023
FIGURE 1

F:\Projects\NEX-2300191 – Hudson, NH – Sousa Realty\Drainage\Stormwater Report\Appendix A – Figures\2300191 – USGS Map.dwg USGS 11/17/23 3:37pm cmason

Attachment "D"



50 0 25 50

(IN FEET)
1 inch = 50 ft.

LEGEND

① ▶ PHOTO LOCATION

PHOTO LOCATION MAP

36 CAMPBELLO STREET
HUDSON, NH

GPI Engineering
Design
Planning
Construction Management

603.893.0720 GPINET.COM

Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

DRAWN BY: SMS
GPI JOB #: NEX-2300191

DATE:
1/8/2024

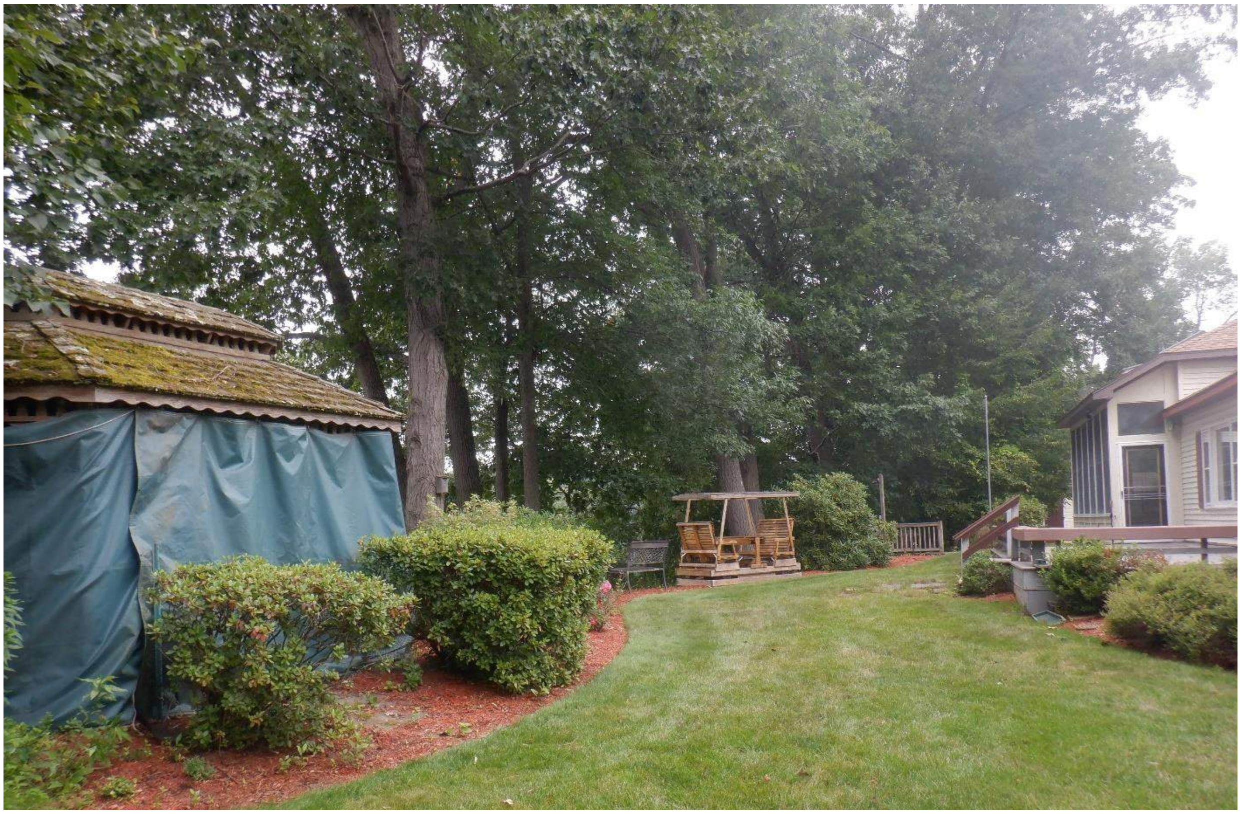
FIGURE
1

1

2


3


4



5

6

Attachment "D"

Attachment "D"

ABUTTERS & NOTIFICATION LIST
For
SOUSA REALTY
36 CAMPBELLO STREET
MAP 165 LOT 49
HUDSON, NH
GPI # NEX-2300191
AS OF 1/5/24

MAP-LOT #	NAME & ADDRESS
165-049 (SUBJECT PARCEL)	JACK A. ATKINSON TRUSTEE ATKINSON REVOCABLE TRUST 36 CAMPBELLO STREET HUDSON, NH 03051
165-050	EDWARD J. WELSH II TRUSTEE JOYCE M. WELSH TRUSTEE 38 CAMPBELLO STREET HUDSON, NH 03051
165-048	JOSELITO MANGUAL DANIEL R. JOWDERS 32 MERRIMAKC STREET HUDSON, NH 03051
165-047	ROBERT A. MILLER SYLVIA E. MILLER 28 MERRIMACK STREET HUDSON, NH 03051
165-046	RICHARD H. MORROW 20 MERRIMACK STREET HUDSON, NH 03051
165-044 165-045	CHESTER E. HURD TRUSTEE JOYCE M. HURD TRUSTEE 12 MERRIMACK STREET HUDSON, NH 03051
165-039	DONALD R. FITZGERALD LISA Y. FITZGERALD 100 WEBSTER STREET HUDSON, NH 03051
165-036	JOHN R. COLBY SONYA J. COLBY 11 KENYON STREET HUDSON, NH 03051

Attachment "D"

ABUTTERS & NOTIFICATION LIST
For
SOUSA REALTY
36 CAMPBELLO STREET
MAP 165 LOT 49
HUDSON, NH
GPI # NEX-2300191
AS OF 1/5/24

165-035	CYNTHIA TUTON JOHN TUTON 13 KENYON STREET HUDSON, NH 03051
165-034	FABIAN GALINDO TRUJILLO ROSALVA GALINDO 15 KENYON STREET HUDSON, NH 03051
165-033 165-032	WILLIAM R. KILLINGSWORTH JOAN E. KILLINGSWORTH 28 CAMPBELLO STREET HUDSON, NH 03051
LAC	LOWER MERRIMACK RIVER LAC FRANCIS MURPHY 72 BERKELEY STREET NASHUA, NH 03064
APPLICANT	SOUSA REALTY 46 LOWELL ROAD HUDSON, NH 03051

Attachment "D"

GPI

Greenman-Pedersen, Inc.

Engineering | Design | Planning | Construction Inspection

ABUTTER NOTIFICATION FOR

SHORELAND PERMIT APPLICATION

VIA CERTIFIED MAIL

January 4, 2024

RE: **Shoreland Permit Application**
Proposed Residential Subdivision
36 Campbello Street
Hudson, NH 03051
Assessors Map 165 Lot 49

Dear Sir or Madam:

This letter is to inform you that a permit application will be filed with the NH Department of Environmental Services for a shoreland impact permit associated with the above referenced project. Under state law RSA 483-B:5-b, iv-a, I am required to notify you about the application, which proposes work abutting your property.

Once it is filed, the permit application, including plans that show the proposed project, will be available for viewing at the Hudson Town Clerk's Office.

Sincerely,

GREENMAN-PEDERSEN, INC.

Cory Mason

Cory Mason, P.E.
Project Engineer

Attachment "D"

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JACK A. ATKINSON TRUSTEE
ATKINSON REVOCABLE TRUST
36 CAMPBELLO STREET

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EDWARD J. WELSH II TRUSTEE
JOYCE M. WELSH TRUSTEE
38 CAMPBELLO STREET
HUDSON, NH 03051

for Instructions

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WILLIAM R. KILLINGSWORTH
JOAN E. KILLINGSWORTH
28 CAMPBELLO STREET
HUDSON, NH 03051

for Instructions

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FABIAN GALINDO TRUJILLO
ROSALVA GALINDO
15 KENYON STREET
HUDSON, NH 03051

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SONYA J. COLBY
11 KENYON STREET
HUDSON, NH 03051

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Attachment "D"

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- ☐ Return Receipt (electronic) $ $0.00
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- ☐ Adult Signature Restricted Delivery $

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$

$5.01

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230-019/

DONALD R. FITZGERALD
LISA Y. FITZGERALD
100 WEBSTER STREET
HUDSON, NH 03051

for Instructions

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- ☐ Return Receipt (electronic) $ $0.00
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- ☐ Adult Signature Required $ $0.00
- ☐ Adult Signature Restricted Delivery $

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$

$5.01

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CHESTER E. HURD TRUSTEE
JOYCE M. HURD TRUSTEE
12 MERRIMACK STREET
HUDSON, NH 03051

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- ☐ Adult Signature Restricted Delivery $

Postage $0.66
$

$5.01

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230019/

RICHARD H. MORROW
20 MERRIMACK STREET
HUDSON, NH 03051

See Reverse for Instructions

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230019/

JOSELITO MANGUAL
DANIEL R. JOWDERS
32 MERRIMAKC STREET
HUDSON, NH 03051

for Instructions

7022 2410 0003 1445 0957

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230019/

ROBERT A. MILLER
SYLVIA E. MILLER
28 MERRIMACK STREET
HUDSON, NH 03051

See Reverse for Instructions

Attachment "D"

Cory Mason

From:	Cory Mason
Sent:	Thursday, January 18, 2024 12:16 PM
To:	fmurphy@shaheengordon.com
Cc:	Sarah Simon
Subject:	Merrimack River (Lower) LAC - Alteration of Terrain & Shoreland Permit - 36 Campbello St., Hudson, NH

Hi Francis,

Greenman Pedersen, Inc. (GPI) is submitting on behalf of our client, Sousa Realty & Development Corp., applications for NHDES Alteration of Terrain Permit and Shoreland Permit for a proposed residential subdivision at 36 Campbello Street in Hudson, NH.

As the project site is located along the Merrimack River, we are providing electronic copies of these submissions via the link below for review and comment by the LAC. Please let us know if you have any comments or questions.

Sousa Realty - Hudson, NH

Thank you,
Cory

Cory Mason, P.E.
Project Engineer

44 Stiles Road, Salem, NH 03079
d 603.827.4527
cmason@gpinet.com | www.gpinet.com

GPI Engineering | Design | Planning | Construction Inspection
Greenman-Pedersen, Inc.
An Equal Opportunity Employer

New Hampshire Natural Heritage Bureau
NHB DataCheck Results Letter

To: Diane Pantermoller
44 Stiles Road, Suite One
Salem, NH 03079

From: NH Natural Heritage Bureau

Date: 11/21/2023 (This letter is valid through 11/21/2024)

Re: Review by NH Natural Heritage Bureau of request dated 11/21/2023

Permit Types: Shoreland Standard Permit
Alteration of Terrain Permit
Stormwater Pollution Prevention

NHB ID: NHB23-3372

Applicant: Diane Pantermoller

Location: Hudson
Tax Map: 165, Tax Lot: 49
Address: 36 Campbello Street

Proj. Description: Subdivide the existing parcel into 11 single family dwelling lots.

The NH Natural Heritage database has been checked for records of rare species and exemplary natural communities near the area mapped below. The species considered include those listed as Threatened or Endangered by either the state of New Hampshire or the federal government. We currently have no recorded occurrences for sensitive species near this project area.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

Based on the information submitted, no further consultation with the NH Fish and Game Department pursuant to Fis 1004 is required.

Attachment "D"

MAP OF PROJECT BOUNDARIES FOR: NHB23-3372

Attachment "D"

EXISTING CONDITIONS

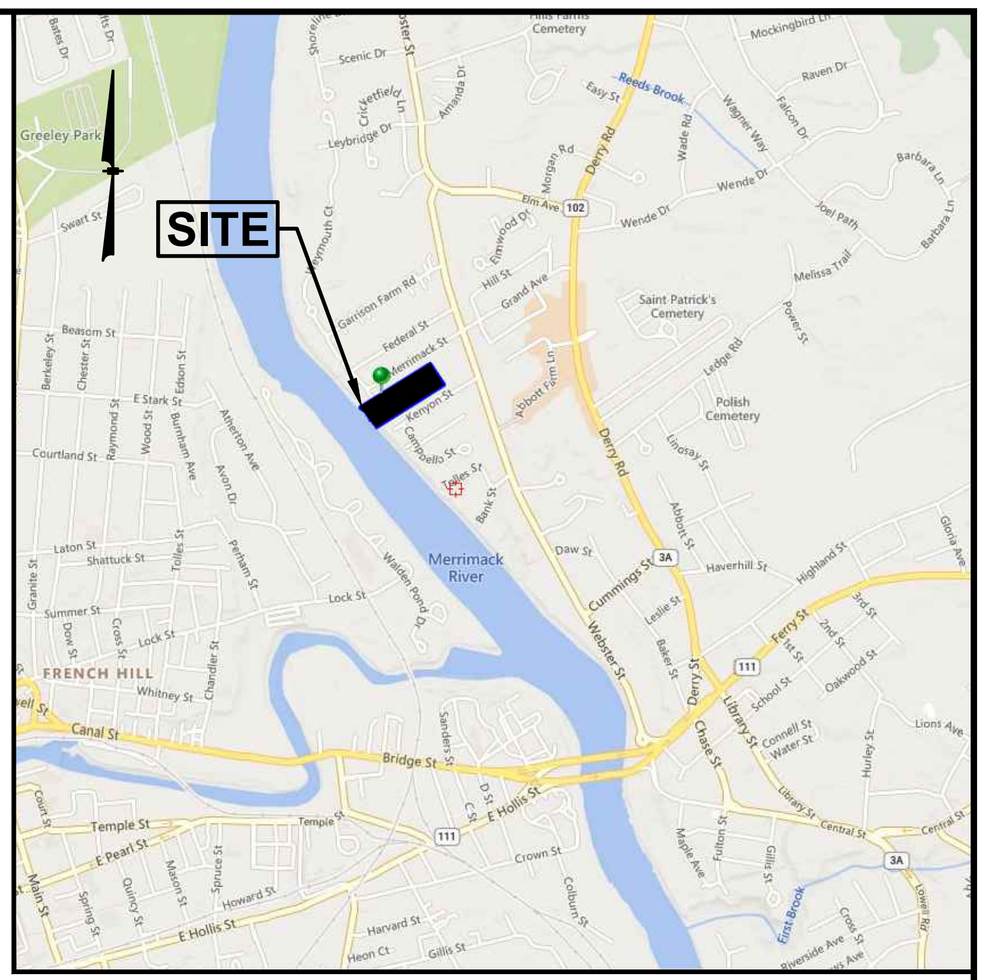
PLAN REFERENCES:

HILLSBOROUGH COUNTY REGISTRY OF DEEDS

1) PLAN NO. 13132
2) PLAN NO. 407
3) PLAN NO. 511
4) PLAN NO. 12135
5) PLAN NO. 13134
6) PLAN NO. 13218
7) PLAN NO. 25875
8) PLAN NO. 30647
9) PLAN NO. 31388
10) PLAN NO. 39078

IMPERVIOUS AREA SUMMARY

DESCRIPTION	EXISTING
IMPERVIOUS AREA WITHIN PROTECTED SHORELAND	6,303 SF
IMPERVIOUS AREA WITHIN WATERFRONT BUFFER	390 SF



LOCATION MAP
(NOT TO SCALE)

LEGEND

CCB	CAPE COD BERM	(MH)	MANHOLE
— G —	GAS LINE	⋈ WV ⋈	WATER VALVE
— T —	UNDERGROUND TELEPHONE	WSO	WATER SHUT OFF
— W —	WATER LINE	HYD	FIRE HYDRANT
— E —	UNDERGROUND ELECTRIC	○	BOLLARD
—○—○—	CHAIN LINK FENCE	GM	GAS METER
—□—□—	STOCKADE FENCE	EM	ELECTRIC METER
— —90— —	CONTOUR ELEVATION	⊕	MONITORING WELL
✿ ✹	TREE	☼	LIGHT POLE
	UTILITY POLE	●	BORING
—<	GUY WIRE	• • • • • • • • •	WETLAND LINE
— · · —	OVERHEAD WIRE	— · · · —	WATER FEATURE
⌒⌒⌒⌒	TREELINE	— – – —	EASEMENT LINE
○	SIGN	━━━━	PROPERTY LINE
×98.69	SPOT ELEVATION	────	ABUTTER PROPERTY LINE
□	CATCH BASIN	- - - - - -	BUILDING SETBACK
Ⓢ	SEWER MANHOLE	━ ━ ━	FLOOD ZONE LINE

OWNER OF RECORD:

MAP 165 LOT 49
A. JACK ATKINSON REVOCABLE TRUST
AGREEMENT OF FEBRUARY 25, 1983
A. JACK ATKINSON, TRUSTEE
36 CAMPBELLO STREET
HUDSON, NH 03051
BOOK 9180 PAGE 1549

0 20 50 100
SCALE: 1" = 20'

GPI Engineering
Design
Planning
Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

PREPARED FOR
SOUSA REALTY &
DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

REVISIONS		
NO.	REVISION	DATE

NOVEMBER 20, 2023

DRAWN/DESIGN BY	CHECKED BY
CNM	DRJ

EXISTING CONDITIONS SHORELAND PERMIT PLAN

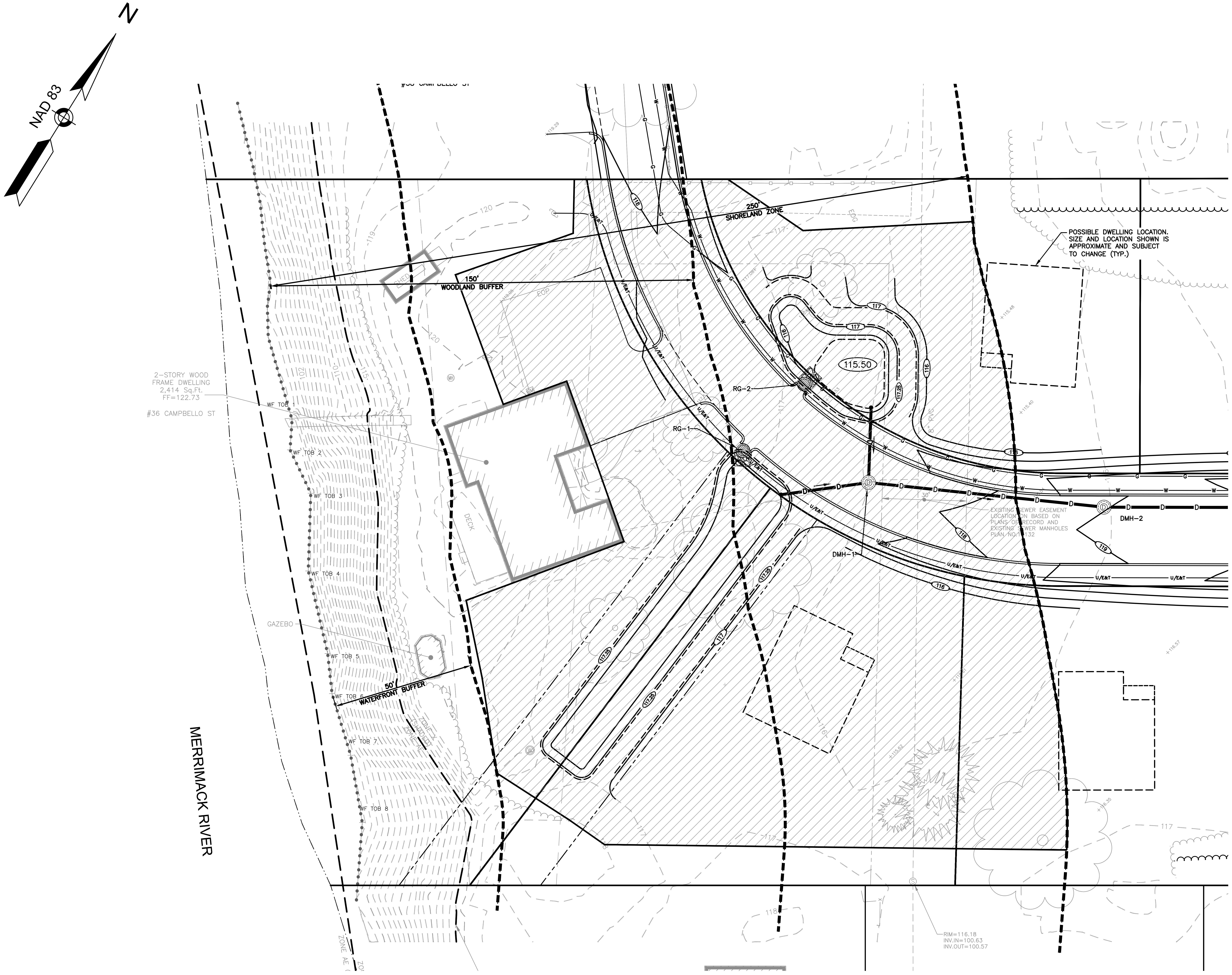
SCALE: 1"=20'

PROJECT NO. NEX-2300191

1 OF 2

F:\Projects\NEX-2300191 - Hudson, NH - Sousa Realty\Shoreland\2300191 Shoreland Permit Plan.dwg EXISTING CONDITIONS 1/08/24 2:46pm ssimon

Attachment "D"



2-STORY WOOD FRAME DWELLING
2,414 Sq.Ft.
FF=122.73
#36 CAMPBELLO ST

POSSIBLE DWELLING LOCATION. SIZE AND LOCATION SHOWN IS APPROXIMATE AND SUBJECT TO CHANGE (TYP.)

EXISTING SEWER EASEMENT LOCATION BASED ON PLANS OF RECORD AND EXISTING SEWER MANHOLES PLAN NO.1-132

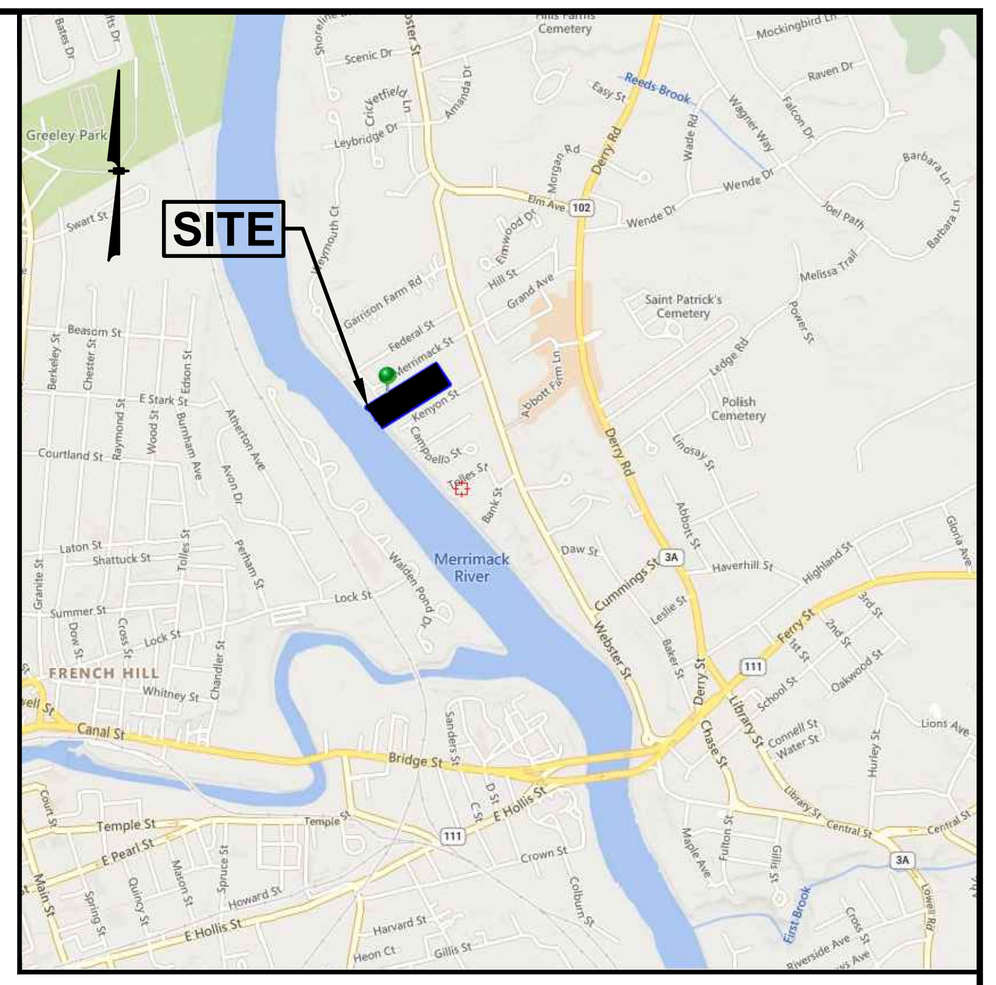
PROPOSED CONDITIONS

▨ TEMPORARY IMPACT AREA WITHIN PROTECTED SHORELAND = 8,410 SF

IMPERVIOUS AREA & IMPACT SUMMARY

DESCRIPTION	EXISTING	PROPOSED
IMPERVIOUS AREA WITHIN PROTECTED SHORELAND	6,303 SF	13,270 SF *
IMPERVIOUS AREA WITHIN WATERFRONT BUFFER	390 SF	390 SF
TEMPORARY IMPACT AREA WITHIN PROTECTED SHORELAND		8,410 SF

* INCLUDES APPROXIMATE AREAS OF PROPOSED HOUSES & DRIVEWAYS (NOT SHOWN).



LOCATION MAP
(NOT TO SCALE)

LEGEND

—— G ——	GAS LINE
—— T ——	UNDERGROUND TELEPHONE
—— W ——	WATER LINE
—— E ——	UNDERGROUND ELECTRIC
— —90— —	CONTOUR ELEVATION
	TREE
	UTILITY POLE
	GUY WIRE
	OVERHEAD WIRE
	TREELINE
	SIGN
×98.69	SPOT ELEVATION
Ⓓ	DRAIN MANHOLE
□	CATCH BASIN
	ROOF DRAIN
	CLEANOUT
Ⓥ	VENT
Ⓢ	SEWER MANHOLE
• • • • • • • • •	WETLAND LINE
	WATER FEATURE
—— U/G/C&T ——	UNDERGROUND COMM
	DITCH LINE
	EASEMENT LINE
	PROPERTY LINE
	ABUTTER PROPERTY LINE
-----------	BUILDING SETBACK
• • • • • • • • •	SOIL TYPE LINE
	ZONE LINE
— — —	FLOOD ZONE LINE
═════	PROP. SLOPED GRANITE CURB (SGC)
C.O.	PROP. CLEANOUT
RG–1 ●	PROP. RAIN GUARDIAN
CB–1	PROP. CATCH BASIN
DMH–1	PROP. DRAIN MANHOLE
MEG	MEET EXISTING GRADE
331.25	PROP. SPOT ELEVATION
(300)	PROP. CONTOUR ELEVATION
G.B.	GRADE BREAK

OWNER OF RECORD:

MAP 165 LOT 49
A. JACK ATKINSON REVOCABLE TRUST
AGREEMENT OF FEBRUARY 25, 1983
A. JACK ATKINSON, TRUSTEE
36 CAMPBELLO STREET
HUDSON, NH 03051
BOOK 9180 PAGE 1549

0 20 50 100
SCALE: 1" = 20'

GPI
Engineering
Design
Planning
Construction Management
603.893.0720 GPINET.COM
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44 Stiles Road, Suite One
Salem, NH 03079

PREPARED FOR
SOUSA REALTY &
DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49
36 CAMPBELLO STREET HUDSON, NEW HAMPSHIRE

REVISIONS

NO.	REVISION	DATE

NOVEMBER 20, 2023

DRAWN/DESIGN BY	CHECKED BY
CNM	DRJ

PROPOSED CONDITIONS SHORELAND PERMIT PLAN

SCALE:
1"=20'

PROJECT NO.
NEX-2300191

2 OF 2

F:\Projects\NEX-2300191 – Hudson, NH – Sousa Realty\Shoreland\2300191 Shoreland Permit Plan.dwg PROPOSED CONDITIONS 1/08/24 2:47pm ssimon

Attachment "E"

ALTERATION OF TERRAIN PERMIT APPLICATION & STORMWATER MANAGEMENT REPORT

PROPOSED RESIDENTIAL SUBDIVISION
ASSESSORS MAP 165 LOT 49
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

GPI

44 Stiles Road, Suite One
Salem, NH 03079
(603) 893-0720

Prepared For:

Sousa Realty & Development Corp.
46 Lowell Road
Hudson, NH 03051

CORY N. MASON No.17099

Cory Mason
1-18-24

January 8, 2024

(GPI Project No.: NEX-2300191)

Sousa Realty & Development Corp.
Proposed Residential Subdivision
Alteration of Terrain Permit Application

TABLE OF CONTENTS

PART I: ALTERATION OF TERRAIN PERMIT

PART II: STORMWATER MANAGEMENT REPORT

PART I

ALTERATION OF TERRAIN PERMIT

NHDES-W-01-003

Attachment "E"

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

Attachment "E"

6. PROJECT TYPE

☐ Excavation Only ☐ Residential ☐ Commercial ☐ Golf Course ☐ School ☐ Municipal
☐ Agricultural ☐ Land Conversion ☐ Other:

7. PROJECT LOCATION INFORMATION

Project Name:

Street/Road Address:

Town/City: County:

Tax Map: Block: Lot Number: 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:	☐ Yes ☐ No	☐ Withdrawal	☐ Discharge
2. Artificial pond created by impounding a stream or wetland Purpose:	☐ Yes ☐ No	☐ Withdrawal	☐ Discharge
3. Unlined pond dug into the water table Purpose:	☐ Yes ☐ No	☐ Withdrawal	☐ Discharge

Post-development, will the proposed project discharge to:

- Within one-quarter mile of a surface water impaired for phosphorus and/or nitrogen? ☐ No ☐ **Yes**
- Within one-quarter mile of a Class A surface water or within the watershed area of an Outstanding Resource Water?
  ☐ No ☐ **Yes**
- Within one-quarter mile of a lake or pond not covered previously? ☐ No ☐ **Yes**

Is the project a High Load area? ☐ Yes ☐ No
If yes, specify the type of high load land use or activity:

Is the project within a Water Supply Intake Protection Area (WSIPA)? ☐ Yes ☐ No
Is the project within a Groundwater Protection Area (GPA)? ☐ Yes ☐ No
Will the well setbacks identified in Env-Wq 1508.02 be met? ☐ Yes ☐ 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? ☐ Yes ☐ No
If yes: Cut volume: cubic feet within the 100-year floodplain.
Fill volume: cubic feet within the 100-year floodplain.

☐ Project *is* within **¼ mile of a designated river** Name of River:
☐ Project *is not* within ¼ mile of a designated river.

☐ Project *is* within a Coastal/Great Bay Region community.
☐ Project *is not* within a Coastal/Great Bay Region community.

8. BRIEF PROJECT DESCRIPTION (PLEASE DO NOT REPLY “SEE ATTACHED”)

Attachment "E"

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

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):

(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

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

G. Total undisturbed cover, in square feet

H. Number of lots proposed:

I. Total length of roadway, in linear feet:

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

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	☐ Yes ☐ No ☐N/A	☐	Permit number:
2. Wetlands Permit	☐ Yes ☐ No ☐N/A	☐	Permit number:
3. Shoreland Permit	☐ Yes ☐ No ☐N/A	☐	Registration date:
4. UIC Registration	☐ Yes ☐ No ☐N/A	☐	Approval letter date:
5. Large/Small Community Well Approval	☐ Yes ☐ No ☐N/A	☐	Permit number:
6. Large Groundwater Withdrawal Permit	☐ Yes ☐ No ☐N/A	☐	Permit number:
7. Other:	☐ Yes ☐ No		

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

Attachment "E"

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. 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.

Attachment "E"

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.**

Attachment "E"

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** ☐ **APPLICANT'S AGENT:**

Signature: M. Sousa Date: 1/16/23

Name (print or type): Manuel D Sousa Jr Title: G.M.

☒ PROPERTY OWNER ☐ PROPERTY OWNER'S AGENT:

Signature: Joseph W Kenny-Tee Date: 1/16/23

Name (print or type): JOSEPH W KENNY TEE Title: TRUSTEE

Attachment "E"

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.

☐ 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.

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.

☐ Stone check dams.

☐ Gravel construction exit.

☐ Temporary sediment trap.

☐ The treatment BMPs proposed.

☐ Any innovative BMPs proposed.

CONSTRUCTION SEQUENCE / EROSION CONTROL

Attachment "E"

☐ 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” × 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.

Attachment "E"

☐ 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” × 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.

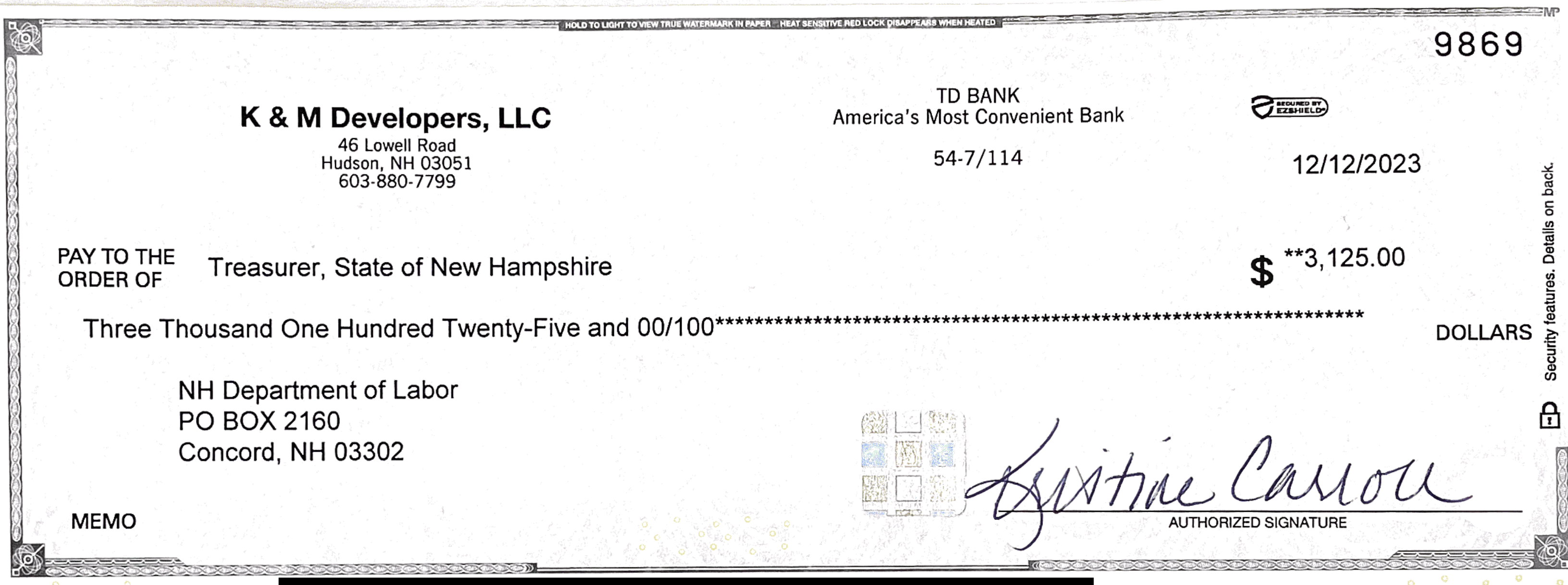
☐ Add a note to the plans that the applicant must provide NHDES a written update of the project and revised plans documenting the project status every five years from the date of the Alteration of Terrain permit.

☐ 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.

Attachment "E"



HOLD TO LIGHT TO VIEW TRUE WATERMARK IN PAPER · HEAT SENSITIVE RED LOCK DISAPPEARS WHEN HEATED

9869

K & M Developers, LLC
46 Lowell Road
Hudson, NH 03051
603-880-7799

TD BANK
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54-7/114

SECURED BY EZSHIELD

12/12/2023

PAY TO THE ORDER OF Treasurer, State of New Hampshire $ **3,125.00

Three Thousand One Hundred Twenty-Five and 00/100*** DOLLARS

NH Department of Labor
PO BOX 2160
Concord, NH 03302

Security features. Details on back.

MEMO

Kristine Carroll
AUTHORIZED SIGNATURE

[redacted]

Attachment "E"

January 18, 2024

I, Cory N. Mason, hereby certify that on January 18, 2024 a copy of the complete Alteration of Terrain Permit Application was hand delivered to the Town of Hudson Planning Department in accordance with Env-Wq 1503.05 (c)(4).

Cory Mason

Cory N. Mason, P.E.
Project Engineer

Attachment "E"

Cory Mason

From: Cory Mason
Sent: Thursday, January 18, 2024 12:16 PM
To: fmurphy@shaheengordon.com
Cc: Sarah Simon
Subject: Merrimack River (Lower) LAC - Alteration of Terrain & Shoreland Permit - 36 Campbello St., Hudson, NH

Hi Francis,

Greenman Pedersen, Inc. (GPI) is submitting on behalf of our client, Sousa Realty & Development Corp., applications for NHDES Alteration of Terrain Permit and Shoreland Permit for a proposed residential subdivision at 36 Campbello Street in Hudson, NH.

As the project site is located along the Merrimack River, we are providing electronic copies of these submissions via the link below for review and comment by the LAC. Please let us know if you have any comments or questions.

Sousa Realty - Hudson, NH

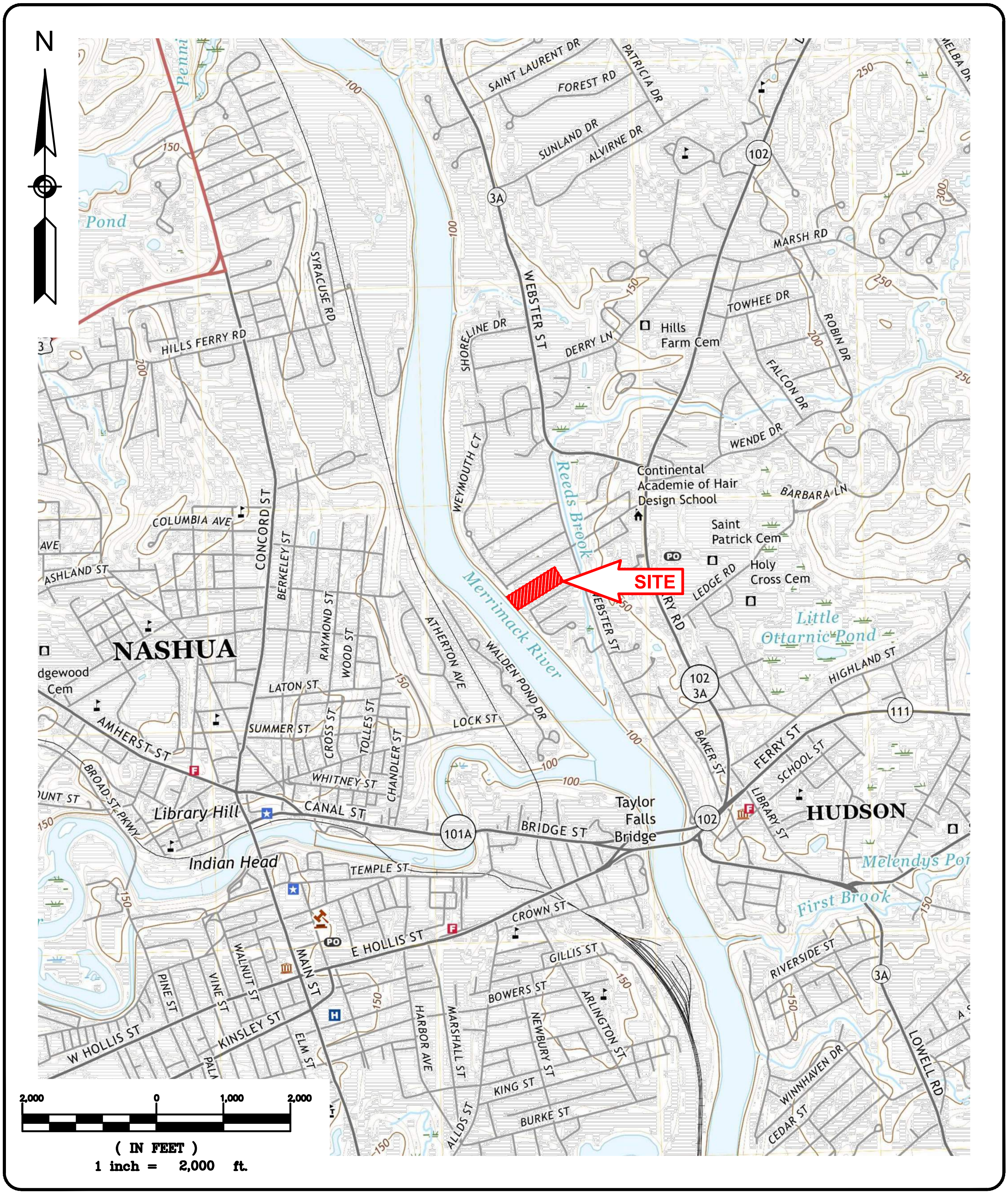
Thank you,
Cory

Cory Mason, P.E.
Project Engineer

44 Stiles Road, Salem, NH 03079
d 603.827.4527
cmason@gpinet.com | www.gpinet.com

GPI Engineering | Design | Planning | Construction Inspection
Greenman-Pedersen, Inc.
An Equal Opportunity Employer

Attachment "E"



USGS MAP

36 CAMPBELLO STREET
HUDSON, NH

GPI
Engineering
Design
Planning
Construction Management
603.893.0720 GPINET.COM

Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

DRAWN BY: CNM
PROJECT #: NEX-2300191

DATE: 11/20/2023

FIGURE 1

F:\Projects\NEX-2300191 – Hudson, NH – Sousa Realty\Drainage\Stormwater Report\Appendix A – Figures\2300191 – USGS Map.dwg USGS 11/17/23 3:37pm cmason

PART II

STORMWATER MANAGEMENT REPORT

SECTION 1

PROJECT NARRATIVE

EXECUTIVE SUMMARY

This report contains a stormwater management analysis for the proposed 11-lot residential subdivision development located at 36 South Campbello Street in Hudson, New Hampshire. The analysis includes both pre- and post-development calculations of stormwater runoff rates and volumes at specific locations on the project site.

This analysis has been prepared in accordance with the Town of Hudson Stormwater Management regulations, the guidelines contained in the New Hampshire Department of Environmental Services (NHDES) New Hampshire Stormwater Manual, and the requirements of Env-Wq 1500 Alteration of Terrain.

The project site consists of a single parcel identified as Map 165 Lot 49 with an area of approximately 4.74 acres. The site is bordered by the Merrimack River to the southwest, private residences along Merrimack Street to the northwest, wetlands and a private residence to the northeast, and private residences along Kenyon Street to the southeast. Campbello Street is accessed from near the northwest property corner where it currently serves the existing house #36.

The applicant is proposing to develop the property with a new subdivision road from Campbello Street and ten (10) new residential lots while retaining and subdividing a lot for the existing house to remain (11 total lots). Campbello Street will be improved from the intersection of Merrimack Street through the site approximately 800 linear feet including a new cul-de-sac with a center landscaped island.

In order to mitigate increases in peak discharge rates and volumes of stormwater runoff as a result of the new impervious surfaces, a comprehensive stormwater management system has been designed that includes two Rain Guardian Turret inlet structures, deep sump catch basins with hooded outlets, a First Defense hydrodynamic particle separator unit, three above ground infiltration basins, and underground Stormtech infiltration chambers.

Based on site topography and discharge points, one analysis point is identified for the purposes of this analysis. Design Point #1 represents the bordering vegetated wetland at the northeast property boundary which receives overland flow from the majority of the site.

The tables below summarize the comparative pre- and post-development peak rates and volumes of stormwater runoff at the design point.

TABLE 1: PEAK RATE ANALYSIS SUMMARY

Design Storm	Pre-Development (cfs)	Post-Development (cfs)	Change (cfs)
Design Point #1 – Wetland			
2-year	0.7	0.3	-0.4
10-year	3.2	1.6	-1.6
25-year	5.8	4.3	-1.5
50-year	8.6	6.8	-1.8

(All values shown are peak rates in CFS, cubic feet per second)

TABLE 2: VOLUME ANALYSIS SUMMARY

Design Storm	Pre-Development (cf)	Post-Development (cf)	Change (cf)
Design Point #1 – Wetland			
2-year	5,334	2,669	-2,665
10-year	16,902	8,966	-7,936
25-year	45,166	18,308	-26,858
50-year	41,088	28,894	-12,194

(All values shown are volumes in CF, cubic feet)

Compliance with the Alteration of Terrain Channel Protection Requirements (Env-Wq 1507.05) is summarized in the following table.

TABLE 3: CHANNEL PROTECTION CRITERIA SUMMARY

1-Year Pre Peak Rate (cfs)	2-Year Pre Peak Rate (cfs)	2-Year Post Peak Rate (cfs)	2-Year Pre Volume (ac-ft)	2-Year Post Volume (ac-ft)	Channel Protection Criteria Met?
Design Point #1 – Wetland					
0.29	0.74	0.29	0.14	0.06	Yes (1)a, (1)b, (2), (3)

As shown above, the channel protection criteria are met for the design point.

In conclusion, by incorporating a new on-site stormwater management system that includes provisions for stormwater treatment and recharge, there will be a decrease in the peak rates and volumes of stormwater runoff leaving the property at the design point during all storms analyzed.

Implementing the maintenance procedures outlined in the attached Inspection and Maintenance Manual (I&M) will ensure the long-term performance of the system.

EXISTING CONDITIONS

The project site consists of a single parcel identified as Map 165 Lot 49 with an area of approximately 4.74 acres. The site is bordered by the Merrimack River to the southwest, private residences along Merrimack Street to the northwest, wetlands and a private residence to the northeast, and private residences along Kenyon Street to the southeast. Campbello Street is accessed from near the northwest property corner where it currently serves the existing house #36.

The site is previously developed with a two-story, 2,414 square foot single family house (#36) located in the southwestern portion of the site with a paved driveway to Campbello Street. The remainder of the 4.74 acre property is primarily maintained grassed lawn with some woody vegetation along the property boundaries and along the bank of the Merrimack River.

There is an existing drywell located at the eastern corner of the driveway to #36 Campbello Street. There are no other drainage structures on the site. The existing house is situated at the approximate high point of the site with surrounding elevations of 121. Topography drops gradually at approximately 1% or less to the northeast. Runoff to the northeast flows over grass and eventually discharges at the wetland near the northeastern property boundary.

Topography drops slightly from the rear of the house to the southwest until it reaches the top of the wooded slope down to the bank of the Merrimack River. This slope is very steep at approximately 1.25:1 until it reaches the bank of the river at approximately elevation 98. A small portion of site runoff flows over land to the river.

The NRCS Web Soil Survey identifies on-site and surrounding soils as Occum fine sandy loam with a Hydrologic Soil Group (HSG)-B classification. Site-Specific Soil Mapping was performed by Gove Environmental Services, Inc on October 3, 2023. According to the Site-Specific Soil Map Report, on-site soils are identified as Deerfield loamy sand and Udorthents, sandy, both with an HSG classification of B. Refer to Appendix B for additional information.

Test pits were performed by Greenman-Pedersen, Inc. (GPI) on September 28, 2023. The five test pits encountered loamy sand and sand with depths to estimated seasonal high water table (ESHWT) of between 36 and 48 inches below ground. The pits were excavated to depths of up to 94 inches below ground and did not encounter refusal. Test pit logs are included in Appendix C.

A bordering vegetated wetland is located near the northeastern property boundary. The wetland was delineated by Gove Environmental Services, Inc. on August 7, 2023 and flags located by this office. This wetland system is associated with Reeds Brook which runs along Webster Street to the south and eventually discharges into the Merrimack River south of the project site.

A portion of the site is located in a special flood hazard area (100-year flood) per Flood Insurance Rate Map Number 33011C0514E, with an effective date of April 18, 2011. The boundary of Zone X and Zone AE is depicted on the plans.

PROPOSED CONDITIONS

The applicant is proposing to develop the property with a new subdivision road from Campbello Street and ten (10) new residential lots while retaining and subdividing a lot for the existing house to remain (11 total lots). Campbello Street will be improved from the intersection of Merrimack Street through the site approximately 800 linear feet. The new paved road will be 24-feet-wide with sloped granite curbing and will terminate in a cul-de-sac with a center landscaped island.

Water service to the new houses will be provided via an extension of the existing municipal services in Federal Street and Merrimack Street which will run along the new subdivision road and be looped at the cul-de-sac. Sewer will run within the subdivision road and tie into the existing municipal sewer line which runs through the property within an existing easement. Electric service will be underground from an existing on-site utility pole. Gas will be provided via a new extension to the site.

In order to mitigate increases in peak discharge rates and volumes of stormwater runoff as a result of the new impervious surfaces, a comprehensive stormwater management system has been designed that includes two Rain Guardian Turret inlet structures, deep sump catch basins with hooded outlets, a First Defense hydrodynamic particle separator unit, three above ground infiltration basins, and underground Stormtech infiltration chambers.

The proposed road will be crowned and graded with a high point around station 3+00. Runoff from the western portion of the road will flow along the gutter line to one of two Rain Guardian turrets which will capture runoff, provide pretreatment, and discharge over a rip rap apron to the surrounding infiltration basins. The infiltration basins are shallow depressions which will provide treatment through groundwater recharge and each include a 6” riser outlet with a grate to discharge runoff from larger storm events without overtopping the basins.

Runoff from the eastern portion of the road will flow along the gutter line to one of two deep sump catch basins with hooded outlets which will capture the gutter flow and discharge to a hydrodynamic particle separator unit which will provide pretreatment by removing floatables and fine particles. Runoff is then directed over a stone outlet apron into an infiltration basin. A 6” riser outlet and a crushed stone emergency spillway are provided to safely convey runoff from larger storm events without overtopping the basin.

Runoff from the roofs of the new houses will be collected in downspouts and routed to underground infiltration systems consisting of Stormtech SC-310 chambers surrounded by crushed stone. One chamber will be provided for approximately each 220 square feet of roof area which will be sufficient to store and recharge runoff from the design storms without overtopping.

Collectively, the Rain Guardian turrets, deep sump catch basins with hooded outlets, hydrodynamic particle separator and infiltration basins provide treatment of the water quality volume (WQV) of stormwater runoff associated with the development. The infiltration basins provide groundwater recharge in excess of the required groundwater recharge volume (GRV). Refer to calculation worksheets within Appendix G.

To prevent erosion and discharge of sediment during construction, Best Management Practices including straw wattle, compost filter sock, catch basin inlet protection, erosion control blanket, a stabilized construction exit, mulch and seeding have been incorporated into the construction sequence.

The total area of disturbance related to the proposed roadway and stormwater management system construction is approximately 165,000 square feet therefore the project will require both an NHDES Alteration of Terrain Permit and an EPA Construction General Permit under the NPDES program.

STORMWATER MODELING METHODOLOGY

The drainage system for this project was modeled using HydroCAD, a stormwater modeling computer program that analyzes the hydrology, and hydraulics of stormwater runoff. HydroCAD is based largely on the hydrology techniques developed by the Soil Conservation Service (SCS/NRCS), combined with other hydrology and hydraulics calculations. For a given rainfall event, these techniques are used to generate hydrographs throughout a watershed. This provides verification that a given drainage system is adequate for the area under consideration, or to predict where flooding or erosion is likely to occur.

In HydroCAD, each watershed is modeled as a subcatchment, streams and culverts as a Reach (or Pond, depending on available storage capacity), and large wetlands and other natural or artificial storage areas as a Pond. SCS hydrograph generation and routing procedures were used to model both Pre-development and Post-development runoff conditions.

The Pre-development and Post-development watershed limits and the subcatchment characteristics were determined using both USGS and on-the-ground topographic survey information and through visual, on-site inspection. Conservative estimates were used at all times in estimating the hydrologic characteristics of each watershed or subcatchment.

The analysis utilizes rainfall amounts from the Northeast Regional Climate Center (NRCC) Extreme Precipitation Tables for the project site location. Rainfall depths for each 24-hour design storm are summarized below.

TABLE 4: RAINFALL SUMMARY

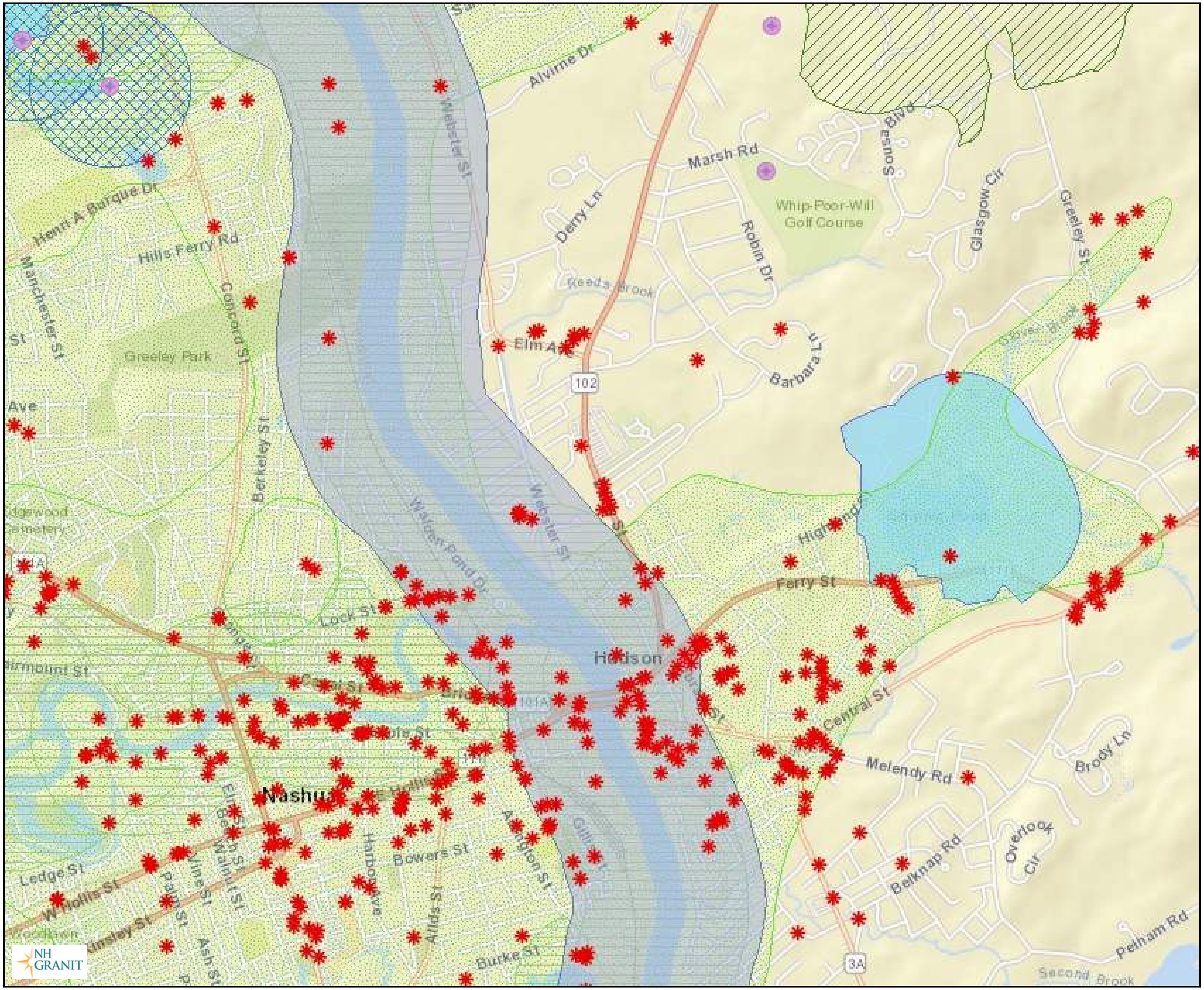
1-Year (in)	2-Year (in)	10-Year (in)	25-Year (in)	50-Year (in)
2.47	2.94	4.43	5.59	6.68

SECTION 2

WEB GIS PRINTOUTS

Attachment "E"

AOT Screening Layer Map



Legend

- ✱ Remediation Sites
- ▢ Coastal and Great Bay Re
- ▩ Designated Rivers Quarte
- ● Public Water Supply Well:
- ▦ Groundwater Classificatio
- ▦ Groundwater Classificatio
- ▩ Water Supply Intake Prote
- ▨ Wellhead Protection Area
- ▤ Class A Lakes with a Qua
- ▦ Class A - All Features
- ■ All Lakes, with a Quarter I
- ▧ Outstanding Resource Wa
- ▤ Surface Waters with Impa Mile Buffer
- ▨ Watersheds with Chloride

Map Scale

1: 25,977

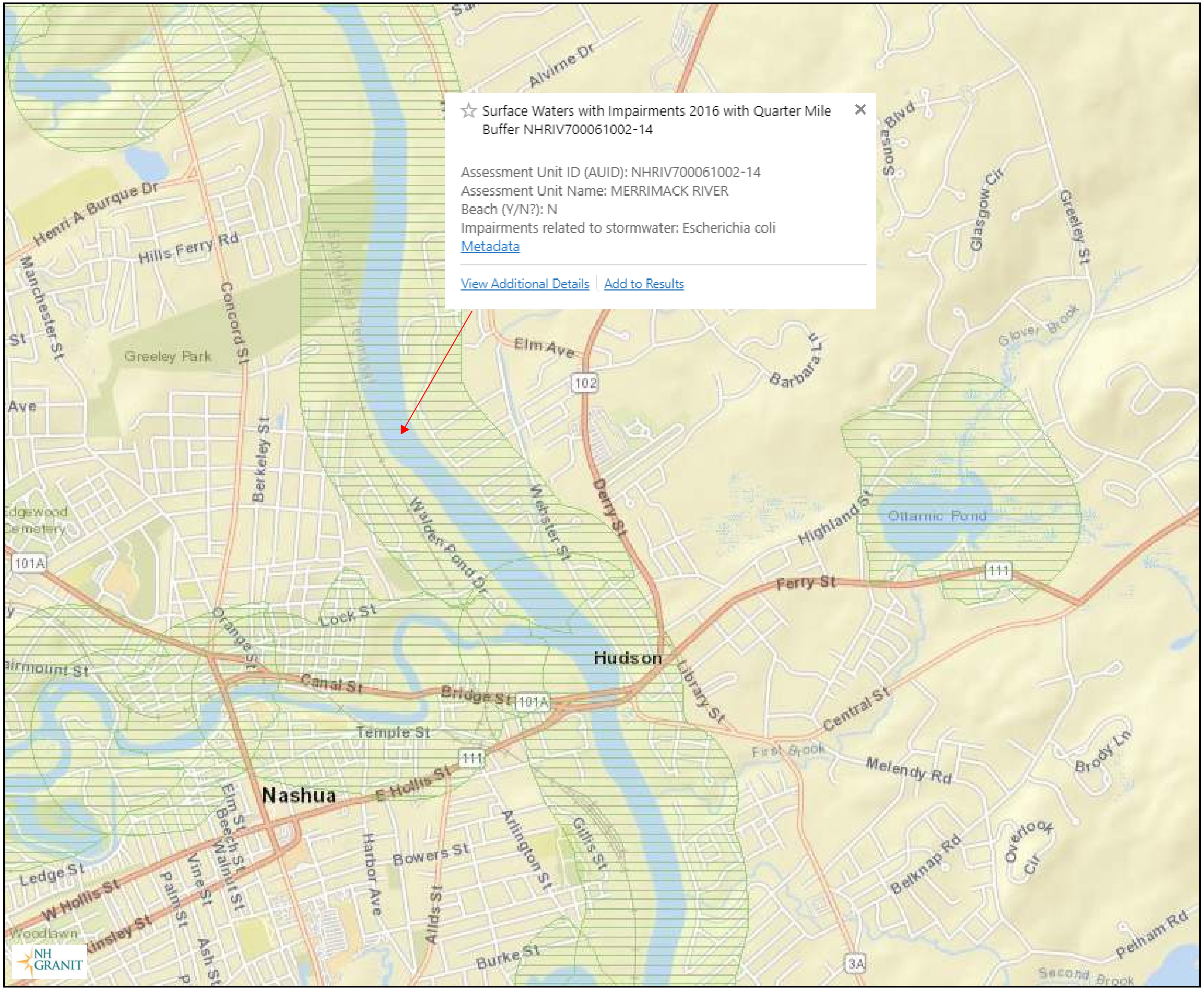
© NH GRANIT, www.granit.unh.edu

Map Generated: 11/27/2023

Notes

Attachment "E"

Surface Water Impairement Layer Map



Surface Waters with Impairments 2016 with Quarter Mile Buffer NHRIV700061002-14

Assessment Unit ID (AUID): NHRIV700061002-14
Assessment Unit Name: MERRIMACK RIVER
Beach (Y/N?): N
Impairments related to stormwater: Escherichia coli
Metadata

View Additional Details | Add to Results

Legend

- ▧ Outstanding Resource Wa
- ▤ Surface Waters with Impa Mile Buffer
- ▨ Watersheds with Chloride

Map Scale
1: 25,977

© NH GRANIT, www.granit.unh.edu

Map Generated: 11/27/2023

Notes

Attachment "E"

SECTION 3

NHB CORRESPONDENCE

New Hampshire Natural Heritage Bureau
NHB DataCheck Results Letter

To: Diane Pantermoller
44 Stiles Road, Suite One
Salem, NH 03079

From: NH Natural Heritage Bureau

Date: 11/21/2023 (This letter is valid through 11/21/2024)

Re: Review by NH Natural Heritage Bureau of request dated 11/21/2023

Permit Types: Shoreland Standard Permit
Alteration of Terrain Permit
Stormwater Pollution Prevention

NHB ID: NHB23-3372

Applicant: Diane Pantermoller

Location: Hudson
Tax Map: 165, Tax Lot: 49
Address: 36 Campbello Street

Proj. Description: Subdivide the existing parcel into 11 single family dwelling lots.

The NH Natural Heritage database has been checked for records of rare species and exemplary natural communities near the area mapped below. The species considered include those listed as Threatened or Endangered by either the state of New Hampshire or the federal government. We currently have no recorded occurrences for sensitive species near this project area.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

Based on the information submitted, no further consultation with the NH Fish and Game Department pursuant to Fis 1004 is required.

Attachment "E"

New Hampshire Natural Heritage Bureau
NHB DataCheck Results Letter

MAP OF PROJECT BOUNDARIES FOR: NHB23-3372

SECTION 4

NRCS WEB SOIL SURVEY

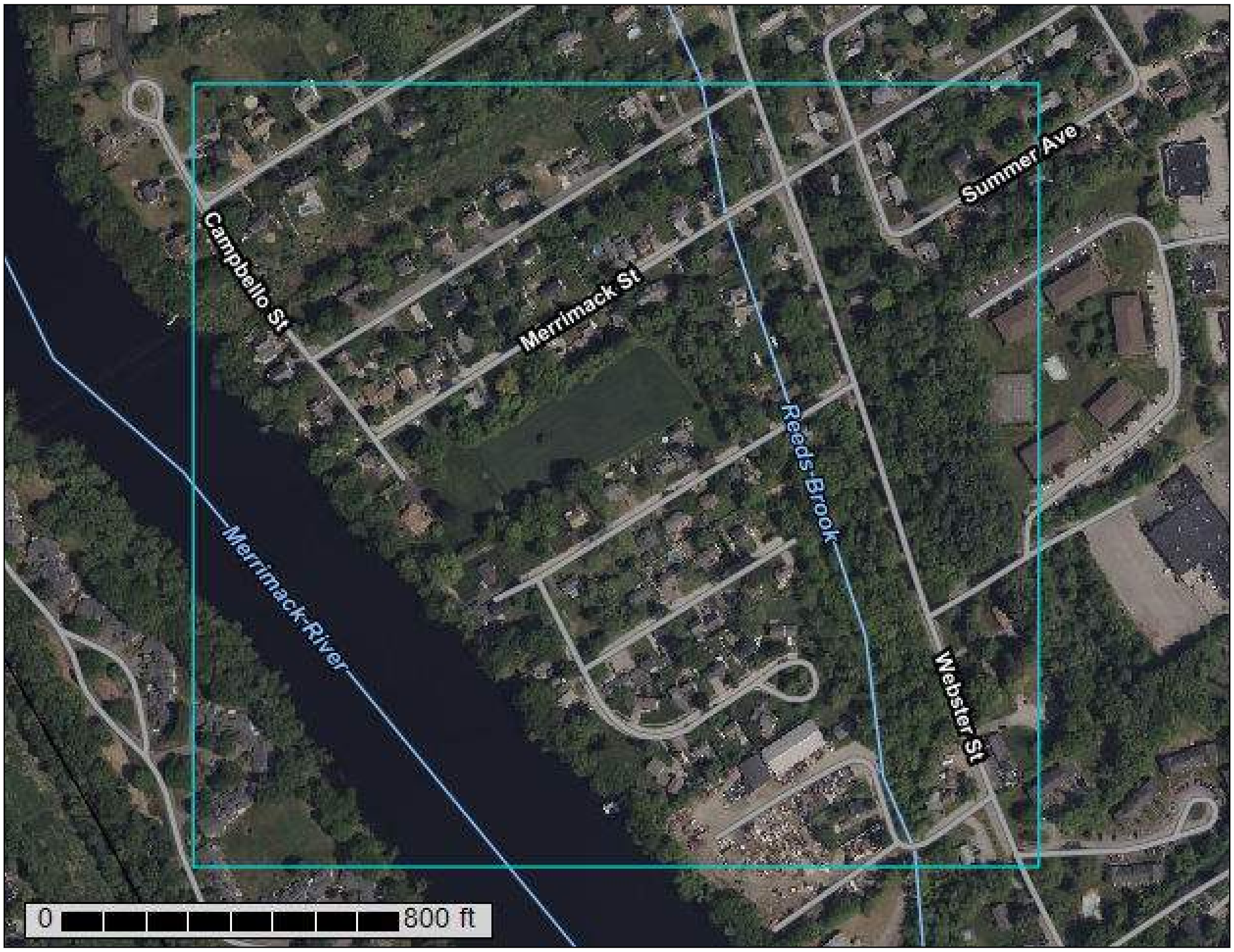
Attachment "E"

United States
Department of
Agriculture

Natural
Resources
Conservation
Service

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

Custom Soil Resource Report for Hillsborough County, New Hampshire, Eastern Part



November 7, 2023

Attachment "E"

Preface

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

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

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

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

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

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

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

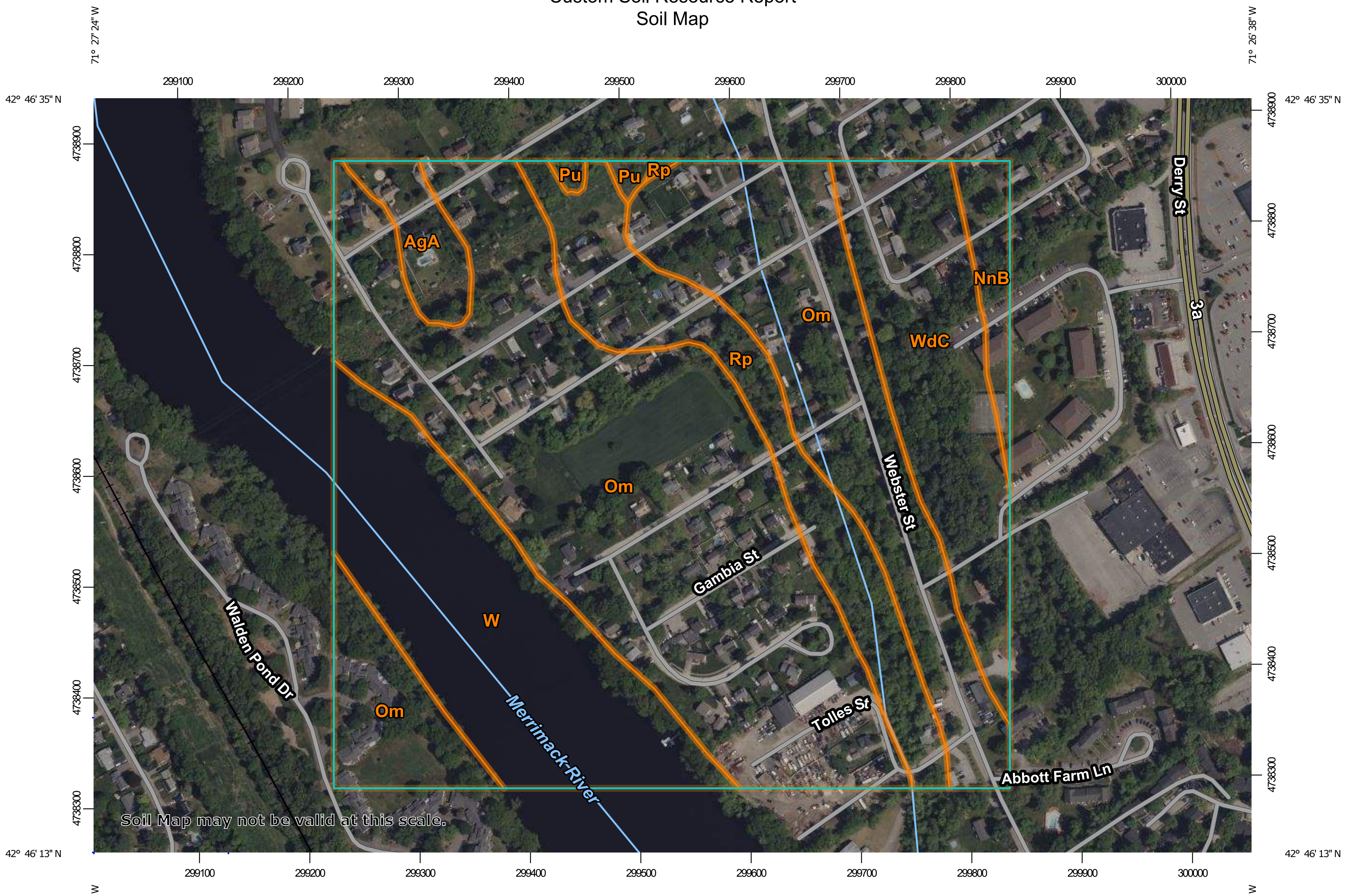
Contents

Soil Map

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

Attachment "E"

Custom Soil Resource Report
Soil Map



Map Scale: 1:4,800 if printed on A landscape (11" x 8.5") sheet.

N

0 50 100 200 300 Meters

0 200 400 800 1200 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

Attachment "E"

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hillsborough County, New Hampshire, Eastern Part
Survey Area Data: Version 26, 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: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

Attachment "E"

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Attachment "E"

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	2.1	2.4%
NnB	Ninigret fine sandy loam, 3 to 8 percent slopes	1.9	2.2%
Om	Occum fine sandy loam, high bottom	48.7	56.6%
Pu	Pootatuck fine sandy loam	0.4	0.5%
Rp	Rippowam fine sandy loam	8.7	10.1%
W	Water (less than 40 acres)	14.4	16.8%
WdC	Windsor loamy sand, 8 to 15 percent slopes	9.9	11.5%
Totals for Area of Interest		**86.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Hillsborough County, New Hampshire, Eastern Part

AgA—Agawam fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tyqw
Elevation: 0 to 1,040 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Agawam and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Agawam

Setting

Landform: Outwash terraces, outwash plains, kame terraces, kames, moraines
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Crest, side slope, riser, tread, rise, dip
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from gneiss, granite, schist, and/or phyllite

Typical profile

Ap - 0 to 11 inches: fine sandy loam
Bw1 - 11 to 16 inches: fine sandy loam
Bw2 - 16 to 26 inches: fine sandy loam
2C1 - 26 to 39 inches: loamy fine sand
2C2 - 39 to 55 inches: loamy fine sand
2C3 - 55 to 65 inches: loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 15 to 35 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F145XY008MA - Dry Outwash

Hydric soil rating: No

Minor Components

Ninigret

Percent of map unit: 5 percent
Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Windsor

Percent of map unit: 4 percent
Landform: Outwash plains, outwash terraces, deltas, dunes
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Walpole

Percent of map unit: 3 percent
Landform: Outwash plains, depressions, outwash terraces, depressions, deltas
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Hinckley

Percent of map unit: 3 percent
Landform: Outwash plains, eskers, kames, deltas
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, crest, side slope, rise
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

NnB—Ninigret fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr7
Elevation: 0 to 1,070 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Ninigret and similar soils: 85 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ninigret

Setting

Landform: Outwash terraces, kames, moraines, outwash plains, kame terraces, depressions, drainageways
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Side slope, crest, tread, rise, dip
Down-slope shape: Linear, convex, concave
Across-slope shape: Concave, convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from gneiss, granite, schist, and/or phyllite

Typical profile

Ap - 0 to 8 inches: fine sandy loam
Bw1 - 8 to 16 inches: fine sandy loam
Bw2 - 16 to 26 inches: fine sandy loam
2C - 26 to 65 inches: stratified loamy sand to loamy fine sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 18 to 38 inches to strongly contrasting textural stratification
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 17 to 39 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Ecological site: F144AY026CT - Moist Silty Outwash
Hydric soil rating: No

Minor Components

Agawam

Percent of map unit: 5 percent
Landform: Kames, moraines, outwash terraces, outwash plains, kame terraces
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Side slope, crest, riser, tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Deltas, outwash plains, dunes, outwash terraces
Landform position (three-dimensional): Riser, tread
Down-slope shape: Linear, convex

Across-slope shape: Linear, convex
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Om—Occum fine sandy loam, high bottom

Map Unit Setting

National map unit symbol: 9fd7
Elevation: 100 to 520 feet
Mean annual precipitation: 44 to 47 inches
Mean annual air temperature: 48 degrees F
Frost-free period: 155 to 160 days
Farmland classification: Prime farmland if protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Occum and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Occum

Setting

Parent material: Sandy and/or coarse-loamy alluvium derived from granite, gneiss or schist

Typical profile

H1 - 0 to 9 inches: fine sandy loam
H2 - 9 to 25 inches: fine sandy loam
H3 - 25 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Ecological site: F144AY010NH - Sandy High Floodplain
Hydric soil rating: No

Minor Components

Pootatuck

Percent of map unit: 15 percent
Hydric soil rating: No

Pu—Pootatuck fine sandy loam

Map Unit Setting

National map unit symbol: 9fdr
Elevation: 100 to 560 feet
Mean annual precipitation: 43 to 47 inches
Mean annual air temperature: 48 degrees F
Frost-free period: 155 to 160 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Pootatuck and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pootatuck

Setting

Parent material: Sandy and/or coarse-loamy alluvium derived from granite, gneiss or schist

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 38 inches: fine sandy loam
H3 - 38 to 63 inches: fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: F144AY012CT - Sandy Low Floodplain
Hydric soil rating: No

Minor Components

Occum

Percent of map unit: 5 percent
Hydric soil rating: No

Rippowam

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Rp—Rippowam fine sandy loam

Map Unit Setting

National map unit symbol: 9fdx
Elevation: 100 to 560 feet
Mean annual precipitation: 43 to 47 inches
Mean annual air temperature: 48 degrees F
Frost-free period: 155 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Rippowam and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rippowam

Setting

Landform: Flood plains
Parent material: Sandy and/or coarse-loamy alluvium derived from granite, gneiss or schist

Typical profile

H1 - 0 to 6 inches: fine sandy loam
H2 - 6 to 33 inches: fine sandy loam
H3 - 33 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Ecological site: F144AY014CT - Wet Sandy Low Floodplain
Hydric soil rating: Yes

Minor Components

Pootatuck

Percent of map unit: 5 percent
Hydric soil rating: No

Saco variant

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

W—Water (less than 40 acres)

Map Unit Composition

Water < 40: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

WdC—Windsor loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svkq
Elevation: 0 to 1,260 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Windsor and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor

Setting

Landform: — error in exists on —
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
Ap - 1 to 11 inches: loamy sand
Bw - 11 to 31 inches: loamy sand
C - 31 to 65 inches: sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 10 percent
Landform: Outwash plains, eskers, kames, deltas
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, rise
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Deerfield

Percent of map unit: 5 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear

Across-slope shape: Linear
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

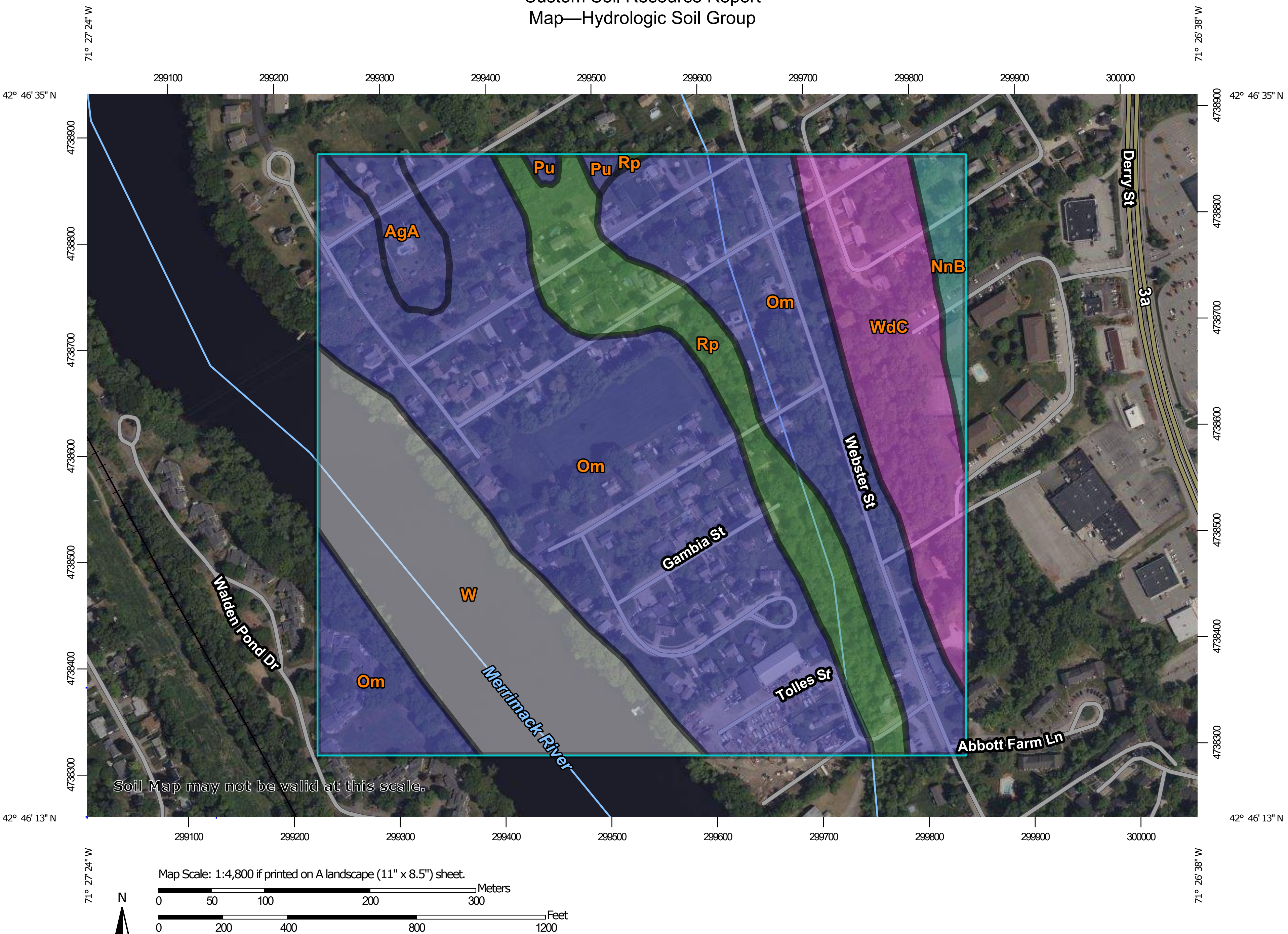
Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

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

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Attachment "E"

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:4,800 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

Attachment "E"

MAP LEGEND

Area of Interest (AOI)

▢ Area of Interest (AOI)

Soils

Soil Rating Polygons

- ■ A
- ■ A/D
- ■ B
- ■ B/D
- ■ C
- ■ C/D
- ■ D
- ▢ Not rated or not available

Soil Rating Lines

- 〰 A
- 〰 A/D
- 〰 B
- 〰 B/D
- 〰 C
- 〰 C/D
- 〰 D
- 〰 Not rated or not available

Soil Rating Points

- ▣ A
- ▣ A/D
- ▣ B
- ▣ B/D
- ▣ C
- ▣ C/D
- ▣ D
- ▣ Not rated or not available

Water Features

〰 Streams and Canals

Transportation

- ┿┿ Rails
- 〰 Interstate Highways
- 〰 US Routes
- 〰 Major Roads
- 〰 Local Roads

Background

■ Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hillsborough County, New Hampshire, Eastern Part
Survey Area Data: Version 26, 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: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

Attachment "E"

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 3 percent slopes	B	2.1	2.4%
NnB	Ninigret fine sandy loam, 3 to 8 percent slopes	C	1.9	2.2%
Om	Occum fine sandy loam, high bottom	B	48.7	56.6%
Pu	Pootatuck fine sandy loam	B	0.4	0.5%
Rp	Rippowam fine sandy loam	A/D	8.7	10.1%
W	Water (less than 40 acres)		14.4	16.8%
WdC	Windsor loamy sand, 8 to 15 percent slopes	A	9.9	11.5%
Totals for Area of Interest			**86.1**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

SECTION 5

AERIAL & SITE PHOTOGRAPHS

Attachment "E"

Aerial - Campbello Street, Hudson, NH

© 2023 Microsoft Corporation © 2023 Maxar ©CNES (2023) Distribution Airbus DS

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SECTION 6

CALCULATIONS

Attachment "E"

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	
Location	
Latitude	42.774 degrees North
Longitude	71.451 degrees West
Elevation	30 feet
Date/Time	Tue Oct 10 2023 11:35:17 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	0.27	0.42	0.52	0.68	0.85	1.07	**1yr**	0.74	1.01	1.24	1.56	1.96	2.47	2.72	**1yr**	2.19	2.61	3.04	3.72	4.34	**1yr**
2yr	0.33	0.51	0.64	0.84	1.05	1.32	**2yr**	0.91	1.21	1.53	1.90	2.37	2.94	3.27	**2yr**	2.60	3.15	3.65	4.37	4.97	**2yr**
5yr	0.39	0.61	0.77	1.03	1.31	1.67	**5yr**	1.13	1.52	1.93	2.41	3.00	3.71	4.16	**5yr**	3.29	4.00	4.63	5.49	6.20	**5yr**
10yr	0.44	0.70	0.88	1.20	1.55	1.99	**10yr**	1.34	1.79	2.31	2.89	3.59	4.43	4.99	**10yr**	3.92	4.80	5.54	6.52	7.34	**10yr**
25yr	0.53	0.83	1.06	1.46	1.94	2.51	**25yr**	1.68	2.24	2.92	3.66	4.55	5.59	6.35	**25yr**	4.95	6.11	7.04	8.20	9.17	**25yr**
50yr	0.59	0.95	1.21	1.70	2.30	3.00	**50yr**	1.99	2.66	3.51	4.40	5.45	6.68	7.63	**50yr**	5.91	7.34	8.43	9.75	10.86	**50yr**
100yr	0.68	1.10	1.42	2.00	2.73	3.58	**100yr**	2.36	3.15	4.19	5.27	6.52	7.98	9.17	**100yr**	7.06	8.82	10.11	11.60	12.86	**100yr**
200yr	0.77	1.26	1.63	2.34	3.24	4.27	**200yr**	2.79	3.74	5.02	6.32	7.81	9.53	11.03	**200yr**	8.43	10.60	12.12	13.80	15.24	**200yr**
500yr	0.93	1.53	1.99	2.90	4.06	5.40	**500yr**	3.51	4.69	6.37	8.02	9.91	12.07	14.07	**500yr**	10.68	13.53	15.43	17.37	19.09	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.22	0.34	0.42	0.57	0.70	0.80	**1yr**	0.60	0.78	1.06	1.32	1.67	2.30	2.56	**1yr**	2.03	2.47	2.72	3.08	3.72	**1yr**
2yr	0.31	0.49	0.60	0.81	1.00	1.20	**2yr**	0.86	1.17	1.37	1.78	2.29	2.88	3.20	**2yr**	2.55	3.08	3.56	4.27	4.87	**2yr**
5yr	0.36	0.55	0.69	0.94	1.20	1.42	**5yr**	1.03	1.38	1.62	2.11	2.69	3.49	3.89	**5yr**	3.09	3.74	4.29	5.14	5.81	**5yr**
10yr	0.39	0.61	0.75	1.05	1.36	1.60	**10yr**	1.17	1.56	1.82	2.38	3.04	4.03	4.52	**10yr**	3.56	4.34	4.94	5.89	6.65	**10yr**
25yr	0.45	0.68	0.85	1.21	1.59	1.87	**25yr**	1.37	1.83	2.13	2.81	3.54	4.87	5.52	**25yr**	4.31	5.30	5.94	7.07	7.90	**25yr**
50yr	0.49	0.74	0.92	1.33	1.78	2.12	**50yr**	1.54	2.08	2.41	3.19	3.98	5.64	6.43	**50yr**	4.99	6.18	6.86	8.12	9.02	**50yr**
100yr	0.53	0.80	1.01	1.45	1.99	2.40	**100yr**	1.72	2.34	2.72	3.48	4.49	6.53	7.52	**100yr**	5.78	7.23	7.92	9.33	10.25	**100yr**
200yr	0.58	0.88	1.11	1.61	2.24	2.71	**200yr**	1.94	2.65	3.05	3.93	5.09	7.58	8.80	**200yr**	6.71	8.47	9.14	10.72	11.69	**200yr**
500yr	0.66	0.98	1.26	1.84	2.61	3.21	**500yr**	2.25	3.14	3.59	4.63	6.02	9.24	10.90	**500yr**	8.17	10.49	11.05	12.89	13.89	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.31	0.48	0.58	0.78	0.96	1.13	**1yr**	0.83	1.10	1.27	1.66	2.10	2.62	2.87	**1yr**	2.32	2.76	3.42	4.22	4.75	**1yr**
2yr	0.35	0.54	0.67	0.91	1.12	1.31	**2yr**	0.97	1.28	1.49	1.92	2.47	3.03	3.37	**2yr**	2.68	3.24	3.76	4.48	5.12	**2yr**
5yr	0.44	0.67	0.83	1.14	1.45	1.67	**5yr**	1.26	1.63	1.89	2.42	3.04	4.00	4.49	**5yr**	3.54	4.32	4.97	5.87	6.59	**5yr**
10yr	0.52	0.81	1.00	1.39	1.80	2.04	**10yr**	1.56	1.99	2.30	2.90	3.61	4.94	5.57	**10yr**	4.37	5.36	6.16	7.20	8.03	**10yr**
25yr	0.68	1.03	1.28	1.83	2.40	2.64	**25yr**	2.07	2.59	2.98	3.67	4.49	6.54	7.42	**25yr**	5.79	7.14	8.19	9.44	10.43	**25yr**
50yr	0.82	1.24	1.55	2.23	3.00	3.23	**50yr**	2.59	3.16	3.62	4.39	5.31	8.09	9.21	**50yr**	7.16	8.86	10.15	11.59	12.72	**50yr**
100yr	0.99	1.50	1.88	2.72	3.73	3.94	**100yr**	3.22	3.85	4.41	5.44	6.29	10.00	11.42	**100yr**	8.85	10.98	12.59	14.26	15.54	**100yr**
200yr	1.21	1.82	2.31	3.34	4.66	4.80	**200yr**	4.02	4.70	5.35	6.54	7.45	12.37	14.16	**200yr**	10.94	13.62	15.61	17.53	19.00	**200yr**
500yr	1.58	2.35	3.02	4.39	6.24	6.24	**500yr**	5.38	6.10	6.94	8.36	9.30	16.38	18.78	**500yr**	14.50	18.06	20.77	23.05	24.79	**500yr**

Powered by ACIS
Northeast Regional Climate Center

Soil Series	number	NHDES Soil Group	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Buckland	237	3	0.6	2.0	0.06	0.2	C	Firm, platy, loamy till	frigid	loamy	no	loam in Cd
Buxton	232	3	0.1	0.6	0.00	0.2	C	Silt and Clay Deposits	frigid	fine	no	silty clay
Canterbury	166	3	0.6	2.0	0.06	0.6	C	Firm, platy, loamy till	frigid	loamy	no	loam in Cd
Chatfield Var.	289	3	0.6	6.0	0.60	6.0	B	Loose till, bedrock	mesic	loamy	no	mwd to swpd
Chesuncook	126	3	0.6	2.0	0.02	0.2	C	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	channery silt loam in Cd
Colonel	927	3	0.6	2.0	0.06	0.6	C	Firm, platy, loamy till	frigid	loamy	yes	loam in Cd
Croghan	613	3	20.0	100.0	20.00	100.0	B	Outwash and Stream Terraces	frigid	sandy	yes	single grain in C
Dartmouth	132	3	0.6	2.0	0.06	0.6	B	Terraces and glacial lake plains	mesic	silty	no	thin strata silty clay loam
Deerfield	313	3	6.0	20.0	20.00	100.0	B	Outwash and Stream Terraces	mesic	sandy	no	single grain in C
Dixfield	378	3	0.6	2.0	0.06	0.6	C	Firm, platy, loamy till	frigid	loamy	yes	fine sandy loam in Cd
Dixmont	578	3	0.6	2.0	0.60	2.0	C	Friable till, silty, schist & phyllite	frigid	loamy	yes	silt loam, platy in C
Duane	413	3	6.0	20.0	6.00	20.0	B	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	cemented (ortstein)
Eldridge	38	3	6.0	20.0	0.06	0.6	C	Sandy/loamy over silt/clay	mesic	sandy over loamy	no	
Elmridge	238	3	2.0	6.0	0.00	0.2	C	Sandy/loamy over silt/clay	mesic	loamy over clayey	no	
Elmwood	338	3	2.0	6.0	0.00	0.2	C	Sandy/loamy over silt/clay	frigid	loamy over clayey	no	
Finch	116	3					C	Outwash and Stream Terraces	frigid	sandy	yes	cemented (ortstein)
Gilmanton	478	3	0.6	2.0	0.06	0.6	C	Firm, platy, loamy till	frigid	loamy	no	fine sandy loam in Cd
Henniker	46	3	0.6	2.0	0.06	0.6	C	Firm, platy, sandy till	frigid	loamy	no	loamy sand in Cd
Hitchcock	130	3	0.6	2.0	0.06	0.6	B	Terraces and glacial lake plains	mesic	silty	no	silt loam to silt in C
Howland	566	3	0.6	2.0	0.06	0.2	C	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	silt loam, platy in Cd
Lanesboro	228	3	0.6	2.0	0.06	0.2	C	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	channery silt loam in Cd
Lovewell	307	3	0.6	2.0	0.60	2.0	B	Flood Plain (Bottom Land)	frigid	silty	no	very fine sandy loam
Machias	520	3	2.0	6.0	6.00	20.0	B	Outwash and Stream Terraces	frigid	sandy or sandy-skeletal	yes	strata sand/gravel in C
Madawaska	28	3	0.6	2.0	6.00	20.0	B	Outwash and Stream Terraces	frigid	loamy over sandy	yes	sandy or sandy-skeletal
adawaska, aquer	48	3	0.6	2.0	6.00	20.0	B	Outwash and Stream Terraces	frigid	loamy over sandy	yes	sandy or sandy-skeletal
Marlow	76	3	0.6	2.0	0.06	0.6	C	Firm, platy, loamy till	frigid	loamy	yes	fine sandy loam in Cd
Melrose	37	3	2.0	6.0	0.00	0.2	C	Sandy/loamy over silt/clay	frigid	loamy over clayey	no	silty clay loam in C
Metacomet	458	3	0.6	2.0	0.06	0.6	C	Firm, platy, sandy till	frigid	loamy	no	loamy sand in Cd
Metallak	404	3	6.0	100.0	6.00	100.0	B	Flood Plain (Bottom Land)	frigid	loamy over sandy	no	sandy or sandy-skeletal
Millis	39	3					C	Firm, platy, sandy till	frigid	loamy	yes	loamy sand in Cd
Montauk	44	3	0.6	6.0	0.06	0.6	C	Firm, platy, sandy till	mesic	loamy	no	loamy sand in Cd
Mundal	610	3	0.6	2.0	0.06	0.6	C	Firm, platy, loamy till	frigid	loamy	yes	gravelly sandy loam in Cd
Newfields	444	3	0.6	2.0	0.60	2.0	B	Loose till, sandy textures	mesic	loamy over sandy	no	sandy or sandy-skeletal
Nicholville	632	3	0.6	2.0	0.60	2.0	C	Terraces and glacial lake plains	frigid	silty	yes	very fine sandy loam
Ninigret	513	3	0.6	6.0	6.00	20.0	B	Outwash and Stream Terraces	mesic	loamy over sandy	no	sandy or sandy-skeletal
Paxton	66	3	0.6	2.0	0.00	0.2	C	Firm, platy, loamy till	mesic	loamy	no	
Peru	78	3	0.6	2.0	0.06	0.6	C	Firm, platy, loamy till	frigid	loamy	yes	
Pittstown	334	3	0.6	2.0	0.06	0.2	C	Firm, platy, silty till, schist & phyllite	mesic	loamy	no	channery silt loam in Cd
Plaisted	563	3	0.6	2.0	0.06	0.6	C	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	channery silt loam in Cd
Podunk	104	3	0.6	6.0	6.00	20.0	B	Flood Plain (Bottom Land)	frigid	loamy	no	loamy to coarse sand in C
Poocham	230	3	0.6	2.0	0.20	2.0	B	Terraces and glacial lake plains	mesic	silty	no	silt loam in C
Pootatuck	4	3	0.6	6.0	6.00	20.0	B	Flood Plain (Bottom Land)	mesic	loamy	no	single grain in C
Scio	531	3	0.6	2.0	0.60	2.0	B	Terraces and glacial lake plains	mesic	silty	no	gravelly sand in 2C
Scituate	448	3	0.6	2.0	0.06	0.2	C	Firm, platy, sandy till	mesic	loamy	no	loamy sand in Cd
Sheepscot	14	3	6.0	20.0	6.00	20.0	B	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	gravelly coarse sand
Sisk	667	3	0.6	2.0	0.00	0.6	C	Firm, platy, loamy till	cryic	loamy	yes	sandy loam in Cd
Skerry	558	3	0.6	2.0	0.06	0.6	C	Firm, platy, sandy till	frigid	loamy	yes	loamy sand in Cd
Sudbury	118	3	2.0	6.0	2.00	20.0	B	Outwash and Stream Terraces	mesic	sandy	no	loam over gravelly sand
Suffield	536	3	0.6	2.0	0.00	0.2	C	Sandy/loamy over silt/clay	mesic	silty over clayey	no	deep to clay C
Sunapee	168	3	0.6	2.0	0.60	6.0	B	Loose till, loamy textures	frigid	loamy	yes	
Sunapee var	269	3	0.6	2.0	0.60	6.0	B	Loose till, loamy textures	frigid	loamy	yes	frigid dystrudept
Surplus	669	3	0.6	2.0	0.00	0.6	C	Firm, platy, loamy till	cryic	loamy	yes	mwd, sandy loam in Cd
Sutton	68	3	0.6	6.0	0.60	6.0	B	Loose till, loamy textures	mesic	loamy	no	
Telos	123	3	0.6	2.0	0.02	0.2	C	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	channery silt loam in Cd

Attachment "E"

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

INFILTRATION PRACTICE CRITERIA (Env-Wq 1508.06)

Type/Node Name: **Infiltration Basin #1**

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**
0.35	ac	A = Area draining to the practice	
0.12	ac	A_I = Impervious area draining to the practice	
0.36	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.37	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.13	ac-in	WQV= 1” x Rv x A	
468	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12”)	
117	cf	25% x WQV (check calc for sediment forebay volume)	
Rain Guardian		Method of pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
1,054	cf	V = Volume[1] (attach a stage-storage table)	**≥ WQV**
480	sf	A_{SA} = Surface area of the bottom of the pond	
3.00	iph	$Ksat_{DESIGN}$ = Design infiltration rate[2]	
3.9	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
115.50	feet	E_{BTM} = Elevation of the bottom of the basin	
112.50	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
109.00	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
3.00	feet	D_{SHWT} = Separation from SHWT	**≥ *** [3]
6.5	feet	D_{ROCK} = Separation from bedrock	**≥ *** [3]
-	ft	D_{amend} = Depth of amended soil, if applicable due high infiltation rate	**≥ 24"**
-	ft	D_T = Depth of trench, if trench proposed	**4 - 10 ft**
	Yes/No	If a trench or underground system is proposed, has observation well been provided?	**←yes**
		If a trench is proposed, does materialmeet 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.	**≥3:1**
116.56	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
116.98	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
117.25	ft	Elevation of the top of the practice (if a basin, this is the elevation of the berm)	
YES		10 peak elevation ≤ Elevation of the top of the trench?[5]	**← yes**
YES		If a basin is proposed, 50-year peak elevation ≤ 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:

The Site Specific Soil Survey identifies soils as Deerfiled. Ksat low B = 6 in/hr, which after applying a factor of safety of 2 yields a design rate of 3 in/hr.

Attachment "E"

NEW HAMPSHIRE DEPARTMENT OF **Environmental Services**

INFILTRATION PRACTICE CRITERIA
(Env-Wq 1508.06)

Type/Node Name: **Infiltration Basin #2**

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**
0.71	ac	A = Area draining to the practice	
0.22	ac	A_I = Impervious area draining to the practice	
0.31	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.33	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.23	ac-in	WQV= 1" x Rv x A	
850	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
213	cf	25% x WQV (check calc for sediment forebay volume)	
Rain Guardian		Method of pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
1,039	cf	V = Volume[1] (attach a stage-storage table)	**≥ WQV**
1,877	sf	A_{SA} = Surface area of the bottom of the pond	
3.00	iph	$Ksat_{DESIGN}$ = Design infiltration rate[2]	
1.8	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
116.00	feet	E_{BTM} = Elevation of the bottom of the basin	
113.00	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
109.50	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
3.00	feet	D_{SHWT} = Separation from SHWT	**≥ *[3]**
6.5	feet	D_{ROCK} = Separation from bedrock	**≥ *[3]**
-	ft	D_{amend} = Depth of amended soil, if applicable due high infiltation rate	**≥ 24"**
-	ft	D_T = Depth of trench, if trench proposed	**4 - 10 ft**
	Yes/No	If a trench or underground system is proposed, has observation well been provided?	**←yes**
		If a trench is proposed, does materialmeet 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.	**≥3:1**
116.63	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
117.05	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
117.25	ft	Elevation of the top of the practice (if a basin, this is the elevation of the berm)	
YES		10 peak elevation ≤ Elevation of the top of the trench?[5]	**← yes**
YES		If a basin is proposed, 50-year peak elevation ≤ 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:

The Site Specific Soil Survey identifies soils as Deerfiled. Ksat low B = 6 in/hr, which after applying a factor of safety of 2 yields a design rate of 3 in/hr.

Attachment "E"

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

INFILTRATION PRACTICE CRITERIA
(Env-Wq 1508.06)

Type/Node Name: **Infiltration Basin #3**

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**
1.34	ac	A = Area draining to the practice	
0.40	ac	A_I = Impervious area draining to the practice	
0.30	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.32	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.43	ac-in	WQV= 1” x Rv x A	
1,560	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12”)	
390	cf	25% x WQV (check calc for sediment forebay volume)	
First Defense		Method of pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
3,138	cf	V = Volume[1] (attach a stage-storage table)	**≥ WQV**
2,106	sf	A_{SA} = Surface area of the bottom of the pond	
3.00	iph	$Ksat_{DESIGN}$ = Design infiltration rate[2]	
3.0	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
113.00	feet	E_{BTM} = Elevation of the bottom of the basin	
110.00	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
106.00	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
3.00	feet	D_{SHWT} = Separation from SHWT	**≥ ***[3]
7.0	feet	D_{ROCK} = Separation from bedrock	**≥ ***[3]
-	ft	D_{amend} = Depth of amended soil, if applicable due high infiltation rate	**≥ 24"**
-	ft	D_T = Depth of trench, if trench proposed	**4 - 10 ft**
	Yes/No	If a trench or underground system is proposed, has observation well been provided?	**←yes**
		If a trench is proposed, does materialmeet 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.	**≥3:1**
114.32	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
114.69	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
115.00	ft	Elevation of the top of the practice (if a basin, this is the elevation of the berm)	
YES		10 peak elevation ≤ Elevation of the top of the trench?[5]	**← yes**
YES		If a basin is proposed, 50-year peak elevation ≤ 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:

The Site Specific Soil Survey identifies soils as Deerfiled. Ksat low B = 6 in/hr, which after applying a factor of safety of 2 yields a design rate of 3 in/hr.

Attachment "E"

NEW HAMPSHIRE DEPARTMENT OF
Environmental Services

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

	ac	Area of HSG A soil that was replaced by impervious cover	0.40"
0.85	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"
0.25	inches	Rd = Weighted groundwater recharge depth	
0.2113	ac-in	GRV = AI * Rd	
767	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):

Infiltration Basin-1 provides 1,054 cf of storage below lowest outlet orifice.
Infiltration Basin-1 exfiltrates 1,481 cf of runoff during a 2-year design storm.

Infiltration Basin-2 provides 1,039 cf of storage below lowest outlet orifice.
Infiltration Basin-2 exfiltrates 2,788 cf of runoff during a 2-year design storm.

Infiltration Basin-3 provides 3,138 cf of storage below lowest outlet orifice.
Infiltration Basin-3 exfiltrates 6,185 cf of runoff during a 2-year design storm.

Total GRV storage = 5,231 cf.

Stage-Area-Storage for Pond INF1: Infiltration Basin #1

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
115.50	480	480	0
115.55	511	536	25
115.60	543	594	51
115.65	575	656	79
115.70	609	720	109
115.75	644	787	140
115.80	680	856	173
115.85	716	929	208
115.90	754	1,004	245
115.95	792	1,083	283
116.00	832	1,164	324
116.05	850	1,183	366
116.10	868	1,203	409
116.15	887	1,223	453
116.20	905	1,243	498
116.25	924	1,264	543
116.30	943	1,284	590
116.35	962	1,305	638
116.40	982	1,325	686
116.45	1,002	1,346	736
116.50	1,021	1,367	787
116.55	1,041	1,388	838
116.60	1,061	1,410	891
116.65	1,082	1,431	944
116.70	1,102	1,453	999
116.75	1,123	1,475	1,054
116.80	1,144	1,496	1,111
116.85	1,165	1,519	1,169
116.90	1,187	1,541	1,228
116.95	1,208	1,563	1,288
117.00	1,230	1,586	1,349
117.05	1,251	1,610	1,411
117.10	1,273	1,633	1,474
117.15	1,294	1,658	1,538
117.20	1,316	1,682	1,603
117.25	**1,338**	**1,706**	**1,669**

Stage-Area-Storage for Pond INF2: Infiltration Basin #2

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
116.00	1,877	1,877	0
116.05	1,916	1,921	95
116.10	1,956	1,966	192
116.15	1,995	2,010	290
116.20	2,036	2,055	391
116.25	2,076	2,099	494
116.30	2,117	2,144	599
116.35	2,159	2,189	706
116.40	2,201	2,235	815
116.45	2,243	2,280	926
116.50	2,286	2,326	1,039
116.55	2,329	2,371	1,154
116.60	2,372	2,417	1,272
116.65	2,416	2,463	1,392
116.70	2,461	2,509	1,514
116.75	2,505	2,556	1,638
116.80	2,551	2,602	1,764
116.85	2,596	2,649	1,893
116.90	2,642	2,696	2,024
116.95	2,688	2,742	2,157
117.00	2,735	2,790	2,293
117.05	2,779	2,830	2,430
117.10	2,824	2,871	2,570
117.15	2,868	2,911	2,713
117.20	2,913	2,952	2,857
117.25	**2,959**	**2,993**	**3,004**

Attachment "E"

Stage-Area-Storage for Pond INF3: Infiltration Basin #3

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
113.00	2,106	2,106	0
113.05	2,137	2,124	106
113.10	2,168	2,142	214
113.15	2,199	2,160	323
113.20	2,230	2,177	434
113.25	2,262	2,195	546
113.30	2,293	2,213	660
113.35	2,325	2,231	775
113.40	2,358	2,250	892
113.45	2,390	2,268	1,011
113.50	2,423	2,286	1,131
113.55	2,456	2,304	1,253
113.60	2,489	2,322	1,377
113.65	2,522	2,340	1,502
113.70	2,556	2,358	1,629
113.75	2,590	2,377	1,758
113.80	2,624	2,395	1,888
113.85	2,658	2,413	2,020
113.90	2,692	2,432	2,154
113.95	2,727	2,450	2,289
114.00	2,762	2,469	2,427
114.05	2,796	2,505	2,566
114.10	2,830	2,542	2,706
114.15	2,864	2,578	2,849
114.20	2,898	2,615	2,993
114.25	2,933	2,652	3,138
114.30	2,967	2,689	3,286
114.35	3,002	2,727	3,435
114.40	3,037	2,764	3,586
114.45	3,073	2,802	3,739
114.50	3,108	2,839	3,893
114.55	3,144	2,877	4,050
114.60	3,180	2,915	4,208
114.65	3,216	2,953	4,368
114.70	3,253	2,992	4,529
114.75	3,289	3,030	4,693
114.80	3,326	3,069	4,858
114.85	3,363	3,108	5,025
114.90	3,400	3,147	5,195
114.95	3,437	3,186	5,365
115.00	**3,475**	**3,225**	**5,538**

Attachment "E"

OUTLET APRON DESIGN

Engineering
Design
Planning
Construction Management
603.893.0720 GPINET.COM

Greenman-Pedersen, Inc.
44 Stiles Road
Suite One
Salem, NH 03079

Project: Campbello St - Hudson, NH Job # 2300191
Date: 17-Nov-23

FES-1 (from HydroCAD POND DMH3)

Q10 = 0.24 cfs
D_o = 12 inches
Tw = 0.2 feet

Design Criteria

Apron Dimensions

The dimensions of the apron at the outlet of the pipe shall be determined as follows:

1.) The width of the apron at the outlet of the pipe or channel shall be 3 times the diameter of the pipe, or the width of the channel.

USE THIS W= **3** feet

2.) The length of the apron shall be determined from the following formula when the tailwater depth at the outlet of the pipe or channel is less than one-half the diameter of the pipe or one-half the width of the channel:

La=1.8*Q/ Do^3/2+ 7Do

USE THIS La= **7.43** feet

Where:

La is the length of the apron
Q is the discharge from the pipe or channel
D_o is the diameter of pipe of width of channel

3.) When the depth of the tailwater at the outlet of the pipe or channel is equal to or greater than one-half the diameter of the pipe or the width of the channel. Then the following formula applies:

La=3.0*Qo/ Do^1.5 +7D_o

La= **7.72** feet

4.) Where there is no well defined channel downstream of the outlet, the width of the downstream end of the apron shall be determined as follows:

a. For minimum tailwater conditions where the tailwater depth is less than the elevation of the center of the pipe:

W=3*Do+La

USE THIS W= **10.43** feet

b. For maximum tailwater conditions where the tailwater depth is greater than the elevation of the center of the pipe:

W=3*Do+0.4*La

W= **6.09** feet

5.) Where there is a stable well-defined channel downstream of the apron, the bottom of the apron shall be equal to the width of the channel.

6.) The side of the apron in a well-defined channel shall be 2:1 (horizontal to vertical) or flatter. The height of the structural lining along the channel sides shall begin at the elevation equal to the top of conduit and taper down to the channel bottom through the length of the apron.

7.) The bottom grade of the apron shall be level (0% grade). No overfall is allowable at the end of the apron.

8.) The apron shall be located so that there are no bends in the horizontal alignment of the apron.

Rock Riprap

The following criteria shall be used to determine the dimensions of the rock riprap used for the apron:

1.) The median stone diameter shall be determined using the formula:

d_{50}=0.02*Q^4/3/(Tw*D_o)

d_{50}= **0.18** inches **USE** **3** inches

d_{50} minimum 3 inches

Where:

d_{50} is the median stone diameter in feet
Tw is the tailwater depth above the invert of the pipe channel in feet
Q is the discharge from the pipe or channel in cubic feet per second
D_o is the diameter of the pipe or width of the channel in feet

2.) Fifty percent by weight of the riprap mixture shall be smaller the than median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size.

3.) The quality and gradation of the rock, the thickness of the riprap lining, filter material and the quality of the stone shall meet the requirements in the Rock Riprap BMP. The minimum depth shall be 6 inches or 1.5 times the largest stone size in the mixture whichever is larger (d).

Thickness of the riprap
d = 1.5*(d100 avg.(largest stone size))
d= **8** inches*

* must use a minimum of 6"

Rock Rip Rap Gradation

% of weight smaller than the given size	size of stone in inches		
100	**4.5**	to	**6.0**
85	**3.9**	to	**5.4**
50	**3.0**	to	**4.5**
15	**0.9**	to	**1.5**

Attachment "E"

OUTLET APRON DESIGN

GPI
Engineering
Design
Planning
Construction Management
603.893.0720 GPINET.COM

Greenman-Pedersen, Inc.
44 Stiles Road
Suite One
Salem, NH 03079

Project: Campbello St - Hudson, NH Job # 2300191
Date: 17-Nov-23

FES-2 (from HydroCAD POND DMH4)

Q10 = 2.33 cfs
D_o = 12 inches
Tw = 0.7 feet

Design Criteria

Apron Dimensions

The dimensions of the apron at the outlet of the pipe shall be determined as follows:

1.) The width of the apron at the outlet of the pipe or channel shall be 3 times the diameter of the pipe, or the width of the channel.

USE THIS W= **3** feet

2.) The length of the apron shall be determined from the following formula when the tailwater depth at the outlet of the pipe or channel is less than one-half the diameter of the pipe or one-half the width of the channel:

La=1.8*Q/ Do^3/2+ 7Do
La= **11.19** feet

Where:

La is the length of the apron
Q is the discharge from the pipe or channel
D_o is the diameter of pipe of width of channel

3.) When the depth of the tailwater at the outlet of the pipe or channel is equal to or greater than one-half the diameter of the pipe or the width of the channel. Then the following formula applies:

La=3.0*Qo/ Do^1.5 +7D_o
USE THIS La= **13.99** feet

4.) Where there is no well defined channel downstream of the outlet, the width of the downstream end of the apron shall be determined as follows:

a. For minimum tailwater conditions where the tailwater depth is less than the elevation of the center of the pipe:

W=3*Do+La
W= **14.19** feet

b. For maximum tailwater conditions where the tailwater depth is greater than the elevation of the center of the pipe:

W=3*Do+0.4*La
USE THIS W= **8.60** feet

5.) Where there is a stable well-defined channel downstream of the apron, the bottom of the apron shall be equal to the width of the channel.

6.) The side of the apron in a well-defined channel shall be 2:1 (horizontal to vertical) or flatter. The height of the structural lining along the channel sides shall begin at the elevation equal to the top of conduit and taper down to the channel bottom through the length of the apron.

7.) The bottom grade of the apron shall be level (0% grade). No overfall is allowable at the end of the apron.

8.) The apron shall be located so that there are no bends in the horizontal alignment of the apron.

Rock Riprap

The following criteria shall be used to determine the dimensions of the rock riprap used for the apron:

1.) The median stone diameter shall be determined using the formula:

d_{50}=0.02*Q^4/3/(Tw*D_o)

d_{50}= **1.06** inches **USE** **3** inches

d_{50} minimum 3 inches

Where:

d_{50} is the median stone diameter in feet

Tw is the tailwater depth above the invert of the pipe channel in feet

Q is the discharge from the pipe or channel in cubic feet per second

D_o is the diameter of the pipe or width of the channel in feet

2.) Fifty percent by weight of the riprap mixture shall be smaller the than median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size.

3.) The quality and gradation of the rock, the thickness of the riprap lining, filter material and the quality of the stone shall meet the requirements in the Rock Riprap BMP. The minimum depth shall be 6 inches or 1.5 times the largest stone size in the mixture whichever is larger (d).

Thickness of the riprap

d = 1.5*(d100 avg.(largest stone size))

d= **8** inches*

* must use a minimum of 6"

Rock Rip Rap Gradation

% of weight smaller than the given size	size of stone in inches		
100	**4.5**	to	**6.0**
85	**3.9**	to	**5.4**
50	**3.0**	to	**4.5**
15	**0.9**	to	**1.5**

Attachment "E"

Hydro International

First Defense® High Capacity

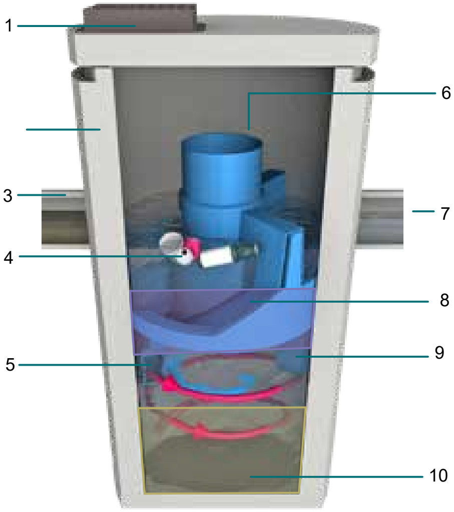
Advanced Hydrodynamic Separator

Product Summary

A Simple Solution for your Trickiest Sites

First Defense® High Capacity is a versatile stormwater separator with some of the highest approved flow rates in the United States, enabling engineers and contractors to save site space and projects costs by using the smallest possible footprint. It also works with single and multiple inlet pipes and inlet grates has an internal bypass to convey infrequent peak flows directly to the outlet.

Fig.1 The First Defense® High Capacity has internal components designed to efficiently capture pollutants and prevent washout at



Product Profile

1. Inlet Grate (optional)
2. Precast chamber
3. Inlet Pipe (optional)
4. Floatables Draw Off Slot (not pictured)
5. Inlet Chute
6. Internal Bypass
7. Outlet pipe
8. Oil and Floatables Storage
9. Outlet chute
10. Sediment Storage Sump

Applications

- Areas requiring a minimum of 50% TSS removal
- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Highways, car parks, industrial areas and urban developments
- Pre-treatment to ponds, storage systems, green infrastructure

How it Works

Highest Flow through the Smallest Footprint

Contaminated stormwater runoff enters the inlet chute from a surface grate and/or inlet pipe. The inlet chute introduces flow into the chamber tangentially to create a low energy vortex flow regime (magenta arrow) that directs sediment into the sump while oils, floating trash and debris rise to the surface.

Treated stormwater exits through a submerged outlet chute located opposite to the direction of the rotating flow (blue arrow). Enhanced vortex separation is provided by forcing the rotating flow within the vessel to follow the longest path possible rather than directly from inlet to outlet.

Higher flows bypass the treatment chamber to prevent turbulence and washout of captured pollutants. An internal bypass conveys infrequent peak flows directly to the outlet eliminating the need for, and expense of, external bypass control structures. A floatables draw off slot functions to convey floatables into the treatment chamber prior to bypass.

Benefits

Small & Simple

- Cut footprint size, cut costs: First Defense® provides space-saving, easy-to-install surface water treatment in standard sized chambers/ manholes.
- Adapt to site limitations: Variable configuratoins will help you effectively slip First Defense® into a tight spot. It also works well with large pipes, multiple inlet pipes and inlet grates.
- Save installation time: Every First Defense® unit is delivered to site pre-assembled and ready for installation – so installation is as easy as fitting any chamber/manhole.

Stormwater Solutions

→ hydro-int.com/firstdefense

Attachment "E"

Sizing & Design

This adaptable online treatment system works easily with large pipes, multiple inlet pipes, inlet grates and now, contains a high capacity bypass for the conveyance of large peak flows. Designed with site flexibility in mind, the First Defense® High Capacity allows engineers to maximize available site space without compromising treatment level.

Free Sizing Tool

This simple online tool will recommend the best separator, model size and online/offline arrangement based on site-specific data entered by the user.

Go to hydro-int.com/sizing to access the tool.

First Defense® High Capacity Model Number	Diameter	Typical TSS Treatment Flow Rates		Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Standard Distance from Outlet Invert to Sump Floor
		NJDEP Certified	110µm						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd^3 / m^3)	(ft / m)	(ft / m)
FD-3HC	3 / 0.9	0.84 / 23.7	1.06 / 30.0	15 / 424	18 / 450	125 / 473	0.4 / 0.3	2.0 - 3.5 / 0.6 - 1.0	3.71 / 1.13
FD-4HC	4 / 1.2	1.50 / 42.4	1.88 / 53.2	18 / 510	24 / 600	191 / 723	0.7 / 0.5	2.3 - 3.9 / 0.7 - 1.2	4.97 / 1.5
FD-5HC	5 / 1.5	2.35 / 66.2	2.94 / 83.2	20 / 566	24 / 600	300 / 1135	1.1 / .84	2.5 - 4.5 / 0.7 - 1.3	5.19 / 1.5
FD-6HC	6 / 1.8	3.38 / 95.7	4.23 / 119.8	32 / 906	30 / 750	496 / 1,878	1.6 / 1.2	3.0 - 5.1 / 0.9 - 1.6	5.97 / 1.8
FD-8HC	8 / 2.4	6.00 / 169.9	7.52 / 212.9	50 / 1415	48 / 1200	1120 / 4239	2.8 / 2.1	3.0 - 6.0 / 0.9 -1.8	7.40 / 2.2
FD-10HC	10 / 3.0	9.38 / 265.6	11.75 / 332.7	50 / 1415	48 / 1200	1742 / 6594	4.4 / 3.3	6.5 -8.0 / 2.0 - 2.4	10.25 / 3.12

[1] Contact Hydro International when larger pipe sizes are required.
[2] Contact Hydro International when custom sediment storage capacity is required.
[3] Minimum distance for models depends on pipe diameter.

Maintenance

Easy vactor hose access through the center shaft of the system makes for quick, simple sump cleanout while trash and floatables can be fished out from the surface with a net.

Nobody maintains our systems better than we do. To ensure optimal, ongoing device performance, be sure to recommend Hydro International as a preferred service and maintenance provider to your clients.

Hydro International®

Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200
Email: stormwaterinquiry@hydro-int.com
Web: www.hydro-int.com/firstdefense

Download Drawings!

→ hydro-int.com/fddrawings

Access the Operation & Maintenance Manual

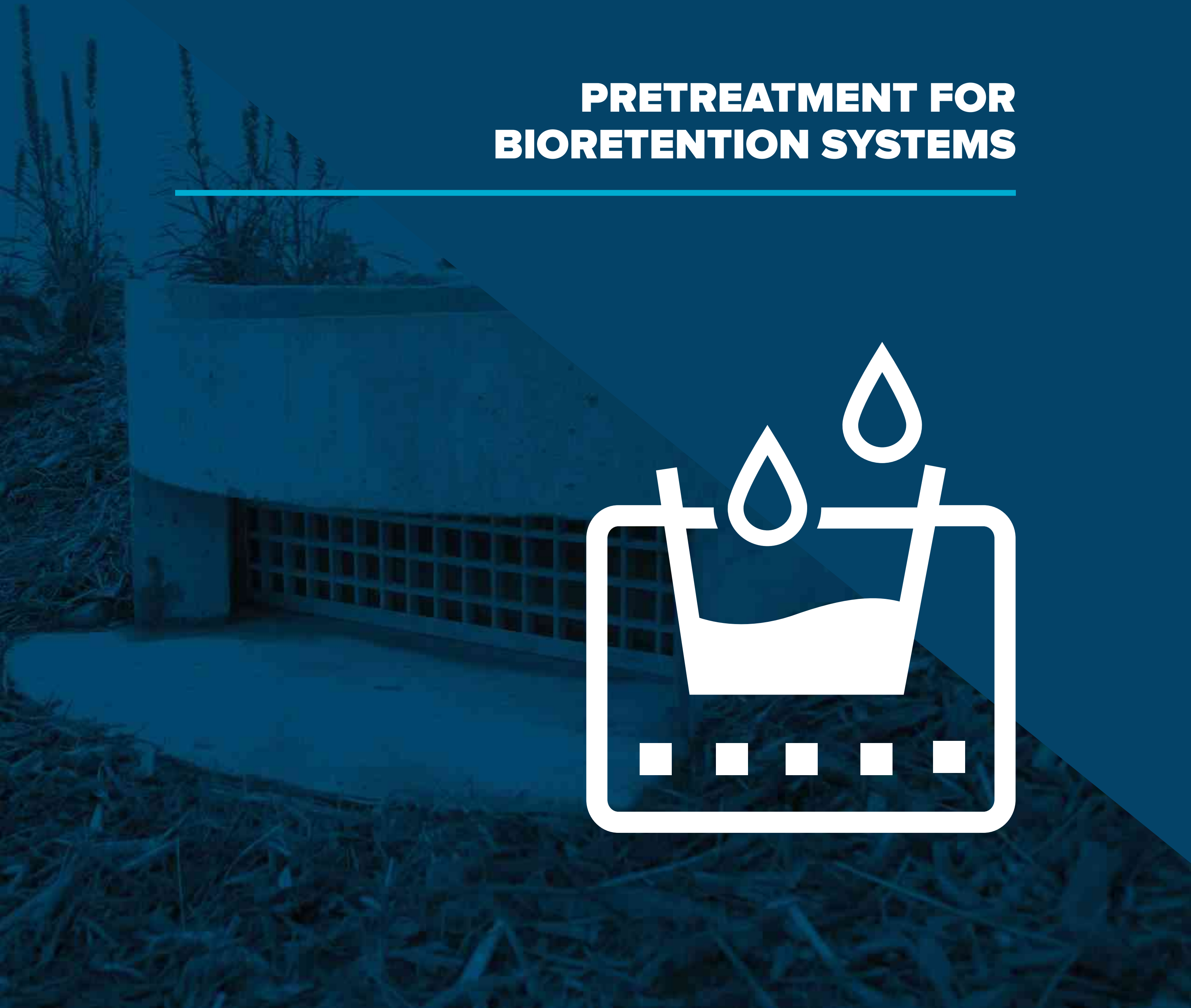
→ hydro-int.com/fd-om

Attachment "E"

FERGUSON
WATERWORKS

RAIN GUARDIAN

PRETREATMENT FOR BIORETENTION SYSTEMS



Attachment "E"

GEO & STORMWATER SOLUTIONS

EXTEND THE LIFE OF YOUR BIORETENTION/RAIN GARDEN/VEGETATED BMP SYSTEM BY KEEPING TRASH, LEAVES AND OTHER DEBRIS OUT

Rain Guardians provide effective pretreatment for stormwater/bioretention/rain garden/vegetated BMP systems and are available in various configurations to meet both commercial and residential needs. The grate, filter and chamber combination captures leaves, trash and other debris with overflow points preventing inlet debris from causing bypass before the bioretention system reaches capacity. These pretreatment devices are often used in urban curbline applications that lack the space for typical sediment forebays.

Maintenance is simple with Rain Guardian pretreatment devices, as sediment and debris can be easily removed from the chamber with a shovel and the drop-in filter can be cleaned with a broom or hose.

BENEFITS

- Maximizes capacity and extends the life of bioretention systems
- Maintenance is simple and only requires a shovel and broom or hose
- Installation (placement and securing) takes minutes
- Helps eliminate bypass and sediment build-up, protecting surrounding vegetation
- Works well with new construction, retrofits and tight urban spaces
- Simplifies visual inspections of accumulated sediment depth

FERGUSON WATERWORKS

Attachment "E"

MODELS AVAILABLE

All functional elements apply to all chambers

Applications:
Commercial - no sidewalk

RAIN GUARDIAN TURRET

Top grate: Captures leaf litter and coarse debris

Chamber base combination: Serves as settling chamber for heavier particles

Filter wall: Allows chamber to dry between rain events

Debris walls: Restrict floatable debris from entering or exiting garden

Configurations: Available in 90, 135 and 180 degree turn configurations

Applications:
Commercial - with sidewalk

RAIN GUARDIAN FOXHOLE

High-strength composite lid:

- Easily supports pedestrian and bike passage (unit rated for concentrated loads of up to 11,200 lbs)
- Lightweight design - 38 lbs/lid
- Easily maintained

Modular design:

- Suitable for any length inlet - 3' increments
- Units are easily connected
- Adaptable to sidewalk widths

Applications: Residential

RAIN GUARDIAN BUNKER

Metal grate:

- Captures leaf litter and coarse debris
- Lightweight design
- Easily maintained

Anodized aluminum filter:
Corrosion resistant

Pre-assembled recycled plastic chamber:
Ultra-resistant to rotting

To learn more about this product, contact your local Ferguson Stormwater/Geo Specialist.
FERGUSONGSS.COM

Attachment "E"

SPECIFICATIONS MODEL TYPE

MATERIAL PROPERTY	TURRET	FOXHOLE
Weight of steel reinforced, cold joint secured monolithic concrete structure	1,030 lbs	2,570 lbs total (inlet, middle, outlet)
Concrete minimum compressive strength	4,000 psi at 28 days	4,000 psi at 28 days
Concrete air entrained	4-8% by volume	4-8% by volume
Manufacturing & design standard	ASTM C858	ASTM C858
Standard exterior dimensions	46" x 50" base, 19.5" total height	2' - 11" x 1' - 7" x varies based on sidewalk width

PROPERTY OF RECYCLED PLASTIC LUMBER	BUNKER
Plastic lumber shall be manufactured with recycled HDPE, post-industrial and post-consumer	95%+
Flexural Strength	ASTM D6109, 1,350 psi
Flexural modulus secant @ 1% strain	ASTM D6109, 79,000 psi
Thermal expansion	ASTM D6341, 0.000058 in/in/*F
Lb/ft of recycled plastic lumber	1.5 lbs
Dry filter box total weight	54 lbs
Standard exterior dimensions of dry filter box	(51.25" L) x (20" W) x (16" H)

MEASUREMENT	TURRET	FOXHOLE	BUNKER
Typical drop from edge of pavement grade to outlet into bioretention	10.5"	7.5"	7.5" and 10.5" options

ANOKA CONSERVATION DISTRICT

RAIN GUARDIAN

FERGUSON
WATERWORKS

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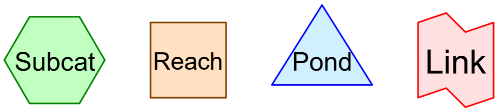
SECTION 7

PRE-DEVELOPMENT HYDROCAD CALCULATIONS

Attachment "E"



Routing Diagram for 2300191 Pre
Prepared by Greenman-Pedersen, Inc, Printed 11/17/2023
HydroCAD® 10.20-3g s/n 01710 © 2023 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.027	61	>75% Grass cover, Good, HSG B (100S)
0.105	98	Paved parking, HSG B (100S)
0.041	98	Roofs, HSG B (100S)
0.858	55	Woods, Good, HSG B (100S)
5.030	**61**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
5.030	HSG B	100S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
5.030		**TOTAL AREA**

Attachment "E"

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	4.027	0.000	0.000	0.000	4.027	>75% Grass cover, Good	100S
0.000	0.105	0.000	0.000	0.000	0.105	Paved parking	100S
0.000	0.041	0.000	0.000	0.000	0.041	Roofs	100S
0.000	0.858	0.000	0.000	0.000	0.858	Woods, Good	100S
0.000	**5.030**	**0.000**	**0.000**	**0.000**	**5.030**	**TOTAL AREA**	

Attachment "E"

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100S: Overland Flow to Runoff Area=5.030 ac 2.90% Impervious Runoff Depth=0.19"
Flow Length=835' Tc=25.4 min CN=61 Runoff=0.29 cfs 0.078 af

Link DP#1: Design Point #1 - Wetland Inflow=0.29 cfs 0.078 af
Primary=0.29 cfs 0.078 af

Total Runoff Area = 5.030 ac Runoff Volume = 0.078 af Average Runoff Depth = 0.19"
97.10% Pervious = 4.884 ac 2.90% Impervious = 0.146 ac

```
                       Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
                       Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
            Reach routing by Dyn-Stor-Ind method  -  Pond routing by Dyn-Stor-Ind method

Subcatchment 100S: Overland Flow to     Runoff Area=5.030 ac   2.90% Impervious   Runoff Depth=0.34"
                                Flow Length=835'   Tc=25.4 min   CN=61   Runoff=0.74 cfs  0.144 af

Link DP#1: Design Point #1 - Wetland                                         Inflow=0.74 cfs  0.144 af
                                                                            Primary=0.74 cfs  0.144 af

             Total Runoff Area = 5.030 ac   Runoff Volume = 0.144 af   Average Runoff Depth = 0.34"
                                              97.10% Pervious = 4.884 ac     2.90% Impervious = 0.146 ac
```

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100S: Overland Flow to Runoff Area=5.030 ac 2.90% Impervious Runoff Depth=1.04"
Flow Length=835' Tc=25.4 min CN=61 Runoff=3.23 cfs 0.436 af

Link DP#1: Design Point #1 - Wetland Inflow=3.23 cfs 0.436 af
Primary=3.23 cfs 0.436 af

Total Runoff Area = 5.030 ac Runoff Volume = 0.436 af Average Runoff Depth = 1.04"
97.10% Pervious = 4.884 ac 2.90% Impervious = 0.146 ac

Attachment "E"

Summary for Subcatchment 100S: Overland Flow to Wetland

Runoff = 3.23 cfs @ 12.41 hrs, Volume= 0.436 af, Depth= 1.04"
Routed to Link DP#1 : Design Point #1 - Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
4.027	61	>75% Grass cover, Good, HSG B
0.105	98	Paved parking, HSG B
0.041	98	Roofs, HSG B
0.858	55	Woods, Good, HSG B
5.030	61	Weighted Average
4.884		97.10% Pervious Area
0.146		2.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	25	0.0150	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.94"
21.6	810	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.4	835	Total			

Summary for Link DP#1: Design Point #1 - Wetland

Inflow Area = 5.030 ac, 2.90% Impervious, Inflow Depth = 1.04" for 10-Year event
Inflow = 3.23 cfs @ 12.41 hrs, Volume= 0.436 af
Primary = 3.23 cfs @ 12.41 hrs, Volume= 0.436 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100S: Overland Flow to Runoff Area=5.030 ac 2.90% Impervious Runoff Depth=1.74"
Flow Length=835' Tc=25.4 min CN=61 Runoff=5.84 cfs 0.728 af

Link DP#1: Design Point #1 - Wetland Inflow=5.84 cfs 0.728 af
Primary=5.84 cfs 0.728 af

Total Runoff Area = 5.030 ac Runoff Volume = 0.728 af Average Runoff Depth = 1.74"
97.10% Pervious = 4.884 ac 2.90% Impervious = 0.146 ac

Attachment "E"

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100S: Overland Flow to Runoff Area=5.030 ac 2.90% Impervious Runoff Depth=2.47"
Flow Length=835' Tc=25.4 min CN=61 Runoff=8.57 cfs 1.037 af

Link DP#1: Design Point #1 - Wetland Inflow=8.57 cfs 1.037 af
Primary=8.57 cfs 1.037 af

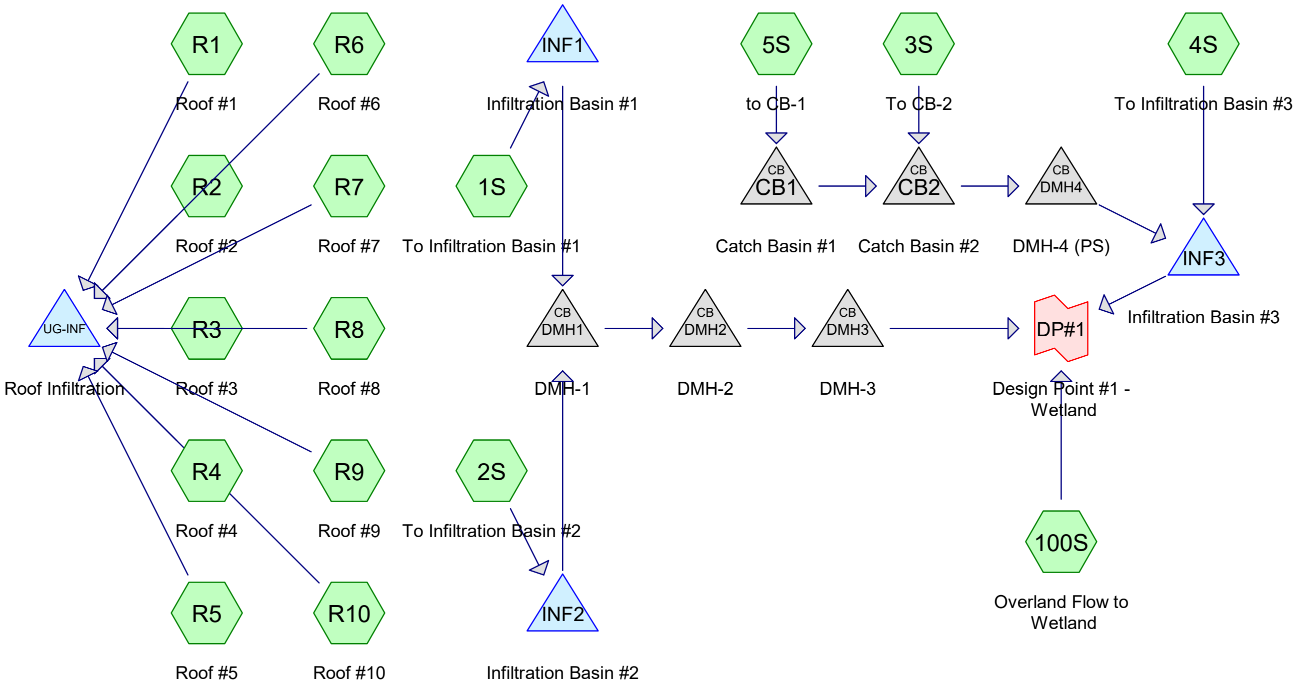
Total Runoff Area = 5.030 ac Runoff Volume = 1.037 af Average Runoff Depth = 2.47"
97.10% Pervious = 4.884 ac 2.90% Impervious = 0.146 ac

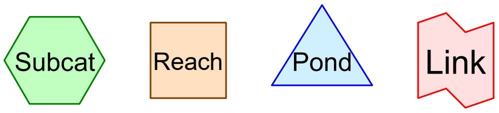
Attachment "E"

SECTION 8

POST-DEVELOPMENT HYDROCAD CALCULATIONS

Attachment "E"





Routing Diagram for 2300191 Post
Prepared by Greenman-Pedersen, Inc, Printed 12/20/2023
HydroCAD® 10.20-3g s/n 01710 © 2023 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.430	61	>75% Grass cover, Good, HSG B (1S, 2S, 3S, 4S, 5S, 100S)
0.719	98	Paved parking, HSG B (1S, 2S, 3S, 4S, 5S, 100S)
0.342	98	Roofs, HSG B (2S, 100S, R1, R10, R2, R3, R4, R5, R6, R7, R8, R9)
0.540	55	Woods, Good, HSG B (100S)
5.030	**68**	**TOTAL AREA**

Attachment "E"

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
5.030	HSG B	1S, 2S, 3S, 4S, 5S, 100S, R1, R10, R2, R3, R4, R5, R6, R7, R8, R9
0.000	HSG C	
0.000	HSG D	
0.000	Other	
5.030		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	3.430	0.000	0.000	0.000	3.430	>75% Grass cover, Good	1S, 2S, 3S, 4S, 5S, 100S
0.000	0.719	0.000	0.000	0.000	0.719	Paved parking	1S, 2S, 3S, 4S, 5S, 100S
0.000	0.342	0.000	0.000	0.000	0.342	Roofs	2S, 100S, R1, R10, R2, R3, R4, R5, R6, R7, R8, R9
0.000	0.540	0.000	0.000	0.000	0.540	Woods, Good	100S
0.000	**5.030**	**0.000**	**0.000**	**0.000**	**5.030**	**TOTAL AREA**	

Attachment "E"

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	CB1	114.00	113.90	22.0	0.0045	0.012	0.0	12.0	0.0	
2	CB2	113.80	113.65	25.0	0.0060	0.012	0.0	12.0	0.0	
3	DMH1	115.45	115.10	84.0	0.0042	0.012	0.0	12.0	0.0	
4	DMH2	115.00	113.97	235.0	0.0044	0.012	0.0	12.0	0.0	
5	DMH3	113.87	112.70	266.0	0.0044	0.012	0.0	12.0	0.0	
6	DMH4	113.55	113.00	113.0	0.0049	0.012	0.0	12.0	0.0	
7	INF1	115.70	115.55	27.0	0.0056	0.013	0.0	6.0	0.0	
8	INF2	115.80	115.55	31.0	0.0081	0.013	0.0	6.0	0.0	
9	INF3	113.36	113.23	13.0	0.0100	0.012	0.0	6.0	0.0	

Attachment "E"

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
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 1S: To Infiltration Basin #1 Runoff Area=15,161 sf 35.60% Impervious Runoff Depth=1.18"
Flow Length=227' Slope=0.0400 '/' Tc=3.7 min CN=WQ Runoff=0.42 cfs 0.034 af

Subcatchment 2S: To Infiltration Basin #2 Runoff Area=30,811 sf 31.30% Impervious Runoff Depth=1.08"
Flow Length=243' Slope=0.0400 '/' Tc=3.8 min CN=WQ Runoff=0.77 cfs 0.064 af

Subcatchment 3S: To CB-2 Runoff Area=0.620 ac 40.45% Impervious Runoff Depth=1.30"
Flow Length=378' Tc=5.2 min CN=WQ Runoff=0.80 cfs 0.067 af

Subcatchment 4S: To Infiltration Basin #3 Runoff Area=0.502 ac 11.13% Impervious Runoff Depth=0.61"
Flow Length=236' Slope=0.0400 '/' Tc=5.1 min CN=WQ Runoff=0.25 cfs 0.025 af

Subcatchment 5S: to CB-1 Runoff Area=0.217 ac 44.23% Impervious Runoff Depth=1.39"
Flow Length=184' Slope=0.0400 '/' Tc=1.0 min CN=WQ Runoff=0.35 cfs 0.025 af

Subcatchment 100S: Overland Flow to Runoff Area=2.333 ac 0.44% Impervious Runoff Depth=0.32"
Flow Length=866' Tc=26.2 min CN=WQ Runoff=0.29 cfs 0.061 af

Subcatchment R1: Roof #1 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=2.71"
Tc=0.0 min CN=98 Runoff=0.11 cfs 0.007 af

Subcatchment R10: Roof #10 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=2.71"
Tc=0.0 min CN=98 Runoff=0.11 cfs 0.007 af

Subcatchment R2: Roof #2 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=2.71"
Tc=0.0 min CN=98 Runoff=0.11 cfs 0.007 af

Subcatchment R3: Roof #3 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=2.71"
Tc=0.0 min CN=98 Runoff=0.11 cfs 0.007 af

Subcatchment R4: Roof #4 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=2.71"
Tc=0.0 min CN=98 Runoff=0.11 cfs 0.007 af

Subcatchment R5: Roof #5 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=2.71"
Tc=0.0 min CN=98 Runoff=0.11 cfs 0.007 af

Subcatchment R6: Roof #6 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=2.71"
Tc=0.0 min CN=98 Runoff=0.11 cfs 0.007 af

Subcatchment R7: Roof #7 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=2.71"
Tc=0.0 min CN=98 Runoff=0.11 cfs 0.007 af

Subcatchment R8: Roof #8 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=2.71"
Tc=0.0 min CN=98 Runoff=0.11 cfs 0.007 af

Subcatchment R9: Roof #9 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=2.71"
Tc=0.0 min CN=98 Runoff=0.11 cfs 0.007 af

Attachment "E"

Pond CB1: Catch Basin #1 Peak Elev=114.47' Inflow=0.35 cfs 0.025 af
12.0" Round Culvert n=0.012 L=22.0' S=0.0045 '/' Outflow=0.35 cfs 0.025 af

Pond CB2: Catch Basin #2 Peak Elev=114.43' Inflow=1.05 cfs 0.092 af
12.0" Round Culvert n=0.012 L=25.0' S=0.0060 '/' Outflow=1.05 cfs 0.092 af

Pond DMH1: DMH-1 Peak Elev=115.45' Inflow=0.00 cfs 0.000 af
12.0" Round Culvert n=0.012 L=84.0' S=0.0042 '/' Outflow=0.00 cfs 0.000 af

Pond DMH2: DMH-2 Peak Elev=115.00' Inflow=0.00 cfs 0.000 af
12.0" Round Culvert n=0.012 L=235.0' S=0.0044 '/' Outflow=0.00 cfs 0.000 af

Pond DMH3: DMH-3 Peak Elev=113.87' Inflow=0.00 cfs 0.000 af
12.0" Round Culvert n=0.012 L=266.0' S=0.0044 '/' Outflow=0.00 cfs 0.000 af

Pond DMH4: DMH-4 (PS) Peak Elev=114.15' Inflow=1.05 cfs 0.092 af
12.0" Round Culvert n=0.012 L=113.0' S=0.0049 '/' Outflow=1.05 cfs 0.092 af

Pond INF1: Infiltration Basin #1 Peak Elev=116.05' Storage=368 cf Inflow=0.42 cfs 0.034 af
Discarded=0.09 cfs 0.034 af Primary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.034 af

Pond INF2: Infiltration Basin #2 Peak Elev=116.30' Storage=594 cf Inflow=0.77 cfs 0.064 af
Discarded=0.16 cfs 0.064 af Primary=0.00 cfs 0.000 af Outflow=0.16 cfs 0.064 af

Pond INF3: Infiltration Basin #3 Peak Elev=113.61' Storage=1,410 cf Inflow=1.28 cfs 0.118 af
Discarded=0.19 cfs 0.118 af Primary=0.00 cfs 0.000 af Outflow=0.19 cfs 0.118 af

Pond UG-INF: Roof Infiltration Peak Elev=0.72' Storage=707 cf Inflow=1.05 cfs 0.068 af
Outflow=0.19 cfs 0.068 af

Link DP#1: Design Point #1 - Wetland Inflow=0.29 cfs 0.061 af
Primary=0.29 cfs 0.061 af

Total Runoff Area = 5.030 ac Runoff Volume = 0.345 af Average Runoff Depth = 0.82"
78.91% Pervious = 3.970 ac 21.09% Impervious = 1.061 ac

Attachment "E"

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
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 1S: To Infiltration Basin #1 Runoff Area=15,161 sf 35.60% Impervious Runoff Depth=2.16"
Flow Length=227' Slope=0.0400 '/' Tc=3.7 min CN=WQ Runoff=0.83 cfs 0.063 af

Subcatchment 2S: To Infiltration Basin #2 Runoff Area=30,811 sf 31.30% Impervious Runoff Depth=2.03"
Flow Length=243' Slope=0.0400 '/' Tc=3.8 min CN=WQ Runoff=1.58 cfs 0.120 af

Subcatchment 3S: To CB-2 Runoff Area=0.620 ac 40.45% Impervious Runoff Depth=2.32"
Flow Length=378' Tc=5.2 min CN=WQ Runoff=1.51 cfs 0.120 af

Subcatchment 4S: To Infiltration Basin #3 Runoff Area=0.502 ac 11.13% Impervious Runoff Depth=1.39"
Flow Length=236' Slope=0.0400 '/' Tc=5.1 min CN=WQ Runoff=0.73 cfs 0.058 af

Subcatchment 5S: to CB-1 Runoff Area=0.217 ac 44.23% Impervious Runoff Depth=2.44"
Flow Length=184' Slope=0.0400 '/' Tc=1.0 min CN=WQ Runoff=0.65 cfs 0.044 af

Subcatchment 100S: Overland Flow to Runoff Area=2.333 ac 0.44% Impervious Runoff Depth=0.98"
Flow Length=866' Tc=26.2 min CN=WQ Runoff=1.35 cfs 0.190 af

Subcatchment R1: Roof #1 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=4.19"
Tc=0.0 min CN=98 Runoff=0.16 cfs 0.011 af

Subcatchment R10: Roof #10 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=4.19"
Tc=0.0 min CN=98 Runoff=0.16 cfs 0.011 af

Subcatchment R2: Roof #2 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=4.19"
Tc=0.0 min CN=98 Runoff=0.16 cfs 0.011 af

Subcatchment R3: Roof #3 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=4.19"
Tc=0.0 min CN=98 Runoff=0.16 cfs 0.011 af

Subcatchment R4: Roof #4 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=4.19"
Tc=0.0 min CN=98 Runoff=0.16 cfs 0.011 af

Subcatchment R5: Roof #5 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=4.19"
Tc=0.0 min CN=98 Runoff=0.16 cfs 0.011 af

Subcatchment R6: Roof #6 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=4.19"
Tc=0.0 min CN=98 Runoff=0.16 cfs 0.011 af

Subcatchment R7: Roof #7 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=4.19"
Tc=0.0 min CN=98 Runoff=0.16 cfs 0.011 af

Subcatchment R8: Roof #8 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=4.19"
Tc=0.0 min CN=98 Runoff=0.16 cfs 0.011 af

Subcatchment R9: Roof #9 Runoff Area=0.030 ac 100.00% Impervious Runoff Depth=4.19"
Tc=0.0 min CN=98 Runoff=0.16 cfs 0.011 af

Attachment "E"

```
Pond CB1: Catch Basin #1                                      Peak Elev=114.80'   Inflow=0.65 cfs  0.044 af
                               12.0"  Round Culvert  n=0.012  L=22.0'  S=0.0045 '/'   Outflow=0.65 cfs  0.044 af

Pond CB2: Catch Basin #2                                      Peak Elev=114.77'   Inflow=1.98 cfs  0.164 af
                               12.0"  Round Culvert  n=0.012  L=25.0'  S=0.0060 '/'   Outflow=1.98 cfs  0.164 af

Pond DMH1: DMH-1                                              Peak Elev=115.73'   Inflow=0.24 cfs  0.010 af
                               12.0"  Round Culvert  n=0.012  L=84.0'  S=0.0042 '/'   Outflow=0.24 cfs  0.010 af

Pond DMH2: DMH-2                                              Peak Elev=115.28'   Inflow=0.24 cfs  0.010 af
                              12.0"  Round Culvert  n=0.012  L=235.0'  S=0.0044 '/'   Outflow=0.24 cfs  0.010 af

Pond DMH3: DMH-3                                              Peak Elev=114.15'   Inflow=0.24 cfs  0.010 af
                              12.0"  Round Culvert  n=0.012  L=266.0'  S=0.0044 '/'   Outflow=0.24 cfs  0.010 af

Pond DMH4: DMH-4 (PS)                                         Peak Elev=114.44'   Inflow=1.98 cfs  0.164 af
                              12.0"  Round Culvert  n=0.012  L=113.0'  S=0.0049 '/'   Outflow=1.98 cfs  0.164 af

Pond INF1: Infiltration Basin #1           Peak Elev=116.56'  Storage=853 cf   Inflow=0.83 cfs  0.063 af
                           Discarded=0.12 cfs  0.063 af   Primary=0.00 cfs  0.000 af   Outflow=0.12 cfs  0.063 af

Pond INF2: Infiltration Basin #2         Peak Elev=116.63'  Storage=1,341 cf   Inflow=1.58 cfs  0.120 af
                           Discarded=0.20 cfs  0.109 af   Primary=0.24 cfs  0.010 af   Outflow=0.44 cfs  0.120 af

Pond INF3: Infiltration Basin #3         Peak Elev=114.32'  Storage=3,336 cf   Inflow=2.69 cfs  0.222 af
                           Discarded=0.26 cfs  0.216 af   Primary=0.09 cfs  0.006 af   Outflow=0.35 cfs  0.222 af

Pond UG-INF: Roof Infiltration              Peak Elev=1.16'  Storage=1,302 cf   Inflow=1.60 cfs  0.106 af
                                                                                  Outflow=0.22 cfs  0.106 af

Link DP#1: Design Point #1 - Wetland                                               Inflow=1.59 cfs  0.206 af
                                                                                  Primary=1.59 cfs  0.206 af

                 Total Runoff Area = 5.030 ac   Runoff Volume = 0.700 af   Average Runoff Depth = 1.67"
                                            78.91% Pervious = 3.970 ac     21.09% Impervious = 1.061 ac
```

Summary for Subcatchment 1S: To Infiltration Basin #1

Runoff = 0.83 cfs @ 12.06 hrs, Volume= 0.063 af, Depth= 2.16"
Routed to Pond INF1 : Infiltration Basin #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (sf)	CN	Description
9,764	61	>75% Grass cover, Good, HSG B
5,398	98	Paved parking, HSG B
15,161		Weighted Average
9,764	61	64.40% Pervious Area
5,398	98	35.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	25	0.0400	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.94"
0.5	45	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	157	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.7	227	Total			

Summary for Subcatchment 2S: To Infiltration Basin #2

Runoff = 1.58 cfs @ 12.06 hrs, Volume= 0.120 af, Depth= 2.03"
Routed to Pond INF2 : Infiltration Basin #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (sf)	CN	Description
21,168	61	>75% Grass cover, Good, HSG B
8,382	98	Paved parking, HSG B
1,261	98	Roofs, HSG B
30,811		Weighted Average
21,168	61	68.70% Pervious Area
9,643	98	31.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	25	0.0400	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.94"
0.5	40	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	178	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.8	243	Total			

Attachment "E"

Summary for Subcatchment 3S: To CB-2

Runoff = 1.51 cfs @ 12.08 hrs, Volume= 0.120 af, Depth= 2.32"
Routed to Pond CB2 : Catch Basin #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
0.369	61	>75% Grass cover, Good, HSG B
0.251	98	Paved parking, HSG B
0.620		Weighted Average
0.369	61	59.55% Pervious Area
0.251	98	40.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	25	0.0200	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.94"
0.5	39	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	314	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.2	378	Total			

Summary for Subcatchment 4S: To Infiltration Basin #3

Runoff = 0.73 cfs @ 12.08 hrs, Volume= 0.058 af, Depth= 1.39"
Routed to Pond INF3 : Infiltration Basin #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
0.446	61	>75% Grass cover, Good, HSG B
0.056	98	Paved parking, HSG B
0.502		Weighted Average
0.446	61	88.87% Pervious Area
0.056	98	11.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	25	0.0400	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.94"
2.5	211	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.1	236	Total			

Summary for Subcatchment 5S: to CB-1

[49] Hint: Tc<2dt may require smaller dt

```
Runoff      =          0.65 cfs @   12.02 hrs,  Volume=           0.044 af,  Depth=  2.44"
    Routed to Pond CB1 : Catch Basin #1
```

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
0.121	61	>75% Grass cover, Good, HSG B
0.096	98	Paved parking, HSG B
0.217		Weighted Average
0.121	61	55.77% Pervious Area
0.096	98	44.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0400	1.32		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.94"
0.7	159	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	184	Total			

Summary for Subcatchment 100S: Overland Flow to Wetland

```
Runoff      =          1.35 cfs @   12.43 hrs,  Volume=           0.190 af,  Depth=  0.98"
    Routed to Link DP#1 : Design Point #1 - Wetland
```

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
1.784	61	>75% Grass cover, Good, HSG B
0.000	98	Paved parking, HSG B
0.010	98	Roofs, HSG B
0.540	55	Woods, Good, HSG B
2.333		Weighted Average
2.323	60	99.56% Pervious Area
0.010	98	0.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	25	0.0150	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.94"
22.4	841	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.2	866	Total			

Summary for Subcatchment R1: Roof #1

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.16 cfs @ 12.00 hrs, Volume= 0.011 af, Depth= 4.19"
Routed to Pond UG-INF : Roof Infiltration

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
0.030	98	Roofs, HSG B
0.030	98	100.00% Impervious Area

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

Summary for Subcatchment R10: Roof #10

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.16 cfs @ 12.00 hrs, Volume= 0.011 af, Depth= 4.19"
Routed to Pond UG-INF : Roof Infiltration

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
0.030	98	Roofs, HSG B
0.030	98	100.00% Impervious Area

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

Summary for Subcatchment R2: Roof #2

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.16 cfs @ 12.00 hrs, Volume= 0.011 af, Depth= 4.19"
Routed to Pond UG-INF : Roof Infiltration

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
0.030	98	Roofs, HSG B
0.030	98	100.00% Impervious Area

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

Summary for Subcatchment R3: Roof #3

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.16 cfs @ 12.00 hrs, Volume= 0.011 af, Depth= 4.19"
Routed to Pond UG-INF : Roof Infiltration

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
0.030	98	Roofs, HSG B
0.030	98	100.00% Impervious Area

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

Summary for Subcatchment R4: Roof #4

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.16 cfs @ 12.00 hrs, Volume= 0.011 af, Depth= 4.19"
Routed to Pond UG-INF : Roof Infiltration

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
0.030	98	Roofs, HSG B
0.030	98	100.00% Impervious Area

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

Summary for Subcatchment R5: Roof #5

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.16 cfs @ 12.00 hrs, Volume= 0.011 af, Depth= 4.19"
Routed to Pond UG-INF : Roof Infiltration

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
0.030	98	Roofs, HSG B
0.030	98	100.00% Impervious Area

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

Summary for Subcatchment R6: Roof #6

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.16 cfs @ 12.00 hrs, Volume= 0.011 af, Depth= 4.19"
Routed to Pond UG-INF : Roof Infiltration

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
0.030	98	Roofs, HSG B
0.030	98	100.00% Impervious Area

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

Summary for Subcatchment R7: Roof #7

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.16 cfs @ 12.00 hrs, Volume= 0.011 af, Depth= 4.19"
Routed to Pond UG-INF : Roof Infiltration

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
0.030	98	Roofs, HSG B
0.030	98	100.00% Impervious Area

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

Summary for Subcatchment R8: Roof #8

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.16 cfs @ 12.00 hrs, Volume= 0.011 af, Depth= 4.19"
Routed to Pond UG-INF : Roof Infiltration

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
0.030	98	Roofs, HSG B
0.030	98	100.00% Impervious Area

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

Summary for Subcatchment R9: Roof #9

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.16 cfs @ 12.00 hrs, Volume= 0.011 af, Depth= 4.19"
Routed to Pond UG-INF : Roof Infiltration

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.43"

Area (ac)	CN	Description
0.030	98	Roofs, HSG B
0.030	98	100.00% Impervious Area

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

Summary for Pond CB1: Catch Basin #1

Inflow Area = 0.217 ac, 44.23% Impervious, Inflow Depth = 2.44" for 10-Year event
Inflow = 0.65 cfs @ 12.02 hrs, Volume= 0.044 af
Outflow = 0.65 cfs @ 12.02 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min
Primary = 0.65 cfs @ 12.02 hrs, Volume= 0.044 af
Routed to Pond CB2 : Catch Basin #2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 114.80' @ 12.07 hrs
Flood Elev= 116.49'

Device	Routing	Invert	Outlet Devices
#1	Primary	114.00'	**12.0" Round Culvert** L= 22.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 114.00' / 113.90' S= 0.0045 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.42 cfs @ 12.02 hrs HW=114.70' TW=114.66' (Dynamic Tailwater)
↳**1=Culvert** (Outlet Controls 0.42 cfs @ 1.02 fps)

Summary for Pond CB2: Catch Basin #2

Inflow Area = 0.837 ac, 41.43% Impervious, Inflow Depth = 2.35" for 10-Year event
Inflow = 1.98 cfs @ 12.06 hrs, Volume= 0.164 af
Outflow = 1.98 cfs @ 12.06 hrs, Volume= 0.164 af, Atten= 0%, Lag= 0.0 min
Primary = 1.98 cfs @ 12.06 hrs, Volume= 0.164 af
Routed to Pond DMH4 : DMH-4 (PS)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 114.77' @ 12.07 hrs
Flood Elev= 116.49'

Device	Routing	Invert	Outlet Devices
#1	Primary	113.80'	**12.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 113.80' / 113.65' S= 0.0060 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.96 cfs @ 12.06 hrs HW=114.77' TW=114.44' (Dynamic Tailwater)
↳**1=Culvert** (Outlet Controls 1.96 cfs @ 3.22 fps)

Summary for Pond DMH1: DMH-1

Inflow Area = 1.055 ac, 32.72% Impervious, Inflow Depth = 0.11" for 10-Year event
Inflow = 0.24 cfs @ 12.42 hrs, Volume= 0.010 af
Outflow = 0.24 cfs @ 12.42 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 12.42 hrs, Volume= 0.010 af
Routed to Pond DMH2 : DMH-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 115.73' @ 12.42 hrs
Flood Elev= 117.62'

Device	Routing	Invert	Outlet Devices
#1	Primary	115.45'	**12.0" Round Culvert** L= 84.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.45' / 115.10' S= 0.0042 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.24 cfs @ 12.42 hrs HW=115.73' TW=115.28' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 0.24 cfs @ 1.96 fps)

Summary for Pond DMH2: DMH-2

Inflow Area = 1.055 ac, 32.72% Impervious, Inflow Depth = 0.11" for 10-Year event
Inflow = 0.24 cfs @ 12.42 hrs, Volume= 0.010 af
Outflow = 0.24 cfs @ 12.42 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 12.42 hrs, Volume= 0.010 af
Routed to Pond DMH3 : DMH-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 115.28' @ 12.42 hrs
Flood Elev= 118.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	115.00'	**12.0" Round Culvert** L= 235.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.00' / 113.97' S= 0.0044 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.24 cfs @ 12.42 hrs HW=115.28' TW=114.15' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 0.24 cfs @ 2.02 fps)

Summary for Pond DMH3: DMH-3

Inflow Area = 1.055 ac, 32.72% Impervious, Inflow Depth = 0.11" for 10-Year event
Inflow = 0.24 cfs @ 12.42 hrs, Volume= 0.010 af
Outflow = 0.24 cfs @ 12.42 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 12.42 hrs, Volume= 0.010 af
Routed to Link DP#1 : Design Point #1 - Wetland

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 114.15' @ 12.42 hrs
Flood Elev= 118.18'

Device	Routing	Invert	Outlet Devices
#1	Primary	113.87'	**12.0" Round Culvert** L= 266.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 113.87' / 112.70' S= 0.0044 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.24 cfs @ 12.42 hrs HW=114.15' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.24 cfs @ 2.02 fps)

Summary for Pond DMH4: DMH-4 (PS)

Inflow Area = 0.837 ac, 41.43% Impervious, Inflow Depth = 2.35" for 10-Year event
Inflow = 1.98 cfs @ 12.06 hrs, Volume= 0.164 af
Outflow = 1.98 cfs @ 12.06 hrs, Volume= 0.164 af, Atten= 0%, Lag= 0.0 min
Primary = 1.98 cfs @ 12.06 hrs, Volume= 0.164 af
Routed to Pond INF3 : Infiltration Basin #3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 114.44' @ 12.06 hrs
Flood Elev= 116.55'

Device	Routing	Invert	Outlet Devices
#1	Primary	113.55'	**12.0" Round Culvert** L= 113.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 113.55' / 113.00' S= 0.0049 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.98 cfs @ 12.06 hrs HW=114.44' TW=113.63' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.98 cfs @ 3.54 fps)

Summary for Pond INF1: Infiltration Basin #1

The Site Specific Soil Survey identifies soils as Deerfield. Ksat low B = 6in/hr, which after applying a factor of safety of 2 yields a design rate of 3 in/hr.

Inflow Area = 0.348 ac, 35.60% Impervious, Inflow Depth = 2.16" for 10-Year event
Inflow = 0.83 cfs @ 12.06 hrs, Volume= 0.063 af
Outflow = 0.12 cfs @ 12.56 hrs, Volume= 0.063 af, Atten= 85%, Lag= 29.9 min
Discarded = 0.12 cfs @ 12.56 hrs, Volume= 0.063 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond DMH1 : DMH-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 116.56' @ 12.56 hrs Surf.Area= 1,047 sf Storage= 853 cf
Flood Elev= 117.25' Surf.Area= 1,338 sf Storage= 1,669 cf

Plug-Flow detention time= 57.8 min calculated for 0.063 af (100% of inflow)
Center-of-Mass det. time= 57.8 min (846.4 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1	115.50'	1,669 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)
115.50	480	81.0	0	0	480
116.00	832	123.0	324	324	1,164
117.00	1,230	142.0	1,025	1,349	1,586
117.25	1,338	147.0	321	1,669	1,706

Device	Routing	Invert	Outlet Devices
#1	Discarded	115.50'	**3.000 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 112.50' Phase-In= 0.01'
#2	Device 3	116.75'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	115.70'	**6.0" Round Culvert** L= 27.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.70' / 115.55' S= 0.0056 '/' Cc= 0.900 n= 0.013 Cast iron, coated, Flow Area= 0.20 sf

Discarded OutFlow Max=0.12 cfs @ 12.56 hrs HW=116.56' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=115.50' TW=115.45' (Dynamic Tailwater)
↑—**3=Culvert** (Controls 0.00 cfs)
  ↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond INF2: Infiltration Basin #2

The Site Specific Soil Survey identifies soils as Deerfield. Ksat low B = 6in/hr, which after applying a factor of safety of 2 yields a design rate of 3 in/hr.

```
Inflow Area =        0.707 ac, 31.30% Impervious, Inflow Depth =  2.03"   for 10-Year event
Inflow      =        1.58 cfs @  12.06 hrs, Volume=          0.120 af
Outflow     =        0.44 cfs @  12.42 hrs, Volume=          0.120 af, Atten= 72%, Lag= 21.5 min
Discarded   =        0.20 cfs @  12.42 hrs, Volume=          0.109 af
Primary     =        0.24 cfs @  12.42 hrs, Volume=          0.010 af
   Routed to Pond DMH1 : DMH-1
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 116.63' @ 12.42 hrs Surf.Area= 2,398 sf Storage= 1,341 cf
Flood Elev= 117.25' Surf.Area= 2,959 sf Storage= 3,004 cf

Plug-Flow detention time= 41.4 min calculated for 0.120 af (100% of inflow)
Center-of-Mass det. time= 41.4 min (835.8 - 794.4)

Volume	Invert	Avail.Storage	Storage Description
#1	116.00'	3,004 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)
116.00	1,877	277.0	0	0	1,877
117.00	2,735	296.0	2,293	2,293	2,790
117.25	2,959	300.0	712	3,004	2,993

Device	Routing	Invert	Outlet Devices
#1	Discarded	116.00'	**3.000 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 113.00' Phase-In= 0.01'
#2	Device 3	116.50'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	115.80'	**6.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.80' / 115.55' S= 0.0081 '/' Cc= 0.900 n= 0.013 Cast iron, coated, Flow Area= 0.20 sf

Discarded OutFlow Max=0.20 cfs @ 12.42 hrs HW=116.63' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.20 cfs)

Primary OutFlow Max=0.24 cfs @ 12.42 hrs HW=116.63' TW=115.73' (Dynamic Tailwater)
↑—**3=Culvert** (Passes 0.24 cfs of 0.60 cfs potential flow)
  ↑—**2=Orifice/Grate** (Weir Controls 0.24 cfs @ 1.17 fps)

Summary for Pond INF3: Infiltration Basin #3

The Site Specific Soil Survey identifies soils as Deerfield. Ksat low B = 6in/hr, which after applying a factor of safety of 2 yields a design rate of 3 in/hr.

Inflow Area = 1.339 ac, 30.07% Impervious, Inflow Depth = 1.99" for 10-Year event
Inflow = 2.69 cfs @ 12.07 hrs, Volume= 0.222 af
Outflow = 0.35 cfs @ 12.78 hrs, Volume= 0.222 af, Atten= 87%, Lag= 42.9 min
Discarded = 0.26 cfs @ 12.78 hrs, Volume= 0.216 af
Primary = 0.09 cfs @ 12.78 hrs, Volume= 0.006 af
 Routed to Link DP#1 : Design Point #1 - Wetland

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 114.32' @ 12.78 hrs Surf.Area= 2,979 sf Storage= 3,336 cf
Flood Elev= 115.00' Surf.Area= 3,475 sf Storage= 5,538 cf

Plug-Flow detention time= 115.8 min calculated for 0.222 af (100% of inflow)
Center-of-Mass det. time= 115.8 min (912.4 - 796.7)

Volume	Invert	Avail.Storage	Storage Description
#1	113.00'	5,538 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)
113.00	2,106	220.0	0	0	2,106
114.00	2,762	228.0	2,427	2,427	2,469
115.00	3,475	247.0	3,112	5,538	3,225

Device	Routing	Invert	Outlet Devices
#1	Discarded	113.00'	**3.000 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 110.00' Phase-In= 0.01'
#2	Device 3	114.25'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	113.36'	**6.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 113.36' / 113.23' S= 0.0100 '/' Cc= 0.900

Attachment "E"

```
                                n= 0.012  Corrugated PP, smooth interior,  Flow Area= 0.20 sf
  #4     Primary        114.50'  10.0' long  + 3.0 '/' SideZ  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=0.26 cfs @ 12.78 hrs  HW=114.32'   (Free Discharge)
└─1=Exfiltration  ( Controls 0.26 cfs)

Primary OutFlow  Max=0.09 cfs @ 12.78 hrs  HW=114.32'  TW=0.00'   (Dynamic Tailwater)
├─3=Culvert  (Passes 0.09 cfs of 0.78 cfs potential flow)
│ └─2=Orifice/Grate  (Weir Controls 0.09 cfs @ 0.85 fps)
└─4=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
```

Summary for Pond UG-INF: Roof Infiltration

The Site Specific Soil Survey identifies soils as Deerfield. Ksat low B = 6in/hr, which after applying a factor of safety of 2 yields a design rate of 3 in/hr.

```
Inflow Area =        0.303 ac,100.00% Impervious,  Inflow Depth =   4.19"    for  10-Year event
Inflow      =       1.60 cfs @   12.00 hrs,  Volume=          0.106 af
Outflow     =       0.22 cfs @   12.45 hrs,  Volume=          0.106 af,  Atten= 86%,  Lag= 27.0 min
Discarded   =       0.22 cfs @   12.45 hrs,  Volume=          0.106 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 1.16' @ 12.45 hrs   Surf.Area= 2,006 sf   Storage= 1,302 cf
Flood Elev= 2.33'   Surf.Area= 2,006 sf   Storage= 2,400 cf

Plug-Flow detention time= 37.2 min calculated for 0.106 af (100% of inflow)
Center-of-Mass det. time= 37.2 min ( 781.7 - 744.5 )

Volume     Invert    Avail.Storage   Storage Description
  #1A       0.00'         152 cf     8.17'W x 24.56'L x 2.33'H Field A
                                     468 cf Overall - 88 cf Embedded = 380 cf  x 40.0% Voids
  #2A       0.50'          88 cf     ADS_StormTech SC-310 +Cap  x 6  Inside #1
                                     Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
                                     Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap
                                     6 Chambers in 2 Rows
                              240 cf  x  10.00  =  2,403 cf  Total Available Storage

   Storage Group A created with Chamber Wizard

Device   Routing         Invert   Outlet Devices
  #1     Discarded        0.00'   3.000 in/hr Exfiltration over Surface area
                                  Conductivity to Groundwater Elevation = -2.00'     Phase-In= 0.01'

Discarded OutFlow  Max=0.22 cfs @ 12.45 hrs  HW=1.16'   (Free Discharge)
└─1=Exfiltration  ( Controls 0.22 cfs)
```

Attachment "E"

Summary for Link DP#1: Design Point #1 - Wetland

```
Inflow Area =        4.728 ac,  16.04% Impervious,  Inflow Depth =   0.52"    for  10-Year event
Inflow      =        1.59 cfs @   12.43 hrs,  Volume=           0.206 af
Primary     =        1.59 cfs @   12.43 hrs,  Volume=           0.206 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
```

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
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 1S: To Infiltration Basin #1  Runoff Area=15,161 sf   35.60% Impervious   Runoff Depth=3.02"
                          Flow Length=227'  Slope=0.0400 '/'  Tc=3.7 min  CN=WQ  Runoff=1.20 cfs  0.088 af

Subcatchment 2S: To Infiltration Basin #2  Runoff Area=30,811 sf   31.30% Impervious   Runoff Depth=2.87"
                          Flow Length=243'  Slope=0.0400 '/'  Tc=3.8 min  CN=WQ  Runoff=2.31 cfs  0.169 af

Subcatchment 3S: To CB-2                    Runoff Area=0.620 ac   40.45% Impervious   Runoff Depth=3.20"
                                      Flow Length=378'  Tc=5.2 min  CN=WQ  Runoff=2.13 cfs  0.165 af

Subcatchment 4S: To Infiltration Basin #3   Runoff Area=0.502 ac   11.13% Impervious   Runoff Depth=2.14"
                          Flow Length=236'  Slope=0.0400 '/'  Tc=5.1 min  CN=WQ  Runoff=1.19 cfs  0.090 af

Subcatchment 5S: to CB-1                    Runoff Area=0.217 ac   44.23% Impervious   Runoff Depth=3.34"
                          Flow Length=184'  Slope=0.0400 '/'  Tc=1.0 min  CN=WQ  Runoff=0.90 cfs  0.060 af

Subcatchment 100S: Overland Flow to          Runoff Area=2.333 ac   0.44% Impervious   Runoff Depth=1.65"
                                     Flow Length=866'  Tc=26.2 min  CN=WQ  Runoff=2.49 cfs  0.321 af

Subcatchment R1: Roof #1                   Runoff Area=0.030 ac  100.00% Impervious   Runoff Depth=5.35"
                                                  Tc=0.0 min  CN=98  Runoff=0.20 cfs  0.013 af

Subcatchment R10: Roof #10                 Runoff Area=0.030 ac  100.00% Impervious   Runoff Depth=5.35"
                                                  Tc=0.0 min  CN=98  Runoff=0.20 cfs  0.013 af

Subcatchment R2: Roof #2                   Runoff Area=0.030 ac  100.00% Impervious   Runoff Depth=5.35"
                                                  Tc=0.0 min  CN=98  Runoff=0.20 cfs  0.013 af

Subcatchment R3: Roof #3                   Runoff Area=0.030 ac  100.00% Impervious   Runoff Depth=5.35"
                                                  Tc=0.0 min  CN=98  Runoff=0.20 cfs  0.013 af

Subcatchment R4: Roof #4                   Runoff Area=0.030 ac  100.00% Impervious   Runoff Depth=5.35"
                                                  Tc=0.0 min  CN=98  Runoff=0.20 cfs  0.013 af

Subcatchment R5: Roof #5                   Runoff Area=0.030 ac  100.00% Impervious   Runoff Depth=5.35"
                                                  Tc=0.0 min  CN=98  Runoff=0.20 cfs  0.013 af

Subcatchment R6: Roof #6                   Runoff Area=0.030 ac  100.00% Impervious   Runoff Depth=5.35"
                                                  Tc=0.0 min  CN=98  Runoff=0.20 cfs  0.013 af

Subcatchment R7: Roof #7                   Runoff Area=0.030 ac  100.00% Impervious   Runoff Depth=5.35"
                                                  Tc=0.0 min  CN=98  Runoff=0.20 cfs  0.013 af

Subcatchment R8: Roof #8                   Runoff Area=0.030 ac  100.00% Impervious   Runoff Depth=5.35"
                                                  Tc=0.0 min  CN=98  Runoff=0.20 cfs  0.013 af

Subcatchment R9: Roof #9                   Runoff Area=0.030 ac  100.00% Impervious   Runoff Depth=5.35"
                                                  Tc=0.0 min  CN=98  Runoff=0.20 cfs  0.013 af
```

Attachment "E"

Pond CB1: Catch Basin #1 Peak Elev=115.34' Inflow=0.90 cfs 0.060 af
12.0" Round Culvert n=0.012 L=22.0' S=0.0045 '/' Outflow=0.90 cfs 0.060 af

Pond CB2: Catch Basin #2 Peak Elev=115.32' Inflow=2.79 cfs 0.226 af
12.0" Round Culvert n=0.012 L=25.0' S=0.0060 '/' Outflow=2.79 cfs 0.226 af

Pond DMH1: DMH-1 Peak Elev=115.96' Inflow=0.72 cfs 0.040 af
12.0" Round Culvert n=0.012 L=84.0' S=0.0042 '/' Outflow=0.72 cfs 0.040 af

Pond DMH2: DMH-2 Peak Elev=115.49' Inflow=0.72 cfs 0.040 af
12.0" Round Culvert n=0.012 L=235.0' S=0.0044 '/' Outflow=0.72 cfs 0.040 af

Pond DMH3: DMH-3 Peak Elev=114.36' Inflow=0.72 cfs 0.040 af
12.0" Round Culvert n=0.012 L=266.0' S=0.0044 '/' Outflow=0.72 cfs 0.040 af

Pond DMH4: DMH-4 (PS) Peak Elev=114.82' Inflow=2.79 cfs 0.226 af
12.0" Round Culvert n=0.012 L=113.0' S=0.0049 '/' Outflow=2.79 cfs 0.226 af

Pond INF1: Infiltration Basin #1 Peak Elev=116.86' Storage=1,184 cf Inflow=1.20 cfs 0.088 af
Discarded=0.14 cfs 0.082 af Primary=0.19 cfs 0.006 af Outflow=0.33 cfs 0.088 af

Pond INF2: Infiltration Basin #2 Peak Elev=116.81' Storage=1,796 cf Inflow=2.31 cfs 0.169 af
Discarded=0.22 cfs 0.135 af Primary=0.53 cfs 0.034 af Outflow=0.75 cfs 0.169 af

Pond INF3: Infiltration Basin #3 Peak Elev=114.58' Storage=4,152 cf Inflow=3.96 cfs 0.315 af
Discarded=0.29 cfs 0.256 af Primary=1.12 cfs 0.059 af Outflow=1.40 cfs 0.315 af

Pond UG-INF: Roof Infiltration Peak Elev=1.59' Storage=1,793 cf Inflow=2.02 cfs 0.135 af
Outflow=0.25 cfs 0.135 af

Link DP#1: Design Point #1 - Wetland Inflow=4.31 cfs 0.420 af
Primary=4.31 cfs 0.420 af

Total Runoff Area = 5.030 ac Runoff Volume = 1.027 af Average Runoff Depth = 2.45"
78.91% Pervious = 3.970 ac 21.09% Impervious = 1.061 ac

```
                         Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
                          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 1S: To Infiltration Basin #1   Runoff Area=15,161 sf   35.60% Impervious   Runoff Depth=3.89"
                  Flow Length=227'   Slope=0.0400 '/'   Tc=3.7 min   CN=WQ   Runoff=1.56 cfs  0.113 af

Subcatchment 2S: To Infiltration Basin #2   Runoff Area=30,811 sf   31.30% Impervious   Runoff Depth=3.72"
                  Flow Length=243'   Slope=0.0400 '/'   Tc=3.8 min   CN=WQ   Runoff=3.04 cfs  0.219 af

Subcatchment 3S: To CB-2                     Runoff Area=0.620 ac   40.45% Impervious   Runoff Depth=4.08"
                                       Flow Length=378'   Tc=5.2 min   CN=WQ   Runoff=2.75 cfs  0.211 af

Subcatchment 4S: To Infiltration Basin #3    Runoff Area=0.502 ac   11.13% Impervious   Runoff Depth=2.92"
                  Flow Length=236'   Slope=0.0400 '/'   Tc=5.1 min   CN=WQ   Runoff=1.67 cfs  0.122 af

Subcatchment 5S: to CB-1                     Runoff Area=0.217 ac   44.23% Impervious   Runoff Depth=4.23"
                  Flow Length=184'   Slope=0.0400 '/'   Tc=1.0 min   CN=WQ   Runoff=1.15 cfs  0.077 af

Subcatchment 100S: Overland Flow to           Runoff Area=2.333 ac   0.44% Impervious   Runoff Depth=2.36"
                                      Flow Length=866'   Tc=26.2 min   CN=WQ   Runoff=3.71 cfs  0.460 af

Subcatchment R1: Roof #1                    Runoff Area=0.030 ac   100.00% Impervious   Runoff Depth=6.44"
                                                     Tc=0.0 min   CN=98   Runoff=0.24 cfs  0.016 af

Subcatchment R10: Roof #10                  Runoff Area=0.030 ac   100.00% Impervious   Runoff Depth=6.44"
                                                     Tc=0.0 min   CN=98   Runoff=0.24 cfs  0.016 af

Subcatchment R2: Roof #2                    Runoff Area=0.030 ac   100.00% Impervious   Runoff Depth=6.44"
                                                     Tc=0.0 min   CN=98   Runoff=0.24 cfs  0.016 af

Subcatchment R3: Roof #3                    Runoff Area=0.030 ac   100.00% Impervious   Runoff Depth=6.44"
                                                     Tc=0.0 min   CN=98   Runoff=0.24 cfs  0.016 af

Subcatchment R4: Roof #4                    Runoff Area=0.030 ac   100.00% Impervious   Runoff Depth=6.44"
                                                     Tc=0.0 min   CN=98   Runoff=0.24 cfs  0.016 af

Subcatchment R5: Roof #5                    Runoff Area=0.030 ac   100.00% Impervious   Runoff Depth=6.44"
                                                     Tc=0.0 min   CN=98   Runoff=0.24 cfs  0.016 af

Subcatchment R6: Roof #6                    Runoff Area=0.030 ac   100.00% Impervious   Runoff Depth=6.44"
                                                     Tc=0.0 min   CN=98   Runoff=0.24 cfs  0.016 af

Subcatchment R7: Roof #7                    Runoff Area=0.030 ac   100.00% Impervious   Runoff Depth=6.44"
                                                     Tc=0.0 min   CN=98   Runoff=0.24 cfs  0.016 af

Subcatchment R8: Roof #8                    Runoff Area=0.030 ac   100.00% Impervious   Runoff Depth=6.44"
                                                     Tc=0.0 min   CN=98   Runoff=0.24 cfs  0.016 af

Subcatchment R9: Roof #9                    Runoff Area=0.030 ac   100.00% Impervious   Runoff Depth=6.44"
                                                     Tc=0.0 min   CN=98   Runoff=0.24 cfs  0.016 af
```

Attachment "E"

Pond CB1: Catch Basin #1 Peak Elev=116.72' Inflow=1.15 cfs 0.077 af
12.0" Round Culvert n=0.012 L=22.0' S=0.0045 '/' Outflow=1.15 cfs 0.077 af

Pond CB2: Catch Basin #2 Peak Elev=116.68' Inflow=3.59 cfs 0.287 af
12.0" Round Culvert n=0.012 L=25.0' S=0.0060 '/' Outflow=3.59 cfs 0.287 af

Pond DMH1: DMH-1 Peak Elev=116.13' Inflow=1.15 cfs 0.081 af
12.0" Round Culvert n=0.012 L=84.0' S=0.0042 '/' Outflow=1.15 cfs 0.081 af

Pond DMH2: DMH-2 Peak Elev=115.65' Inflow=1.15 cfs 0.081 af
12.0" Round Culvert n=0.012 L=235.0' S=0.0044 '/' Outflow=1.15 cfs 0.081 af

Pond DMH3: DMH-3 Peak Elev=114.51' Inflow=1.15 cfs 0.081 af
12.0" Round Culvert n=0.012 L=266.0' S=0.0044 '/' Outflow=1.15 cfs 0.081 af

Pond DMH4: DMH-4 (PS) Peak Elev=115.82' Inflow=3.59 cfs 0.287 af
12.0" Round Culvert n=0.012 L=113.0' S=0.0049 '/' Outflow=3.59 cfs 0.287 af

Pond INF1: Infiltration Basin #1 Peak Elev=116.98' Storage=1,328 cf Inflow=1.56 cfs 0.113 af
Discarded=0.15 cfs 0.094 af Primary=0.46 cfs 0.019 af Outflow=0.60 cfs 0.113 af

Pond INF2: Infiltration Basin #2 Peak Elev=117.05' Storage=2,434 cf Inflow=3.04 cfs 0.219 af
Discarded=0.25 cfs 0.157 af Primary=0.70 cfs 0.062 af Outflow=0.95 cfs 0.219 af

Pond INF3: Infiltration Basin #3 Peak Elev=114.69' Storage=4,512 cf Inflow=5.24 cfs 0.409 af
Discarded=0.30 cfs 0.286 af Primary=2.76 cfs 0.123 af Outflow=3.07 cfs 0.409 af

Pond UG-INF: Roof Infiltration Peak Elev=2.15' Storage=2,260 cf Inflow=2.42 cfs 0.162 af
Outflow=0.29 cfs 0.162 af

Link DP#1: Design Point #1 - Wetland Inflow=6.78 cfs 0.663 af
Primary=6.78 cfs 0.663 af

Total Runoff Area = 5.030 ac Runoff Volume = 1.363 af Average Runoff Depth = 3.25"
78.91% Pervious = 3.970 ac 21.09% Impervious = 1.061 ac

Attachment "E"

SECTION 9

SITE SPECIFIC SOIL REPORT BY GOVE ENVIRONMENTAL SERVICES, INC.

Attachment "E"

GOVE ENVIRONMENTAL SERVICES, INC

SITE-SPECIFIC SOIL SURVEY REPORT
For
36 Campbello Street, Hudson, NH
By
GES, Inc.
Project # 2023106
Date: 10-03-2023

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 purpose product, intended for infiltration requirements by the NH DES Alteration of Terrain Bureau. The soil map was produced by a professional soil scientist and is not a product of the USDA Natural Resources Conservation Service. This report accompanies the soil map.

The site-specific soil map (SSSM) was produced 10-03-2023; prepared by JP Gove, CSS #004, GES, Inc.

Soils were identified with the New Hampshire State-wide Numerical Soils Legend, USDA NRCS, Durham, NH. Issue # 10, January 2011.

Hydrologic Soil Group was determined using SSSNNE Special Publication No. 5, Ksat Values for New Hampshire Soils, September 2009.

High Intensity Soil Map symbols, based upon SSSNNE Special Publication 1, December 2017, were added to the Soil Legend.

Scale of soil map: Approximately 1” = 40’.

Contours Interval: 1 feet

2. LANDFORMS & EXISTING CONDITIONS:

The site is located on a broad flat outwash plain. At one time, it might have been a flood plain to the river. It was originally mapped by the NRCS as Occum high bottom, which is a well drained sandy soil that rarely (if ever) floods. What was found on site is a moderately well drained soil that matches the soil range in characteristics of Deerfield loamy sand. The site is a mowed field. The slope to the river is rip-rap. The Merrimack River is at the base of the slope. A single residence is currently on the site.

3. DATE SOIL MAP PRODUCED

Date(s) of on-site field work: 10-03-2023

Date(s) of test pits: 09-28-2023

Test pits recorded by: GPI – Diane Pantermoller

4. GEOGRAPHIC LOCATION AND SIZE OF SITE

City or town where soil mapping was conducted: Hudson

Location: 36 Campbello Street, Map 165, Lot 49

Size of area: Approximately 5 acres

Was the map for the entire lot? Yes

If no, where was the mapping conducted on the parcel: n/a

5. 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? n/a

Who was the map prepared for? GPI

6. SOIL IDENTIFICATION LEGEND

Map Unit Symbol	Map Unit Name	HISS Symbol	Hydrologic Soil Group
313	Deerfield loamy sand	311	B
400/dbbbb	Udorthents, sandy	361	B
699	Urban land	n/a	impervious
W	Water		

d= moderately well drained, b = glacial sands, b = bouldery surface, b = moderate Ksat, b = hydrologic group B

SLOPE PHASE:

0-8%	B	8-15%	C	15-25%	D
25%+	E				

7. OFFICIAL SOIL SERIES DESCRIPTIONS & ONSITE MAP UNIT DESCRIPTIONS

DEERFIELD SERIES

The Deerfield series consists of very deep, moderately well drained soils formed in glaciofluvial deposits. They are nearly level to strongly sloping soils on terraces, deltas, and outwash plains. Slope ranges from 0 to 15 percent. Saturated hydraulic conductivity is high or very high. Mean annual temperature is about 9 degrees C. and mean annual precipitation is about 1194 mm.

TAXONOMIC CLASS: Mixed, mesic Aquic Udipsamments

RANGE IN CHARACTERISTICS: Solum thickness ranges from 38 to 100 cm. Gravel, generally fine gravel, ranges from 0 to less than 15 percent in the solum and 0 to 20 percent in the substratum. Reaction ranges from extremely acid through slightly acid unless limed. Iron depletions with chroma of two or less are between depths of 38 and 100 cm from the mineral soil surface.

The O horizon, where present, has a hue of 5YR to 10YR, value of 2 to 3, and chroma of 1 to 3. It is slightly to highly decomposed plant material.

The Ap horizon has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 1 to 3. It is fine sandy loam, sandy loam, loamy fine sand, loamy sand, fine sand, or sand. Undisturbed pedons commonly have an O horizon and a thin sequence of A, E, and Bs, Bhs or Bh horizons. They may also have an AB or AE horizon. The Ap or A horizon has weak or moderate very fine to medium granular structure and is friable or very friable.

The Bw horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 6. Texture of the upper part of the Bw horizon, within a depth of 25 cm from the soil surface, has the same range as the A horizon. Below 25 cm the texture is loamy fine sand, loamy sand, fine sand, sand or coarse sand. Structure is weak, very fine to medium granular or subangular blocky, or is single grain. Moist consistence is friable, very friable, or loose.

The BC horizon has hue of 7.5YR to 2.5Y, value of 3 to 6, and chroma of 2 to 4. Texture range is the same as the lower part of the Bw horizon. Structure is weak, very fine to medium subangular blocky, or is single grain. Moist consistence is friable, very friable, or loose.

The C horizon has hue of 7.5YR to 5Y, value of 4 to 6, and chroma of 1 to 4. Texture is loamy fine sand, loamy sand, fine sand, sand or coarse sand. Stratified textures of these textures and gravel, coarse sand, or loamy coarse sand are present in some pedons. It is single grain or massive. Moist consistence is friable, very friable or loose.

GEOGRAPHIC SETTING: Deerfield soils are level to strongly sloping soils on outwash terraces, outwash deltas, and outwash plains. Slope gradients are commonly 0 to 3 percent, but range to 15 percent. The soils formed in thick deposits of sand derived mainly from granite, gneiss and quartzite, but in places containing materials from schist and sandstone. The sand is poorly graded; medium sand is generally dominant and typically contains little or no gravel. The mean annual precipitation typically ranges from 965 to 1397 mm but the range includes as low as 660 mm in some places east of Adirondack Mountains in the Champlain Valley of New York. The mean annual temperature ranges from 7 to 11 degrees C. The frost-free period ranges from 120 to 200 days

ONSITE:

313 Deerfield loamy sand is sandy throughout, and friable throughout. Test pit logs place the estimated seasonal high water table at 36 inches, which is moderately well drained. The flat field is uniformly Deerfield loamy sand. Inclusions would be Windsor loamy sand, where the seasonal high water table is greater than 40 inches. Inclusions would be 5%.

400E/dbbbb Udorthents, sandy is the very steep rip-rap slope to the river. Below the rip-rap would be sandy soils.

699 Urban land is the house and paving around the house.

W is the Merrimack River.

8. RESPONSIBLE SOIL SCIENTIST

Name: James Gove

Certified Soil Scientist Number: 004

9. OTHER DISTINGUISHING FEATURES OF SITE

Is the site in a natural condition? For the most part.

If no, what is the nature of the disturbance? House and rip-rap slopes.

SECTION 10

INFILTRATION FEASIBILITY REPORT AND TEST PIT LOGS

Attachment "E"

GPI Greenman-Pedersen, Inc.

Engineering | Design | Planning | Construction Inspection

INFILTRATION FEASIBILITY REPORT

SOUSA REALTY - CAMPBELLO STREET - HUDSON, NH

TABLE OF CONTENTS

Attachment "E"

1. Location of Practice

Three infiltration basins are proposed, two of which (Infiltration Basin #1 and Infiltration Basin #2) are located in the western portion of the property near the existing residential dwelling and the third (Infiltration Basin #3) is located along the eastern property boundary adjacent to the wetlands.

2. Existing Topography

The existing elevations within the area of the proposed Infiltration Basin #1 and Infiltration Basin #2 range from 116 to 117. The existing elevations within Infiltration Basin #3 range between 112.5 and 113.0.

3. Test Pit Locations

See Grading & Drainage Plan for locations of test pits.

4. Seasonal High Water Table and Bedrock Depths

Test pits were performed by Greenman-Pedersen, Inc. (GPI) on September 28, 2023. The five test pits encountered loamy sand and sand with depths to estimated seasonal high water table (ESHWT) of between 36 and 48 inches below ground. The pits were excavated to depths of up to 94 inches below ground and did not encounter refusal.

5. Profile Descriptions

See following pages for Test Pit Logs

6. Soil Type

Site-Specific Soil Mapping was performed by Gove Environmental Services, Inc on October 3, 2023. According to the Site-Specific Soil Map Report, on-site soils are identified as Deerfield loamy sand and Udorthents, sandy, both with an HSG classification of B.

7. Summary of Data Used to Determine Infiltration Rate

Based on Ksat values for New Hampshire soils, the Ksat low B for Deerfield soil is 6.0 in/hr. Applying a factor of safety of 2 yields a design rate 3.0 in/hr.

TEST PIT DATA

Client:	Sousa Realty
Project Address:	36 Campbello Street
Town, State:	Hudson, NH
Job Number:	NEX-2300191
Date:	September 28, 2023
Performed by:	Diane Pantermoller

Test Pit No.	**1**	SCS Soil:	Occum Fine Sandy Loam
ESHWT:	36”	Standing Water:	90”
Refusal:	>94”	Roots:	None

Depth	Horizon	Soil Texture	Color	Consistence	Layer Description (Gravel, Stones, Fill, etc)
0-15”	A	Loamy Sand	10yr 3/4	Friable	
15-25”	B	Loamy Sand	10yr 5/6	Friable	
25-94”	C	Loamy Sand	2.5y 6/3	Friable	

Test Pit No.	**2**	SCS Soil:	Occum Fine Sandy Loam
ESHWT:	36”	Standing Water:	60”
Refusal:	>84”	Roots:	None

Depth	Horizon	Soil Texture	Color	Consistence	Layer Description (Gravel, Stones, Fill, etc)
0-14”	A	Loamy Sand	10yr 3/2	Friable	
14-26”	B	Loamy Sand	10yr 5/6	Friable	
26-60”	C1	Loamy Sand	2.5y 6/3	Friable	
60-84”	C2	Sand	7.5yr 6/8	Loose	

Test Pit No.	**3**	SCS Soil:	Occum Fine Sandy Loam
ESHWT:	36”	Standing Water:	48”
Refusal:	>84”	Roots:	None

Depth	Horizon	Soil Texture	Color	Consistence	Layer Description (Gravel, Stones, Fill, etc)
0-14”	A	Loamy Sand	10yr 3/2	Friable	
14-28”	B	Loamy Sand	10yr 5/6	Friable	
28-84”	C	Fine Sand	2.5y 6/3	Friable	

Test Pit No.	**4**	SCS Soil:	Occum Fine Sandy Loam
ESHWT:	36”	Standing Water:	54”
Refusal:	>78”	Roots:	None

Depth	Horizon	Soil Texture	Color	Consistence	Layer Description (Gravel, Stones, Fill, etc)
0-12”	A	Loamy Sand	10yr 3/2	Friable	
12-24”	B	Loamy Sand	10yr 5/6	Friable	
24-78”	C	Loamy Sand	2.5y 6/3	Friable	

Test Pit No.	**5**	SCS Soil:	Occum Fine Sandy Loam
ESHWT:	48”	Standing Water:	None
Refusal:	>90”	Roots:	None

Depth	Horizon	Soil Texture	Color	Consistence	Layer Description (Gravel, Stones, Fill, etc)
0-18”	A	Loamy Sand	10yr 3/4	Friable	
18-40”	B	Loamy Sand	10yr 5/6	Friable	
40-90”	C	Loamy Sand	2.5y 6/3	Friable	

NOTES

SECTION 11

INSPECTION AND MAINTENANCE MANUAL FOR STORMWATER MANAGEMENT SYSTEMS

Attachment "E"

INSPECTION AND MAINTENANCE MANUAL FOR STORMWATER MANAGEMENT SYSTEMS

PROPOSED RESIDENTIAL SUBDIVISION
ASSESSOR'S MAP 165 LOT 49
CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

GPI
44 Stiles Road, Suite One
Salem, NH 03079
(603) 893-0720

Prepared For:

Sousa Realty & Development Corp.
46 Lowell Road
Hudson, NH 03051

November 20, 2023

(GPI Project No.: NEX-2300191)

Sousa Realty & Development Corp.
Inspection and Maintenance Manual (I&M)

Attachment "E"

Inspection & Maintenance Manual for Stormwater Management Systems

Sousa Realty & Development Corp., Hudson, NH

TABLE OF CONTENTS

SECTION 1 I & M DOCUMENTATION REQUIREMENTS

The developer shall be responsible for the inspection and maintenance of all stormwater management systems in accordance with this manual and the requirements of NHDES Env-Wq 1507.07 until such time that the roadway is accepted by the Town of Hudson. After that time, the Hudson Public Works Department will take over the responsibility for inspection and maintenance. All recordkeeping required by the I&M Manual shall be maintained by the responsible party.

Logs shall 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 cleanout of any sediments or debris, the location where the sediment and debris was disposed after removal will be indicated. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

All stormwater facilities associated with this development are identified on Figure 1 contained within Section 3 of this manual, and shall be inspected and maintained in accordance with the procedures outlined in Section 2, and results and observations listed individually on the log form included in Section 5.

SECTION 2 BMP SPECIFIC I & M PROCEDURES

Road Sweeping

Prior to the road being accepted by the Town, sweeping shall be done at a minimum of once in the early fall and then immediately following spring snowmelt to remove sand and other debris and when visual buildup of debris is apparent. Pavement surfaces shall be swept at other times such as in the fall after leaves have dropped to remove accumulated debris. Since contaminants typically accumulate within 12 inches of the curbline, street cleaning operations should concentrate in cleaning curb and gutter lines for maximum pollutant removal efficiency. Other areas shall also be swept periodically when visual buildup of debris is apparent.

Once the road is accepted by the Town, it shall be included as part of the Town’s road sweeping program.

Once removed from paved surfaces, the sweeping must be handled and disposed of properly. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

Deep Sump Hooded Catch Basins

Prior to the road being accepted by the Town, all catch basins shall be inspected and cleaned as required at least twice per year including at the end of the foliage and snow removal seasons. Sediment must be removed whenever the depth of deposits is greater than or equal to one half the depth from the bottom of sump to the invert of the lowest pipe in the basin. If the basin outlet is designed with a hood to trap floatable materials check to ensure watertight seal is working. Damaged hoods should be replaced when noted by inspection. At a minimum, remove floating debris and hydrocarbons at the time of the inspection.

Once the road is accepted by the Town, the catch basins will be inspected and cleaned in accordance with the Town’s maintenance plan.

Sediment and debris can be removed by a clamshell bucket; however, a vacuum truck is preferred. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

Rain Guardian Turrets

During the first year of operation the Rain Guardian unit shall be inspected after at least two large storm events (>1 inch) to ensure proper operation. Once the road is accepted by the Town, the Rain Guardian Turrets will be inspected and cleaned in accordance with the Town’s maintenance plan. Refer to the attached Rain Guardian maintenance procedures for additional information.

Above Ground Infiltration Basins

The above ground infiltration basins shall initially be inspected by the developer within the first three months after completion of the site’s construction and the basins becoming operational.

Inlet and outlet pipes, outlet structures, rip rap aprons or other practices should be inspected a annually and corrective action implemented (e.g. maintenance, repairs or replacement) as needed. Trash, debris and sediment should be removed from the basin and any inlet or outlet structures as needed. Sediment should be removed when it significantly affects basin capacity.

The bottoms, interior and exterior side slopes and crest of the basin should be mowed on an as needed basis to prevent establishment of woody vegetation. Embankments should be inspected annually for settlement, erosion, seepage, animal burrows, woody vegetation and other conditions that could degrade the embankment and reduce its stability for impounding water. Corrective action should be implemented if any such conditions are found.

Stone Aprons/Weirs/Spillways

Inspect at least once annually for damage and deterioration. Repair damages immediately.

Hydrodynamic Particle Separator (First Defense Unit)

Initial maintenance to be performed twice a year for the first year after the unit is online and operational. A vacuum truck must be used at a minimum of once per year for sediment removal. Refer to the attached First Defense Owner’s manual for operation and maintenance procedures and schedules thereafter.

Vegetated Areas

Inspect slopes and embankments early in the growing season to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows. During the summer months, all landscape features are to be maintained with the minimum possible amount of fertilizers, pesticides or herbicides.

Winter Maintenance

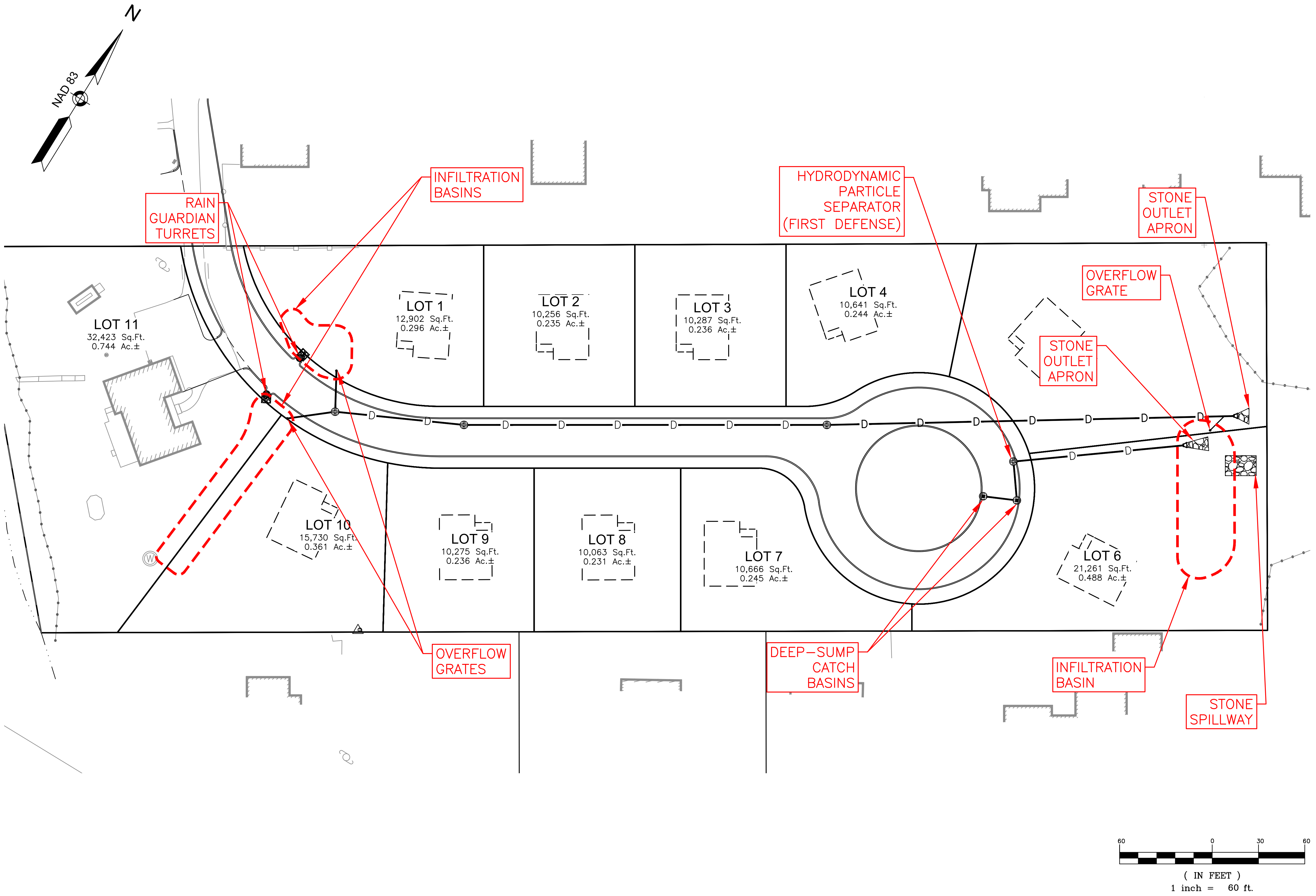
Proposed snow storage is located along the edge of the roadways. Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage swales or ditches. The minimum amount of deicing chemicals needed is to be used. Once the road is accepted by the Town, plowing will be in accordance with Hudson’s Winter Maintenance, which includes salt/sand tracking reports (MS4 requirement).

Control of Invasive Species

During maintenance activities, check for the presence of invasive species. Invasive species must be managed/removed in accordance with RSA 430:530 and AGR 3800. See Section 4 of this manual for information from the University of New Hampshire Cooperative Extension and the New Hampshire Guide to Upland Invasive Species from the New Hampshire Department of Agriculture Markets and Food, Plant Industry Division or the information provided on their website (http://www.agriculture.nh.gov/divisions/plant-industry/invasive-plants.htm).

SECTION 3 BMP MAINTENANCE EXHIBIT

Attachment "E"



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DRAWN BY: CNM
PROJECT #: NEX-2300191
DATE: 11/20/23
REV.: -

FIGURE
1

GPI
Engineering
Design
Planning
Construction Management
603.893.0720
GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

BMP MAINTENANCE EXHIBIT
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

SECTION 4 CONTROL OF INVASIVE SPECIES

CONTACT INFORMATION

TERRESTRIAL PLANTS

Douglas Cygan, Invasive Species Coordinator, NH Department of Agriculture, Markets & Food, Division of Plant Industry, 29 Hazen Drive, Concord, NH 03301
(603) 271-3488, douglas.cygan@agr.nh.gov
Website: www.agriculture.nh.gov

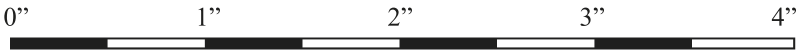
AQUATIC PLANTS

Amy Smagula, Clean Lakes and Exotic Species Coordinator, NH Department of Environmental Services, 29 Hazen Drive, PO Box 95, Concord, NH 03302
(603) 271-2248, asmagula@des.state.nh.us.

RESOURCES

NH Coastal Watershed Invasive Plant Partnership (CWIPP)
www.des.nh.gov/organization/divisions/water/wmb/coastal/cwipp/index.htm
Invasive Plant Atlas of New England (IPANE)
http://invasives.eeb.uconn.edu/ipane
Natural Resource Conservation Service (NRCS)
http://plants.usda.gov
New England Wildflower Society (NEWS)
www.newfs.org
New Hampshire Department of Agriculture, Markets & Food (DAMF)
www.agriculture.nh.gov
New Hampshire Department of Resources & Economic Development, Natural Heritage Bureau (DRED)
http://www.naturalheritage.org
New Hampshire Department of Resources & Economic Development, Division of Forests and Lands (DRED)
http://www.nhdfl.org/organization/div_nhnhi.htm
New Hampshire Department of Environmental Services (DES)
www.des.state.nh.us/wmb/exoticspecies
New Hampshire Fish & Game Department
www.wildlife.state.nh.us
The Nature Conservancy (TNC)
www.nature.org
U.S. Department of Agriculture's Animal Plant Health Inspection Service (USDA APHIS)
www.aphis.usda.gov
University of New Hampshire Cooperative Extension (UNHCE)
www.ceinfo.unh.edu

Funding for the printing of this booklet provided by:
U.S. Department of Agriculture's Animal Plant Health Inspection Service



Attachment "E"

New Hampshire Guide to Upland Invasive Species

New Hampshire
Department of Agriculture
Markets and Food, Plant Industry Division

5th Edition
2018

Douglas Cygan

New Hampshire Department of Agriculture, Markets & Food
Terrestrial Invasive Plant Species

Introduction

Throughout the world, non-native invasive species have become an overwhelming problem resulting in impacts to the natural environment and managed landscapes. Invasive species typically possess certain traits that give them an advantage over most native species. The most common traits include the production of many offspring, early and rapid development, and adaptability and high tolerance to many environmental conditions. These traits allow invasive species to be highly competitive and, in many cases, suppress native species. Studies show that invasives can reduce natural diversity, impact endangered or threatened species, reduce wildlife habitat, create water quality impacts, stress and reduce forest and agricultural crop production, damage personal property, and cause health problems.

Invasive species began arriving in North America in the mid-to-late 1700s by various means. Many were brought here for ornamental uses, erosion control, or to provide for wildlife habitat. Others arrived inadvertently through international travel and commerce.

Impacts and Actions

Biologists have found that invasive species cover more than 100 million acres of land in the U.S. and their population numbers continue to spread. The repeated process of spread has become so extreme that invasive species cost the United States billions of dollars per year. This is a result of lost agricultural and forest crops, impacts to natural resources and the environment, and the control efforts required to eradicate them.

On February 3, 1999, President Clinton signed Executive Order 13112, which established the National Invasive Species Council. The Council is responsible for assessing the impacts of invasive species, providing the nation with guidance and leadership on invasive species issues, and seeing that federal programs are coordinated and compatible with state and local initiatives.

Each state is also required to participate by evaluating and responding to their invasive species concerns. In the summer of 2000, the State of New Hampshire passed House Bill 1258-FN, which created the Invasive Species Act (ISA) and the New Hampshire Invasive Species Committee.

Attachment "E"

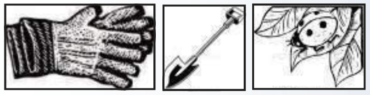
GLOSSARY OF PLANT TERMS

Alternate: Arranged singly at each node, as leaves or buds on different sides of a stem.
Annual: Living or growing for only one year or season.
Aril: A fleshy, usually brightly colored cover of a seed that develops from the ovule stalk and partially or entirely envelops the seed.
Axis: The point at which the leaf is attached to the main stem or branch.
Berry: A small, juicy, fleshy fruit.
Biennial: Having a life cycle that normally takes two growing seasons to complete.
Capsule: A dry dehiscent fruit that develops from two or more united capsules.
Compound: Composed of more than one part.
Deciduous: Shedding or losing foliage at the end of the growing season.
Dehiscent: The spontaneous opening of a fruit at maturity.
Drupe: A fleshy fruit usually having a single hard stone enclosing a seed.
Entire: Referring to a leaf not having an indented margin.
Filiform: Having the form resembling a thread or filament.
Furrowed: A rut groove or narrow depression.
Glabrous: Having no hairs or projections; smooth.
Imbricate: To be arranged with regular overlapping edges.
Inflorescence: A cluster of small flowers arranged on a flower stalk.
Lanceolate: A leaf tapering from a rounded base toward an apex, lance-shaped
Lenticels: The small, corky pores or narrow lines on the surface of the stems of woody plants that allow the interchange of gases between the interior tissue and the surrounding air.
Lustrous: Having a sheen or glow.
Native: A species that originated in a certain place or region; indigenous.
Naturalized: Adapted or acclimated to a new environment without cultivation.
Opposite: Growing in pairs on either side of a stem.
Ovate: Broad or rounded at the base and tapering toward the end.
Panicle: A branched cluster of flowers in which the branches are racemes
Peduncle: The stalk of a solitary flower of an inflorescence.
Peltate: Leaf being round with the stem attached near its center.
Perennial: Living three or more years.
Perfect: Having both stamens and pistals in the same flower.
Pod: A dry, several-sealed, dehiscent fruit.
Pubescent: Covered in fine short hairs.
Raceme: Elongated cluster of flowers along the main stem in which the flowers at the base open first.
Rhizome: A horizontal, usually underground stem that often sends out roots and shoots from its nodes.
Samara: A winged, often one-seed indehiscent fruit as of the ash, elm or maple.
Simple: Having no divisions or branches; not compound.
Umbel: A flat-topped or rounded inflorescence.

Lythrum salicaria - Purple Loosestrife

Family: Lythraceae
Native to: Eurasia

Description: Perennial growing 30-80" tall by $^{2}/_{3}$'s as wide. **Stems:** 4-6 sided, turning woody in summer. **Leaves:** Opposite to whorled, lanceolate, 2-4" long. **Flowers:** Spiked raceme, purple to magenta, June to October. **Fruit:** Capsule. **Habitat:** Mostly found in wetlands and aquatic systems, full to partial sun. **Spread:** Each plant can produce approximately 2.5-4.5 million seeds. Seeds dispersed by water, wildlife and humans. **Comments:**Invades wetlands suppressing native species and destroying wildlife habitat. **Controls:** Hand pull, use a spade to dig larger plants or use biocontrols (*Galerucella Spp*., top left is a larvae & top right is an adult).

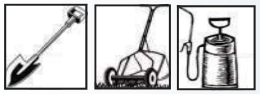


Photos by Douglas Cygan

Phragmites australis - Common Reed

Family: Poaceae
Native to: Eurasia

Description: Perennial rhizomatous grass growing 14' tall. **Stems:** Called 'culms' are large, hollow and grow up to 1" dia. **Leaves:** Lanceolate, up to 24" long, bluish-green in color. **Flowers:** Panicles with many spikelets having seven small reddish flowers. **Habitat:** Mostly found in marshlands, but also grows in freshwater wetlands and aquatic systems, full to partial sun. **Spread:** Spreads primarily by rhizomes. **Comments:** Forms dense colonies that suppress native species and alter wildlife habitat. **Controls:** Hand pull small plants. Use a spade to dig larger plants or apply herbicides.



Photos by Douglas Cygan

Attachment "E"

New Hampshire Invasive Species Committee

The New Hampshire Invasive Species Committee (ISC) is an advisory group for the Commissioner of the NH Department of Agriculture, Markets & Food (DAMF) on matters concerning invasive species in the state. The ISC consists of 11 appointed members representing the following: the NH Department of Agriculture, the NH Department of Environmental Services, the NH Department of Resources & Economic Development, the NH Department of Transportation, the NH Department of Fish & Game, The College of Life Science & Agriculture of the University of NH, the UNH Cooperative Extension, environmental interests, horticultural interests, general public interests, and livestock owners & feed growers interests. The ISC meets regularly to conduct the following efforts:

- Review information;
- Evaluate and discuss potentially invasive plant, insect and fungi species of concern;
- Host guest presentations on related topics;
- Develop outreach and educational materials;
- Formulate management practices as guidance for the control of invasive species; and
- Prepare lists of proposed prohibited and restricted species.

(*Note: This committee is not charged with the evaluation or listing of aquatic plant species, which is conducted by the Department of Environmental Services under RSA-487:16-a. However, a brief description of the program and four of the aquatic species are described on pages 29 & 30 of this book*).

New Hampshire Rules

In accordance with the Invasive Species Act (ISA), HB 1258-FN, the DAMF is the lead state agency for terrestrial invasive plants, insects and fungi species. The DAMF has the responsibility for the evaluation, publication and development of rules on invasive plant species. This is for the purpose of protecting the health of native species, the environment, commercial agriculture, forest crop production, and human health. Therefore, the rule, Agr 3800, states "**No person shall collect, transport, import, export, move, buy, sell, distribute, propagate or transplant any living or viable portion of any listed prohibited invasive plant species, which includes all of their cultivars and varieties, listed"** (see the New Hampshire Department of Agriculture's website at www.agriculture.nh.gov to review the complete set of rules).

Invasive Upland Plant Species (Agr 3800)

Invasive Insect Species

(To see the complete list of all 16 invasive insects refer to rules Agr 3800)

Invasive Aquatic Plant Species

To see the complete list of invasive aquatic plants refer to DES's Env-Wq 1300 rules

Attachment "E"

New Hampshire Department of Environmental Services
Aquatic Invasive Plant Species

"Exotic aquatic species" are plants or animals that are not part of New Hampshire's native aquatic flora and fauna. Since the first exotic aquatic plant infestation in New Hampshire was discovered in 1965 in Lake Winnipesaukee, exotic aquatic plant infestations have increased to a total of 83 infestations in 72 waterbodies in 2008. Species present include variable milfoil (63 waterbodies), Eurasian milfoil (3 waterbodies), fanwort (9 waterbodies), water chestnut (1 waterbody) and Brazilian elodea (1 waterbody), Curly Leaf Pondweed (3 waterbodies), and European Naiad (3 waterbodies), and Didymo (1 waterbody). Most of these exotic plants can propagate by fragmentation as well as by seed.

Exotic aquatic plant fragments can easily become attached to aquatic recreational equipment, such as boats, motors, and trailers, and can spread from waterbody to waterbody through transient boating activities. Infestations can have detrimental effects on the ecological, recreational, aesthetic, and economic values of the state's precious surface waters, limiting use of the waterbodies and decreasing shorefront property values by as much as 1020 percent according to a UNH study (Halstead, et al., 2001).

Myriophyllum heterophyllum - Variable Milfoil

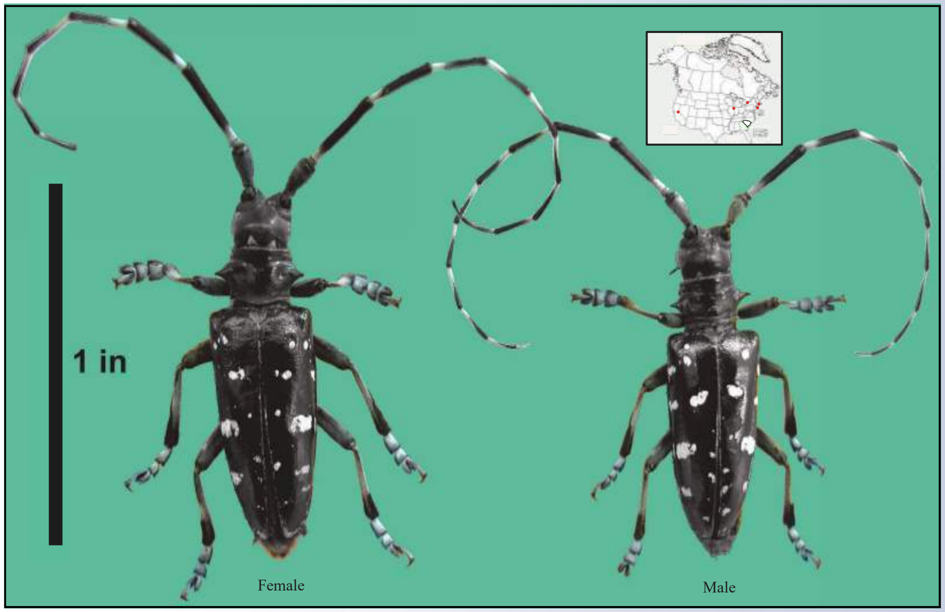
Family: Haloragaceae
Native to: Eurasia

Description: Submerged aquatic perennial growing 20' tall. **Stems:** Round, thick and reddish. **Leaves:** Feathery leaflets surrounding the stem. **Flowers:** Stalks that emerge above the water with green leaves, June to August. **Habitat:** Lakes, ponds, calm streams, and other similar aquatic systems with full to partial sun. **Spread:** It reproduces primarily by vegetative propagules when individual plant segments break off, and dispersed by water movement, humans, and boats. **Comments:**Invades water bodies, suppresses native species and destroys fish habitat. **Controls:** Prevention, hand pulling, bottom screening, and aquatic herbicide use.

Photos by Amy Smagula

Anoplophora glabripennis - Asian Longhorned Beetle

Family: Cerambycidae
Native to: Europe



Asian Longhorned Beetle—*Anoplophora glabripennis* (Photo by Chris Rallis)

The Asian longhorned beetle (ALB) is a serious threat to a large variety of deciduous hardwoods in North America. ALB is a large glossy black insect with white spots dotting its elytra. Adults grow to 1-1.5" long and have whitish bandings on their antennae. Females are typically bigger than males. Tree injury occurs when larvae tunnel through the xylem (heartwood) of the host, thus weakening the tree. Hosts trees include, but aren't limited to: Maple, Chestnut, Poplar, Willow, Birch, Elm, and Mountain ash. Adult females chew a crater in the bark and lay 1-egg per site. Upon hatching the larvae feed on the wood and emerge as adults in 1-2 years through perfect $^{3}/_{8}$" diameter exit holes. Other signs include coarse wood shavings called frass, oozing sap, oviposition sites, leaf-feeding damage, and mature beetles. **If found, please call the NH Dept. of Agriculture at (603) 271-2561**.


Oviposition Site


Egg (Rutgers University)


Sap flow from injury


Larval damage (Rutgers Univ.)


Adult feeding damage on leaf


3/8" diameter exit hole

Photos by Douglas Cygan, Chris Rallis & Rutgers University

WHAT YOU CAN DO

Attachment "E"

There are many things that you, as an individual, can do to help control the spread of invasive species and preserve native flora and fauna:

- Minimize impacts to natural vegetation, soils, and drainage.
- Learn how to identify invasive plants and know how to tell them apart from native species.
- Control invasives on your property by following recommended practices.
- When landscaping, ask your local garden center or contact your County Extension Service about alternative plantings.
- Become active in local or regional initiatives to control invasives.
- After working in an area with invasive species remove any soil, or propagules that may have adhered to clothing, shoes, vehicle tires, etc.

CONTROL METHODS

Mechanical: Mechanical control involves hand pulling, digging, cultivation, mowing, cutting or utilizing some type of physical barrier such as a tarpaulin, mulch, wood chips, etc. This method is most effective when populations of unwanted species are low.

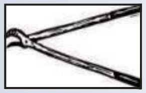
Cultural: Cultural control is the manipulation of a plant community to prevent the introduction or spread of an unwanted species. This can be accomplished by modifying the growing environment such as the soil, available light or moisture, or planting trees or shrubs that can outcompete the invasive species.

Chemical: Chemical control involves the use of an approved herbicide to manage a targeted species. The application method must be chosen to avoid damage to beneficial or native species. The applicator must adhere to all State and Federal pesticide regulations and in many cases be licensed by the state. For more information, contact the NH Department of Agriculture's Pesticide Control Division at 603-271-3550 or www.agriculture.nh.gov.

Biological: Biological control is the use of native or introduced beneficial organisms to naturally reduce populations of unwanted species. Most biological controls are found to be self-sustaining and host specific.

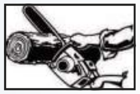

Pulling


Digging


Cutting-Hand tools


Herbiciding

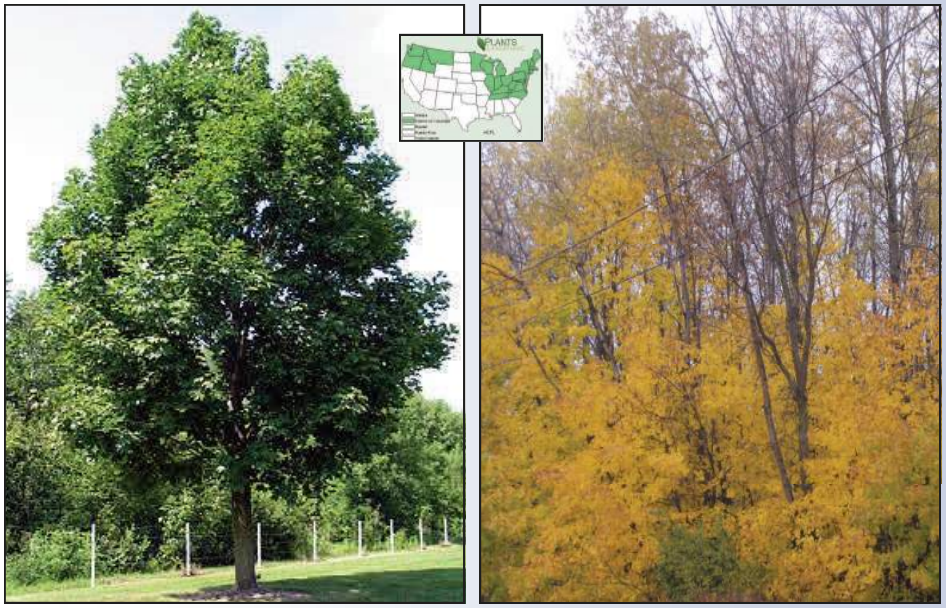

Mowing


Cutting-Saws


Biocontrols

Acer platanoides - Norway Maple

Family: Aceraceae
Native to: Europe



Norway Maple—*Acer platanoides*

Norway Maple (in yellow) Invasion in Franklin, NH

Description: Large deciduous tree 60' high by 40' wide. **Bark:** Grayish and somewhat furrowed. **Twigs:** Smooth, olive-brown. **Buds:** Terminal, imbricate, rounded, smooth, greenish-red. **Leaves:** Opposite, 4-7" wide, 5-lobed, dark green to dark red above, lustrous below. **Flowers:** Greenish-yellow, April. **Fruit:** Horizontal samara. **Zone:** 3-7. **Habitat:** Moist, well drained soils, full sun to partial shade. **Spread:** Seeds spread by wind and water. **Comments:** Leaf stalks exude milky white sap. Fast growing, buds break earlier than most native species. Naturalizes in woodlands where it can outcompete native species. **Controls:** Pull or dig seedlings/saplings. Cut large trees and prune suckers when they sprout. Herbicide: foliar spray, cut-stem, bark banding, or slash bark with ax and apply to wounds.

Milky white sap-leaf petiole

Leaf with winged seed

Terminal buds rounded

Flowers greenish-yellow

Bark is grayish & furrowed

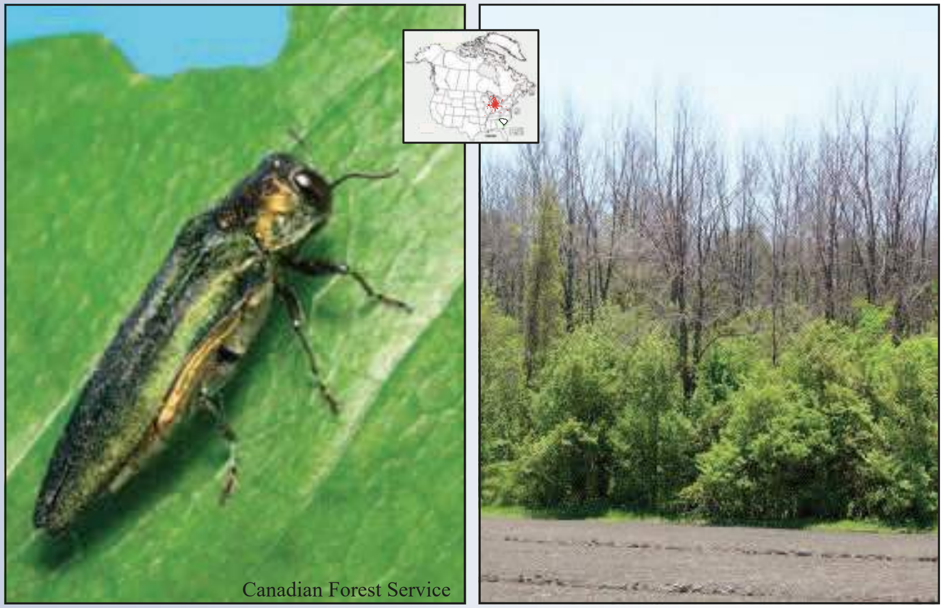
Leaves turn yellow in Fall

Photos by Douglas Cygan

Attachment "E"

Agrilus planipennis - Emerald Ash Borer

Family: Buprestidae
Native to: Asia



Emerald Ash Borer—*Agrilus planipennis*

Dead standing Ash trees (Canadian Forest Service)

Emerald Ash Borers (EAB) are small invasive wood boring beetles that attack all species of ash trees (*Fraxinus spp.*). Native to East Asia, it is suspected that they were accidentally introduced to North America in infested wood packing material. The adults are 3/8” to ½” in length by 1/16” in width. Their bodies have a dark metallic green appearance. Adults emerge from a D-shaped exit hole from late May to mid-July and live for 3-6 weeks, during which time they feed on ash foliage, and fly 1-mile or so in search of a mate and to lay eggs. Females will lay 60-90 eggs in the crevices of ash tree bark. Larvae emerging from the eggs create distinctive S-shaped feeding galleries within the cambium which is directly beneath the bark. These feeding galleries can girdle the tree and result in tree death. Movement of EAB into new uninfested areas is principally through transportation of firewood. **If found, please contact the NH Dept. of Agriculture at (603) 271-2561.**

Egg

Larvae in feeding galleries

Adult with wings spread

Feeding galleries in cambium

D-shaped exit hole

EAB Purple prism trap

Photos by Douglas Cygan & Chris Rallis

DO NOT MOVE FIREWOOD

Adelges tsugae - Hemlock Wooly Adelgid

Family: Adelgidae
Native to: Asia


Hemlock Wooly Adelgid—*Adelges tsugae* Nests

Hemlock trees dead from Adelgid (www.earthportal.org)

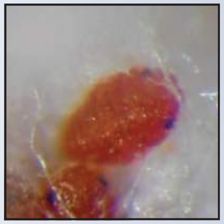
Hemlock Wooly Adelgid (*Adelges tsugae*) (HWA) is a serious pest to all North American hemlock trees (*Tsuga spp.*). It is native to Japan & China and was first found in the Pacific Northwest in the 1920's. By the 1950's it had reached the east coast and now infects hemlock trees from Georgia to Maine. It spreads by movement of nursery stock, wind and animals. These insects are extremely small averaging about $^{1}/_{8}$" in length with piercing-sucking mouth parts similar in appearance to aphids. All adults are females with each producing 50-300 eggs. To protect themselves & their eggs they produce a white-waxy covering. Adults insert their piercing mouth parts into the stem at the base of the needles. Trees die from needle loss & lack of nutrition. **If found, please call the NH Dept. of Agriculture at (603) 271-2561**.


Adult female laying eggs


Egg mass in protective nest


Eggs & crawlers (Chris Rallis)


Heavily infested branch


Crawlers (Chris Rallis)


Crawler leaving nest (Chris Rallis)

Photos by Douglas Cygan & Chris Rallis

Ailanthus altissima - Tree of Heaven

Attachment "E"

Family: Simaroubaceae
Native to: China


Tree of Heaven—*Ailanthus altissima*

Tree of Heaven invasion

Description: Deciduous tree up to 60' tall by 40' wide. **Bark:** Grayish, slightly furrowed. **Twigs:**Reddish-brown. **Leaves:** Compound, 18-24" long with 13 -25 leaflets arranged alternately on stem, lanceolate, 3-5" long with 2-4 teeth near base. **Flowers:** Panicles, 8-16" long, yellowish-green, mid-June. **Fruit:** Samara. **Zone:** 4-8. **Habitat:** Highly adaptable and pollution tolerant, full sun to partial shade. **Spread:** Seeds are wind dispersed. **Comments:** Very fast growing, dense canopy shades out native species. **Controls:** Remove seedlings and saplings by hand. Larger trees can be mechanically removed or cut. To prevent suckering, if trees are cut, apply herbicide to cut portion of stump.


Leaf scar on stem


Compound leaves & leaf


Leaf bud


Flowers yellowish-green


Bark grayish & furrowed


Winged seed cluster

Photos by Douglas Cygan

Alliaria petiolata - Garlic Mustard

Family: Cruciferae
Native to: Europe

Garlic Mustard—*Alliaria petiolata*

Woodland invasion (photo by Cornell University)

Description: Cool season biennial, 2nd year plants flower and reach 2-3$^{1}/_{2}$' tall. **Leaves:** Triangular, coarsely toothed, heart-shaped. **Flowers:** Umbel, small, 4-petals, white, April-May. **Fruit:** Pods, seeds turn black when mature. **Zone:** 4-8. **Habitat:** Prefers moist shaded flood-plains, forests and roadsides, adaptable to most soil and light conditions. **Spread:** Seeds spread by water and wildlife. **Comments:** Plants spread quickly into natural areas leading to competition and displacement of native species. **Controls:** Small populations can be hand pulled while large populations can be continuously cut back to prevent flowering and seed production. Herbicide treatments are also effective.

Basal rosette

Leaf

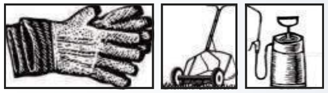
Flower buds

Flowers 4-petaled, white

Stems

Seed pods

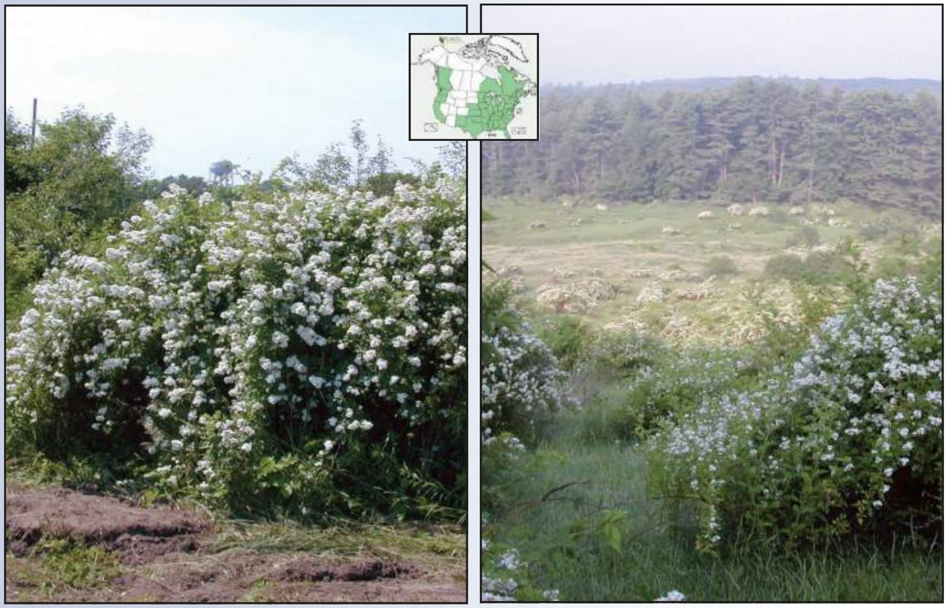
Photos by Douglas Cygan



Rosa multiflora - Multiflora Rose

Attachment "E"

Family: Rosaceae
Native to: Japan & Korea



Multiflora Rose-*Rosa multiflora*

Multiflora Rose invasion, Canterbury, NH

Description: Hardy shrub / climber reaching up to 15' or more in height and 10' in width. **Stems:** Long and arching, forming dense clumps, thorns may or may not be present. **Leaves:** Alternately arranged, compound with 7-9 leaflets and having feather margins at base. **Flowers:** Clusters of white or pink, June to July. **Fruit:** Rose hips turn red in fall. **Zone:** 3-8. **Habitat:** Prefers moist, well drained soils, full sun. **Spread**: Fruits with seeds are dispersed by birds. **Comments:** Very aggressive, leading to competition and displacement of native species. **Controls:** Hand or mechanical removal, cutting, or herbicide application.

Twig/stem bark

Leaves

Feathery margin at base of leaf

Flowers white

Fall color

Fruit is called a hip

Photos by Douglas Cygan

Rhamnus cathartica - Common Buckthorn

Family: Rhamnaceae
Native to: Eurasia

Description: Deciduous shrub or small tree measuring 20' by 15'. **Bark:** Grayish to brown with raised lenticels. **Stems:** Cinnamon colored with terminal spine. **Leaves:** Alternate, simple and broadly ovate with toothed margins. **Flowers:** Inconspicuous, 4-petaled, greenish-yellow, mid-June. **Fruit:** Fleshy, 1/4” diameter turning black in the fall. **Zone:** 3-7. **Habitat:** Adapts to most conditions including pH, heavy shade to full sun. **Spread:** Seeds are bird dispersed. **Comments: Highly:** Aggressive, fast growing, outcompetes native species. **Controls:** Remove seedlings and saplings by hand. Larger trees can be cut or plants can be treated with an herbicide.

Photos courtesy of John M. Randall/The Nature Conservancy

Rhamnus frangula - Glossy Buckthorn

Family: Rhamnaceae
Native to: Japan

Description: Tall deciduous shrub up to 20' in height by 15' wide, **Bark:** Grayish with whitish lenticels. **Twigs:** Reddish-brown. **Leaves:** Ovate, 4-5" long by 3-4" wide, arranged alternate or whorled on stem. **Flowers:** Small, greenish-white, mid-June. **Fruit:** Fleshy, turning black in the fall. **Zone:** 2-7. **Habitat:** Highly adaptable and pollution tolerant, full sun to partial shade. **Spread:** Seeds are bird dispersed. **Comments:** Very fast growing, dense canopy shades out native species. **Controls:** Remove seedlings and saplings by hand. Larger trees can be cut or herbicide may be used.

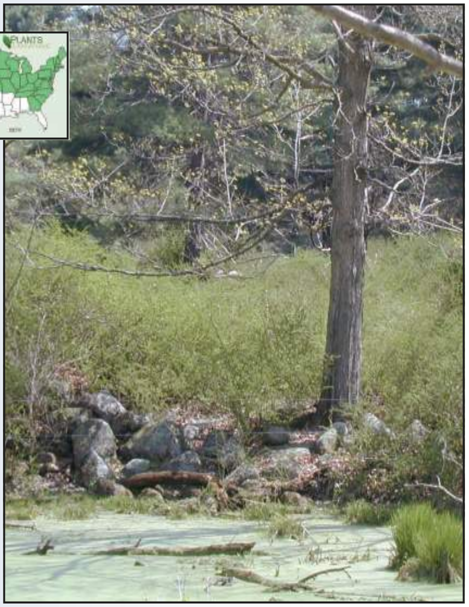
Photos by Douglas Cygan

Attachment "E"

Berberis thunbergii - Japanese Barberry

Family: Berberidaceae
Native to: Japan

Japanese Barberry-*Berberis thunbergii*



Japanese Barberry invasion, Antrim, NH

Description: Deciduous shrub, 2-4$^{1}/_{2}$' tall. **Leaves:** Ovate, simple, entire. Color varies depending on variety. **Flowers:** Small yellowish, bloom in May in clusters of 2-4. **Fruit:** Drupe, turning red in summer. **Zone:** 4-8. **Habitat:** Prefers well drained soils in semi shade and often occurring in forests, roadsides, and open fields. **Spread:** Seeds are dispersed by wildlife. **Comments:** Forms dense thickets in natural environments where it becomes established, resulting in impacts to native flora and fauna. **Controls:** Remove small immature plants by hand. Dig larger plants with a garden spade or remove mechanically. Cut stems at base or control with herbicide treatment.

‘Crimson Pygmy’ variety

Leaves

Thorn

Flowers yellowish

Frost covered Barberry

Fruit is a fleshy drupe

Photos by Douglas Cygan

Berberis vulgaris - European Barberry

Family: Berberidaceae
Native to: China


European Barberry-*Berberis vulgaris*


Woodland invasion, Claremont, NH

Description: Shrub 3-8' in height by 3-6' in width. **Stems:** Tan bark with 3 long spines at each leaf axis. **Leaves:** Alternate, simple, $^1/_2$"-$1^1/_2$" long, bright green above, dull below. **Flowers:** Perfect, yellow, $^1/_2$" long, mid-April to May. **Fruit:** Oblong drupe turning pale red in fall. **Zone:** 4-8. **Habitat:** Prefers full sun to partial shade and open spaces to wooded areas. **Spread:** Seeds are dispersed by birds and wildlife. **Comments:** Highly adaptable to most environments and is pollution tolerant. **Controls:** Hand pull young plants. Cut or mechanically remove older larger plants or apply approved herbicides for large populations.


Thorns


Leaves

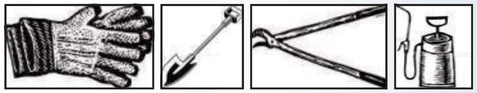

Flowers


Flowers whitish-yellow


Stems


Seed pods

Photos by Douglas Cygan



Attachment "E"

Polygonum cuspidatum - Japanese Knotweed

Family: Polygonaceae
Native to: Japan

Description: Perennial reaching 10' in height and width. Bohemian Knotweed (*Reynoutria x bohemica*) is similar. **Stems:** Greenish, hollow and jointed, similar to bamboo. **Leaves:** Alternate, broadly ovate, 3-7" long. **Flowers:** Small, whitish, forming panicles, August-September. **Seeds:** Calyx, brown, triangular. **Habitat:** Found in woodland sites, open spaces, ditches, roadsides, riverbanks. Prefers moist, well-drained soils. **Spread:** Stem & root fragments, and by seed. **Comments:** Aggressive, spreads quickly along surface waters and in right-of-ways. **Controls: Do <u>not</u> mow**, cut stems at base then smother by covering area with heavy-duty fabric/plastic, herbicides also recommended.

Photos by Douglas Cygan

Polygonum perfoliatum - Mile-a-Minute Vine

Family: Polygonaceae
Native to: Asia

Description: Very fast growing herbaceous perennial vine growing to 25' in height. **Stems:** Greenish with stiff barbs used for support. **Leaves:** Alternate, triangular in shape with clasping bract at the base, 1-3" long. **Flowers:** Racemes, inconspicuous and white forming at the bract, August - October. **Seeds:** An achene within a greenish, berry-like fruit. **Habitat:** Grows in partial shade to full sun, fields, roadsides & forests. Prefers moist, well-drained soils. **Spread:** Seed spread by birds & wildlife. **Comments:** Fast growing, aggressive. **Controls:** Mowing, hand cutting or herbicide use is recommended.

Photos by Leslie J. Mehrhoff

Microstegium vimineum - Japanese Stilt Grass

Family: Poaceae
Native to: Asia


Japanese Stilt Grass—*Microstegium vimineum*

Japanese Stilt Grass woodland invasion

Description: Weak-stemmed annual grass, reaching 2-4' tall. **Leaves:** Lanceolate, tapered at both ends, 2-3" long with silvery stripe of reflective hairs down the midrib. **Flowers:** Racemes occur at the ends of the stalk itself, late August. **Fruit:** Achenes develop in late fall. **Zone:** 5-11. **Habitat:** Occurs along riverbanks, floodplains, forests and roadsides, adaptable to most soil and light conditions. **Spread:** Seeds spread by water, wildlife & humans. **Comments:** Plants spread quickly into natural areas leading to competition and displacement of native species. **Controls:** Small populations can be hand pulled while large populations can be continuously cut back to prevent flowering and seed production. Herbicide treatments are also effective.


Early development

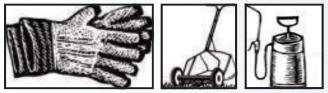

Root (UMASS Extension)


Leaf with silvery reflective hairs along midrib


Fall-leaves turn purplish


Seed-Achene

Photos courtesy of Leslie J. Mehrhoff/UCONN-IPANE and UMASS Extension



Attachment "E"

Celastrus orbiculatus - Oriental Bittersweet

Family: Celastraceae
Native to: Japan, China


Oriental Bittersweet-*Celastrus orbiculatus*

Oriental Bittersweet invasion, Concord, NH

Description: Deciduous vine reaching heights of 40-60'. **Bark:** Tannish, furrowed. **Leaves:** Alternate, ovate, bluntly toothed, 3-4" long by 2/3's as wide, tapered at the base. **Flowers:** Small, greenish, blooming in spring. **Fruit:** Yellow dehiscent capsule surrounding an orange-red aril. *Fruits occur in the axils of the stems whereas native bittersweet (Celastrus scandens) fruits at the ends.* **Zone:** 4-8. **Habitat:** Disturbed edges, roadsides, fields, forests and along rivers and streams. **Spread:** Birds and humans. **Comments:** Very aggressive, climbs up and over trees and smothers them. Do not buy wreaths made of these vines. **Controls:** Difficult to manage. Cutting, pulling, or recommended herbicide use applied to foliage, bark, or cut-stump.


Looking up into canopy


Leaves

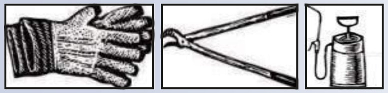

Native trees being strangled


Flowers yellowish-white


Mature Orange-yellow fruit


Fruit is a fleshy capsule

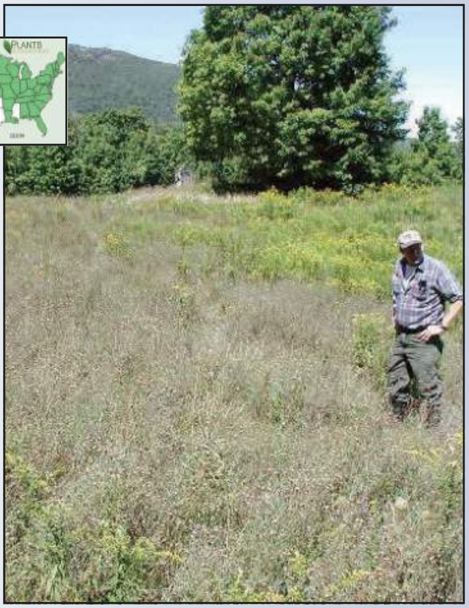
Photos by Douglas Cygan



Centaurea maculosa - Spotted Knapweed

Family: Compositae
Native to: Eurasia


Spotted Knapweed—*Centaurea maculosa*


Invasion (photo by Leslie Mehrhoff)

Description: Tall erect herbaceous perennial living 3-5 years. **Leaves:** Alternate, divided, Pale green, 1-3" long. **Flowers:** Aster-like, terminal, purple, July-August. **Fruit:** Each plant produces thousands of brownish seeds per year. **Zone:** 3-10. **Habitat:** Invades dry sunny roadsides, fields and waste places. Its large taproot allows it to survive harsh winters and draught **Spread:** Seeds spread by wind and wildlife. **Comments:** Plants spread quickly into natural meadows and fields leading to competition and displacement of native species. Roots excrete a toxin killing off other plants. **Controls:** Small populations can be hand pulled while large populations can be continuously cut back to prevent flowering and seed production. Herbicide treatments are also effective.


Basal rosette


Leaf

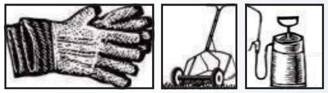

Seed head


Flowers—Aster like


Stems


Seeds

Photos by Leslie Mehrhoff & Douglas Cygan

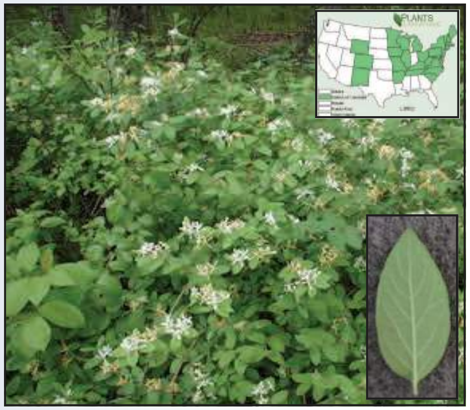


Attachment "E"

Lonicera morrowii - Morrow's Honeysuckle

Family: Caprifoliaceae
Native to: Japan

Description: Shrub reaching 6-8' tall. **Stems:** Smooth, glabrous, Tannish, hollow. **Leaves:** Ovate, simple, entire, opposite, pubescent beneath, 1-2$^{1}/_{2}$" long. **Flowers:** Tubular, white, turning yellow with age, May to June. **Fruits:** Berry turning red. **Zone:** 3 . **Habitat:** Moist to wet shaded floodplains, forests, roadsides, fields, waste places. **Spread:** Seeds are dispersed by wildlife and humans. **Comments:** Rapidly invades sites, forming a dense vegetative layer that outcompetes native flora and fauna species. **Controls:** Hand control is effective for small plants, while mechanical removal and repetitive cutting also work well. Herbicide treatment is better for areas with greater infestations.



Photos by Douglas Cygan & Leaf Photo by Leslie J. Mehrhoff

Lonicera tatarica - Tatarian Honeysuckle

Family: Caprifoliaceae
Native to: Eurasia

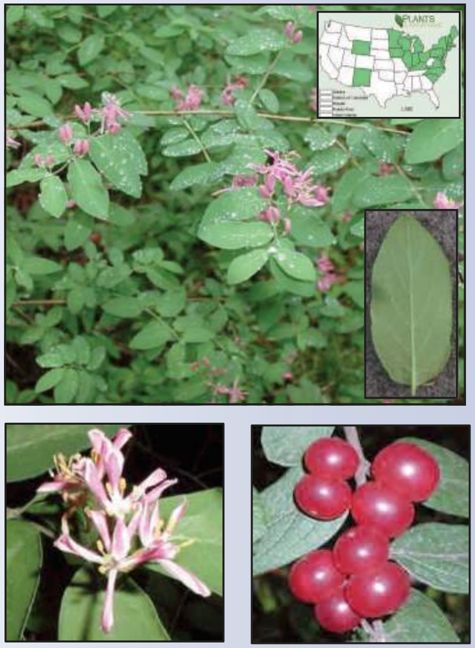
Description: Upright deciduous shrub reaching 6-15' tall. **Stems:** Smooth, glabrous, tan, hollow. **Leaves:** Ovate, smooth, bluish-green, opposite, 1-2$^{1}/_{2}$" long. **Flowers:** Tubular, pink or white, April to May. **Fruit:** Berry with two seeds, turning red in fall. **Zone:** 3. **Habitat:** Under story species in woodland sites, also invades open spaces. Thrives in moist soils. **Spread:** Seeds dispersed by wildlife and humans. **Comments:** Rapidly invades forests, fields, roadsides and floodplains. Outcompetes native species. **Controls:** Hand control is effective for small plants while mechanical removal, cutting and chemical applications are better for larger stands.

Photos by Leslie J. Mehrhoff & Berry Photo by Douglas Cygan

Lonicera x bella - Showy Bush Honeysuckle

Family: Caprifoliaceae
Native to: Eurasia

Description: Shrub reaching 20' in height and width. **Stems:** Greenish to tan with corky wings. **Leaves:** Oppositely arranged, simple and elliptic, 1-3" long by half as wide, light green. **Flowers:** Yellow, white or pink, May to early June. **Fruit:** Fleshy red, forming in pairs in leaf axis. **Zone:** 4. **Habitat:** Prefers dry upland soils, full sun to heavy shade, pH adaptable. **Spread:** Seeds are dispersed by birds. **Comments:** *L. x bella* is a cross between *L. tatarica* & *L. morrowii*. Spreads into natural areas forming dense stands, which displace native species. **Controls**: Hand or mechanical removal, continuous cutting, girdling, and herbicide treatment.


Photos courtesy of Leslie J. Mehrhoff/UCONN-IPANE

Lonicera japonica - Japanese Honeysuckle

Family: Caprifoliaceae
Native to: Eurasia

Description: Climbing vine. **Stems:** Reddish-brown, pubescent. **Leaves:** Opposite and not clasping the stem as opposed to the three native honeysuckle vines that do clasp the stem, oblong, 1$^1/_2$ -2" long, rounded at base. **Flowers:** Tubular, white or yellow, fragrant, May to mid-July. **Fruit:** Berry, smooth, blackish to slightly purplish. **Zone:** 4-8. **Habitat:** Prefers moist soils and full sun to partial shade. **Spread:** Seeds spread by wildlife. **Comments:** Vines grow quickly, covering native vegetation, resulting in loss of habitat. **Controls:** hand or mechanical removal, cutting, girdling, chemical.


Photos courtesy of John M. Randall/The Nature Conservancy
& Leaf Photo by Leslie J. Mehrhoff

Attachment "E"

Cynanchum nigrum - Black Swallow-Wort

Family: Asclepiadaceae
Native to: Eurasia

Description: Perennial herbaceous vine that grows to 6'. **Leaves:** Opposite, lanceolate, dark glossy green, simple with a smooth edge, 2-4" long. **Flowers:** Small $^1/_4$", 5-petaled, purplish, from June to September. **Seed:** Seeds are similar to those of milkweed. **Zone:** 4 to 8. **Habitat:** It prefers full to partial sun. **Spread:** Seeds dispersed by wind. **Comments:** Invades roadsides, fields, disturbed sites, meadows, and woodlands, outcompeting native species. **Controls:** Hand pull young plants. Remove and destroy seed pods before they open. Apply herbicides as a foliar spray during the growing season. If plants are to be dug, use a spade and make sure that all root fragments are removed.


Photos by Douglas Cygan

Cynanchum rossicum - Pale Swallow-Wort

Family: Asclepiadaceae
Native to: China

Description: Perennial vine growing to 3-6'. Very similar to black swallow-wort with the exception of the flowers. **Leaves:** Opposite, lanceolate, 2-4" long. **Flowers:** Magenta, $^3/_8$", flowering from June to September. **Seed:** Seeds are similar to milkweed. **Zone:** 4 to 8. **Habitat:** It prefers full to partial sun. **Spread:** Seeds dispersed by wind. **Comments:** Invades roadsides, fields, disturbed sites, meadows and woodlands. **Controls:** Hand pull young plants. Remove and destroy seed pods before they open. Apply herbicides as a foliar spray. Dig using a spade to ensure all root fragments are removed.


Photos courtesy of John M. Randall/The Nature Conservancy

Elaeagnus umbellata - Autumn Olive

Family: Elaeagnaceae
Native to: Asia

Autumn Olive—Elaeagnus umbellata

Autumn Olive invasion in Concord, NH

Description: Weedy deciduous shrub measuring 20' by 20'. **Bark:** Silvery-gray and smooth with whitish lenticels. **Stems:** Cinnamon-brown. **Leaves:** Elliptical, 2-3" long, glossy, green above and silverish below. **Flowers:** Solitary, whitish, 4-petaled, mid-June. **Fruit:** Drupe. **Zone:** 3-8. **Habitat:** Naturalizes in open spaces exposed to full sun. **Spread:** Seeds dispersed by birds and wildlife. **Comments:** Very aggressive. Outcompetes and displaces native species. **Controls:** Remove seedlings and saplings by hand. Larger shrubs can be mechanically removed, or cut and apply herbicide to stump.

Silvery-gray Bark

Leaves

Terminal bud

Flowers whitish

Fall Color

Fruit is a fleshy drupe

Photos by Douglas Cygan

Attachment "E"

Ligustrum obtusifolium - Blunt-leaved Privet

Family: Oleaceae
Native to: Europe

Blunt-leaved Privet-*Ligustrum obtusifolium*

Blunt-leaved Privet (Photo: Leslie J. Mehrhoff)

Description: Shrub reaching 12' tall by 10-12' wide. **Stems:** Greenish, smooth. **Leaves:** Opposite, simple and elliptic, 1-3" long by half as wide, blunt tipped, light green. **Flowers:** Small white panicles, May to early June. **Fruit:** Small blackish drupe. **Zone:** 4-7. **Habitat:** Prefers dry upland soils, full sun to heavy shade, pH adaptable. **Spread:** Seeds dispersed by birds. **Comments**: Becomes established in natural areas leading to competition and displacement of native species. **Controls:** Hand or mechanical removal, cutting, herbicide applications such as foliar or cut-stem.

Twig/stem bark

Leaves

Terminal bud

Flowers white

Fall color

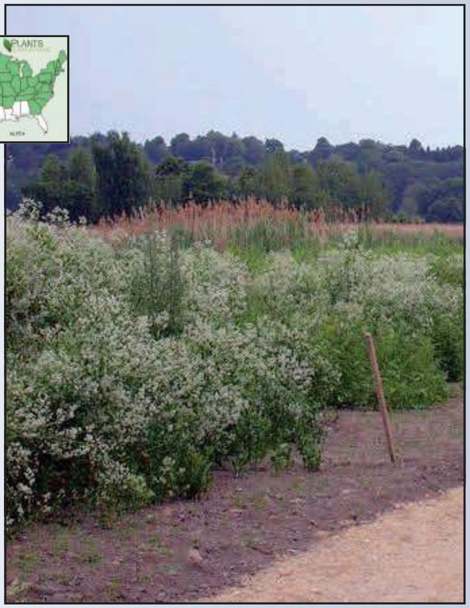
Fruit is a dark drupe

Photos by Douglas Cygan & Leslie Mehrhoff

Lepidium latifolium - Perennial Pepperweed

Family: Cruciferae
Native to: Eurasia

Perennial Pepperweed—*Lepidium latifolium*



Perennial Pepperweed invasion Seacoast area, NH

Description: Long lived perennial growing 2-4' tall. **Leaves:** Alternate, lanceolate with serrated edge. **Flowers:** Terminal, tightly clustered, white, July. **Fruit:** Silicle, rounded, flattish, hairy $^{1}/_{16}$" long. **Zone:** 4-8. **Habitat:** Prefers wet, brackish soils such as coastal tidal marshes and ditches, wetlands, and floodplains. **Spread:** Seeds and creeping rhizome fragments spread by water, wildlife and humans. **Comments:** Plants spread quickly into natural areas leading to competition and displacement of native coastal wetland species. **Controls:** Small populations can be hand pulled while large populations can be continuously cut back to prevent flowering and seed production. Herbicide treatments are also effective.

Basal rosette

Leaf

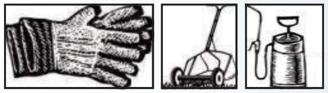
Rhizome root with shoot

Flower head

Persistent stems

Seeds (photo—USDA)

Photos by Kevin Lucey & Jennifer Forman

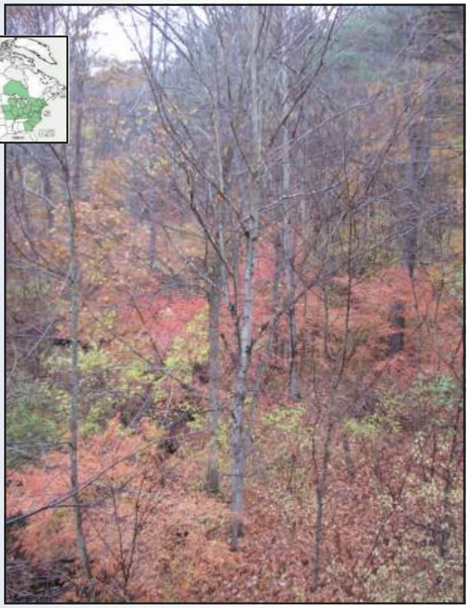


Attachment "E"

Euonymus alatus - Burning Bush

Family: Celastraceae
Native to: Asia

Burning Bush-*Euonymus alatus*



Burning Bush invasion, Boscawen, NH

Description: Deciduous shrub reaching 20' in height and width. **Stems:** Greenish with corky wings. **Leaves:** Oppositely arranged, simple and elliptic, 1-3" long by half as wide, light green. **Flowers:** Inconspicuous greenish-yellow, May to June. **Fruit:** Fleshy green capsule turning red in fall. **Zone:** 3 to 8. **Habitat:** Prefers dry upland soils, full sun to heavy shade, pH adaptable. **Spread**: Seeds are dispersed by birds and wildlife. **Comments:** Outcompetes and displaces native species. **Controls:** Hand remove seedlings and saplings. Use a spade or shovel to dig out larger plants. Large populations may be controlled with herbicide use.

Corky-winged bark

Leaves

Terminal buds

Flowers yellowish-white

Fall color

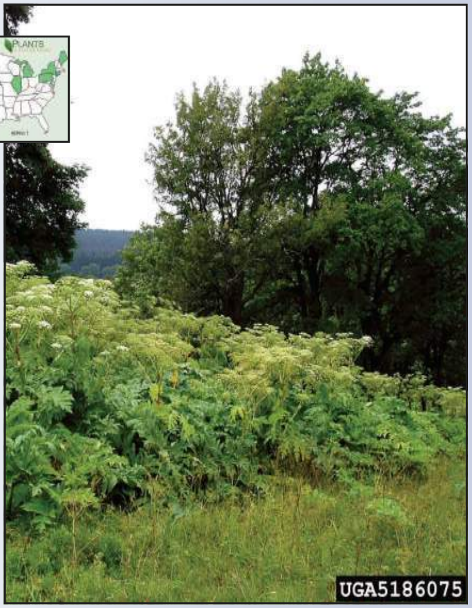
Fruit is a fleshy capsule

Photos by Douglas Cygan

Heracleum mantegazzianum - Giant Hogweed

Family: Apiaceae
Native to: China

Giant Hogweed-*Heracleum mantegazzianum*



Open field invasion (Photo-Bugwood.org)

Description: Biennial growing to 15' tall. **Stems:** Greenish with purple splotches, 2-4" diameter with coarse hairs, hollow. **Leaves:** Large, compound, deeply incised, 3-5' wide, hairy on underside. **Flowers:** White inflorescence, 1-2' in diameter, May-June. **Seeds:** Flattened, $^3/_8$" long, ovate with 4 brown resin canals. **Zone:** 3-8. **Habitat:** Found in wet areas, roadsides, gardens, open spaces, full sun to partial shade. **Spread:** Seeds dispersed by water, wildlife and humans. **Comments:** The clear, watery sap is phototoxic to human skin, causing severe blistering and burns. Spreads readily and displaces native species. **Controls:** Remove plants by digging up tap root. Herbicide can also be used as a foliar treatment.

Purple spotted, hairy stem

Leaf

130-150 Floral rays

Flowers whitish umbel

Persistent dead stalks

Seeds with resinous veins

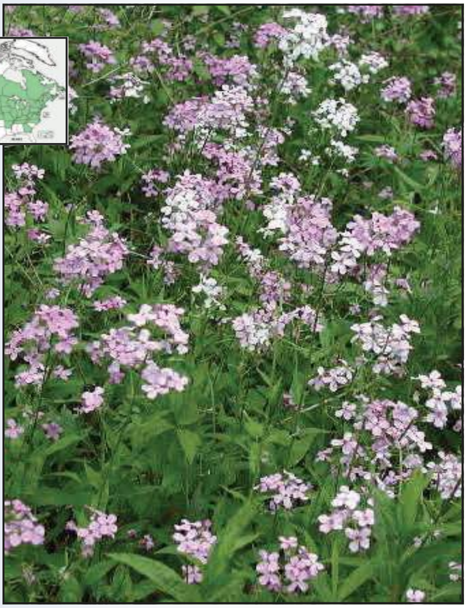
Photos by Douglas Cygan

Attachment "E"

Hesperis matronalis - Dame's Rocket

Family: Brassicaceae
Native to: Eurasia

Dame's Rocket—*Hesperis matronalis*



Dame's Rocket invasion

Description: Cool season biennial, 2nd year plants flower and reach 30" tall. **Leaves:** Alternately arranged and lanceolate in shape with toothed margins. **Flowers:** Terminal racemes, 4-petals, purplish, early to mid spring. **Fruit:** Pods, seeds turn brown when mature. **Zone:** 4-8. **Habitat:** Prefers partial sun, moist to mesic conditions such as floodplains, forests and roadsides, adaptable to full sun with adequate moisture. **Spread:** Seeds spread by water and wildlife. **Comments:** Plants spread quickly into natural areas leading to competition and displacement of native species. **Controls:** Small populations can be hand pulled while large populations can be continuously cut back to prevent flowering and seed production. Herbicide treatments are also effective.

Basal rosette

Leaf

Flower buds

Flowers 4-petaled, white

Stems

Seed pods

Photos by Leslie Mehroff

SECTION 5 STORMWATER INSPECTION & MAINTENANCE LOG

Attachment "E"

STORMWATER INSPECTION AND MAINTENANCE LOG

36 Campbello Street - Hudson, NH

General Information			
Project Name	Proposed Residential Subdivision	**Location**	Hudson, NH
Date of Inspection		**Start/ End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			

	Site Specific BMP's	Maintenance Interval
1	Road Sweeping	6 Months
2	Deep Sump Catch Basins	6 Months
3	Rain Guardian Turrets	6 Months (See separate maintenance log for First Defense Unit)
4	Above Ground Infiltration Basins	6 Months
5	Stone Aprons/Weirs/Spillways	1 Year
6	Hydrodynamic Particle Separator (First Defense Unit)	1 Year (See separate maintenance log for First Defense Unit)
7	Vegetated Areas	1 Year

Attachment "E"

BMP Description	Corrective Action Required?		Notes
Road Sweeping			
Evidence of debris accumulation	YES	NO	
Evidence of oil grease	YES	NO	
Other (specify)	YES	NO	
Deep Sump Catch Basins			
Grates clear of debris	YES	NO	
Inlet and outlet clear of debris	YES	NO	
Evidence of oil grease	YES	NO	
Observance of accumulated sediment	YES	NO	Sediment Depth =
Evidence of structural deterioration	YES	NO	
Evidence of flow bypassing facility	YES	NO	
Other (specify)	YES	NO	
Rain Guardian Turret			
Grates clear of debris	YES	NO	
Inlet and outlet clear of debris	YES	NO	
Observance of accumulated sediment	YES	NO	Sediment Depth =
Evidence of structural deterioration	YES	NO	
Other (specify)	YES	NO	
See separate maintenance log for Rain Guardian			
Above Ground Infiltration Basins			
Inlet and outlet clear of debris	YES	NO	
Bottom surface clear of debris	YES	NO	
Evidence of rilling or gullying	YES	NO	
Observance of accumulated sediment	YES	NO	Sediment Depth =
Bottom dewaters within 72 hrs. of a storm event	YES	NO	
Standing water or wet spots	YES	NO	
Other (specify)	YES	NO	
Stone Aprons/Weirs/Spillways			
Inlet/inflow pipe clear of debris	YES	NO	
Overflow spillway clear of debris	YES	NO	
Evidence of rilling or gullying	YES	NO	
Tree growth	YES	NO	
Other (specify)	YES	NO	
Hydrodynamic Particle Separator (First Defense Unit)			
See separate maintenance log for First Defense Unit			
Vegetated Areas			
Clear of debris	YES	NO	
Evidence of rilling or gullying	YES	NO	
Observance of accumulated sediment	YES	NO	Sediment Depth =
Dewaters between storms	YES	NO	
Vegetation healthy and growing	YES	NO	

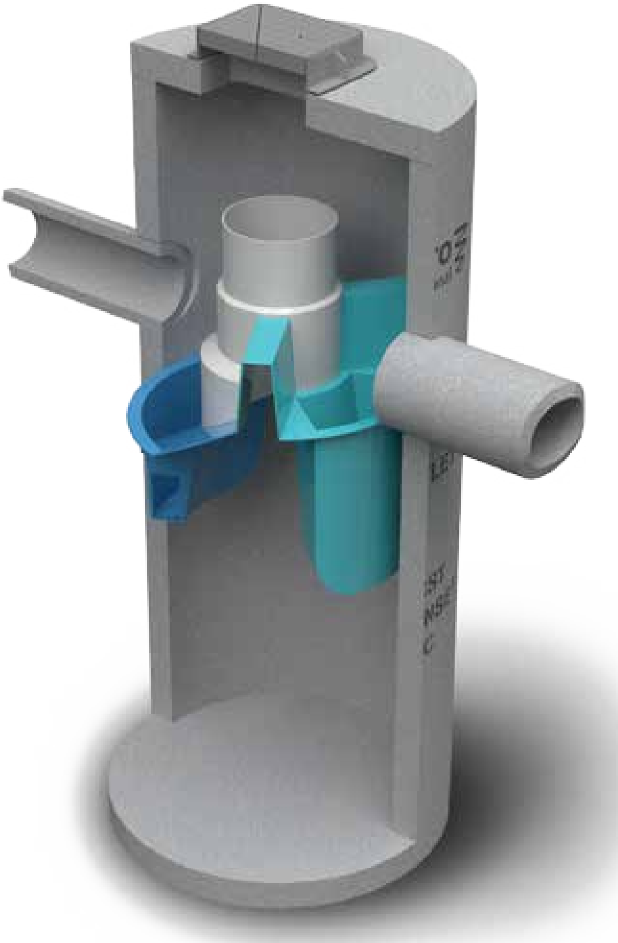
Standing water or wet spots	YES	NO	
Tree growth	YES	NO	
Other (specify)	YES	NO	

NOTE: Photos shall be provided with each inspection log and shall be sufficiently labeled to identify photo location.

SECTION 6

FIRST DEFENSE OPERATION AND MAINTENANCE MANUAL

Attachment "E"



Operation and Maintenance Manual

First Defense® and First Defense®-HC

Vortex Separator for Stormwater Treatment

Stormwater Solutions

Turning Water Around ...®

Table of Contents

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DISCLAIMER: Information and data contained in this manual is exclusively for the purpose of assisting in the operation and maintenance of Hydro International plc's First Defense®. No warranty is given nor can liability be accepted for use of this information for any other purpose. Hydro International plc has a policy of continuous product development and reserves the right to amend specifications without notice.

I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations (refer to *Section II. Model Sizes & Configurations*, page 4) to accommodate a wide range of pipe sizes, peak flows and depth constraints.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig.1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for “offline” arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 500% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

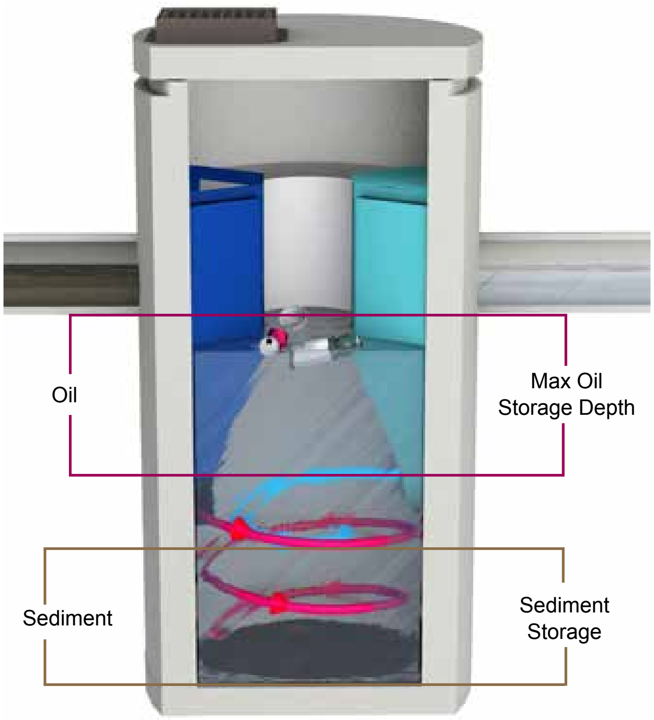

Fig.1 Pollutant storage volumes in the First Defense®.

II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components of the First Defense®-4HC and First Defense®-6HC have modified geometries as to allow greater design flexibility needed to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2a - 2b). First Defense® model parameters and design criteria are shown in Table 1.

First Defense® Components

1. **Built-In Bypass**
2. **Inlet Pipe**
3. **Inlet Chute**
4. **Floatables Draw-off Port**
5. **Outlet Pipe**
6. **Floatables Storage**
7. **Sediment Storage**
8. **Inlet Grate or Cover**

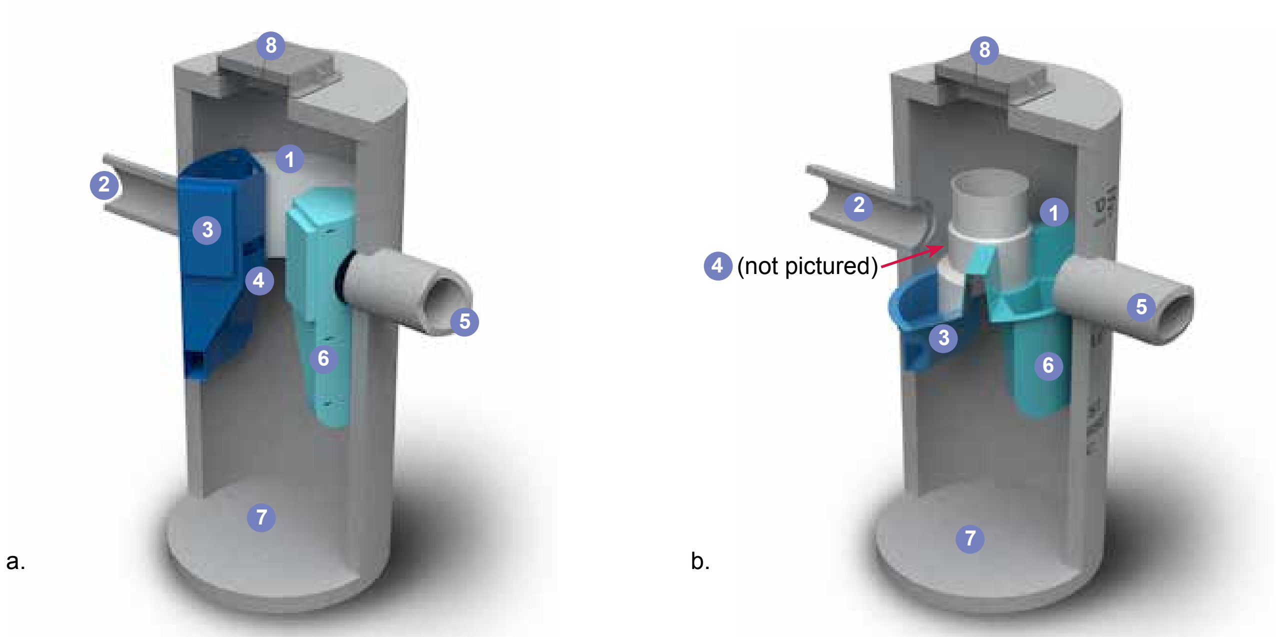

Fig.2a) First Defense®-4 and First Defense®-6; b) First Defense®-4HC and First Defense®-6HC, with higher capacity dual internal bypass and larger maximum pipe diameter.

Table 1. First Defense® Pollutant Storage Capacities and Maximum Clean out Depths

First Defense® Model Number	Diameter	Oil Storage Capacity	Oil Clean Out Depth	Maximum Sediment Storage Capacity[1]		Recommended Sediment Clean-out Capacity	
				Volume	Depth	Volume	Depth
	(ft / m)	(gal / L)	(in / cm)	(yd^3 / m^3)	(in / cm)	(yd^3 / m^3)	(in / cm)
FD-4	4 / 1.2	180 / 681	<23.5 / 60	1.3 / 1.0	33 / 84	0.7 / 0.5	18 / 46
FD-4HC		191 / 723	<24.4 / 62				
FD-6	6 / 1.8	420 / 1,590	<23.5 / 60	3.3 / 2.5	37.5 / 95	1.3 / 1.0	15 / 38
FD-6HC		496 / 1,878	<28.2 / 72				

NOTE

[1] Sediment storage capacity and clean out depth may vary, as larger sediment storage sump volumes are provided when required.

III. Maintenance

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil. Maximum pollutant storage capacities are provided in Table 1.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense®-HC have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vactor hose used for maintenance should be less than 15 inches in diameter.

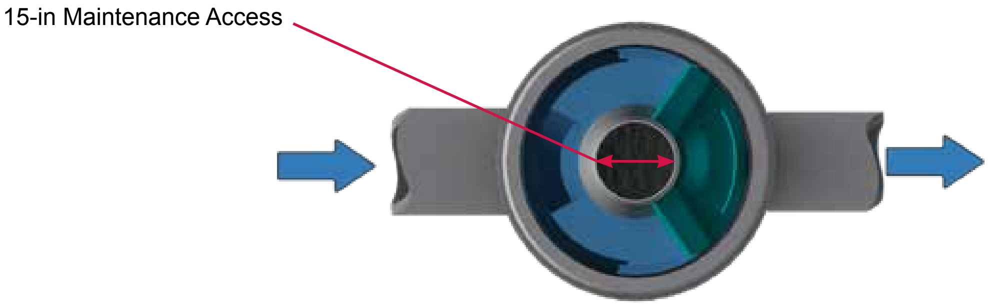

Fig.3 The central opening to the sump of the First Defense®-HC is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil / flotables removal, for a 6-ft First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the grate or lid to the manhole.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.
4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.
5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.
6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.
7. Securely replace the grate or lid.
8. Take down safety equipment.
9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.5).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump.

Scheduling

- Floatables and sump clean out are typically conducted once a year during any season.
- Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.

Fig.4 Floatables are removed with a vactor hose (First Defense model FD-4, shown).

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe (such as a Sludge Judge®)
- Vactor truck (flexible hose recommended)
- First Defense® Maintenance Log

Floatables and sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the grate or lid to the manhole.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.
4. Remove oil and floatables stored on the surface of the water with the vactor hose (Fig.5) or with the skimmer or net (not pictured).
5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).
6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor (Fig.5).
7. Retract the vactor hose from the vessel.
8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.
9. Securely replace the grate or lid.

Fig.5 Sediment is removed with a vactor hose (First Defense model FD-4, shown).

Maintenance at a Glance

Activity	Frequency
Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.	

Attachment "E"

Hydro International®

First Defense® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL SIZE (CIRCLE ONE): **FD-4** **FD-4HC** **FD-6** **FD-6HC**

INLET (CIRCLE ALL THAT APPLY): **GRATED INLET (CATCH BASIN)** **INLET PIPE (FLOW THROUGH)**

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

inspired by HX

Attachment "E"

Hydro International®

First Defense® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment Depth Measured	Volume of Sediment Removed	Site Activity and Comments

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Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

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Attachment "E"

Notes

Attachment "E"

What is HX?

HX is Hydro Experience, it is the essence of Hydro. It's interwoven into every strand of Hydro's story, from our products to our people, our engineering pedigree to our approach to business and problem-solving.

HX is a stamp of quality and a mark of our commitment to optimum process performance. A Hydro solution is tried, tested and proven.

There is no equivalent to Hydro HX.

Stormwater Solutions

94 Hutchins Drive
Portland, ME 04102

Tel: (207) 756-6200
Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

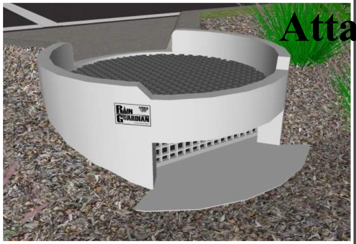
www.hydro-int.com

Turning Water Around...®

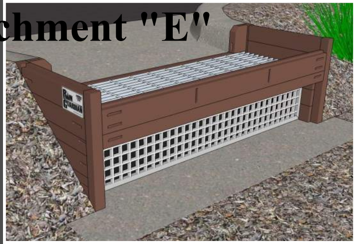
SECTION 7 RAIN GUARDIAN MAINTENANCE GUIDE

U.S. PATENT NOS. 8,501,016 AND 8,858,804

Attachment "E"



COMMERCIAL/INDUSTRIAL



RESIDENTIAL

PRETREATMENT FOR BIORETENTION

Rain Gardens • Swales • Filtration Basins • Infiltration Basins

Maintenance Guide

Rain Guardian pretreatment chambers simplify bioretention maintenance by collecting sand, leaves, grass clippings, and other debris in an easy to clean, confined location. Regularly maintaining the Rain Guardian sustains its functionality by maximizing storage and filtration capacities. Maintenance frequency is variable and depends on many factors such as rainfall frequency, drainage area size and land use type, and season of the year. The general cleaning process is identical for the Rain Guardian Turret and Rain Guardian Bunker.

Following rain events, inspect the pretreatment chamber for debris on the top grate, within the chamber, and on the vertical, drop-in filter wall. The maintenance steps described below should be completed if areas of the top grate are clogged, the chamber is >75% full, or the vertical filter wall is clogged. Maintenance should be completed when stormwater has completely drained from the bioretention practice. The filter wall allows the chamber to dry between rain events, which further simplifies maintenance by ensuring removed debris is largely dry. Ensure all debris collected during cleaning of the chamber is completely removed from the site and properly disposed of according to local environmental rules. Once cleaning is complete, reinstall the filter wall with filter fabric facing the inside of the chamber and replace the top grate.

Clear Debris from Top Grate

- Leaf litter and garbage commonly accumulate on the top grate
- Simply remove and dispose of debris by hand or with a shovel prior to removing top grate

Remove Debris from Inside Chamber

- Remove top grate and place on paved inlet to avoid damage to nearby plants
- Remove and dispose of accumulated debris within chamber using a shovel

Clean Filter Wall

- Remove drop-in filter by lifting vertically
- Clean filter wall with a stiff bristled broom or rinse clean with pressurized water

www.RainGuardian.biz

1318 McKay Dr. NE, Suite 300
Ham Lake, MN 55304
(763) 434-2030 (M-F 8:00-4:30)

SECTION 8 DE-ICING LOG

Attachment "E"

Deicing Log

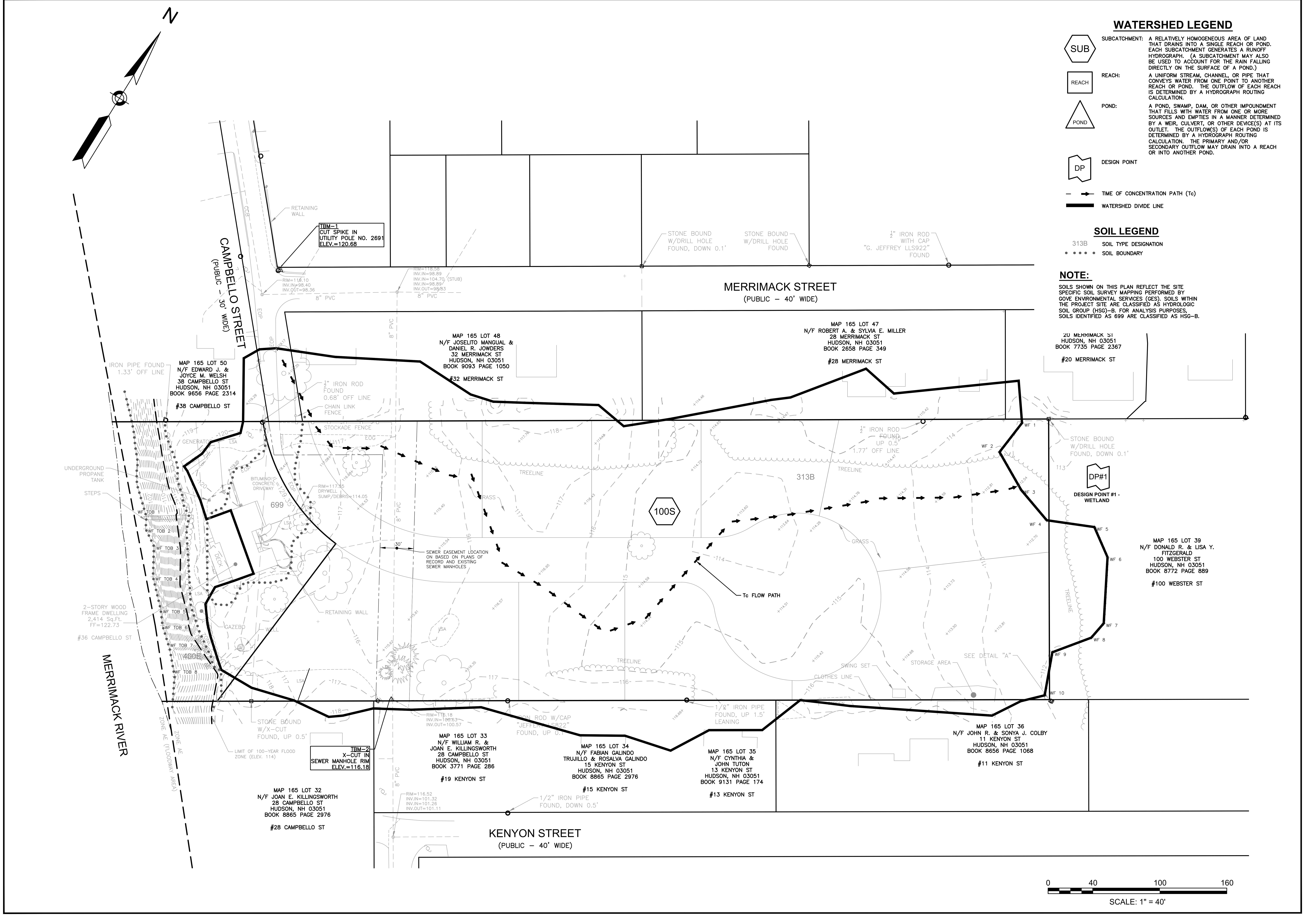
Date Applied	Type of Deicing Material	Amount Applied

Attachment "E"

SECTION 12

PRE & POST-DEVELOPMENT DRAINAGE AREA PLANS

Attachment "E"



WATERSHED LEGEND

SUB	SUBCATCHMENT:	A RELATIVELY HOMOGENEOUS AREA OF LAND THAT DRAINS INTO A SINGLE REACH OR POND. EACH SUBCATCHMENT GENERATES A RUNOFF HYDROGRAPH. (A SUBCATCHMENT MAY ALSO BE USED TO ACCOUNT FOR THE RAIN FALLING DIRECTLY ON THE SURFACE OF A POND.)
REACH	REACH:	A UNIFORM STREAM, CHANNEL, OR PIPE THAT CONVEYS WATER FROM ONE POINT TO ANOTHER REACH OR POND. THE OUTFLOW OF EACH REACH IS DETERMINED BY A HYDROGRAPH ROUTING CALCULATION.
POND	POND:	A POND, SWAMP, DAM, OR OTHER IMPOUNDMENT THAT FILLS WITH WATER FROM ONE OR MORE SOURCES AND EMPTIES IN A MANNER DETERMINED BY A WEIR, CULVERT, OR OTHER DEVICE(S) AT ITS OUTLET. THE OUTFLOW(S) OF EACH POND IS DETERMINED BY A HYDROGRAPH ROUTING CALCULATION. THE PRIMARY AND/OR SECONDARY OUTFLOW MAY DRAIN INTO A REACH OR INTO ANOTHER POND.
DP	DESIGN POINT	
– ➞	TIME OF CONCENTRATION PATH (Tc)	
▬	WATERSHED DIVIDE LINE	

SOIL LEGEND

313B	SOIL TYPE DESIGNATION
• • • • •	SOIL BOUNDARY

NOTE:

SOILS SHOWN ON THIS PLAN REFLECT THE SITE SPECIFIC SOIL SURVEY MAPPING PERFORMED BY GOVE ENVIRONMENTAL SERVICES (GES). SOILS WITHIN THE PROJECT SITE ARE CLASSIFIED AS HYDROLOGIC SOIL GROUP (HSG)–B. FOR ANALYSIS PURPOSES, SOILS IDENTIFIED AS 699 ARE CLASSIFIED AS HSG–B.

GPI
Engineering
Design
Planning
Construction Management
603.893.0720 GPINET.COM

Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

PREPARED FOR
SOUSA REALTY &
DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

REVISIONS

NO.	REVISION	DATE

NOVEMBER 20, 2023

DRAWN/DESIGN BY	CHECKED BY
SMS/CNM	DRJ

PRE - DEVELOPMENT DRAINAGE AREA PLAN

SCALE:
1"=40'

PROJECT NO.
NEX-2300191

1 OF 2

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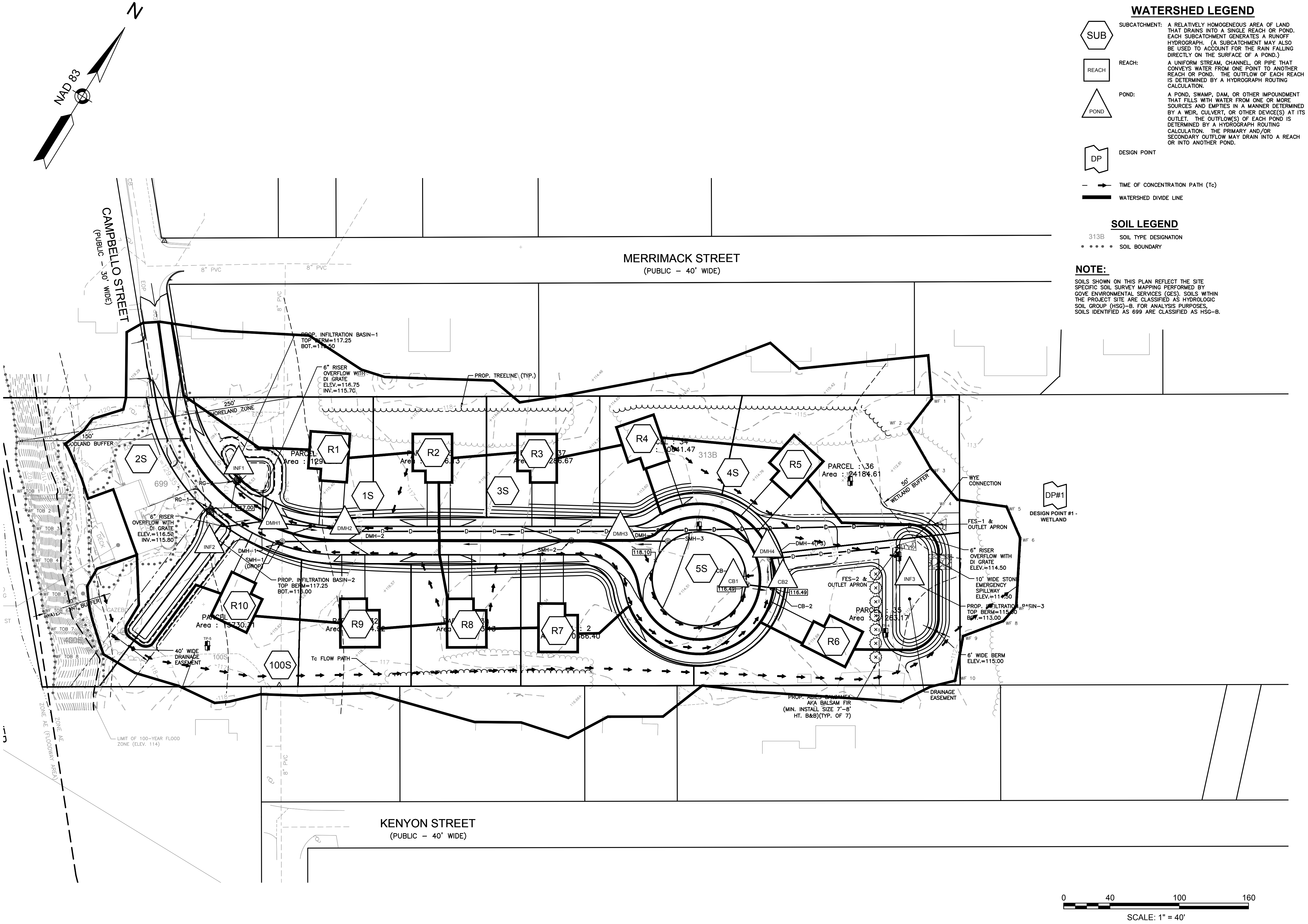
Attachment "E"



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DP	DESIGN POINT	
— ➔	TIME OF CONCENTRATION PATH (Tc)	
▬	WATERSHED DIVIDE LINE	

SOIL LEGEND

313B	SOIL TYPE DESIGNATION
• • • • •	SOIL BOUNDARY

NOTE:

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F:\Projects\NEX-2300191 – Hudson, NH – Sousa Realty\Drainage\Drainage Area Plans (CAD)\2300191 – Post-Development.dwg Post 11/20/23 3:38pm cmason

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46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

REVISIONS

NO.	REVISION	DATE

NOVEMBER 20, 2023

DRAWN/DESIGN BY	CHECKED BY
SMS/CNM	DRJ

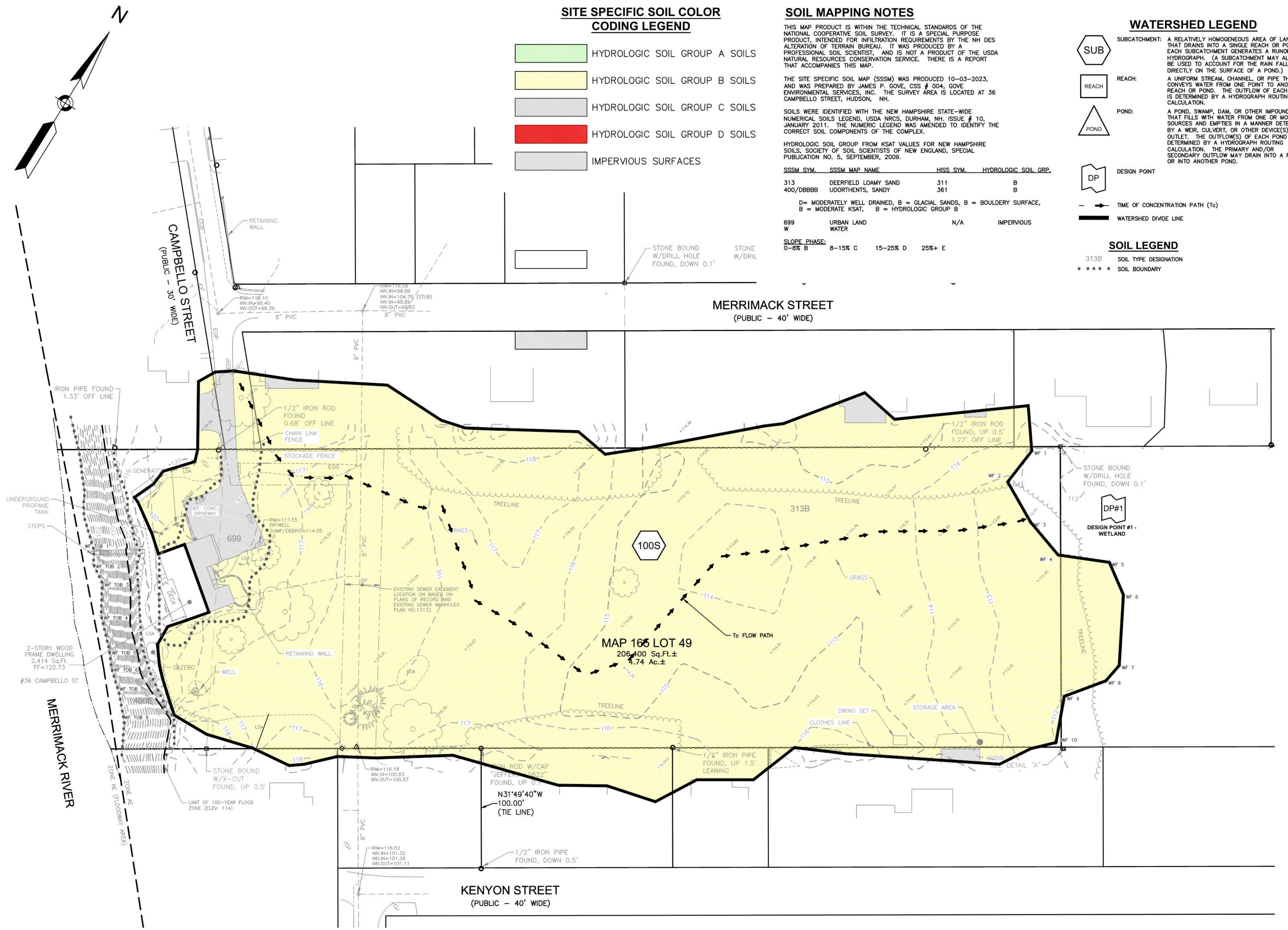
POST - DEVELOPMENT DRAINAGE AREA PLAN

SCALE:
1"=40'

PROJECT NO.
NEX-2300191

2 OF 2

Attachment "E"



SITE SPECIFIC SOIL COLOR CODING LEGEND

- 🟩 HYDROLOGIC SOIL GROUP A SOILS
- 🟨 HYDROLOGIC SOIL GROUP B SOILS
- ▨ HYDROLOGIC SOIL GROUP C SOILS
- 🟥 HYDROLOGIC SOIL GROUP D SOILS
- ▨ IMPERVIOUS SURFACES

SOIL MAPPING NOTES

THIS MAP PRODUCT IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOIL SURVEY. IT IS A SPECIAL PURPOSE PRODUCT, INTENDED FOR INFILTRATION REQUIREMENTS BY THE NH DES ALTERATION OF TERRAIN BUREAU. IT WAS PRODUCED BY A PROFESSIONAL SOIL SCIENTIST, AND IS NOT A PRODUCT OF THE USDA NATURAL RESOURCES CONSERVATION SERVICE. THERE IS A REPORT THAT ACCOMPANIES THIS MAP.

THE SITE SPECIFIC SOIL MAP (SSSM) WAS PRODUCED 10–03–2023, AND WAS PREPARED BY JAMES P. GOVE, CSS # 004, GOVE ENVIRONMENTAL SERVICES, INC. THE SURVEY AREA IS LOCATED AT 36 CAMPBELLO STREET, HUDSON, NH.

SOILS WERE IDENTIFIED WITH THE NEW HAMPSHIRE STATE–WIDE NUMERICAL SOILS LEGEND, USDA NRCS, DURHAM, NH. ISSUE # 10, JANUARY 2011. THE NUMERIC LEGEND WAS AMENDED TO IDENTIFY THE CORRECT SOIL COMPONENTS OF THE COMPLEX.

HYDROLOGIC SOIL GROUP FROM KSAT VALUES FOR NEW HAMPSHIRE SOILS, SOCIETY OF SOIL SCIENTISTS OF NEW ENGLAND, SPECIAL PUBLICATION NO. 5, SEPTEMBER, 2009.

SSSM SYM.	SSSM MAP NAME	HISS SYM.	HYDROLOGIC SOIL GRP.
313	DEERFIELD LOAMY SAND	311	B
400/DBBBB	UDORTHENTS, SANDY	361	B

D= MODERATELY WELL DRAINED, B = GLACIAL SANDS, B = BOULDERY SURFACE, B = MODERATE KSAT, B = HYDROLOGIC GROUP B

699	URBAN LAND	N/A	IMPERVIOUS
W	WATER		

SLOPE PHASE:

0–8% B	8–15% C	15–25% D	25%+ E

WATERSHED LEGEND

SUB	SUBCATCHMENT:	A RELATIVELY HOMOGENEOUS AREA OF LAND THAT DRAINS INTO A SINGLE REACH OR POND. EACH SUBCATCHMENT GENERATES A RUNOFF HYDROGRAPH. (A SUBCATCHMENT MAY ALSO BE USED TO ACCOUNT FOR THE RAIN FALLING DIRECTLY ON THE SURFACE OF A POND.)
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DP	DESIGN POINT	
– →	TIME OF CONCENTRATION PATH (Tc)	
▬	WATERSHED DIVIDE LINE	

SOIL LEGEND

313B	SOIL TYPE DESIGNATION
• • • • •	SOIL BOUNDARY

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Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

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SOUSA REALTY &
DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49
36 CAMPBELLO STREET HUDSON, NEW HAMPSHIRE

REVISIONS

NO.	REVISION	DATE

NOVEMBER 20, 2023

DRAWN/DESIGN BY	CHECKED BY
SMS/CNM	DRJ

PRE - DEVELOPMENT COLOR SOIL GROUP PLAN

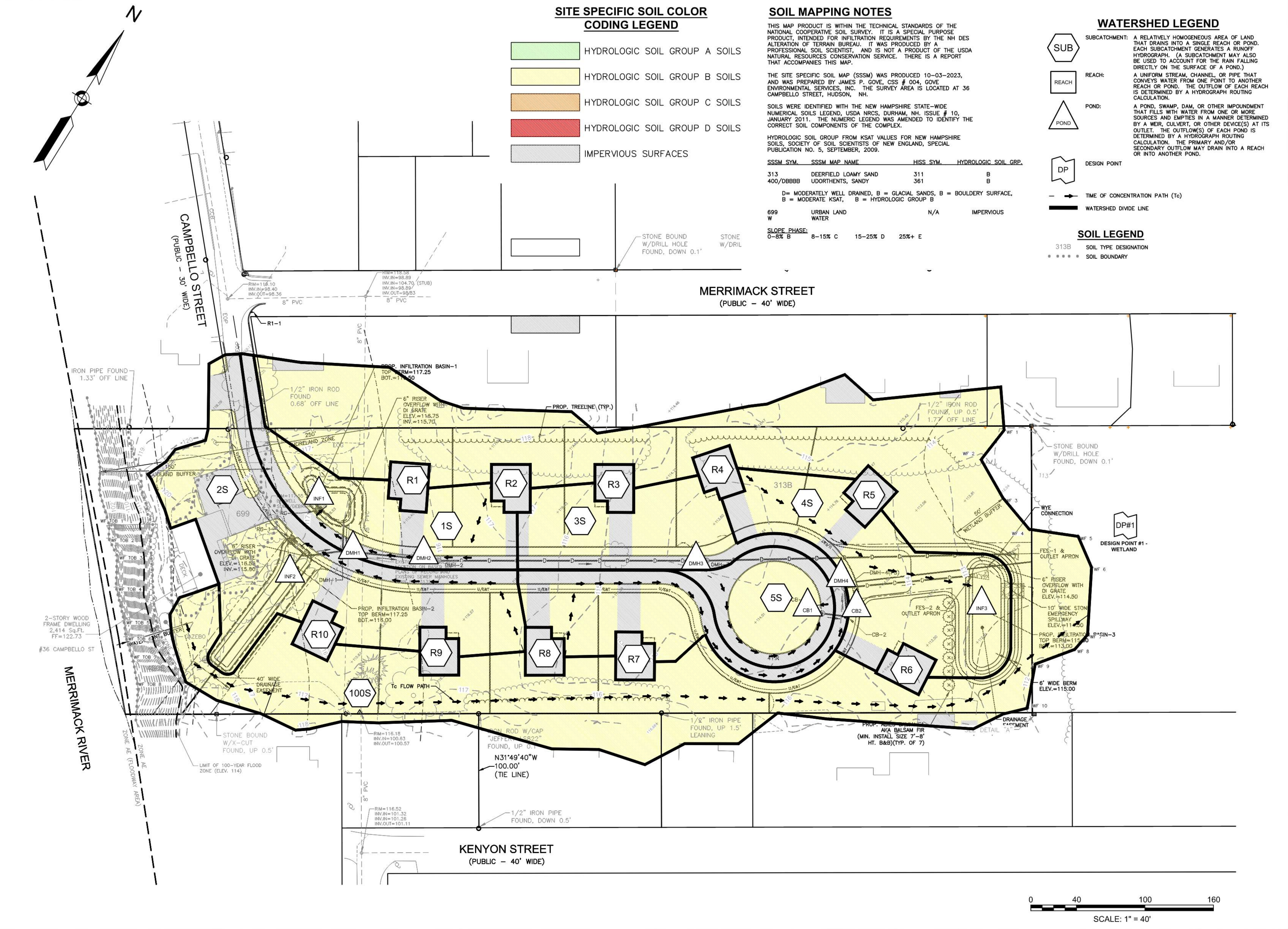
SCALE:
1"=40'

PROJECT NO.
NEX-2300191

1 OF 2

F:\Projects\NEX-2300191 – Hudson, NH – Sousa Realty\Drainage\Drainage Area Plans (CAD)\2300191 – Pre-Development Color Soil Plan.dwg Pre 11/28/23 4:52pm cmason

Attachment "E"



SITE SPECIFIC SOIL COLOR CODING LEGEND

🟩 HYDROLOGIC SOIL GROUP A SOILS

🟨 HYDROLOGIC SOIL GROUP B SOILS

🟧 HYDROLOGIC SOIL GROUP C SOILS

🟥 HYDROLOGIC SOIL GROUP D SOILS

▨ IMPERVIOUS SURFACES

SOIL MAPPING NOTES

THIS MAP PRODUCT IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOIL SURVEY. IT IS A SPECIAL PURPOSE PRODUCT, INTENDED FOR INFILTRATION REQUIREMENTS BY THE NH DES ALTERATION OF TERRAIN BUREAU. IT WAS PRODUCED BY A PROFESSIONAL SOIL SCIENTIST, AND IS NOT A PRODUCT OF THE USDA NATURAL RESOURCES CONSERVATION SERVICE. THERE IS A REPORT THAT ACCOMPANIES THIS MAP.

THE SITE SPECIFIC SOIL MAP (SSSM) WAS PRODUCED 10–03–2023, AND WAS PREPARED BY JAMES P. GOVE, CSS # 004, GOVE ENVIRONMENTAL SERVICES, INC. THE SURVEY AREA IS LOCATED AT 36 CAMPBELLO STREET, HUDSON, NH.

SOILS WERE IDENTIFIED WITH THE NEW HAMPSHIRE STATE–WIDE NUMERICAL SOILS LEGEND, USDA NRCS, DURHAM, NH. ISSUE # 10, JANUARY 2011. THE NUMERIC LEGEND WAS AMENDED TO IDENTIFY THE CORRECT SOIL COMPONENTS OF THE COMPLEX.

HYDROLOGIC SOIL GROUP FROM KSAT VALUES FOR NEW HAMPSHIRE SOILS, SOCIETY OF SOIL SCIENTISTS OF NEW ENGLAND, SPECIAL PUBLICATION NO. 5, SEPTEMBER, 2009.

SSSM SYM.	SSSM MAP NAME	HISS SYM.	HYDROLOGIC SOIL GRP.
313	DEERFIELD LOAMY SAND	311	B
400/DBBBB	UDORTHENTS, SANDY	361	B

D= MODERATELY WELL DRAINED, B = GLACIAL SANDS, B = BOULDERY SURFACE, B = MODERATE KSAT, B = HYDROLOGIC GROUP B

699	URBAN LAND	N/A	IMPERVIOUS
W	WATER		

SLOPE PHASE:

0–8% B	8–15% C	15–25% D	25%+ E

WATERSHED LEGEND

SUB	SUBCATCHMENT:	A RELATIVELY HOMOGENEOUS AREA OF LAND THAT DRAINS INTO A SINGLE REACH OR POND. EACH SUBCATCHMENT GENERATES A RUNOFF HYDROGRAPH. (A SUBCATCHMENT MAY ALSO BE USED TO ACCOUNT FOR THE RAIN FALLING DIRECTLY ON THE SURFACE OF A POND.)
REACH	REACH:	A UNIFORM STREAM, CHANNEL, OR PIPE THAT CONVEYS WATER FROM ONE POINT TO ANOTHER REACH OR POND. THE OUTFLOW OF EACH REACH IS DETERMINED BY A HYDROGRAPH ROUTING CALCULATION.
POND	POND:	A POND, SWAMP, DAM, OR OTHER IMPOUNDMENT THAT FILLS WITH WATER FROM ONE OR MORE SOURCES AND EMPTIES IN A MANNER DETERMINED BY A WEIR, CULVERT, OR OTHER DEVICE(S) AT ITS OUTLET. THE OUTFLOW(S) OF EACH POND IS DETERMINED BY A HYDROGRAPH ROUTING CALCULATION. THE PRIMARY AND/OR SECONDARY OUTFLOW MAY DRAIN INTO A REACH OR INTO ANOTHER POND.
DP	DESIGN POINT	
— ➜	TIME OF CONCENTRATION PATH (Tc)	
▬	WATERSHED DIVIDE LINE	

SOIL LEGEND

313B	SOIL TYPE DESIGNATION
• • • • •	SOIL BOUNDARY

F:\Projects\NEX-2300191 – Hudson, NH – Sousa Realty\Drainage\Drainage Area Plans (CAD)\2300191 – Post-Development Color Soil Plan.dwg Post 11/28/23 4:53pm cmason

GPI
Engineering
Design
Planning
Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

PREPARED FOR
SOUSA REALTY &
DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

REVISIONS

NO.	REVISION	DATE

NOVEMBER 20, 2023

DRAWN/DESIGN BY	CHECKED BY
SMS/CNM	DRJ

POST - DEVELOPMENT COLOR SOIL GROUP PLAN

SCALE: 1"=40'

PROJECT NO. NEX-2300191

2 OF 2

Attachment "F"

The State of New Hampshire
Department of Environmental Services

Robert R. Scott, Commissioner

REQUEST FOR MORE INFORMATION

February 22, 2024

Manny Sousa
Sousa Realty & Development Corp.
46 Lowell Road
Hudson, NH 03051
(sent via email to: msousa@sousarealtynh.com)

RE: Alteration of Terrain Permit Application #240123-011
Proposed Residential Subdivision
Tax Map 165, Lots 49 – Hudson

Dear Mr. Sousa:

The New Hampshire Department of Environmental Services (NHDES) is in receipt of an application and supporting plans and information for an Alteration of Terrain (AoT) Permit for the above referenced project. After review of the information submitted, the following items need to be addressed for NHDES to make a **final determination** on the application for a permit:

General Requirements:

1. Because this project is located within a groundwater protection area, there needs to be 4 feet of separation between the bottom of the infiltrating stormwater practices and the seasonal high groundwater. Alternatively, a filtering practice, such as a bioretention system can be used with a two foot thick filter layer, which would only require one foot of separation to the groundwater table. See Env-Wq 1508.08 for further information.

2. Plans show that stormwater BMPs (StormTech Chambers) will be located on individual residential lots rather than connecting the lots to the site drainage network. Provide draft easement language as required by Env-Wq 1504.07(b). Before transfer of subdivided lots, drainage easements and deed restrictions shall be recorded for each lot that contain the stormwater practices. A permit condition will require that the subdivision plan include a note requiring that the BMPs be constructed as shown on the plans.

3. Please provide draft drainage easement language to DES for review with your resubmittal.

Plans:

General

4. Pursuant to Env-Wq 1504.15(a), please add to the plans the last statement in this section that defines “stable” for areas to be paved.
5. Pursuant to Env-Wq 1504.15(c), please add specifications to the plans for temporary and permanent seeding.

General Notes and Legend (Sheet 2 of 16)

6. Construction Sequence Note 9 indicates that lot grading will occur prior to permanent stabilization of the project site. Please note that no disturbance of individual lots, except as shown on the construction plans, shall be performed until after the construction and stabilization of all other construction associated with the application has been completed.

Existing Conditions Plan (Sheet 3 of 16)

7. In accordance with Env-Wq 1504.01(c), please have the CWS sign and seal the Existing Conditions Plan sheet.

Subdivision Plan (Sheet 4 of 16)

8. Please add a note to this plan to address Comment #2 above.
9. Please show drainage easements for the Proposed Infiltration Basin-1 and for the storm drain pipes between Lots 5 & 6.

Grading & Drainage Plan (Sheet 5 of 16)

10. Please provide all finished contour grading for the project including on the individual lots if that is the intent. The post-development drainage map shows the lots will drain to the road, which is up to five feet above existing grade.
11. Please add a hydrodynamic separator detail.
12. Please show at least one roof drainage system fully designed on this sheet and add elevations for it to the detail on Sheet 13 of 16. Then show a typical size and location for each system on each of the remaining lots.
13. The 6-inch riser overflow invert for Proposed Infiltration Basin-3 does not match the HydroCAD model, please update.

Erosion and Sediment Control Plan (Sheet 6 of 16)

14. Please clearly identify the limits of disturbance on this plan.

Notes:

Wildlife Protection Notes (Env-Wq 1504.17)

15. Please add the following notes on the cover sheet of the plan set. In the first note, fill in the specifics for the project.

    - All observations of threatened or endangered species shall be reported immediately to the New Hampshire Fish and Game Department Nongame and Endangered Wildlife Environmental Review Program by phone at 603-271-2461 and by email at NHFGreview@wildlife.nh.gov. Email subject line: NHB23-3372, PROJECT NAME, Wildlife Species Observation.
    - Photographs of the observed species and nearby elements of habitat or areas of land disturbance shall be provided to NHF&G in digital format at the above email address for verification as feasible;
    - In the event a threatened or endangered species is observed on the project site during the term of the permit, the species shall not be disturbed, handled, or harmed in any way prior to consultation with NHF&G and implementation of corrective actions recommended by

NHF&G, if any, to assure the project does not appreciably jeopardize the continued existence of threatened and endangered species as defined in Fis 1002.04;

- The NHF&G, including its employees and authorized agents, shall have access to the property during the term of the permit.

Stormwater Management Report:

General

16. Total proposed impervious land cover is low, doesn't appear the approx. 800 square foot typical driveways are accounted for in the modeling, please verify and add if not.
17. Use a minimum impervious area of 3,000 square feet per lot, which is based on 30% impervious for the median lot size of approximately 10,000 square feet.

Project Narrative

18. Pursuant to Env-Wq 1504.09(a), please add to the narrative a discussion of how the proposed development will impact the wetlands on the site.

Site Specific Soil Survey

19. Pursuant to Env-Wq 1504.13(f), the Site Specific Soil Survey Report shall be stamped and signed by the soil scientist.

Color Soil Maps

20. Pursuant to Env-Wq 1504.09(b)(3), the Color Soil Map shall be stamped and signed by the soil scientist.

Infiltration Feasibility Report

21. Pursuant to Env-Wq 1504.13(d), the SHWT shall be observed and described by a certified soil scientist or subsurface designer. Please add Diane Pantermoller's credentials or indicate another qualified individual that was present.
22. Pursuant to Env-Wq 1504.14(b), because the soil is classified as Deerfield, the design infiltration rate shall be determined by the field measurement method.
23. Pursuant to Env-Wq 1504.13(c), please dig additional test pits or borings in each infiltration basin location (missing for Basins 1 & 2). Additionally, because infiltration is proposed on each lot, please add test pits or borings in the middle of the parcel to get representative coverage across the entire parcel, at a minimum one each in Lots 2 and 8.

Pre-Development Drainage Map

24. Please extend the topographic data north to Merrimack Street to fully assess existing drainage conditions. It appears there are two potential low spots along the northern edge of the parcel through which flow leaves the project area. One is at the sewer easement near 32 Merrimack Street, and the other is at the break in the tree line at 28 Merrimack Street. Further, please assess how to include the localized depression (closed contour 114) behind 28 Merrimack Street as well as the high spot behind 32 Merrimack Street, into the pre-development drainage analysis.

Attachment "F"

Post-Development Drainage Map

25. Please revise following updates to the pre-development condition.
26. Please show proposed lot grading in order to verify post-development drainage conditions function as shown.

Inspection and Maintenance (I&M) Manual:

27. Please provide correspondence from the Town that they will accept the Inspection and Maintenance responsibilities.

Revisions:

28. Pursuant to Env-Wq 1503.15(b), changes to the revised plans are to be called out and a revision date must be added to each page that has been changed. Graphical revision callouts should be included on the plans. If any changes to the project documents were made other than those identified above, please indicate what additional changes were made in your response letter.

Electronic Files:

29. Pursuant to Env-Wq 1503.15(e), provide, in electronic format, a copy of all project documents that were modified in response to the request for more information. As a separate document, provide a copy of the complete application with all documents current to reflect any modifications from the original application.

Please be aware that pursuant to RSA 485-A:17, **all the information requested above must be provided in a single and complete response within the next 120 days, by June 21, 2024, or your application will be denied**. Please include the file number on your response to this request, as well as a narrative of the changes from the current application. If you have any questions, please call me at (603) 271-1087 or email at: Jeffrey.W.Price@des.nh.gov.

Sincerely,

Jeffrey W. Price, PE
Alteration of Terrain Bureau

cc: Cory Mason, Greenman-Pedersen, Inc. (cmason@gpinet.com)
Town of Hudson (bdubowik@hudsonnh.gov, bgradert@hudsonnh.gov)
Lower Merrimack River Local Advisory Committee (fmurphy@shaheengordon.com)

Attachment "G"

TOWN OF HUDSON

Conservation Commission

William Collins, Chairman Dave Morin, Selectmen Liaison

12 School Street • Hudson, New Hampshire 03051 • Tel: 603-886-6008 • Fax: 603-816-1291

Motion to Recommend Conditional Use Application Approval

Date: January 08, 2024

Application: Campbello Street Extension
36 Campbello Street
Map 165, Lot 049

Description of work to be performed: The proposed project entails subdividing a 4.74 acre lot into 11 single family house lots, extending the existing Campbello Street roadway which terminates into a Cul-de-Sac and constructing three storm water infiltration features. As presented the applicant is proposing a permanent wetland buffer impact of approximately 4,500 square feet where the majority of which will effect the wetland buffer along the easterly side of proposed Lot 6.

In brief, on December 16, 2023 members of the Hudson Conservation Commission along with applicant representatives visited the property located at 36 Campbello Street to review the proposed areas where wetland buffer areas would be impacted. It was noted during the site walk that the proposed construction area is currently maintained as an open field which is mowed on a regular basis. The topography of the land is very flat with very little change in elevation from west to east or North to South. The wetland feature on the east side of the property drains southerly along Webster Street into a larger wetland complex that then flows into the Merrimack River. At proposed Lots 5 and 6 a significant area of standing water was observed indicating well saturated soils and slow evaporation rates. Typical wetland and wetland buffer vegetation at these locations was non-existent as both the applicant’s property and the abutting neighbor’s properties the wetland buffers were being mowed on a regular basis. As this project will create a significant amount of impervious surfaces and after site review it is the opinion of the Conservation Commission that careful consideration should be given to restoring the wetland buffer areas at proposed lot 5 and 6 to aid in Stormwater filtration, infiltration and to enhance evaporation rates to minimize flooding which would be a potential concern during extended rain events.

Members Present during the site walk: Carl Murphy, Ken Dickinson, William Collins, Linda Krisciunas

Applicant Representatives present: David Jordan, Greenman-Pedersen, Inc. And Manny Sousa Jr. Sousa Realty and Development Corp.

Conservation Members Stepping Down: None

Alternates Seated: Linda Krisciunas

Commission member Ken Dickinson moved to Recommend approval of the Conditional Use Application filed on behalf of A. Jack Atkinson, Trustee by representatives of Greenman-Pedersen, Inc. and Sousa Realty & Development Corp. for the purpose of constructing Stormwater Infiltration Basins to meet storm water treatment requirements which will permanently impact 4,500 square feet of wetland buffer along the back of proposed Lot 6 at the property located at 36 Campbello Street map 165, Lot 049 with the following stipulations as noted below.

1. During Construction and restoration erosion control barriers shall be installed and maintained to the satisfaction of the Town Engineer.
2. It is recommended that the outflow from Outlet Apron noted as FES-1 shown on sheet 7 of 16 of the plan set be redirected into Infiltration Basin-3.
3. It is recommended that the applicant create and implement a wetland buffer restoration plan for the disturbed buffer areas existing on the easterly side of proposed Lot 5 and Lot 6 as part of site plan approval. The details and implementation of said Restoration Plan to be added to the General Notes and Legend found on sheet 2 of 16 of the plan set.
4. It is recommended to have the applicant install approved "Do not cut/Do Not Disturb town conservation markers along the conservation districts boundaries. Furthermore, Post and Rail fence sections could be erected and maintained to aid in delineating the wetland buffer boundary as is typical on other excepted residential developments. If this recommendation is accepted by the Planning Board details of the Do Not Cut/ Do Not Disturb Markers and Post and Rail Fencing shall be added to the General Notes and Legend found on sheet 2 of 16 of the plan set.
5. It is recommended that efforts be made to save three trees on the site. One Japanese Red Maple tree lies in the middle of the proposed roadway but could be relocated and incorporated into the landscaping of the Cul-de-Sac Island. The other two trees to be saved lie near Infiltration Basin-1 and Infiltration Basin-2, careful excavation to minimize tree root damage could be implemented during their construction.

Second By: Commission member Carl Murphy

Vote: Favorable: 5 Unfavorable: 0 Abstaining: 0

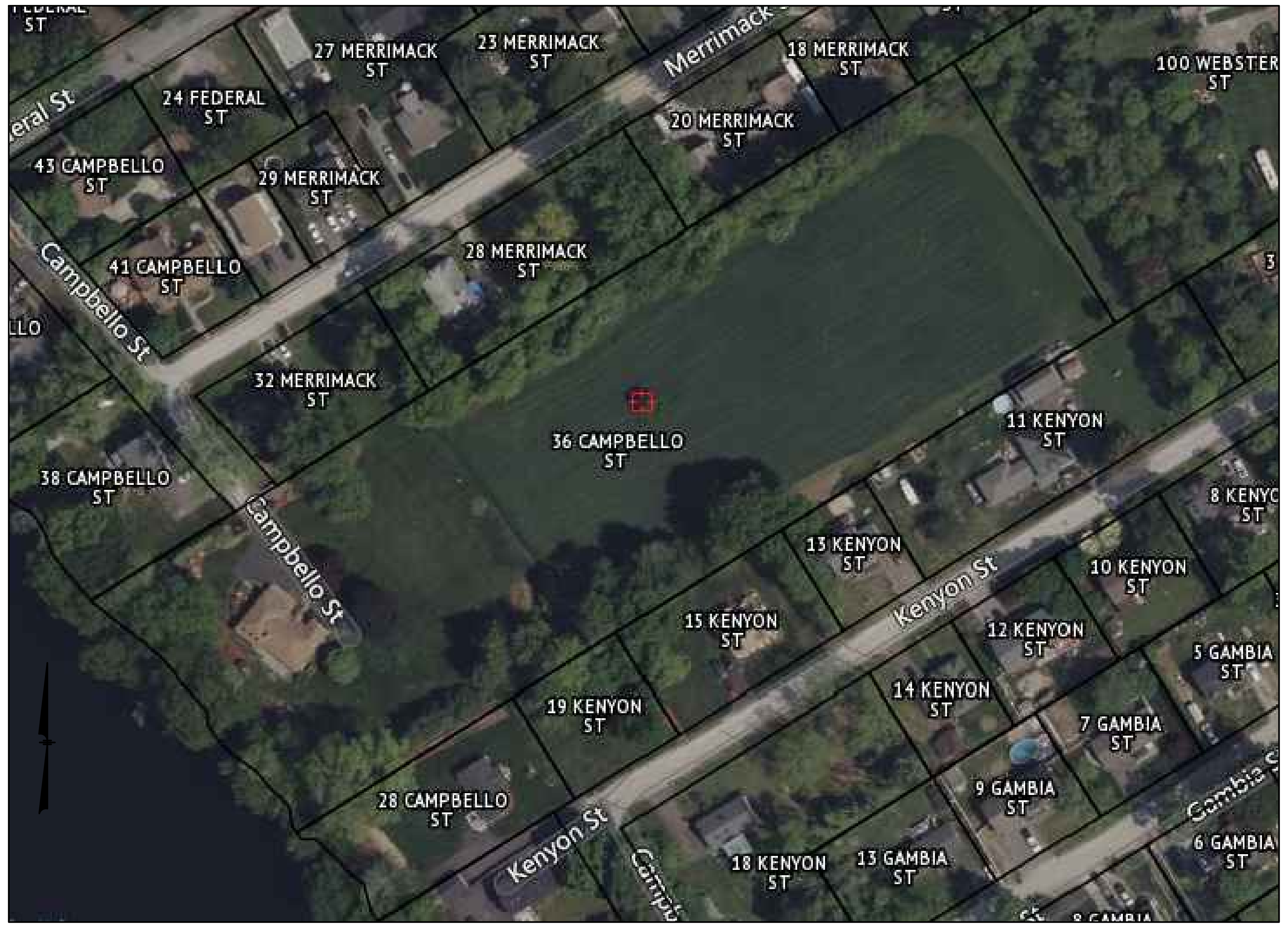
Dissention Reason(s): (see below) **n/a**

William G Collins

William Collins, Chairman

SITE PLAN
CAMPBELLO STREET

ASSESSORS MAP 165 LOT 49
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE



LOCATION MAP
1"=100'

Prepared for:
SOUSA REALTY & DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ABUTTERS:

MAP/LOT #	NAME & ADDRESS
165-049 (SUBJECT PARCEL)	A. JACK ATKINSON REVOCABLE TRUST AGREEMENT OF FEBRUARY 25, 1983 A. JACK ATKINSON, TRUSTEE 36 CAMPBELLO STREET HUDSON, NH 03051
165-050	EDWARD J. WELSH II TRUSTEE JOYCE M. WELSH TRUSTEE 38 CAMPBELLO STREET HUDSON, NH 03051
165-048	JOSELITO MANGUAL DANIEL R. JOWDERS 32 MERRIMAKC STREET HUDSON, NH 03051
165-047	ROBERT A. MILLER SYLVIA E. MILLER 28 MERRIMACK STREET HUDSON, NH 03051
165-046	RICHARD H. MORROW 20 MERRIMACK STREET HUDSON, NH 03051
165-044 165-045 165-073 165-074	CHESTER E. HURD TRUSTEE JOYCE M. HURD TRUSTEE 18 MERRIMACK STREET HUDSON, NH 03051
165-039	DONALD R. FITZGERALD LISA Y. FITZGERALD 100 WEBSTER STREET HUDSON, NH 03051
165-036	JOHN R. COLBY SONYA J. COLBY 11 KENYON STREET HUDSON, NH 03051
165-035	CYNTHIA TUTON JOHN TUTON 13 KENYON STREET HUDSON, NH 03051
165-034	FABIAN GALINDO TRUJILLO ROSALVA GALINDO 15 KENYON STREET HUDSON, NH 03051
165-033 165-032	WILLIAM R. KILLINGSWORTH JOAN E. KILLINGSWORTH 28 CAMPBELLO STREET HUDSON, NH 03051

APPROVED BY THE HUDSON, NH PLANNING BOARD
DATE OF MEETING: ____________________________
SIGNATURE____________________________________DATE__________________
SIGNATURE____________________________________DATE__________________

SITE PLANS ARE VALID FOR TWO YEARS FROM THE DATE OF PLANNING BOARD MEETING FINAL APPROVAL. FINAL ALL SHEETS APPROVAL COMMENCES AT THE PLANNING BOARD MEETING DATE AT WHICH THE PLAN ACHIEVES FINAL APPROVAL.

SHEET INDEX

0 100 200 300 400
SCALE: 1" = 100'

PERMITS AND APPROVALS

TYPE	PERMIT NUMBER	DATE:
NH DES ALTERATION OF TERRAIN	#2024–00179	
NH DES SHORELAND	#240123–011	
NH DES SEWER CONNECTION		

GPI
Engineering
Design
Planning
Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

PREPARED FOR
SOUSA REALTY & DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

STATE OF NEW HAMPSHIRE
DAVID R. JORDAN
No. 7778
LICENSED PROFESSIONAL ENGINEER
4/16/24

REVISIONS		
3	REV. SHEETS 2, 4-7	4/15/24
4	REV. FOR SITE PLAN SUBMISSION	4/2/24
3	REV. TITLE	4/2/24
2	REV. SHEETS 1-16, ADD SIGHT LINE PLAN	3/1/24
1	REV. SHEET 2	1/4/24
NO.	REVISION	DATE

NOVEMBER 20, 2023

DRAWN/DESIGN BY: CNM
CHECKED BY: DRJ

TITLE SHEET

SCALE: 1"=100'
PROJECT NO. NEX-2300191

1 OF 16

F:\Projects\NEX-2300191 – Hudson, NH – Sousa Realty\CAD Files\2300191_CVR.dwg COVER 4/16/24 8:13am ssimon

LEGEND

SGC	SLOPED GRANITE CURB
VGC	VERTICAL GRANITE CURB
SCC	SLOPED CONCRETE CURB
VCC	VERTICAL CONCRETE CURB
CCB	CAPE COD BERM
DSLY	DOUBLE SOLID LINE YELLOW
DDLY	DOUBLE DASHED LINE YELLOW
SDLY	SINGLE DASHED LINE YELLOW
SSLY	SINGLE SOLID LINE YELLOW
SSLW	SINGLE SOLID LINE WHITE
SDLW	SINGLE DASHED LINE WHITE
—— G ——	GAS LINE
—— T ——	UNDERGROUND TELEPHONE
—— W ——	WATER LINE
—— E ——	UNDERGROUND ELECTRIC
—□——□—	WOOD GUARDRAIL
—∘——∘—	METAL GUARDRAIL
—∘——∘—	CHAIN LINK FENCE
—□——□—	STOCKADE FENCE
—//—//—//—	POST & RAIL FENCE
—— x ——	WIRE FENCE
— —90— —	CONTOUR ELEVATION
✿ ✹	TREE
	UTILITY POLE
——<	GUY WIRE
—— · · ——	OVERHEAD WIRE
⌒⌒⌒⌒⌒	TREELINE
⊠ PB	PULL BOX
	SIGN
× 98.69	SPOT ELEVATION
Ⓓ	DRAIN MANHOLE
□	CATCH BASIN
RD	ROOF DRAIN
CO	CLEANOUT
Ⓥ	VENT
Ⓢ	SEWER MANHOLE
Ⓣ	TELEPHONE MANHOLE
Ⓔ	ELECTRIC MANHOLE
Ⓦ	WATER MANHOLE
MH	MANHOLE
⋈ GV ⋈	GAS VALVE
GSO	GAS SHUT OFF
⋈ WV ⋈	WATER VALVE
WSO	WATER SHUT OFF
	FIRE HYDRANT
∘	BOLLARD
GM	GAS METER
EM	ELECTRIC METER
⊕	MONITORING WELL
☼	LIGHT POLE
●	BORING
●—●—●—●—●	WETLAND LINE
—— · · · ——	WATER FEATURE
—— U/C&T ——	UNDERGROUND COMM
—— · · · — · · · ——	DITCH LINE
—— – – ——	EASEMENT LINE
———	PROPERTY LINE
———	ABUTTER PROPERTY LINE
------------	BUILDING SETBACK
• • • • • • • • •	SOIL TYPE LINE
—— – – ——	ZONE LINE
—— —— ——	FLOOD ZONE LINE
TBR	TO BE REMOVED
- x x x x x x	TO BE REMOVED
①	NUMBER OF PARKING SPACES
T.D.	TIP DOWN CURB
═══	PROP. SLOPED GRANITE CURB (SGC)
C.O.	PROP. CLEANOUT
RG–1 ●	PROP. RAIN GUARDIAN
CB–1 ▦	PROP. CATCH BASIN
DMH–1 Ⓓ	PROP. DRAIN MANHOLE
MEG ——x	MEET EXISTING GRADE
331.25 ——x	PROP. SPOT ELEVATION
——(300)——	PROP. CONTOUR ELEVATION
TW=	TOP OF WALL ELEV.
BW=	BOTTOM OF WALL ELEV.
G.B.	GRADE BREAK
TP	TEST PIT
——⋈——	PROP. GATE VALVE
—△——△—	PROP. STRAW WATTLE

APPROVED BY THE HUDSON, NH PLANNING BOARD

DATE OF MEETING: ______________________________

SIGNATURE_____________________________________DATE__________________

SIGNATURE_____________________________________DATE__________________

SITE PLANS ARE VALID FOR TWO YEARS FROM THE DATE OF PLANNING BOARD MEETING FINAL APPROVAL. FINAL ALL SHEETS APPROVAL COMMENCES AT THE PLANNING BOARD MEETING DATE AT WHICH THE PLAN ACHIEVES FINAL APPROVAL.

PROJECT NOTES:

1) THE PURPOSE OF THIS PLAN IS TO SHOW AN 11–UNIT SINGLE FAMILY RESIDENTIAL DEVELOPMENT ON MAP 165 LOT 49. THE PROPOSED ROADWAY SHOWN ON THIS PLAN IS INTENDED TO BE PRIVATE.

2) ZONING DISTRICT: TOWN RESIDENCE (TR)

3) EXISTING LOT AREA = 206.400 SF
= 4.74 Ac.±

4) OWNER OF RECORD:

A. JACK ATKINSON REVOCABLE TRUST AGREEMENT OF FEBRUARY 25, 1983
A. JACK ATKINSON, TRUSTEE
36 CAMPBELLO STREET
HUDSON, NH 03051
BOOK 9180 PAGE 1549

2) THIS PLAN IS THE RESULT OF AN ON–THE–GROUND FIELD SURVEY PERFORMED BY THIS OFFICE BETWEEN AUGUST 4, 2023 AND AUGUST 10, 2023.

3) BEARINGS SHOWN HEREON ARE BASED ON NAD83 PER GPS OBSERVATIONS PERFORMED BY THIS OFFICE ON AUGUST 4, 2023.

4) ELEVATIONS SHOWN HEREON ARE BASED ON NAVD88 PER GPS OBSERVATIONS PERFORMED BY THIS OFFICE ON AUGUST 4, 2023.

5) LOCATION OF UNDERGROUND UTILITIES IS APPROXIMATE ONLY. ADDITIONAL UNDERGROUND UTILITIES OTHER THAN THOSE SHOWN MAY BE ENCOUNTERED. INVERTS ARE LISTED IN A CLOCKWISE DIRECTION ENDING WITH THE INVERT OUT (UNLESS OTHERWISE NOTED).

6) A PORTION OF THE SURVEY TRACT IS LOCATED IN A SPECIAL FLOOD HAZARD AREA ZONE AE (1% CHANCE ANNUAL FLOOD) PER FLOOD INSURANCE RATE MAP NUMBER 33011C0514E, WITH AN EFFECTIVE DATE OF APRIL 18, 2011.

7) FEMA FLOOD BOUNDARIES SHOWN HEREON TAKEN FROM FEMA'S NATIONAL FLOOD HAZARD LAYER GIS DATA.

8) WETLAND LINES SHOWN HEREON DELINEATED BY GOVE ENVIRONMENTAL SERVICES, INC. ON AUGUST 7, 2023.

9) A SITE SPECIFIC SOIL SURVEY WAS CONDUCTED BY GOVE ENVIRONMENTAL SERVICES, INC. ON OCTOBER 3, 2023.

10) THE PROJECT REQUIRES STATE ALTERATION OF TERRAIN (AOT) AND SHORELAND PERMITS FROM NHDES.

CONSTRUCTION NOTES:

1) ALL DRAINAGE PIPE SHALL BE CORRUGATED HIGH–DENSITY POLYETHYLENE PIPE WITH STANDARD JOINTS, DUAL–WALL, SMOOTH INTERIOR, AS MANUFACTURED BY ADS, INC., OR APPROVED EQUAL, UNLESS OTHERWISE NOTED ON PLAN.

2) ELEVATIONS ARE BASED ON NAVD88 DATUM.

3) ANY UTILITY FIELD ADJUSTMENTS SHALL BE APPROVED BY THE ENGINEER OF RECORD AND COORDINATED WITH THE APPROPRIATE LOCAL UTILITY COMPANY.

4) THE LOCATIONS OF UNDERGROUND UTILITIES ARE APPROXIMATE ONLY. THE CONTRACTOR IS TO VERIFY EXACT LOCATION PRIOR TO CONSTRUCTION. THE CONTRACTOR IS TO NOTIFY THE DESIGN ENGINEER OF ANY DISCREPANCIES. CONSTRUCTION SHALL COMMENCE BEGINNING AT THE LOWEST INVERT (POINT OF CONNECTION) AND PROGRESS UP GRADIENT. PROPOSED INTERFACE POINTS (CROSSINGS) WITH EXISTING UNDERGROUND INSTALLATIONS SHALL BE FIELD VERIFIED BY TEST PIT PRIOR TO COMMENCEMENT OF CONSTRUCTION.

5) ALL CONSTRUCTION SHALL CONFORM TO MUNICIPAL DPW AND ALL APPLICABLE STATE AND FEDERAL STANDARDS.

6) THE CONTRACTOR SHALL CALL AND COORDINATE WITH DIG–SAFE (DIAL 811) PRIOR TO COMMENCING ANY EXCAVATION.

7) THIS SITE WILL REQUIRE A USEPA NPDES PERMIT FOR STORMWATER DISCHARGE FOR THE SITE CONSTRUCTION SINCE THE DISTURBANCE EXCEEDS ONE ACRE (ACTUAL DISTURBANCE = 165,000 SF±). THE CONSTRUCTION SITE OPERATOR SHALL DEVELOP AND IMPLEMENT A CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP), WHICH SHALL REMAIN ON SITE AND MADE ACCESSIBLE TO THE PUBLIC. A NOTICE OF INTENT (NOI) SHALL BE FILED WITH THE EPA AT LEAST 14 CALENDAR DAYS PRIOR TO CONSTRUCTION. A COMPLETED NOTICE OF TERMINATION (NOT) SHALL BE SUBMITTED TO THE EPA WITHIN 30 DAYS AFTER EITHER OF THE FOLLOWING CONDITIONS HAVE BEEN MET: FINAL STABILIZATION HAS BEEN ACHIEVED ON ALL PORTIONS OF THE SITE FOR WHICH THE PERMITTEE IS RESPONSIBLE; OR ANOTHER OPERATOR/PERMITTEE HAS ASSUMED CONTROL OVER ALL AREAS OF THE SITE THAT HAVE NOT BEEN FINALLY STABILIZED.

8) ALL TRAFFIC CONTROL AND TEMPORARY CONSTRUCTION SIGNAGE ARRANGEMENTS, ACCEPTABLE TO NHDOT AND THE TOWN DEPARTMENT OF PUBLIC WORKS, SHALL BE EMPLOYED DURING OPERATIONS WITHIN THE PUBLIC RIGHT–OF–WAY.

9) ALL PROPOSED CATCH BASINS SHALL HAVE 4' SUMPS AND OUTLETS EQUIPPED WITH "ELIMINATOR" OIL HOODS OR APPROVED EQUAL.

10) ALL PIPE DATA IS CALCULATED TO CENTER OF STRUCTURE, TYP.

11) CONTRACTOR TO REFER TO THE "INSPECTION AND MAINTENANCE MANUAL FOR STORMWATER MANAGEMENT SYSTEMS" (I&M) FOR SITE MAINTENANCE DURING AND AFTER CONSTRUCTION.

12) THE CONTRACTOR SHALL MAINTAIN EMERGENCY ACCESS TO ALL AREAS AFFECTED BY HIS WORK AT ALL TIMES.

13) ALL EXCAVATIONS SHALL BE THOROUGHLY SECURED ON A DAILY BASIS BY THE CONTRACTOR AT THE COMPLETION OF CONSTRUCTION OPERATIONS IN THE IMMEDIATE AREA.

14) THE CONTRACTOR SHALL STABILIZE ALL DITCHES, SWALES, AND PONDS PRIOR TO DIRECTING STORMWATER RUN–OFF TO THEM.

15) PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL CONFIRM WITH THE ENGINEER THAT HE HAS THE MOST RECENT SET OF PLANS. SITE WORK SHALL BE CONSTRUCTED FROM A COMPLETE SET OF PLANS, NOT ALL FEATURES ARE DETAILED ON EVERY PLAN. THE ENGINEER IS TO BE NOTIFIED OF ANY CONFLICT WITHIN THIS PLAN SET.

16) CONTRACTOR SHALL CONFIRM WITH ENGINEER ALL LAYOUT ITEMS NOT SHOWN OR ANNOTATED. THE LOCATION OF ALL STRUCTURES AND UTILITIES SHALL BE CONFIRMED PRIOR TO LAYOUT OF PAVED AREAS. EXACT LOCATION OF PAVEMENT SHALL BE CONFIRMED WITH ENGINEER PRIOR TO PLACEMENT OF BINDER COURSE PAVEMENT.

CONSTRUCTION NOTES (CONT'D):

17) SEE CONSTRUCTION DETAIL SHEETS FOR ADDITIONAL INFORMATION.

18) ROOF RUNOFF FROM ALL HOMES SHALL BE COLLECTED BY GUTTERS AND DOWNSPOUTS CONNECTED TO STORMTECH CHAMBERS (SEE DETAIL SHEET 13). THE ROOF INFILTRATION UNITS SHALL BE MAINTAINED BY THE HOMEOWNER.

19) ALL WORK SHALL CONFORM TO THE APPLICABLE REGULATIONS AND STANDARDS OF THE TOWN OF HUDSON, AND SHALL BE BUILT IN A WORKMANLIKE MANNER IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS.

20) THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL EROSION AND SEDIMENT CONTROL DEVICES AS SHOWN IN THE PLANS THROUGHOUT THE DURATION OF THE PROJECT IN ACCORDANCE WITH APPLICABLE STANDARDS. THE DETAILS PROVIDED SERVE AS A GUIDE ONLY.

21) CONTRACTOR SHALL VERIFY TBM ELEVATIONS PRIOR TO CONSTRUCTION.

22) THE CONTRACTOR SHALL COORDINATE MATERIALS AND INSTALLATION SPECIFICATIONS WITH THE INDIVIDUAL UTILITY AGENCIES/COMPANIES, AND ARRANGE FOR ALL INSPECTIONS.

23) THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING AND DETERMINING THE LOCATION, SIZE AND ELEVATION OF ALL EXISTING UTILITIES, SHOWN OR NOT SHOWN ON THESE PLANS, PRIOR TO THE START OF ANY CONSTRUCTION. THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY UTILITIES FOUND INTERFERING WITH THE PROPOSED CONSTRUCTION AND APPROPRIATE REMEDIAL ACTION SHALL BE AGREED TO BY THE ENGINEER BEFORE PROCEEDING WITH THE WORK. THE CONTRACTOR SHALL BE RESPONSIBLE TO CONTACT "DIG SAFE" (1–888–344–7233) AT LEAST 72 HOURS BEFORE DIGGING.

24) CONTRACTOR SHALL DISPOSE OF ANY UNSUITABLE MATERIAL ONSITE (I.E. TRASH, STUMPS, ETC.) IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS.

25) STORM DRAINAGE SYSTEM SHALL BE CONSTRUCTED TO LINE AND GRADE AS SHOWN ON THE PLANS. CONSTRUCTION METHODS AND MATERIALS SHALL CONFORM TO TOWN OF HUDSON STANDARDS.

26) ALL RIMS AND GRATES TO BE SET AT FINISH PAVEMENT GRADE REGARDLESS OF STATED RIM ELEVATIONS.

27) THE PROJECT MUST BE MANAGED TO MEET THE REQUIREMENTS AND INTENT OF RSA 430:53 AND AGR 3800 RELATIVE TO INVASIVE SPECIES.

28) ANY TREE STUMPS SHALL EITHER BE GROUND OR REMOVED AND DISPOSED OF AT A SOLID WASTE FACILITY.

29) CONTRACTOR SHALL NOT IMPORT ANY FILL OVER THE AMOUNT OF TEN CUBIC YARDS CUMULATIVE TOTAL PER SOURCE TO ANY JOB SITE IN THE TOWN OF HUDSON WITHOUT SOILS TESTING VERIFYING THE ABSENCE OF ALL CONSTITUENTS OF CONCERN, AND WITHOUT PRIOR APPROVAL BY ENGINEERING DEPARTMENT STAFF. DOCUMENTATION SUCH AS TEST REPORTS, CERTIFICATIONS AND SIEVE ANALYZES OF FILL SHALL BE PROVIDED TO THE ENGINEERING DEPARTMENT FOR APPROVAL PRIOR TO TRANSPORTING THE MATERIAL TO HUDSON.

CONSTRUCTION SEQUENCE:

1) AN ON–SITE PRECONSTRUCTION MEETING SHALL BE HELD WITH THE TOWN ENGINEER OR DESIGNATED REPRESENTATIVE PRIOR TO INITIATING EARTH MOVING ACTIVITIES AND AFTER PERIMETER EROSION CONTROL MEASURES, PROTECTIVE FENCING, WASTE DISPOSAL AND CONSTRUCTION ACCESS PADS HAVE BEEN INSTALLED.

2) INSTALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES AS REQUIRED.

3) CUT AND STUMP AREAS OF PROPOSED CONSTRUCTION.

4) REMOVE AND STOCKPILE TOPSOIL. STOCKPILE SHALL BE SEEDED TO PREVENT EROSION.

5) CONSTRUCT CLOSED DRAINAGE SYSTEM. PROTECT CULVERT INLETS AND CATCH BASINS WITH SEDIMENTATION BARRIERS.

6) PERFORM SITE GRADING, PLACING SEDIMENT CONTROL BARRIERS AS REQUIRED TO CONTROL SOIL EROSION.

7) INSTALL UNDERGROUND UTILITIES.

8) BEGIN TEMPORARY AND PERMANENT SEEDING AND MULCHING. ALL CUT AND FILL SLOPES SHALL BE SEEDED OR MULCHED IMMEDIATELY AFTER THEIR CONSTRUCTION.

9) DAILY, OR AS REQUIRED, CONSTRUCT, INSPECT, AND IF NECESSARY, RECONSTRUCT STRAW WATTLE, COMPOST FILTER SOCK, EROSION CONTROL BLANKET, TEMPORARY BERMS, DRAINS, DITCHES, SEDIMENT CONTROL FENCES AND SEDIMENT TRAPS INCLUDING MULCHING AND SEEDING. REFER TO "INSPECTION AND MAINTENANCE MANUAL FOR STORMWATER MANAGEMENT SYSTEMS" (I&M) FOR ADDITIONAL REQUIREMENTS AND INFORMATION. COPIES OF ALL INSPECTION REPORTS ARE TO BE PROVIDED TO THE CONSERVATION COMMISSION DURING CONSTRUCTION AND AVAILABLE UPON REQUEST AFTER CONSTRUCTION IS COMPLETED.

10) BEGIN EXCAVATION FOR AND CONSTRUCTION OF HOMES.

9) FINISH PAVING ALL ROADWAYS. AFTER PAVING IS INSTALLED, IT SHALL BE SWEPT CLEAN AS NEEDED.

10) COMPLETE PERMANENT SEEDING AND LANDSCAPING.

11) AFTER GRASS HAS BEEN FULLY GERMINATED IN ALL SEEDED AREAS, REMOVE ALL TEMPORARY EROSION CONTROL MEASURES.

TEMPORARY EROSION CONTROL MEASURES:

1) PERIMETER CONTROLS SHALL BE INSTALLED PRIOR TO EARTH MOVING OPERATIONS.

2) TEMPORARY WATER DIVERSION (SWALES, BASINS, ETC.) MUST BE USED AS NECESSARY UNTIL AREAS ARE STABILIZED.

3) PONDS AND SWALES SHALL BE INSTALLED EARLY ON IN THE CONSTRUCTION SEQUENCE (BEFORE ROUGH GRADING THE SITE).

4) ALL DITCHES AND SWALES SHALL BE STABILIZED PRIOR TO DIRECTING RUNOFF TO THEM.

5) DISTURBED SOIL AREAS THAT WILL REMAIN IDLE FOR MORE THAN 30 DAYS SHALL BE TEMPORARILY STABILIZED AS SOON AS PRACTICABLE BUT NO LATER THAN FIVE DAYS FROM THE INITIAL DISTURBANCE WITH SEED AND MULCH, EROSION CONTROL BLANKETS OR CRUSHED STONE OR OTHER SUITABLE MEASURES APPROVED BY THE TOWN ENGINEER OR DESIGNATED REPRESENTATIVE. ALL DISTURBED SOIL AREAS THAT HAVE ACHIEVED FINAL GRADING SHALL BE PERMANENTLY STABILIZED WITHIN THREE DAYS FOLLOWING FINAL GRADING.

6) ALL EROSION CONTROLS SHALL BE INSPECTED WEEKLY AND AFTER EVERY HALF–INCH OF RAINFALL.

7) 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. 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.

8) WINTER CONSTRUCTION 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.
- DISTURBED AREAS THAT WILL REMAIN IDLE OVER THE WINTER PERIOD SHALL EMPLOY WINTER STABILIZATION MEASURES AS DESCRIBED IN SECTION 4–3 OF THE NH STORMWATER MANUAL VOLUME 3, AS AMENDED.

9) 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.

10) SEDIMENT TRAPS SHALL BE INSTALLED AS REQUIRED. BARRIERS AND TRAPS ARE TO BE MAINTAINED AND CLEANED UNTIL ALL SLOPES HAVE A HEALTHY STAND OF GRASS.

11) MULCH SHALL BE MOWINGS OF ACCEPTABLE HERBACEOUS GROWTH, FREE FROM NOXIOUS WEEDS OR WOODY STEMS, AND SHALL BE DRY. NO SALT HAY SHALL BE USED.

12) FILL MATERIAL SHALL BE FREE FROM STUMPS, WOOD, ROOTS, ETC.

13) STOCKPILED MATERIALS SHALL BE PLACED ONLY IN AREAS SHOWN ON THE PLANS. STOCKPILES SHALL BE PROTECTED BY SEDIMENT CONTROL FENCE AND SEEDED TO PREVENT EROSION. THESE MEASURES SHALL REMAIN UNTIL ALL MATERIAL HAS BEEN PLACED OR DISPOSED OFF SITE.

14) ALL DISTURBED AREAS SHALL BE LOAMED AND SEEDED. A MINIMUM OF 6 INCHES OF LOAM SHALL BE INSTALLED WITH NOT LESS THAN ONE POUND OF SEED PER 50 SQUARE YARDS OF AREA.

15) SEED MIX SHALL BE EQUAL PARTS OF RED FESCUE (CREEPING), KENTUCKY BLUEGRASS, REDTOP, PERENNIAL RYEGRASS.

16) PAVED ROADWAYS MUST BE KEPT CLEAN AT ALL TIMES. PROVIDE SWEEPING ON A DAILY BASIS OR AS DIRECTED BY THE TOWN.

17) ALL CATCH BASIN INLETS WILL BE PROTECTED WITH INLET PROTECTION – SEE DETAIL.

18) ALL DEWATERING OPERATIONS MUST DISCHARGE DIRECTLY INTO A SEDIMENT FILTER AREA.

19) AFTER ALL DISTURBED AREAS HAVE BEEN STABILIZED THE TEMPORARY EROSION CONTROL MEASURES ARE TO BE REMOVED.

INSPECTION & MAINTENANCE PLAN FOR STORMWATER SYSTEM:

CONSTRUCTION PHASE:

1) THE CONTRACTOR IS TO INSTALL AND MAINTAIN DRAINAGE FACILITIES AS SHOWN ON THE SITE PLANS BY GREENMAN–PEDERSEN, INC.

2) PRIOR TO CONSTRUCTION, ALL EROSION/SEDIMENT CONTROL CONTROL DEVICES SHOWN ON ABOVE PLAN ARE TO BE INSTALLED. TO PREVENT SEDIMENT CONTROL INTRUSION INTO SURROUNDING AREAS DURING CONSTRUCTION, THE CONTRACTOR IS TO SET SEDIMENT CONTROL FENCING AT ALL SLOPES WHICH MAY ERODE IN THE DIRECTION OF ANY OPEN DRAINAGE FACILITIES OR ABUTTING PROPERTY. SUCH PREVENTIVE MEASURES ARE TO BE MAINTAINED THROUGHOUT THE CONSTRUCTION PROCESS.

3) ALL CONSTRUCTION OF DRAINAGE FACILITIES IS TO BE INSPECTED BY INSPECTORS FROM THE TOWN OF HUDSON AND BY AN AUTHORIZED AGENT TO VERIFY CONFORMANCE TO THE DESIGN PLAN.

4) THE SEQUENCE OF DRAINAGE CONSTRUCTION SHALL BE AS FOLLOWS:

A) CLEAR, GRUB, EXCAVATE AREAS FOR STORMWATER BASINS.

B) INSTALL CATCH BASINS, PIPES AND MANHOLES.

5) ALL EXPOSED SOILS SHALL BE IMMEDIATELY STABILIZED WITH A LAYER OF MULCH HAY.

6) UPON INSTALLATION OF CATCH BASINS, INLET PROTECTION – AS DESCRIBED ON AFOREMENTIONED PLAN – SHALL BE INSTALLED AND MAINTAINED UNTIL READY FOR PAVING.

7) PRIOR TO CONSTRUCTION OF IMPERVIOUS AREAS, ALL DRAINAGE STRUCTURES AND PIPES SHALL BE INSTALLED AND INSPECTED FOR PROPER FUNCTION. DURING CONSTRUCTION OF OTHER SITE FEATURES, ALL DRAINAGE FACILITIES SHALL BE INSPECTED ON A DAILY BASIS AND CLEANED/REPAIRED IMMEDIATELY UPON DISCOVERY OF SEDIMENT BUILD–UP OR DAMAGE.

8) INSPECTIONS ARE TO BE PERFORMED AND INSPECTION LOGS FILLED OUT IN ACCORDANCE WITH US EPA CGP REQUIREMENTS FROM THE START OF CONSTRUCTION THROUGH FINAL STABILIZATION. THE START OF CONSTRUCTION MEANS THE INITIAL DISTURBANCE OF SOILS ASSOCIATED WITH CONSTRUCTION. FINAL STABILIZATION MEANS 85% VEGETATIVE GROWTH FOR UNPAVED AREAS.

POST CONSTRUCTION PHASE:

SEE "INSPECTION AND MAINTENANCE MANUAL FOR STORMWATER MANAGEMENT SYSTEMS" (I&M) PREPARED BY GREENMAN–PEDERSEN, INC.

GPI Engineering Design Planning Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

PREPARED FOR
SOUSA REALTY &
DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49

36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

DAVID R. JORDAN
No. 7778
4/16/24

REVISIONS		
4	REV. PER TOWN COMMENTS	4/15/24
3	REV. FOR SITE PLAN SUBMISSION	4/2/24
2	REVISE NOTES	3/1/24
1	REVISE NOTES	1/4/24
NO.	REVISION	DATE

NOVEMBER 20, 2023

DRAWN/DESIGN BY: CNM
CHECKED BY: DRJ

GENERAL NOTES AND LEGEND

SCALE: NOT TO SCALE

PROJECT NO. NEX-2300191

2 OF 16

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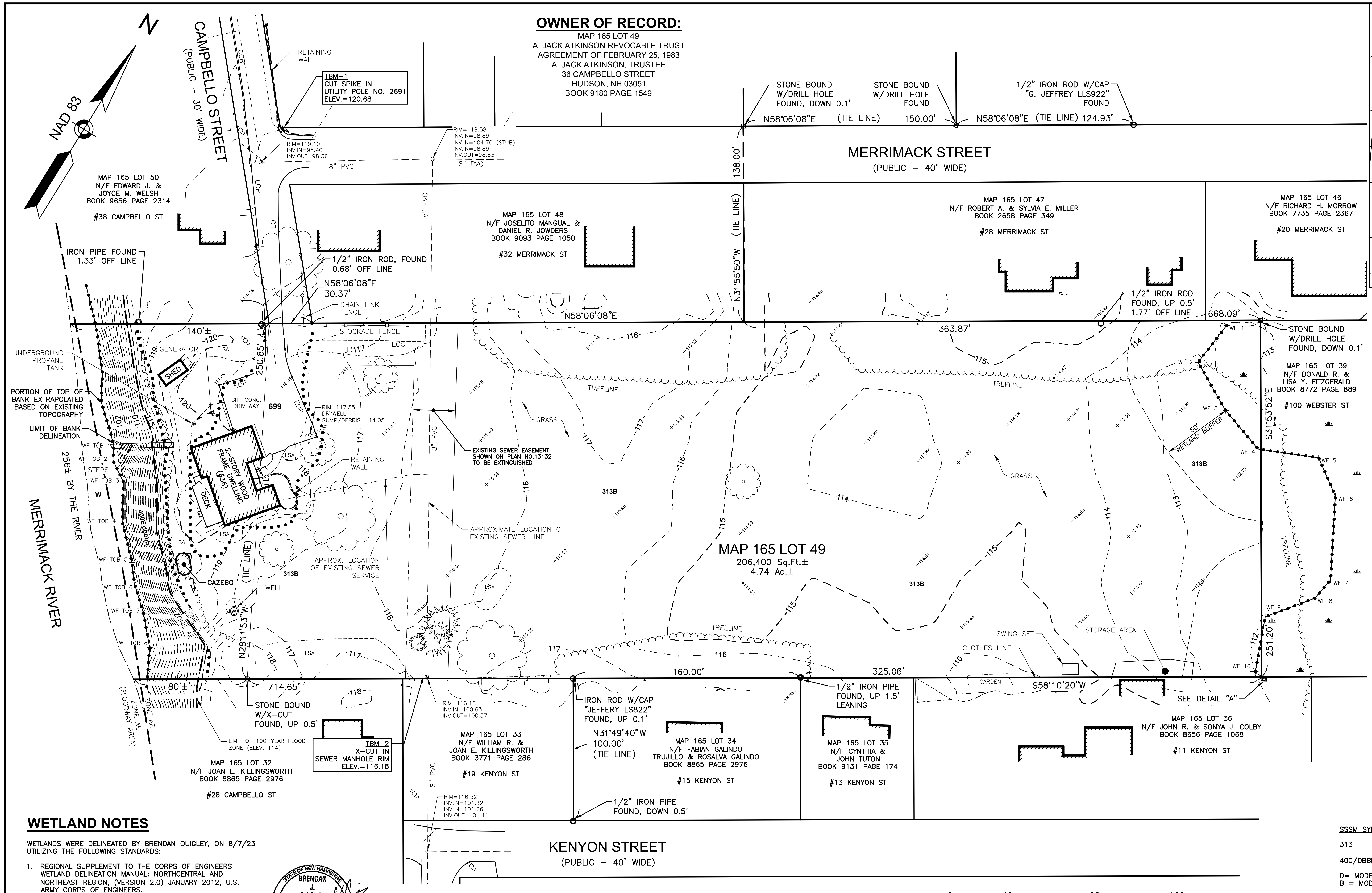
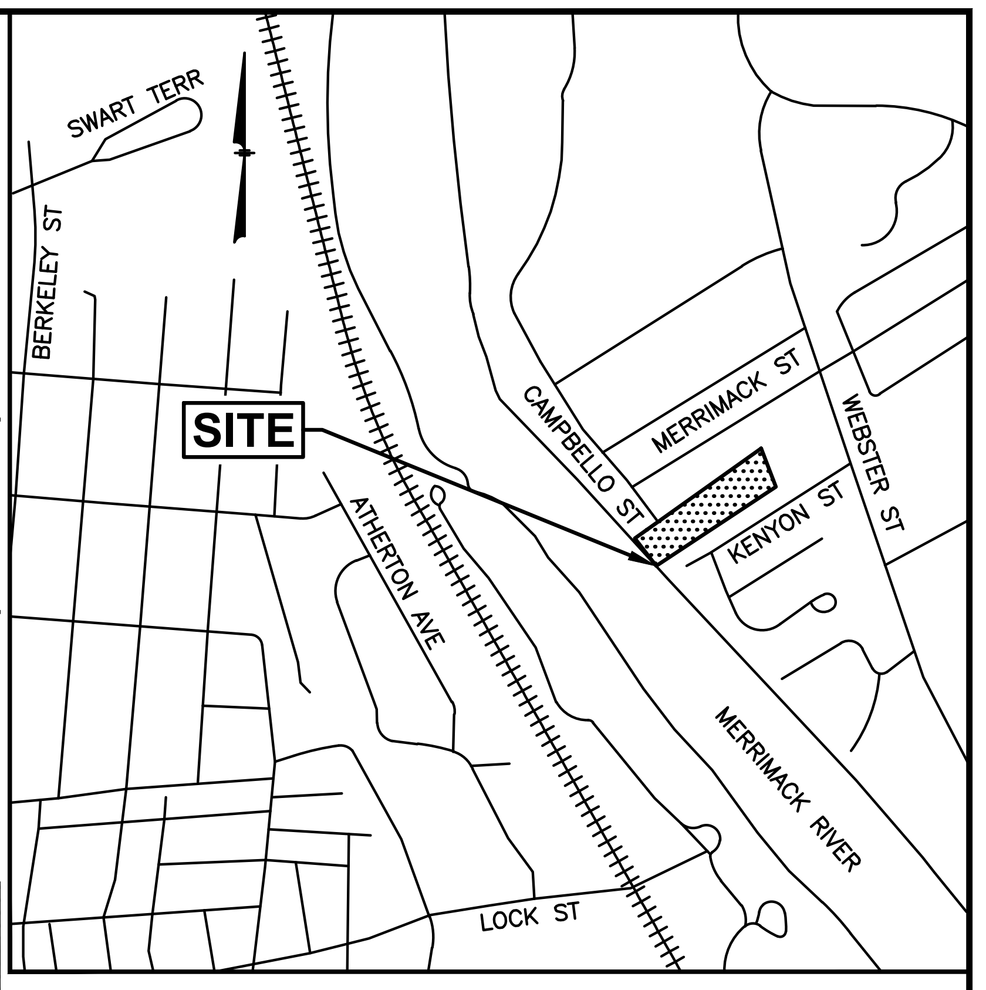


OWNER OF RECORD:

MAP 165 LOT 49
A. JACK ATKINSON REVOCABLE TRUST
AGREEMENT OF FEBRUARY 25, 1983
A. JACK ATKINSON, TRUSTEE
36 CAMPBELLO STREET
HUDSON, NH 03051
BOOK 9180 PAGE 1549



LOCATION MAP

(1"=1000')

NOTES:

1) ZONE: TOWN RESIDENTIAL DISTRICT (TR)
   MIN. LOT SIZE: 10,000 Sq.Ft.
   MIN. LOT FRONTAGE: 90 Ft.
   SETBACKS:
   FRONT 30 Ft.
   SIDE 15 Ft.
   REAR 15 Ft.
   REFER TO THE TOWN OF HUDSON ZONING ORDINANCE FOR VERIFICATION, ADDITIONAL RESTRICTIONS AND PERMITTED USES. THE ZONING INFORMATION SHOWN HEREON IS BASED ON A REVIEW OF THE HUDSON ZONING ORDINANCE.

2) THIS PLAN IS THE RESULT OF AN ON–THE–GROUND FIELD SURVEY PERFORMED BY THIS OFFICE BETWEEN AUGUST 4, 2023 AND AUGUST 10, 2023.

3) BEARINGS SHOWN HEREON ARE BASED ON NAD83 PER GPS OBSERVATIONS PERFORMED BY THIS OFFICE ON AUGUST 4, 2023.

4) ELEVATIONS SHOWN HEREON ARE BASED ON NAVD88 PER GPS OBSERVATIONS PERFORMED BY THIS OFFICE ON AUGUST 4, 2023.

5) LOCATION OF UNDERGROUND UTILITIES IS APPROXIMATE ONLY. ADDITIONAL UNDERGROUND UTILITIES OTHER THAN THOSE SHOWN MAY BE ENCOUNTERED. INVERTS ARE LISTED IN A CLOCKWISE DIRECTION ENDING WITH THE INVERT OUT (UNLESS OTHERWISE NOTED).

6) A PORTION OF THE SURVEY TRACT IS LOCATED IN A SPECIAL FLOOD HAZARD AREA (100 YEAR FLOOD) PER FLOOD INSURANCE RATE MAP NUMBER 33011C0514E, WITH AN EFFECTIVE DATE OF APRIL 18, 2011.

7) FEMA FLOOD BOUNDARIES SHOWN HEREON TAKEN FROM FEMA'S NATIONAL FLOOD HAZARD LAYER GIS DATA.

8) WETLAND LINES SHOWN HEREON DELINEATED BY GOVE ENVIRONMENTAL SERVICES, INC. ON AUGUST 7, 2023.

SOIL MAPPING NOTES

THIS MAP PRODUCT IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOIL SURVEY. IT IS A SPECIAL PURPOSE PRODUCT, INTENDED FOR INFILTRATION REQUIREMENTS BY THE NH DES ALTERATION OF TERRAIN BUREAU. IT WAS PRODUCED BY A PROFESSIONAL SOIL SCIENTIST, AND IS NOT A PRODUCT OF THE USDA NATURAL RESOURCES CONSERVATION SERVICE. THERE IS A REPORT THAT ACCOMPANIES THIS MAP.

THE SITE SPECIFIC SOIL MAP (SSSM) WAS PRODUCED 10–03–2023, AND WAS PREPARED BY JAMES P. GOVE, CSS # 004, GOVE ENVIRONMENTAL SERVICES, INC. THE SURVEY AREA IS LOCATED AT 36 CAMPBELLO STREET, HUDSON, NH.

SOILS WERE IDENTIFIED WITH THE NEW HAMPSHIRE STATE–WIDE NUMERICAL SOILS LEGEND, USDA NRCS, DURHAM, NH. ISSUE # 10, JANUARY 2011. THE NUMERIC LEGEND WAS AMENDED TO IDENTIFY THE CORRECT SOIL COMPONENTS OF THE COMPLEX.

HYDROLOGIC SOIL GROUP FROM KSAT VALUES FOR NEW HAMPSHIRE SOILS, SOCIETY OF SOIL SCIENTISTS OF NEW ENGLAND, SPECIAL PUBLICATION NO. 5, SEPTEMBER, 2009.

SSSM SYM.	SSSM MAP NAME	HISS SYM.	HYDROLOGIC SOIL GRP.
313	DEERFIELD LOAMY SAND	311	B
400/DBBBB	UDORTHENTS, SANDY	361	B

D= MODERATELY WELL DRAINED, B = GLACIAL SANDS, B = BOULDERY SURFACE, B = MODERATE KSAT, B = HYDROLOGIC GROUP B

SSSM SYM.	SSSM MAP NAME	HISS SYM.	HYDROLOGIC SOIL GRP.
699	URBAN LAND	N/A	IMPERVIOUS
W	WATER		

SLOPE PHASE:

0–8% – B 8–15% – C 15–25% – D 25%+ – E

SOIL SURVEY PERFORMED

JAMES P. GOVE
No. 004
10-03-2023

BY

GOVE ENVIRONMENTAL SERVICES, INC.
8 CONTINENTAL DR., BLDG 2, UNIT H, EXETER, NH 03833–7507

WETLAND NOTES

WETLANDS WERE DELINEATED BY BRENDAN QUIGLEY, ON 8/7/23 UTILIZING THE FOLLOWING STANDARDS:

1. REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: NORTHCENTRAL AND NORTHEAST REGION, (VERSION 2.0) JANUARY 2012, U.S. ARMY CORPS OF ENGINEERS.
2. FIELD INDICATORS OF HYDRIC SOILS IN THE UNITED STATES, A GUIDE FOR IDENTIFYING AND DELINEATING HYDRIC SOILS, VERSION 8.2. UNITED STATES DEPARTMENT OF AGRICULTURE (2018).
3. NEW ENGLAND HYDRIC SOILS TECHNICAL COMMITTEE. 2020 VERSION 4, FIELD INDICATORS FOR IDENTIFYING HYDRIC SOILS IN NEW ENGLAND. NEW ENGLAND INTERSTATE WATER POLLUTION CONTROL COMMISSION, LOWELL, MA.
4. U.S. ARMY CORPS OF ENGINEERS NATIONAL WETLAND PLANT LIST, VERSION 3.5. (2020)
5. CLASSIFICATION OF WETLANDS AND DEEPWATER HABITATS OF THE UNITED STATES, USFW MANUAL FWS/OBS–79/31 (1979).

BRENDAN J. QUIGLEY
No. 249
11-28-23

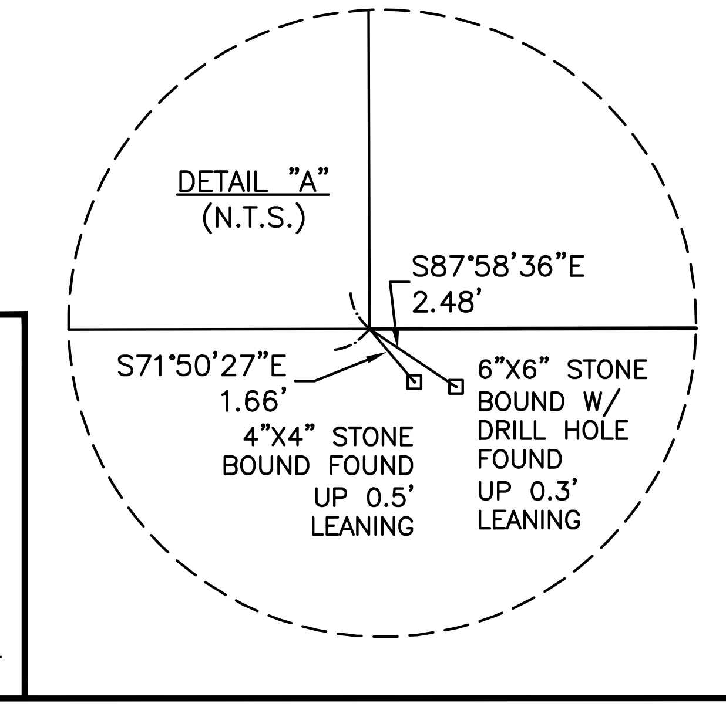
APPROVED BY THE HUDSON, NH PLANNING BOARD

DATE OF MEETING: ____________________

SIGNATURE____________________DATE__________

SIGNATURE____________________DATE__________

SITE PLANS ARE VALID FOR TWO YEARS FROM THE DATE OF PLANNING BOARD MEETING FINAL APPROVAL. FINAL ALL SHEETS APPROVAL COMMENCES AT THE PLANNING BOARD MEETING DATE AT WHICH THE PLAN ACHIEVES FINAL APPROVAL.



LEGEND

CCB	CAPE COD BERM	(MH)	MANHOLE
— G —	GAS LINE	WV ⋈	WATER VALVE
— T —	UNDERGROUND TELEPHONE	WSO	WATER SHUT OFF
— W —	WATER LINE	HYD	FIRE HYDRANT
— E —	UNDERGROUND ELECTRIC	○	BOLLARD
—○—○—	CHAIN LINK FENCE	GM	GAS METER
—□—□—	STOCKADE FENCE	EM	ELECTRIC METER
— —90— —	CONTOUR ELEVATION	⊕	MONITORING WELL
	TREE	☼	LIGHT POLE
	UTILITY POLE	⊕	BORING
——<	GUY WIRE	●—●—●—●	WETLAND LINE
—— · · ——	OVERHEAD WIRE	—— · · · ——	WATER FEATURE
⌒⌒⌒⌒	TREELINE	—— – – ——	EASEMENT LINE
	SIGN	━━━━	PROPERTY LINE
×98.69	SPOT ELEVATION	———	ABUTTER PROPERTY LINE
□	CATCH BASIN	- - - - - -	BUILDING SETBACK
Ⓢ	SEWER MANHOLE	━ ━ ━	FLOOD ZONE LINE
313B	SOIL CLASSIFICATION	• • • • • •	SOIL BOUNDARY

0 40 100 160

SCALE: 1" = 40'

CERTIFICATION:

I CERTIFY THAT THIS SURVEY AND PLAN WAS PREPARED BY ME OR THOSE UNDER MY DIRECT SUPERVISION AND THAT THIS PLAN IS THE RESULT OF AN ACTUAL SURVEY PERFORMED ON THE GROUND IN AUGUST 2023 AND HAS AN ERROR OF CLOSURE OF NOT MORE THAN ONE PART IN TEN THOUSAND.

STATE OF NEW HAMPSHIRE
No. 1019
SCOTT M. L'ITALIEN
LICENSED LAND SURVEYOR

4/2/2024

SCOTT M. L'ITALIEN, LLS #1019 DATE

PLAN REFERENCES:

HILLSBOROUGH COUNTY REGISTRY OF DEEDS

1) PLAN NO. 13132
2) PLAN NO. 407
3) PLAN NO. 511
4) PLAN NO. 12135
5) PLAN NO. 13134
6) PLAN NO. 13218
7) PLAN NO. 25875
8) PLAN NO. 30647
9) PLAN NO. 31388
10) PLAN NO. 39078

GPI Engineering
Design
Planning
Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
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Salem, NH 03079

PREPARED FOR
SOUSA REALTY &
DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49

36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

STATE OF NEW HAMPSHIRE
No. 1019
SCOTT M. L'ITALIEN
LICENSED LAND SURVEYOR
4/2/2024

REVISIONS

NO.	REVISION	DATE
2.	REV. FOR SITE PLAN SUBMISSION	4/2/24
1.	MISC. REVISIONS	3/1/24

NOVEMBER 20, 2023

DRAWN/DESIGN BY	CHECKED BY
KAC	SML

EXISTING CONDITIONS PLAN

SCALE: 1"=40'

PROJECT NO. NEX-2300191

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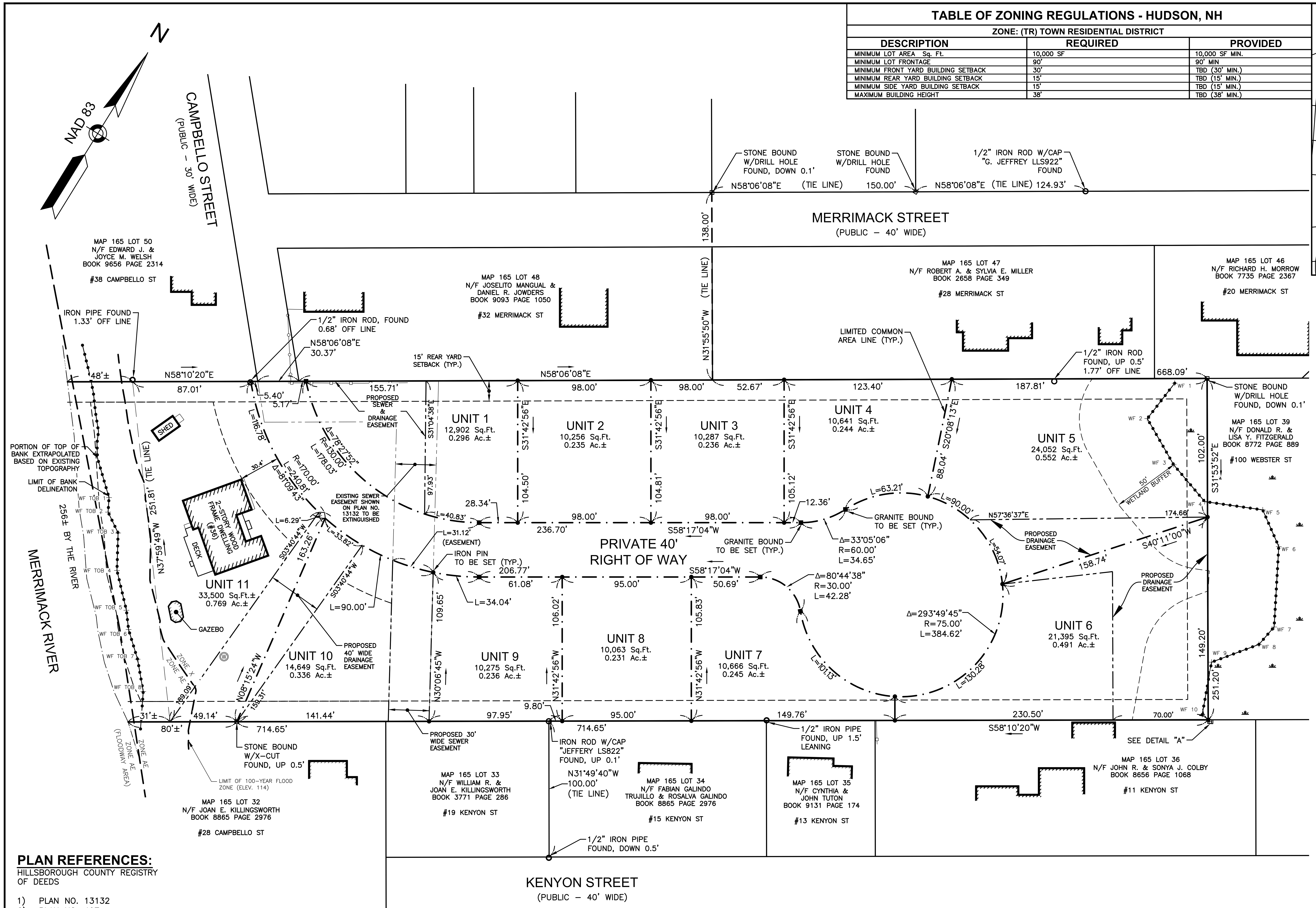
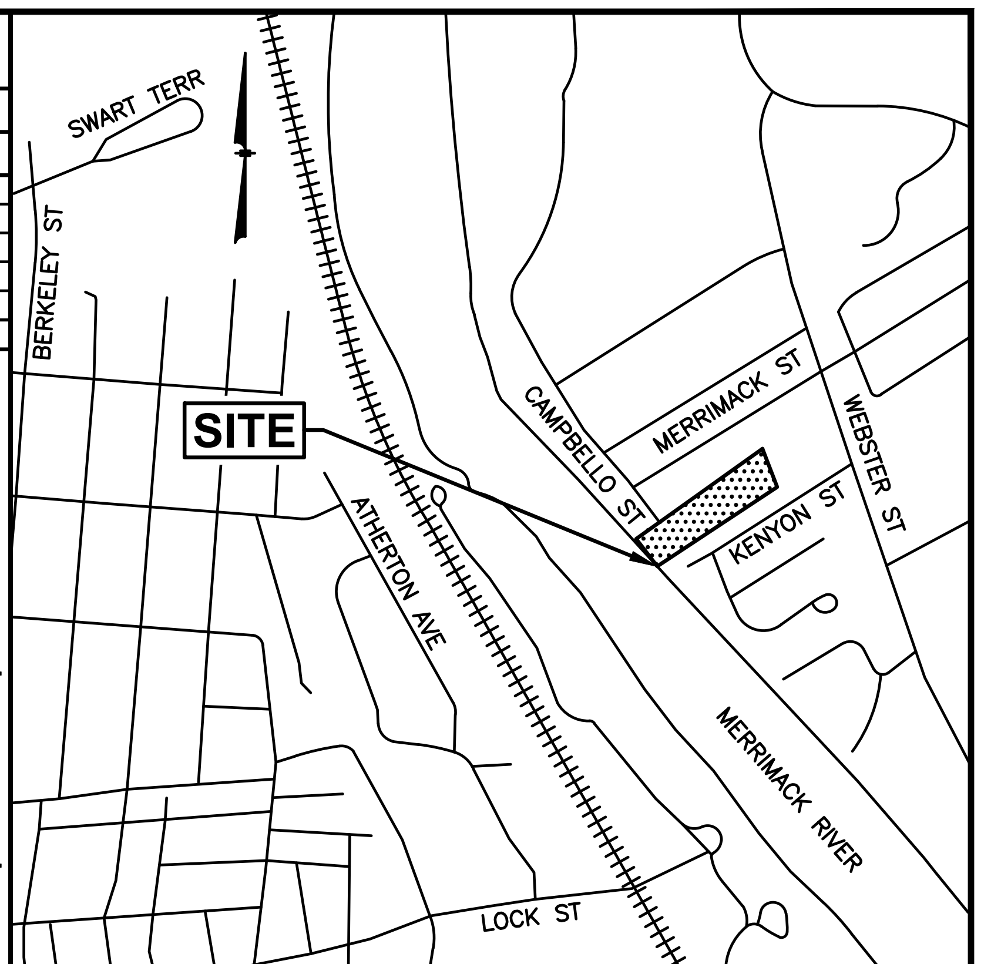


TABLE OF ZONING REGULATIONS - HUDSON, NH

ZONE: (TR) TOWN RESIDENTIAL DISTRICT

DESCRIPTION	REQUIRED	PROVIDED
MINIMUM LOT AREA Sq. Ft.	10,000 SF	10,000 SF MIN.
MINIMUM LOT FRONTAGE	90'	90' MIN
MINIMUM FRONT YARD BUILDING SETBACK	30'	TBD (30' MIN.)
MINIMUM REAR YARD BUILDING SETBACK	15'	TBD (15' MIN.)
MINIMUM SIDE YARD BUILDING SETBACK	15'	TBD (15' MIN.)
MAXIMUM BUILDING HEIGHT	38'	TBD (38' MIN.)



LOCATION MAP
(1"=1000')

NOTES:

1) ZONE: TOWN RESIDENTIAL DISTRICT (TR)

REFER TO THE TOWN OF HUDSON ZONING ORDINANCE FOR VERIFICATION, ADDITIONAL RESTRICTIONS AND PERMITTED USES. THE ZONING INFORMATION SHOWN HEREON IS BASED ON A REVIEW OF THE HUDSON ZONING ORDINANCE.

2) THIS PLAN IS THE RESULT OF AN ON-THE-GROUND FIELD SURVEY PERFORMED BY THIS OFFICE BETWEEN AUGUST 4, 2023 AND AUGUST 10, 2023.

3) BEARINGS SHOWN HEREON ARE BASED ON NAD83 PER GPS OBSERVATIONS PERFORMED BY THIS OFFICE ON AUGUST 4, 2023.

4) ELEVATIONS SHOWN HEREON ARE BASED ON NAVD88 PER GPS OBSERVATIONS PERFORMED BY THIS OFFICE ON AUGUST 4, 2023.

5) LOCATION OF UNDERGROUND UTILITIES IS APPROXIMATE ONLY. ADDITIONAL UNDERGROUND UTILITIES OTHER THAN THOSE SHOWN MAY BE ENCOUNTERED. INVERTS ARE LISTED IN A CLOCKWISE DIRECTION ENDING WITH THE INVERT OUT (UNLESS OTHERWISE NOTED).

6) A PORTION OF THE SURVEY TRACT IS LOCATED IN A SPECIAL FLOOD HAZARD AREA (100 YEAR FLOOD) PER FLOOD INSURANCE RATE MAP NUMBER 33011C0514E, WITH AN EFFECTIVE DATE OF APRIL 18, 2011.

7) FEMA FLOOD BOUNDARIES SHOWN HEREON TAKEN FROM FEMA'S NATIONAL FLOOD HAZARD LAYER GIS DATA.

8) WETLAND LINES SHOWN HEREON DELINEATED BY GOVE ENVIRONMENTAL SERVICES, INC. ON AUGUST 7, 2023.

9) THE EXISTING SEWER EASEMENT SHOWN ON HCRD PLAN NO. 13132 IS BEING MODIFIED AND REPLACED WITH THE EASEMENTS AS SHOWN ON THIS PLAN.

10) ALL GRANITE BOUNDS TO BE SET SHALL BE 4"X4"X3'.

11) THE PROPOSED RIGHT OF WAY SHOWN HEREON IS INTENDED TO TO REMAIN A PRIVATE WAY.

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Salem, NH 03079

PREPARED FOR
SOUSA REALTY &
DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

OWNER OF RECORD:

MAP 165 LOT 49
A. JACK ATKINSON
REVOCABLE TRUST AGREEMENT OF
FEBRUARY 25, 1983
A. JACK ATKINSON, TRUSTEE
36 CAMPBELLO STREET
HUDSON, NH 03051
BOOK 9180 PAGE 1549

REVISIONS

NO.	REVISION	DATE
3.	REV. PER TOWN COMMENTS	4/15/24
2.	REV. FOR SITE PLAN SUBMISSION	4/2/24
1.	MISC. REVISIONS	3/1/24

NOVEMBER 20, 2023

DRAWN/DESIGN BY	CHECKED BY
KAC	SML

UNIT LAYOUT PLAN

SCALE: 1"=40'

PROJECT NO. NEX-2300191

4 OF 16

PLAN REFERENCES:

HILLSBOROUGH COUNTY REGISTRY OF DEEDS

1) PLAN NO. 13132
2) PLAN NO. 407
3) PLAN NO. 511
4) PLAN NO. 12135
5) PLAN NO. 13134
6) PLAN NO. 13218
7) PLAN NO. 25875
8) PLAN NO. 30647
9) PLAN NO. 31388
10) PLAN NO. 39078

APPROVED BY THE HUDSON, NH PLANNING BOARD

DATE OF MEETING:______________________

SIGNATURE______________________DATE______________

SIGNATURE______________________DATE______________

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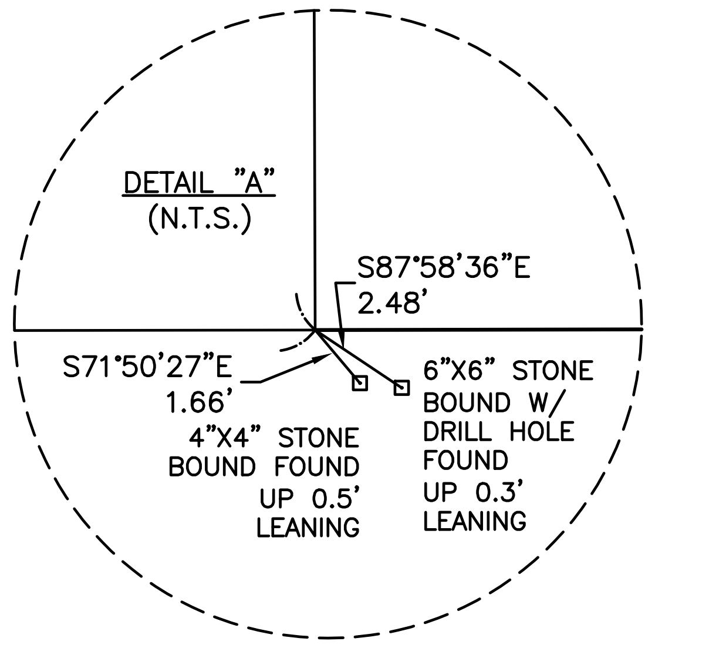

LEGEND

CCB	CAPE COD BERM
—○—○—	CHAIN LINK FENCE
—□—□—	STOCKADE FENCE
●●●●●●	WETLAND LINE
— · · · —	WATER FEATURE
— – – —	EASEMENT LINE
——	PROPERTY LINE
▬ · ▬ · ▬	LIMITED COMMON AREA LINE
——	ABUTTER PROPERTY LINE
- - - - -	BUILDING SETBACK
▬ ▬ ▬	FLOOD ZONE LINE
(CBA)	CONTIGUOUS BUILDABLE AREA
■	GRANITE BOUND W/ DRILL HOLE TO BE SET
●	IRON PIN TO BE SET

CERTIFICATION:

I CERTIFY THAT THIS SURVEY AND PLAN WAS PREPARED BY ME OR THOSE UNDER MY DIRECT SUPERVISION AND THAT THIS PLAN IS THE RESULT OF AN ACTUAL SURVEY PERFORMED ON THE GROUND IN AUGUST 2023 AND HAS AN ERROR OF CLOSURE OF NOT MORE THAN ONE PART IN TEN THOUSAND.

STATE OF NEW HAMPSHIRE LAND LICENSED SURVEYOR
No. 1019
SCOTT M. L'ITALIEN

Scott L'Italien 4/15/2024

SCOTT M. L'ITALIEN, LLS #1019 DATE

0 40 100 160
SCALE: 1" = 40'

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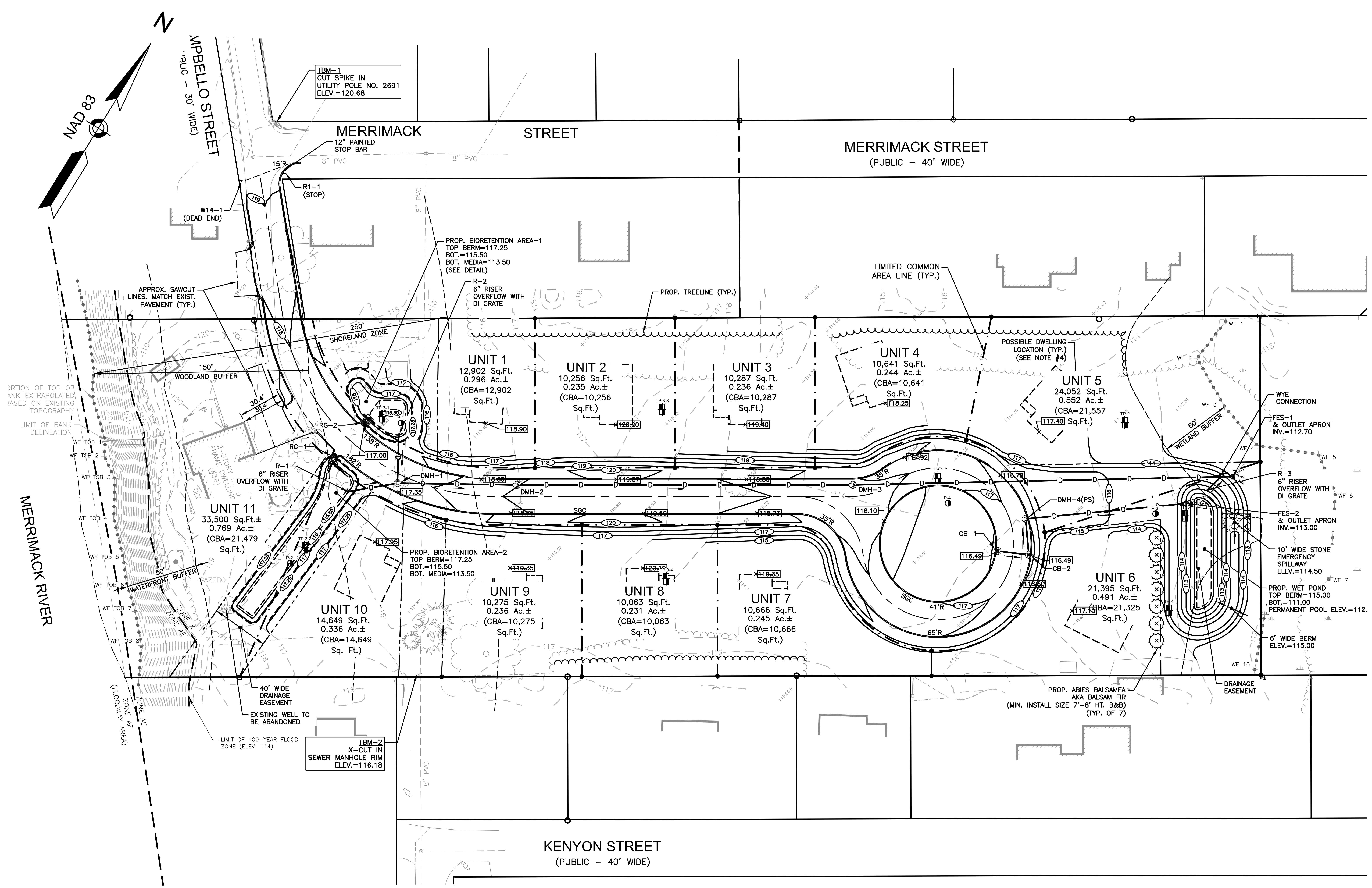

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NOTES:

1) SEE SHEET 2 FOR NOTES AND LEGEND INFORMATION.
2) SEE SHEETS 9 AND 10 FOR CROSS–SECTIONS.
3) SEE SHEETS 11 THRU 16 FOR CONSTRUCTION DETAILS.
4) THE SIZE AND LOCATION OF THE FUTURE DWELLINGS IS APPROXIMATE ONLY AND IS SUBJECT TO CHANGE.

DRAINAGE PIPE SCHEDULE

FROM: STRUCTURE NUMBER	PIPE SIZE (INCHES)	TYPE OF PIPE	APPROX. PIPE LENGTH (FEET)	SLOPE OF PIPE (FT./FT.)	TO: STRUCTURE NUMBER
CB–1	12	HDPE	22	0.005	CB–2
CB–2	12	HDPE	25	0.006	DMH–4(PS)
DMH–1	12	HDPE	83	0.004	DMH–2
DMH–2	12	HDPE	235	0.004	DMH–3
DMH–3	12	HDPE	266	0.004	FES–1
DMH–4(PS)	12	HDPE	113	0.005	FES–2
R–1	6	DI	35	0.007	DMH–1
R–2	6	DI	34	0.004	DMH–1
R–3	6	DI	13	0.004	WYE

DRAINAGE STRUCTURES

CB–1*
RIM=116.49
INV.OUT=114.00

CB–2*
RIM=116.49
INV.IN=113.90(CB–1)
INV.OUT=113.80

DMH–1*
RIM=117.47
INV.IN=115.55(R–2)
INV.IN=115.55(R–1)
INV.OUT=115.45

DMH–2
RIM=118.95
INV.IN=115.10(DMH–1)
INV.OUT=115.00

DMH–3
RIM=118.18
INV.IN=113.97(DMH–2)
INV.OUT=113.87

DMH–4(PS)
RIM=116.55
INV.IN=113.65(CB–2)
INV.OUT=113.55

RG–1
RIM=117.00

RG–2
RIM=117.00

FES–1
INV.=112.70

FES–2
INV.=113.00

R–1
GRATE = 116.50
INV. = 115.80

R–2
GRATE = 116.75
INV. = 115.70

R–3
GRATE = 114.50
INV. = 112.75

* DENOTES LOW PROFILE FRAME, COVER AND TOP SLAB

RG DENOTES RAIN GUARDIAN TURRET (SEE DETAIL)

(PS) DENOTES FIRST DEFENSE FD–4HC HYDRODYNAMIC PARTICLE SEPARATOR OR APPROVED EQUAL. (SEE DETAIL)

0 40 100 160
SCALE: 1" = 40'

APPROVED BY THE HUDSON, NH PLANNING BOARD
DATE OF MEETING:________________________________
SIGNATURE___________________________________DATE________________
SIGNATURE___________________________________DATE________________

SITE PLANS ARE VALID FOR TWO YEARS FROM THE DATE OF PLANNING BOARD MEETING FINAL APPROVAL. FINAL ALL SHEETS APPROVAL COMMENCES AT THE PLANNING BOARD MEETING DATE AT WHICH THE PLAN ACHIEVES FINAL APPROVAL.

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44 Stiles Road, Suite One
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PREPARED FOR
SOUSA REALTY &
DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

DAVID R. JORDAN
No. 7778
4/16/24

REVISIONS

NO.	REVISION	DATE
3	REV. PER TOWN COMMENTS	4/15/24
2	REV. FOR SITE PLAN SUBMISSION	4/2/24
1	MISC. REVISIONS	3/1/24

NOVEMBER 20, 2023

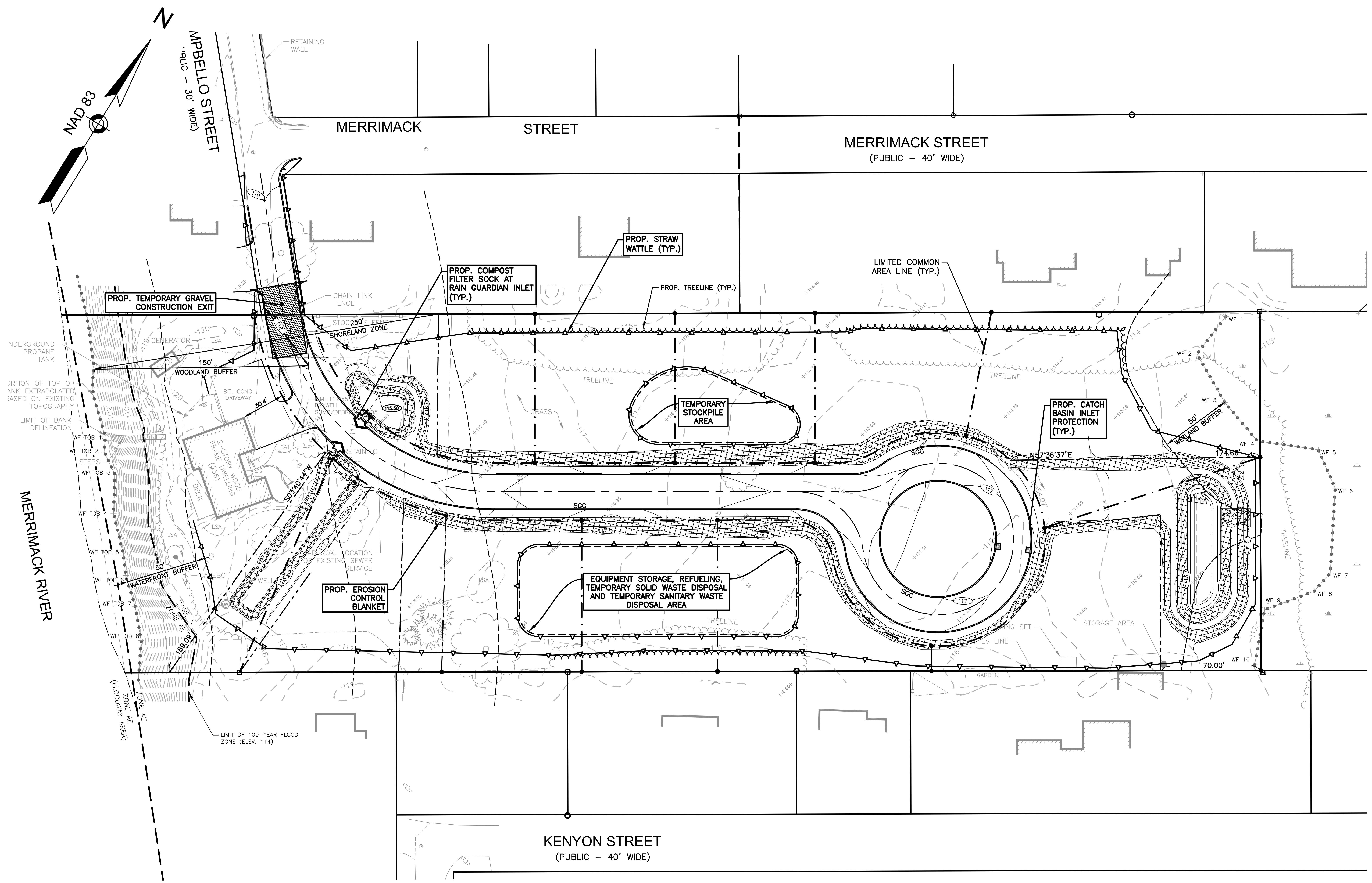
DRAWN/DESIGN BY	CHECKED BY
CNM	DRJ

GRADING & DRAINAGE PLAN

SCALE:
1"=40'

PROJECT NO.
NEX-2300191

5 OF 16



NOTES:

1) SEE SHEET 2 FOR NOTES AND LEGEND INFORMATION.
2) SEE SHEETS 11 THRU 16 FOR CONSTRUCTION DETAILS.

0 40 100 160
SCALE: 1" = 40'

APPROVED BY THE HUDSON, NH PLANNING BOARD
DATE OF MEETING: ______________________
SIGNATURE______________________ DATE__________
SIGNATURE______________________ DATE__________

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HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49

36 CAMPBELLO STREET HUDSON, NEW HAMPSHIRE

DAVID R. JORDAN
No. 7778
4/16/24

REVISIONS

NO.	REVISION	DATE
3	REV. PER TOWN COMMENTS	4/15/24
2	REV. FOR SITE PLAN SUBMISSION	4/2/24
1	MISC. REVISIONS	3/1/24

NOVEMBER 20, 2023

DRAWN/DESIGN BY	CHECKED BY
CNM	DRJ

EROSION & SEDIMENT CONTROL PLAN

SCALE:
1"=40'

PROJECT NO.
NEX-2300191

6 OF 16

APPROVED BY THE HUDSON, NH PLANNING BOARD

DATE OF MEETING: ______________________________

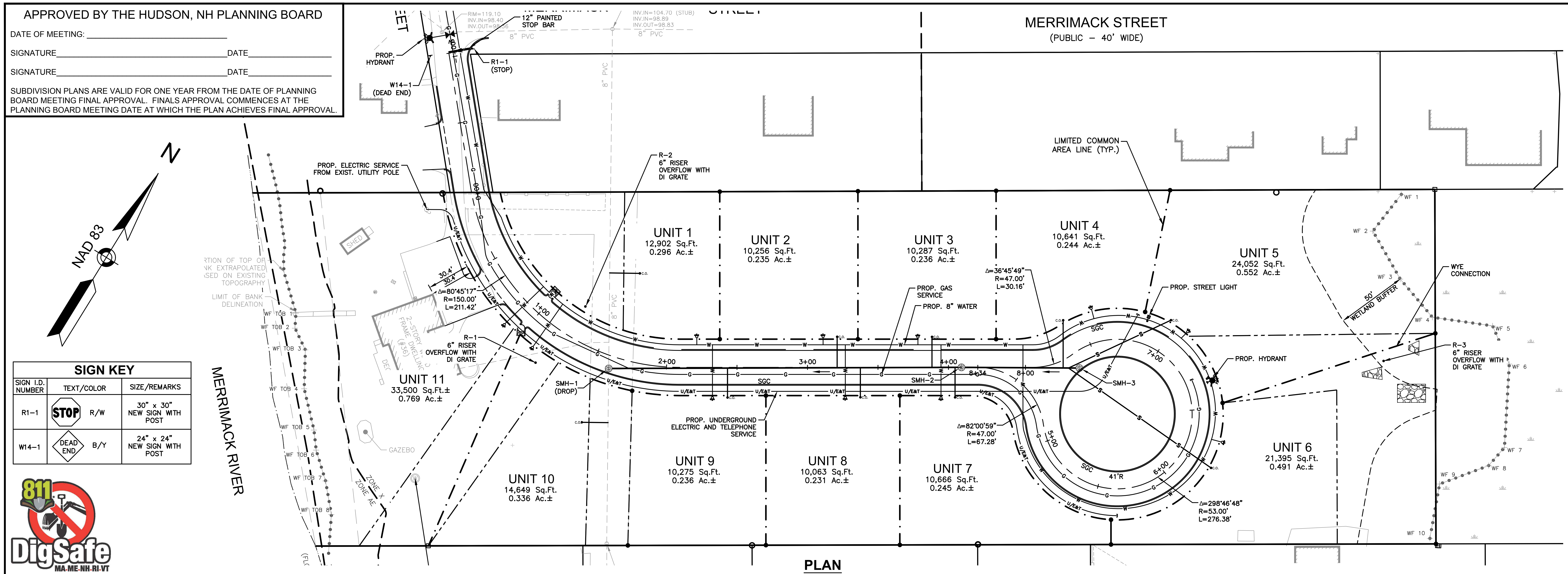
SIGNATURE______________________________DATE______________

SIGNATURE______________________________DATE______________

SUBDIVISION PLANS ARE VALID FOR ONE YEAR FROM THE DATE OF PLANNING BOARD MEETING FINAL APPROVAL. FINALS APPROVAL COMMENCES AT THE PLANNING BOARD MEETING DATE AT WHICH THE PLAN ACHIEVES FINAL APPROVAL.

SIGN KEY

SIGN I.D. NUMBER	TEXT/COLOR	SIZE/REMARKS
R1–1	STOP R/W	30" x 30" NEW SIGN WITH POST
W14–1	DEAD END B/Y	24" x 24" NEW SIGN WITH POST



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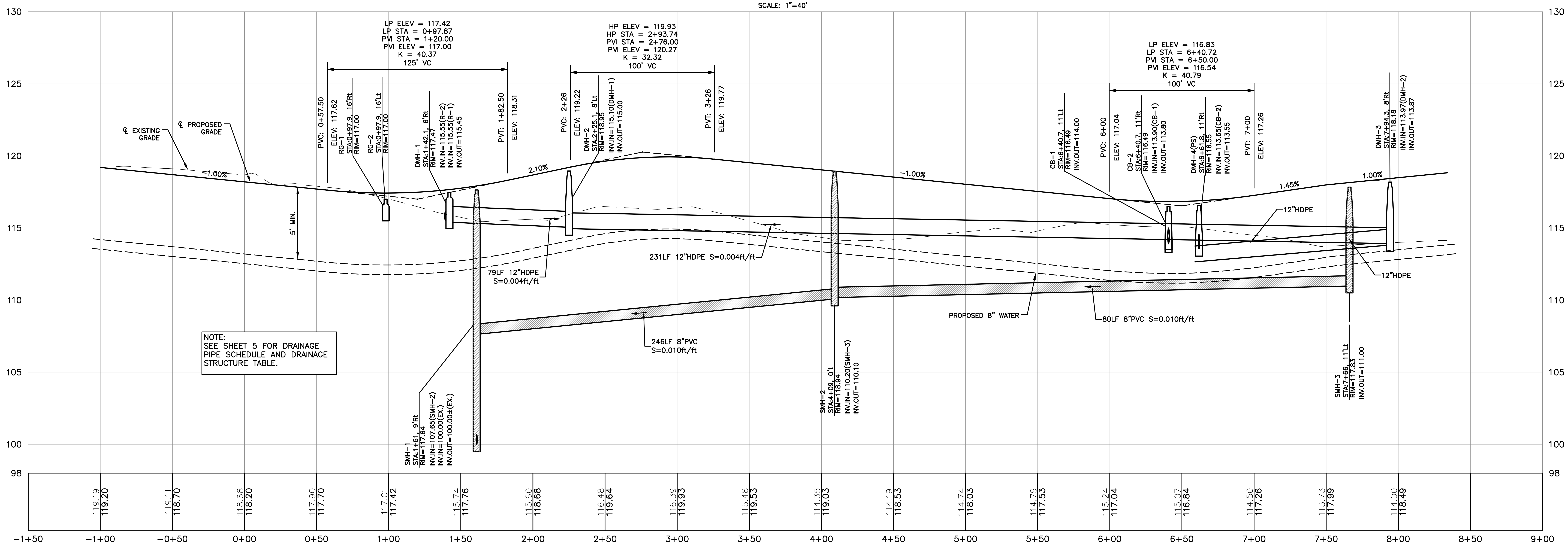
PLAN

SCALE: 1"=40'



NOTE:
SEE SHEET 5 FOR DRAINAGE PIPE SCHEDULE AND DRAINAGE STRUCTURE TABLE.

PROFILE

SCALE: 1"=40'H/4'V

0 40 100 160

SCALE: 1" = 40'

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HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49

36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

STATE OF NEW HAMPSHIRE
DAVID R. JORDAN
No. 7778
LICENSED PROFESSIONAL ENGINEER
4/16/24

REVISIONS

NO.	REVISION	DATE
3	REV. PER TOWN COMMENTS	4/15/24
2	REV. FOR SITE PLAN SUBMISSION	4/2/24
1	MISC. REVISIONS	3/1/24

NOVEMBER 20, 2023

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CNM	DRJ

ROADWAY PLAN & PROFILE

SCALE: 1"=40'

PROJECT NO. NEX-2300191

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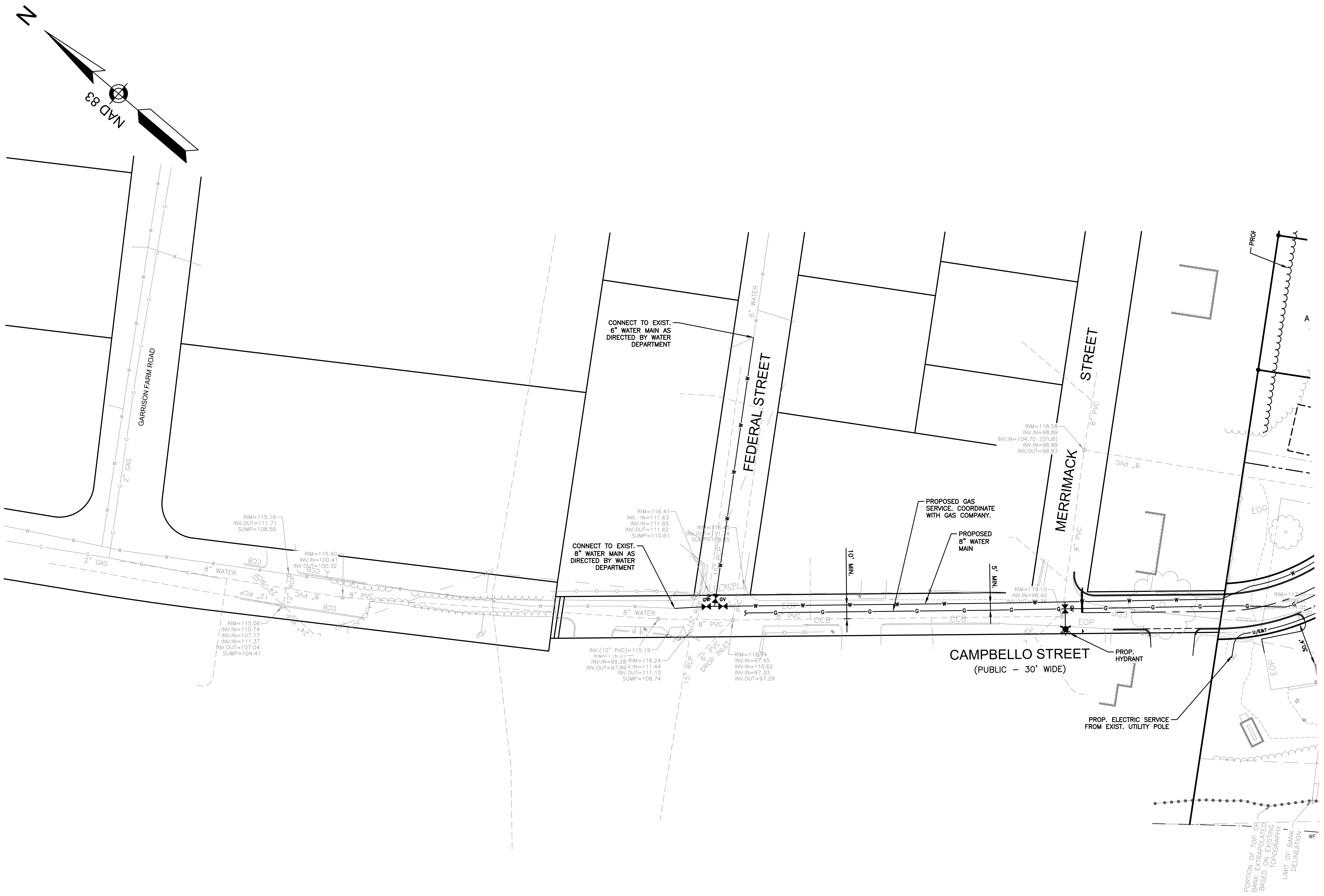

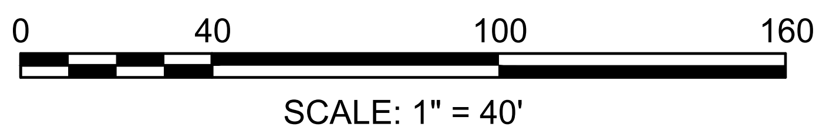

SCALE: 1" = 40'

F:\Projects\NEX-2300191 – Hudson, NH – Sousa Realty\CAD Files\2300191_SUBD.dwg UTILITY 4/02/24 1:59pm srollins

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DATE OF MEETING: ______________________

SIGNATURE______________________DATE__________

SIGNATURE______________________DATE__________

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HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49

36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

DAVID
R.
JORDAN
No. 7778
4/2/24

REVISIONS		
2	REV. FOR SITE PLAN SUBMISSION	4/2/24
1	ADD HYDRANT	3/1/24
NO.	REVISION	DATE

NOVEMBER 20, 2023

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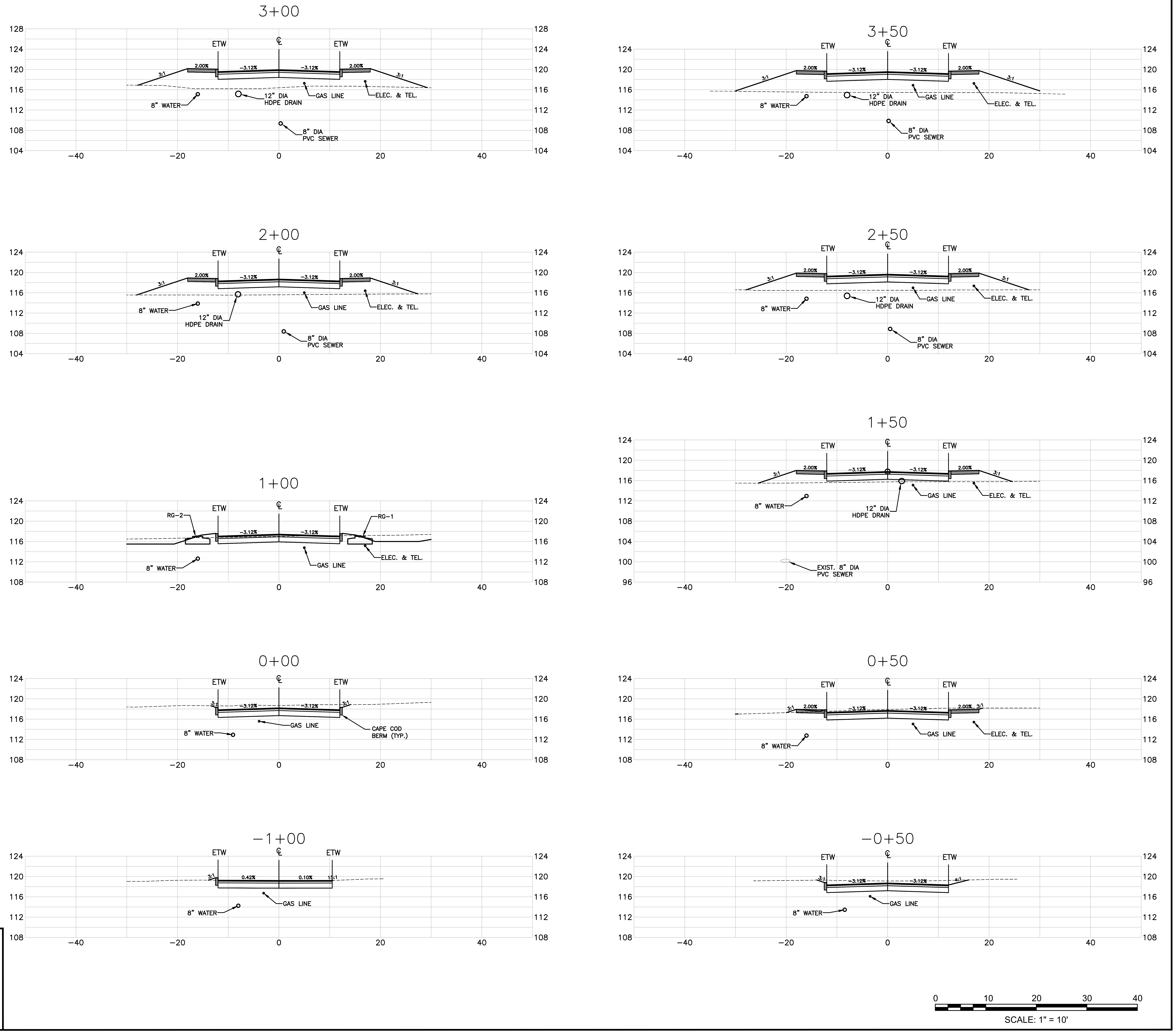
CNM	DRJ

OFF-SITE UTILITY EXTENSION PLAN

SCALE:
1"=40'

PROJECT NO.
NEX-2300191



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ASSESSOR MAP 165 LOT 49

36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

DAVID R. JORDAN
No. 7778
4/2/24

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NO.	REVISION	DATE

NOVEMBER 20, 2023

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CNM	DRJ

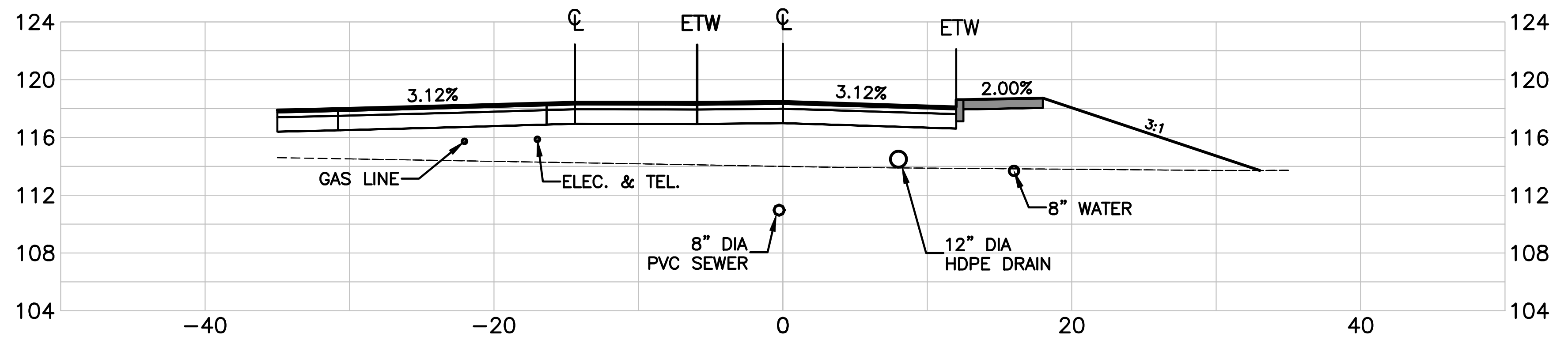
ROADWAY CROSS SECTIONS (1 OF 2)

SCALE: 1"=10'

PROJECT NO. NEX-2300191

9 OF 16

8+00



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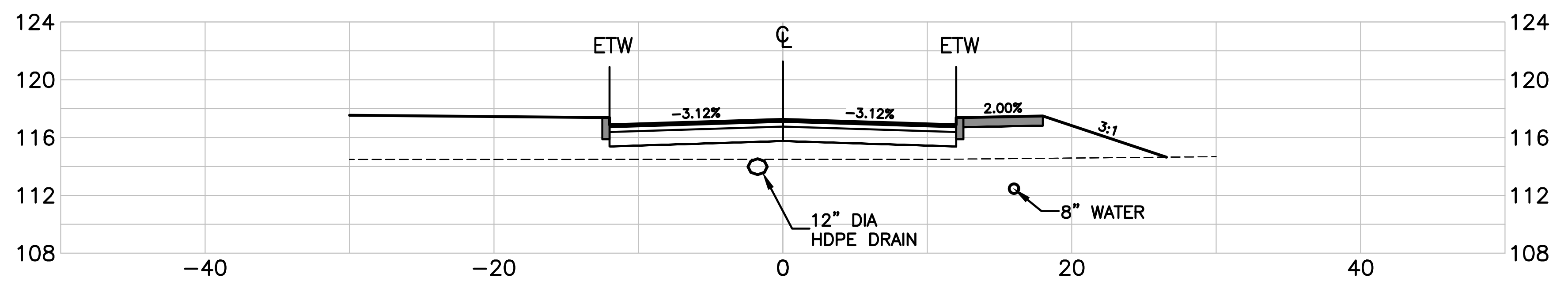

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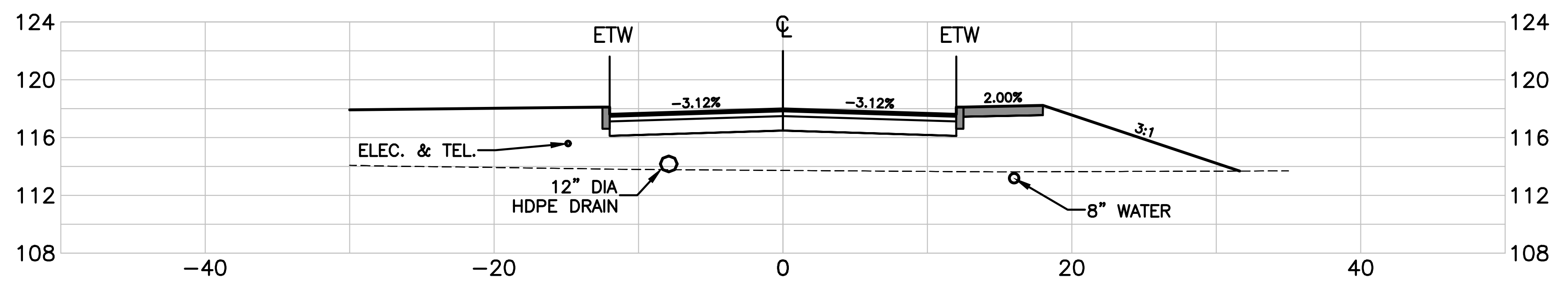

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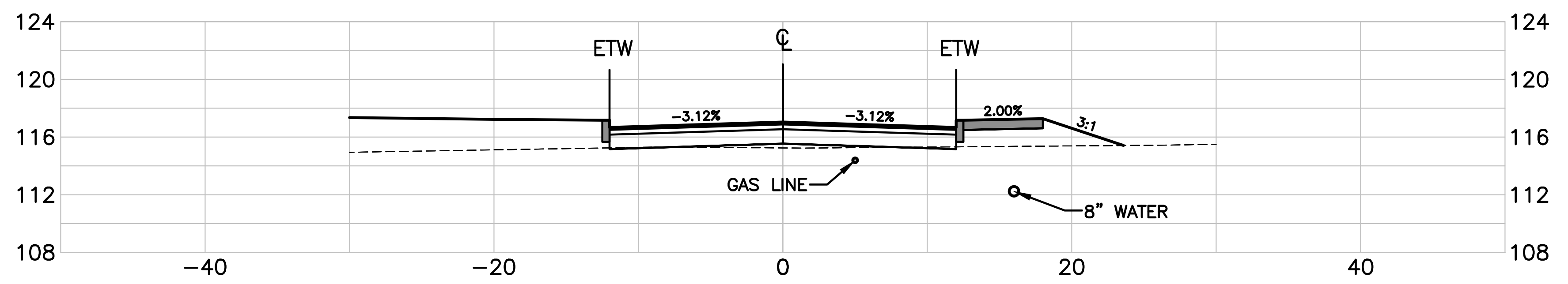

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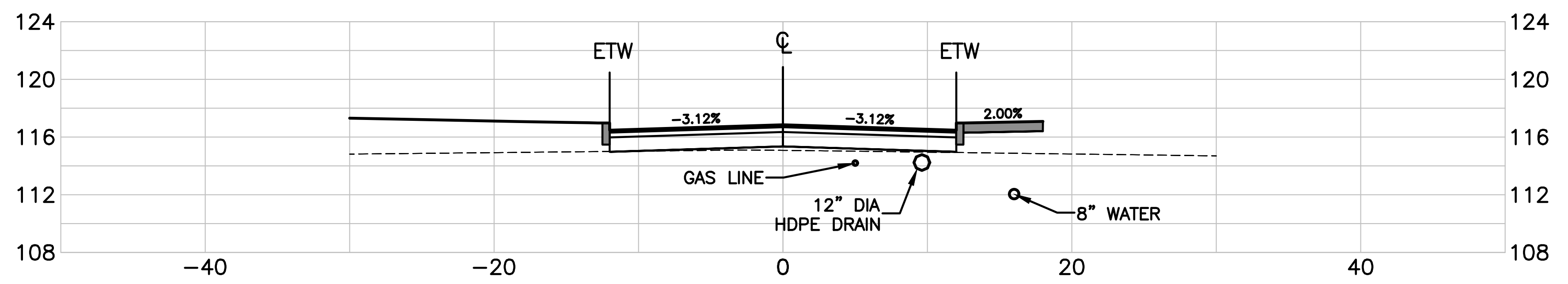

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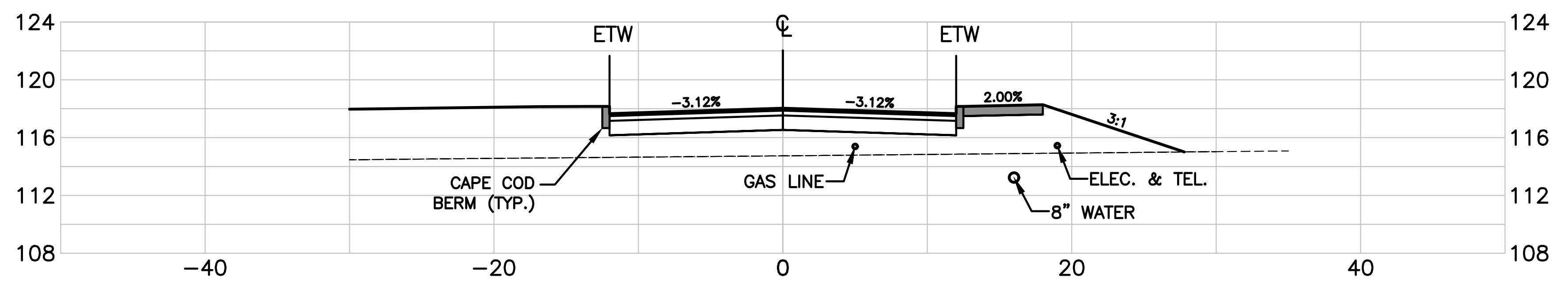

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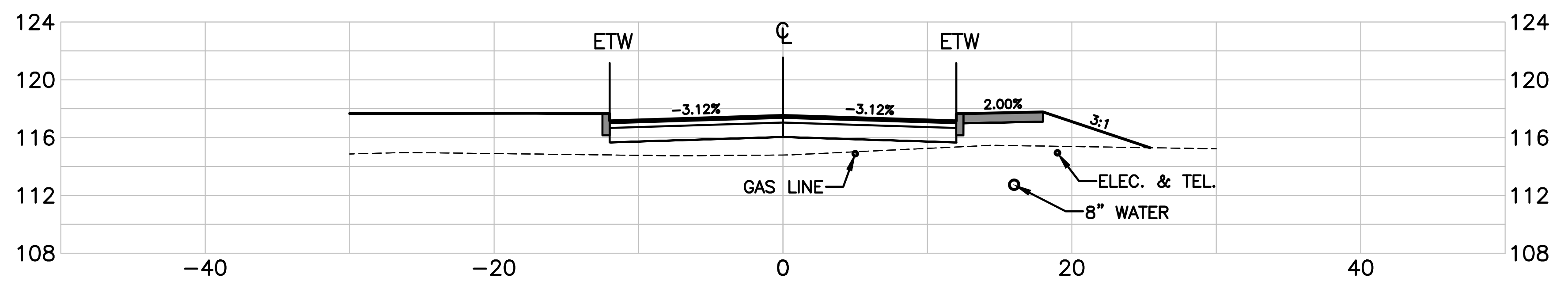

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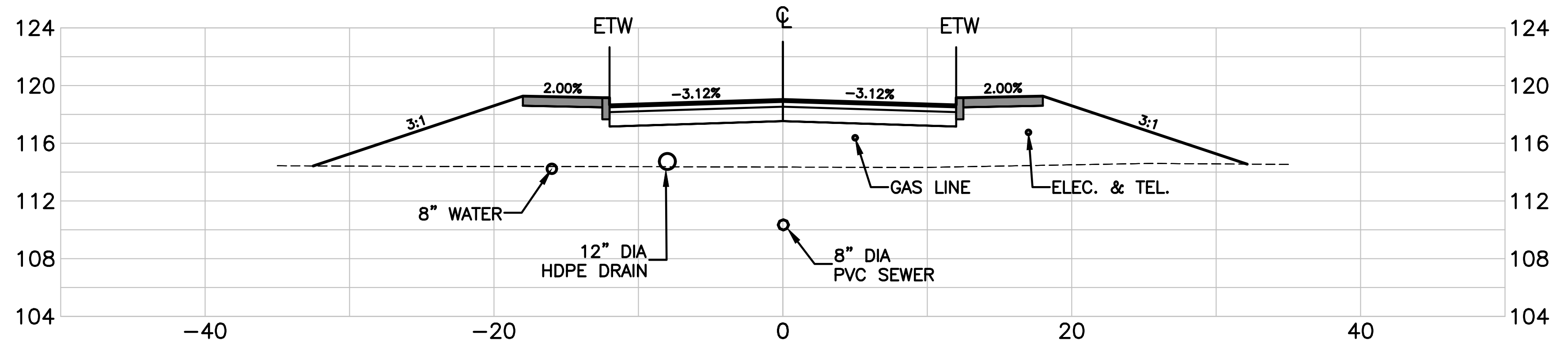

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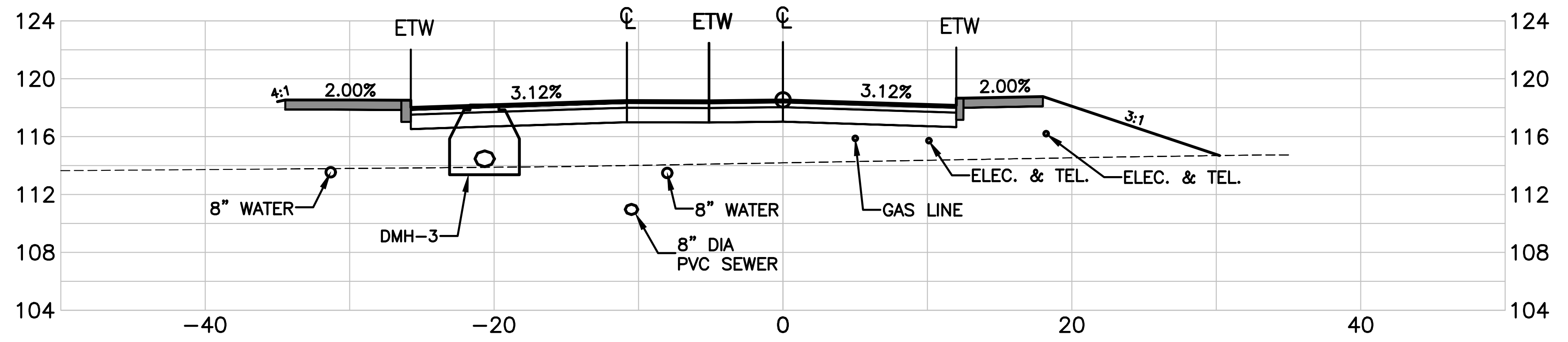

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DATE OF MEETING: ______________________________

SIGNATURE______________________________________DATE________________

SIGNATURE______________________________________DATE________________

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0 10 20 30 40

SCALE: 1" = 10'

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Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

PREPARED FOR
SOUSA REALTY &
DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49

36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

DAVID R. JORDAN
No. 7778
4/2/24

REVISIONS

NO.	REVISION	DATE
2	REV. FOR SITE PLAN SUBMISSION	4/2/24
1	MISC. REVISIONS	3/1/24

NOVEMBER 20, 2023

DRAWN/DESIGN BY	CHECKED BY
CNM	DRJ

ROADWAY
CROSS
SECTIONS
(2 OF 2)

SCALE:
1"=10'

PROJECT NO.
NEX-2300191

10 OF 16

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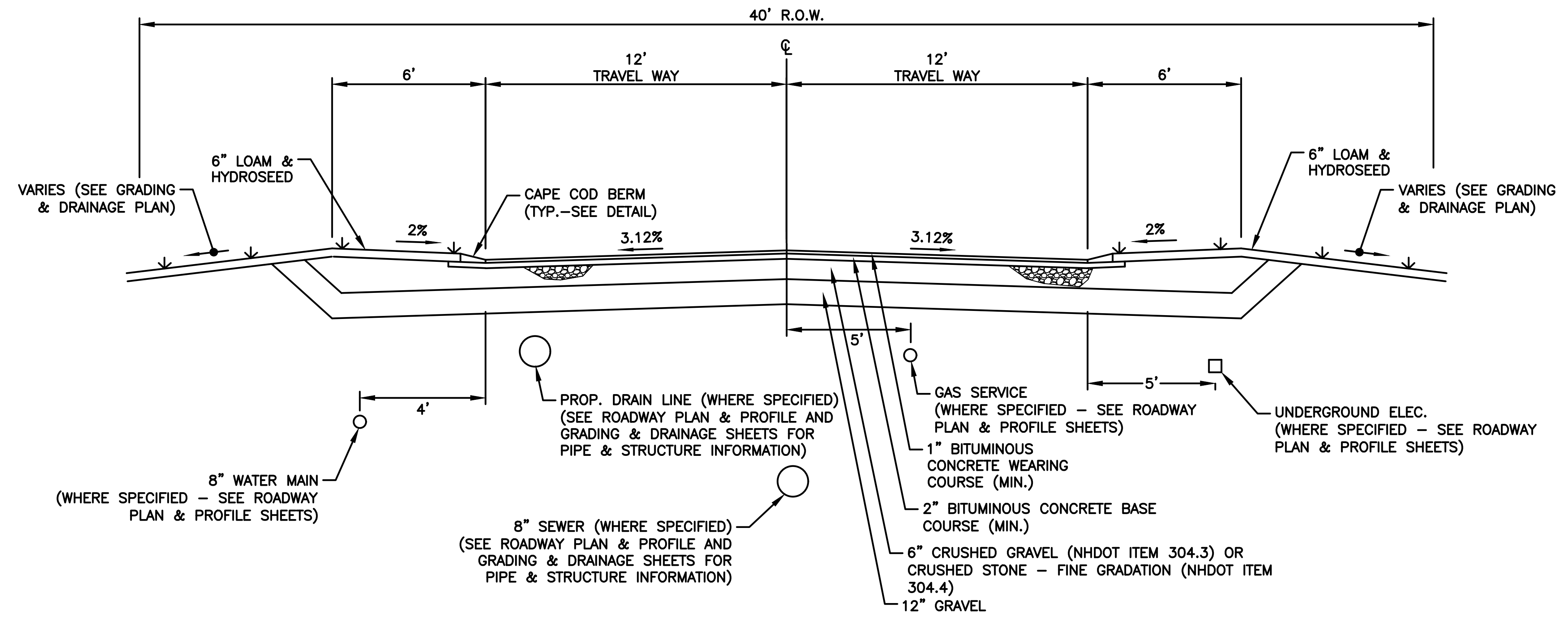
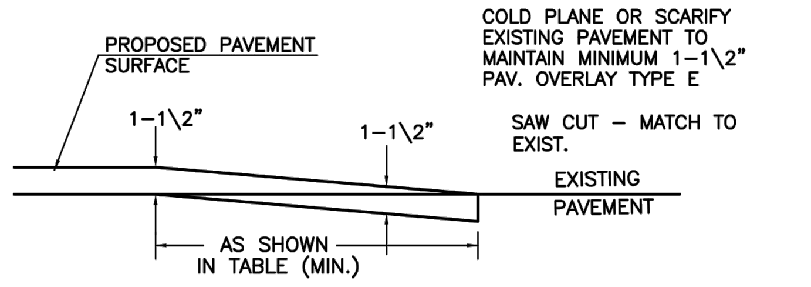


TYPICAL ROADWAY SECTION

NOT TO SCALE



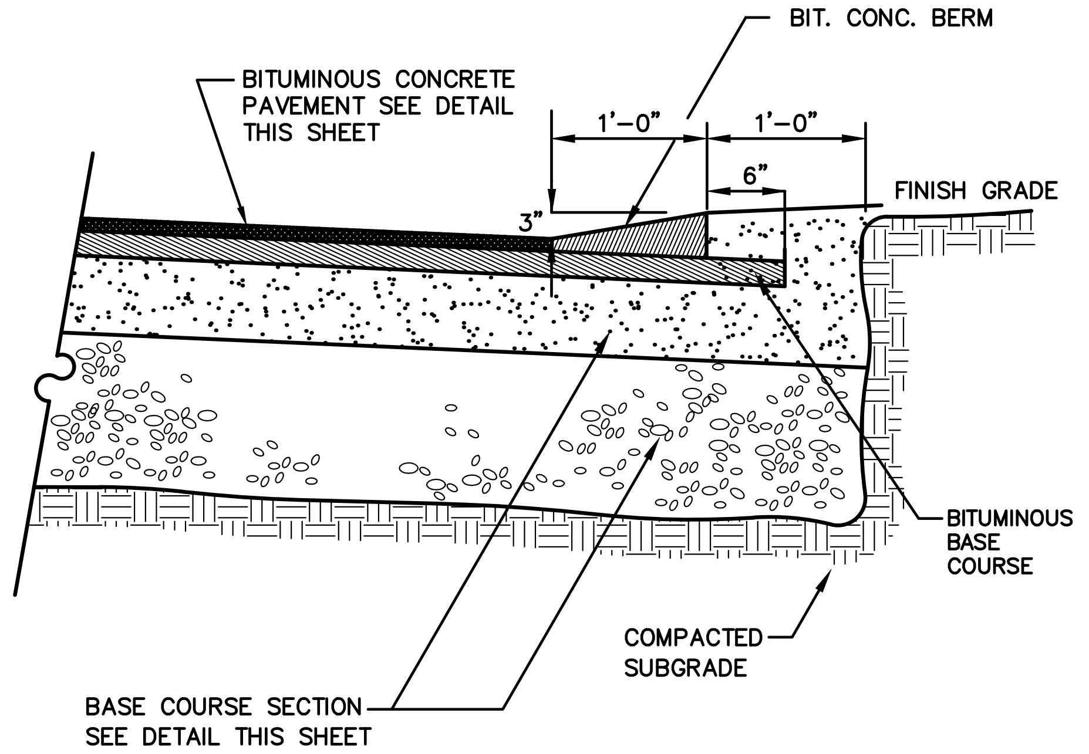
PAVEMENT END MATCH

NOT TO SCALE

	< 5%	> 5%
NEGATIVE SLOPE	5'	10'
POSITIVE SLOPE	5'	20'

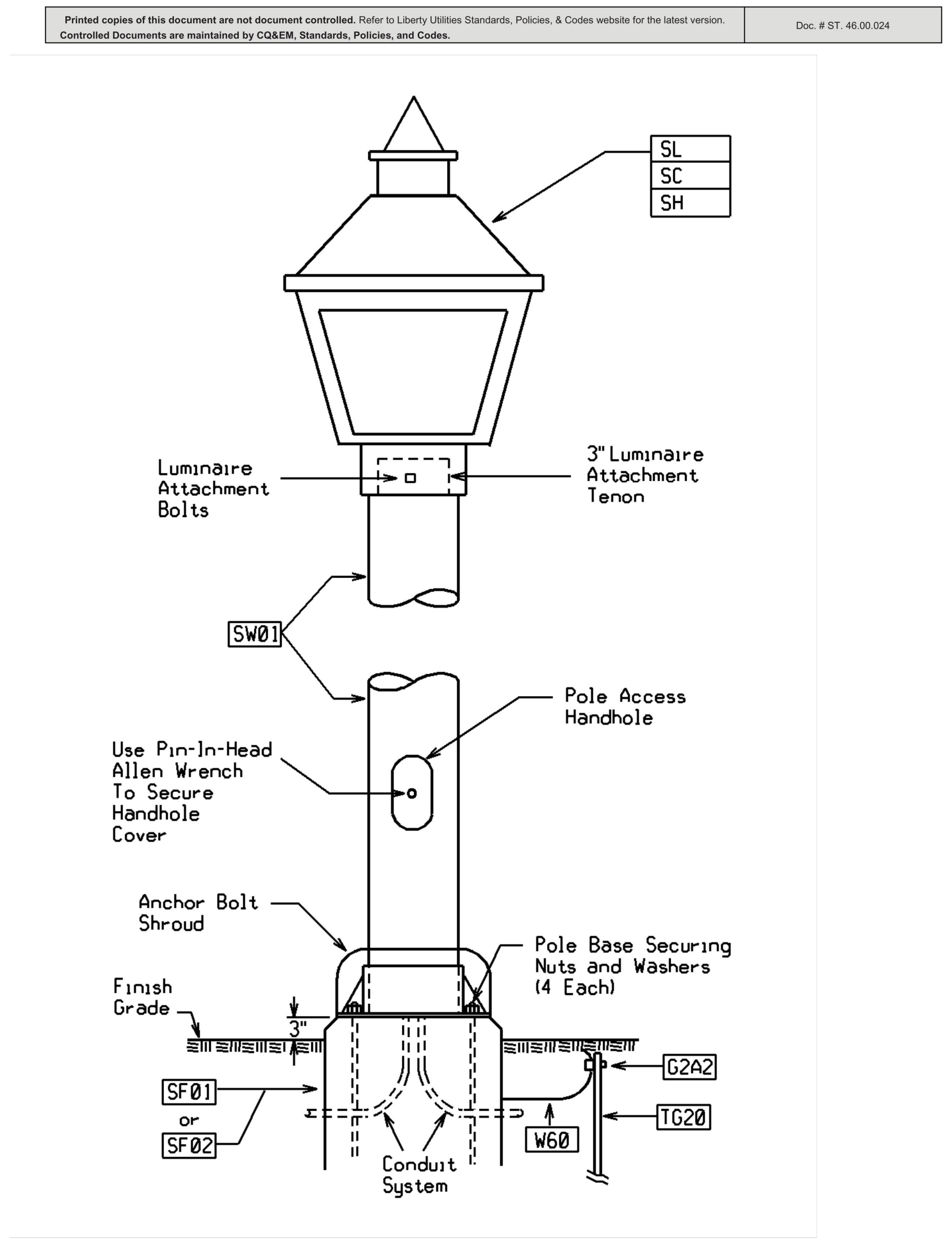
TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL R–6
PAVEMENT END MATCH
TOWN OF HUDSON AUGUST–01
REV: SCALE: NTS



CAPE COD BERM

NOT TO SCALE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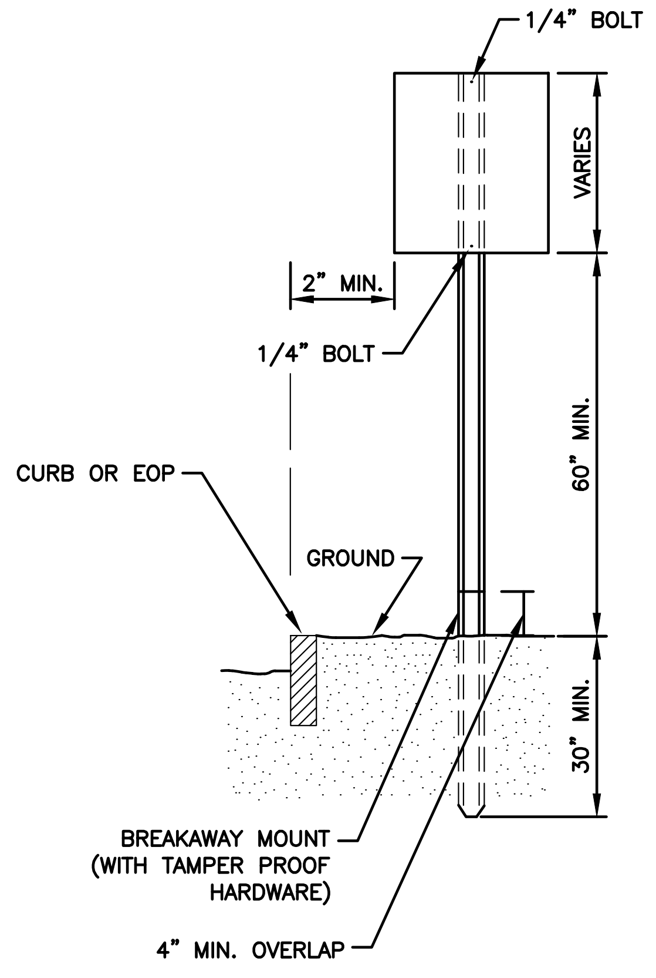
Doc. # ST. 46.00.024

Figure 45
Suburban Post Top Pole - Anchor Base, Fiberglass, – Installation

"SUBURBAN" POST TOP LIGHT POLE

NOT TO SCALE



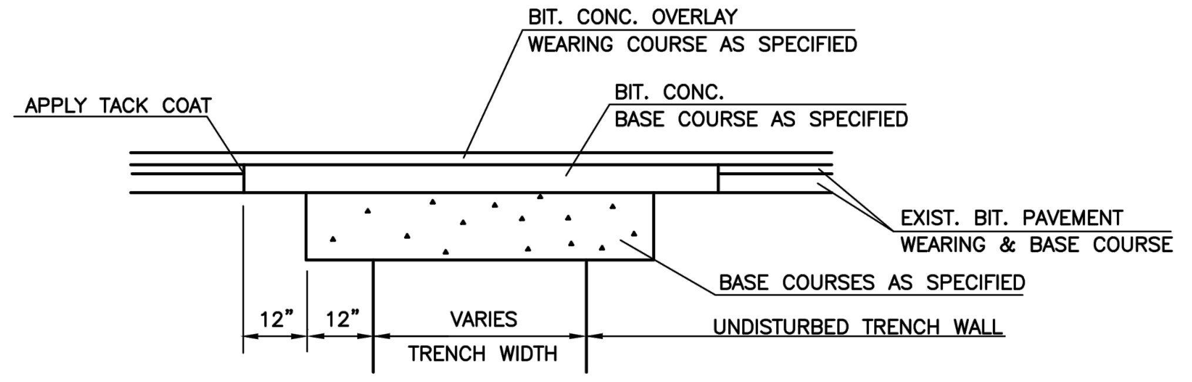
NOTES:

1. POSTS SHALL BE PLUMB; ANY POST BENT OR OTHERWISE DAMAGED SHALL BE REMOVED AND PROPERLY REPLACED. POSTS MAY BE SET OR DRIVEN.
2. WHEN POSTS ARE SET, HOLES SHALL BE DUG TO THE PROPER DEPTH; AFTER INSERTING POSTS, THE HOLES SHALL BE BACKFILLED WITH SUITABLE MATERIAL IN

   CARE BEING TAKEN TO PRESERVE THE ALIGNMENT OF THE POST.
3. WHEN POSTS ARE DRIVEN, A SUITABLE DRIVING CAP SHALL BE USED AND AFTER DRIVING THE TOP OF THE POST SHALL HAVE SUBSTANTIALLY THE SAME CROSS–SECTIONAL DIMENSION AS THE BODY OF THE POST; BATTERED HEADS WILL NOT BE ACCEPTED.
4. POSTS SHALL NOT BE DRIVEN WITH THE SIGN ATTACHED TO THE POST.
5. SIGNS SHALL BE ERECTED IN CONFORMANCE WITH THE REQUIREMENTS OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".
6. WHEN SIGN IS IN PLACE NO PART OF POST SHALL EXTEND ABOVE THE SIGN.

MUTCD SIGN

NOT TO SCALE



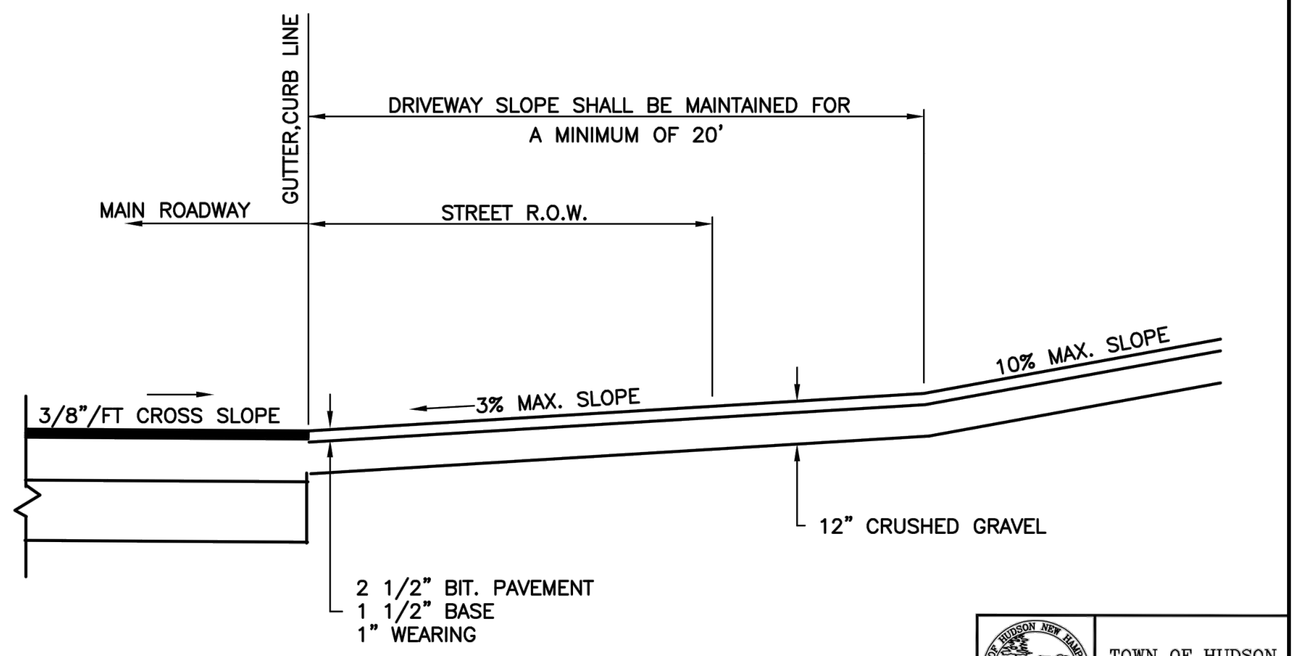
NOTE: AT END OF OVERLAY, SAW CUT AND REMOVE EXISTING PAVEMENT.
BUTT PROPOSED OVERLAY TO EXISTING WEARING COURSE.

PAVEMENT PATCH WITH OVERLAY

NOT TO SCALE

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL R–5
PAVEMENT PATCH WITH OVERLAY
TOWN OF HUDSON AUGUST–01
REV: 8/23/19 SCALE: NTS

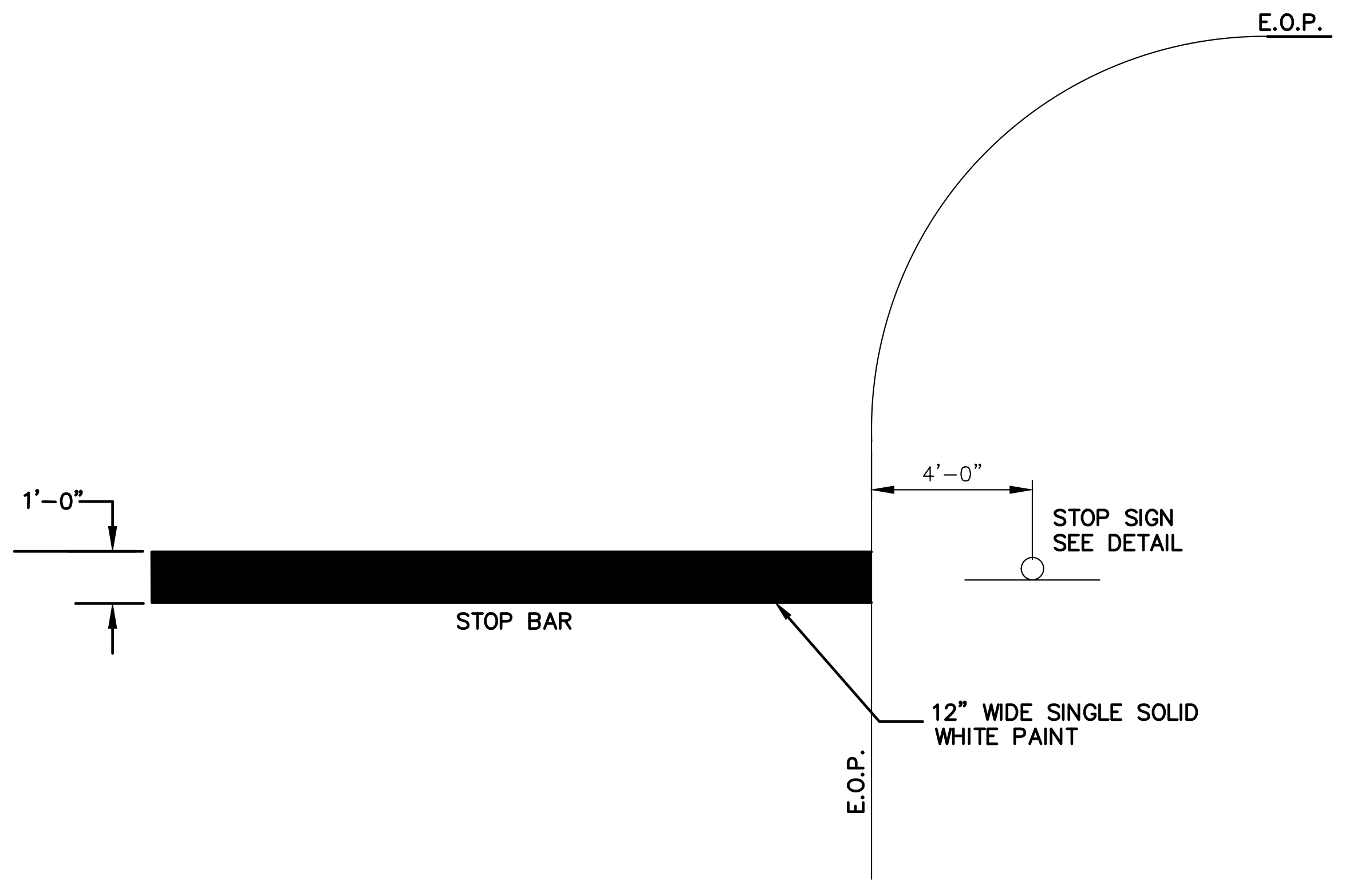


DRIVEWAY CROSS–SECTION

NOT TO SCALE

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL R–8
DRIVEWAY CROSS–SECTION
TOWN OF HUDSON AUGUST–01
REV: 8/23/19 SCALE: NTS



PAINTED STOP BAR DETAIL

NOT TO SCALE

APPROVED BY THE HUDSON, NH PLANNING BOARD
DATE OF MEETING: ____________________________
SIGNATURE____________________________________DATE________________
SIGNATURE____________________________________DATE________________

SITE PLANS ARE VALID FOR TWO YEARS FROM THE DATE OF PLANNING BOARD MEETING FINAL APPROVAL. FINAL ALL SHEETS APPROVAL COMMENCES AT THE PLANNING BOARD MEETING DATE AT WHICH THE PLAN ACHIEVES FINAL APPROVAL.

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Engineering
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Planning
Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

PREPARED FOR
SOUSA REALTY &
DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

DAVID R. JORDAN
No. 7778
4/2/24

REVISIONS

NO.	REVISION	DATE
2	REV. FOR SITE PLAN SUBMISSION	4/2/24
1	MISC. REVISIONS	3/1/24

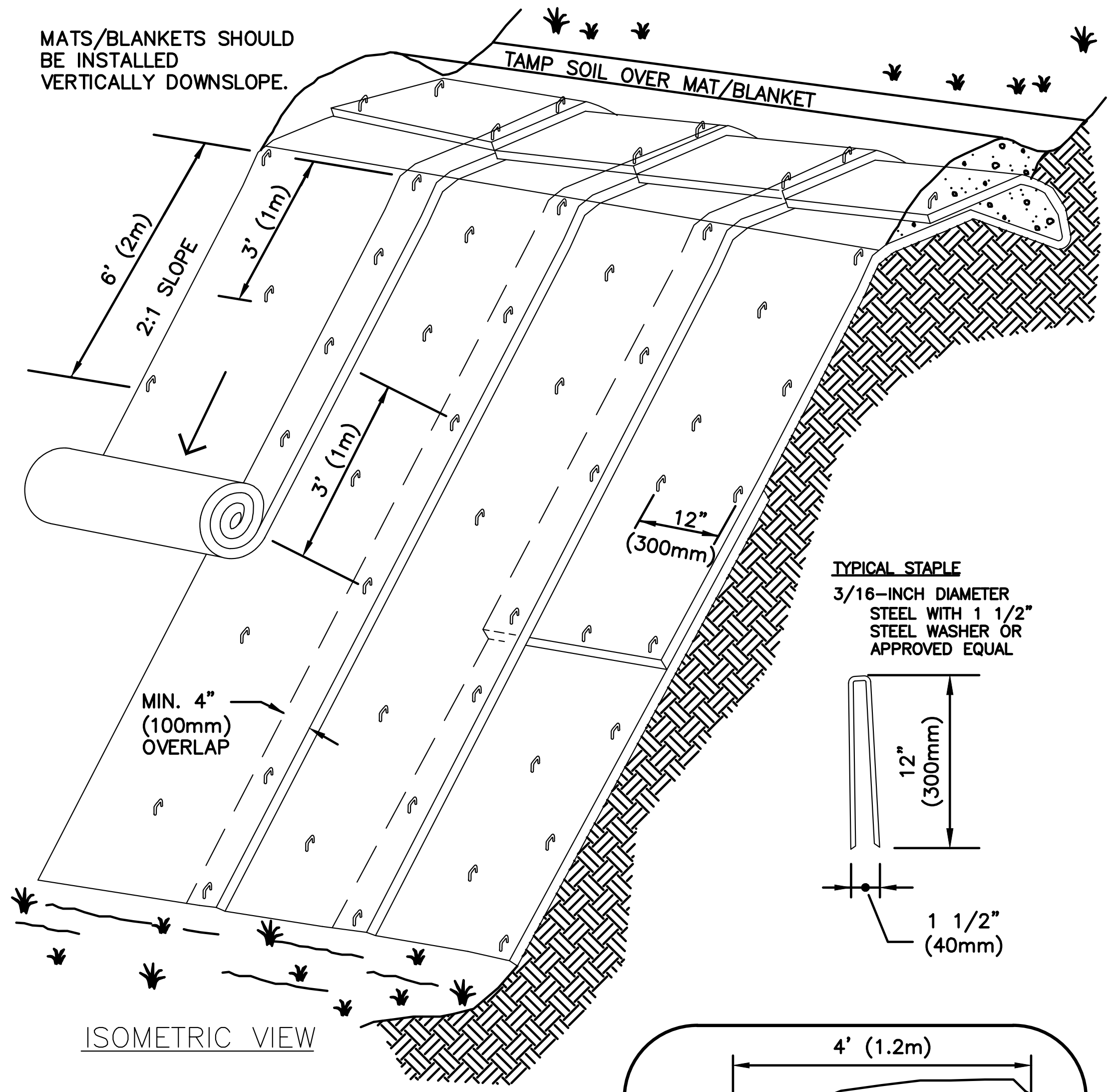
NOVEMBER 20, 2023

DRAWN/DESIGN BY	CHECKED BY
CNM	DRJ

CONSTRUCTION DETAILS

SCALE:
AS SHOWN

PROJECT NO.
NEX-2300191



ISOMETRIC VIEW

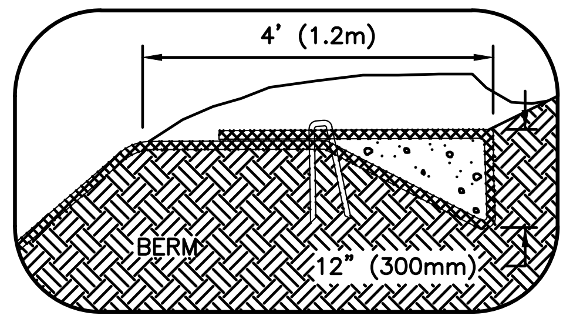
TYPICAL SLOPE SOIL STABILIZATION

NOTES:

1. BEGIN AT THE TOP OF BLANKET INSTALLATION AREA BY ANCHORING BLANKET IN A 6" DEEP TRENCH. BACKFILL AND COMPACT TRENCH AFTER STAPLING.
2. ROLL THE BLANKET DOWN THE SWALE IN THE DIRECTION OF THE WATER FLOW. LAY BLANKETS LOOSELY & MAINTAIN DIRECT CONTACT WITH SOIL – DO NOT STRETCH.
3. THE EDGES OF BLANKETS MUST BE STAPLED WITH APPROX. 4 INCH OVERLAP WHERE 2 OR MORE STRIP WIDTHS ARE REQUIRED.
4. WHEN BLANKETS MUST BE SPLICED DOWN THE SWALE, PLACE BLANKET END OVER END WITH 6 INCH (MIN.) OVERLAP AND ANCHOR DOWN SLOPE BLANKET IN A 6 INCH DEEP TRENCH.
5. BLANKETS SHALL BE STAPLED ENOUGH TO ANCHOR BLANKET WHILE MAINTAINING CONTACT WITH SOIL. STAPLES SHALL BE PLACED DOWN THE CENTER & STAGGERED WITH THE STAPLES PLACED ALONG EDGES. PATTERN & AMOUNT OF STAPLES VARIES BY MANUFACTURER, SO FOLLOW MANUFACTURERS RECOMMENDATIONS.
6. BLANKET SHALL BE NORTH AMERICAN GREEN SC–150 BN OR APPROVED EQUAL.

MAINTENANCE & MATS

1. BLANKETS SHALL BE INSPECTED WEEKLY DURING CONSTRUCTION & AFTER A RAINFALL IN EXCESS OF 1/2" IN A 24–HOUR PERIOD.
2. FAILURES SHALL BE REPAIRED IMMEDIATELY. IF ANY OF THE FOLLOWING OCCUR; SLOPE WASHOUT, MAT DISPLACEMENT, DAMAGE TO MAT, THE AFFECTED AREA SHALL BE REPAIRED & RESEEDED & MAT SHALL BE REPLACED OR RE–INSTALLED.



TYPICAL INSTALLATION OF EROSION CONTROL BLANKETS FOR SLOPES

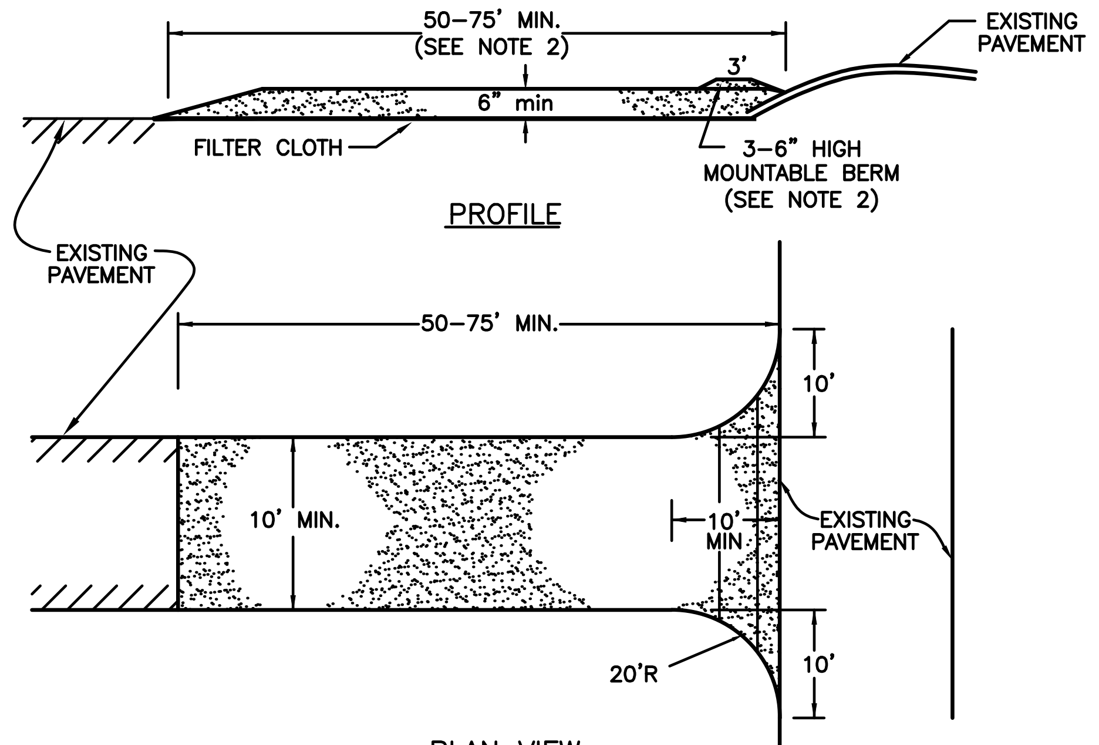
NOT TO SCALE

NOTE:

1) DO NOT USE PRODUCTS THAT CONTAIN WELDED PLASTIC OR THAT ARE "PHOTODEGRADABLE". USE PRODUCTS WITH BIODEGRADABLE NETTING AND NATURAL FIBER MATERIAL (I.E. STRAW OR COCONUT FIBER).
2) THERE SHALL BE NO PLASTIC, OR MULTI–FILAMENT OR MONOFILAMENT POLYPROPYLENE NETTING OR MESH WITH AN OPENING SIZE OF GREATER THAN 1/8 INCHES MATERIAL UTILIZED.

BLANKET SLOPE PROTECTION FOR EROSION CONTROL

NOT TO SCALE



1. STONE FOR A STABILIZED CONSTRUCTION EXIT SHALL BE 3 INCH CRUSHED STONE, RECLAIMED STONE, OR RECYCLED CONCRETE EQUIVALENT.

2. THE MINIMUM LENGTH OF THE STABILIZED EXIT SHALL NOT BE LESS THAN 75 FEET, UNLESS A MOUNTABLE BERM IS INSTALLED AT THE EXIT, THEN THE LENGTH MAY BE REDUCED TO 50 FEET.

3. THE THICKNESS OF THE STONE FOR THE STABILIZED EXIT SHALL NOT BE LESS THAN 6 INCHES.

4. THE WIDTH OF THE EXIT SHALL NOT BE LESS THAN THE FULL WIDTH OF THE ENTRANCE WHERE INGRESS OCCURS OR 10 FEET, WHICHEVER IS GREATER.

5. GEOTEXTILE FILTER CLOTH SHALL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING THE STONE.

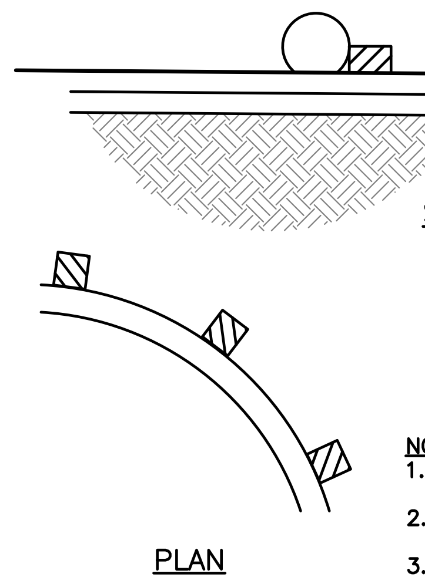
6. ALL SURFACE WATER THAT IS FLOWING TO OR DIVERTED TOWARD THE CONSTRUCTION EXIT SHALL BE PIPED BENEATH THE EXIT. IF PIPING IS IMPRACTICAL, A BERM WITH 5:1 SLOPES THAT CAN BE CROSSED BY VEHICLES MAY BE SUBSTITUTED FOR THE PIPE.

7. THE EXIT SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY. THIS MAY REQUIRE PERIODIC TOPDRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, WASHED OR TRACKED ONTO PUBLIC RIGHTS–OF–WAY MUST BE REMOVED PROMPTLY. CONTRACTOR SHOULD SWEEP THE EXISTING PAVEMENT AREA ANY TIME SEDIMENT IS TRACKED ONTO THE ADJACENT PAVEMENT OR TRAVELED WAY.

8. WHEELS SHALL BE CLEANED TO REMOVE MUD PRIOR TO ENTRANCE ONTO PUBLIC RIGHTS–OF–WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE. PREVENT ANY SEDIMENT FROM ENTERING STORM DRAINS, DITCHES OR WATERWAYS.

STABILIZED CONSTRUCTION EXIT

NOT TO SCALE

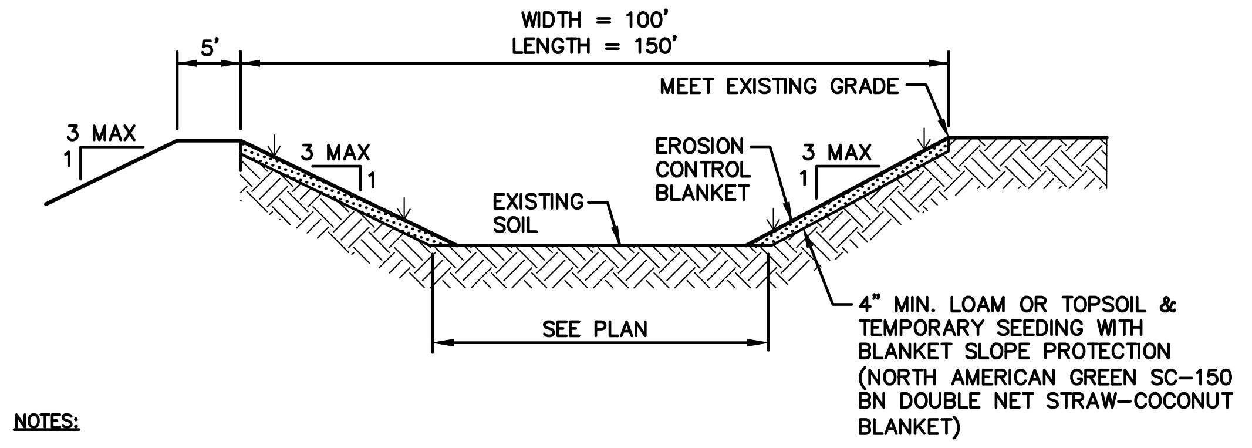


NOTES:

1. ALL MATERIAL TO MEET FILTREXX SPECIFICATIONS
2. FILTER MEDIA FILL TO MEET APPLICATION REQUIREMENTS.
3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMIND BY ENGINEER.

COMPOST FILTER SOCK ON PAVEMENT

NOT TO SCALE

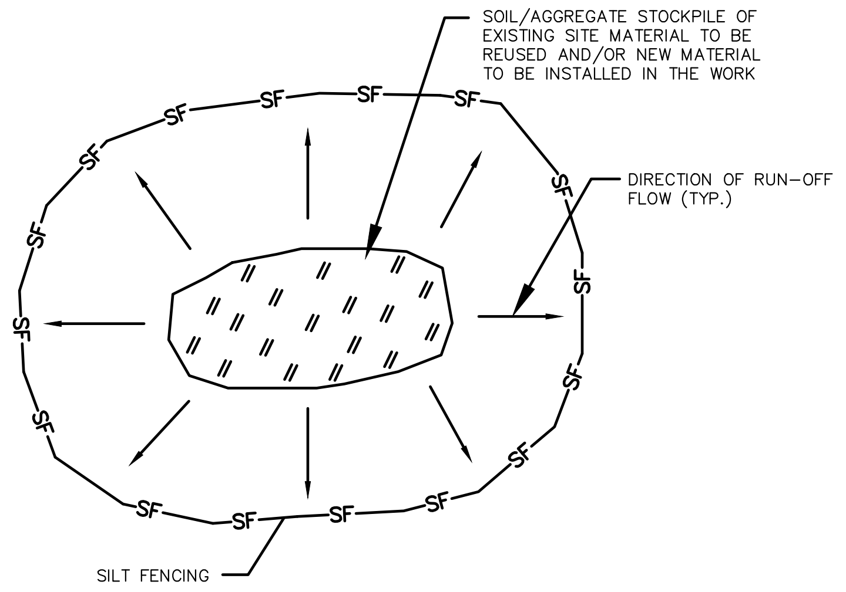


NOTES:

1. SIDE SLOPES OF THE TRAP SHALL BE 3:1 OR FLATTER, AND SHALL BE STABILIZED IMMEDIATELY AFTER CONSTRUCTION.
2. THE SPILLWAY ON THE TRAP SHOULD BE A MINIMUM OF 1 FOOT BELOW THE CREST OF THE TRAP AND SHALL DISCHARGE TO A STABILIZED AREA.
3. THE TRAP SHALL BE CLEANED WHEN 50% OF THE ORIGINAL VOLUME IS FILLED. MATERIALS REMOVED FROM THE TRAP SHALL BE PROPERLY DISPOSED OF AND STABILIZED.

TEMPORARY SEDIMENT TRAP TYPICAL CROSS SECTION

NOT TO SCALE



NOTES:

1. ALL EXISTING EXCAVATED MATERIAL THAT IS NOT TO BE REUSED IN THE WORK IS TO BE IMMEDIATELY REMOVED FROM THE SITE AND PROPERLY DISPOSED OF.

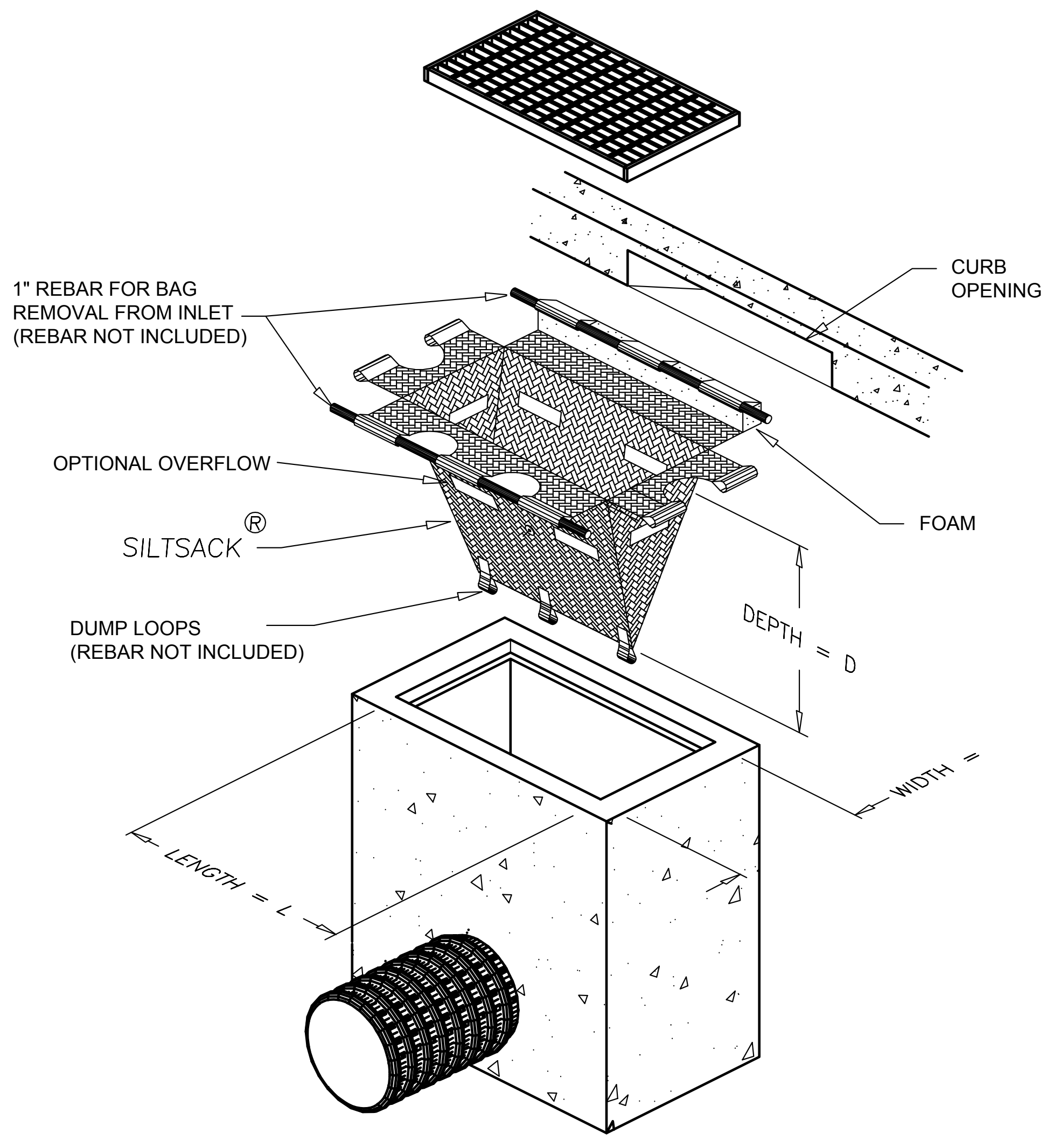
2. SOIL/AGGREGATE STOCKPILE SITES TO BE WHERE SHOWN ON THE DRAWINGS.

3. RESTORE STOCKPILE SITES TO PRE–EXISTING PROJECT CONDITION AND RESEED AS REQUIRED.

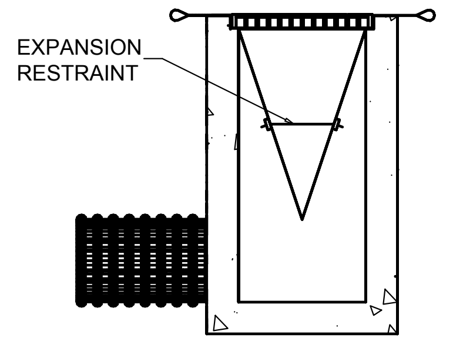
4. STOCKPILE HEIGHTS MUST NOT EXCEED 35'. STOCKPILE SLOPES MUST BE 2:1 OR FLATTER.

MATERIALS STOCKPILE

NOT TO SCALE



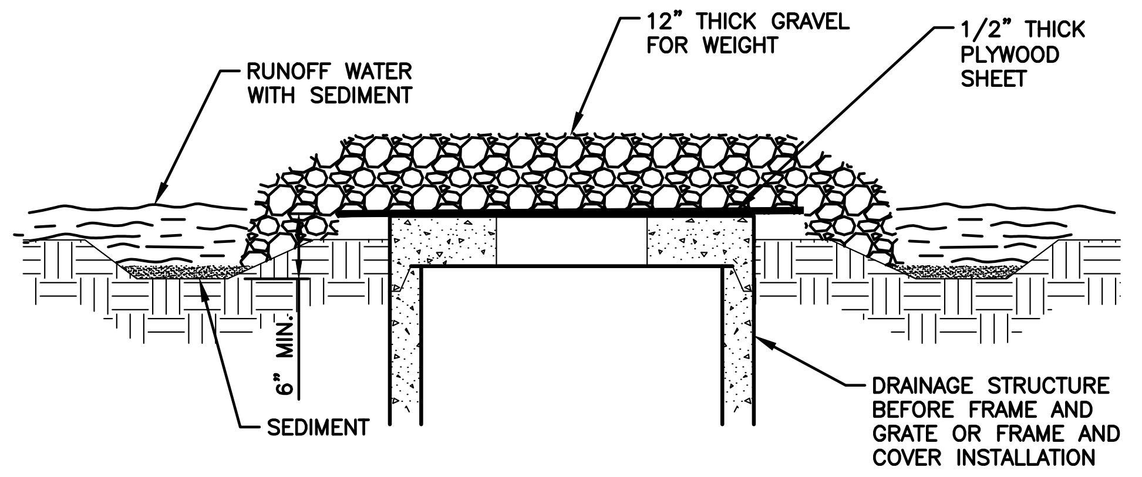
SIDE VIEW INSTALLED



INSTALLATION DETAIL

SILT SACK

NOT TO SCALE

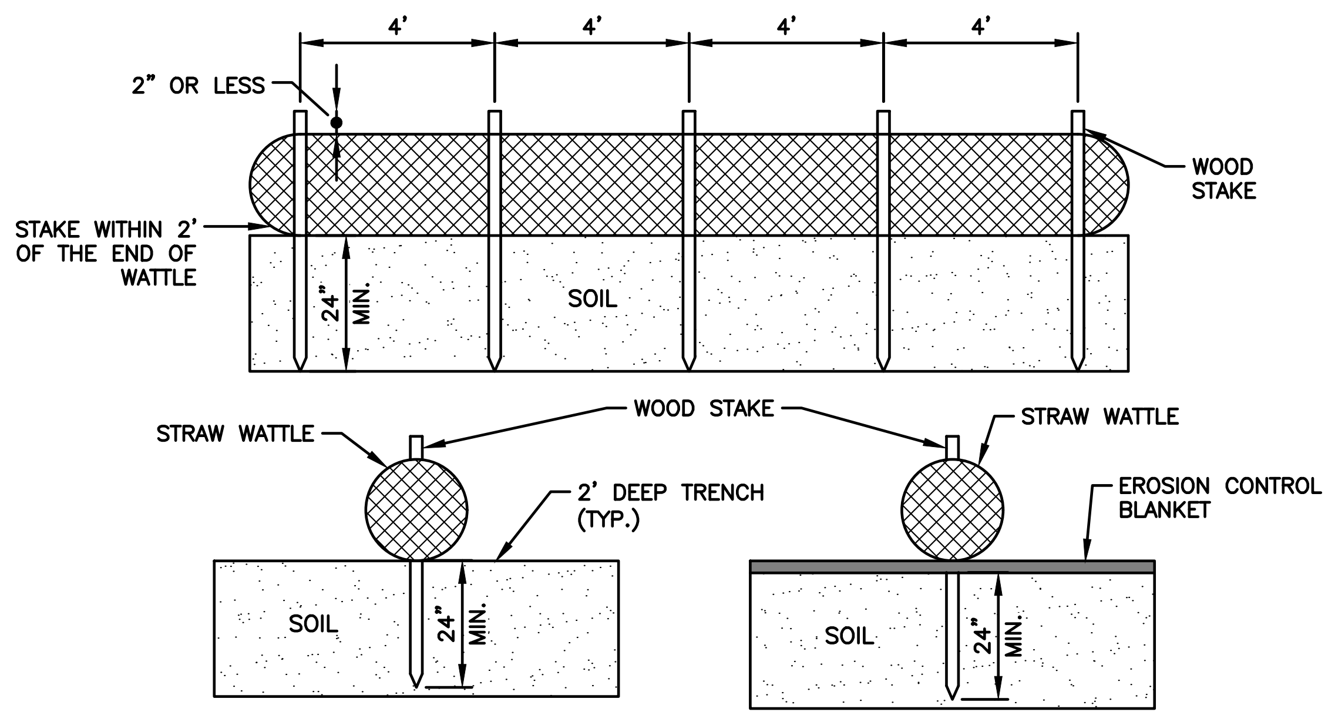


MAINTENANCE

1. ALL STRUCTURES SHOULD BE INSPECTED AFTER EVERY RAIN STORM AND REPAIRS MADE AS NECESSARY.
2. SEDIMENT SHOULD BE REMOVED FROM THE TRAPPING DEVICES AFTER THE SEDIMENT HAS REACHED A MAXIMUM OF ONE HALF OF THE DEPTH OF THE TRAP. THE SEDIMENT SHOULD BE DISPOSED OF IN A SUITABLE AREA AND PROTECTED FROM EROSIION BY EITHER STRUCTURUAL OR VEGETATIVE MEANS.
3. THE TEMPOARARY TRAPS SHOULD BE REMOVED AND THE AREA REPAIRED AS SOON AS THE CONTRIBUTING DRAINAGE AREA TO THE INLET HAS BEEN COMPLETELY STABILIZED.
4. ALL STRUCTURES WITH INLET PROTECTION MUST BE CLEANED AT THE END OF CONSTRUCTION AND WHEN THE SITE IS FULLY STABILIZED.

INLET PROTECTION

NOT TO SCALE



WATTLE CROSS SECTION: ON BARE SOIL

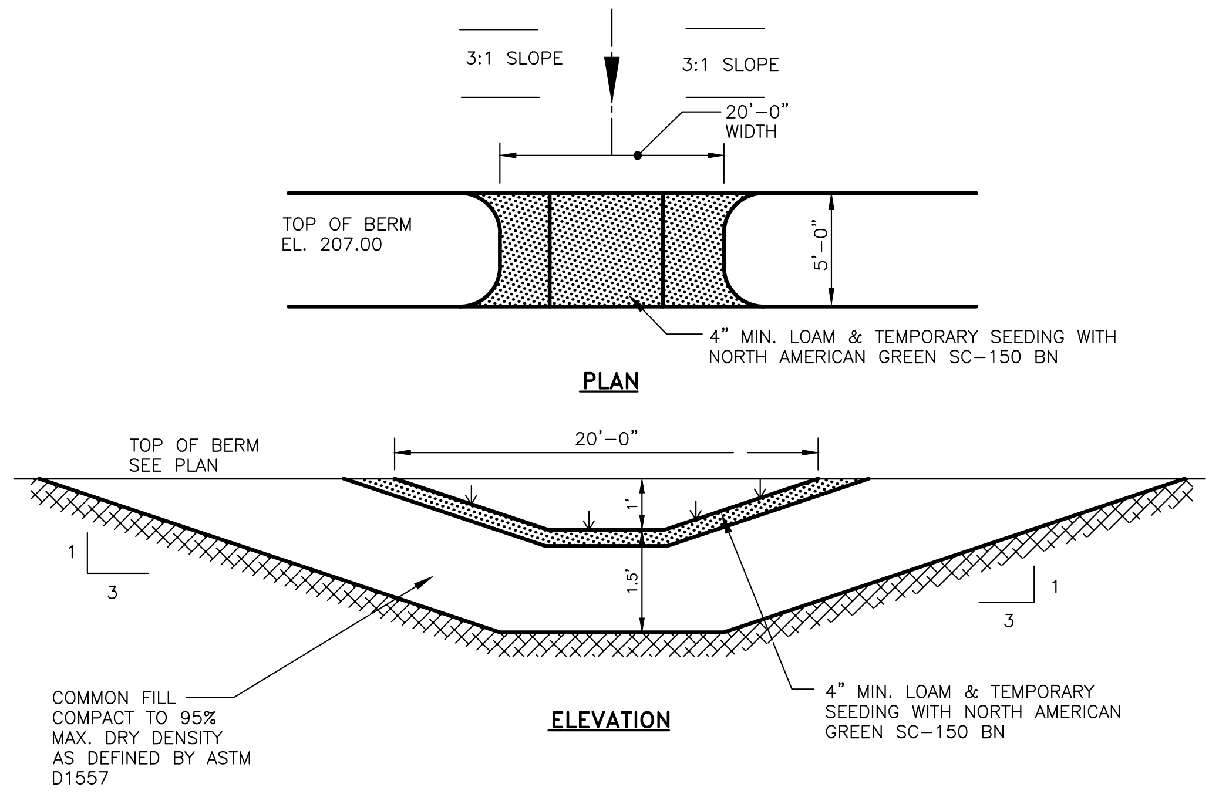
WATTLE CROSS SECTION: ON EROSION CONTROL BLANKET

NOTES:

1. ENDS OF WATTLES SHALL BE TURNED SLIGHTLY UP.
2. RECCOMMENDED STAKES ARE 1 1/8" WIDE x 1 1/8" THICK x 30" LONG. STAKES SHALL NOT EXCEED ABOVE THE STRAW WATTLE MORE THAN 2".

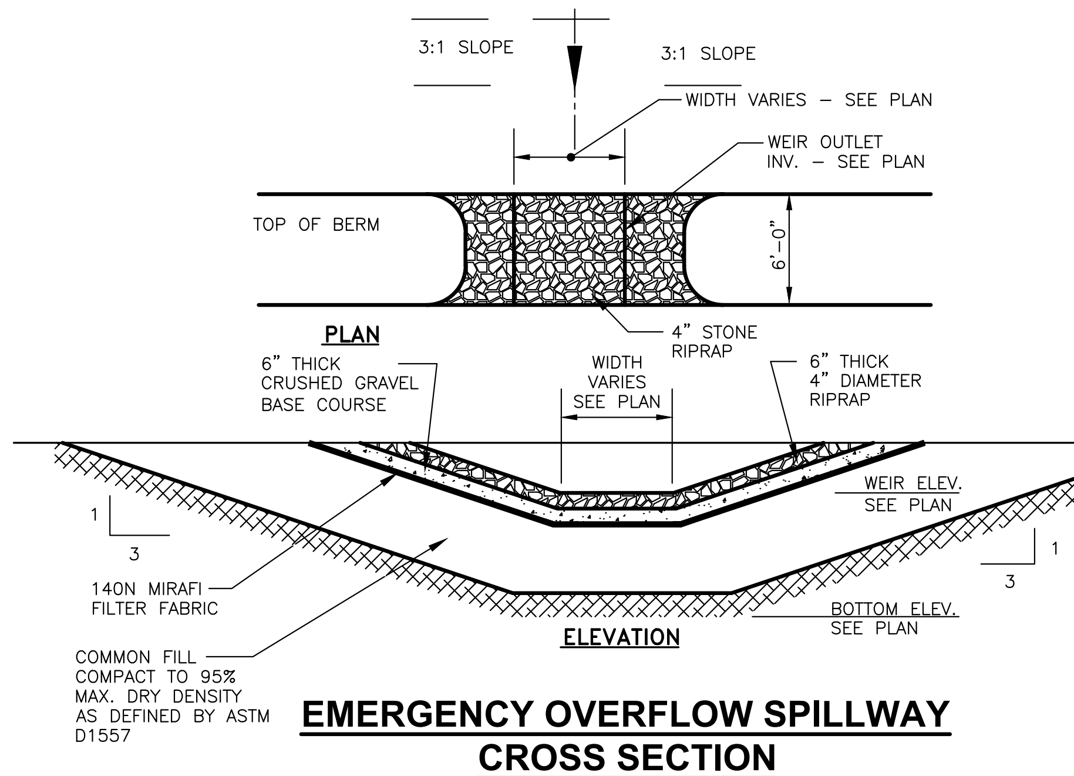
STRAW WATTLE

NOT TO SCALE



SEDIMENT TRAP SPILLWAY

NOT TO SCALE



EMERGENCY OVERFLOW SPILLWAY CROSS SECTION

NOT TO SCALE

APPROVED BY THE HUDSON, NH PLANNING BOARD

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SIGNATURE______________________________DATE______________

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Greenman-Pedersen, Inc.
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46 LOWELL ROAD
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ASSESSOR MAP 165 LOT 49

36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

DAVID R. JORDAN
No. 7778
4/2/24

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NO.	REVISION	DATE
2	REV. FOR SITE PLAN SUBMISSION	4/2/24
1	MISC. REVISION	3/1/24

NOVEMBER 20, 2023

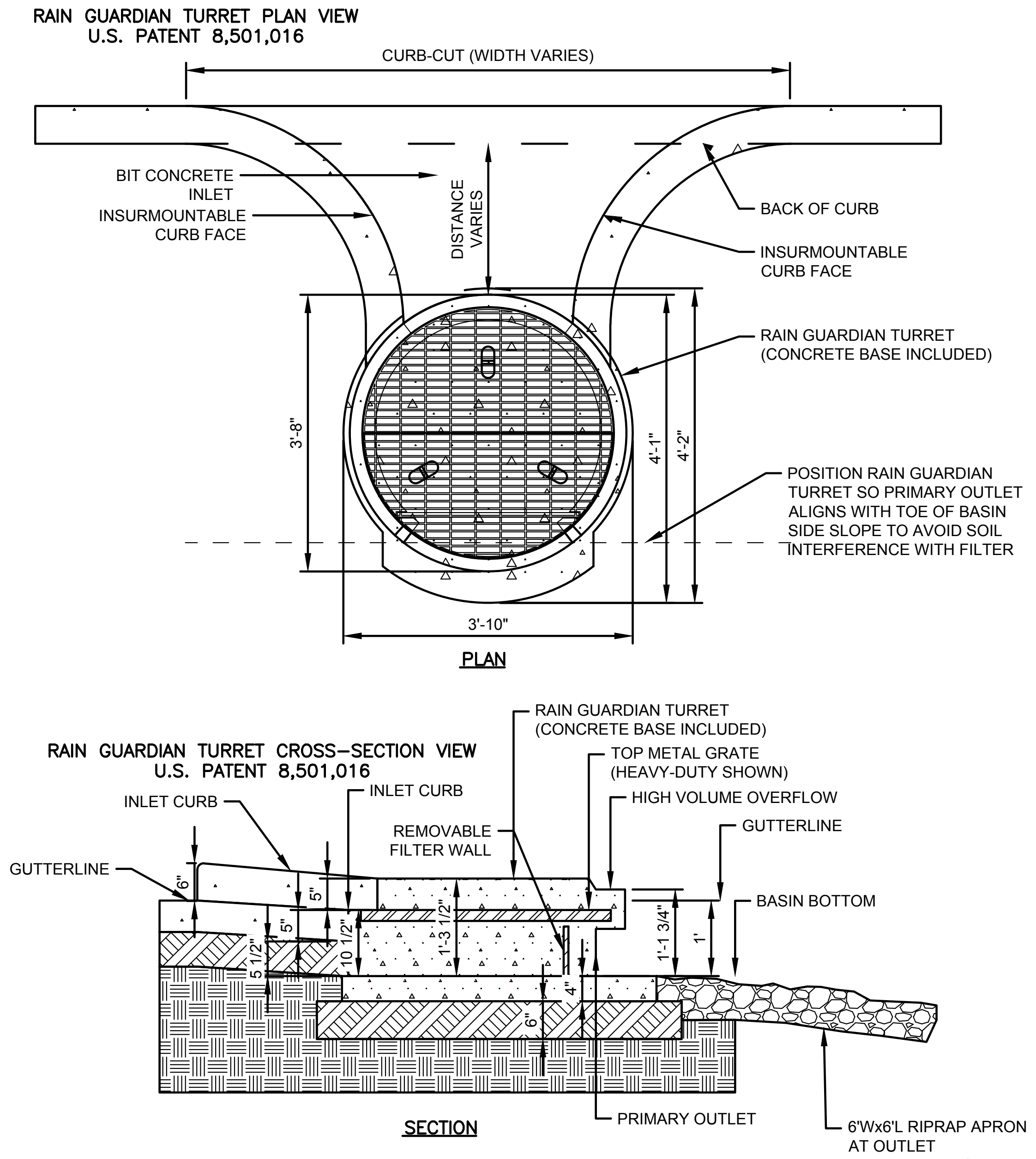
DRAWN/DESIGN BY CNM
CHECKED BY DRJ

CONSTRUCTION DETAILS

SCALE: AS SHOWN

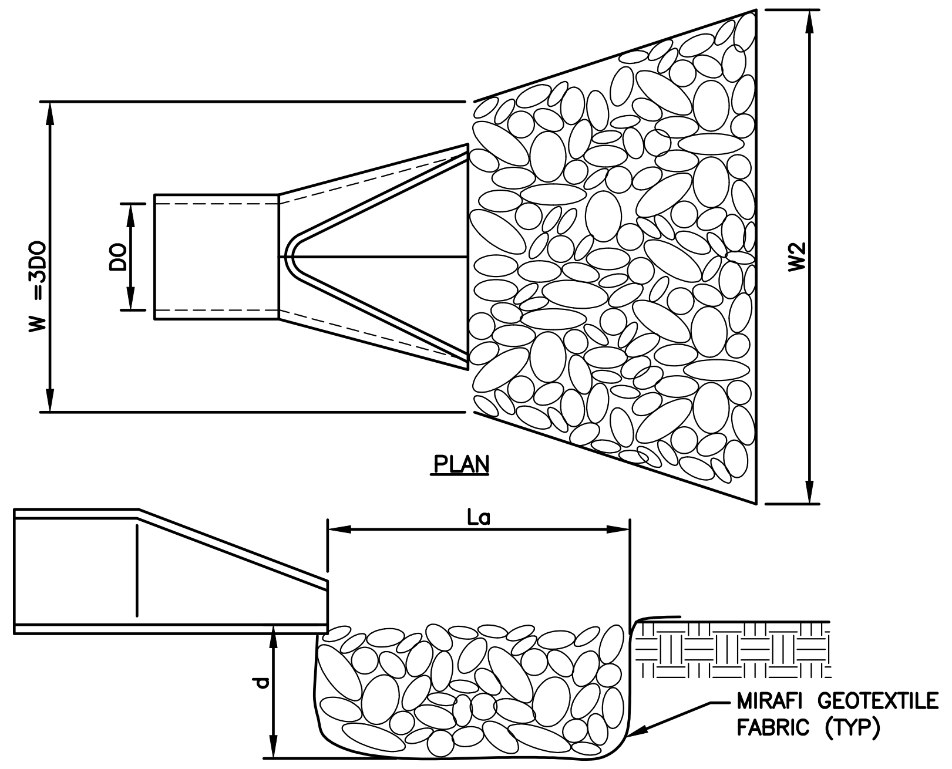
PROJECT NO. NEX-2300191

12 OF 16



RAIN GUARDIAN TURRET

NOT TO SCALE



OUTLET	Do	La	W_1	W_2	d_{50}	d
FES–1	12"	7.5'	3'	10.5'	3"	8"
FES–2	12"	14'	3'	9'	3"	8"

ROCK RIP–RAP GRADATION

% OF WEIGHT SMALLER THAN THE GIVEN SIZE	SIZE OF STONE IN INCHES
100	4.5 TO 6.0
85	3.9 TO 5.4
50	3.0 TO 4.5
15	0.9 TO 1.5

CONSTRUCTION NOTES:

1. THE SUBGRADE FOR THE FILTER MATERIAL, GEOTEXTILE FABRIC, AND RIP–RAP SHALL BE PREPARED TO THE LINES AND GRADES SHOWN ON THE PLANS.
2. THE ROCK OR GRAVEL USED FOR FILTER OR RIP–RAP SHALL CONFORM TO THE SPECIFIED GRADATION.
3. GEOTEXTILE FABRICS SHALL BE PROTECTED FROM PUNCTURE OR TEARING DURING THE PLACEMENT OF THE ROCK RIP–RAP. DAMAGED AREAS IN THE FABRIC SHALL BE REPAIRED BY PLACING A PIECE OF FABIC OVER THE DAMAGED AREA OR BY COMPLETE REPLACE,\MENT OF THE FABRIC. ALL OVERLAPS REQUIRED FOR REPAIRS OR JOINING TWO PIECES OF FABRIC SHALL BE A MINIMUM OF 12 INCHES.
4. STONE FOR THE RIP–RAP MAY BE PLACED BY EQUIPMENT AND SHALL BE CONSTRUCTED TO THE FULL LAYER THICKNESS IN ONE OPERATION AND IN SUCH A MANNER AS TO PREVENT SEGREGATION OF THE STONE SIZES.
5. THE MEDIAN STONE DIAMEMETER FOR THE RIP–RAP APRON IS d50. FIFTY PERCENT BY WEIGHT OF THE RIP–RAP MIXTURE SHALL BE SMALLER THAN THE MEDIAN STONE SIZE. THE LARGEST STONE SIZE IN THE MIXTURE SHALL BE 1.5 d50.

STONE OUTLET APRON

NOT TO SCALE

APPROVED BY THE HUDSON, NH PLANNING BOARD

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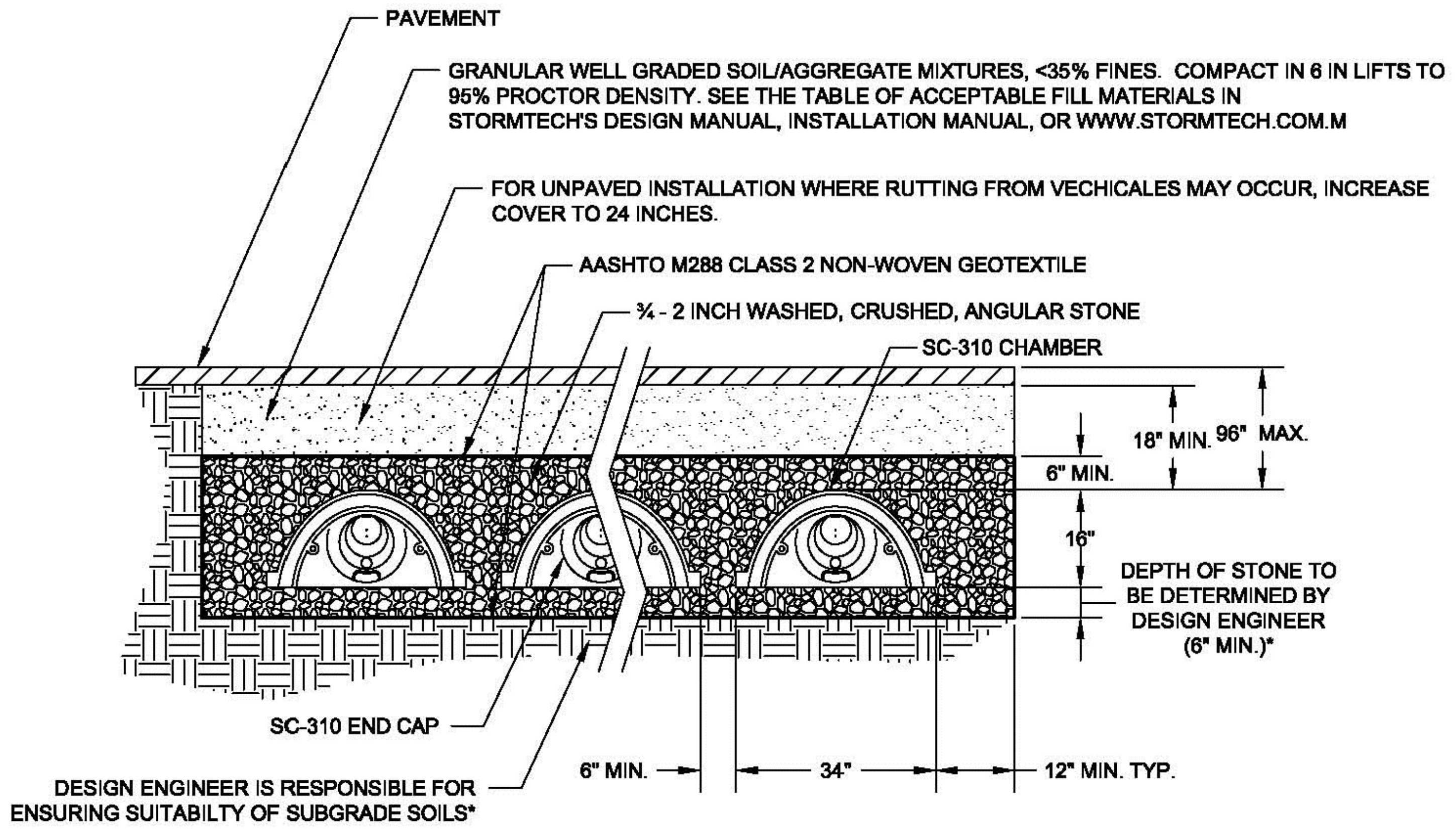
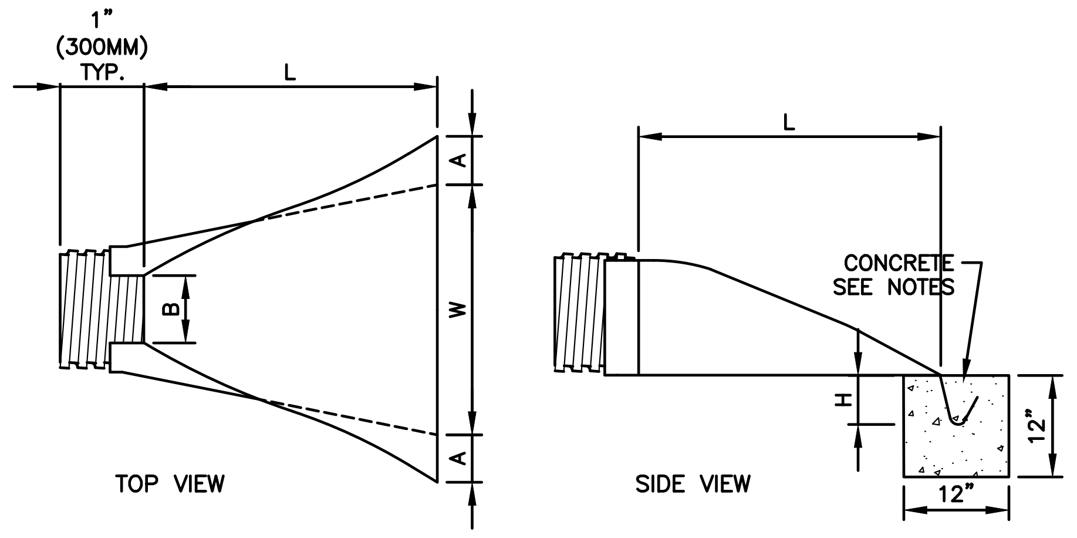


FOR STORMTECH
INFORMATION CALL 1-888-892-2694

STORMTECH SC-310 CHAMBER SYSTEM
TYPICAL CROSS SECTION
(FOR ROOF RECHARGE)

NOT TO SCALE

* SEE STORMTECH'S DESIGN MANUAL



DIMENSIONS, INCHES (mm)						
PIPE DIAMETER	PART NO.	A, ±1 (25)	B MAX	H, ±1 (25)	L, ±1/2 (13)	W, ±2 (50)
12", 15" (300,375)	1210 NP	6.5 (165)	10 (254)	6.5 (165)	25 (635)	29 (736)
18" (450)	1810 NP	7.5 (190)	15 (380)	6.5 (168)	32 (812)	35 (890)
24" (600)	2410 NP	7.5 (190)	18 (450)	6.5 (165)	36 (900)	45 (1140)
30" (750)	3010 NP	10.5 (266)	NA	7.0 (178)	53 (1346)	68 (1725)
36" (900)	3610 NP	10.5 (266)	NA	7.0 (178)	53 (1346)	68 (1725)

CONSTRUCTION SPECIFICATIONS:

PREPARE BEDDING:

BACKFILL MATERIAL AROUND THE END SECTION MAY BE THE SAME AS THE MATERIAL AROUND THE PIPE, PLACE A FEW INCHES OF BACKFILL MATERIAL IN THE TRENCH OR DITCH WHERE THE END SECTION WILL BE PLACED. COMPACT AND CONTOUR THIS BEDDING MATERIAL TO GENERALLY MATCH THE END SECTION, EXCAVATE AN AREA IN THE BEDDING WHERE TOE TROUGH WILL SEAT SO THAT THE END SECTION WILL BE LEVEL WITH THE BOTTOM OF THE TRENCH OR DITCH IN THE FINISHED INSTALLATION.

PLACE END SECTION OF PIPE:

OPEN THE END SECTION COLLAR AND SEAT IT OVER THE TWO PIPE CONNECTIONS. ONCE THE END SECTION IS POSITIONED, CHECK TO MAKE SURE THAT THE INVERT OF THE END SECTION MATCHES THE INVERT OF THE PIPE AND THAT THE END SECTION IS LEVEL WITH THE TRENCH OR DITCH BOTTOM.

SECURE THE END SECTION:

SLIP THE STAINLESS STEEL ROD THROUGH THE PRE–DRILLED HOLES AT THE TOP OF THE COLLAR. THE ROD SHOULD BE BETWEEN THE CROWNS OF THE TWO PIPE CONNECTIONS. PLACE A WASHER ON EITHER END OF THE ROD. PLACE A NUT ON EITHER END OF THE ROD AND TIGHTEN WITH A WRENCH.

SECURE THE TOE TROUGH:

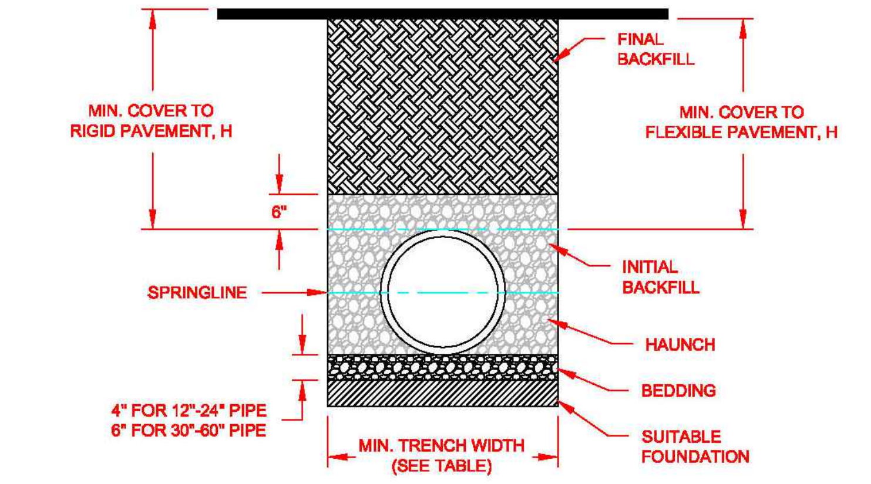
TO PREVENT WASHOUTS FROM HIGH VELOCITY FLOW, IT IS RECOMMENDED THAT THE TROUGH BE SECURED WITH CONCRETE. POUR CONCRETE IN THE TROUGH UP TO THE LEVEL OF THE TRENCH OR DITCH BOTTOM AND ALONG THE ENTIRE LENGTH OF THE TROUGH.

FINISH BACKFILL:

SHOVEL BACKFILL AROUND THE END SECTION IN 6 TO 9 INCH LAYERS EQUALLY ON BOTH SIDES, KNIFING IT TO ELIMINATE VOIDS. TAMP WITH A SMALL–FACED COMPACTOR OR OTHER EQUIPMENT SUITABLE FOR SMALL AREAS. CONTINUE PLACING, KNIFING, AND COMPACTING BACKFILL LAYERS TO THE TOP OF THE END SECTION TO SEAT IT WELL INTO THE BACKFILL.

FLARED END SECTION
HIGH DENSITY POLYETHYLENE (HDPE)

NOT TO SCALE



RECOMMENDED MINIMUM TRENCH WIDTHS

PIPE DIAM.	MIN. TRENCH WIDTH
4"	21"
6"	23"
8"	26"
10"	28"
12"	30"
15"	34"
18"	39"
24"	48"
30"	56"
36"	64"
42"	72"
48"	80"
54"	88"
60"	96"

MINIMUM RECOMMENDED COVER BASED ON VECHICLE LOADING CONDITIONS

	SURFACE LIVE LOADING CONDITION	
PIPE DIAM.	H-25	HEAVY CONSTRUCTION (75T AXLE LOAD) *
12" - 48"	12"	48"
54" - 60"	24"	60"

* VEHICLES IN EXCESS OF 75T MAY REQUIRE ADDITIONAL COVER

MINIMUM RECOMMENDED COVER BASED ON RAILWAY LOADING CONDITIONS

PIPE DIAM.	COOPER E-80**
UP TO 24"	24"
30"-36"	36"
42"-60"	48"

** COVER IS MEASURED FROM TOP OF PIPE TO BOTTOM OF RAILWAY TIE.

*** E-80 COVER REQUIREMENTS, ARE ONLY APPLICABLE TO ASTM F 2306 PIPE.

NOTES:

1. ALL PIPE SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321, "STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY FLOW APPLICATIONS", LATEST ADDITION

2. MEASURES SHOULD BE TAKEN TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL, WHEN REQUIRED.

3. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER. AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A GEOTEXTILE MATERIAL.

4. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I, II OR III. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" (100mm) FOR 4"-24" (100mm-600mm); 6" (150mm) FOR 30"-60" (750mm-900mm).

5. INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE CLASS I, II OR III IN THE PIPE ZONE EXTENDING NOT LESS THAN 6" ABOVE CROWN OF PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION.

6. MINIMUM COVER: MINIMUM COVER, H, IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" FROM THE TOP OF PIPE TO GROUND SURFACE. ADDITIONAL COVER MAY BE REQUIRED TO PREVENT FLOATION. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS 12" UP TO 48" DIAMETER PIPE AND 24" OF COVER FOR 54"-60" DIAMETER PIPE, MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT.

© 2007 ADS, INC.

ADVANCED DRAINAGE SYSTEMS, INC. ("ADS") HAS PREPARED THIS DETAIL BASED ON INFORMATION PROVIDED TO ADS. THIS DRAWING IS INTENDED TO DEPICT THE COMPONENTS AS REQUESTED. ADS HAS NOT PERFORMED ANY ENGINEERING OR DESIGN SERVICES FOR THIS PROJECT, NOR HAS ADS INDEPENDENTLY VERIFIED THE INFORMATION SUPPLIED. THE INSTALLATION DETAILS PROVIDED HEREIN ARE GENERAL RECOMMENDATIONS AND ARE NOT SPECIFIC FOR THIS PROJECT. THE DESIGN ENGINEER SHALL REVIEW THESE DETAILS PRIOR TO CONSTRUCTION. IT IS THE DESIGN ENGINEERS RESPONSIBILITY TO ENSURE THE DETAILS PROVIDED HEREIN MEETS OR EXCEEDS THE APPLICABLE NATIONAL, STATE, OR LOCAL REQUIREMENTS AND TO ENSURE THAT THE DETAILS PROVIDED HEREIN ARE ACCEPTABLE FOR THIS PROJECT.

REV.	DESCRIPTION	BY	MM/DD/YY	CHK'D
2	ADDED E-80 INFORMATION	TJR	08/20/07	

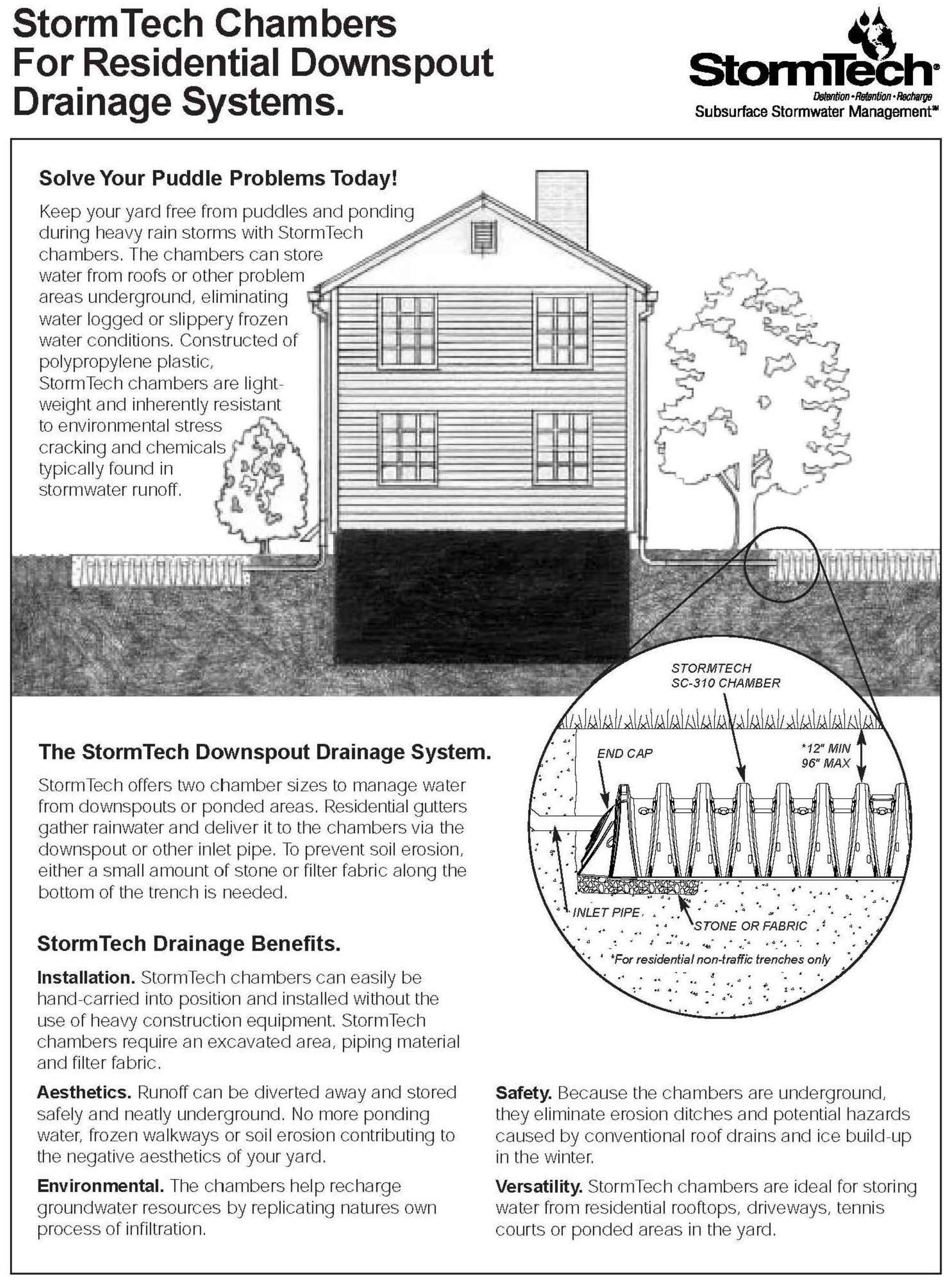
TYPICAL TRENCH DETAIL
DRAWING NUMBER: STD-101

ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OHIO 43026

CKS
10/18/06
NTS
1 OF 1

HDPE PIPE TRENCH

NOT TO SCALE



StormTech Chambers
For Residential Downspout
Drainage Systems.

Solve Your Puddle Problems Today!

Keep your yard free from puddles and ponding during heavy rain storms with StormTech chambers. The chambers can store water from roofs or other problem areas underground, eliminating water logged or slippery frozen water conditions. Constructed of polypropylene plastic, StormTech chambers are light-weight and inherently resistant to environmental stress cracking and chemicals typically found in stormwater runoff.

The StormTech Downspout Drainage System.

StormTech offers two chamber sizes to manage water from downspouts or ponded areas. Residential gutters gather rainwater and deliver it to the chambers via the downspout or other inlet pipe. To prevent soil erosion, either a small amount of stone or filter fabric along the bottom of the trench is needed.

StormTech Drainage Benefits.

Installation. StormTech chambers can easily be hand-carried into position and installed without the use of heavy construction equipment. StormTech chambers require an excavated area, piping material and filter fabric.

Aesthetics. Runoff can be diverted away and stored safely and neatly underground. No more ponding water, frozen walkways or soil erosion contributing to the negative aesthetics of your yard.

Environmental. The chambers help recharge groundwater resources by replicating natures own process of infiltration.

Safety. Because the chambers are underground, they eliminate erosion ditches and potential hazards caused by conventional roof drains and ice build-up in the winter.

Versatility. StormTech chambers are ideal for storing water from residential rooftops, driveways, tennis courts or ponded areas in the yard.

NOTE:
1) PROVIDE ONE STORMTECH SC–310 CHAMBER FOR EVERY 220 SF OF ROOF AREA
2) THE INSTALLATION AND MAINTENENCE OF THE ROOF INFILTRATION UNITS IS A REQUIREMENT PURSUANT TO THE ALTERATION OF TERRAIN PERMIT.
3) EACH ROW OF CHAMBERS SHALL BE SET ON A 6 INCH STONE BASE WITH 12 INCHES OF STONE ON ALL SIDES AND 6 INCHES OF STONE OVER THE TOP OF THE CHAMBERS.
4) THE BASE STONE SHALL BE INSTALLED AT LEAST ONE FOOT ABOVE THE SEASONAL HIGH WATER TABLE. WATER TABLE SHALL BE CONFIRMED WITH A TEST PIT PRIOR TO CONSTRUCTION.

STORMTECH ROOF RECHARGE

NOT TO SCALE

GPI
Engineering
Design
Planning
Construction Management
603.893.0720 GPINET.COM

Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

PREPARED FOR
SOUSA REALTY &
DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

DAVID R. JORDAN
No. 7778
4/2/24

REVISIONS

NO.	REVISION	DATE
2	REV. FOR SITE PLAN SUBMISSION	4/2/24
1	MISC. REVISION	3/1/24

NOVEMBER 20, 2023

DRAWN/DESIGN BY: CNM
CHECKED BY: DRJ

CONSTRUCTION
DETAILS

SCALE:
AS SHOWN

PROJECT NO.
NEX-2300191

13 OF 16

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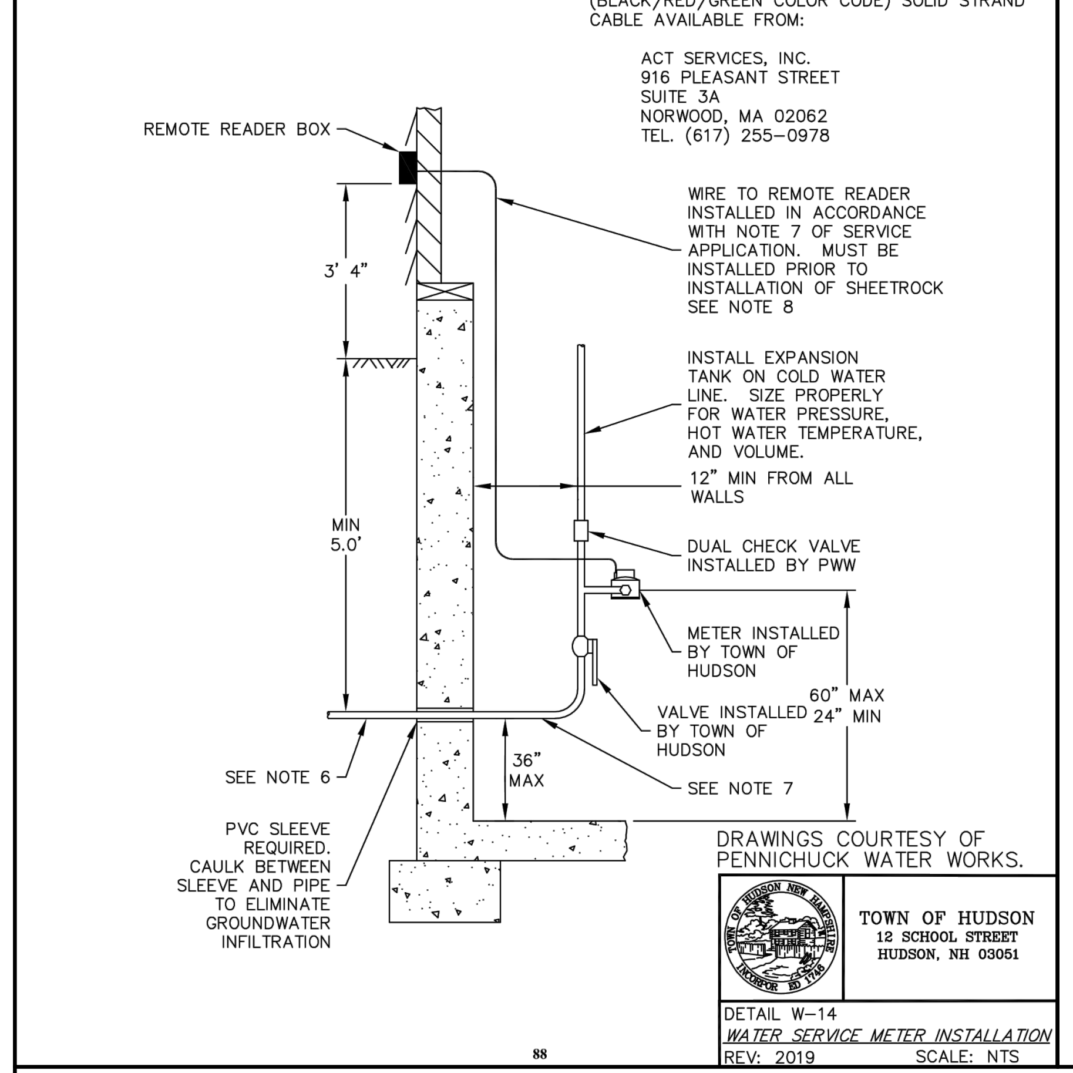
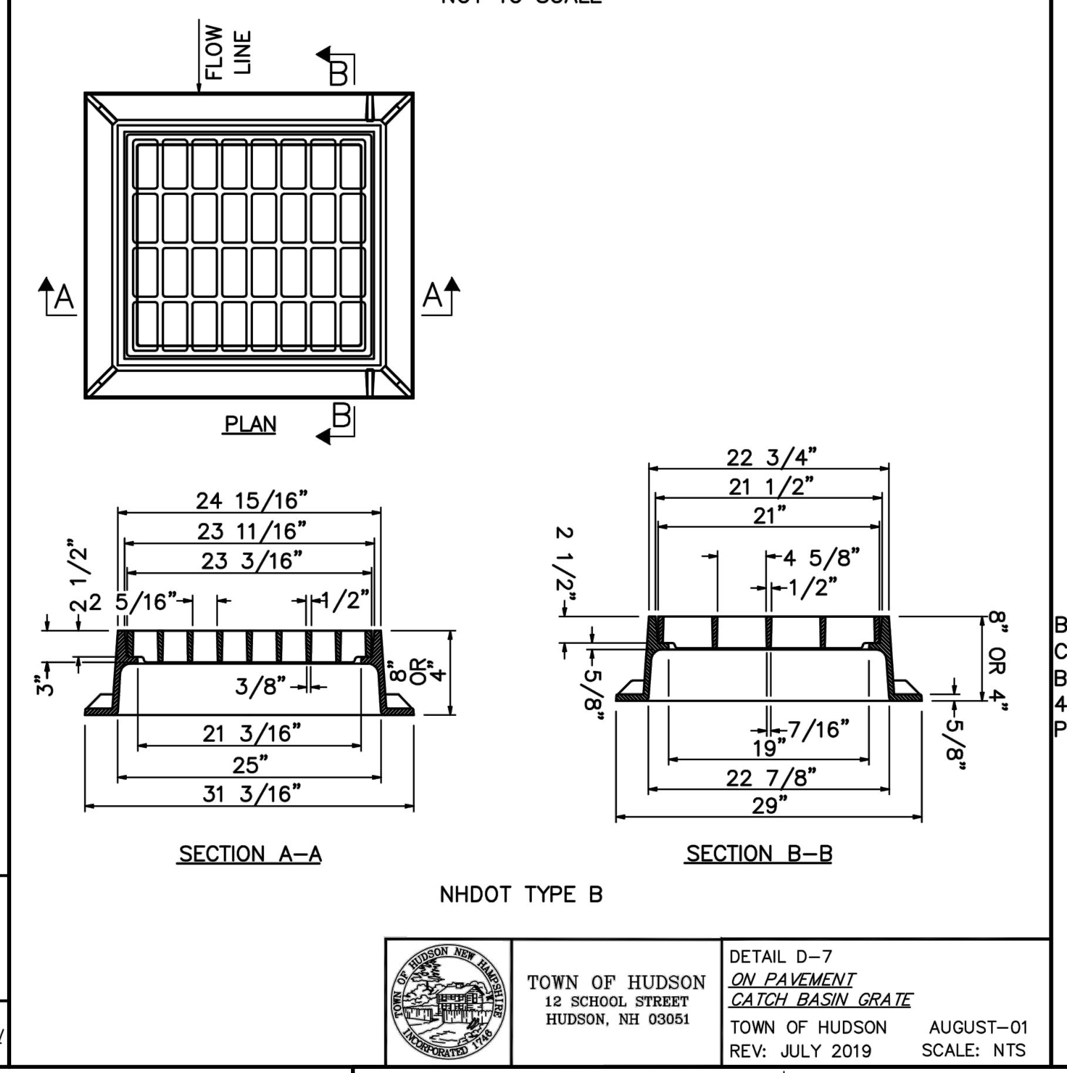
NOTES:
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON SPECIFICATIONS.
2. SEE SERVICE APPLICATION REQUIREMENTS.
3. INSTALLATION UNDER FOOTING OR THROUGH FOUNDATION WALL AT OWNER'S EXPENSE.
4. OWNER MUST PROVIDE A CLEAN, DRY, ACCESSIBLE, AND WARM (CONTINUALLY ABOVE 45° F) LOCATION FOR THE WATER METER.
5. OUTSIDE READER MUST BE LOCATED ADJACENT TO DRIVEWAY.
6. SERVICE LINE FROM STREET, SIZE & MATERIALS TO BE APPROVED BY TOWN OF HUDSON. ONLY TYPE "K" COPPER TUBING OR 200 PSIG RATED CTS POLYETHYLENE TUBING ARE ACCEPTABLE FOR SERVICE LINES. SAND TO BE USED FOR BACKFILL FOR A MINIMUM OF 6" ABOVE AND BELOW THE SERVICE LINE.
7. PROVIDE A MINIMUM OF 24" OF STRAIGHT COPPER AT SERVICE ENTRANCE INSIDE OF BUILDING TO ALLOW FOR INSTALLATION OF TOWN OF HUDSON METER AND VALVES.
8. METER WIRE TO BE 22 AWG 3-STRAND (BLACK/RED/GREEN COLOR CODE) SOLID STRAND CABLE AVAILABLE FROM:

ACT SERVICES, INC.
916 PLEASANT STREET
SUITE 3A
NORWOOD, MA 02062
TEL. (617) 255-0978



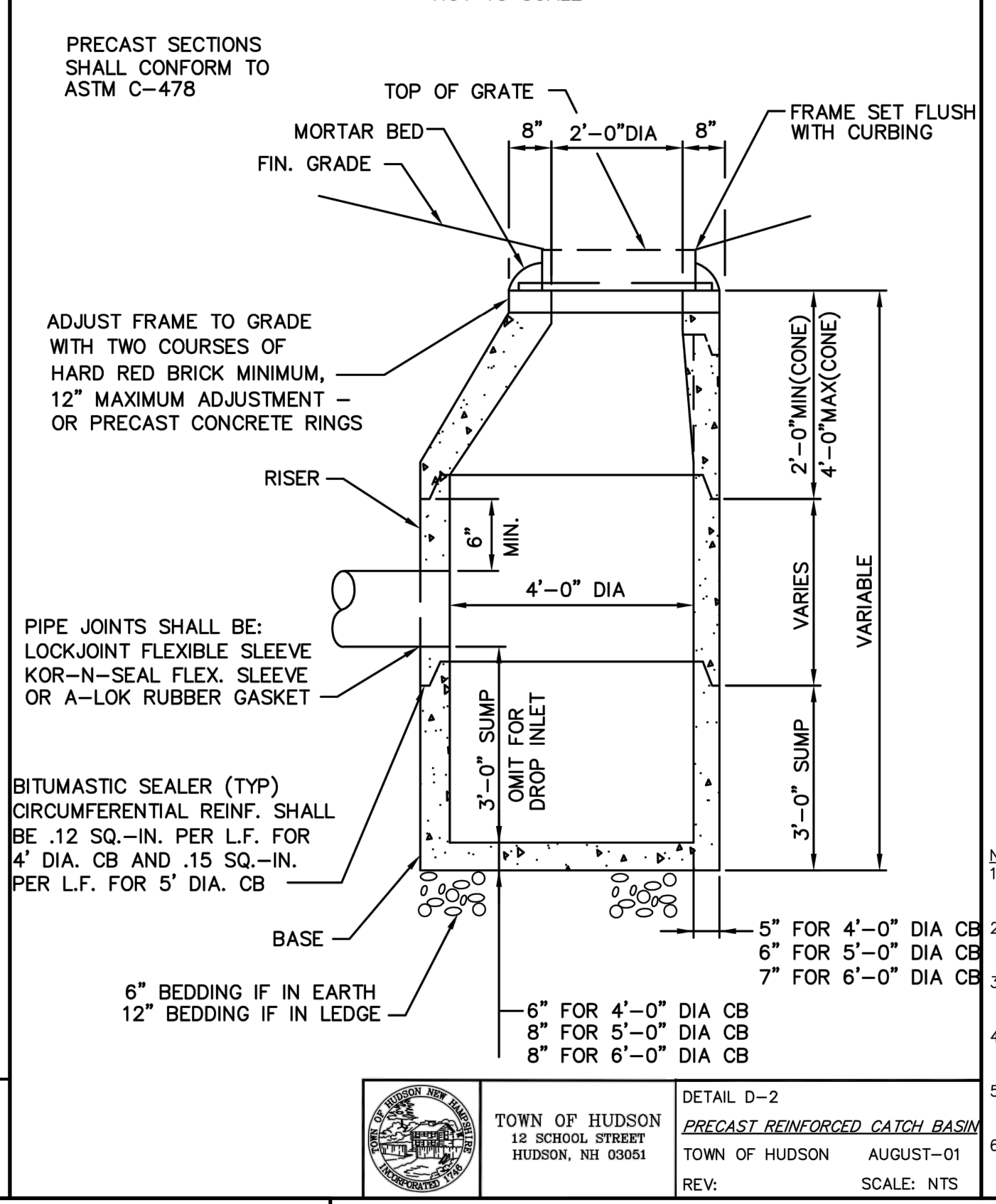
ON PAVEMENT CATCH BASIN GRATE

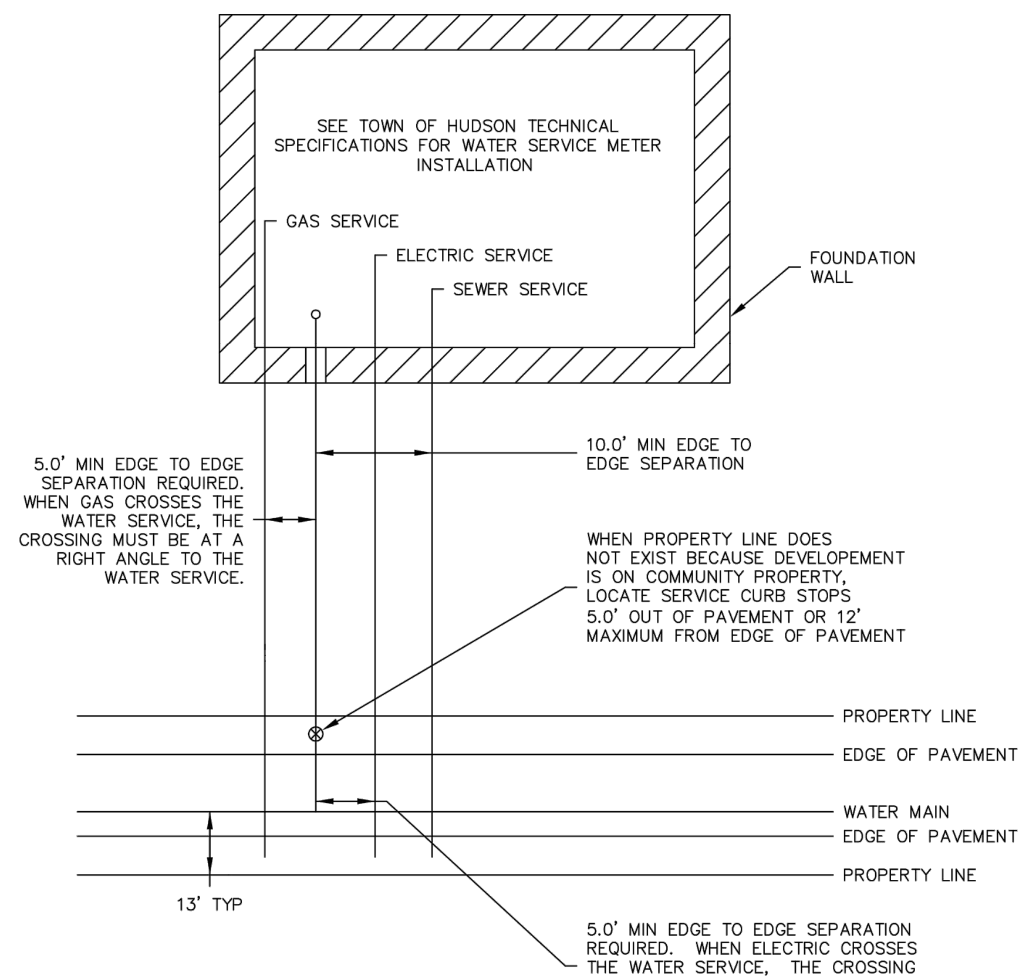
NOT TO SCALE



PRECAST REINFORCED CATCH BASIN

NOT TO SCALE





NOTES:
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. SERVICE ENTRANCE SHALL BE MADE IN THE FRONT OR SIDE OF BUILDING.
4. SERVICE ENTRANCE MADE IN REAR OF HOUSE WILL NOT BE ACCEPTED UNLESS PREVIOUSLY APPROVED BY P.W.W.
5. SERVICE ENTRANCE LOCATION WILL BE DETERMINED BY THE P.W.W. REPRESENTATIVE ON SITE.
6. IF SERVICE IS TAPPED OFF A FIRE SERVCE, THEN SEE DETAIL W-24.

85

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

TOWN OF HUDSON 12 SCHOOL STREET HUDSON, NH 03051
DETAIL W-11
OUTSIDE WATER SERVICE ENTRANCE
REV: 2019 SCALE: NTS

Client: Sousa Realty
Project Address: 36 Campbello Street
Town, State: Hudson, NH
Job Number: NEX-2300191
Date: September 28, 2023
Performed by: Diane Pantermoller

Test Pit No. **1** SCS Soil: Occum Fine Sandy Loam
ESHWT: 36” Standing Water: 90”
Refusal: >94” Roots: None

Depth	Horizon	Soil Texture	Color	Consistence	Layer Description (Gravel, Stones, Fill, etc)
0-15”	A	Loamy Sand	10yr 3/4	Friable	
15-25”	B	Loamy Sand	10yr 5/6	Friable	
25-94”	C	Loamy Sand	2.5y 6/3	Friable	

Test Pit No. **2** SCS Soil: Occum Fine Sandy Loam
ESHWT: 36” Standing Water: 60”
Refusal: >84” Roots: None

Depth	Horizon	Soil Texture	Color	Consistence	Layer Description (Gravel, Stones, Fill, etc)
0-14”	A	Loamy Sand	10yr 3/2	Friable	
14-26”	B	Loamy Sand	10yr 5/6	Friable	
26-60”	C1	Loamy Sand	2.5y 6/3	Friable	
60-84”	C2	Sand	7.5yr 6/8	Loose	

Test Pit No. **3** SCS Soil: Occum Fine Sandy Loam
ESHWT: 36” Standing Water: 48”
Refusal: >84” Roots: None

Depth	Horizon	Soil Texture	Color	Consistence	Layer Description (Gravel, Stones, Fill, etc)
0-14”	A	Loamy Sand	10yr 3/2	Friable	
14-28”	B	Loamy Sand	10yr 5/6	Friable	
28-84”	C	Fine Sand	2.5y 6/3	Friable	

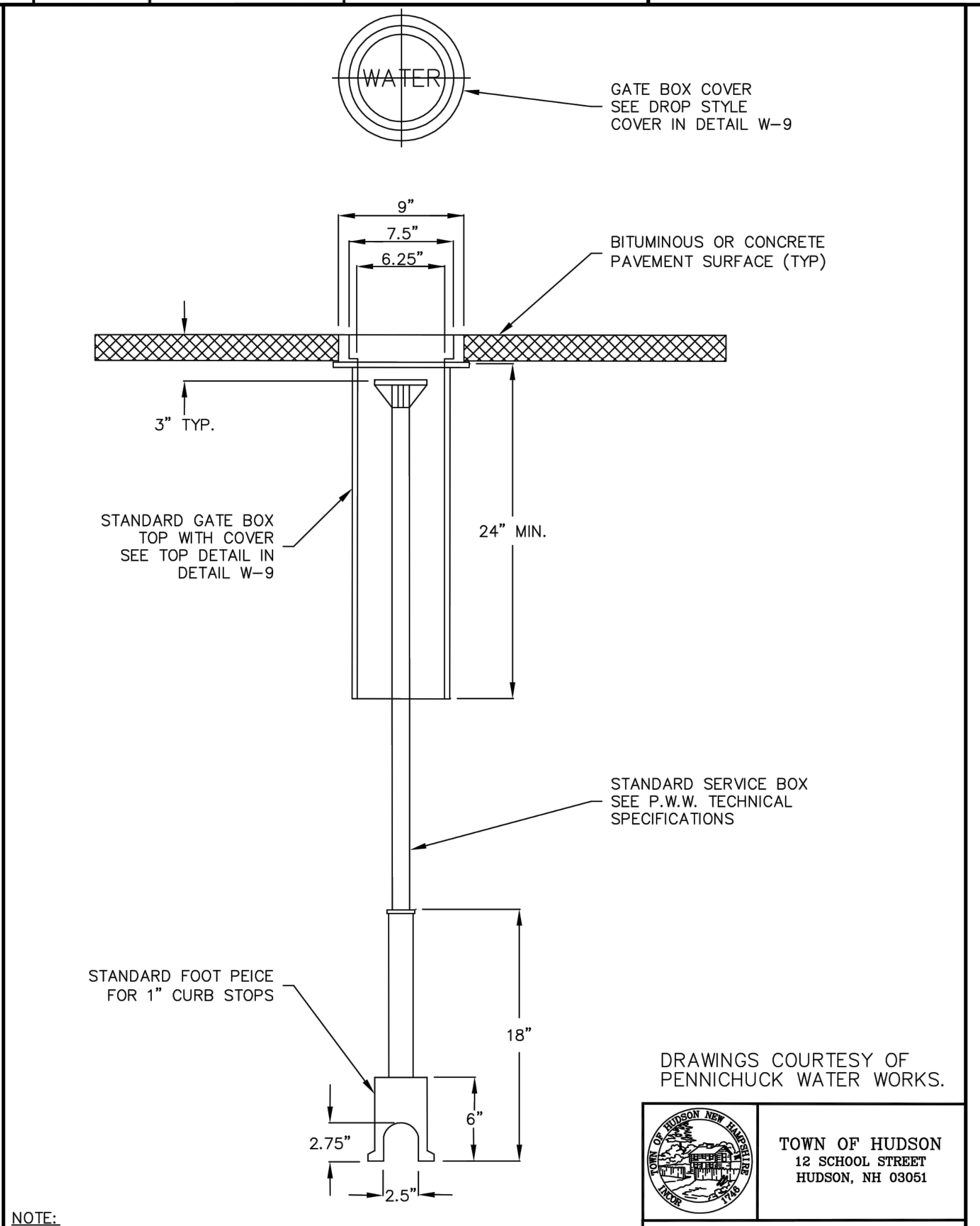
Test Pit No. **4** SCS Soil: Occum Fine Sandy Loam
ESHWT: 36” Standing Water: 54”
Refusal: >78” Roots: None

Depth	Horizon	Soil Texture	Color	Consistence	Layer Description (Gravel, Stones, Fill, etc)
0-12”	A	Loamy Sand	10yr 3/2	Friable	
12-24”	B	Loamy Sand	10yr 5/6	Friable	
24-78”	C	Loamy Sand	2.5y 6/3	Friable	

Test Pit No. **5** SCS Soil: Occum Fine Sandy Loam
ESHWT: 48” Standing Water: None
Refusal: >90” Roots: None

Depth	Horizon	Soil Texture	Color	Consistence	Layer Description (Gravel, Stones, Fill, etc)
0-18”	A	Loamy Sand	10yr 3/4	Friable	
18-40”	B	Loamy Sand	10yr 5/6	Friable	
40-90”	C	Loamy Sand	2.5y 6/3	Friable	

TEST PIT LOGS



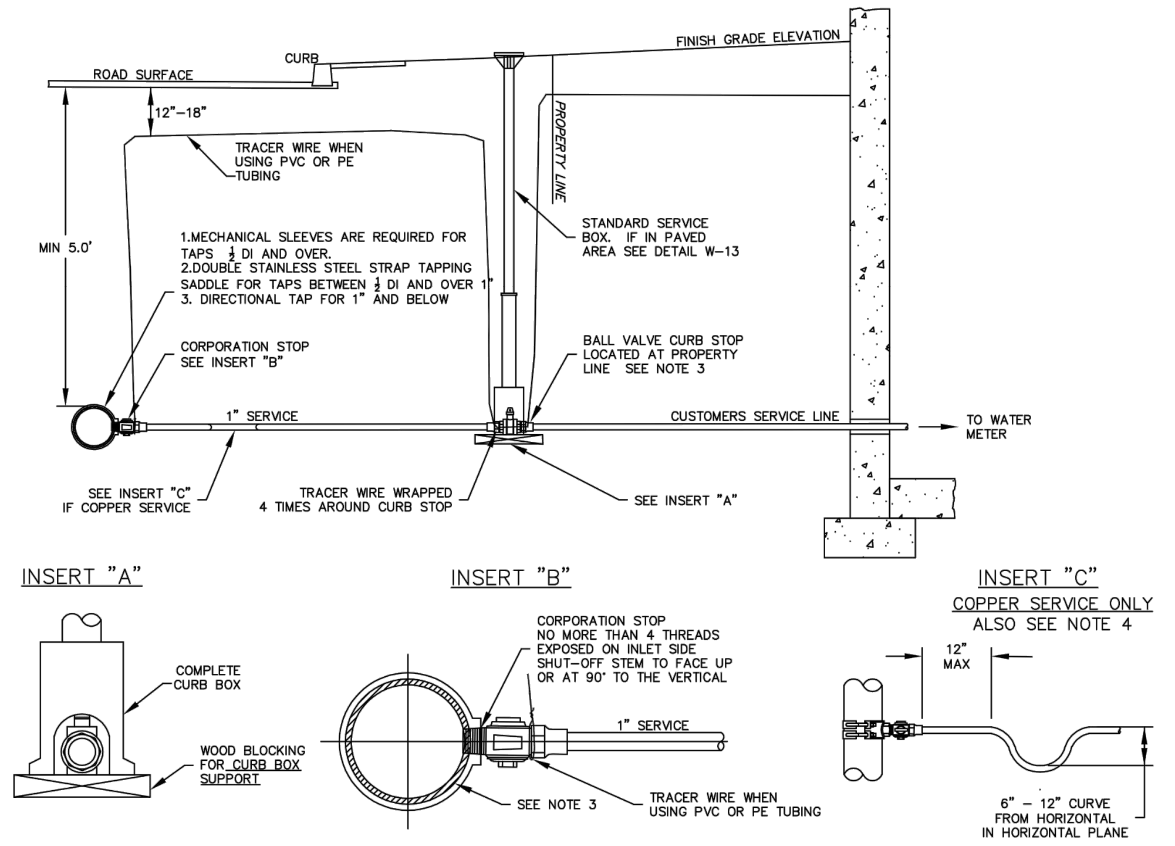
NOTE:
ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.

87

TOWN OF HUDSON 12 SCHOOL STREET HUDSON, NH 03051
DETAIL W-13
WATER SERVICE BOX IN PAVED AREAS
REV: 2019 SCALE: NTS

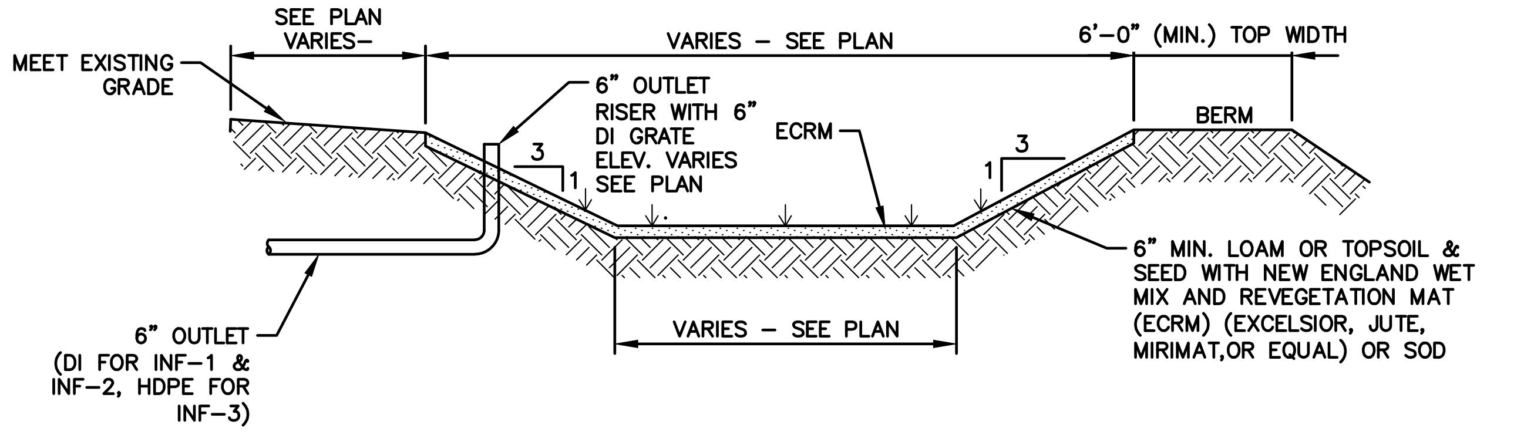
DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

TOWN OF HUDSON 12 SCHOOL STREET HUDSON, NH 03051
DETAIL W-20
1"-2" WATER SERVICE AND CURB BOX INSTALLATION
REV: 2019 SCALE: NTS



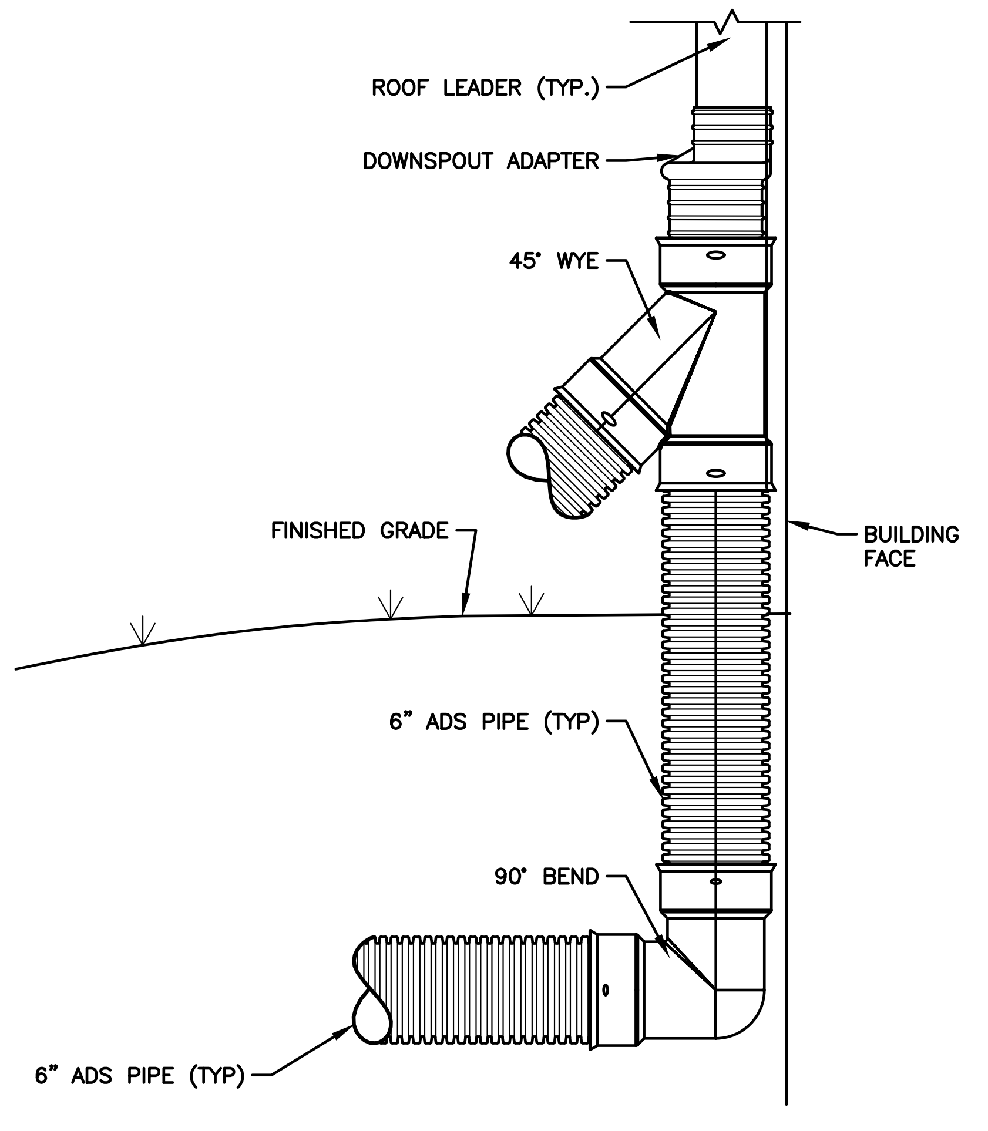
NOTES:
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. IF WATER MAIN IS PVC OR TRANSITE, A DOUBLE STAINLESS STEEL STRAP TAPPING SADDLE MUST BE USED TO CONNECT THE CORPORATION TO THE WATER MAIN.
4. IF WATER MAIN IS PVC OR TRANSITE, AND THE NEW WATER SERVICE IS COPPER THEN SEE DETAIL W-19.
5. IF WATER MAIN IS A FIRE SERVICE, THEN SEE DETAIL W-24.

NOTE:
1) DO NOT TRAFFIC EXPOSED SOIL SURFACE WITH CONSTRUCTION EQUIPMENT. IF FEASIBLE, PERFORM EXCAVATIONS WITH EQUIPMENT POSITIONED OUTSIDE THE LIMITS OF THE INFILTRATION SYSTEM.
2) AFTER THE INFILTRATION SYSTEM AREA IS EXCAVATED TO THE FINAL DESIGN ELEVATION, THE FLOOR SHOULD BE DEEPLY TILLED WITH A ROTARY TILLER OR DISC HARROW TO RESTORE INFILTRATION RATES, FOLLOWED BY A PASS WITH A LEVELING DRAG.
3) DO NOT PLACE INFILTRATION SYSTEMS INTO SERVICE UNTIL THE CONTRIBUTING AREAS HAVE BEEN FULLY STABILIZED.



INFILTRATION BASIN - TYP. CROSS SECTION

NOT TO SCALE



ROOF DRAIN DETAIL WITH OVERFLOW

NOT TO SCALE

APPROVED BY THE HUDSON, NH PLANNING BOARD
DATE OF MEETING: ______________________
SIGNATURE______________________DATE______________
SIGNATURE______________________DATE______________
SITE PLANS ARE VALID FOR TWO YEARS FROM THE DATE OF PLANNING BOARD MEETING FINAL APPROVAL. FINAL ALL SHEETS APPROVAL COMMENCES AT THE PLANNING BOARD MEETING DATE AT WHICH THE PLAN ACHIEVES FINAL APPROVAL.

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GPI Engineering Design Planning Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

PREPARED FOR
SOUSA REALTY & DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

DAVID R. JORDAN No. 7778
4/2/24

REVISIONS

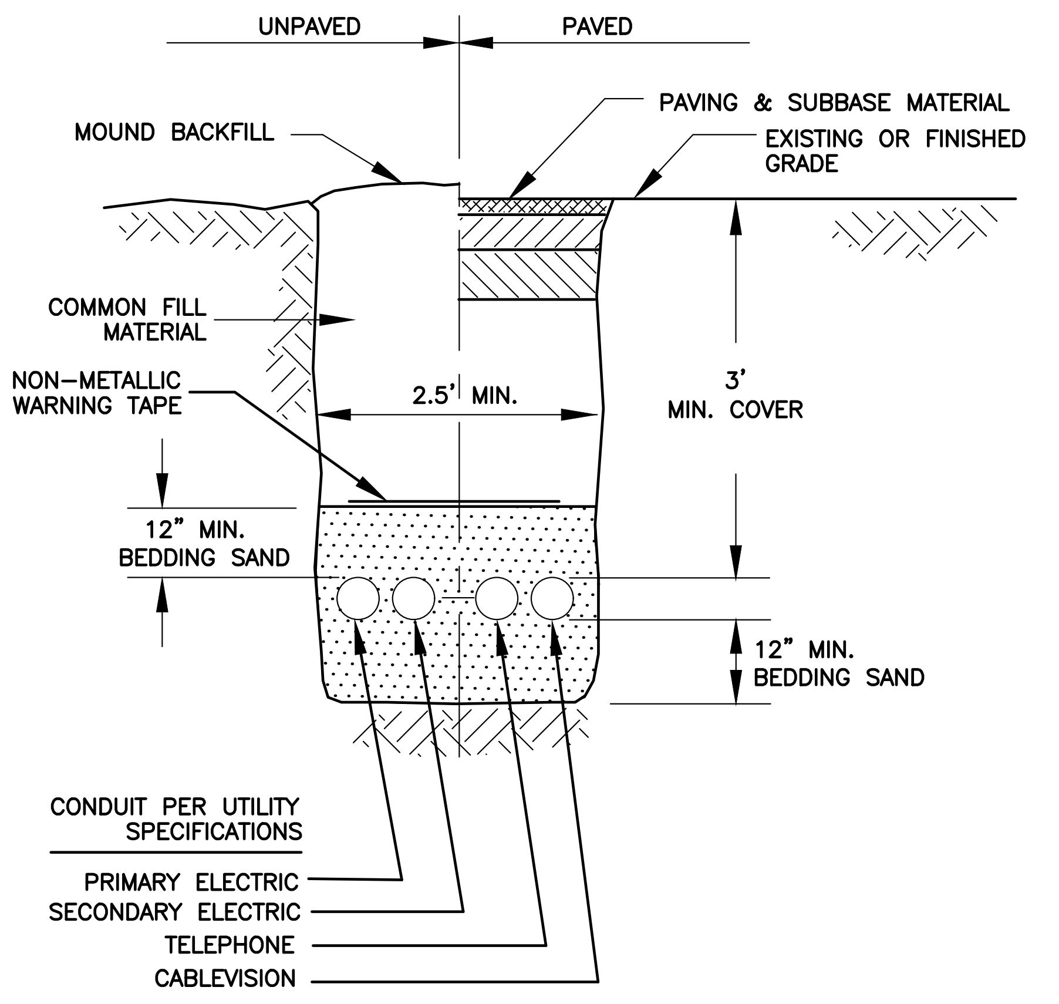
NO.	REVISION	DATE
2	REV. FOR SITE PLAN SUBMISSION	4/2/24
1	MISC. REVISION	3/1/24

NOVEMBER 20, 2023

DRAWN/DESIGN BY	CHECKED BY
CNM	DRJ

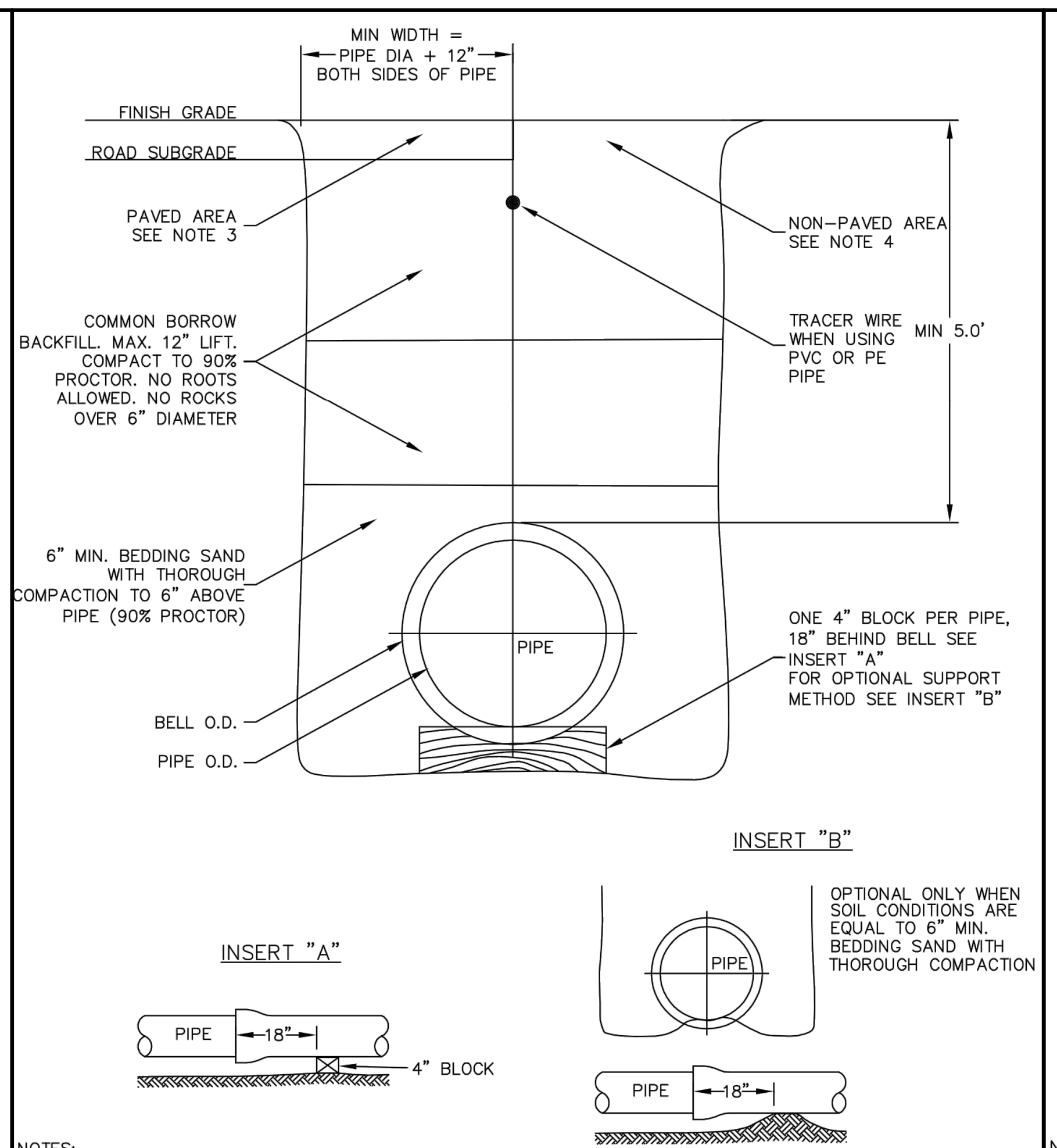
CONSTRUCTION DETAILS

SCALE: AS SHOWN
PROJECT NO. NEX-2300191
14 OF 16



UTILITY TRENCH

OR AS SPECIFIED BY UTILITY COMPANIES.
NOT TO SCALE

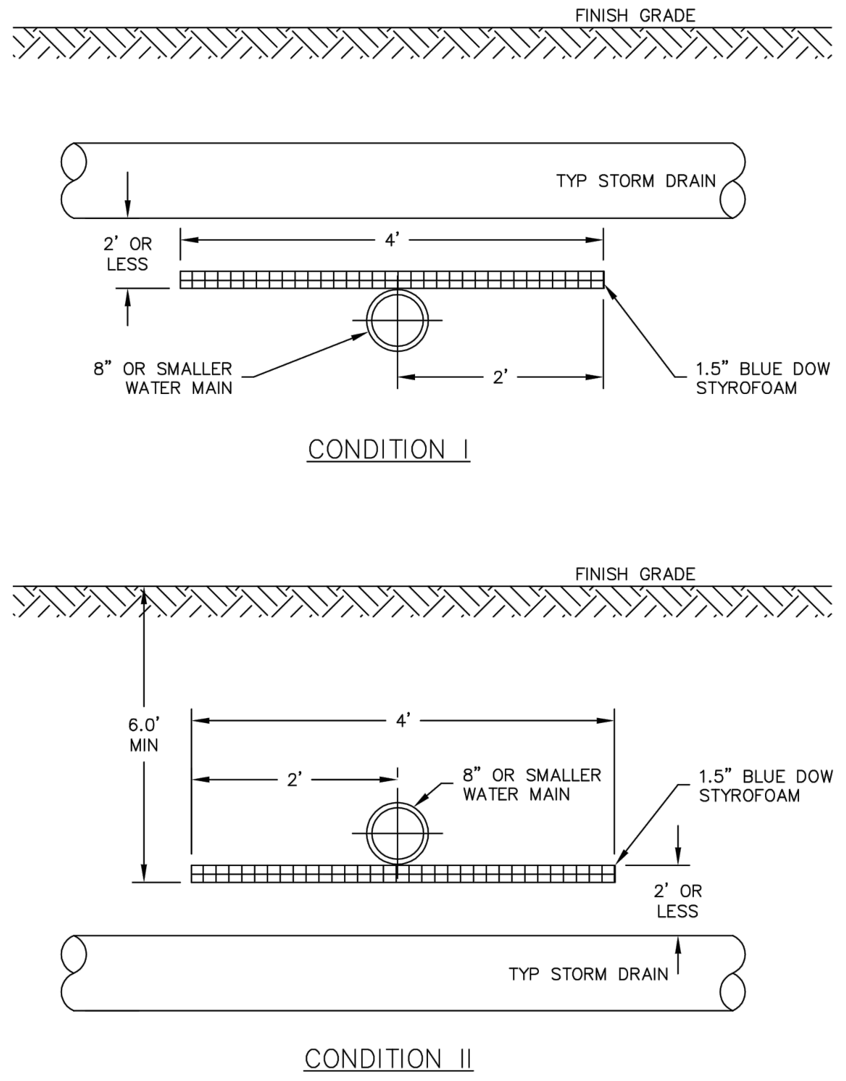


NOTES:
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. REQUIREMENTS FOR SUBBASE AND BASE MATERIAL TYPE ARE TO BE IN ACCORDANCE WITH TOWN OF HUDSON STANDARDS. SEE DEATIL R-1.
4. REQUIREMENTS FOR GRAVEL, LOAM AND/OR SEED ARE TO BE IN ACCORDANCE WITH TOWN OF HUDSON STANDARDS. SEE DETAIL. 76

DRAWINGS COURTESY PENNICHUCK WATER WORKS.

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-2
WATER TRENCH
REV: 2019 SCALE: NTS

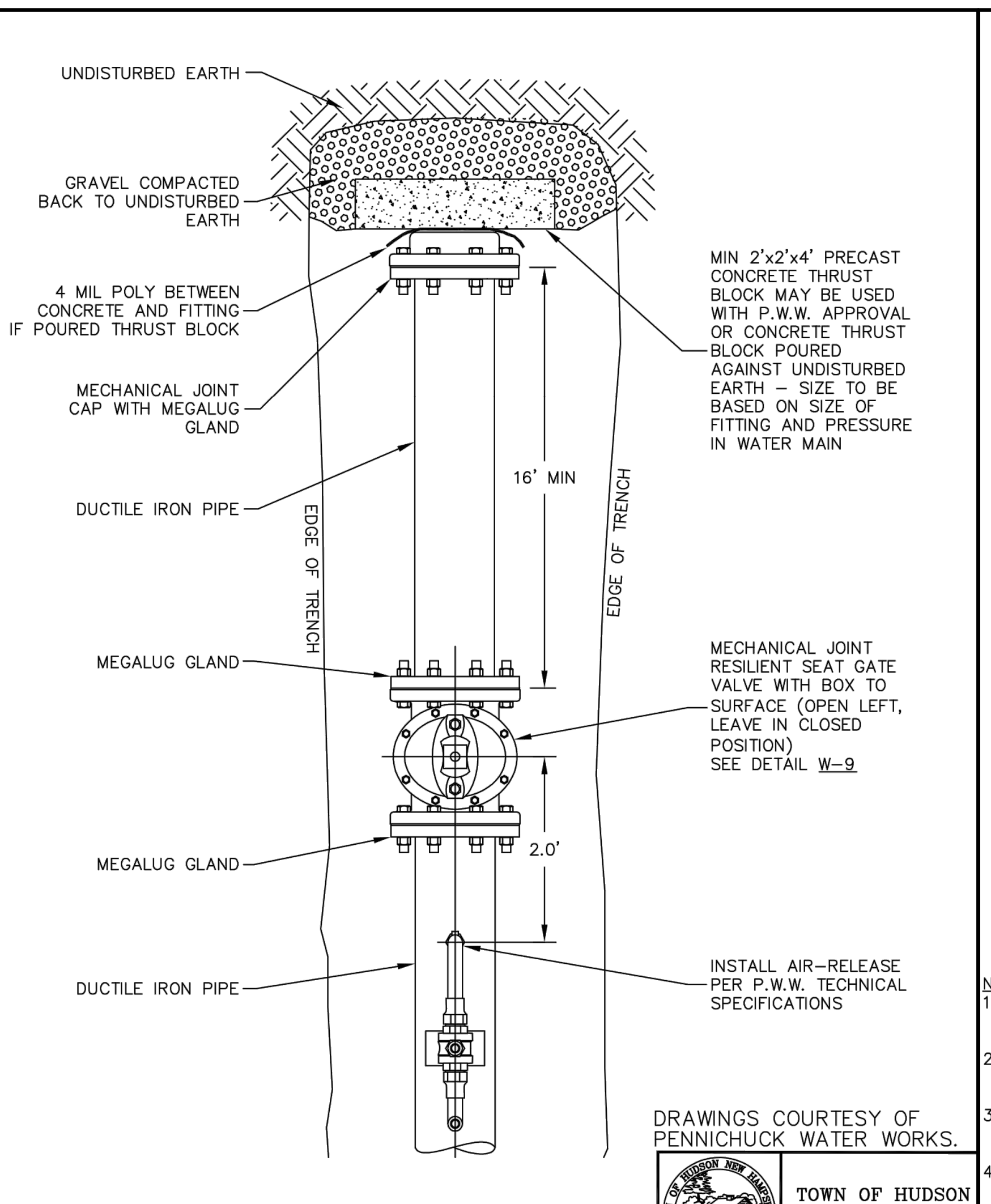


NOTES:
1. THE TOWN OF HUDSON RESERVES THE RIGHT TO MODIFY INSULATION REQUIREMENTS AS NECESSARY BASED ON FIELD CONDITIONS, ETC.
2. THE LENGTH OR WIDTH OF INSULATION SHALL EXTEND 1 STORM DRAIN PIPE DIAMETER BEYOND THE EDGE OF STORM DRAIN PIPE IN EACH DIRECTION OR A MINIMUM OF 2' BEYOND THE CENTERLINE OF THE STORM DRAIN PIPE, WHICHEVER IS GREATER.
3. ALL BUTT JOINT SEAMS TO BE OVERLAPPED WITH A 1' PIECE OF INSULATION CENTERED OVER SEAM. 92

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-18
STORM DRAIN, WATER MAIN INTERSECTING RUNS – ELEV. VIEW
REV: 2019 SCALE: NTS

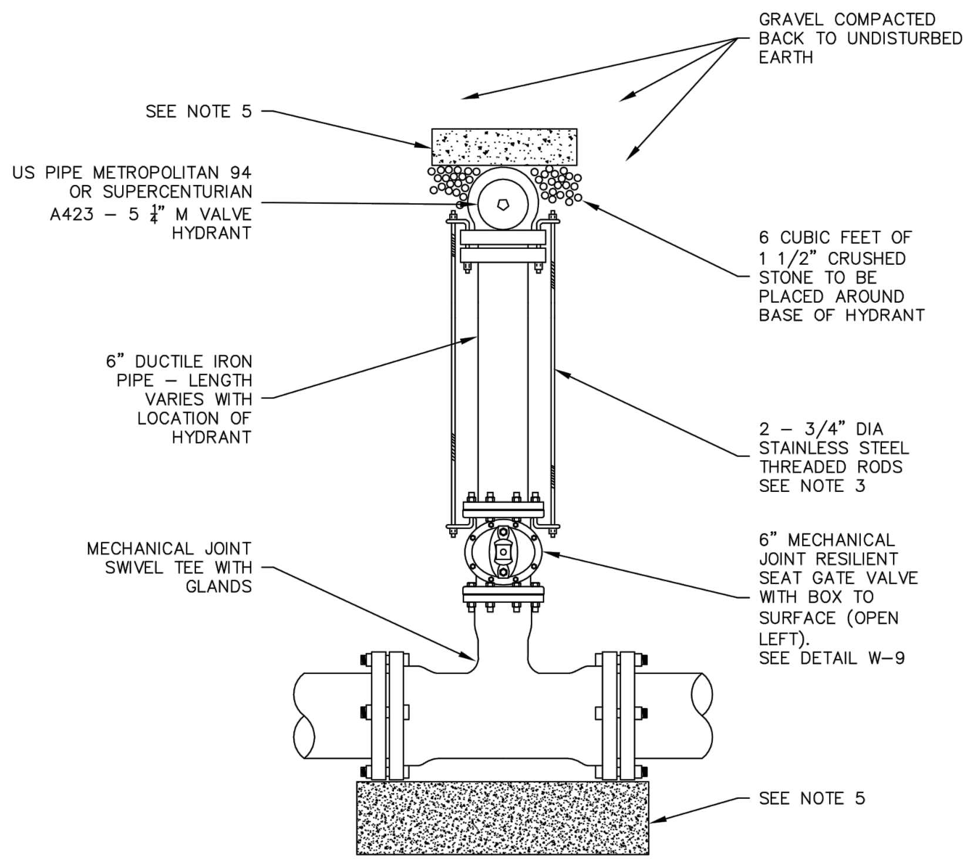


NOTES:
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE. 82

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-8
WATER END OF MAIN INSTALLATION
REV: 2019 SCALE: NTS

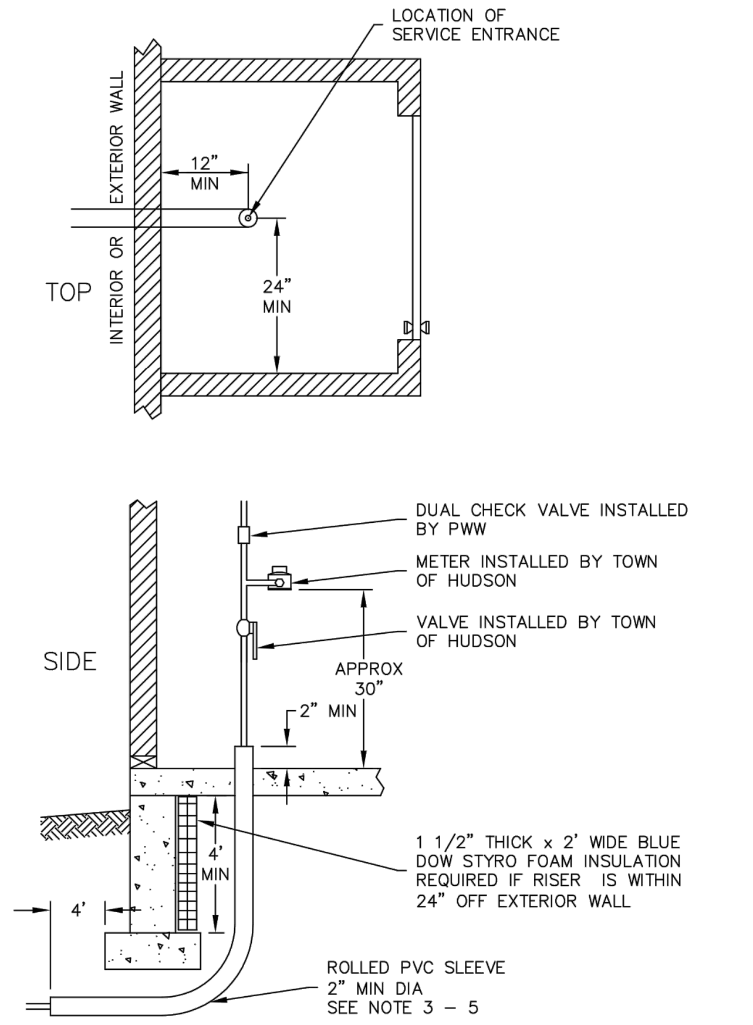


NOTES:
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. ALL THREADED RODS AND NUTS MUST BE STAINLESS STEEL.
4. WHEN DISTANCE FROM WATER MAIN TO HYDRANT IS MORE THAN 10', SUBSTITUTE MEGALUGS IN LIEU OF THREADED ROD OR GRIP RINGS.
5. MIN OF 2–2'x2'x4' PRECAST CONCRETE THRUST BLOCK MAY BE USED WITH TOWN OF HUDSON APPROVAL OR CONCRETE THRUST BLOCK POURED AGAINST UNDISTURBED EARTH – SIZE TO BE BASED ON SIZE OF FITTING AND PRESSURE IN WATER MAIN. SEE DETAIL W-7. 84

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-10
WATER HYDRANT INSTALLATION
REV: 2019 SCALE: NTS

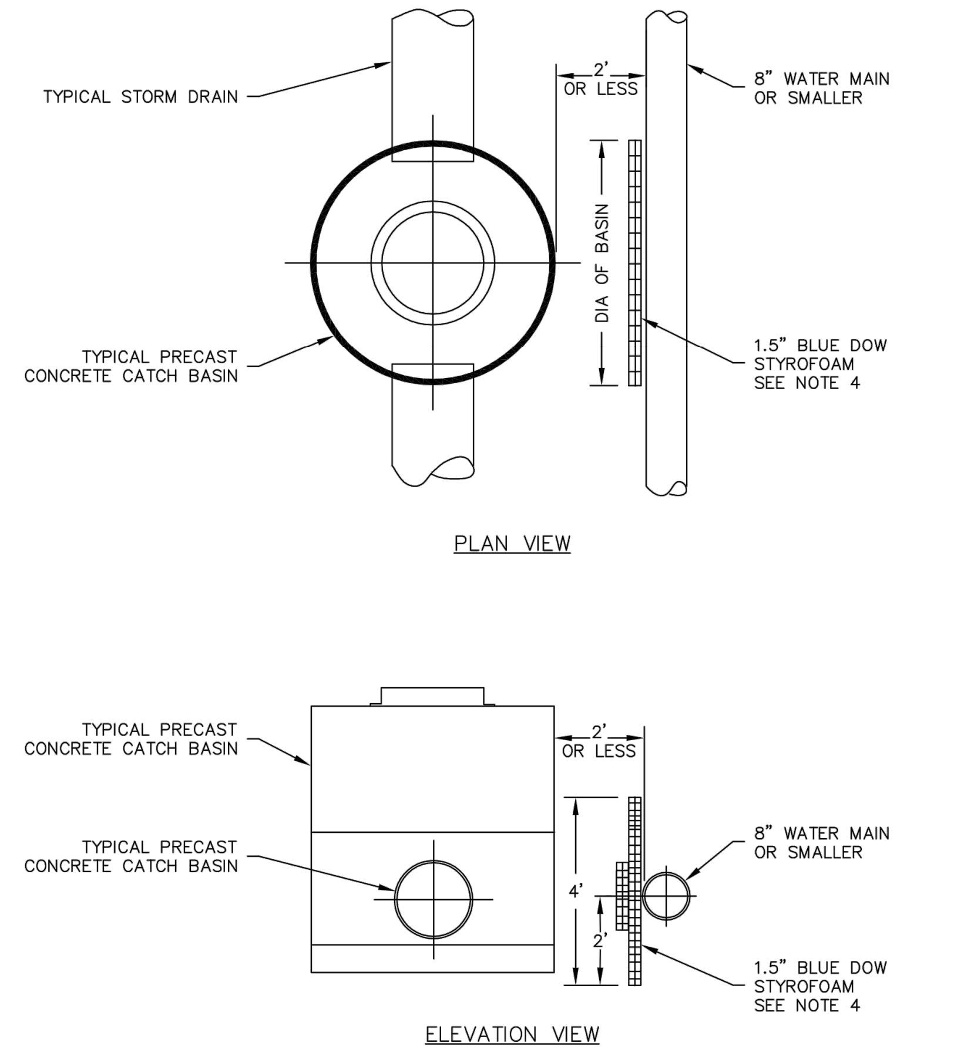


NOTES:
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL WATER SERVICES IN SLAB CONSTUCTION BUILDINGS MUST BE INSTALLED IN PVC PIPE SLEEVES AS SHOWN.
3. NOTES 4 THROUGH 8 ON DETAIL W-14 ALSO APPLY.
4. SLEEVE IS TO EXTEND 4" BEYOND THE EXTERIOR LINE OF THE FOUNDATION WALL WITH ONE CONTINUOUS PIECE OF SLEEVE.
5. ON SLEEVES GREATER THAN 2" IN DIAMETER, SOLVENT WELDED JOINTS WILL BE ACCEPTABLE. <u>HOWEVER, MANUFACTURED BENDS BENDS WILL NOT BE ACCEPTABLE.</u>
6. A CLOSET OR UTILITY ROOM MUST BE PROVIDED. 89

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-15
WATER SLAB CONSTRUCTION
REV: 2019 SCALE: NTS



NOTES:
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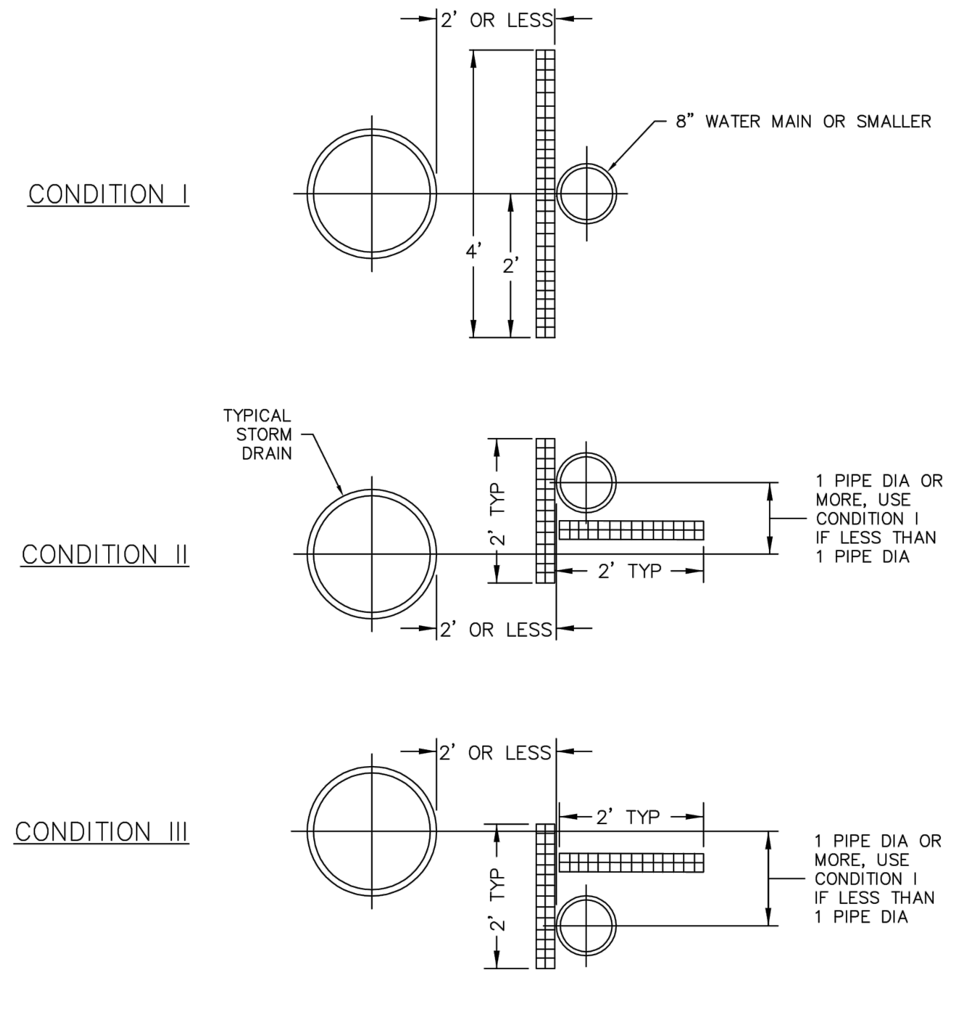
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. P.W.W., INC. RESERVES THE RIGHT TO MODIFY INSULATION REQUIREMENTS AS NECESSARY BASED ON FIELD CONDITIONS, ETC.
4. ALL BUTT JOINT SEAMS TO BE OVERLAPPED WITH 1' PIECE OF INSULATION CENTERED OVER SEAM. 90

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-16
CATCH BASIN INSULATION
REV: 2019 SCALE: NTS



NOTES:
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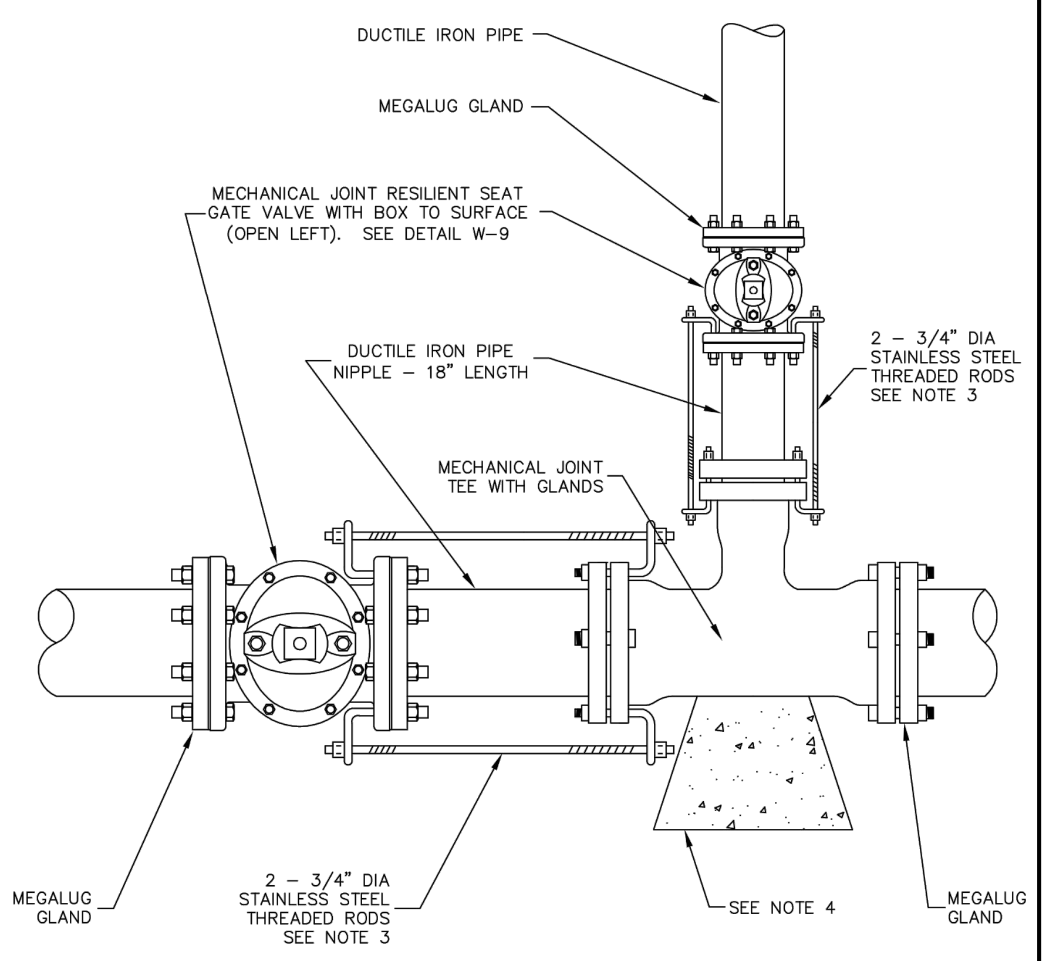
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. P.W.W., INC. RESERVES THE RIGHT TO MODIFY INSULATION REQUIREMENTS AS NECESSARY BASED ON FIELD CONDTIONS, ETC.
4. INSULATION TO BE RUN HORIZONTALLY AS LONG AS CONDITIONS I, II, OR III ABOVE EXIST. ALL BUTT JOINT SEAMS TO BE OVERLAPPED WITH 1' PIECE OF INSULATION CENTERED OVER SEAM.
5. ▦ – 1.5" (MIN) BLUE DOW STYROFOAM 91

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-17
STORM DRAIN / WATER MAIN PARALLEL RUNS – ELEVATION VIEW
REV: 2019 SCALE: NTS



NOTES:
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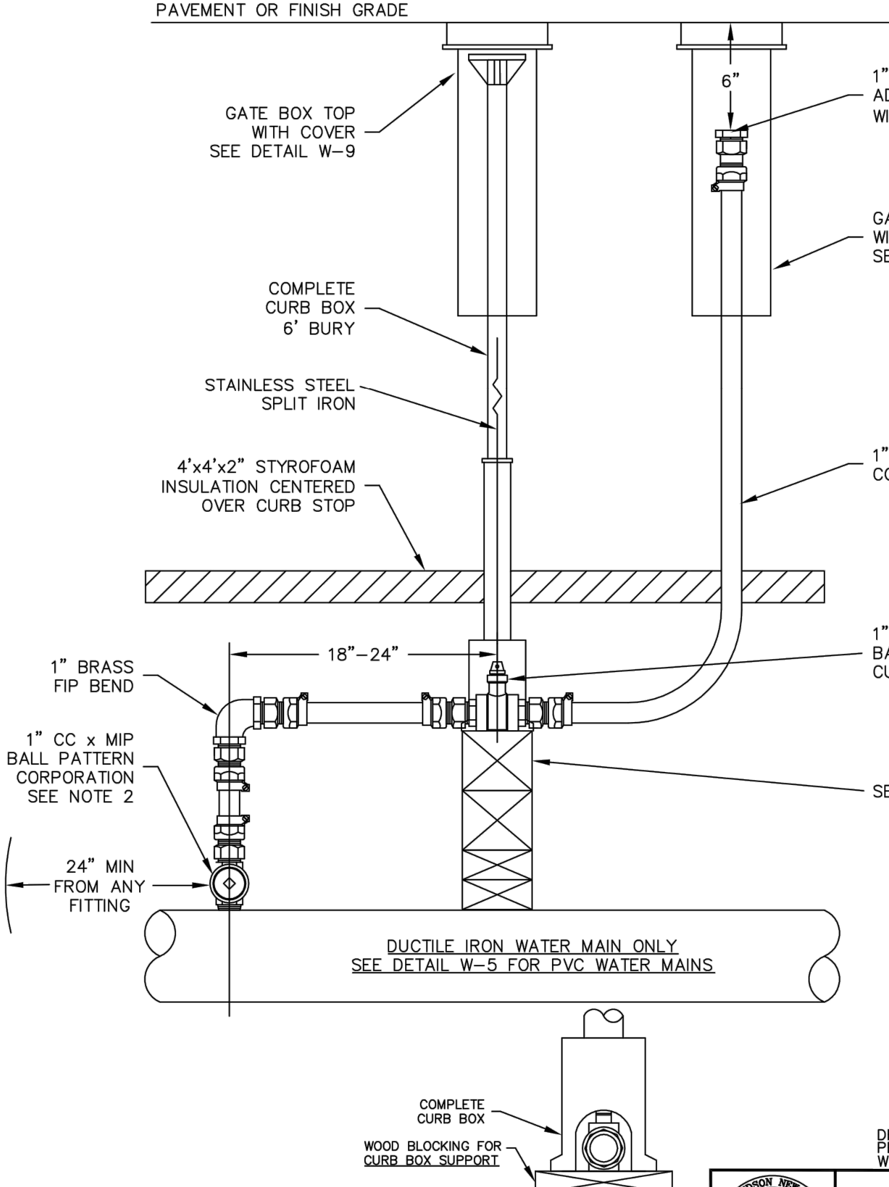
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTHS OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. ALL THREADED RODS AND NUTS MUST BE STAINLESS STEEL.
4. MIN 2'x2'x4' PRECAST CONCRETE THRUST BLOCK MAY BE USED WITH P.W.W. APPROVAL OR CONCRETE THRUST BLOCK POURED AGAINST UNDISTURBED EARTH – SIZE TO BE BASED ON SIZE OF FITTING AND PRESSURE IN WATER MAIN. SEE DETAIL W-7. 80

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-6
WATER TEE INSTALLATION
REV: 2019 SCALE: NTS



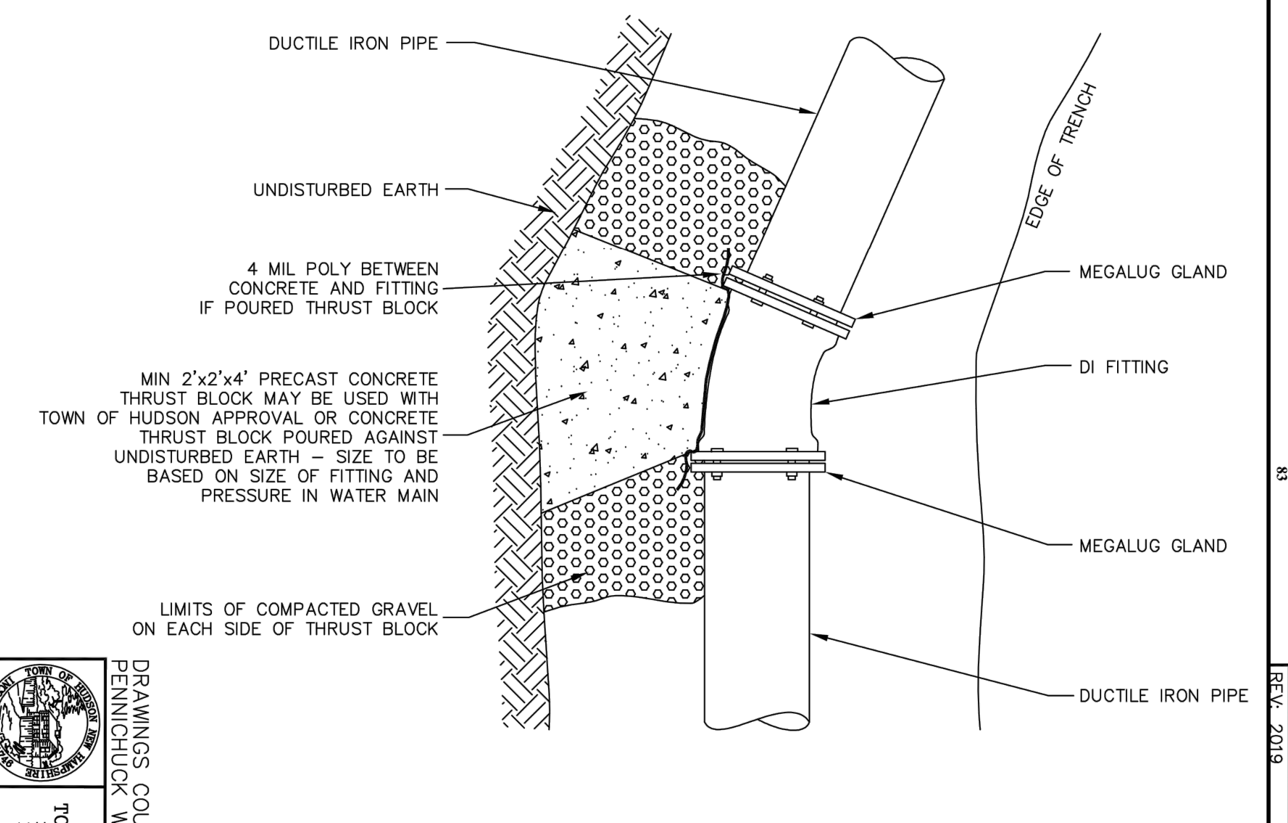
INSERT "A"

NOTES:
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO P.W.W. TECHNICAL SPECIFICATIONS.
2. WATER MAIN MAY BE DIRECT TAPPED WHEN IT IS 6" OR LARGER DUCTILE IRON.
3. SEE DETAIL W-5 FOR INSTALLATION ON PVC WATER MAINS. 77

DRAWINGS COURTESY PENNICHUCK WATER WORKS.

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-3
WATER 1" RELEASE VALVE INSTALLATION ON DUCTILE IRON
REV: 2019 SCALE: NTS



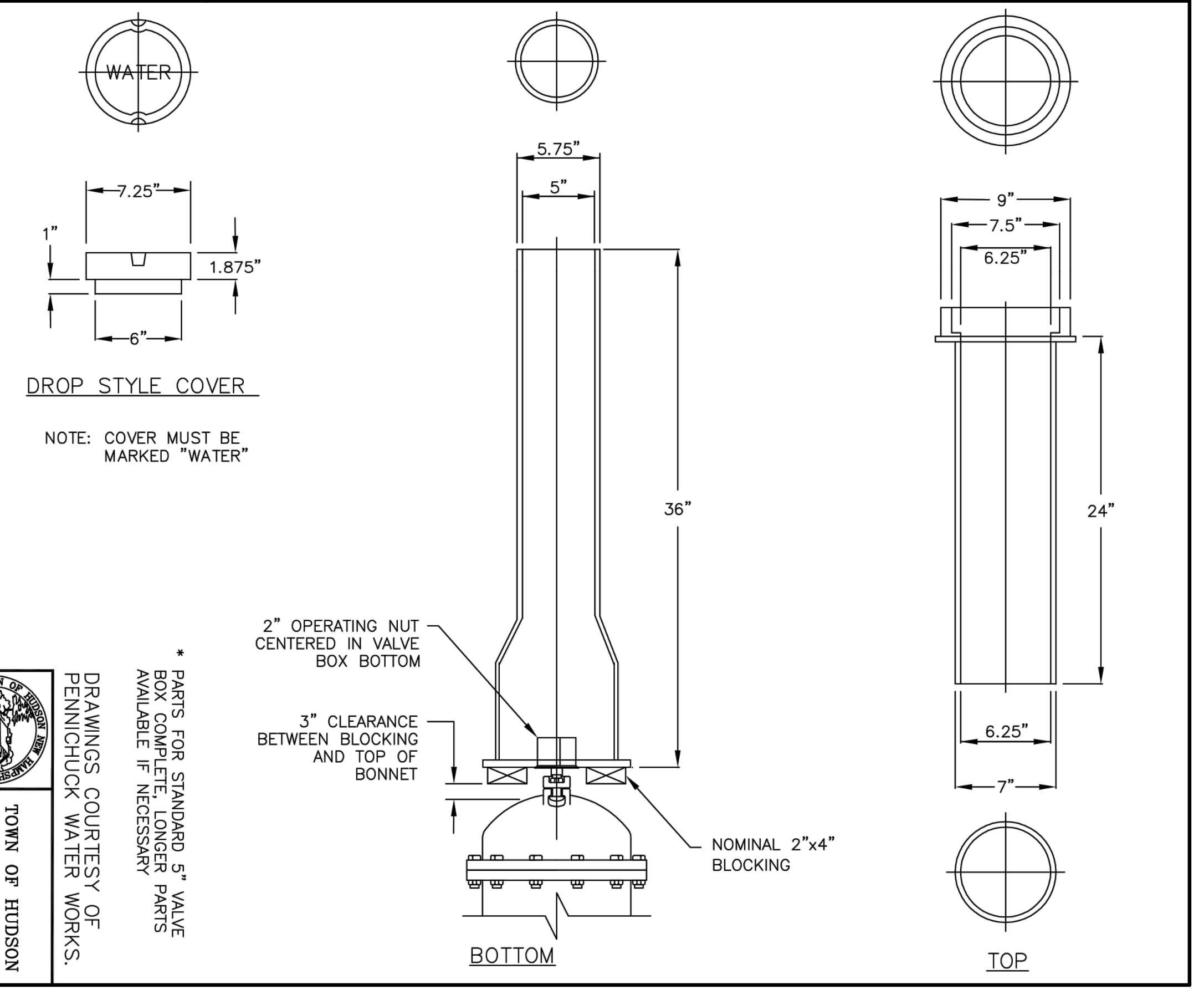
81

NOTES:
1. ALL MATERIAL AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-7
WATER THRUST BLOCK BEHIND FITTINGS INSTALLATION
REV: 2019 SCALE: NTS



NOTE: COVER MUST BE MARKED "WATER"

83

* PARTS FOR STANDARD 5" VALVE BOX COMPLETE, LONGER PARTS AVAILABLE IF NECESSARY

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-9
WATER VALVE BOX
REV: 2019 SCALE: NTS

APPROVED BY THE HUDSON, NH PLANNING BOARD

DATE OF MEETING: ______________________________

SIGNATURE______________________________ DATE______________

SIGNATURE______________________________ DATE______________

SITE PLANS ARE VALID FOR TWO YEARS FROM THE DATE OF PLANNING BOARD MEETING FINAL APPROVAL. FINAL ALL SHEETS APPROVAL COMMENCES AT THE PLANNING BOARD MEETING DATE AT WHICH THE PLAN ACHIEVES FINAL APPROVAL.

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Engineering
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603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
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PREPARED FOR
SOUSA REALTY &
DEVELOPMENT CORP.
46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49

36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

DAVID R. JORDAN
No. 7778
4/2/24

REVISIONS		
2	REV. FOR SITE PLAN SUBMISSION	4/2/24
1	MISC. REVISION	3/1/24
NO.	REVISION	DATE

NOVEMBER 20, 2023

DRAWN/DESIGN BY: CNM
CHECKED BY: DRJ

CONSTRUCTION DETAILS

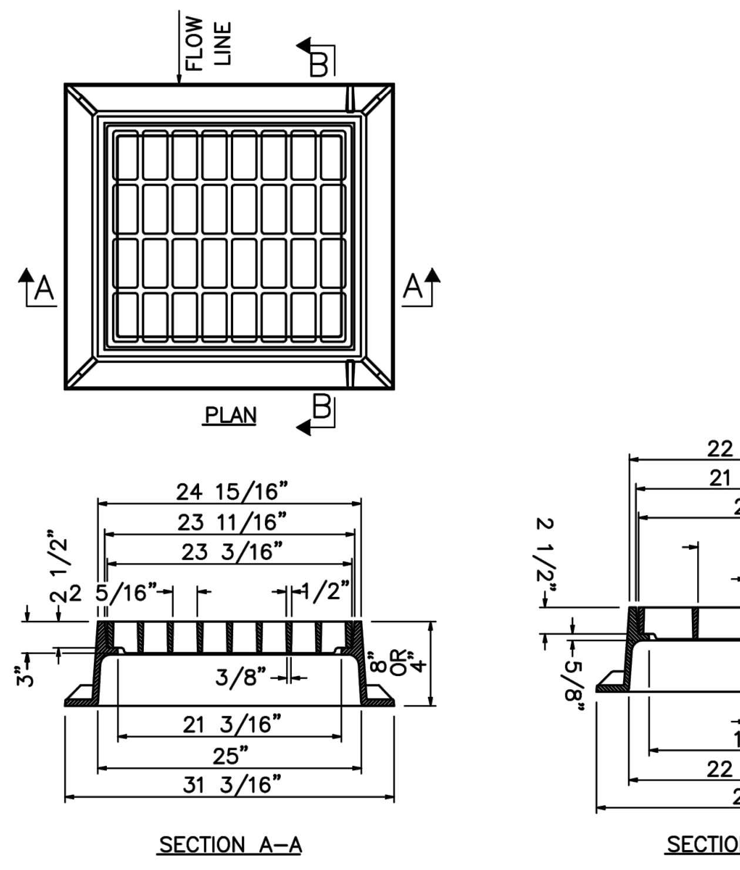
SCALE: AS SHOWN

PROJECT NO. NEX-2300191

15 OF 16

ON PAVEMENT CATCH BASIN GRATE

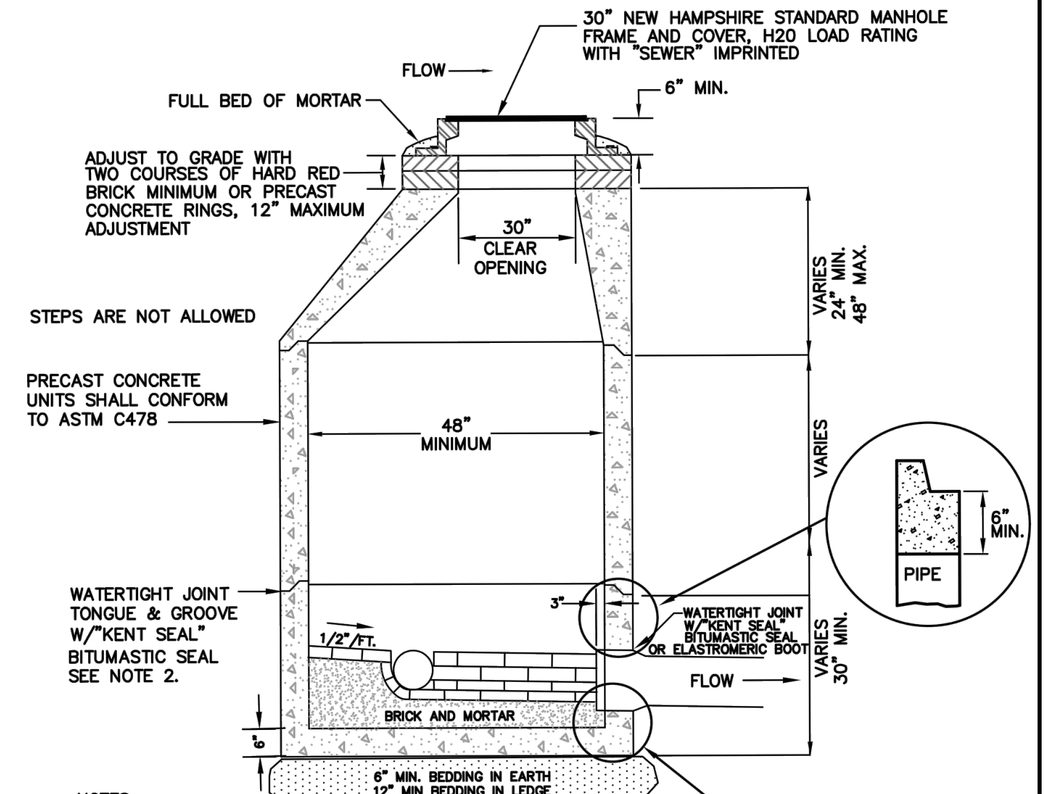
NOT TO SCALE



NHDOT TYPE B

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL D–7
ON PAVEMENT CATCH BASIN GRATE
TOWN OF HUDSON AUGUST–01
REV: JULY 2019 SCALE: NTS



NOTES:

1. ALL GASKETS AND SEALANTS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS WRITTEN INSTRUCTIONS.
2. FOR BITUMASTIC TYPE JOINTS THE AMOUNT OF SEALANT SHALL BE SUFFICIENT TO FILL AT LEAST 75% OF THE JOINT CAVITY. APPROVED BITUMASTIC SEALANTS
   RAM–NEK
   KENT SEAL No. 2

TYPE OF PIPE	SIZE	MAX. DIST. TO FIRST JOINT
R.C.P. & C.I.	ALL	48"
C.I.P.	ALL	48"
P.V.C.	>15"	48"
V.C.P.	0–12"	18"
V.C.P.	>12"	36"

ALL SECTIONS SHALL BE CONCRETE CLASS AA (4000 PSI). CIRCUMFERENTIAL REINFORCEMENT SHALL BE 0.12 SQ. IN. PER L.F. IN ALL SECTIONS AND SHALL BE PLACED IN THE CENTER THIRD OF THE WALL. THE TONGUE OR THE GROOVE OF THE JOINT SHALL CONTAIN ONE LINE OF CIRCUMFERENTIAL REINFORCEMENT EQUAL TO 0.12 SQ. IN. PER L.F.

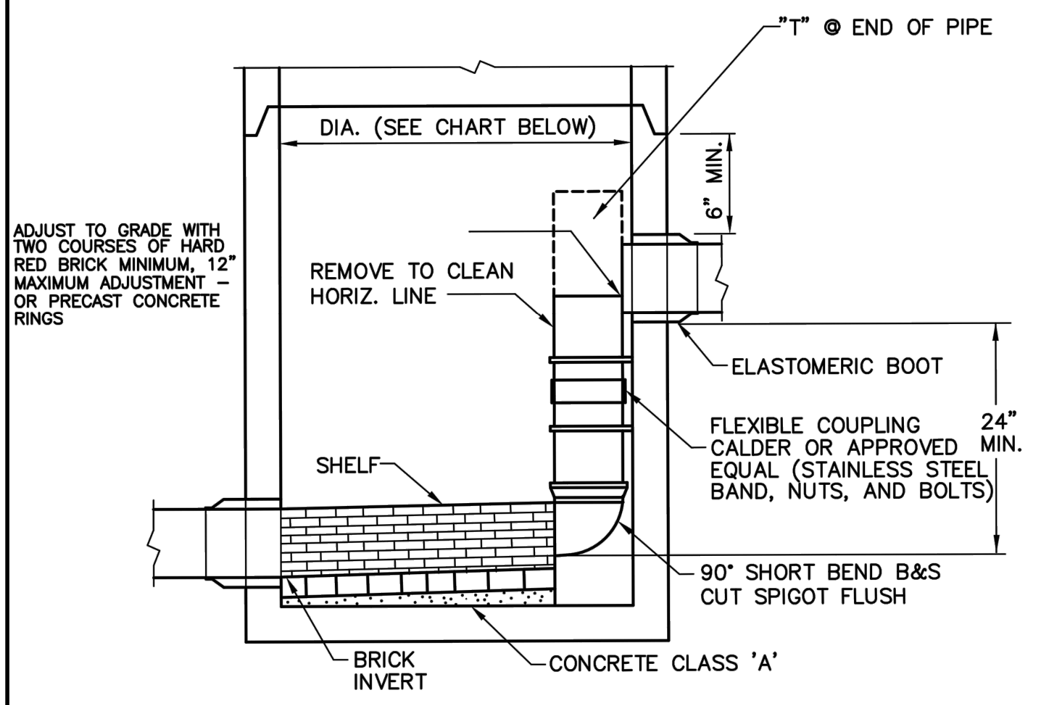
BASE SECTION TO BE FULL WALL THICKNESS AND MONOLITHIC TO A POINT 6" ABOVE THE PIPE CROWN.

SEWER MANHOLE

NOT TO SCALE

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL S–1
SEWER MANHOLE
TOWN OF HUDSON AUGUST–01
REV: 8/23/19 SCALE: NTS



MAN HOLE SIZE CHART

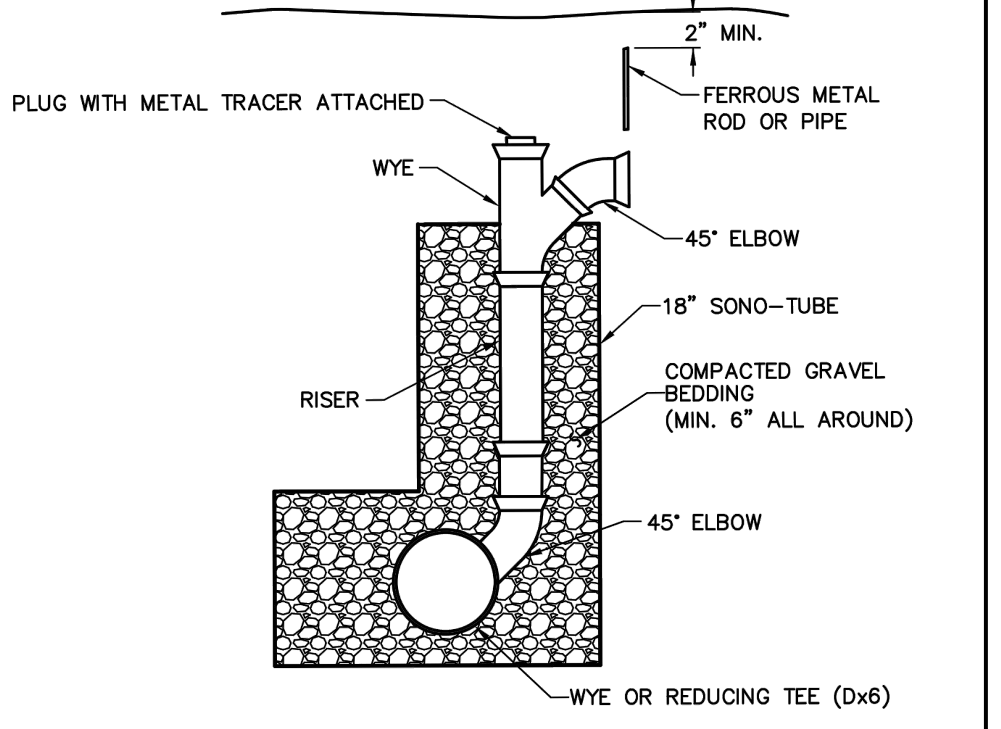
ONE 8" DROP USE 4' DIA.
ONE 10" DROP USE 4' DIA.
TWO 8" DROP USE 5' DIA.
TWO 10" DROP USE 5' DIA.
ONE 12" DROP USE 5' DIA.
ONE 15" DROP USE 5' DIA.
ONE 18" DROP USE 6' DIA.
ONE 24" DROP USE 6' DIA.

INTERNAL DROP SMH

NOT TO SCALE

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL S–3
INTERNAL DROP SMH
TOWN OF HUDSON AUGUST–01
REV: JULY 2019 SCALE: NTS

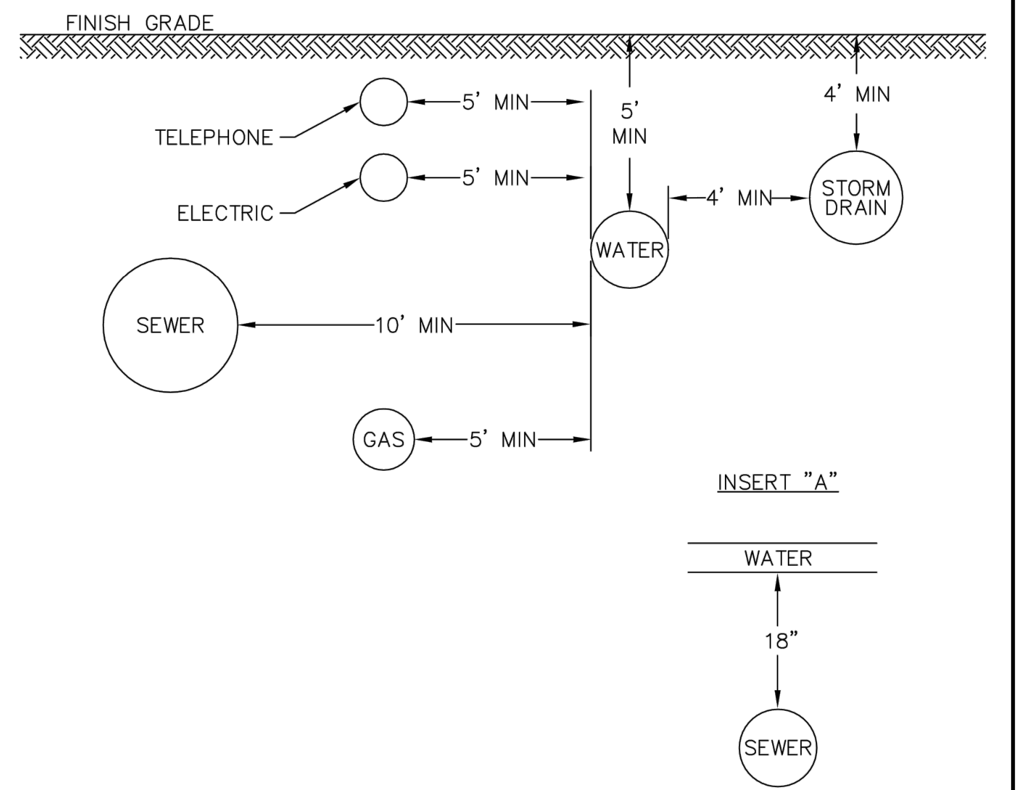


CHIMNEY

NOT TO SCALE

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL S–7
CHIMNEY
TOWN OF HUDSON AUGUST–01
REV: SCALE: NTS



NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL WATER MAINS SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. SEE DETAIL A–2 FOR TRENCH DETAIL.
4. SEE DETAIL A–11 FOR OUTSIDE SERVICE ENTRANCE DETAIL.
4. AT CROSSINGS WHERE 10' HORIZONTAL SEPERATION IS NOT POSSIBLE, 18" VERTICAL SEPERATION SHALL BE PROVIDED. SEE INSERT "A".

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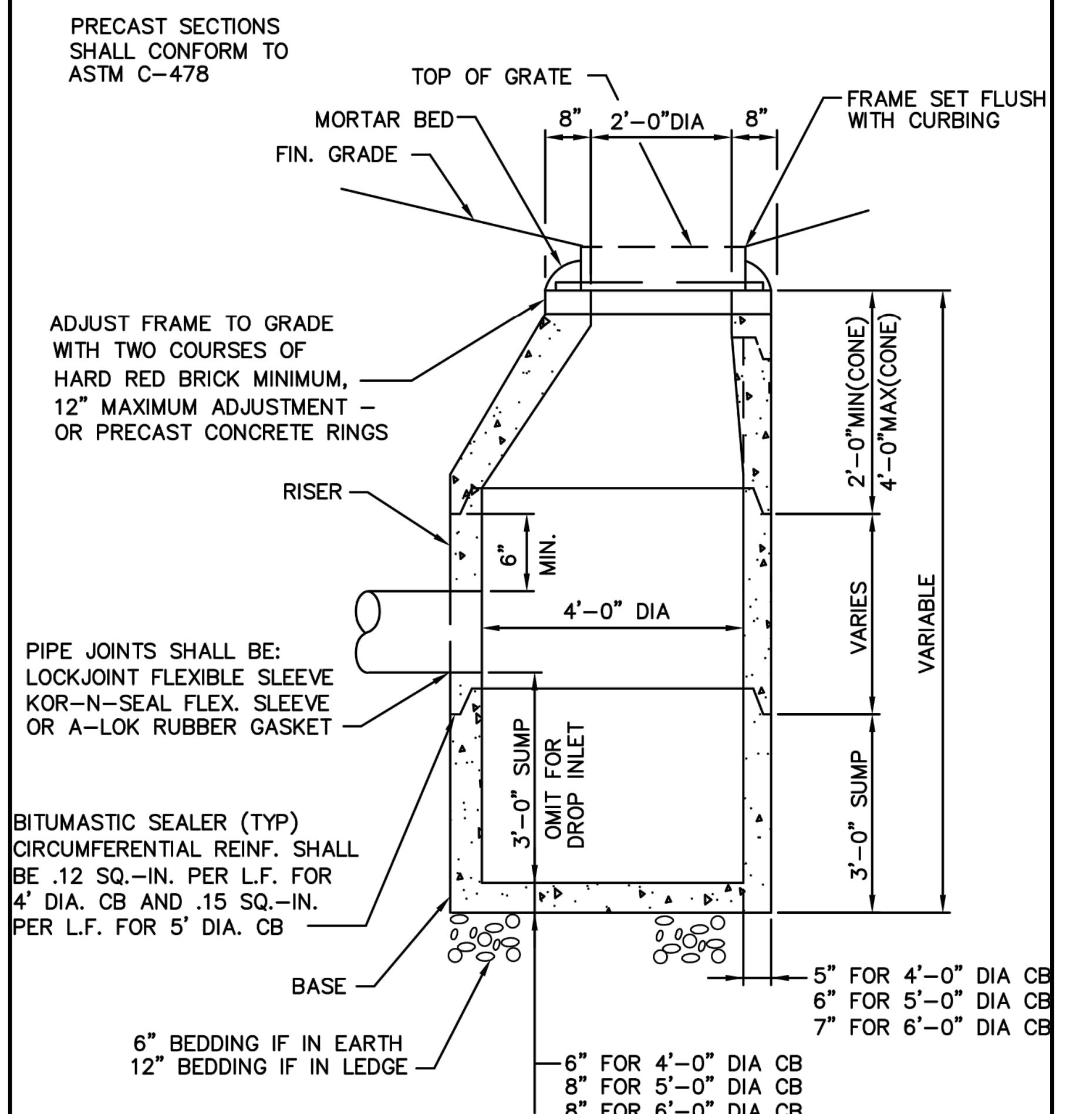
DRAWINGS COURTESY PENNICHUCK WATER WORKS.

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W–1
WATER UTILITY SEPARATION
REV: 2019 SCALE: NTS

PRECAST REINFORCED CATCH BASIN

NOT TO SCALE

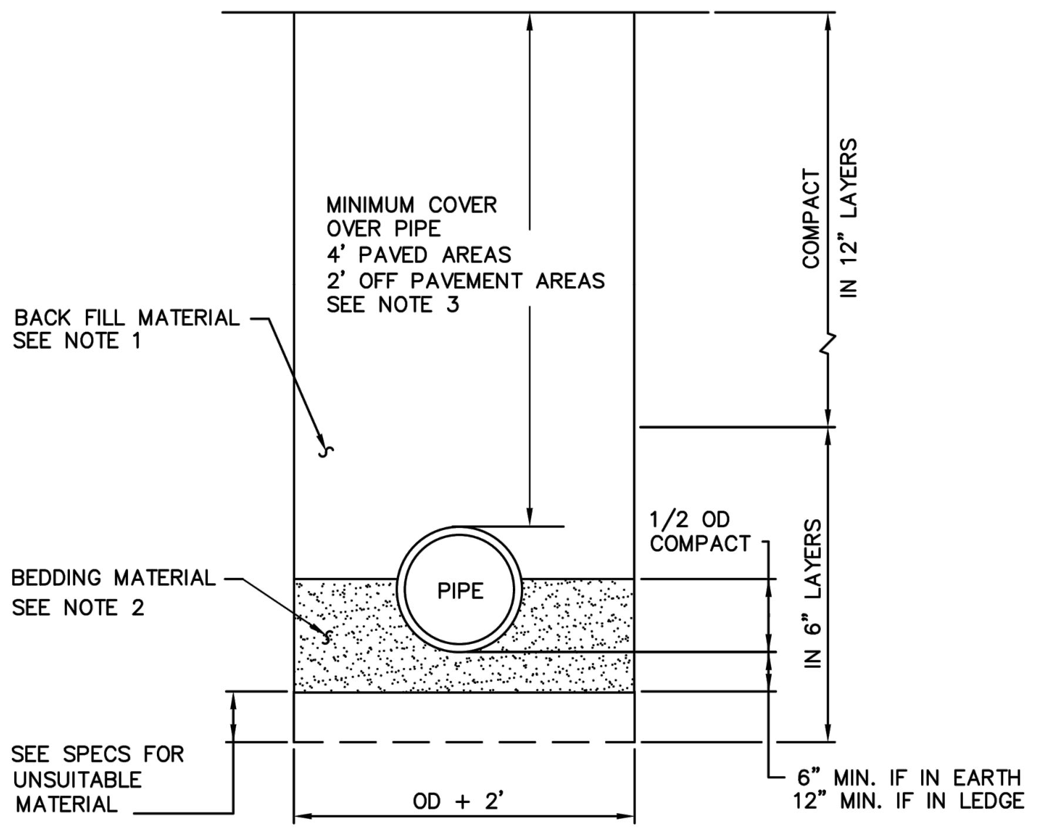


TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL D–2
PRECAST REINFORCED CATCH BASIN
TOWN OF HUDSON AUGUST–01
REV: SCALE: NTS

DRAINAGE TRENCH – RCP

NOT TO SCALE

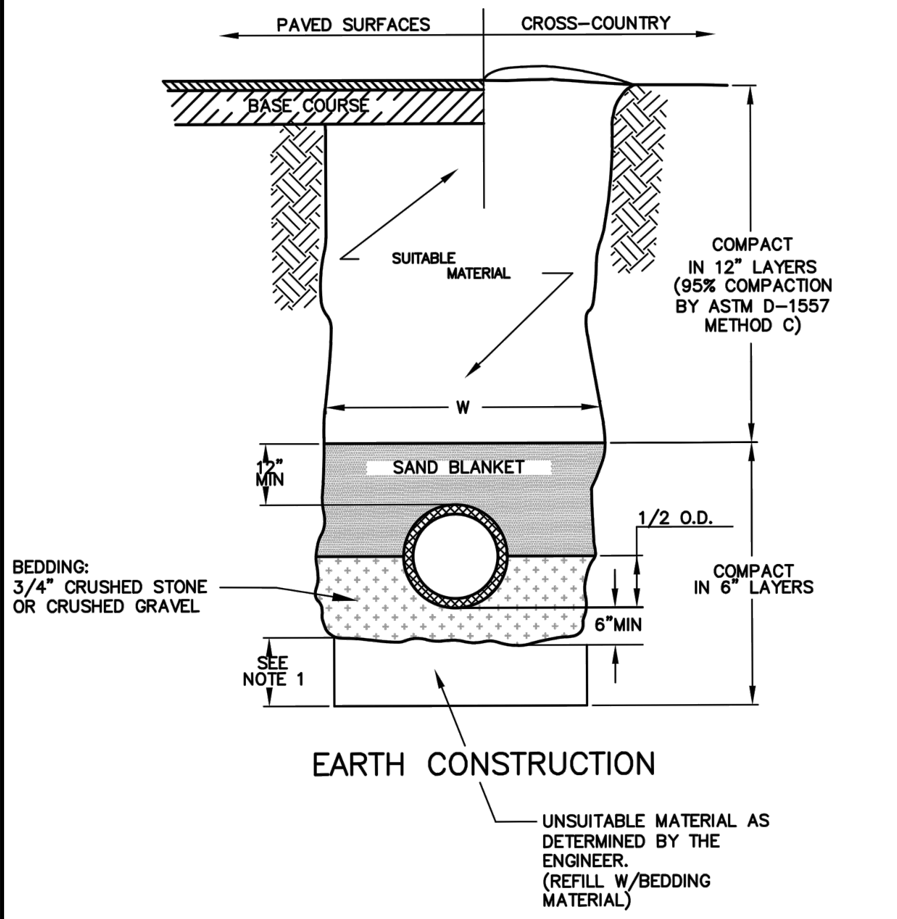


NOTES:

1. COMMON BORROW BACKFILL SHALL BE COMPACTED TO 90% PROCTOR. NO ROOTS OVER 6" IN DIAMETER ALLOWED.
2. BEDDING SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATTER AND METTING ASTM C33, STONE SIZE #67
   100% PASSING 1 INCH SCREEN
   90–100% PASSING 3/4 INCH SCREEN
   20–50% PASSING 3/8 INCH SCREEN
   0–10% PASSING #4 SIEVE
   0–5% PASSING #8 SIEVE
   WHERE ORDERED BY THE ENGINEER TO STABILIZE THE TRENCH BASE. GRADED SCREENED GRAVEL OR CRUSHED STONE 1/2 TO 3/4 INCH SHALL BE USED.

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL D–3
DRAINAGE TRENCH – RCP
TOWN OF HUDSON AUGUST–01
REV: SCALE: NTS



NOTES:

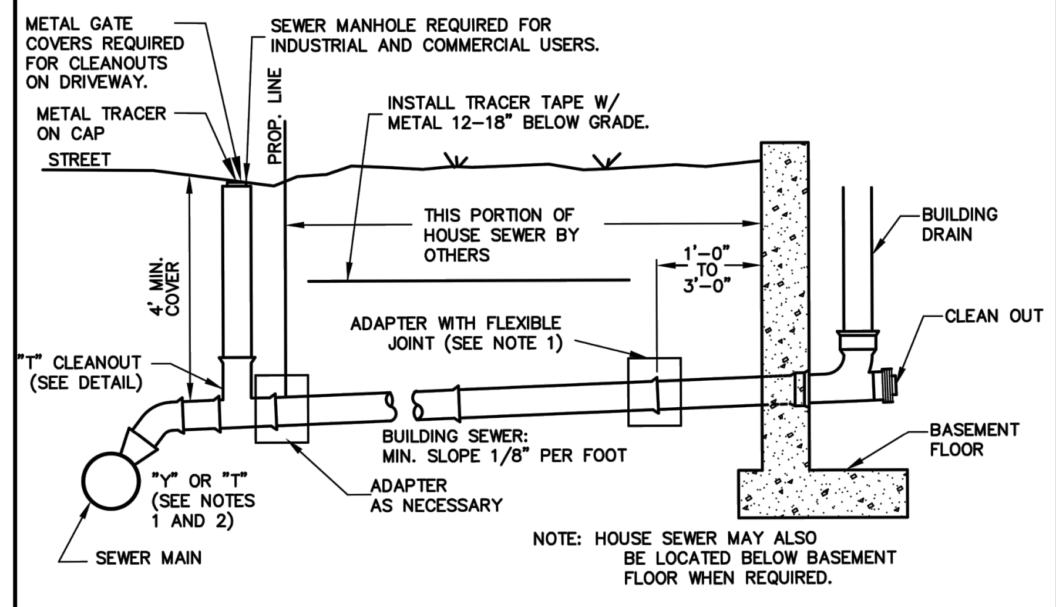
1. ORDERED EXCAVATION OF UNSUITABLE MATERIAL BELOW GRADE, REFILL WITH BEDDING MATERIAL.

SEWER TRENCH SECTION

NOT TO SCALE

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL S–4
SEWER TRENCH SECTION
TOWN OF HUDSON AUGUST–01
REV: SCALE: NTS



NOTE: HOUSE SEWER MAY ALSO BE LOCATED BELOW BASEMENT FLOOR WHEN REQUIRED.

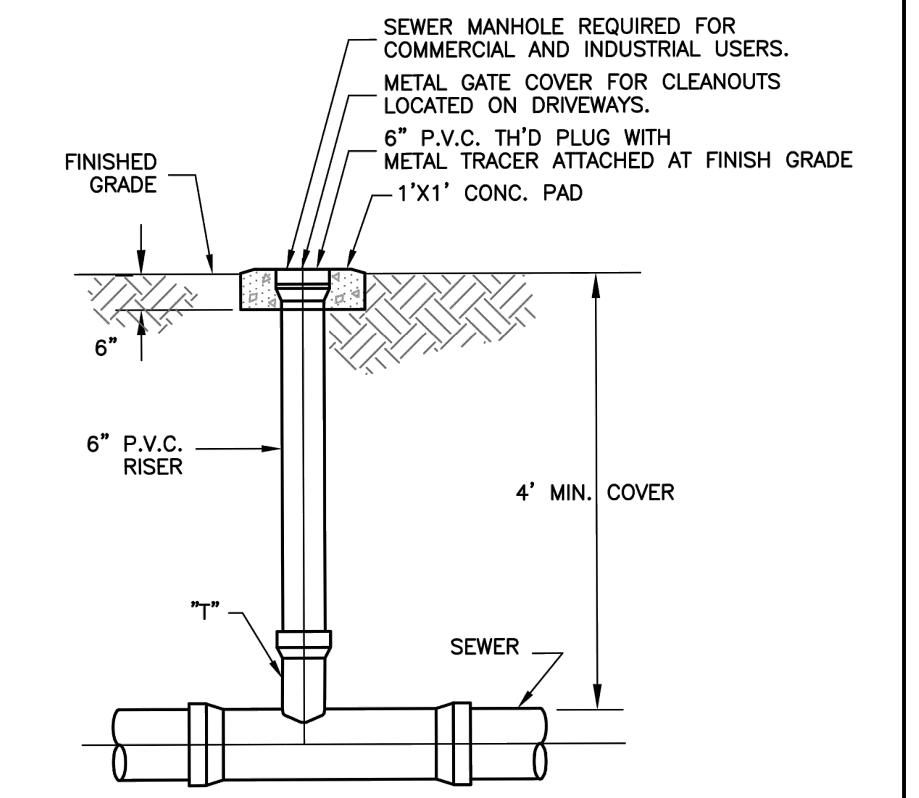
1. JOINTS SHALL BE BE DEPENDENT UPON A NEOPRENE OR ELASTOMERIC GASKET FOR WATERTIGHTNESS. ALL JOINTS SHALL BE PROPERLY MATCHED WITH THE PIPE MATERIALS USED. WHERE DIFFERING MATERIALS ARE TO BE CONNECTED, AS AT THE STREET SEWER "Y" OR AT THE FOUNDATION WALL, APPROPRIATE ADAPTERS SHALL BE USED.
2. WHERE A "T" OR "Y" IS NOT AVAILABLE IN THE EXISTING STREET SEWER, AN APPROPRIATE CONNECTION SHALL BE MADE IN ACCORDANCE WITH THE TOWN ENGINEER
3. PIPE SHALL BE 6" DIAMETER MINIMUM FROM SEWER MAIN TO EASEMENT (@ PL) AND 4" DIAMETER MINIMUM FROM CLEANOUT TO BUILDING FOUNDATION

BUILDING SERVICE CONNECTION

NOT TO SCALE

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL S–5
BUILDING SERVICE CONNECTION
TOWN OF HUDSON AUGUST–01
REV: 8/23/19 SCALE: NTS

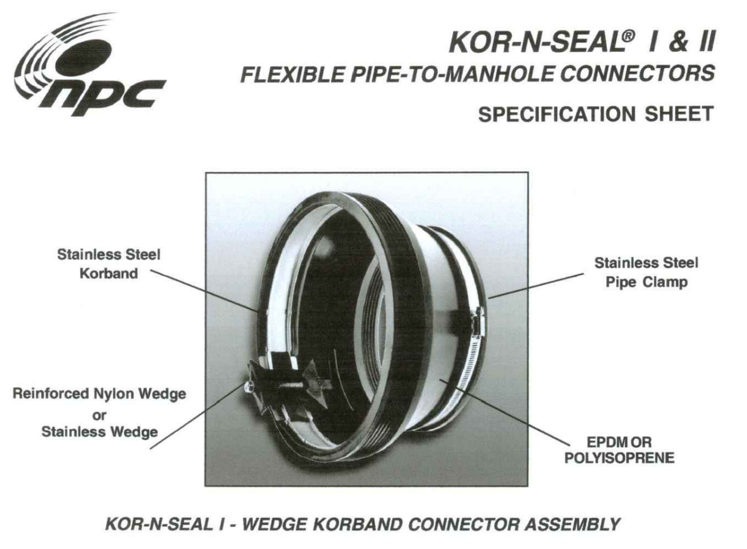


SEWER CLEANOUT

NOT TO SCALE

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL S–6
SEWER CLEANOUT
TOWN OF HUDSON AUGUST–01
REV: 8/23/19 SCALE: NTS



KOR-N-SEAL® I & II
FLEXIBLE PIPE-TO-MANHOLE CONNECTORS
SPECIFICATION SHEET

KOR-N-SEAL I - WEDGE KORBAND CONNECTOR ASSEMBLY

KOR-N-SEAL

NOT TO SCALE

NOTES

1. ALL MANHOLES, INCLUDING ALL COMPONENT PARTS, SHALL HAVE ADEQUATE SPACE, STRENGTH AND LEAKPROOF QUALITIES CONSIDERED NECESSARY BY THE ENGINEER FOR THE INTENDED SERVICE. SPACE REQUIREMENTS AND CONFIGURATIONS, SHALL BE AS SHOWN ON THE DRAWING. MANHOLES MAY BE AN ASSEMBLY OF PRECAST SECTIONS, WITH OR WITHOUT STEEL REINFORCEMENT, WITH ADEQUATE JOINTING, OR CONCRETE CAST MONOLITHICALLY IN PLACE WITH OR WITHOUT REINFORCEMENT. IN ANY APPROVED MANHOLE, THE COMPLETE STRUCTURE SHALL BE OF SUCH MATERIAL AND QUALITY AS TO WITHSTAND (H–20 LOADING) WITHOUT FAILURE AND PREVENT LEAKAGE IN EXCESS OF ONE GALLON PER DAY PER VERTICAL FOOT OF MANHOLE, CONTINUOUSLY FOR THE LIFE OF THE STRUCTURE. A PERIOD GENERALLY IN EXCESS OF 25 YEARS IS TO BE UNDERSTOOD IN BOTH CASES.
2. BARRELS AND CONE SECTIONS SHALL BE PRECAST REINFORCED OR NON–REINFORCED CONCRETE, OR POURED IN PLACE REINFORCED OR NON–REINFORCED CONCRETE.
3. PRECAST CONCRETE BARREL SECTIONS, CONES AND BASES SHALL CONFORM TO ASTM C 478.
4. LEAKAGE TEST SHALL BE PERFORMED IN ACCORDANCE WITH THE SPECIFICATIONS (5 POUNDS FOR 5 MINS., NO DROP BELOW 4 POUNDS).
5. INVERTS AND SHELVES MANHOLES SHALL HAVE A BRICK PAVED SHELF AND INVERT, CONSTRUCTED TO CONFORM TO THE SIZE OF THE PIPE AND FLOW. AT CHANGES IN DIRECTION, THE INVERTS SHALL BE LAID OUT IN CURVES OF THE LONGEST RADIUS POSSIBLE TANGENT TO THE CENTER LINE OF THE SEWER PIPES. SHELVES SHALL BE CONSTRUCTED TO THE ELEVATION OF THE HIGHEST PIPE. CROWN AND SLOPE TO DRAIN TOWARD THE FLOW THROUGH CHANNEL. UNDERLAYMENT OF INVERT AND SHELF SHALL CONSIST OF BRICK MASONRY. INVERTS AND SHELVES SHALL BE PLACED AFTER TESTING.
6. FRAMES AND COVERS MANHOLE FRAMES AND COVERS SHALL PROVIDE A 30 INCH CLEAR OPENING. A 3 INCH (MINIMUM HEIGHT) LETTER "S" OR THE WORD "SEWER" SHALL BE CAST INTO THE TOP SURFACE. CASTINGS SHALL BE EVEN–GRAINED CAST IRON AND SHALL BE EQUAL TO CLASS 30, CONFORMING TO ASTM A 48.
7. BEDDING SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATTER AND MEETING ASTM C33
   100 PASSING 1 INCH SCREEN
   90–100 PASSING 3/4 INCH SCREEN
   20–55 PASSING 3/8 INCH SCREEN
   0–10 PASSING #4 SIEVE
   0–5 PASSING #8 SIEVE
   WHERE ORDERED BY THE ENGINEER TO STABILIZE THE BASE. SCREENED GRAVEL OR CRUSHE STONE 1/2 TO 1–1/2 INCH SHALL BE USED.
8. FLEXIBLE JOINT A FLEXIBLE JOINT SHALL BE PROVIDED WITHIN THE FOLLOWING DISTANCES:
   RCP & CI PIPE (ALL SIZES): 48"
   AC & VC PIPE (UP THROUGH 12" DIA.):18"
   AC & VC PIPE (LARGER THAN 12" DIA.):36"
9. SHALLOW MANHOLE IN LIEU OF A CONE SECTION, WHEN MANHOLE DEPTH IS LESS THAN 6 FEET, A REINFORCED CONCRETE SLAB COVER MAY BE USED. IT MUST HAVE AN ECCENTRIC ENTRANCE OPENING AND BE CAPABLE OF SUPPORTING H–20 LOADS.

9a. DI PIPE – NONE REQUIRED
   PVC (ASTM 3034) – UP THROUGH 15: DIA – NONE REQUIRED
   PVC (ASTM F 679) – LARGER THAN 15: DIA – 48" – 60"
   PVC (ASTM F 789) – ALL SIZES – 48" – 60"
   ABS (ASTM D 2680) – ALL SIZES – SAME AS PVC ABOVE

9b. UNDER SEVERE CONDITIONS WHEN DIFFERENTIAL SETTING CANNOT BE CONTROLLED WITHIN NORMAL LIMITS, VARIATIONS IN THE STUB LENGTH MAY BE NECESSARY OTHER PLASTIC PIPES SHALL BE REVIEWED ON A CASE BY CASE BASIS.

10. MANHOLE STEPS ARE NOT PERMITTED.
11. MAXIMUM DISTANCE BETWEEN SEWER MANHOLES SHALL BE 300 FEET.
12. SEWER MANHOLE SHALL BE REQUIRED FOR ALL (EXISTING AND NEW) INDUSTRIAL AND COMMERCIAL USERS AND WILL BE LOCATED AT ROW/PROPERTY LINE.

NOTE
SEPARATE CONSTRUCTION SPECIFICATIONS MUST BE ATTACHED OR INCLUDED IN THE CONTRACT DOCUMENTS. THESE STANDARD DRAWINGS ARE NOT COMPLETE WITHOUT THESE SPECIFICATIONS.

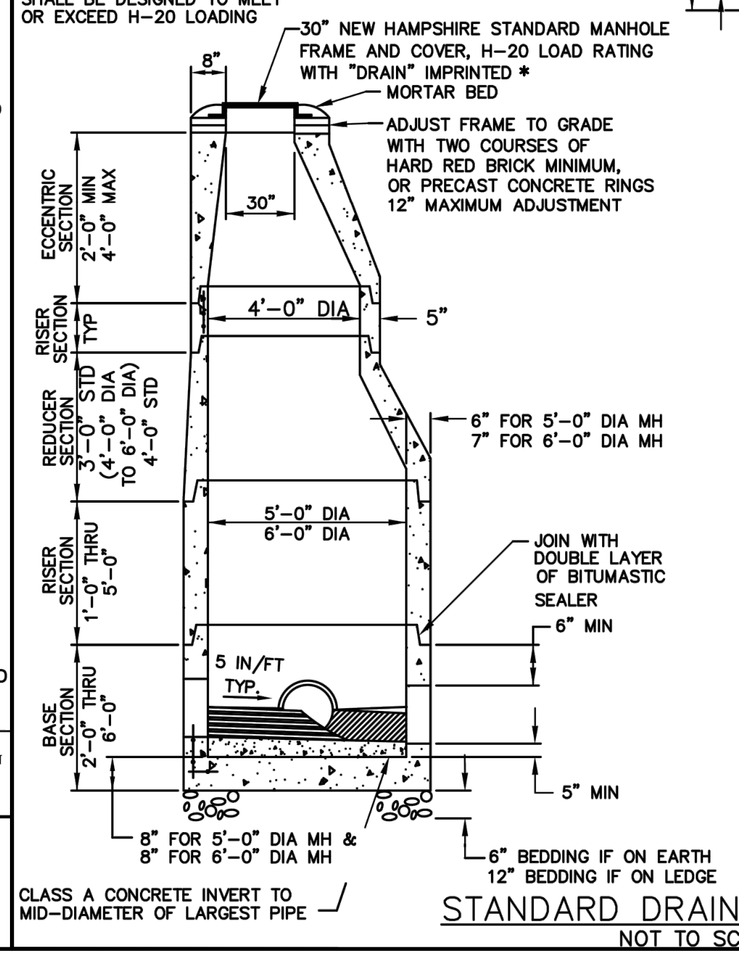
STANDARD MANHOLE – PART A

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

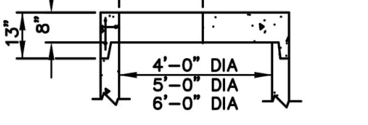
DETAIL S–2
STANDARD MANHOLE – PART A
TOWN OF HUDSON AUGUST–01
REV: 8/23/19 SCALE: NTS

NOTE:
ALTERNATE ECCENTRIC TOP SHALL BE DESIGNED TO MEET OR EXCEED H–20 LOADING

*COVER SHALL BE EAST JORDAN IRON WORKS OR APPROVED EQUAL.



CLASS A CONCRETE INVERT TO MID–DIAMETER OF LARGEST PIPE



ALTERNATE COVER

GENERAL NOTES FOR MH's AND CB's

1. REINFORCING STEEL SHALL CONFORM TO THE LATEST ASTM A185 SPECIFICATIONS:

SECTION SIZE	STEEL REQUIREMENT
4'–0" DIA	0.12 SQ.IN./L.F.
5'–0" DIA	0.15 SQ.IN/L.F.
6'–0" DIA	0.18 SQ.IN./L.F.
8'–0" DIA	0.24 SQ.IN./L.F.

2. CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 4000 PSI MINIMUM.
3. DESIGN SPECIFICATIONS SHALL CONFORM TO ASTM C478 LATEST EDITION.
4. BASE SECTIONS SHALL BE POURED MONOLITHICALLY.
5. PIPE JOINTS SHALL BE:
   LOCK JOINT, FLEXIBLE SLEEVE
   KOR–N–SEAL FLEXIBLE SLEEVE
   A–LOK RUBBER GASKET
6. A FLEXIBLE JOINT SHALL BE PROVIDED WITHIN THE FOLLOWING DISTANCES:

PIPE TYPE	PIPE SIZE	DISTANCE
RCP & CI	ALL SIZES	4'–0"
DI	ALL SIZES	NONE REQUIRED

UNDER SEVERE CONDITIONS WHEN DIFFERENTIAL SETTING CAN NOT BE CONTROLLED WITHIN NORMAL LIMITS, VARIATIONS IN THE STUB LENGTH MAY BE NECESSARY.

STANDARD DRAINAGE MANHOLE

NOT TO SCALE

TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL D–1
STANDARD DRAINAGE MANHOLE
TOWN OF HUDSON AUGUST–01
REV: JULY 2019 SCALE: NTS

APPROVED BY THE HUDSON, NH PLANNING BOARD

DATE OF MEETING:______________________________

SIGNATURE______________________________DATE______________

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Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

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46 LOWELL ROAD
HUDSON, NH 03051

ASSESSOR MAP 165 LOT 49
36 CAMPBELLO STREET
HUDSON, NEW HAMPSHIRE

DAVID R. JORDAN
No. 7778
4/2/24

REVISIONS

NO.	REVISION	DATE
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1	REV. DRAINAGE MANHOLE	3/1/24

NOVEMBER 20, 2023

DRAWN/DESIGN BY	CHECKED BY
CNM	DRJ

CONSTRUCTION DETAILS

SCALE:
AS SHOWN

PROJECT NO.
NEX-2300191

16 OF 16