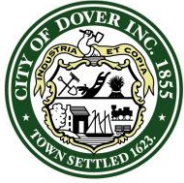


CITY OF DOVER

PLANNING TECHNICAL REVIEW COMMITTEE –AGENDA

Meeting Type: Regular Meeting
Meeting Location: Council Conference Room – City Hall, Dover NH
Meeting Date: **Thursday, February 11, 2021**
Meeting Time: **10:30 AM**

1. 10:30 AM – 11:15 AM: Site Review for Equine Properties, LLC, Assessor's Map H, Lot 37A, zoned Commercial, located at 239 Knox Marsh Road. (Proposal is to construct a private roadway to provide access to two (2) mixed use buildings, each building consisting of commercial space on the first floor with 26 residential units on the second and third floor & construct twelve (12) single family dwellings). (P21-04) A related CUP application will also appear before the Planning Board.



CITY OF DOVER

TECHNICAL REVIEW COMMITTEE MINUTES – P20-60

Application Type: Open Space Subdivision Review
Applicant(s): 54 BRR, LLC
Owner(s): 54 BRR, LLC
Location: 54 Back River Road (Tax Map I, Lot 6)
Date: January 14, 2021

INTENT: To develop an affordable housing community with 44 detached, 384 s.f., one-bedroom single-family dwellings

UNITS PROPOSED: 44

AGENDA ITEM #: 1

ACREAGE: 7.162 acres

ZONING DISTRICT: R-12

EXISTING LAND USE: Residential

PROPOSED LAND USE: Residential

SURROUNDING LAND USE: Residential and River

ZBA ACTION: None

PERMITS REQUIRED: AOT, Shoreland, CUP, and SWPPP

WAIVERS REQUESTED:
153-14.D: Parking TBD

ATTENDANCE:

Members:

Donna Benton, Planning
Elena Piekut, Zoning
Jim Maxfield, Inspections/Fire
Dave White, Engineering
Dan Barufaldi, Economic Development
Sgt. Marn Speidel, Police

Others:

Chris Parker
Max Kenney
Mike Sievert
John and Maggie Randolph
Robbi Woodburn

Approval of the 12/17/2020 Minutes:

D.White made a motion to approve the December 17, 2020 minutes. Seconded by J.Maxfield. Vote: U/A

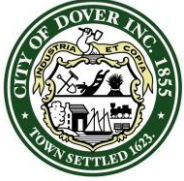
PLAN REVIEW:

Planning:

- *Water and Sewer Investment Fees*
- *Impact Fees (\$391,380)*
- CUP will go to Conservation Commission then Planning Board
- *Reach out to Postmaster about mail kiosk*
- Keeping existing house? Road goes through it? Revise and note.
- Traffic study-
 - How was the 1.41 and 1.18 COVID-19 adjustment factor found?
 - Did this analysis considered 40 additional units off Leathers Lane?
- *Provide:*
 - One combined plan set with engineering, landscape, lighting, architectural renderings in one package
 - *Draft Rental agreement/lease regarding HUD rental rates and draft of deed restriction on low-rental*
 - *Letters to Serve*
 - *Waiver requests for lighting and landscaping*
- *Revise plan to:*
 - *Add note about ride-sharing, shuttles, etc.*
 - *Add note about deeded conservation space*
 - *Finalize renderings (ie add shed, color palate, beams, pavilions removed, etc)*
 - *Indicate how cars maneuver dumpster*
 - *Add visitor parking by existing house*
 - *Add owner's signatures*
 - *Add professional signature and stamps*
 - Provide different road name
 - *Consider relocating the attached sheds to the rear of the units*
 - *Reduce from 3 curb cuts to 2*
 - Where is the PTAPP note?
 - Revise spelling of owner of Lot 6C-6
 - Fix Map numbers on Red Barn to I not I-2
 - Provide easement between neighboring open space
 - Can plantings along the Red Barn Drive side, be moved to the top of the hillside on Red Barn to take advantage of the elevation and enhance the screening
 - Add note on plan that should this develop ever be turned into condominiums then Planning Board approval would be necessary

Engineering Comments:

- Use SMHs on the dead end of the services instead of cleanouts
- Show the inverts of the existing SMH in Back River Rd
- I assume this gravities to the proposed SMH that the FM ties into
- Note outside drops on plan view at the smhs



CITY OF DOVER

TECHNICAL REVIEW COMMITTEE MINUTES – P20-60

Application Type: Open Space Subdivision Review
Applicant(s): 54 BRR, LLC
Owner(s): 54 BRR, LLC
Location: 54 Back River Road (Tax Map I, Lot 6)
Date: January 14, 2021

- On C504 change sewer MH invert to show brick masonry only. Not concrete under the shelf
- Show Neenah hinged covers
- The city requires the stone to extend over the pipe on the sewer trench typical
- Bed the FM in stone also
- The HOA must have a maintenance agreement in place for the sewer pump station
- The pump station must have a transfer switch and outlet to tie a generator into it for emergency use
- Have a downward tee or wye into the pump station for the gravity flow
- Show drainage lines on the utilities plan
- The sewer/drain line may have a conflict from cb6 and smh2
- Include in the drainage report the pre/post volume
- Show UGE on the plans
- Will there be gas? That will need to be shown
- Use DI for the 6inch main to the hydrant. You can use HDPE for the rest after the hydrant.
- Spec CTS (copper tubing size) poly for 3/4 to 2 inch services
- Install curb boxes to each unit. Show them behind the curb line or sidewalk where possible
- Spec 12x6 stainless steel tapping and gate in Back River Road
- Isolate the side mains with gate valves and install a main gate after the first set of gates and after the hydrant
- Water details
- Hydraulic analysis on 6 inch sewer
- 2x2 sign post
- Stones under manholes
- Flood valves?

Police Department Comments:

- Lack of sufficient guest/overflow parking remains a concern. (Concern about future overflow onto Back River Road)
- Traffic Impact Analysis:
 - Page 8: What is the source of the COVID-19 adjustment factors applied?
 - Page 20: intersection capacity analysis summary for NH108/Back River Road is based on turning movement counts from October 2020. Even with COVID adjustment factors, this cannot duplicate the pre-COVID conditions.
 - During AM peak, this intersection does not operate at LOS C or A for Route 108 NB Thru, Route 108 SB Thru, or Back River Road queues. It's already at F for these approaches.

Fire/Inspections Comments:

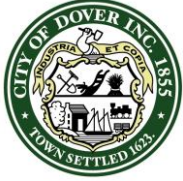
- Provide alternative street name as there is already a Cottage Drive. Revise stamped plan set
- Discussion regarding standby power source for the dwelling units waste water in utility loss of power scenario.
- Provide revised building plans
- Signage at Fire Access "No Parking Area Maintain 20' Fire Access" or similar
- Add accessibility note
- Detail accessible parking

Economic Development:

- Are true color renderings available for the units? Will they all be the same or will designs vary?

Planning Board Comments:

- *Back-up generator needed*
- *Hazardous waste?*
- *Snow storage?*
- *Fire suppression*
- *Where are the mechanicals?* Show utility closet on floorplans
- *Salt management to be included in Maintenance Plan*
- *Emergency access to Red Barn feasible?*
- *Re-use stonewall*
- *How are buildings constructed-onsite or pre-fab?*



CITY OF DOVER

TECHNICAL REVIEW COMMITTEE MINUTES – P20-60

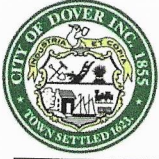
Application Type: Open Space Subdivision Review
Applicant(s): 54 BRR, LLC
Owner(s): 54 BRR, LLC
Location: 54 Back River Road (Tax Map I, Lot 6)
Date: January 14, 2021

Next Steps:

Resubmit full Planning Board package by February 1 (CC deadline) for February 23 meeting. Attend Conservation Commission meeting on 2/8/21.

Adjournment:

D.Barufaldi moved to adjourn the meeting at 11:21am Seconded by D.White. Vote: U/A



City of Dover, New Hampshire SITE REVIEW APPLICATION

[Revision Date: June 4, 2019]

Office Use Only	Project #:	_____	Date Received:	_____
	Amount Paid:	_____	Time Received:	_____

APPLICANT AND OWNER INFORMATION

Name of Applicant: Equine Properties LLC Telephone # 603-944-7530

Address of Applicant: 149 Epping Road, Suite 2A Exeter NH 03833

E-Mail Address: faireday@aol.com

Name of Property Owner (if different from applicant): Same Telephone # _____

Address of Property Owner: _____

PROPERTY INFORMATION

Address of Property: 239 Knox Marsh Road

Assessor's Map # H Lot(s) # 37A

Zoning District(s) Commercial Overlay District(s) Wetland & Secondary groundwater recharge

Size of Parcel: 407,542 sq. ft. 9.36 ac. Property Deed: Book 4783 Page: 326

Existing Use of Property: Single Family Home

SITE PLAN INFORMATION

Describe Proposed Use: Proposed 2 mixed use buildings & 12 single family homes

Area of Parcel to be Developed: _____ 200,000 +/- two phases sq. ft.

If Multi-family Residential, Specify Number of Units & Buildings Proposed: 2 buildings w/ 26 units each on second and third floors

Number of Parking Spaces: Existing _____ Proposed 99

Highway Access (check where applicable): _____ City Street ☒ State Highway

Number of Employees Total: N/A In Maximum Shift: N/A

Disposition of Parcel:

Building Setbacks:

Building Footprint 27,166 +/- sq. ft.

Front Yard 30 ft.

Total Building Area 27,166 +/- sq. ft.

Rear Yard 15 ft.

Paved Area 73,000 +/- sq. ft.

Side Yard: Right 12 ft. Left 12 ft.

City Water? ☒ Yes ☐ NoHow far is city water from the property? Knox Marsh RoadCity Sewer? ☒ Yes ☐ NoHow far is city sewer from the property? Knox Marsh Road
Hanson Road (ex. easement)**BUILDING INFORMATION**Type of Building to be Built: Mixed Use & Single FamilyHeight of Building: +/- 30' Finished Floor Elevation: 96.60'Number of Seats (where applicable) N/AEstimated value of construction: +/- 13 Million Refuse removal: Public/Private (circle one)**WAIVER REQUESTS**Site Review Regulations section(s) to be waived: Max grade of 3% within 75' of an intersection
Road width of 24'Justification for waiver request(s) (*attach additional sheets as needed*):See attached waiver request.**SURVEYOR INFORMATION**Name of Surveyor and Company (Licensed in N.H.) Kenneth A Berry, PE, LLS
Christopher R. Berry
Berry Surveying & EngineeringAddress 335 Second Crown Point Rd, Barrington, NH 03825 Telephone #: 603-332-2863Professional License #: 805 E-mail address: K.Berry@BerrySurveying.com
crberry@metrocast.net**ENGINEER INFORMATION**Name of Engineer and Company (Licensed in N.H.) Kenneth A Berry, PE, LLS
Christopher R. Berry
Berry Surveying & EngineeringAddress 335 Second Crown Point Rd, Barrington, NH 03825 Telephone #: 603-332-2863Professional License #: 14243 E-mail address: K.Berry@BerrySurveying.com
crberry@metrocast.net**ARCHITECT INFORMATION**Name of Architect and Company (Licensed in N.H.) Thomas A. House, THA Architects LLCAddress P.O. Box 88, Stratham NH 03885 Telephone #: 603-770-2491

Professional License #: _____ E-mail address: thouse@thaarc.com

LANDSCAPE ARCHITECT INFORMATION

Name of Landscape Architect and Company (Licensed in N.H.) Eric R. Buck Terrain Planning & Design

Address 311 Kast Hill Road, Hopkinton NH 03229 Telephone #: 603-491-2322

Professional License #: 78 E-mail address: _____

SOIL SCIENTIST INFORMATION

Name of Soil Scientist and Company (Licensed in N.H.) John P. Hayes III

Address 7 Limestone Way, North Hampton NH 03862 Telephone #: 603-205-4396

Professional License #: 87 E-mail address: johnphayes@comcast.net

CONSERVATION EASEMENT HOLDER

Name of Easement Holder: _____ Telephone # _____

Address Easement Holder: _____

SIGNATURES

I/We hereby submit this application to the City of Dover Planning Board and attest that to the best of my knowledge all of the information on this application form and in the accompanying application materials and documentation is true and accurate. Furthermore, I/we submit that the existing conditions sheet of the plan represents the lot in question, and that no alteration of the site shall take place during Planning Board review up to and including the pre-construction meeting. As applicant or as agent, I attest that I am duly authorized to act in this capacity.

Signature of Property Owner: RR Date: 1/21/12

Signature of Applicant (if different from owner): _____ Date: _____

Signature of Agent: _____ Date: 1/21/12

AUTHORIZATION TO ENTER SUBJECT PROPERTY

I, and my successors, hereby authorize members of the Dover Planning Board, Planning Department and other pertinent City Departments and boards to enter my property for the purpose of evaluating this application, including performing inspections during the application phase, post-approval phase, construction phase and occupancy phase. It is understood that these individuals must use all reasonable care, courtesy, and diligence when on the property.

Signature of Property Owner: RR Date: 1/21/12

AUTHORIZATION TO COMPLETE THE PROJECT ON SUBJECT PROPERTY

I, and my successors, hereby the City of Dover or its assigns to enter my property for the purpose of completing the site work as required by the approved plan should the letter or credit or other surety be called. It is understood that these individuals must use all reasonable care, courtesy, and diligence when on the property.

Signature of Property Owner: RR Date: 1/21/12

Signature of Applicant (if different from owner): _____ Date: _____

CERTIFICATION OF FEES

I, and my successors, hereby certify that I understand that the City of Dover collects impact fees, utility investment fees and inspection fees for projects developed in Dover. Said fees must be paid before a Certificate of Occupancy can be obtained for a structure, unless a different payment schedule is agreed to by the applicant and the City prior to approvals being issued by the Dover Planning Board. Additionally, should the property be in "Current Use" it will be subject to the Land Use Change Tax.

Signature of Property Owner: RR Date: 1/21/12

Signature of Applicant (if different from owner): _____ Date: _____

PLANNING BOARD FEE SCHEDULE

(Revised July 1, 2020)

Below are the fees associated with plan review and are subject to a nonrefundable application fee to cover administrative expenses. Please complete the information below and provide payment with your application submittal. **Plan review fees shall be paid prior to technical review committee (TRC) being scheduled.** For plans not requiring TRC review, **fees are due 21 days prior** to the Planning Board meeting. Staff will coordinate abutter/notice fees, which will be invoiced and must be paid 28 hours before the Planning Board meeting for an application to be heard. Fees shall be paid by cash or check made payable to "City of Dover."

A. Plan Review Fees

1. Application fee for the following (**SELECT ALL THAT APPLY**):

- ☐ SUBDIVISION Application fee \$200.00 + \$150.00 x # _____ new lots created = \$ _____
- ☐ LOT LINE ADJUSTMENT Application fee \$200.00 + \$100.00 X # _____ of lots involved = \$ _____
- ☐ TRANSFER OF DEVELOPMENT RIGHTS Application fee \$200.00 = \$ _____
- ☐ SITE REVIEW – RESIDENTIAL Application fee \$200.00 + \$100.00 x # 64 per dwelling unit = \$ 6,600.00
- ☐ SITE REVIEW – NON-RESIDENTIAL Application fee \$200.00 + (not to exceed \$10,000)
 - ☐ New construction \$.15 sq. ft. x # _____ sq. ft. = \$ _____
 - ☐ Additions (new floor space) \$.10 per sq. ft. x # _____ sq. ft. = \$ _____
- ☐ MOTEL/HOTEL \$35.00 x # _____ per lodging unit = \$ _____
- ☐ CHANGE OF USE Application fee \$200.00 + (not to exceed \$5,000)
 - ☐ Existing floor spaces \$.10 per sq. ft. x # _____ sq. ft. = \$ _____
- ☐ CONDITIONAL USE PERMIT Application fee \$200.00 x # 2 per Application = \$ 400.00
- ☐ GRAVEL PIT/ EXCAVATIONS
 - ☐ Application fee \$50.00 = \$ _____
 - ☐ Permit fee \$75.00 = \$ _____
- ☐ EXTENSIONS/AMENDMENTS/WAIVERS FOR AN APPROVED PLAN Application fee \$200.00 = \$ _____
- ☐ REQUEST FOR REZONING Application fee \$200.00 = \$ _____
- ☐ DRIVEWAY WAIVER Application fee \$200.00 = \$ _____

SUB TOTAL=

\$ _____

AND

2. IMPERVIOUS PAVED AREA (for new development or additions to existing parking lots (not to exceed \$10,000) Application fee \$200.00 + \$.07 sq. ft. x # 73,000 =

\$ 5,310.00

TOTAL PLAN REVIEW FEE=

\$ 12,310.00

B. Abutter Notification/Mailing Labels - this office will create and print the abutter list and provide labels in triplicate for each abutter. The applicant/owner will need to review the list and provide to this office the engineer, architect, licensed land surveyor (LLS), licensed landscape architect (LLA) and/or soil scientist whose professional seal appears on the plan with names and addresses for notices.

- ☐ Applicant & Owner, engineer, architect, LLS, LLA and/or soil scientist
 - ☐ Certified letters fee # 5 of x \$8.00 = \$ 40.00
- ☐ Certified letters fee: # of abutters 11 X \$8.00 = \$ 88.00
- ☐ First Class Mail fee (for individual owner of units within a condominium or other collective form of ownership): # of abutters _____ X \$1.00 = \$ _____
- ☐ Creating/Printing Abutter Labels in triplicate per sheet 2 x \$10.00 = \$ 20.00

SUB TOTAL=

\$ _____

C. Foster's newspaper public notice fee \$100.00 x # 3 applications =

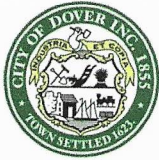
\$ 300.00

TOTAL NOTICE FEE=

\$ 448.00

The above amount must be paid 28 hours prior to the Planning Board meeting, to be heard.

Provided \$12,549.00



City of Dover, New Hampshire SITE PLAN REVIEW SUBMISSION CHECKLIST

[Revision Date: June 4, 2019]

This site plan review checklist, as required by Chapter 153-6-B(2), should be completed by the applicant. It is intended to assist the applicant in the planning process of preparing a Site Plan Review application for Planning Board action. The size of the project will determine the types of information required for review, therefore, a **pre-application conference** with the Planning Department to determine the list of items that must be completed is strongly encouraged.

The first step would be to appear before the Technical Review Committee, to apply, eight (8) folded copies of the site plan with scale of not less than 1"=50' or 1"=100' for larger site plans, need to be provided, along with payment of plan review fees.

Two weeks prior to Planning Board, three (3) full size and twelve (12) half size (11x17), folded, copies of the plan set and materials, including response to TRC comments, will be due. Abutter/Notice Fees will be invoiced and need to be paid 28 hours prior to the Planning Board meeting.

The applicant is cautioned that this checklist is only a guide and is not intended to be a complete list of all site plan review requirements. Please refer to the Site Plan Review Regulations for full details.

APPLICANT: Equine Properties LLC File Number: _____

PROJECT TITLE: McCrone Place

PROPERTY LOCATION: 239 Knox Marsh Road Tax Map: H Lot: 37A

	Where/How Provided	Reviewed
1. Completed and signed Application form	X	
2. Plan Review Fees are provided	X	
3. Electronic copy of the engineered/surveyed plan layout	X	
4. Electronic copy of supplementary materials and application	X	
5. Traffic Impact Assessment and Analysis (Standard or Advanced)	X	
6. Waiver requests to the Site Plan Review Regulations, with written justification	X	
7. Conditional Use Permit applications	X	
8. A colored rendering of the streetscape that will be created along the existing public right-of-way	X	
9. A colored architectural plan showing all sides of buildings	X	
10. Folded copies of site plan w/scale of not less than 1"=50' or 1"=100' for larger site plans, for TRC. Plans shall contain the following items as appropriate:	X	
Location map at appropriate scale	X	
Proposed Project name and title and Planning File #	X	
Date, north arrow and scale	X	
Names of all abutting property owners	X	
Name and address of owners and/or applicants	X	
Signature & stamp of NH licensed land surveyor and/or engineer	X	
Zoning District boundaries, including any special or overlay districts	X	
Location of Conservation District areas	X	
Location, names and widths of existing and proposed streets, including pavement widths, grades, curbs and crosswalks	X	
Location and widths of existing & proposed easements & right of ways	X	
Location and width of existing and proposed access/egress ways	X	

	Explain How Provided	Reviewed
Depict pedestrian walkways and accessible access	X	
Existing and proposed property lines with dimensions and bearings tied into Dover's Geographic Information System coordinate system	X	
Existing and proposed topographic information at two foot intervals	X	
Existing and proposed buildings and structure locations	X	
Minimum building setbacks or build to lines on all lots	X	
Location and size of existing and proposed electric, telephone, gas cable and other underground utilities	X	
Existing and proposed water lines and fire hydrants, including materials and capacity needed	X	
Location and materials of sanitary sewage facilities within project site and projected additional peak hour sewer load	X	
Existing and proposed stormwater lines and facilities	X	
Lighting plan depicting all existing and proposed exterior light fixtures and a lighting level analysis for parking lots	X	
Location of Flood Hazard Zone	N/A	
Location of all bodies of water and watercourses	X	
Location of wetlands and buffers	X	
Neighborhood plan with aerial underlay showing how project relates to abutting uses within the plan set	X	
Existing natural features and/or significant vegetation on property	X	
Depict existing contours up to 100 ft. beyond project limits	X	
Landscape plan depicting existing and proposed landscaping, prepared by a licensed Professional Landscape Architect	X	
Location of parking layout delineating spaces and arrangement; note addressing maximum required spaces	X	
Location, material and size of existing and proposed pavement area	X	
Location of proposed fire lanes	X	
Specify finished floor elevations of buildings	X	
Location of solid waste disposal facilities (dumpster, pad and screening, etc.), including required screening	X	
Depict all service, storage, loading bays and utility areas	X	
All applicable Dover Common Site Plan notes	X	
11. Additional Information if appropriate		
Stormwater Management Plan depicting the existing & proposed storm drainage system and engineered drainage analysis	X	
Stormwater Management System Operation and Maintenance Plan	X	
Letter to Serve from Public and Private Utilities	will provide	
Erosion and Sedimentation Control Plan	X	
Landscape Operation and Maintenance Plan	X	
Proposed restrictive covenants or homeowners association documents	will provide	
Dates and permit numbers of all required state and federal permits	will provide	
If wetland buffer, indicate placards locations, as applicable	X	
Depict test boring locations, groundwater elevations and soil profiles and/or soils types call-outs	X	
Location of proposed drive-in facilities	X	
Provide additional exhibits/technical data determined appropriate by the Planning Board or its staff as required	X	

REVIEWED BY: _____ DATE _____ TRC DATE _____

CHECKED

By CRB
1-20-21

CITY OF DOVER PLANNING DEPARTMENT
Revised August 10, 2020

APPLICANT: _____ FILE NUMBER: _____

List of Common Site Plan Notes

The following list of commonly required notes is intended to be used as a guide to applicants and should not be construed as a comprehensive note requirement list for all projects. A preapplication conference with the Planning Department is suggested to help determine the actual notes that may be required.

1. The intent of this plan is to *(describe the purpose of the plan)*.
2. Owners of Record are: Name _____
Street address _____
Municipality, State, Zip Code _____
Authorized Signature _____
3. The parcel(s) is *(are)* shown as Lot No. _____, Map _____ of the City of Dover Tax Assessor's Maps.
4. The subject parcel(s) contains _____ acres or _____ sq. ft. area of land.
5. Title reference for the project parcel(s) is the Strafford County Registry of Deeds, Book No. _____, Page No. _____.
6. Reference Plans: *(List all reference plans and their SCRD #)*
7. All applicable right-of-way, conservation, slope, construction, power line, cross travel, or other easements shall be referenced in a note.
8. Zoning dimensional and density requirements are as follows:

Required:	Provided:
a. Zoning district _____ sub-district _____	
b. Minimum lot size: _____ acres (sq. ft.)	
c. Minimum lot frontage: _____ ft.	
d. Minimum yard setbacks/build-to-lines:	
Front _____ ft.	
Side _____ ft.	
Rear _____ ft.	
Abut-a-street _____ ft.	
e. Maximum/minimum lot coverage _____ %	
f. Minimum/maximum bldg. height _____ ft./stories	

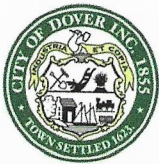
This property falls within the following zoning overlay districts: *(List districts)*

9. List any variances or special exceptions granted by the Zoning Board of Adjustment or Conditional Use Permits granted by the Planning Board for the proposed use or structure, including the case number and date of decision and any conditions.
10. Property line information has been obtained from a survey performed by *(surveyor)* on *(date)* with an error not greater than 1 in 10,000 *(or has been obtained from _____ Plan, prepared by (surveyor))*.
11. Subject parcel is *(is not)* located within a Federally designated flood hazard area (Community panel number 33017C0xxxD, Effective Date: September 30, 2015).
12. Wetlands were delineated by _____, Certified Wetlands Scientist, Certification Number _____, in accordance with Chapter 170-27.1 of the Zoning Ordinance, on _____, 20____.
13. As-built plans of the subdivision shall be submitted on paper and in digital format AutoCAD DWG, AutoCAD DXF or ESRI format to the City of Dover Engineer's Office upon completion of project if a street is proposed for City acceptance. As-built plans shall be prepared and certified correct by a L.L.S. or P.E. Digital files shall be geo-referenced to New Hampshire State Plane Coordinates NAD83 and shall be expressed in feet.
14. The installation of electric power, cable television and telephone lines shall be underground throughout the site for which development is proposed.
15. The subject parcel(s) is (are) served by municipal water and sewer *(or is served by on-site well and septic system)*.
16. All construction shall conform with the State of New Hampshire Department of Transportation (NHDOT) "Standard Specifications for Road and Bridge Construction" and with the City of Dover Community Services Regulations and standard specification for construction. The more stringent specification shall apply.
17. All erosion control notes shall include provisions for construction sequencing, temporary erosion control measures, and permanent standards such as loam spread rate for disturbed areas, rates of lime, type and rates for fertilizer, and seed and mulch mixture with rates of application.
18. The limits of construction disturbance that are located in or within the 50 ft. of Conservation and Wetland Districts shall be staked, flagged and clearly identified prior any earth disturbing activity occurs.
19. All treatment swales to be constructed shall have sod bottoms.
20. A letter of credit for the cost of revegetating all disturbed areas on the site shall be submitted, and the approved construction sign installed prior to any earth disturbing activity occurs.
21. A pre-construction conference with the developer, the design engineer, the earthwork contractor and the City Engineer shall occur prior to any earth disturbing activity.
22. Site Construction hours shall be limited to Monday-Friday 7 AM-6 PM, Saturday and Sunday 9 AM-4 PM. Hours of construction must be documented on a site construction sign along with the contact information for the general contractor. Said signage must be located and approved by the City Engineer or Assistant City Manager.

23. Building addresses (including apt/unit numbers if applicable) shall be assigned by the Building Official at the time of issuance of a building permit.
24. The proposed use for the site (structure) is _____. (More specific uses are encouraged, such as single family, duplex, multi-family, restaurant, hotel, doctor's office, etc. Should more than one use be proposed, an indication of the percentage of each use is suggested.)
25. The following federal and state permits have been issued for the subject property: *(List permit type, number and date of issuance.)*
26. Commercial vehicle route during construction shall conform to Dover City Code or be coordinated with the Community Services Director.
27. Any retaining wall taller than four feet (4') requires issuance of a building permit from Inspection Services.
28. Any fence taller than seven feet (7') requires the issuance of a building permit from Inspection Services.
29. Applicant shall complete Land Use Development Tracking Form, most recently revised version, utilizing the online Pollution Tracking and Accounting Pilot Project (PTAPP) portal.
<https://www.unh.edu/unhsc/ptapp>
30. The owner of record shall record at the Registry of Deeds documentation sufficient to provide notice to all persons/entities that may acquire any property subject to the requirements and responsibilities described in the approved STORMWATER Management Plan. The notice shall comply with the applicable requirements for recording contained in RSA 477 and 478. The notice need not set forth the requirements at length, so long as it is sufficient to provide notice to prospective purchasers to the requirements for maintenance and reporting.
31. Fire department access road(s) shall be installed and maintained to support the imposed loads of fire apparatus in all weather conditions at all times.
32. The maximum parking space calculation is _____ (broken down) and _____ spaces are provided.
33. Exterior lighting shall be cut-off type fixtures per Chapter 153-14-E and shall provide lighting directed on-site only.
34. Topographic survey performed by _____ on *(dates)*.
35. Elevations are based on U.S.G.S. NVD 1988 datum. (or Elevations depicted are based on information obtained from the City Engineer's Office and was derived from coordinates for control stations _____ and _____. These coordinates have not been adjusted to 1983 datum).
36. A security system shall be installed as required by Chapter 45, Article I, section 45-2 of the Code of the City of Dover. *(If a business establishment or multi-family dwelling contained in a new, altered or repaired structure)*
37. Approved backflow preventers shall be provided for both fire and domestic water lines.

38. The (*existing or proposed*) structure shall be served by a sprinkler system as required by Chapter 81- 30 of the Code of the City of Dover and the adopted State of NH Building and Fire Codes.
39. Sprinkler connections must be flushed in accordance with NFPA 24 and a Contractor's Material and Test Certificate for Underground Piping form must be completed and approved by Inspection Services prior to connection of the backflow device.
40. Fire department connection(s) shall be located on the street side of the building per NFPA 13. Access to the FDC shall maintain a clear and unobstructed path at all times.
41. The site layout is designed in compliance with applicable accessibility regulations. The proposed structure will be also be designed in accordance with applicable accessibility regulations. (i.e. IBC, ANSI-117.1) and NH RSA 155-A:5.

REMARKS:



City of Dover, New Hampshire CONDITIONAL USE PERMIT APPLICATION

[Revision Date: October 19, 2020]

Office Use Only	Project #: _____	Date Received: _____
	Amount Paid: _____	Time Received: _____

APPLICANT AND OWNER INFORMATION

Name of Applicant: Equine Properties LLC Telephone # 603-944-7530

Address of Applicant: 149 Epping Road, Suite 2A Exeter NH 03833

E-Mail Address: faireday@aol.com

Name of Property Owner (if different from applicant): Same Telephone # _____

Address of Property Owner: _____

PROPERTY INFORMATION

Assessor's Map # H Lot(s) # 37A

Address of Property: 239 Knox Marsh Road

Zoning District(s) Commercial Overlay District(s) Wetland & secondary groundwater recharge

Existing Use of Property: Single Family Home

CONDITIONAL USE PERMIT INFORMATION

Type of Conditional Use Permit (Check All That Apply):

- | | | |
|--|---|--|
| ☒ Conservation District | ☐ RCM Use Overlay District | ☐ Gateway District |
| ☒ Groundwater Protection | ☐ Off-Street Parking and Loading | ☐ Alternative Treatment Center |
| ☐ Wetland Protection District | ☐ Central Business District | ☐ Heritage Residential District |

Describe Proposed Use or Activity That Requires Conditional Use Permit and Describe Any Impacts:

See attached conditional use permit narrative for justification.

List Any Associated State or Federal Permits That Have Been or Will Be Applied For and Indicate Their Status: See plans for permit list

Name of Professional That Prepared Plans: Kenneth A Berry, PE, LLS
Berry Surveying & Engineering

Address 335 Second Crown Point Rd, Barrington, NH 03825 Telephone #: 603-332-2863

Professional License #: 805 E-mail address: K.Berry@BerrySurveying.com

SIGNATURES

I/We hereby submit this application to the City of Dover Planning Board and attest that to the best of my knowledge all of the information on this application form and in the accompanying application materials and documentation is true and accurate. As applicant or as agent, I attest that I am duly authorized to act in this capacity.

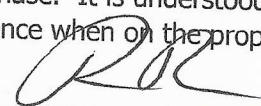
Signature of Property Owner:  Date: 1/21/21

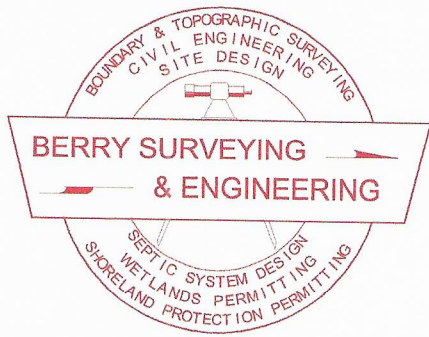
Signature of Applicant (if different from owner): _____ Date: _____

Signature of Agent: _____ Date: 1/21/21

AUTHORIZATION TO ENTER SUBJECT PROPERTY

I, and my successors, hereby authorize members of the Dover Planning Board, Planning Department and other pertinent City Departments and boards to enter my property for the purpose of evaluating this application, including performing inspections during the application phase, post-approval phase, construction phase and occupancy phase. It is understood that these individuals must use all reasonable care, courtesy, and diligence when on the property.

Signature of Property Owner:  Date: 1/21/21



BERRY SURVEYING & ENGINEERING

335 Second Crown Point Road

Barrington, NH 03825

Phone: (603) 332-2863

Fax: (603) 335-4623

www.BerrySurveying.Com

January 21, 2021

City of Dover Planning Department
Attn: City Planner Donna Benton
288 Central Ave
Dover, NH 03820

RE: "McCrone Place"
Equine Properties LLC
239 Knox Marsh Road
Mixed Use Site Plan
Map H, Lot 37A

Mrs. Benton,

On behalf of Equine Properties LLC, Berry Surveying and Engineering (BS&E) submits to TRC a proposed mixed use site plan application located at 239 Knox Marsh Road.

Background

Equine Properties LLC owns the parcel known as 239 Knox Marsh Road, Map H, Lot 37A. There is an existing house and driveway that sit in the southeastern corner of the Lot. The Lot is mostly open with two planted tree farms on either side of the house, and the main tree line running along the property line. Berry Surveying & Engineering has conducted a full boundary survey as well as a topographic analysis. In addition, a certified wetland scientist has been on site and located all wetlands (wetland found along the northern boundary line abutting the railroad). A soil scientist has also been on site and conducted a site specific soil map (SSSM), in order to determine the soil types and slopes on site.

Proposal

The proposal is to construct a private roadway off Knox Marsh Road. This road will be known as "Concolor Drive" and will provide access to the proposed mixed use site plan development. Two (2) mixed use buildings will be constructed at the front of the site. Each building will have commercial space on the first floor, 26 residential units on the floors above, adjacent parking and sidewalks. Mixed use buildings will have first floor commercial with 2 stories of residential.

The road will continue up to the northwestern corner of the parcel where it will have a hammerhead turn around. This section of road will provide access to 12 new single family homes. Each single family unit will have its own driveway, deck and side yard. A variance was granted for this parcel in 2019, allowing the 12 single families and 52 apartment units to be built on this parcel.

As part of the site plan development an intensive drainage analysis was done. The existing flows and volumes were calculated and analyzed against the proposed flows to make sure the proposed development would not increase flows offsite. Given the location of the parcel in relation to adjacent stream watersheds, gravel wetlands were chosen because they provide a level of treatment that removes nitrogen and phosphorus, which will greatly benefit the downstream discharge locations. In addition, the proposed drainage design will help the secondary groundwater recharge zone by reducing the peak flows.

The two mixed unit buildings and 12 single family units will be serviced by municipal water and sewer. The proposed development will have two sewer connections in order to separate the flows of the mixed use buildings and single family homes. The first sewer connection will be an 8" line that will tie into an existing manhole in Knox Marsh Road. This sewer line will service the two mixed use buildings. The second sewer connection will be made in Hanson Road. This connection will service the proposed single family homes. Some of the single family homes will be connected via forcemain. Pump design will be provided to the City as part of the design. A 4" fire line and domestic line will be installed for each of the mixed use buildings. In addition, hydrants will be installed along the road to provide adequate protection. The mixed use buildings will be serviced by a new 8" sewer service that will tie into the existing sewer main in Knox Marsh Road. The single family units will be serviced by an existing sewer main on Lot 38.

The site was also designed to be wild life friendly and allow for small animal migration throughout the site. The design will feature the following elements: 3:1 side slopes, natural fiber matting, and outlet structures with crushed stone sumps. All of these methods have been used for similar projects in the past. All proper erosion and sediment control methods will be taken to ensure that no sediment is tracked onto Knox Marsh road, abutting lots, wetlands or buffers. Upon start of construction, a construction entrance will be installed off Knox Marsh Road to prevent tracking. Perimeter control will be installed at the edge of construction to contain sediment within the construction zone.

As part of this application, a trip generation analysis has been conducted by Stephen Pernaw of Stephen Pernaw & Company Inc. This analysis will be submitted to NHDOT to determine if an additional analysis is needed.

As part of the site plan application, a conditional use permit will be required for construction within the 50' buffer, and having more than 20% of impervious cover within the secondary groundwater recharge zone. In addition, waivers are is being requested to allow a 4% road grade within 75' of the intersection and a roadway width of 20'. See attached waiver request. All other state and federal permits are being applied for and will be provided to the city when acquired.

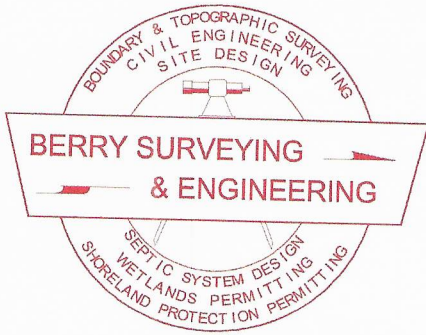
BERRY SURVEYING & ENGINEERING

James F. Hayden
Engineering Technician



Christopher R. Berry
Principal, President

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January 21, 2021

City of Dover Planning Board
Attention: City Planner Donna Benton
288 Central Ave
Dover, NH 03820

RE: "McCrone Place"
Equine Properties LLC
239 Knox Marsh Road
Mixed Use Site Plan
Map H, Lot 37A

Chairperson & Members of the Dover Planning Board:

In accordance with to the subdivision standards Article 157-30, the following waiver is hereby requested:

1. Identification of Waiver Request: Maximum road grade of 3% within 75' of an intersection per Dover Subdivision Regulation 157-32.G.

- Proposed road with a -4.0% grade of Knox Marsh road for less than 15', then flattening to a positive 2 grade into the development.

2. Explanation:

The applicant is proposing to construct a private roadway off Middle road in order to provide access to a proposed mixed use site development. The proposed road will have a grade of -4% off Knox Marsh Road for a distance less than feet. NHDOT requires all proposed roads to have a grade of -4%. By having a grade of -4%, the NHDOT plow trucks will not damage proposed driveways and roadways.

3. Waiver Justification:

a. Granting the waiver will properly carry out the purpose and intent of the regulations.

The intent of requiring a maximum road grade of 3% within 75' of an intersection is to ensure vehicular and pedestrian safety as vehicles approach intersections. Although the proposed roadway has -4% road grade within 75' of the intersection, it will still be a safe intersection. The road is designed to transition from a -4% grade to a 2% grade. This will allow for a safe platform for vehicles to stop at.

January 21, 2021

b. Strict conformity to the regulations would pose an unnecessary hardship to the applicant.

Requiring the applicant meet the grading requirement would cause them to be noncompliant with NHDOT regulations and the State would not allow it.

1. Identification of Waiver Request: Minimum road width of 24'.

- Proposed road with a width of 20'.

2. Explanation:

The applicant is proposing to construct a private roadway off Middle road in order to provide access to a proposed mixed use site development. The proposed road will have a width of 30' for the first 250'. This portion of the road will access the two proposed mixed use buildings. A width of 30' was chosen not only for the increased traffic flow to the mixed use buildings but also to allow emergency vehicles the ability to turn in and out of the mixed use building parking areas. After that the road will lessen in width to 20'. This portion of the road will be used to access the 12 single family homes.

3. Waiver Justification:

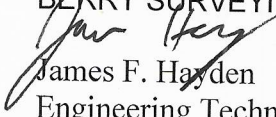
a. Granting the waiver will properly carry out the purpose and intent of the regulations.

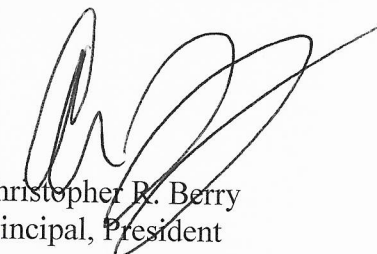
The intent of requiring a minimum road width of 24' is to ensure safety and allow emergency vehicles the ability to navigate through road networks. The section of road that is less than 24' will provide access to 12 single family homes. Given the anticipated low traffic volumes for this portion of the site, a 20' wide road was deemed appropriate. A 4' at grade walk is provided for most of it, however the lane width is 20'.

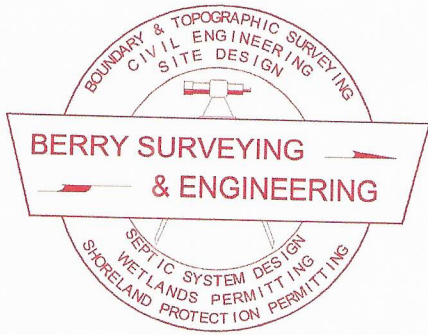
b. Strict conformity to the regulations would pose an unnecessary hardship to the applicant.

Requiring the applicant to have a 24' road would increase the overall impervious surface on site and require additional buffer disturbance and add additional impervious surface over the 20% required within the secondary groundwater recharge zone. Given the proximity to the wetland buffer and the project being within the secondary groundwater recharge zone, the 20' roadway seemed an appropriate width that would not only meet the traffic needs but also reduce impervious surface.

Respectfully Submitted,
BERRY SURVEYING & ENGINEERING


James F. Hayden
Engineering Technician


Christopher R. Berry
Principal, President



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January 21, 2021

City of Dover Planning Board
288 Central Ave
Dover, NH 03820

RE: "McCrone Place"
Equine Properties LLC
239 Knox Marsh Road
Mixed Use Site Plan
Map H, Lot 37A

Mr. Bird and the Dover Conservation Commission

Berry Surveying & Engineering (BS&E,) on behalf of Equine Properties, LLC respectfully requests the City of Dover Conservation Commission to accept the following Conditional Use Permit:

- Disturbance within the 50' wetland buffer.

1. Identification of Conditional Use Permits

Regulations in the zoning ordinance do not allow for earth disturbance within the 50' wetland buffer. However, Section 170-27.C states that a conditional use permit may be granted by the planning board, given the following standards, as shown below, are met. Below we show the project's compliance with the standards required to grant a Conditional Use Permit, and we provide justification for its approval.

2. Compliance with the following standards

- a) The APPLICANT shall demonstrate that the proposed use is essential to the productive use of land not in the district; is located and constructed to minimize any detrimental impact of such use upon the surface waters or other environmentally sensitive areas, where it is physically impossible to locate DOVER CODE P 170-101 such use on land not in the district; and economic advantage alone shall not be deemed a sufficient reason for such proposed use.

- **There is an existing wetland that spans across the northern boundary line which causes the wetland buffer to stick out into the property. Given the shape of the lot, it creates a "choke point" in the northwestern corner of the lot. The**

road location was chosen so that the single family houses could be placed on the uphill side of the road, away from the buffer and provide a greater separation to the abutting condo owner.

- b) A soil erosion and sedimentation control plan is submitted and followed to verify the planned avoidance of sediment pollutant runoff to bodies of water.
 - **A full erosion and sediment control plan will be submitted as part of this design. Silt soxx or mulch berm will be used to contain the sediment within the project limits. Rip-Rap and natural fiber matting will be used for slope stabilization. All necessary precautions will be taken to ensure that no sediment goes into the remaining wetland or buffer areas.**
- c) Necessary state and federal approvals have been applied for. Said permits shall be received prior to the issuance of the Conditional Use Permit by the Planning Department.
 - **As part of this design, the applicant will be filing for a NHDES Alteration of Terrain Permit, among other state permits. Copies of the permits will be provided to the City when acquired.**
- d) That architecture and landscape design shall grow from local climate, topography, history, and building practice.
 - **An in depth landscaping design will also be done to ensure that new vegetation is promoted to grow throughout the construction site. In addition, the disturbed buffer areas will receive a special conservation seed mix that will allow for re-vegetation of those areas.**

3. Justification for approval of Conditional Use Permits

The proposed development will have 3,951 Sq.Ft. of buffer disturbance. All of this disturbance will be for the construction of the proposed road and relating grading through the buffer, as well as the construction of a gravel wetland for stormwater treatment. The remaining area of road and proposed units will be pulled towards the center of the lot and away from the wetland. There will be no other buffer disturbance on this project.

As part of the site plan development an intensive drainage analysis was done. The existing flows and volumes were calculated and analyzed against the proposed flows to



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make sure the proposed development would not increase flows offsite. Given the location of the parcel in relation to adjacent stream watersheds, gravel wetlands were chosen because they provide a level of treatment that removes nitrogen and phosphorus, which will greatly benefit the downstream discharge locations.

The site was also designed to be wildlife friendly and allow for small animal migration throughout the site. The design will feature the following elements: 3:1 side slopes, natural fiber matting, and outlet structures with crushed stone sumps. All of these methods have been used for similar projects in the past.

All proper erosion and sediment control methods will be taken to ensure that no sediment is tracked onto Knox Marsh Road, abutting lots, or the wetlands. Upon start of construction, a construction entrance will be installed off Knox Marsh Road to prevent tracking. Perimeter control will be installed at the edge of construction to contain sediment within the construction zone.

An intensive landscaped buffer will be installed at the edge of disturbance to provide a buffer between the development and the remaining undisturbed buffer area. This landscaped buffer will feature highbush blueberries and ink berries. A mixture of evergreens and maples trees will also be planted along the buffer. Placards will also be installed to show where the buffer/edge of disturbance is to prevent future disturbance once the area is stabilized.

- More than 20% impervious within the secondary groundwater protection zone.

1. Identification of Conditional Use Permits

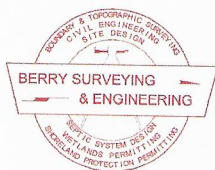
Regulations in the zoning ordinance do not allow for more than 20% impervious cover in the secondary groundwater recharge zone. However, Section 170-28.E states that a conditional use permit may be granted by the planning board, given the following standards, as shown below, are met.

Below we show the project's compliance with the standards required to grant a Conditional Use Permit, and we provide justification for its approval.

2. Compliance with the following standards

a) The proposed development plan incorporates a stormwater drainage plan, approved by the Planning Board and prepared by a professional engineer certified to practice in the State of New Hampshire

- **A full drainage analysis was conducted as part of the application. The drainage analysis was designed to be not only compliant with the City of Dover regulations but also with Alteration of Terrain (AoT) regulations. An infiltration pond will be constructed as part of the development. This**



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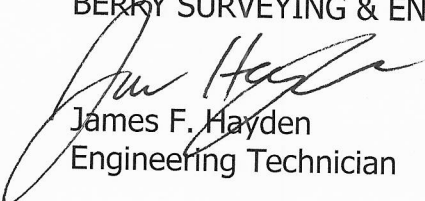
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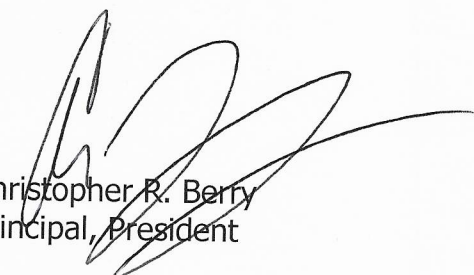
infiltration pond will meet the groundwater recharge volume standards set forth by AoT.

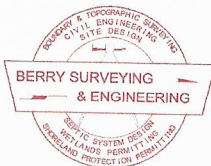
a) Groundwater Protection Zone of all development-generated stormwater runoff from a ten (10) year storm. Furthermore, the stormwater drainage plan shall provide for the removal of oil and gasoline from parking LOT runoff by use of treatment swales, oil/gas separators or other device, prior to retention and percolation of the runoff.

- **Swales and sediment forebays will be constructed as part of the development. These are designed to capture the runoff and retain any debris, sediment, and oil/gasoline before the runoff gets into the proposed ponds. If anything gets through the swales/forebays, the ponds will act as a second level of protection, preventing anything from getting to the final discharge points.**

BERRY SURVEYING & ENGINEERING


James F. Hayden
Engineering Technician


Christopher R. Berry
Principal, President



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MEMORANDUM

Ref: 2067A

To: Michael Garrepy
Garrepy Planning Consultants, LLC

From: Stephen G. Pernaw, P.E., PTOE

Subject: Proposed Mixed-Use Site Plan
Dover, New Hampshire

Date: January 20, 2021

As requested, Pernaw & Company, Inc. has conducted this “*Traffic Evaluation*” for the proposed mixed-use development located on the north side of NH155 (Knox Marsh Road) in Dover, New Hampshire. The purpose of this memorandum is to summarize the results of our trip generation analysis, as well as our research of available traffic count data. To summarize:

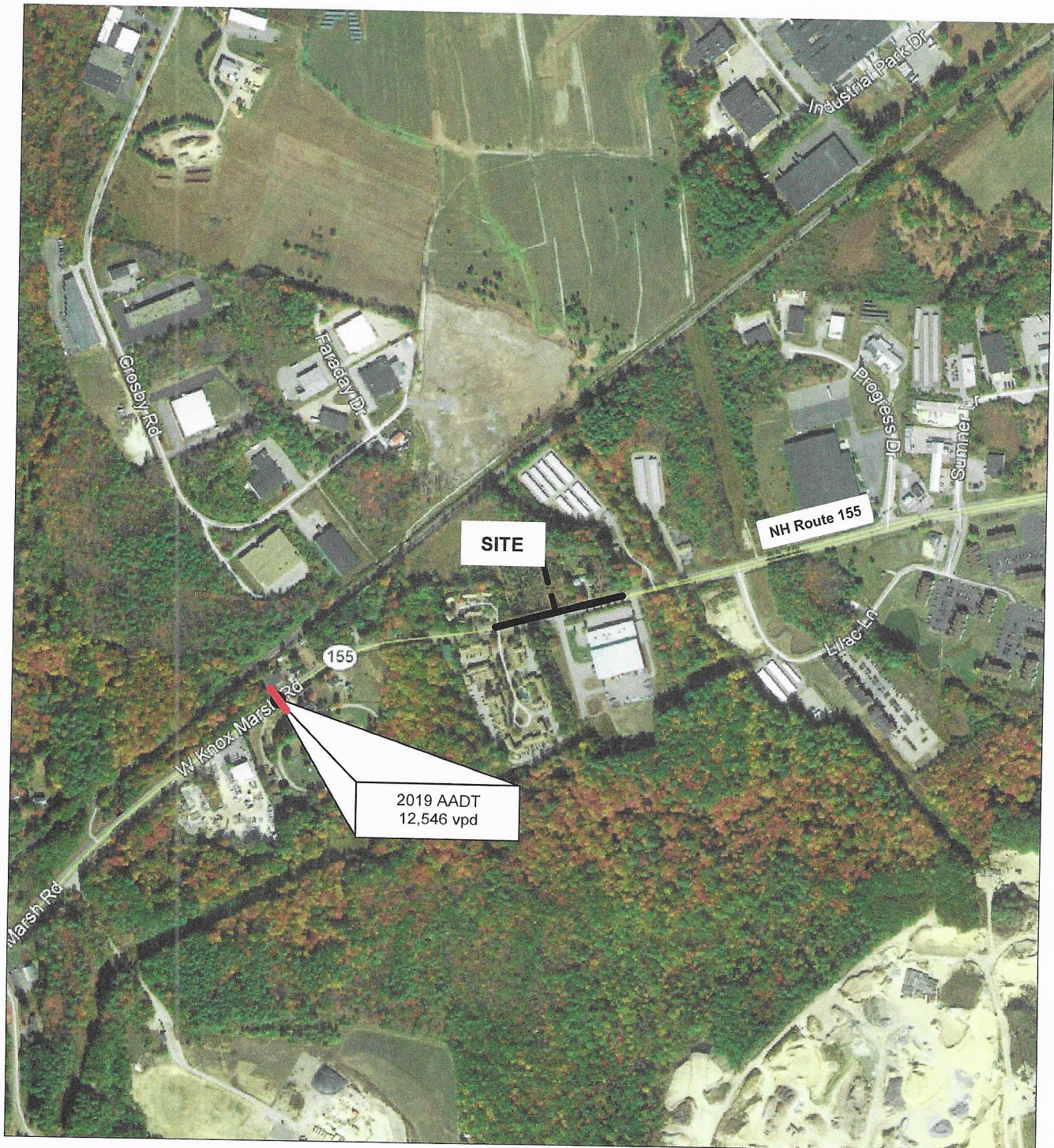
Proposed Development – According to the plan entitled “*Mixed Use Site Pan*” prepared by Berry Surveying & Engineering for Equine Properties, LLC (see Attachment 1), the proposed development consists 64 rental apartments and 23,000 sf of commercial space. Vehicular access to the site will be provided via one two-way commercial driveway that will intersect the north side of NH Route 155 directly across from the westerly F. W. Webb Company warehouse driveway.

Figure 1 shows the location of the subject site with respect to the area roadway system, and it also shows the location of the nearby NHDOT short-term automatic traffic recorder count station on NH155.

Existing Traffic Volumes – Research at the NHDOT revealed that the closest short-term Automatic Traffic Recorder count station to the site is located on NH155 approximately 0.25 miles to the west at the Dover-Madbury municipal boundary. According to the NHDOT reports, this section of NH155 carried an Annual Average Daily Traffic (AADT) volume of approximately 12,546 vehicles per day (vpd) in 2019, up slightly from 12,397 vpd in 2018 (see Attachments 2 - 4).

These AADT estimates were derived from a three-day traffic count conducted in 2017. Interesting to note, the more recent traffic count data collected in September 2020 clearly shows the impact of the Covid-19 pandemic.

Both the 2017 and 2020 data demonstrate that weekday traffic volumes in the area typically reach peak levels from 7:00 to 8:00 AM and from 4:00 to 5:00 PM on NH155, thus corresponding to the typical commuter periods. The diagrams on Page 3 summarize the daily and hourly variations in traffic demand along NH155, west of the subject site.



 = AUTOMATIC TRAFFIC RECORDER LOCATION (NHDOT)

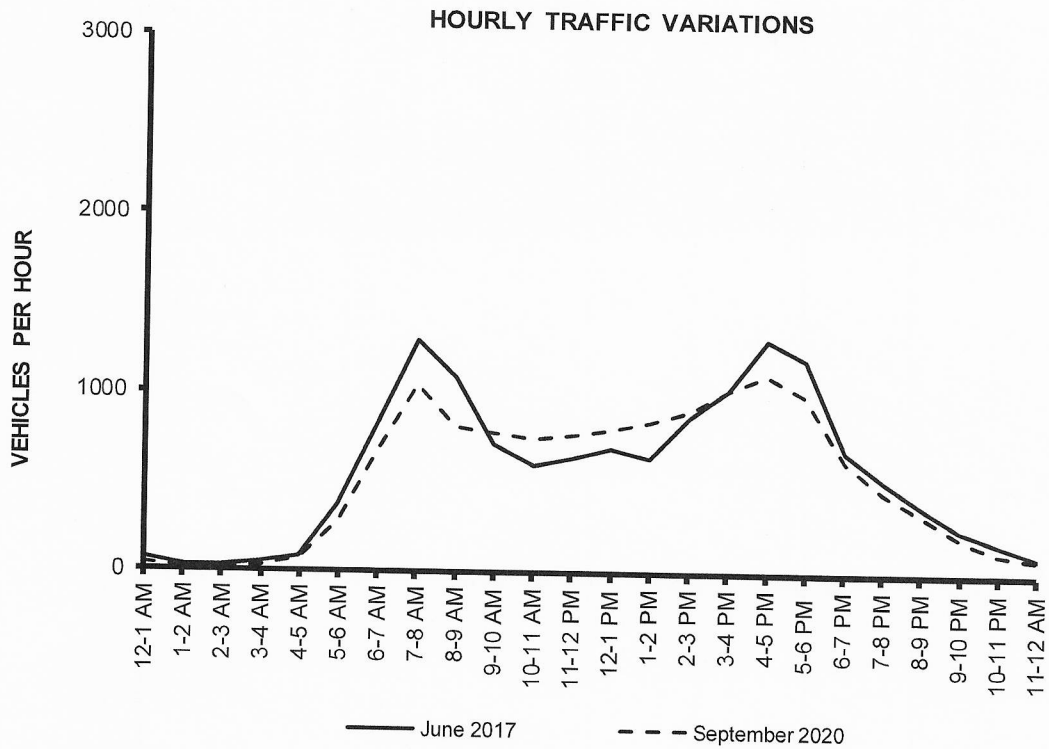
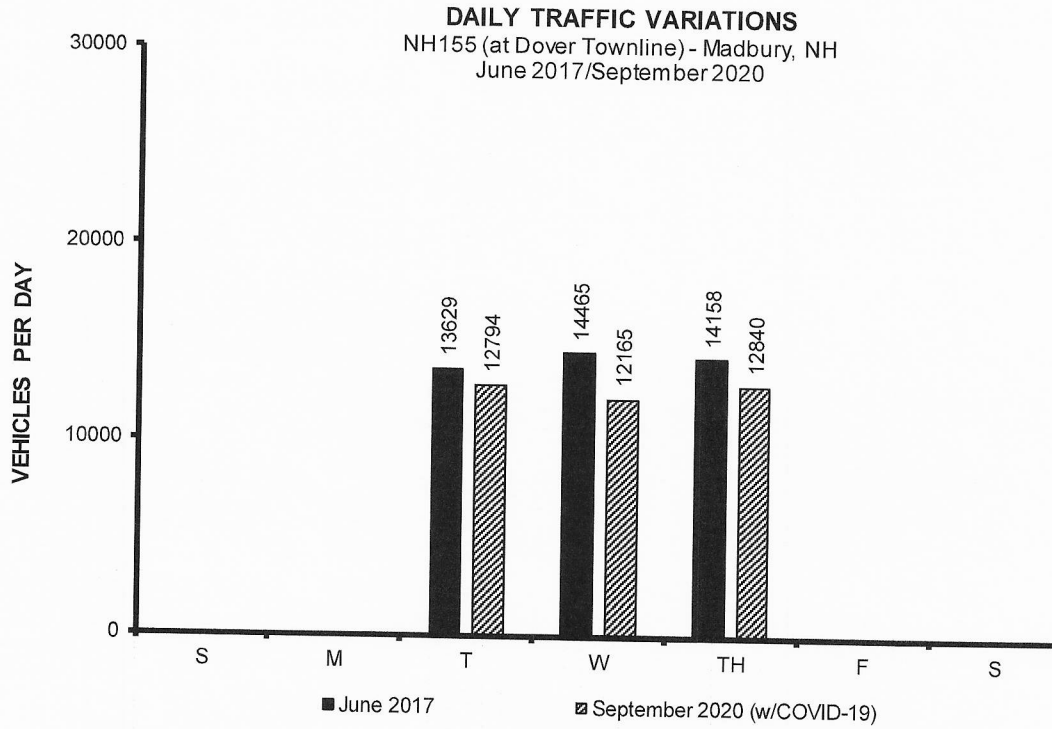


2067A

Figure 1

Site Location

Traffic Evaluation, Proposed Mixed-Use Development, Dover, New Hampshire



Trip Generation - To estimate the quantity of vehicle-trips that will be generated by the mixed-use development, Pernaw & Company, Inc. considered several standard trip generation rates and equations published by the Institute of Transportation Engineers (ITE)¹. Land Use Code 220 (Multifamily Housing / Low-Rise) is the most applicable category for the residential portion of the site (the detached units and those on the second floor of the commercial buildings). The number of dwelling units was used as the independent variable in this case.

Recognizing that the future tenants in the commercial space are unknown at this juncture, several possible uses/tenants were identified for estimating future trips. More specifically, the ITE trip rates/equations for a combination of warehousing, manufacturing, office, light industrial, and specialty trade contractor uses were utilized for estimating the trips associated with the non-residential portion of the site.

The trip generation analysis is summarized on Table 1 and shows that the proposed mixed-use development will generate approximately 55 vehicle-trips (27 arrivals, 28 departures) during the AM peak hour period, and approximately 68 vehicle-trips (32 arrivals, 36 departures) during the PM peak hour period, on an average weekday basis (see Attachment 5).

Table 1		Trip Generation Summary					
	Residential	Non-Residential					Total
	Apartments ¹ (64 Units)	Manufacturing ² (4,000 sf)	Warehouse ³ (3,000 sf)	Contractor ⁴ (6,000 sf)	Office ⁵ (6,000 sf)	Light Industrial ⁶ (4,000 sf)	
Weekday (24 hrs)							
Entering	222 veh	8 veh	3 veh	31 veh	35 veh	37 veh	336 veh
Exiting	<u>222 veh</u>	<u>8 veh</u>	<u>3 veh</u>	<u>31 veh</u>	<u>35 veh</u>	<u>37 veh</u>	<u>336 veh</u>
Total	444 trips	16 trips	6 trips	62 trips	70 trips	74 trips	672 trips
AM Peak Hour							
Entering	7 veh	2 veh	1 veh	7 veh	6 veh	4 veh	27 veh
Exiting	<u>24 veh</u>	<u>0 veh</u>	<u>0 veh</u>	<u>3 veh</u>	<u>1 veh</u>	<u>0 veh</u>	<u>28 veh</u>
Total	31 trips	2 trips	1 trips	10 trips	7 trips	4 trips	55 trips
PM Peak Hour							
Entering	25 veh	1 veh	0 veh	4 veh	1 veh	1 veh	32 veh
Exiting	<u>15 veh</u>	<u>2 veh</u>	<u>1 veh</u>	<u>8 veh</u>	<u>7 veh</u>	<u>3 veh</u>	<u>36 veh</u>
Total	40 trips	3 trips	1 trips	12 trips	8 trips	4 trips	68 trips

¹ITE Land Use Code 220 - Multifamily Housing (Low-Rise) - Trip Equation Method

²ITE Land Use Code 40 - Manufacturing - Trip Rate Method

³ITE Land Use Code 60 - Warehousing - Trip Rate Method

⁴ITE Land Use Code 80 - Specialty Trade Contractor - Trip Rate Method

⁵ITE Land Use Code 70 - General Office Building - Trip Equation Method (Weekday and PM) & Trip Rate Method (AM)

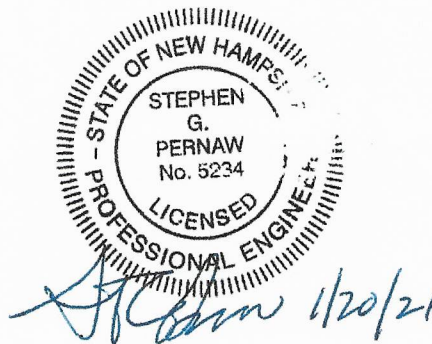
⁶ITE Land Use Code 10 - General Light Industrial - Trip Equation Method

¹ Institute of Transportation Engineers, *Trip Generation*, tenth edition (Washington, D.C., 2017).

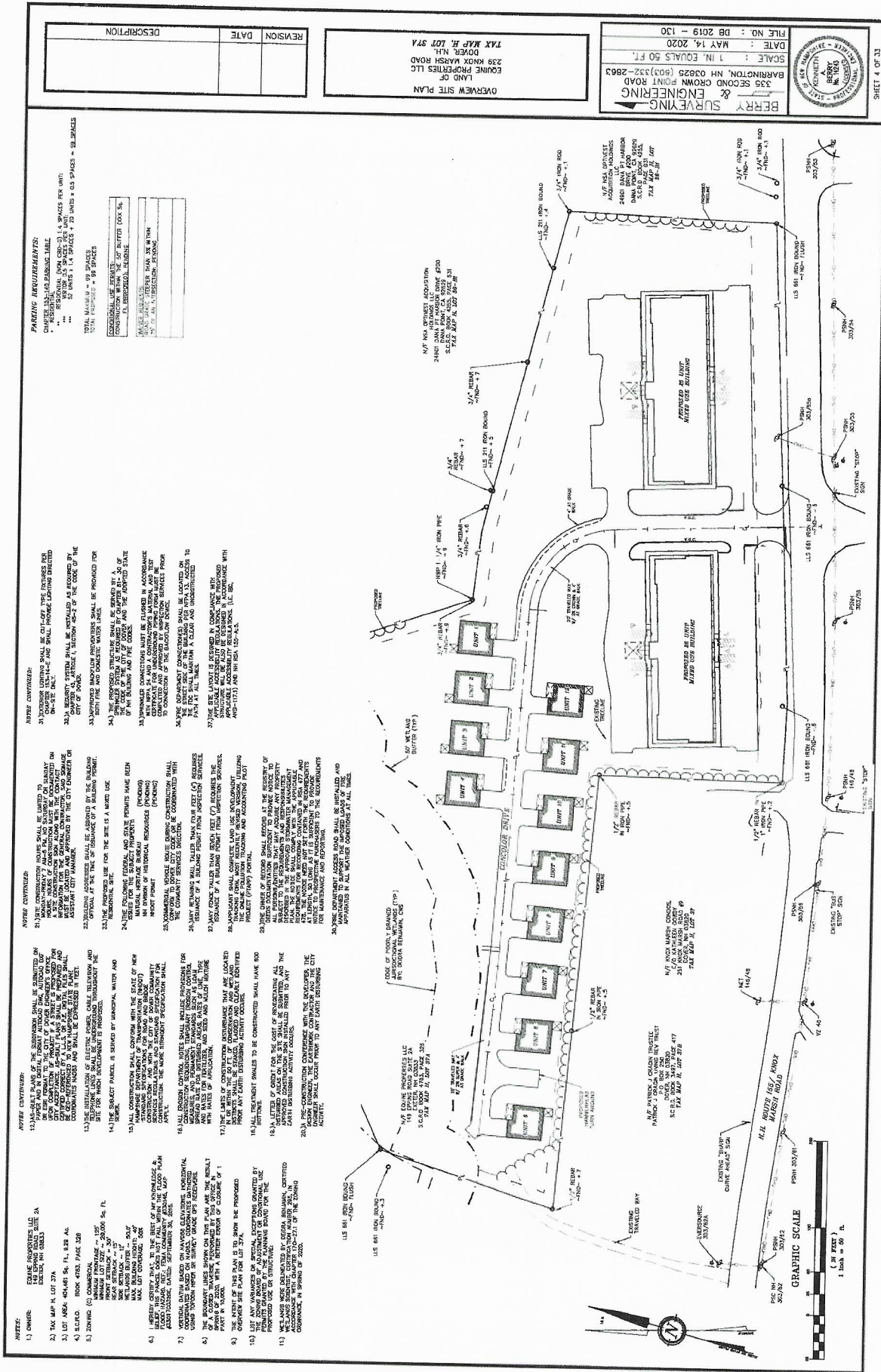
Findings & Conclusions:

1. Access to the subject site is proposed via one two-way commercial driveway that will intersect the north side of NH155 directly across from the westerly F.W. Webb site driveway, thus converting this existing three-leg T-intersection into a standard four-leg intersection.
2. According to data collected at the NHDOT count station that is located approximately 0.25 miles west of the proposed site driveway intersection, this section of NH 155 carried an average weekday traffic volume of approximately 12,546 vehicles per day in 2019. The highest hourly traffic volumes occurred from 7:00 to 8:00 AM and from 4:00 to 5:00 PM on weekdays.
3. The trip generation analysis indicates that the proposed mixed-use development will generate approximately 55 vehicle-trips during the AM peak hour (27 arrivals, 28 departures) and 68 vehicle-trips during the PM peak hour (32 arrivals, 36 departures) when fully occupied.
4. Based on the previous F. W. Webb traffic study that was conducted by our office, it is reasonable to expect that approximately 85% of the traffic generated by the site will travel to/from points east on NH155 (toward the Turnpike). This means that right-turn arrivals and left-turn departures will be the predominant turning movement patterns at the site driveway.
5. Based on the trip generation estimates contained herein, the subject driveway will function adequately with one shared departure lane on its approach to NH155, and this approach should operate under STOP sign control (MUTCD #R1-1).
6. Development sites that generate 500-1,500 vehicle-trips per day are generally considered to be "medium" traffic generators. Based on the daily estimate of 672 vehicle-trips per day (see Table 1), the proposed mixed-use development is not considered to be a major traffic generator.
7. This section of NH155 exhibits a straight horizontal alignment and the vertical profile is essentially flat. This means that with the appropriate clearing of roadside vegetation on both sides of the proposed site driveway, the NHDOT 400-foot all-season sight distance can be achieved.

Attachments



ATTACHMENTS





Transportation Data Management System

List View

All DIRs

Record	3701 of 5744 Goto Record go		
Location ID	82281051	MPO ID	
Type	SPOT	HPMS ID	
On NHS	No	On HPMS	No
LRS ID	S0000155	LRS Loc Pt.	
SF Group	04	Route Type	
AF Group	04	Route	NH 155
GF Group	E	Active	Yes
Class Dist Grp	Default	Category	3
Seas Clss Grp	Default		
WIM Group	Default		
QC Group	Default		
Funct'l Class	Minor Arterial	Milepost	
Located On	Knox Marsh Rd		
Loc On Alias	NH 155 (KNOX MARSH RD) AT DOVER TL		
More Detail			
STATION DATA			

Directions: 2-WAY EB WB ?

AADT

Year	AADT	DHV-30	K %	D %	PA	BC	Src
2019	12,546 ³		11	51	11,493 (92%)	1,053 (8%)	Grown from 2018
2018	12,397 ³		11	51	11,431 (92%)	966 (8%)	Grown from 2017
2017	12,154	1,395	11	51	11,280 (93%)	874 (7%)	
2016	10,506 ³				9,581 (91%)	925 (9%)	Grown from 2015
2015	10,300 ³						Grown from 2014

Travel Demand Model

Model Year	Model AADT	AM PHV	AM PPV	MD PHV	MD PPV	PM PHV	PM PPV	NT PHV	NT PPV
------------	------------	--------	--------	--------	--------	--------	--------	--------	--------

VOLUME COUNT

Date	Int	Total
Thu 9/3/2020	60	12,840
Wed 9/2/2020	60	12,165
Tue 9/1/2020	60	12,794
Thu 6/15/2017	60	14,158
Wed 6/14/2017	60	14,465
Tue 6/13/2017	60	13,629
Thu 7/17/2014	60	12,590
Wed 7/16/2014	60	12,010
Tue 7/15/2014	60	11,989
Wed 4/17/2013	60	12,882

VOLUME TREND

Year	Annual Growth
2019	1%
2018	2%
2017	16%
2016	2%
2015	3%
2014	-9%
2013	-8%
2011	3%
2008	0%
2005	0%



Transportation Data Management System



Excel Version

Weekly Volume Report			
Location ID:	82281051	Type:	SPOT
Located On:	Knox Marsh Rd	:	
Direction:	2-WAY		
Community:	MADBURY	Period:	Mon 8/31/2020 - Sun 9/6/2020
AADT:			

Start Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Avg	Graph
12:00 AM		34	40	46				40	0.3%
1:00 AM		21	25	19				22	0.2%
2:00 AM		15	23	22				20	0.2%
3:00 AM		30	40	37				36	0.3%
4:00 AM		69	66	80				72	0.6%
5:00 AM		278	277	292				282	2.2%
6:00 AM		683	615	638				645	5.1%
7:00 AM		1041	979	977				999	7.9%
8:00 AM		810	879	829				839	6.7%
9:00 AM		774	684	728				729	5.8%
10:00 AM		749	688	738				725	5.8%
11:00 AM		764	713	748				742	5.9%
12:00 PM		799	745	761				768	6.1%
1:00 PM		846	697	811				785	6.2%
2:00 PM		904	823	841				856	6.8%
3:00 PM		1029	1004	1062				1,032	8.2%
4:00 PM		1111	1148	1132				1,130	9.0%
5:00 PM		990	927	1075				997	7.9%
6:00 PM		628	617	721				655	5.2%
7:00 PM		456	444	491				464	3.7%
8:00 PM		334	307	334				325	2.6%
9:00 PM		209	199	232				213	1.7%
10:00 PM		127	155	152				145	1.1%
11:00 PM		93	70	74				79	0.6%
Total	0	12,794	12,165	12,840	0	0	0		
24hr Total		12794	12165	12840				12,600	
AM Pk Hr		7:00	7:00	7:00					
AM Peak		1041	979	977				999	
PM Pk Hr		4:00	4:00	4:00					
PM Peak		1111	1148	1132				1,130	
% Pk Hr		8.68%	9.44%	8.82%				8.98%	



Transportation Data Management System



Excel Version

Weekly Volume Report			
Location ID:	82281051	Type:	SPOT
Located On:	Knox Marsh Rd	:	
Direction:	2-WAY		
Community:	MADBURY	Period:	Mon 6/12/2017 - Sun 6/18/2017
AADT:	12154		

Start Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Avg	Graph
12:00 AM		67	64	48				60	0.4%
1:00 AM		27	38	38				34	0.2%
2:00 AM		31	18	38				29	0.2%
3:00 AM		49	41	36				42	0.3%
4:00 AM		83	80	95				86	0.6%
5:00 AM		365	353	318				345	2.5%
6:00 AM		841	835	832				836	5.9%
7:00 AM		1289	1395	1375				1,353	9.6%
8:00 AM		1091	1142	1050				1,094	7.8%
9:00 AM		716	804	745				755	5.4%
10:00 AM		597	658	660				638	4.5%
11:00 AM		641	727	673				680	4.8%
12:00 PM		691	702	661				685	4.9%
1:00 PM		641	777	660				693	4.9%
2:00 PM		871	904	890				888	6.3%
3:00 PM		1020	1107	1034				1,054	7.5%
4:00 PM		1297	1338	1294				1,310	9.3%
5:00 PM		1195	1206	1182				1,194	8.5%
6:00 PM		686	720	799				735	5.2%
7:00 PM		524	580	631				578	4.1%
8:00 PM		378	410	449				412	2.9%
9:00 PM		255	254	346				285	2.0%
10:00 PM		172	207	188				189	1.3%
11:00 PM		102	105	116				108	0.8%
Total	0	13,629	14,465	14,158	0	0	0		
24hr Total		13629	14465	14158				14,084	
AM Pk Hr		7:00	7:00	7:00					
AM Peak		1289	1395	1375				1,353	
PM Pk Hr		4:00	4:00	4:00					
PM Peak		1297	1338	1294				1,310	
% Pk Hr		9.52%	9.64%	9.71%				9.62%	

Trip Generation Summary

Alternative: McCrone Property - Dover, NH

Phase:

Project: 2067A

Open Date: 1/20/2021

Analysis Date: 1/20/2021

ITE	Land Use	Weekday Average Daily Trips				Weekday AM Peak Hour of Adjacent Street Traffic				Weekday PM Peak Hour of Adjacent Street Traffic			
		*	Enter	Exit	Total	*	Enter	Exit	Total	*	Enter	Exit	Total
110	INDUSTRIAL 1		37	36	37		4	0	4		1	3	4
	4 1000 Sq. Ft. GFA				7974								
140	MANUFACTURING 1		8	8	16		2	0	2		1	2	3
	4 1000 Sq. Ft. GFA												
150	WAREHOUSE 1		3	23	36		1	0	1		0	1	1
	3 1000 Sq. Ft. GFA												
180	TRADE-CONTR 1		31	30	31		7	3	10		4	8	12
	6 1000 Sq. Ft. GFA				6162								
220	LOW-RISE 1		222	221	222		7	24	31		25	15	40
	64 Dwelling Units				443444								
710	OFFICEGENERAL 1		35	34	35		6	1	7		1	7	8
	6 1000 Sq. Ft. GFA				6870								
Unadjusted Volume													
Internal Capture Trips		336		331	336	667	672	27	28	55	32	36	68
Pass-By Trips			0	0	0	0	0	0	0	0	1	1	2
Volume Added to Adjacent Streets			0	0	0	0	0	0	0	0	0	0	0
		336		331	667	27	28	55	31	35	31	35	66

* - Custom rate used for selected time period.

Source: Institute of Transportation Engineers, Trip Generation Manual 10th Edition
TRIP GENERATION 10, TRAFFICWARE, LLC

TABLE OF CONTENTS:

SHEET 1	~ NEIGHBORHOOD PLAN
SHEET 2	~ EXISTING CONDITIONS PLAN
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SHEET 4	~ CONSTRUCTION PHASING PLAN
SHEET 5	~ OVERVIEW SITE PLAN
SHEET 6	~ SITE PLAN EAST
SHEET 7	~ SITE PLAN WEST
SHEET 8	~ OVERVIEW GRADING PLAN
SHEET 9	~ DETAIL GRADING PLAN
SHEET 10	~ PLAN & PROFILE CONCOLOR DRIVE 0+00 TO 5+00
SHEET 11	~ PLAN & PROFILE CONCOLOR DRIVE 5+00 TO END
SHEET 12	~ P-101 GRAVEL WETLAND #101
SHEET 13	~ P-102 & P-105 INFILTRATION POND #102 & DETENTION POND #103
SHEET 14	~ P-103 GRAVEL WETLAND #103
SHEET 15	~ P-104 GRAVEL WETLAND #104
SHEET 15	~ EROSION & SEDIMENT CONTROL PLAN EAST
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SHEET 18	~ OVERVIEW UTILITY PLAN
SHEET 19	~ UTILITY PLAN & PROFILE CONCOLOR DRIVE 0+00 TO 5+00
SHEET 20	~ UTILITY PLAN & PROFILE CONCOLOR DRIVE 5+00 TO END
SHEET 21	~ LIGHTING PLAN
SHEET 22	~ L-01 LANDSCAPING PLAN EAST
SHEET 23	~ L-02 LANDSCAPING PLAN WEST
SHEET 24	~ NHDOT-1 SIGHT DISTANCE WEST BOUND
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SHEET 27	~ E-101 SEDIMENT & EROSION DETAILS
SHEET 28	~ E-102 SEDIMENT & EROSION DETAILS
SHEET 29	~ C-101 CONSTRUCTION DETAILS
SHEET 20	~ C-102 CONSTRUCTION DETAILS
SHEET 31	~ C-103 CONSTRUCTION DETAILS
SHEET 32	~ D-101 DRAINAGE DETAILS
SHEET 33	~ U-101 UTILITY DETAILS
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SHEET 35	~ U-103 UTILITY DETAILS
SHEET 36	~ L-101 LANDSCAPING DETAILS
SHEET 37	~ TRUCK TURNING ENTRANCE
SHEET 38	~ TRUCK TURNING SITE

OWNER & APPLICANT: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833

SURVEYOR OF RECORD: KENNETH A. BERRY, PE, LLS
CPSWQ, CPESC, CESSWI
BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825
(603) 332-2863

ENGINEER OF RECORD: KENNETH A. BERRY, PE, LLS
CPSWQ, CPESC, CESSWI
BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825
(603) 332-2863

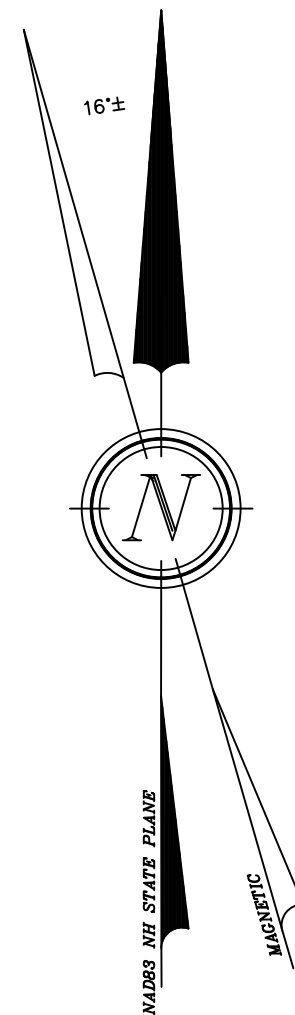
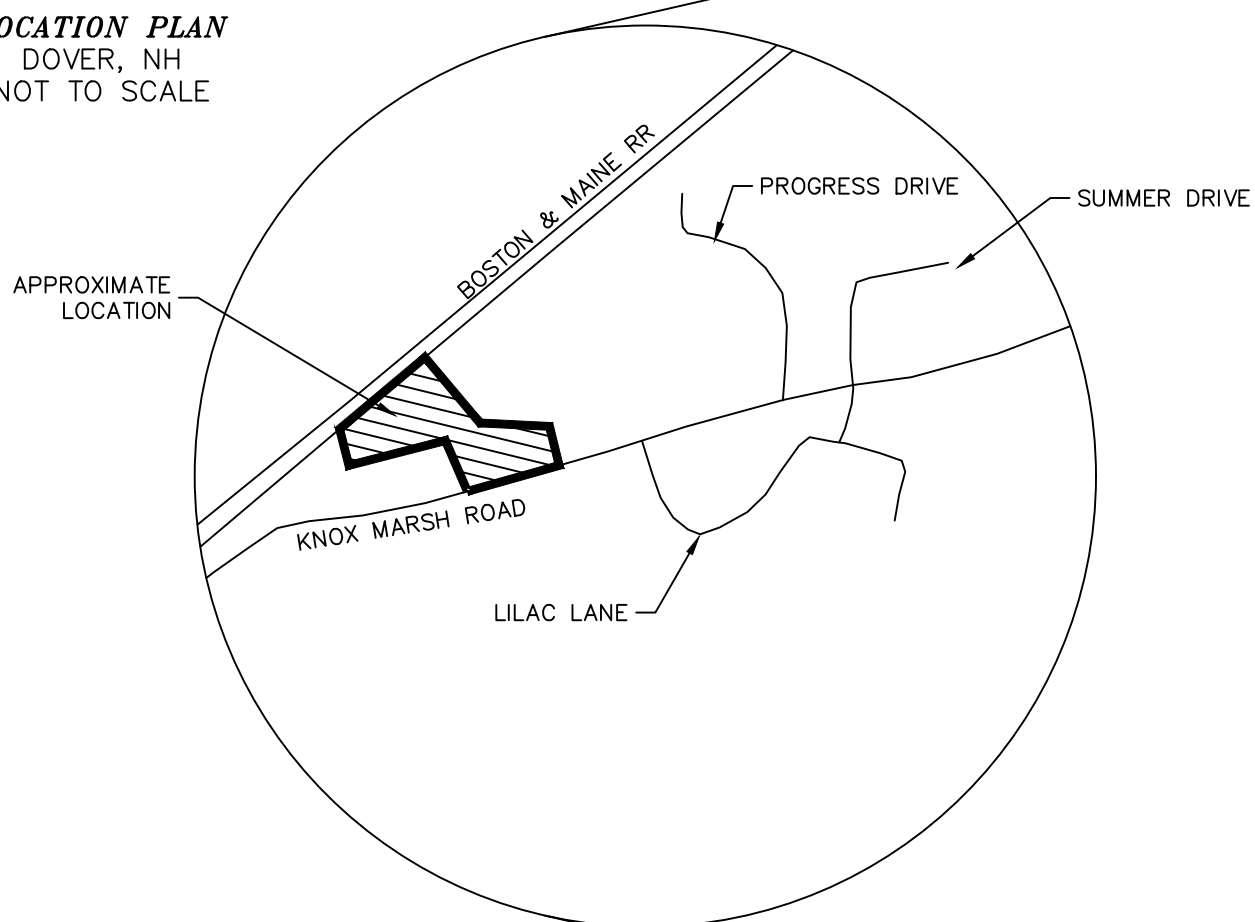
WETLAND SCIENTIST: DEIDRA BENJAMIN, CWS #295
100 LEAVITT ROAD
PITTSFIELD, NH 03263

SOIL SCIENTIST: JOHN P. HAYES, III CWS #18, CSS #87
7 LIMESTONE WAY
NORTH HAMPTON, NH 03862
(603) 205-4396

LANDSCAPE ARCHITECT: ERIC R. BUCK #87
TERRAIN PLANNING & DESIGN
311 KAST HILL ROAD
HOPKINTON, NH 03229

ARCHITECT: THOMAS A. HOUSE
THA ARCHITECTS LLC
P.O. BOX 88
STRATHAM, NH 03885

LOCATION PLAN
DOVER, NH
NOT TO SCALE



REQUIRED PERMITS:

~ NHDES SEWER DISCHARGE PERMIT	(PENDING)
~ NHDES ALTERATION OF TERRAIN PERMIT	(PENDING)
~ US EPA NOI & SWPPP	(PENDING)
~ NATURAL HERITAGE BUREAU	(PENDING)
~ NH DIVISION OF HISTORICAL RESOURCES	(PENDING)
~ NHDOT DRIVEWAY PERMIT	(PENDING)

GENERAL PLAN SET NOTES:

- 1.) 11x17" PLANS ARE HALF THE PUBLISHED SCALE.
- 2.) ALL PLANS ARE CONSIDERED TO BE NOT FOR CONSTRUCTION UNLESS THEY CONTAIN THE APPROVAL STAMP OF THE CITY OF DOVER.

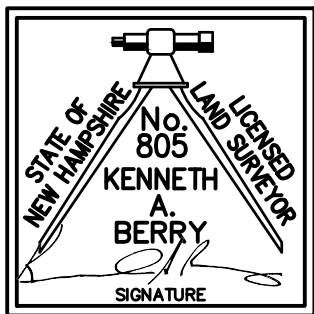
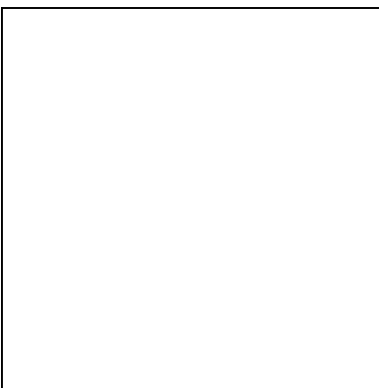
WHETHER OR NOT OTHERWISE EXPRESSLY RECITED ON THIS SITE PLAN, THE SITE PLAN APPROVAL GRANTED IS CONDITIONED ON FAITHFUL AND DILIGENT ADHERENCE BY THE OWNER/SUBDIVIDER/DEVELOPER OF ALL TERMS, CONDITIONS, PROVISIONS AND SPECIFICATIONS OF THE CITY OF DOVER LAND SITE PLAN REGULATIONS AS AMENDED OR AS MAY LATER BE AMENDED, IN EFFECT ON THE DATE OF APPROVAL, UNLESS OR EXCEPT INSOFAR AS EXPRESSLY WAIVED, IN ANY PARTICULAR, BELOW. NON - ADHERENCE MAY RESULT IN A REVOCATION OF APPROVAL. ANY VARIATION FROM THE APPROVED PLAN WILL REQUIRE A RESUBMISSION FOR SITE PLAN APPROVAL.

” McCRONE PLACE ”
FOR
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

NOTE:

BERRY SURVEYING & ENGINEERING HAS PREPARED AN INSPECTION & MAINTENANCE MANUAL AS PART OF THIS PROJECTS DOCUMENTATION. ALL USERS ARE BOUND TO THIS DOCUMENT AS PART OF THE APPROVAL OF THE PLANNING BOARD. COPIES OF THE YEARLY INSPECTIONS ARE TO BE DELIVERED TO THE CITY OF DOVER COMMUNITY SERVICES DEPARTMENT.

VICINITY SKETCH
DOVER, NH
SCALE: 1" = 200' ±



BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
SCALE : AS SHOWN
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066

MIXED USE SITE PLAN
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

PLANNING FILE #	REVISION	DATE	DESCRIPTION

E.O.P.	EDGE OF PAVEMENT
S.G.C.	SLOPED GRANITE CURB
V.G.C.	VERTICAL GRANITE CURB
A.C.P.	ASBESTOS CLAY PIPE
BITUM.	BITUMINOUS
E.S.H.W.T	ESTIMATE SEASONAL HIGH WATER TABLE

TYP.	TYPICAL
U.G.E	UNDER GROUND ELECTRIC / UTILITY
U.D.	UNDER DRAIN
C.O.	CLEAN OUT
INV.	INVERT
ELEV.	ELEVATION
F.E.S.	FLARED END SECTION
HDPE	HIGH DENSITY POLYETHYLENE
RCP	REINFORCED CONCRETE PIPE
RECB	ROLLED EROSION CONTROL BLANKET
F.G.	FINISHED GRADE
E.G.	EXISTING GRADE
E.T.W.	EDGE OF TRAVELED WAY
T.B.R.	TO BE REMOVED
PL	PROPERTY LINE
CL	CENTER LINE
CF	CUBIC FEET
P.C.	POINT OF CURVATURE
P.T.	POINT OF TANGENCY
P.V.P.	POINT OF VERTICAL CURVE
P.V.I.	POINT OF VERTICAL INTERSECTION
P.V.T.	POINT OF VERTICAL TANGENCY
EX.	EXISTING
PROP.	PROPOSED
STA.	STATION

```

~ SSL ( ) ~ {SIZE} SINGLE SOLID LINE (COLOR W=WHITE, Y=YELLOW)
~ DSL ( ) ~ {SIZE} DOUBLE SOLID LINE (COLOR W=WHITE, Y=YELLOW)
~ SSB ( ) ~ {SIZE} SINGLE SOLID W/ BROKEN LINE (COLOR W=WHITE, Y=YELLOW)
~ SBL ( ) ~ {SIZE} SINGLE BROKEN LINE (COLOR W=WHITE, Y=YELLOW)
~ DBL ( ) ~ {SIZE} DOUBLE BROKEN LINE (COLOR W=WHITE, Y=YELLOW)

```

- IRON BOUND (FND)
- REBAR (FND)
- RAILROAD SPIKE (FND)
- UTILITY POLE / GUY WIRE
- SINGLE POST SIGN
- CURB STOP
- GATE VALVE
- GAS VALVE
- FIRE HYDRANT
- CATCH BASIN
- SEWER MANHOLE
- DRAIN MANHOLE
- TREE

E113.83 EXISTING SPOT ELEVATION

BUILDING SETBACK LINE
 EXISTING GAS LINE
 EXISTING WATER LINE
 EXISTING SEWER LINE
 EXISTING DRAIN LINE
 OVERHEAD UTILITIES
 EXISTING CONTOUR MINOR
 EXISTING CONTOUR MAJOR

	TEMPORARY BENCHMARK
	CURB STOP
	GATE VALVE
	GAS VALVE
	CATCH BASIN
	SHEET DETAIL
	THRUST BLOCK

 LIGHTING
 PROPOSED SPOT ELEVATION
 EASEMENT LINE
 PROPOSED GAS LINE
 PROPOSED WATER LINE
 PROPOSED SEWER LINE
 PROPOSED DRAIN LINE
 PROPOSED UNDERDRAIN
 PROPOSED CONTOUR MINOR
 PROPOSED CONTOUR MAJOR
 SAW CUT LINE
 PROPOSED UNDERGROUND UTILITY
 FILTERREX SILT SOXX (8" or 12" AS NOTED)
 ORANGE CONSTRUCTION PERIMETER FENCE



REVISION	DATE	DESCRIPTION

NEIGHBORHOOD PLAN
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

SIGN ID NUMBER	SIGN SIZE (WIDTH x HEIGHT)	SIGN	TEXT DIMENSIONS	NO. OF SIGNS	BACKGROUND	LEGEND	BORDER	POST SIZE & QUANTITY
R1-1	30"x30"		SEE STANDARD HIGHWAY SIGNS 2004 EDITION PUBLISHED BY USDOT - FHWA	5	RED	WHITE	WHITE	SQUARE (5)
R7-8	12"x18"		SEE STANDARD HIGHWAY SIGNS 2004 EDITION PUBLISHED BY USDOT - FHWA	8	WHITE	GREEN w/ WHITE SYMBOL ON BLUE	RED	SQUARE (8)
R7-8a	12"x6"		SEE STANDARD HIGHWAY SIGNS 2004 EDITION PUBLISHED BY USDOT - FHWA	8	WHITE	GREEN	GREEN	SQUARE (8)
R8-31	12"x18"		SEE STANDARD HIGHWAY SIGNS 2004 EDITION PUBLISHED BY USDOT - FHWA	2	WHITE	RED	RED	SQUARE (2)
R2-1	24"x30"		SEE STANDARD HIGHWAY SIGNS 2004 EDITION PUBLISHED BY USDOT - FHWA	1	WHITE	GREEN	GREEN	SQUARE (1)

N/F NSA OPTIVEST ACQUISITION HOLDINGS
24901 DANA PT HARBOR DR #200
DANA POINT, CA 92629
TAX MAP H, LOT 36-B1
S.C.R.D. BOOK 4225, PAGE 631

N/F KNOX MARSH CONDOS
C/O KATHLEEN GOWDY
251 KNOX MARSH RD #9
DOVER, NH 03820
TAX MAP H, LOT 37

N/F KENNETH A BROWN
213 E LOCKHAVEN DR
FAYETTEVILLE, NC 26314
TAX MAP H, LOT 37-8
S.C.R.D. BOOK 3843, PAGE 420

N/F GARY P NOEL
29 S HAMPTON RD
AMESBURY, MA 01913
TAX MAP H, LOT 37-12
S.C.R.D. BOOK 1574. PAGE 770

N/F NATALIE HEBERT REV LIV TST
NATALIE HEBERT TSTEE
462 SIXTH ST

TAX MAP H, LOT 37-14
S.C.R.D. BOOK, 4519, PAGE 327

N/F NANCY L TAYLOR
251 KNOX MARSH RD UNIT 16
DOVER, NH 03820
TAX MAP H, LOT 37-16
S.C.R.D. BOOK, 4519, PAGE 327

N/F SETH PETERS
23 OLD MILL RD
LEE, NH 03861
TAX MAP H, LOT 37-6
S.C.R.D. BOOK. 4547. PAGE 449

N/F PATRICK J CRAGIN LIV REV TST
PATRICK J CRAGIN TSTEE
PO BOX 250
DOVER, NH 03820
TAX MAP H, LOT B
TAX MAP H, LOT 38
S.C.R.D. BOOK, 3497, PAGE 417

N/F BOSTON & MAINE RR
IRON HOURSE PARK
HIGH ST
NORTH BILLERICA, MA 01862
TAX MAP C, LOT 5

N/F OLDE MADBURY LANE INC
PO BOX 250
DOVER, NH 03820
TAX MAP H, LOT 40-D
S.C.R.D. BOOK 3684, PAGE 74

N/F 237 ALBANY STREET INV. LLC
ABEL AND BRUNELLE ASSOC
160 MIDDLESEX TURNPIKE
BEDFORD, MA 01730
TAX MAP H, LOT 40-B
S.C.R.D. BOOK 4112, PAGE 770

TEST PIT #101
0-8" 10YR 3/3 DARK BROWN, FINE SANDY LOAM, GRANULAR, FRIABLE
8-18 10YR 4/6 DARK YELLOWISH BROWN, LOAMY FINE SAND, GRANULAR, FRIABLE
18-26 2.5Y 5/4 LIGHT OLIVE BROWN, FINE SAND, GRANULAR, FRIABLE
26-44 2.5Y 5/3 LIGHT OLIVE BROWN, VERY FINE SAND WITH REDDISHMORPHIC FEATURES PRESENT, GRANULAR, FRIABLE
44-72 5Y 5/3 OLIVE, SILT LOAM WITH REDDISHMORPHIC FEATURES PRESENT, BLOCKY, FIRM
TERMINATED: 72"
E.S.H.W.T.: 26"
RESTRICTIVE LAYER: 42"
REFUSAL: NONE
GROUND WATER OBSERVED: 64"
PERC RATE: 10 MIN./IN.

TEST PIT #101A
0-10" 10YR 3/3 DARK BROWN, FINE SANDY LOAM, GRANULAR, FRIABLE
10-72 10YR 4/6 DARK YELLOWISH BROWN, LOAMY FINE SAND, GRANULAR, FRIABLE
18-26 2.5Y 5/4 LIGHT OLIVE BROWN, FINE SAND, GRANULAR, FRIABLE
26-38 2.5Y 5/3 LIGHT OLIVE BROWN, VERY FINE SAND WITH REDDISHMORPHIC FEATURES PRESENT, GRANULAR, FRIABLE
38-72 5Y 5/3 OLIVE, SILT LOAM WITH REDDISHMORPHIC FEATURES PRESENT, BLOCKY, FIRM
TERMINATED: 72"
E.S.H.W.T.: 26"
RESTRICTIVE LAYER: 38"
REFUSAL: N/A
GROUND WATER OBSERVED: 50"
PERC RATE: 8 MIN./IN.

TEST PIT #102
0-10" 10R 5/3 DARK BROWN, FINE SANDY LOAM, GRANULAR, FRIABLE
10-18" 10R 4/4 DARK YELLOWISH BROWN, LOAMY FINE SAND, GRANULAR, FRIABLE
18-24" 2.5Y 5/4 LIGHT OLIVE BROWN, FINE SAND, GRANULAR, FRIABLE
24-46" 2.5Y 5/3 LIGHT OLIVE BROWN, VERY FINE SAND WITH REDDISH-MORPHIC FEATURES PRESENT, GRANULAR, FRIABLE
46-72" 5Y 5/3 OLIVE, SILT LOAM WITH REDDISH-MORPHIC FEATURES PRESENT, BLOCKY, FIRM
TERMINATED: 72"
S.E.W.T.M.: 24"
RESTRICTIVE LAYER: 46"
REFUSAL: N/A
GROUND WATER OBSERVED: 44"
PERC RATE: 10 MIN. ON

TEST PIT #103
0-6" 10R 1/3 DARK BROWN, FINE SANDY LOAM, GRANULAR, FRAGILE
6-18" 10R 4/5 DARK YELLOWISH BROWN, LOAMY FINE SAND, GRANULAR, FRAGILE
18-24" 2.5Y 5/4 LIGHT OLIVE BROWN, FINE SAND, GRANULAR, FRAGILE
24-48" 2.5Y 5/3 LIGHT OLIVE BROWN, VERY FINE SAND WITH REDDYMORPHIC FEATURES PRESENT, GRANULAR, FRAGILE
48-72" 5Y 5/3 OLIVE, SILT LOAM WITH REDDYMORPHIC FEATURES PRESENT, BLOCKY, FIRM
TERMINATED: 72"
E.S.H. M.T.: 24"
RESTRICTIVE LAYER: 48"
REFUSAL: NONE
GROUND WATER OBSERVED: 65"
PERC RATE: 10 MIN./IN.

TEST PIT #103A
0-5" 10YR 3/3 DARK BROWN, FINE SANDY LOAM, GRANULAR, FRABLE
6-18" 10YR 4/6 DARK YELLOWISH BROWN, LOAMY FINE SAND, GRANULAR, FRABLE
18-24" 2.5Y 5/4 LIGHT OLIVE BROWN, FINE SAND, GRANULAR, FRABLE
2.5-12" 2.5Y 5/4 LIGHT OLIVE BROWN, VERY FINE SAND WITH REDDISH/OXIDE FEATURES PRESENT, GRANULAR, FRABLE
50-72" 5Y 5/3 OLIVE, SILT LOAM WITH REDDISH/OXIDE FEATURES PRESENT, BLOCKY, FIRM
TERMINATED: 72"
E.S.H.W.T.: 24"
RESTRICTIVE LAYER: 50"
REFUSAL: N/A
GROUND WATER OBSERVED: 48"
PERC RATE: 10 MIN./IN.

TEST PIT #104
0-12" 10YR 3/3 DARK BROWN, FINE SANDY LOAM, GRANULAR, FRABLE
12-34" 10YR 5/6 YELLOWISH BROWN, FINE SANDY LOAM, GRANULAR, FRABLE
24-28" 2.5Y 5/4 LIGHT OLIVE BROWN, FINE SANDY LOAM, GRANULAR, FRABLE
28-60" 2.5Y 5/3 LIGHT OLIVE BROWN, VERY FINE SANDY LOAM WITH REDDISH/OXIDE FEATURES PRESENT, MASSIVE, FRABLE
60-70" 2.5Y 5/2 GRAYISH BROWN, GRAVELLY FINE SANDY LOAM WITH REDDISH/OXIDE FEATURES PRESENT, MASSIVE, FIRM
TERMINATED: 70"
E.S.H.W.T.: 28"
RESTRICTIVE LAYER: 60"
REFUSAL: LEDGE N/A
GROUND WATER OBSERVED: 55"
PERC RATE: 6 MIN./IN.

TEST PIT #105
0-14" TOR 3/2 VERY DARK GRAYISH BROWN, FINE SANDY LOAM, GRANULAR, FRIABLE
14-28" TOR 5/8 YELLOWISH BROWN, FINE SANDY LOAM, GRANULAR, FRIABLE
28-54" TOR 2 1/4 LIGHT BROWN, GRAVELLY FINE SANDY LOAM, GRANULAR, FRIABLE
54-64" 2.5Y 5/3 LIGHT BROWN, GRAVELLY FINE SANDY LOAM WITH REDDISHMOPHY FEATURES PRESENT, MASSIVE, FRIABLE
TERMINATED: 64"
E.S.H.W.T.: 32"
RESTRICTIVE LAYER: N/A
REFUSAL: NONE
GROUND WATER OBSERVED: 40"
PERC RATE: 4 MIN./IN.

TEST PIT #106
0-14" 10YR 3/3 DARK BROWN, FINE SANDY LOAM, GRANULAR, FRAGILE
14-24" 10YR 5/6 YELLOWISH BROWN, FINE SANDY LOAM, GRANULAR, FRAGILE
24-30" 2.5Y 5/4 LIGHT OLIVE BROWN, FINE SANDY LOAM, GRANULAR, FRAGILE
30-62" 2.5Y 5/3 LIGHT OLIVE BROWN, VERY FINE SANDY LOAM WITH REDDYMORPHIC FEATURES PRESENT, MASSIVE, FIRM
62-72" 10YR 5/6 YELLOWISH BROWN, GRAVELLY FINE SANDY LOAM WITH REDDYMORPHIC FEATURES PRESENT, MASSIVE, FIRM
TERMINATED: 72"
E.S.H.W.T.: 30"
RESTRICTIVE LAYER: 60"
REFUSAL: LEUGE N/A
GROUND WATER OBSERVED: 55"
PERC RATE: 4 MIN./IN.

- 1) FIELD INDICATORS OF HYDRIC SOILS IN THE UNITED STATES, VERSION 7.0. 2010. L.M. VASILAS, G.W. HURT, AND C.V. NOBLE (EDS.). UNITED STATES DEPARTMENT OF AGRICULTURE, NATURAL RESOURCES CONSERVATION SERVICE, IN COOPERATION WITH THE NATIONAL TECHNICAL COMMITTEE FOR HYDRIC SOILS.
- 2) FIELD INDICATORS FOR IDENTIFYING HYDRIC SOILS IN NEW ENGLAND. VERSION 3. APRIL 2004. NEWIPCC WETLANDS WORKGROUP. WILMINGTON, MA 01887.
- 3) NORTH AMERICAN DIGITAL FLORA: NATIONAL WETLAND PLANT LIST, VERSION 2.1.0 ([HTTP://WETLAND.PLANTS.USACE.ARMY.MIL](http://wetland.plants.usace.army.mil)). U.S. ARMY CORPS OF ENGINEERS, WETLANDS AND DEEPWATER DISTRICT CENTER, COLD REGIONS RESEARCH AND ENGINEERING LABORATORY, HANOVER, NH, AND BONAP, CHAPEN HILL.
- 4) STATE OF NEW HAMPSHIRE 2014 WETLAND PLANT LIST. LICHVAR, R.W., M. B. FLEMING, N.C. MEYER, AND W.A. KIRCHNER. 2014. THE NATIONAL WETLAND PLANT LIST: 2014 UPDATE OF WETLAND RATINGS. PHYTONEURON 2014—411-41-42.
- 5) CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL. JANUARY 1987. WETLANDS RESEARCH PROGRAM TECHNICAL REPORT Y-87-1.
- 6) REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: NORTH-CENTRAL AND NORTHEAST REGION. JULY 2012, VERSION 2.0. U.S. ARMY CORPS OF ENGINEERS, ENVIRONMENTAL LABORATORY ERDC/EL-TR-12-1.
- 7) CLASSIFICATION OF WETLANDS AND DEEPWATER HABITATS OF THE UNITED STATES. DECEMBER 1979. L. COWARDIN, P. CARTER, F. GOLETT, AND E. LUGER. U.S. DEPARTMENT OF THE INTERIOR. FISH AND WILDLIFE SERVICE. FWS/OBS-79/31.

BzB NRCS SOIL LABEL
S.C.R.D. STRAFFORD COUNTY REGISTRY OF DEEDS
TYP.
FND FOUND

BzA - BUXTON SILT LOAM, 0 TO 3 PERCENT SLOPES
WfB - WINDSOR LOAMY SAND, 3 TO 8 PERCENT SLOPES
WdA - WINDSOR LOAMY SAND, 0 TO 3 PERCENT SLOPES
ScA - SCANTIC SILT LOAM, 0 TO 3 PERCENT SLOPES

SEE WEBSOIL USDA-NRCS

(IN FEET)
1 inch = 50 ft.

- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
- 2.) TAX MAP H, LOT 37A
- 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
- 4.) S.C.R.D. BOOK 4783, PAGE 326
- 5.) (C) COMMERCIAL SECONDARY GROUNDWATER RECHARGE
MINIMUM FRONTAGE ~ 125'
MINIMUM LOT SIZE ~ 20,000 Sq. Ft.
FRONT SETBACK ~ 30'
REAR SETBACK ~ 15'
SIDE SETBACK ~ 12'
WETLANDS BUFFER ~ 50.0'
MAX. BUILDING HEIGHT: 40'
MAX. LOT COVERAGE: 50%
MAX. IMPERVIOUS COVERAGE: 20%
- 6.) I HEREBY CERTIFY THAT, TO THE BEST OF MY KNOWLEDGE AND BELIEF, THIS PARCEL DOES NOT FALL WITHIN THE FLOOD PLAIN FLOOD HAZARD. REF.: FEMA COMMUNITY #330145, MAP #33017C0320E, DATED: SEPTEMBER 30, 2015.
- 7.) VERTICAL DATUM BASED ON NAVD88 ELEVATIONS. HORIZONTAL COORDINATES BASED ON NAD83. COORDINATES GATHERED USING TOPCON HIPER SR SURVEY GRADE GPS RECEIVERS.
- 8.) THE BOUNDARY LINES SHOWN ON THIS PLAN ARE THE RESULT OF A CLOSED TRAVERSE PERFORMED BY THIS OFFICE IN SPRING OF 2020, WITH A BETTER ERROR OF CLOSURE OF 1 PART IN 10,000.
- 9.) THE INTENT OF THIS PLAN IS TO SHOW THE EXISTING CONDITION ON TAX MAP H, LOT 37A AS OF THE DATE OF THE SURVEY.
- 10.) EXISTING IMPERVIOUS COVER = 5,332 Sq.Ft.
- 11.) SEE PLAN REFERENCE #2.
HANSON ROAD WAS DISCONTINUED AS A PUBLIC WAY BY THE TOWN, NEW HAMPSHIRE CITY COUNCIL ON JULY 8, 1998.

- 1.) "SUBDIVISION PLAN, N.H. ROUTE 155 - KNOX MARSH ROAD, DOVER, N.H., FOR SOUTHWEST PARTNERS REALTY, LLC."
BY: NORWAY PLAINS ASSOCIATES, INC.
DATED: NOVEMBER 1996
FILE NUMBER 303
S.C.R.D.: PLAN # 50-65
- 2.) "STANDARD BOUNDARY SURVEY AND LOT LINE ADJUSTMENT, PLAN OF LAND, LOTS 38 & 37B, TAX ASSESSOR'S MAP H, N.H. ROUTE 155 KNOX MARSH ROAD, DOVER, N.H., COUNTY OF STRAFFORD"
BY: CIVILWORKS, PAUL J. CONNELLY, LLS
DATED: SEPTEMBER 15, 1998
S.C.R.D.: PLAN # 54-41 & PLAN # 54-44
SEE REFERENCE PLAN NOTE # 5 REGARDING HANSON ROAD DISCONTINUANCE.

- 4.) "AS BUILT PLAN FOR KNOX MARSH CONDOMINIUMS, KNOX MARSH ROAD, DOVER, NH"
BY: KIMBALL CHASE COMPANY INC.
DATED: MARCH 21, 1985
S.C.R.D.: PLAN # 27A-23
- 4.) "AMENDED SITE PLAN FOR KNOX MARSH CONDOMINIUMS, KNOX MARSH ROAD, DOVER, NH"
BY: KIMBALL CHASE COMPANY INC.
DATED: DECEMBER 9, 1985
S.C.R.D.: PLAN # 23-87
- 5.) PLAN OF LOT, ESTATE OF GLADYS D. McCRONE HEIRS, JANET C. VARNEY, LOIS A. McCRONE, GLADYS M. SMITH, ROBERT W. McCRONE, DOVER, NH"
BY: ROBERT W. McCRONE, LLS
DATED: NOVEMBER 2, 1993
S.C.R.D.: PLAN # 26A-43
- 6.) "LOT LINE ADJUSTMENT PLAN, ROUTE 155 - KNOX MARSH ROAD, DOVER, N.H., FOR SOUTHWEST PARTNERS REALTY L.L.C."
BY: NORWAY PLAINS ASSOCIATES, INC.
DATED: APRIL 2000
FILE NUMBER 303
S.C.R.D.: PLAN # 59-47
- 7.) PLAN OF LAND FOR LOIS L. McCRONE, KNOX MARSH ROAD, DOVER, NEW HAMPSHIRE"
BY: ROBERT W. McCRONE, LLS #221
DATED DECEMBER 2, 2002
S.C.R.D.: PLAN # 68-29
- 8.) RIGHT-OF-WAY AND TRACK MAP, BOSTON AND MAINE R.R.
OPERATED BY THE BOSTON AND MAINE R.R.,
STATION 3390+07 TO STATION 3442+97 VZ.N.H./63
STATION 3442+97 TO STATION 3495+77 VZ.N.H./64
DATED JUNE 30, 1914
ON FILE WITH PAN AM AND AT BS95-77

LISTING CONDITIONS PLAN
 LAND OF
 EQUINE PROPERTIES LLC
 239 KNOX MARSH ROAD
 DOVER, N.H.
 TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603) 332-2863
SCALE: 1 IN. EQUALS 50 FT.

STATE OF
NEW HAMPSHIRE
No. 805
KENNETH
A. BERRY
LAND SURVEYOR
SIGNATURE

SHEET 2 OF 38

I CERTIFY THAT THIS PLAT EXCEEDS THE
MINIMUM REQUIREMENT FOR ACCURACY AND
COMPLETENESS OF THE STATE OF N.H. AT
OF THE CITY OF DOVER, N.H. - 1:10,000



KENNETH A. BERRY LLS 805 DA

S.S.S.M. SOILS LEGEND

<u>SYMBOL</u>	<u>SOIL TAXONOMIC NAME</u>	<u>HYDROLOGIC SOIL GROUP</u>
WfA	WINDSOR VARIANT	A
WfB	WINDSOR VARIANT	A
WfC	WINDSOR VARIANT	A
BzA	BUXTON MODERATELY DRAINED	C
BzB	BUXTON MODERATELY DRAINED	C
BzC	BUXTON MODERATELY DRAINED	C
ScA-P	SCANTIC POORLY DRAINED	D
ScB-P	SCANTIC POORLY DRAINED	D

SLOPE: A = 0-3% B = 3-8% C = 8-15% D = 15-25% E = 25-50% F = 50%+

DENOMINATOR: /VPD = VERY POORLY DRAINED /PD = POORLY DRAINED
 /SWPD = SOMEWHAT POORLY DRAINED /MWD = MODERATELY WELL DRAINED

NRCS SOILS LEGEND		
<u>SYMBOL</u>	<u>SOIL TAXONOMIC NAME</u>	<u>HYDROLOGIC SOIL GROUP</u>
WdA	WINDSOR LOAMY SAND	A
WtB	WINDSOR LOAMY SAND	A
BzA	BUXTON SILT LOAM	C
ScA	SUFFIELD SILT LOAM	D

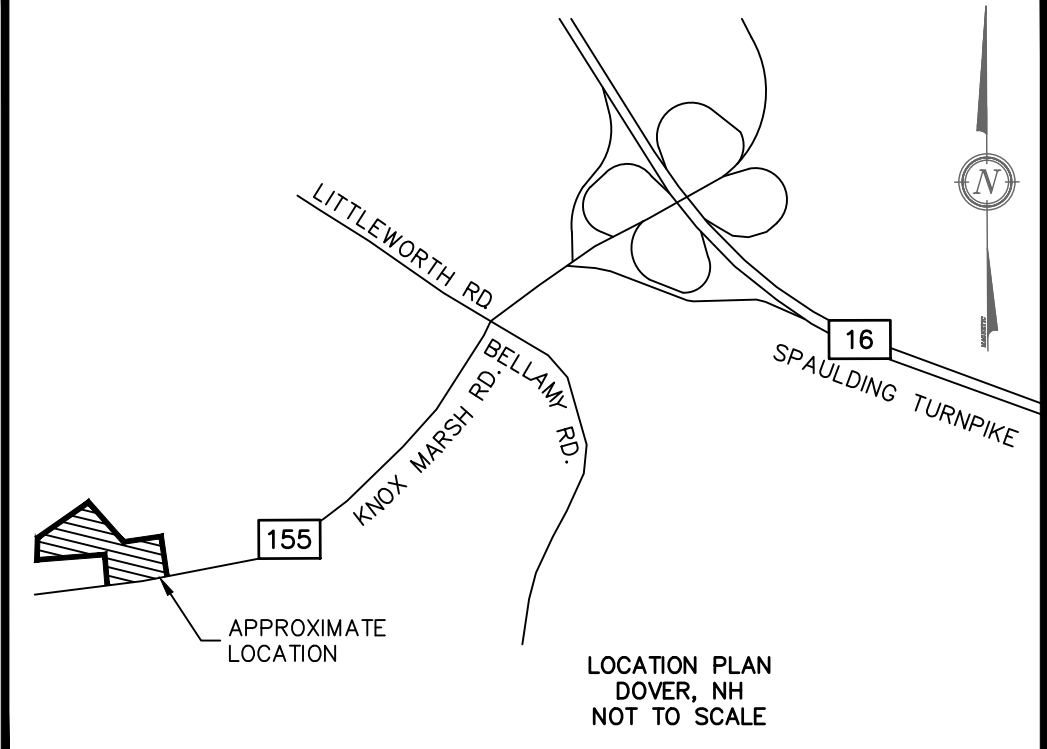
SLOPE: A = 0-3% B = 3-8% C = 8-15% D = 15-25% E = 25-50% F = 50%+

DENOMINATOR: /VPD = VERY POORLY DRAINED /PD = POORLY DRAINED
 /SWPD = SOMEWHAT POORLY DRAINED /MWD = MODERATELY WELL DRAINED

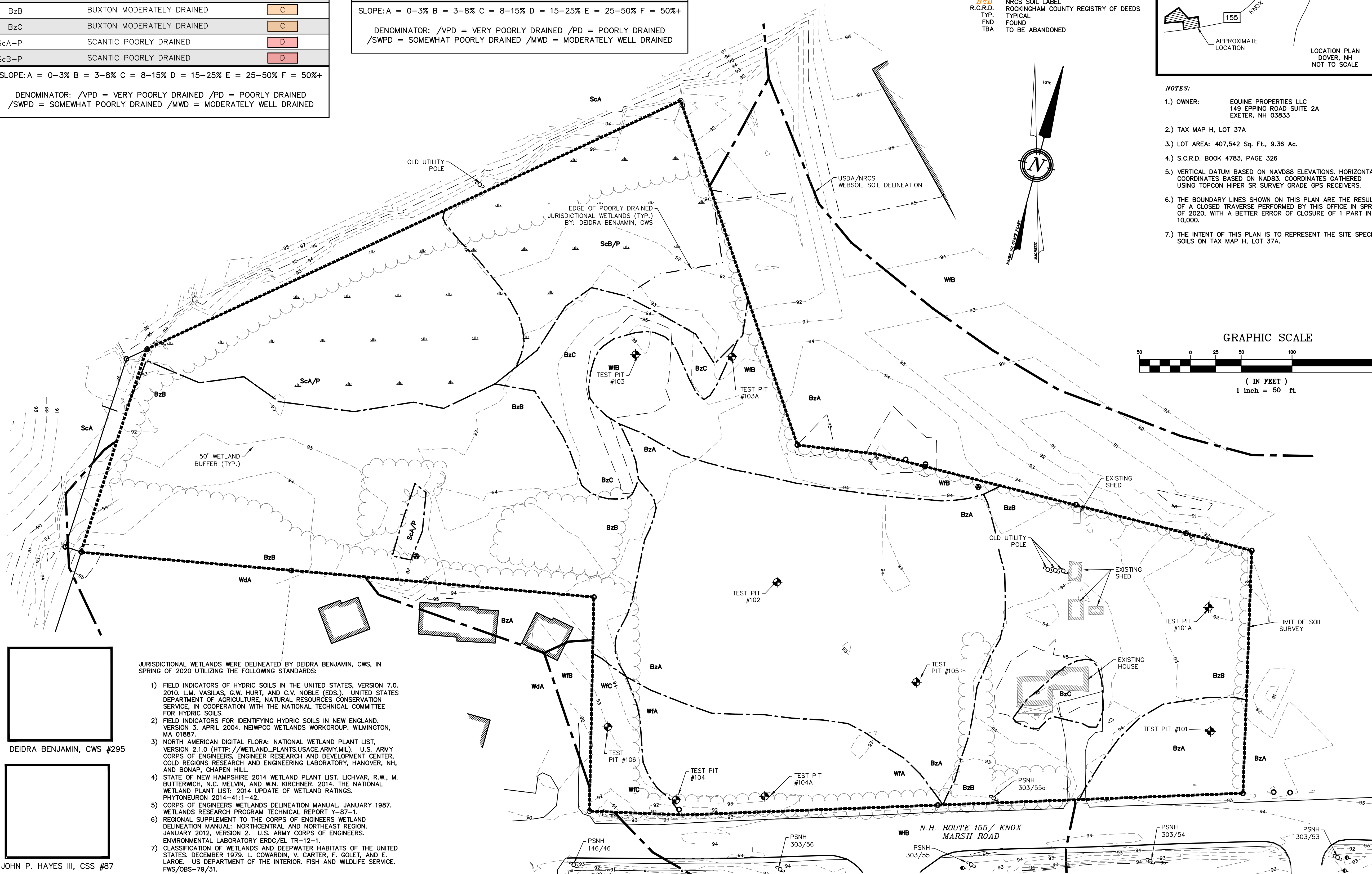
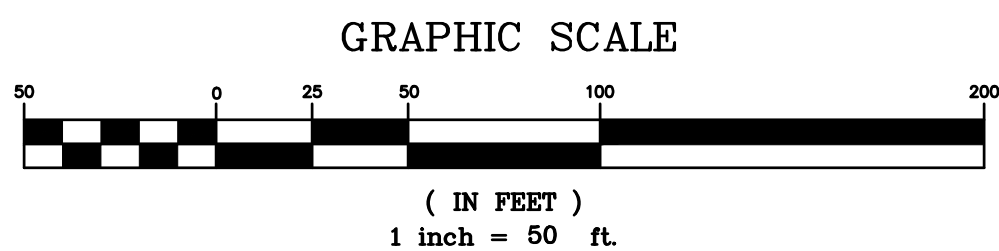
LEGEND:

	IRON BOUND ~FND~
	IRON PIPE ~FND~
	GRANITE BOUND ~FND~
	UTILITY POLE/GUY WIRE
	BENCHMARK

	MATCH LINE & POINT
	WETLAND LINE
	EXISTING CONTOUR MINOR
	EXISTING CONTOUR MAJOR
	OFF SITE NRCS SOIL LINE
	SOIL LINE
	LIMIT OF SOIL SURVEY
	SOIL SERIES
	NRCS SOIL LABEL
	ROCKINGHAM COUNTY REGISTRY OF DEEDS
	TYPICAL
	FND FOUND
	TBA TO BE ABANDONED



- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
- 2.) TAX MAP H, LOT 37A
- 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
- 4.) S.C.R.D. BOOK 4783, PAGE 326
- 5.) VERTICAL DATUM BASED ON NAVD88 ELEVATIONS. HORIZONTAL COORDINATES BASED ON NAD83. COORDINATES GATHERED USING TOPCON HIPER SR SURVEY GRADE GPS RECEIVERS.
- 6.) THE BOUNDARY LINES SHOWN ON THIS PLAN ARE THE RESULT OF A CLOSED TRAVERSE PERFORMED BY THIS OFFICE IN SPRING OF 2020, WITH A BETTER ERROR OF CLOSURE OF 1 PART IN 10,000.
- 7.) THE INTENT OF THIS PLAN IS TO REPRESENT THE SITE SPECIFIC SOILS ON TAX MAP H, LOT 37A.



- 1) FIELD INDICATORS OF HYDRIC SOILS IN THE UNITED STATES, VERSION 7.0. 2010. I.M. VASILAS, G.W. HURT, AND C.V. NOBLE (EDS.). UNITED STATES DEPARTMENT OF AGRICULTURE, NATURAL RESOURCES CONSERVATION SERVICE. COOPERATION WITH THE NATIONAL TECHNICAL COMMITTEE FOR HYDRIC SOILS.
- 2) FIELD INDICATORS FOR IDENTIFYING HYDRIC SOILS IN NEW ENGLAND. VERSION 3. APRIL 2004. NEIWPCC WETLANDS WORKGROUP. WILMINGTON, MA 01887.
- 3) NONFEDERAL DIGITAL FLORA: NATIONAL WETLAND PLANT LIST, VERSION 2.1.0 (<http://wetland.plants.usace.army.mil/>). U.S. ARMY CORPS OF ENGINEERS, ENGINEER RESEARCH AND DEVELOPMENT CENTER, COLD REGIONS RESEARCH AND ENGINEERING LABORATORY, HANOVER, NH, AND BONAP, CHAPEN HILL.
- 4) STATE AND NEW HAMPSHIRE 1994 WETLAND PLANT LIST. LUCHVAR, R.W., M. BURKHOF, N.C. MC VIN, AND W.N. KIRCHNER. 2014. THE NATIONAL WETLAND PLANT LIST: 2014 UPDATE OF WETLAND RATINGS. PHYTONEURON 194A–411:1–42.
- 5) CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL. JANUARY 1987. ENVIRONMENTAL LABORATORY EDC/EL TRP-12-1.
- 6) WETLANDS RESEARCH PROGRAM TECHNICAL REPORT Y-87-1.
- 7) REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: NORTHCENTRAL AND NORTHEAST REGION. JANUARY 2012, VERSION 2. U.S. ARMY CORPS OF ENGINEERS, ENVIRONMENTAL LABORATORY EDC/EL TRP-12-1.
- 8) CLASSIFICATION OF WETLANDS AND DEEPWATER HABITATS OF THE UNITED STATES. 1979. EDWARD J. BARTER, F. SOLEET, AND E. LAROE. U.S. DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE. FWS/OBS-79/31.

JOHN P. HAYES III, CSS #87

TE SPECIFIC SOILS MAP
LAND OF
EQUINE PROPERTIES LLC
2239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

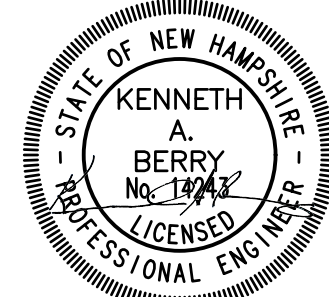
BERRY SURVEYING & ENGINEERING

335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863

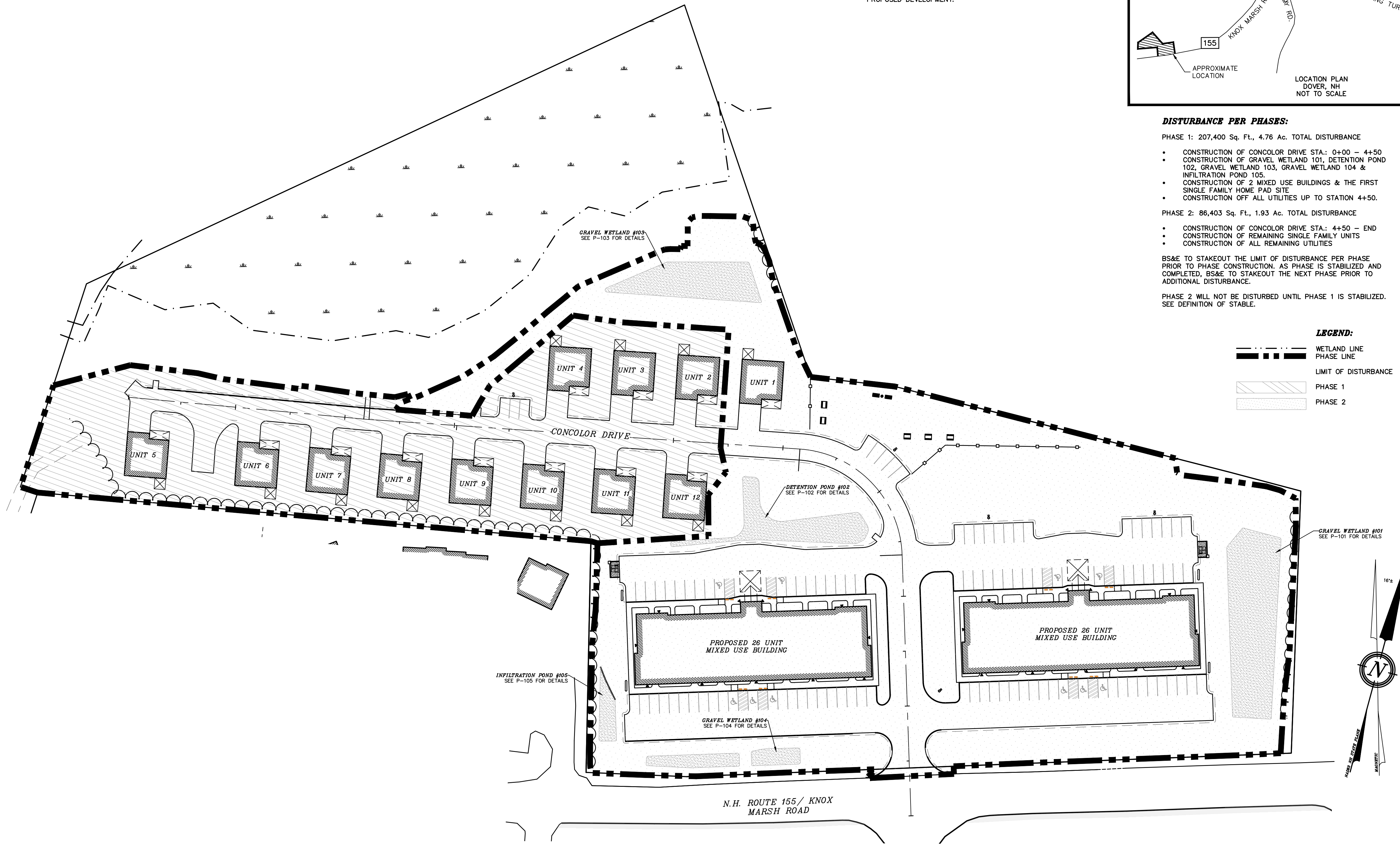
SCALE : 1 IN. EQUALS 50 FT.

DATE : JANUARY 21, 2021

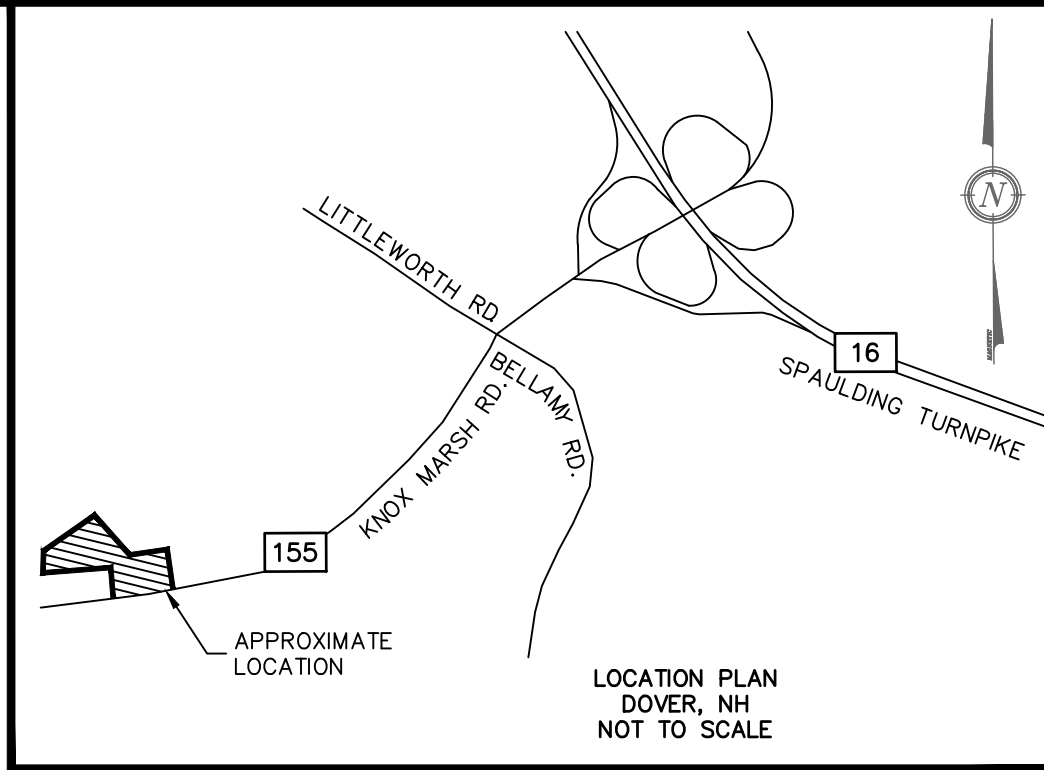
FILE NO. : DB 2020 - 066



SHEET 3 OF 38



- NOTES:
- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
 - 2.) TAX MAP H, LOT 37A
 - 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
 - 4.) S.C.R.D. BOOK 4783, PAGE 326
 - 5.) THE INTENT OF THIS PLAN IS TO SHOW THE PHASES FOR THE PROPOSED DEVELOPMENT.



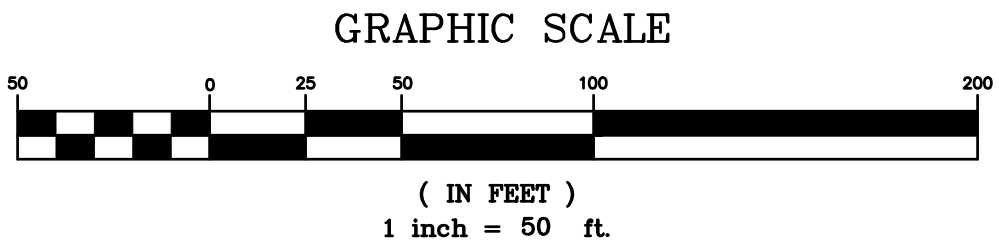
DISTURBANCE PER PHASES:

- PHASE 1: 207,400 Sq. Ft., 4.76 Ac. TOTAL DISTURBANCE
- CONSTRUCTION OF CONCOLOR DRIVE STA: 0+00 – 4+50
 - CONSTRUCTION OF GRAVEL WETLAND 101, DETENTION POND 102, GRAVEL WETLAND 103, GRAVEL WETLAND 104 & INFILTRATION POND 105.
 - CONSTRUCTION OF 2 MIXED USE BUILDINGS & THE FIRST SINGLE FAMILY HOME PAD SITE
 - CONSTRUCTION OFF ALL UTILITIES UP TO STATION 4+50.
- PHASE 2: 86,403 Sq. Ft., 1.93 Ac. TOTAL DISTURBANCE
- CONSTRUCTION OF CONCOLOR DRIVE STA: 4+50 – END
 - CONSTRUCTION OF REMAINING SINGLE FAMILY UNITS
 - CONSTRUCTION OF ALL REMAINING UTILITIES

BS&E TO STAKEOUT THE LIMIT OF DISTURBANCE PER PHASE PRIOR TO PHASE CONSTRUCTION. AS PHASE IS STABILIZED AND COMPLETED, BS&E TO STAKEOUT THE NEXT PHASE PRIOR TO ADDITIONAL DISTURBANCE.

PHASE 2 WILL NOT BE DISTURBED UNTIL PHASE 1 IS STABILIZED. SEE DEFINITION OF STABLE.

- LEGEND:**
- WETLAND LINE
 - - - PHASE LINE
 - LIMIT OF DISTURBANCE
 - /// PHASE 1
 - /// PHASE 2



PLANNING FILE #

REVISION	DATE	DESCRIPTION

CONSTRUCTION PHASING PLAN
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
SCALE : 1 IN. EQUALS 50 FT.
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 – 066

STATE OF NEW HAMPSHIRE
KENNETH A. BERRY
No. 12442
LICENSED PROFESSIONAL ENGINEER

SHEET 4 OF 38

- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
- 2.) TAX MAP H, LOT 37A
- 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
- 4.) S.C.R.D. BOOK 4783, PAGE 326
- 5.) ZONING: (C) COMMERCIAL, SECONDARY GROUNDWATER RECHARGE
MINIMUM FRONTAGE ~ 125'
MINIMUM LOT SIZE ~ 20,000 Sq. Ft.
FRONT SETBACK ~ 30'
REAR SETBACK ~ 15'
SIDE SETBACK ~ 12'
WETLANDS BUFFER ~ 50.0'
MAX. BUILDING HEIGHT: 40'
MAX. LOT COVERAGE: 50%
- 6.) I HEREBY CERTIFY THAT, TO THE BEST OF MY KNOWLEDGE & BELIEF, THIS PARCEL DOES NOT FALL WITHIN THE FLOOD PLAIN FLOOD HAZARD, REF. FEZ. COMMUNITY #330145, MAP #33017C0320E, DATED: SEPTEMBER 30, 2015.
- 7.) VERTICAL DATUM BASED ON NAVD88 ELEVATIONS. HORIZONTAL COORDINATES BASED ON NAD83. COORDINATES GATHERED USING TOPCON HIPER SR SURVEY GRADE GPS RECEIVERS. TOPO SURVEY PERFORMED IN SPRING 2020, 1' CONTOURS PROVIDED.
- 8.) THE BOUNDARY LINES SHOWN ON THIS PLAN ARE THE RESULT OF A CLOSED TRAVERSE PERFORMED BY THIS OFFICE IN SPRING OF 2020, WITH A BETTER ERROR OF CLOSURE OF 1 PART IN 10,000.
- 9.) THE INTENT OF THIS PLAN IS TO SHOW THE PROPOSED OVERVIEW SITE PLAN FOR LOT 37A.
- 10.) LIST ANY VARIANCES OR SPECIAL EXCEPTIONS GRANTED BY THE ZONING BOARD OF ADJUSTMENT OR CONDITIONAL USE PERMITS GRANTED BY THE PLANNING BOARD FOR THE PROPOSED USE OR STRUCTURE:
—CASE Z19—20 WAS APPROVED ON DECEMBER 19, 2019
- 11.) WETLANDS WERE DELINEATED BY DEIDRA BENJAMIN, CERTIFIED WETLANDS SCIENTIST, CERTIFICATION NUMBER 295, IN ACCORDANCE WITH CHAPTER 170:27.1 OF THE ZONING ORDINANCE, IN SPRING OF 2020.

- 12.) AS-BUILT PLANS OF THE SITE PLAN SHALL BE SUBMITTED ON PAPER AND IN DIGITAL FORMAT AUTOCAD DWG, AUTOCAD DXF OR ESRI FORMAT TO THE CITY OF DOVER ENGINEER'S OFFICE UPON COMPLETION OF PROJECT IF A STREET IS PROPOSED FOR CITY ACCEPTANCE. AS-BUILT PLANS SHALL BE PREPARED AND CERTIFIED CORRECT BY A L.L.S. OR P.E. DIGITAL FILES SHALL BE GEO-REFERENCED TO NEW HAMPSHIRE STATE PLANE COORDINATES NAD83 AND SHALL BE EXPRESSED IN FEET.
- 13.) THE INSTALLATION OF ELECTRIC POWER, CABLE TELEVISION AND TELEPHONE LINES SHALL BE UNDERGROUND THROUGHOUT THE SITE FOR WHICH DEVELOPMENT IS PROPOSED.
- 14.) THE SUBJECT PARCEL IS SERVED BY MUNICIPAL WATER AND SEWER.
- 15.) ALL CONSTRUCTION SHALL CONFORM WITH THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION (NHDOT) STANDARD SPECIFICATIONS FOR ROADS AND BRIDGE CONSTRUCTION" AND WITH THE CITY OF DOVER COMMUNITY SERVICES REGULATIONS AND STANDARD SPECIFICATION FOR CONSTRUCTION. THE MORE STRINGENT SPECIFICATION SHALL APPLY.
- 16.) ALL EROSION CONTROL NOTES SHALL INCLUDE PROVISIONS FOR CONSTRUCTION SEQUENCING, TEMPORARY EROSION CONTROL MEASURES, AND PERMANENT STANDARDS SUCH AS LOAM SEED MIXTURE FOR DISTURBED AREAS, RATES OF LIME, TYPE AND RATES FOR FERTILIZER, AND SEED AND MULCH MIXTURE WITH RATES OF APPLICATION.
- 17.) THE LIMITS OF CONSTRUCTION DISTURBANCE THAT ARE LOCATED IN OR WITHIN THE 50 FT. OF CONSERVATION AND WETLAND DISTRICTS SHALL BE STAKED, FLAGGED AND CLEARLY IDENTIFIED PRIOR ANY EARTH DISTURBING ACTIVITY OCCURS.
- 18.) ALL TREATMENT SWALES TO BE CONSTRUCTED SHALL HAVE SOD BOTTOMS.
- 19.) A LETTER OF CREDIT FOR THE COST OF REVEGETATING ALL DISTURBED AREAS ON THE SITE SHALL BE SUBMITTED, AND THE APPROVED CONSTRUCTION SIGN INSTALLED PRIOR TO ANY EARTH DISTURBING ACTIVITY OCCUR.
- 20.) A PRE-CONSTRUCTION CONFERENCE WITH THE DEVELOPER, THE DESIGN ENGINEER, THE EARTHWORK CONTRACTOR AND THE CITY ENGINEER SHALL OCCUR PRIOR TO ANY EARTH DISTURBING ACTIVITY.

- 21.) SITE CONSTRUCTION HOURS SHALL BE LIMITED TO MONDAY-FRIDAY 7 AM-6 PM, NO SATURDAY OR SUNDAY HOURS. HOURS OF CONSTRUCTION MUST BE DOCUMENTED ON A SITE CONSTRUCTION SIGN ALONG WITH THE CONTACT INFORMATION FOR THE GENERAL CONTRACTOR. SAID SIGNAGE MUST BE LOCATED AND APPROVED BY THE CITY ENGINEER OR ASSISTANT CITY MANAGER.
- 22.) BUILDING ADDRESSES SHALL BE ASSIGNED BY THE BUILDING OFFICIAL AT THE TIME OF ISSUANCE OF A BUILDING PERMIT.
- 23.) THE PROPOSED USE FOR THE SITE IS A MIXED USE RESIDENTIAL SITE, WITH 12 SINGLE FAMILY HOMES. SEE 170-28.3 FOR PROHIBITED USES.
- 24.) THE FOLLOWING FEDERAL AND STATE PERMITS HAVE BEEN ISSUED FOR THE SUBJECT PROPERTY:
 - ~ NHDES SEWER DISCHARGE PERMIT (PENDING)
 - ~ NHDES ALTERATION OF TERRAIN PERMIT (PENDING)
 - ~ US EPA NOI & SWPPP (PENDING)
 - ~ NATURAL HERITAGE BUREAU (PENDING)
 - ~ NH DIVISION OF HISTORICAL RESOURCES (PENDING)
 - ~ NHDOT DRIVEWAY PERMIT (PENDING)
- 25.) COMMERCIAL VEHICLE ROUTE DURING CONSTRUCTION SHALL CONFORM TO DOWER CITY CODE OR BE COORDINATED WITH THE COMMUNITY SERVICES DIRECTOR.
- 26.) ANY RETAINING WALL TALLER THAN FOUR FEET (4') REQUIRES ISSUANCE OF A BUILDING PERMIT FROM INSPECTION SERVICES.
- 27.) ANY FENCE TALLER THAN SEVEN FEET (7') REQUIRES THE ISSUANCE OF A BUILDING PERMIT FROM INSPECTION SERVICES.
- 28.) APPLICANT SHALL COMPLETE LAND USE DEVELOPMENT TRACKING FORM, MOST RECENTLY REVISED VERSION, UTILIZING THE ONLINE POLLUTION TRACKING AND ACCOUNTING PILOT PROJECT (PTAPP) PORTAL.
- 29.) THE OWNER OF RECORD SHALL RECORD AT THE REGISTRY OF DEEDS DOCUMENTATION SUFFICIENT TO PROVIDE NOTICE TO ALL PERSONS/ENTITIES THAT MAY ACQUIRE ANY PROPERTY SUBJECT TO THE REQUIREMENTS AND RESPONSIBILITIES DESCRIBED IN THE APPROVED STORMWATER MANAGEMENT PLAN. THE NOTICE SHALL COMPLY WITH THE APPLICABLE REQUIREMENTS FOR RECORDING CONTAINED IN RSA 477 AND 478. THE NOTICE NEED NOT SET FORTH THE REQUIREMENTS AT LENGTH, SO LONG AS IT IS SUFFICIENT TO PROVIDE NOTICE TO PROSPECTIVE PURCHASERS TO THE REQUIREMENTS FOR MAINTENANCE AND REPORTING.

- 4.) FIRE DEPARTMENT ACCESS ROAD SHALL BE INSTALLED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF FIRE APPARATUS IN ALL WEATHER CONDITIONS AT ALL TIMES.
- 31.) EXTERIOR LIGHTING SHALL BE CUT-OFF TYPE FIXTURES PER CHAPTER 153-14-E AND SHALL PROVIDE LIGHTING DIRECTED ON-SITE ONLY.
- 32.) A SECURITY SYSTEM SHALL BE INSTALLED AS REQUIRED BY CHAPTER 45, ARTICLE I, SECTION 45-2 OF THE CODE OF THE CITY OF DOVER.
- 33.) APPROVED BACKFLOW PREVENTERS SHALL BE PROVIDED FOR BOTH FIRE AND DOMESTIC WATER LINES.
- 34.) THE PROPOSED STRUCTURE SHALL BE SERVED BY A SPRINKLER SYSTEM AS REQUIRED BY CHAPTER 81- 30 OF THE CODE OF THE CITY OF DOVER AND THE ADOPTED STATE OF NH BUILDING AND FIRE CODES.
- 35.) SPRINKLER CONNECTIONS MUST BE FLUSHED IN ACCORDANCE WITH NFPA 24 AND A CONTRACTOR'S MATERIAL AND TEST CERTIFICATE FOR UNDERGROUND PIPING FORM MUST BE COMPLETED AND APPROVED BY INSPECTION SERVICES PRIOR TO CONNECTION OF THE BACKFLOW DEVICE.
- 36.) FIRE DEPARTMENT CONNECTION(S) SHALL BE LOCATED ON THE STREET SIDE OF THE BUILDING PER NFPA 13, ACCESS TO THE STREET SHALL MAINTAIN A CLEAR AND UNOBSTRUCTED PATH AT ALL TIMES.
- 37.) THE SITE LAYOUT IS DESIGNED IN COMPLIANCE WITH APPLICABLE ACCESSIBILITY REGULATIONS. THE PROPOSED STRUCTURE WILL BE ALSO BE DESIGNED IN ACCORDANCE WITH APPLICABLE ACCESSIBILITY REGULATIONS. (I.E. IBC, ANSI-117.1) AND NH RSA 155-A:5.
- 38.) EXISTING DRIVEWAY ALONG KNOX MARSH ROAD TO BE SAW CUT AND REMOVED.

39.) EXISTING BUILDING IMPERVIOUS AREA: 2,831 Sq. Ft. (0.7%)
EXISTING PAVED IMPERVIOUS AREA: 2,701 Sq. Ft. (0.7%)
TOTAL EXISTING IMPERVIOUS COVER IS 5,532 Sq. Ft. (1.4%)
PROPOSED BUILDING IMPERVIOUS AREA: 27,166 Sq. Ft. (6.7%)
PROPOSED PAVED IMPERVIOUS AREA: 73,000 Sq. Ft. (17.9%)
TOTAL PROPOSED IMPERVIOUS COVER IS 100,166 Sq. Ft. (24.6%)

RECREATION SPACE REQUIREMENTS (DOVER CODE ARTICLE V, 170-15).
PROPOSED NUMBER OF BEDROOMS: 124
OPEN SPACE REQUIREMENT (100 SF PER BEDROOM): 12,400 SF
½ RECREATION SPACE FOR PASSIVE USE: 6,200 SF (SATISFIED ON SITE)
½ RECREATION SPACE FOR ACTIVE USE: 6,200 SF (SATISFIED OFF SITE)
RECREATION FEE REQUIRED

CONDITIONAL USE PERMIT:
CONSTRUCTION WITHIN THE 50' BUFFER (3,951
Sq. Ft. PROPOSED): PENDING
24.6% IMPERVIOUS COVERAGE IN THE SECONDARY
GROUNDWATER RECHARGE ZONE: PENDING

WAIVER REQUEST:
ROAD GRADE STEEPER THAN 3% WITHIN 75' OF AN INTERSECTION: PENDING
ROAD WIDTH OF 20':PENDING

COMMERCIAL DISTRICT ZONING TABLE

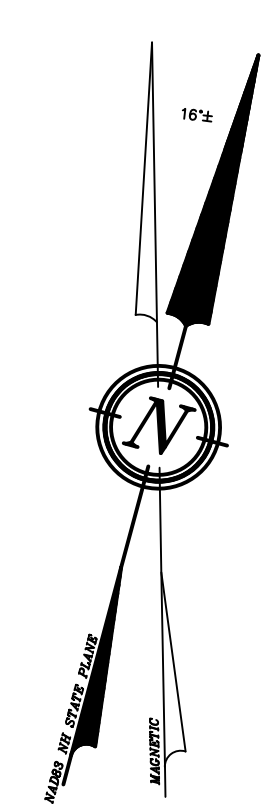
- DENSITY CALCULATION
 - LOT AREA = 407,542 Sq.Ft.
 - WETLANDS = 77,264 Sq.Ft.
 - UPLANDS = 327,583 Sq.Ft.
 - NUMBER OF UNITS = 327,583 Sq.Ft./5,000 Sq.Ft. PER UNIT = 66 UNITS

CHAPTER 153-14D PARKING TABLE

- RESIDENTIAL
 - RESIDENTIAL (NON CBD-G) 1.4 SPACES PER UNIT:
 - VISITOR 0.5 SPACES PER UNIT:
 - 52 UNITS x 1.4 SPACES + 20 UNITS x 0.5 SPACES = 99 SPACES

SNOW STORAGE:

- STORAGE CALCULATION (6:1 RATIO USED)
 - PAVED AREA = 73,000 Sq.Ft. / 6,000 = 12,167 Sq.Ft.



PLANNING FILE #	REVISION	DATE	DESCRIPTION

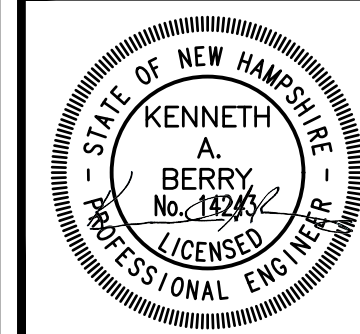
OVERVIEW SITE PLAN

LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
 335 SECOND CROWN POINT ROAD
 BARRINGTON, NH 03825 (603) 332-2863

SCALE : 1 IN. EQUALS 50 FT.

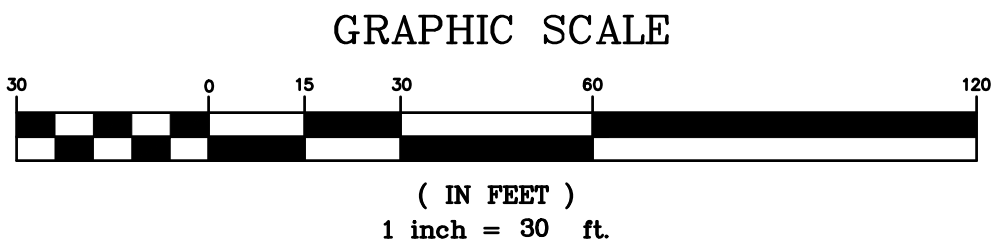
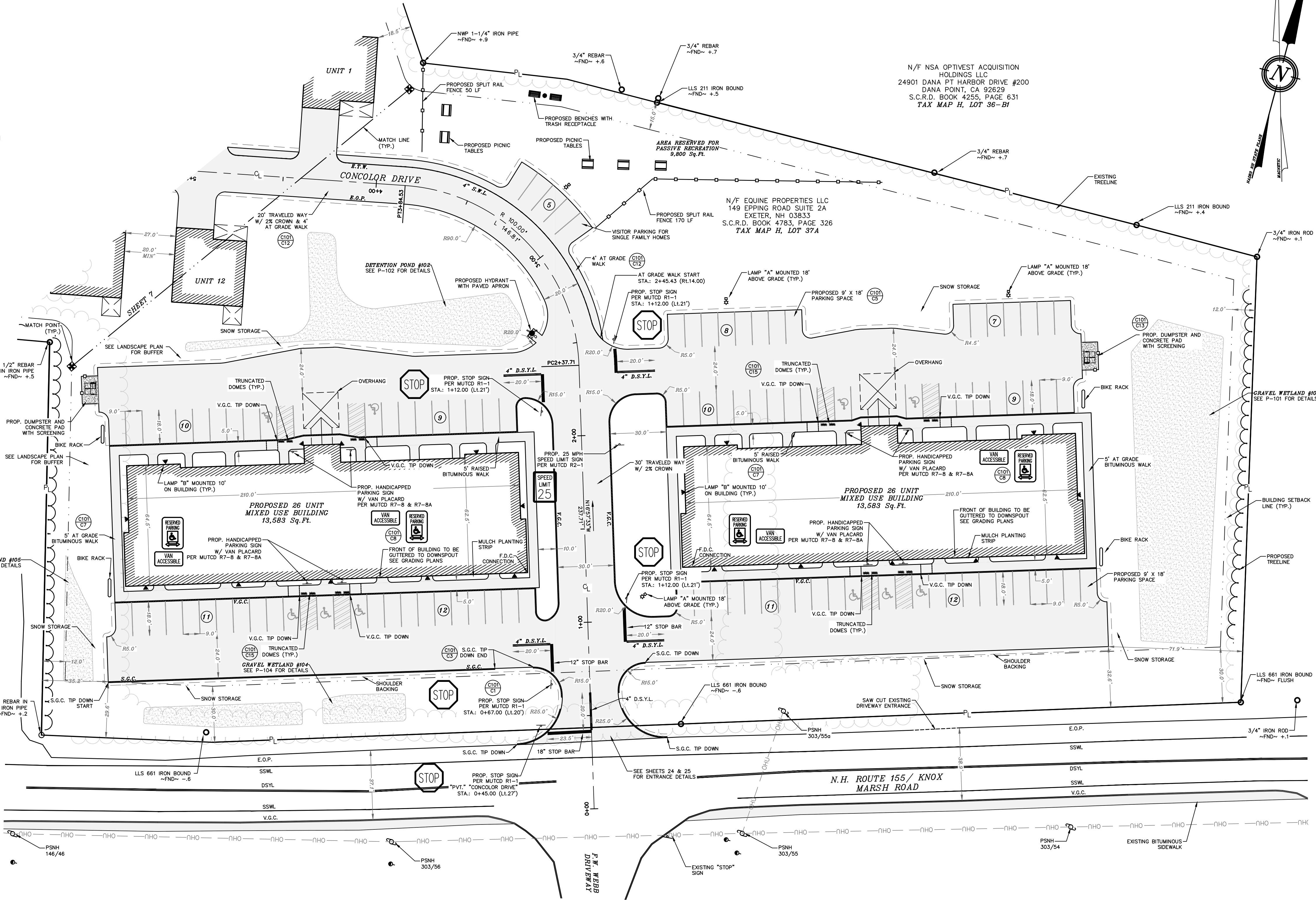
DATE : JANUARY 21, 2021



NOTES:

- OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
- TAX MAP H, LOT 37A
- LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
- S.C.R.D. BOOK 4783, PAGE 326
- ZONING: (C) COMMERCIAL, SECONDARY GROUNDWATER RECHARGE
MINIMUM FRONTAGE ~ 125'
MINIMUM LOT SIZE ~ 20,000 Sq. Ft.
FRONT SETBACK ~ 30'
REAR SETBACK ~ 15'
SIDE SETBACK ~ 12'
WETLANDS BUFFER ~ 50.0'
MAX. BUILDING HEIGHT: 40'
MAX. LOT COVERAGE: 50%
MAX. IMPERVIOUS COVERAGE: 20%
- THE INTENT OF THIS PLAN IS TO SHOW THE EASTERN SITE PLAN
DETAIL OF THE PROPOSED DEVELOPMENT.
- SEE OVERVIEW SITE PLAN FOR ALL OTHER STANDARD SITE PLAN
NOTES.

N/F KNOX MARSH CONDOS,
C/O KATHLEEN GOWDY
251 KNOX MARSH ROAD #9
DOVER, NH 03820
TAX MAP H, LOT 37



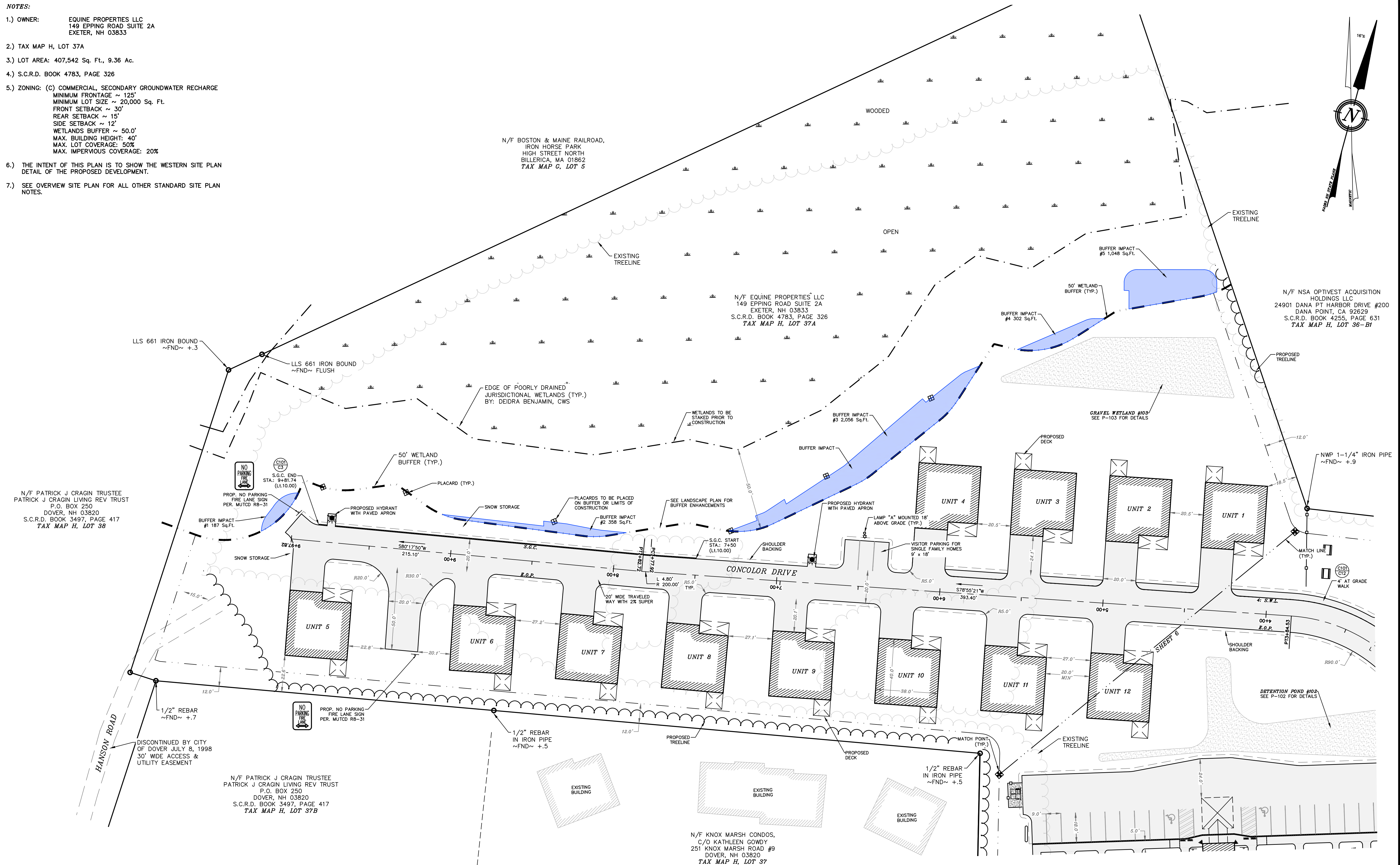
PLANNING FILE #	REVISION	DATE	DESCRIPTION

SITE PLAN EAST
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
SCALE : 1 IN. EQUALS 30 FT.
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066

KENNETH A. BERRY
REGISTERED PROFESSIONAL ENGINEER
STATE OF NEW HAMPSHIRE
No. 12442

- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
- 2.) TAX MAP H, LOT 37A
- 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
- 4.) S.C.R.D. BOOK 4783, PAGE 326
- 5.) ZONING: (C) COMMERCIAL, SECONDARY GROUNDWATER RECHARGE
MINIMUM FRONT SETBACK ~ 125'
MINIMUM LOT SIZE ~ 20,000 Sq. Ft.
FRONT SETBACK ~ 30'
REAR SETBACK ~ 15'
SIDE SETBACK ~ 12'
WETLANDS BUFFER ~ 50.0'
MAX. BUILDING HEIGHT: 40'
MAX. LOT COVERAGE: 50%
MAX. IMPERVIOUS COVERAGE: 20%
- 6.) THE INTENT OF THIS PLAN IS TO SHOW THE WESTERN SITE PLAN
DETAIL OF THE PROPOSED DEVELOPMENT.
- 7.) SEE OVERVIEW SITE PLAN FOR ALL OTHER STANDARD SITE PLAN
NOTES.

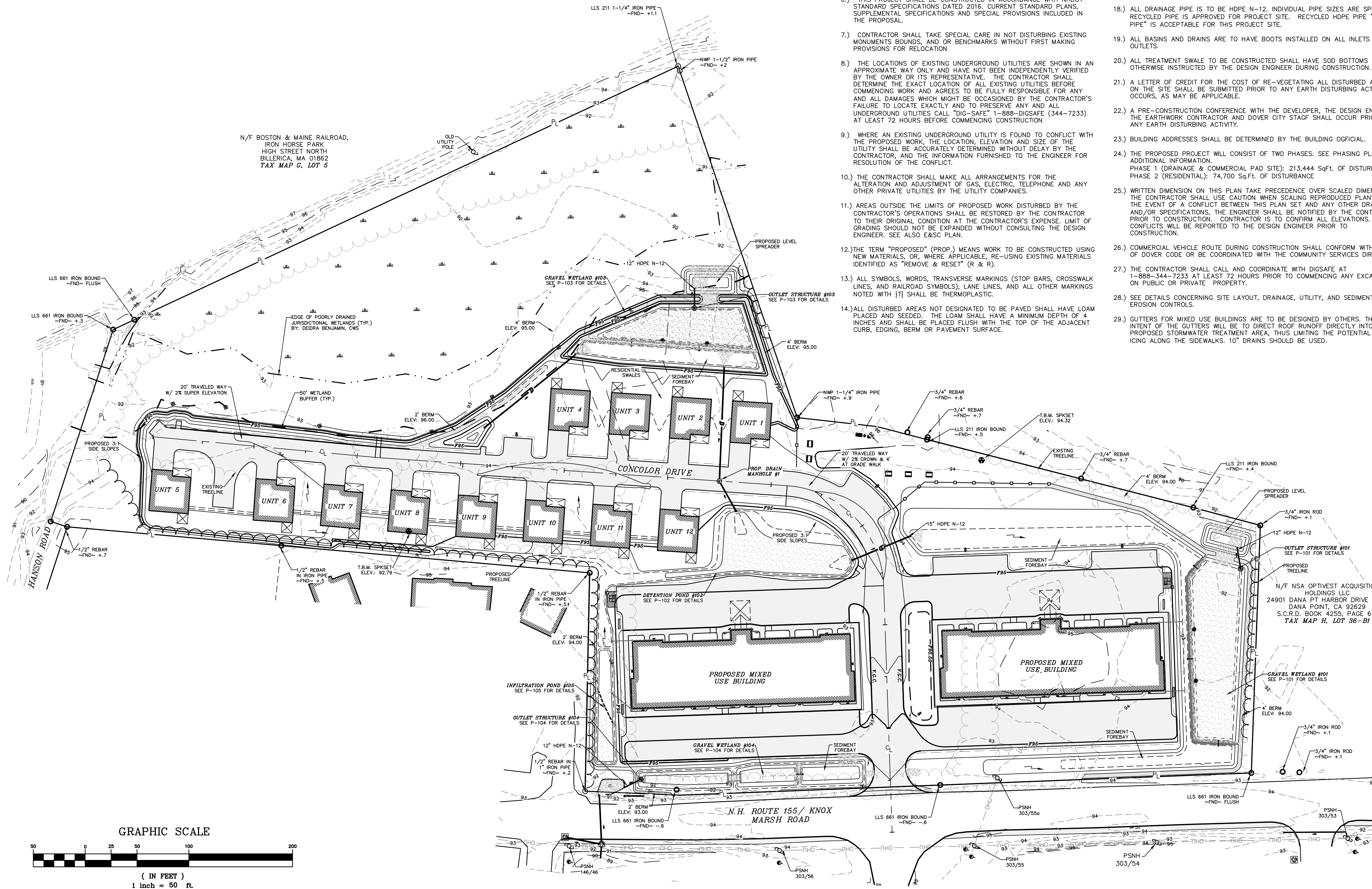
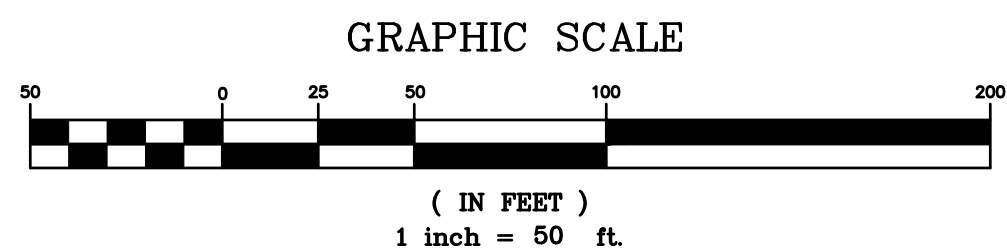
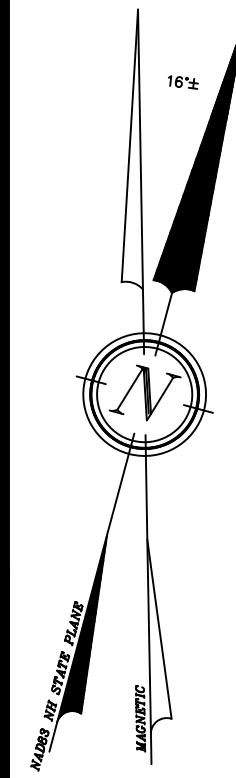


GRAPHIC SCALE



(IN FEET)
1 inch = 30 ft.





NOTES:

- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
- 2.) TAX MAP H, LOT 37A
- 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
- 4.) S.C.R.D. BOOK 4783, PAGE 326
- 5.) THE INTENT OF THIS PLAN IS SHOW THE OVERVIEW GRADING AND DRAINAGE DESIGN FOR THE PROPOSED MIXED USE SITE DEVELOPMENT.
- 6.) THIS PROJECT SHALL BE CONSTRUCTED IN ACCORDANCE WITH NHDOT STANDARD SPECIFICATIONS DATED 2016, CURRENT STANDARD PLANS, SUPPLEMENTAL SPECIFICATIONS AND SPECIAL PROVISIONS INCLUDED IN THE PROPOSAL.
- 7.) CONTRACTOR SHALL TAKE SPECIAL CARE IN NOT DISTURBING EXISTING MONUMENTS BOUNDS, AND OR BENCHMARKS WITHOUT FIRST MAKING PROVISIONS FOR RELOCATION
- 8.) THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO LOCATE EXACTLY AND TO PRESERVE ANY AND ALL UNDERGROUND UTILITIES CALL "DIG-SAFE" 1-888-DIGSAFE (344-7233) AT LEAST 72 HOURS BEFORE COMMENCING CONSTRUCTION
- 9.) WHERE AN EXISTING UNDERGROUND UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
- 10.) THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES.
- 11.) AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE. LIMIT OF GRADING SHOULD NOT BE EXPANDED WITHOUT CONSULTING THE DESIGN ENGINEER. SEE ALSO E&SC PLAN.
- 12.) THE TERM "PROPOSED" (PROP.) MEANS WORK TO BE CONSTRUCTED USING NEW MATERIALS, OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE & RESET" (R & R).
- 13.) ALL SYMBOLS, WORDS, TRANSVERSE MARKINGS (STOP BARS, CROSSWALK LINES, AND RAILROAD SYMBOLS), LANE LINES, AND ALL OTHER MARKINGS NOTED WITH {} SHALL BE THERMOPLASTIC.
- 14.) ALL DISTURBED AREAS NOT DESIGNATED TO BE PAVED SHALL HAVE LOAM PLACED AND SEEDED. THE LOAM SHALL HAVE A MINIMUM DEPTH OF 4 INCHES AND SHALL BE PLACED FLUSH WITH THE TOP OF THE ADJACENT CURB, EDGING, BERM OR PAVEMENT SURFACE.

NOTES CONTINUED:

- 15.) ALL ELEVATIONS TO BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. THE DESIGN ENGINEER IS TO BE NOTIFIED IMMEDIATELY OF ANY DISCREPANCY. TEMPORARY BENCHMARKS (T.B.M.) ARE TO BE PROVIDED BY THE DESIGN ENGINEER.
- 16.) NOTE THAT THE PROJECT IS SUBJECT TO THE EPA NPDES PHASE II. THE NOTICE OF INTENT (NOI) MUST BE FILED ALONG WITH A STORMWATER POLLUTION PREVENTION PLAN (SWPPP). BIWEEKLY INSPECTIONS WILL BE CONDUCTED BY THE DESIGN ENGINEER AND AFTER STORM EVENTS OF OVER 0.25".
- 17.) UPON FINAL COMPLETION AND 85% STABILIZATION THE DRAINAGE SYSTEM IS TO BE CLEANED OF ALL DEBRIS TO INCLUDE THE PUMPING OF THE BASIN SUMPS. SEE SHEET E102, DETAIL E18 FOR DEFINITION OF STABLE.
- 18.) ALL DRAINAGE PIPE IS TO BE HDPE N-12. INDIVIDUAL PIPE SIZES ARE SPECIFIED, RECYCLED PIPE IS APPROVED FOR PROJECT SITE. RECYCLED HDPE PIPE "GREEN PIPE" IS ACCEPTABLE FOR THIS PROJECT SITE.
- 19.) ALL BASINS AND DRAINS ARE TO HAVE BOOTS INSTALLED ON ALL INLETS AND OUTLETS.
- 20.) ALL TREATMENT SWALE TO BE CONSTRUCTED SHALL HAVE SOD BOTTOMS UNLESS OTHERWISE INSTRUCTED BY THE DESIGN ENGINEER DURING CONSTRUCTION.
- 21.) A LETTER OF CREDIT FOR THE COST OF RE-VEGETATING ALL DISTURBED AREAS ON THE SITE SHALL BE SUBMITTED PRIOR TO ANY EARTH DISTURBING ACTIVITY OCCURS, AS MAY BE APPLICABLE.
- 22.) A PRE-CONSTRUCTION CONFERENCE WITH THE DEVELOPER, THE DESIGN ENGINEER, THE EARTHWORK CONTRACTOR AND DOVER CITY STAGF SHALL OCCUR PRIOR TO ANY EARTH DISTURBING ACTIVITY.
- 23.) BUILDING ADDRESSES SHALL BE DETERMINED BY THE BUILDING OFFICIAL.
- 24.) THE PROPOSED PROJECT WILL CONSIST OF TWO PHASES. SEE PHASING PLAN FOR ADDITIONAL INFORMATION.
PHASE 1 (DRAINAGE & COMMERCIAL PAD SITE): 213,444 Sq.ft. OF DISTURBANCE
PHASE 2 (RESIDENTIAL): 74,700 Sq.ft. OF DISTURBANCE
- 25.) WRITTEN DIMENSION ON THIS PLAN TAKE PRECEDENCE OVER SCALED DIMENSIONS. THE CONTRACTOR SHALL USE CAUTION WHEN SCALING REPRODUCED PLANS. IN THE EVENT OF A CONFLICT BETWEEN THIS PLAN SET AND ANY OTHER DRAWINGS AND/OR SPECIFICATIONS, THE ENGINEER SHALL BE NOTIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. CONTRACTOR IS TO CONFIRM ALL ELEVATIONS. CONFLICTS WILL BE REPORTED TO THE DESIGN ENGINEER PRIOR TO CONSTRUCTION.
- 26.) COMMERCIAL VEHICLE ROUTE DURING CONSTRUCTION SHALL CONFORM WITH CITY OF DOVER CODE OR BE COORDINATED WITH THE COMMUNITY SERVICES DIRECTOR.
- 27.) THE CONTRACTOR SHALL CALL AND COORDINATE WITH DIGSAFE AT 1-888-344-7233 AT LEAST 72 HOURS PRIOR TO COMMENCING ANY EXCAVATION ON PUBLIC OR PRIVATE PROPERTY.
- 28.) SEE DETAILS CONCERNING SITE LAYOUT, DRAINAGE, UTILITY, AND SEDIMENT AND EROSION CONTROLS.
- 29.) GUTTERS FOR MIXED USE BUILDINGS ARE TO BE DESIGNED BY OTHERS. THE INTENT OF THE GUTTERS WILL BE TO DIRECT ROOF RUNOFF DIRECTLY INTO THE PROPOSED STORMWATER TREATMENT AREA, THUS LIMITING THE POTENTIAL FOR ICING ALONG THE SIDEWALKS. 10" DRAINS SHOULD BE USED.

PLANNING FILE #	
REVISION	DATE

OVERVIEW GRADING PLAN

LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING

335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863

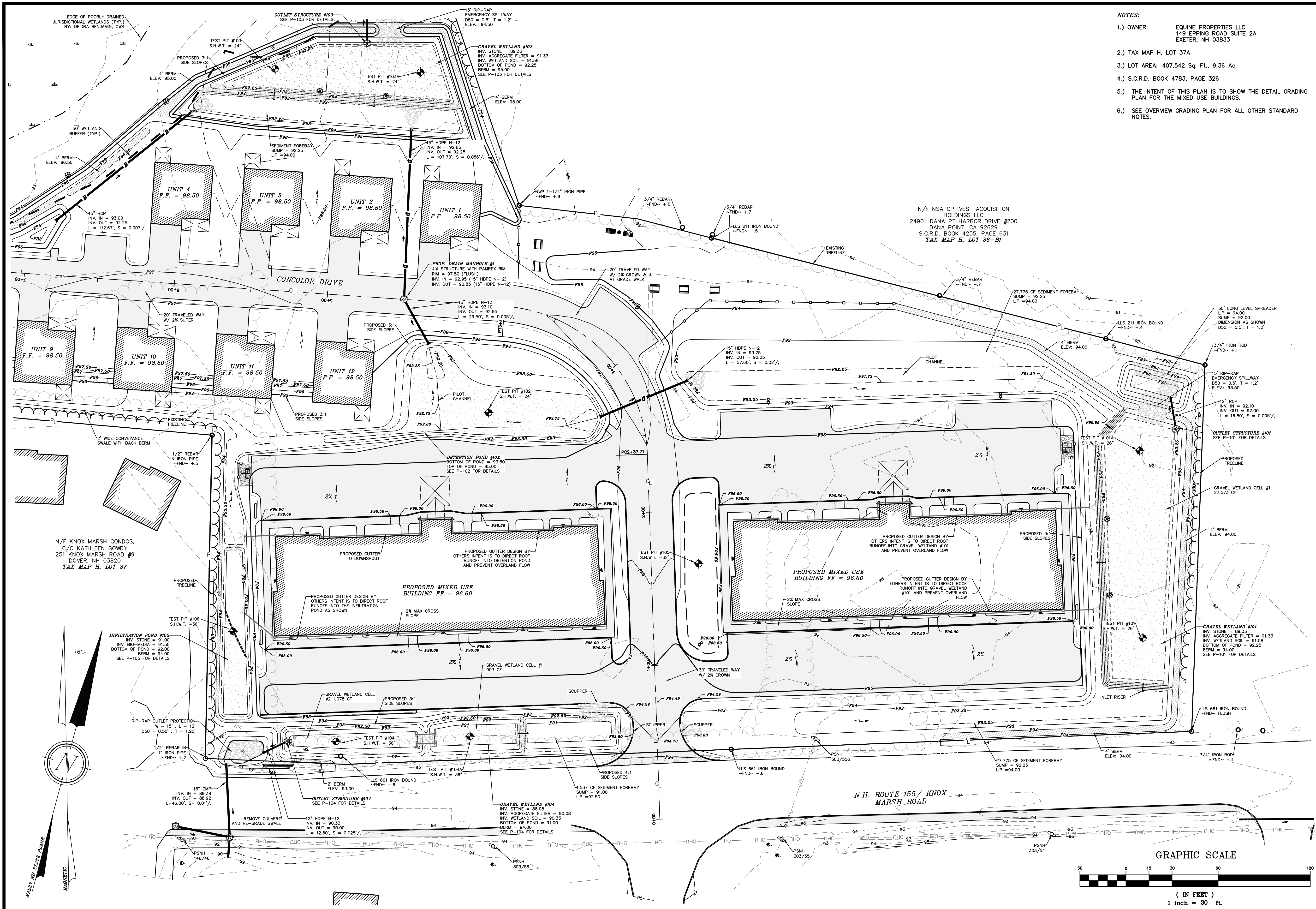
SCALE : 1 IN. EQUALS 50 FT.

DATE : JANUARY 21, 2021

FILE NO. : DB 2020 - 066

KENNETH A. BERRY
REGISTERED PROFESSIONAL ENGINEER

SHEET 8 OF 38

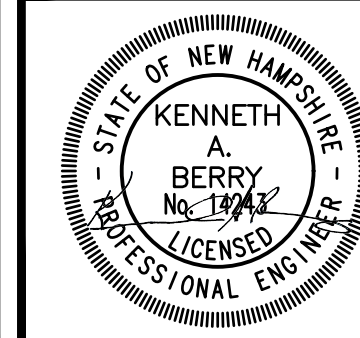


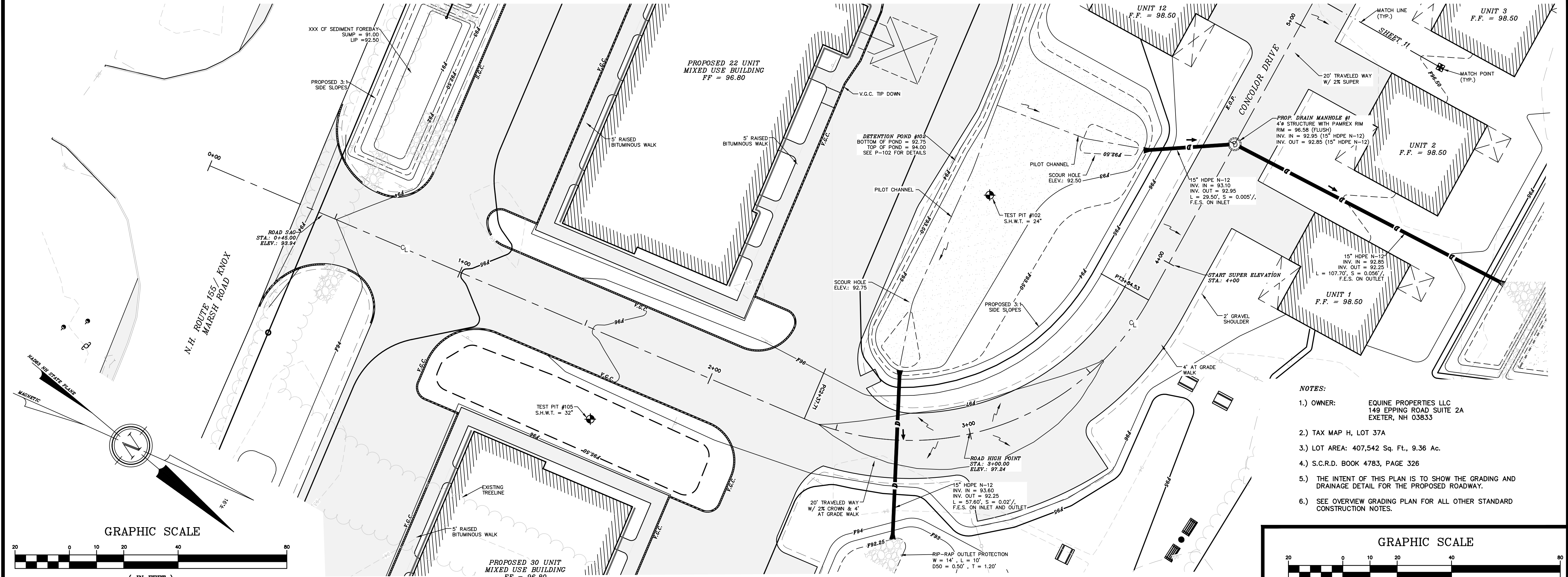
- NOTES:
- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD, SUITE 2A
EXETER, NH 03833
 - 2.) TAX MAP H, LOT 37A
 - 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
 - 4.) S.C.R.D. BOOK 4783, PAGE 326
 - 5.) THE INTENT OF THIS PLAN IS TO SHOW THE DETAIL GRADING PLAN FOR THE MIXED USE BUILDINGS.
 - 6.) SEE OVERVIEW GRADING PLAN FOR ALL OTHER STANDARD NOTES.

PLANNING FILE #	
REVISION	DATE

DETAIL GRADING PLAN
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

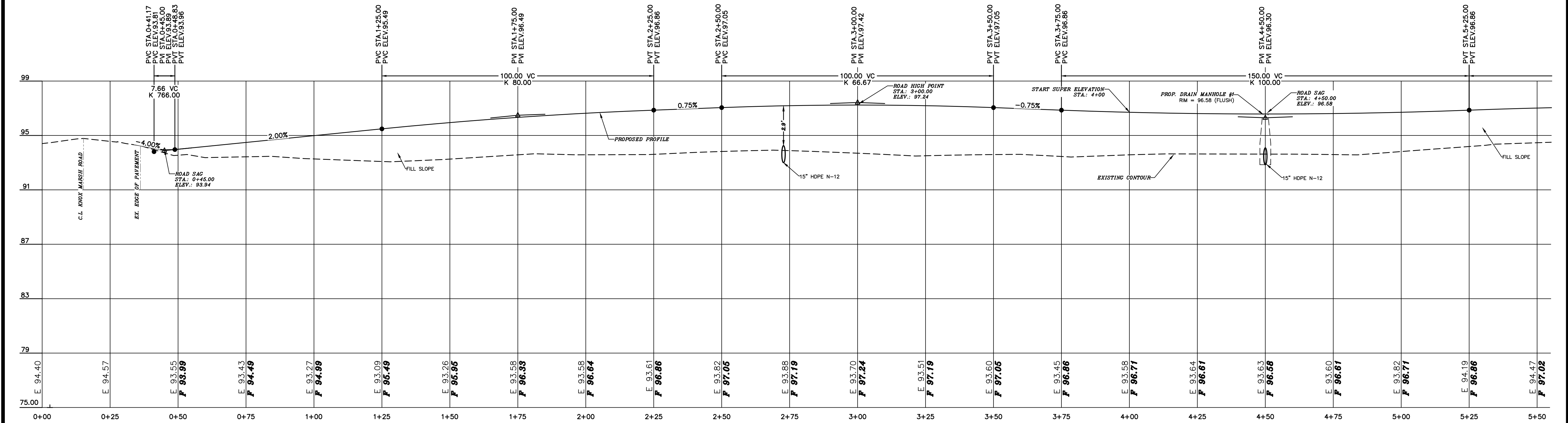
BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
SCALE : 1 IN. EQUALS 30 FT.
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066





PLAN VIEW CONCOLOR DRIVE 0+00 TO 5+00

PROFILE VIEW CONCOLOR DRIVE 0+00 TO 5+00



- NOTES:
- 1) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
 - 2) TAX MAP H, LOT 37A
 - 3) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
 - 4) S.C.R.D. BOOK 4783, PAGE 326
 - 5) THE INTENT OF THIS PLAN IS TO SHOW THE GRADING AND DRAINAGE DETAIL FOR THE PROPOSED ROADWAY.
 - 6) SEE OVERVIEW GRADING PLAN FOR ALL OTHER STANDARD CONSTRUCTION NOTES.

PLANNING FILE #			
REVISION	DATE	DESCRIPTION	

PLAN AND PROFILE CONCOLOR DRIVE 0+00 TO 5+00

LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

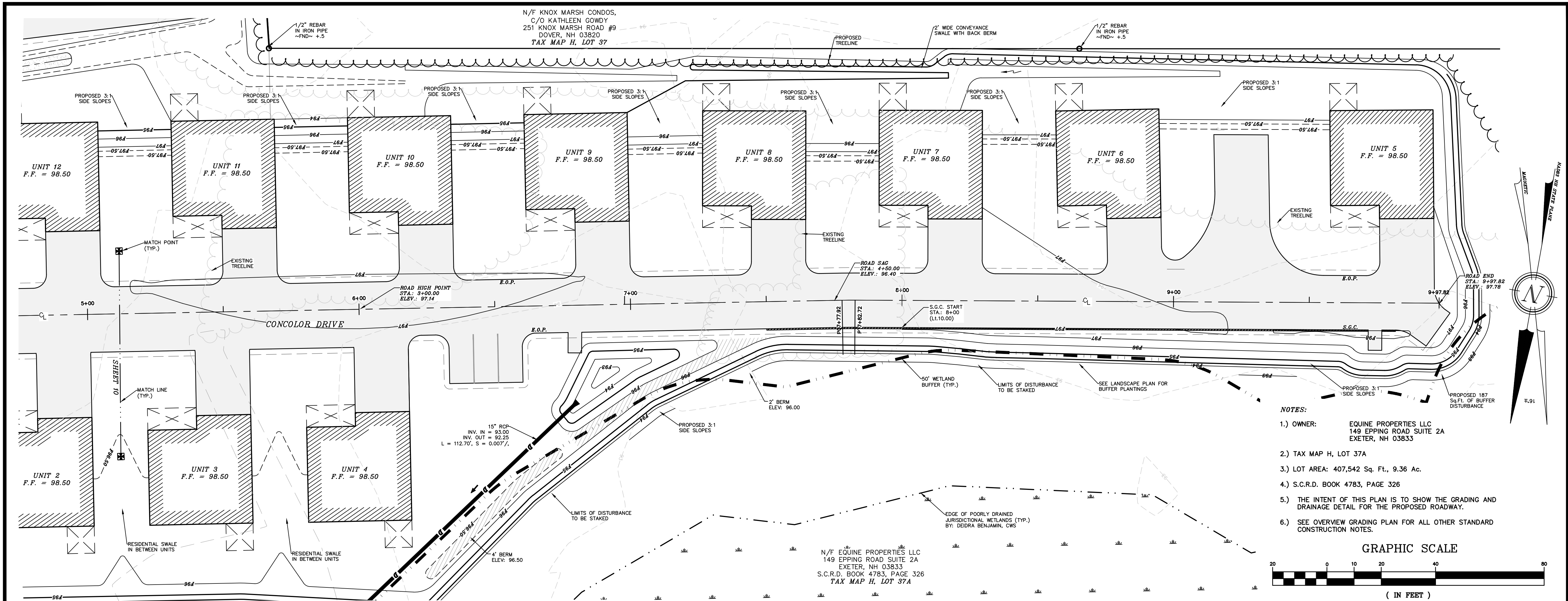
BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863

SCALE : 1 IN. EQUALS 20 FT.

DATE : JANUARY 21, 2021

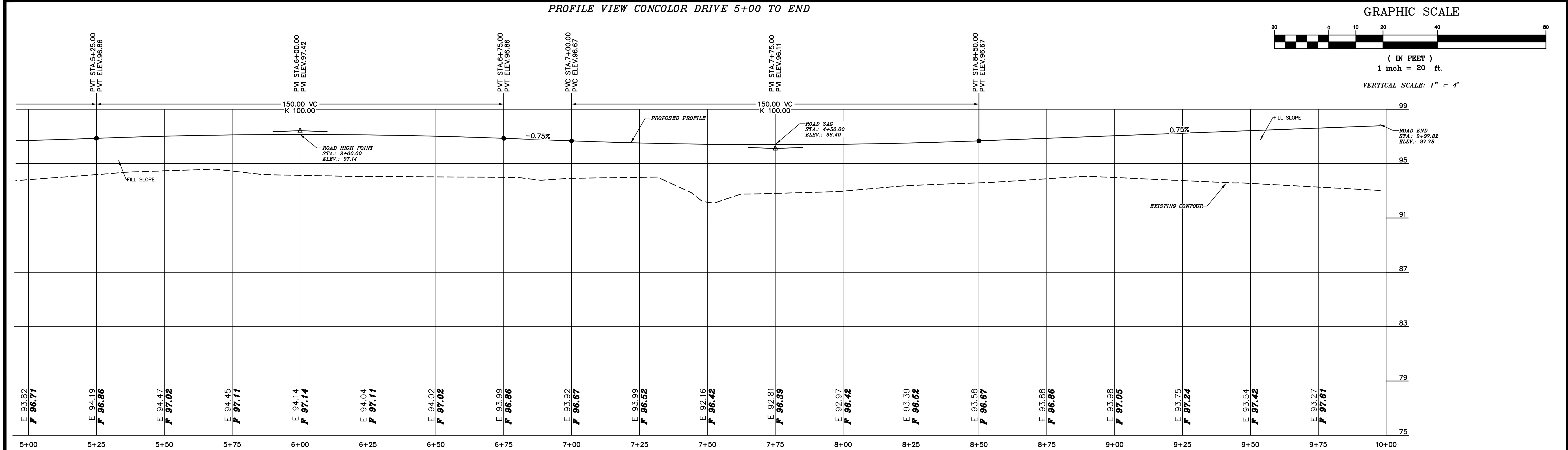
FILE NO. : DB 2020 - 066

SHEET 10 OF 38



PLAN VIEW CONCOLOR DRIVE 5+00 TO END

PROFILE VIEW CONCOLOR DRIVE 5+00 TO END



PLANNING FILE #	
REVISION	DATE

PLAN AND PROFILE CONCOLOR DRIVE 5+00 TO END	
LAND OF EQUINE PROPERTIES LLC 239 KNOX MARSH ROAD DOVER, N.H. TAX MAP H, LOT 37A	DESCRIPTION

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
SCALE : 1 IN. EQUALS 20 FT.
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066

KENNETH A. BERRY
REGISTERED PROFESSIONAL ENGINEER
STATE OF NEW HAMPSHIRE

MAINTENANCE REQUIREMENTS

ACTIVITY	FREQUENCY
CLOGGING AND SYSTEM PERFORMANCE	
INSPECT INLETS AND OUTLETS TO ENSURE GOOD CONDITION AND NO EVIDENCE OF DETERIORATION. CHECK TO SEE IF HIGH-FLOW BYPASS IS FUNCTIONING. REMEDY: REPAIR OR REPLACE ANY DAMAGED STRUCTURAL PARTS, INLETS AND OUTLETS. CLEAR OR REMOVE DEBRIS OR RESTRICTIONS.	ANNUALLY, MORE FREQUENTLY IN THE FIRST YEAR OF OPERATION
CHECK FOR INTERNAL EROSION, EVIDENCE OF SHORT-CIRCUITING, AND ANIMAL BURROWS. REMEDY: SOIL EROSION FROM SHORT-CIRCUITING OR ANIMAL BURROWS SHOULD BE REPAIRED WHEN THEY OCCUR.	
CHECK THAT THE SYSTEM IS FULLY DRAINING WITHIN A 24-48 HOUR PERIOD AFTER RAIN EVENTS. REMEDY: REPAIR OR RESTORE HYDRAULIC INLET OR OUTLET CONFIGURATION.	
VEGETATION	
CHECK FOR ROBUST VEGETATION COVERAGE THROUGHOUT THE SYSTEM AND DEAD OR DYING PLANTS. REMEDY: VEGETATION SHOULD COVER > 75% OF THE SYSTEM AND SHOULD BE RESEEDED AND CARED FOR AS NEEDED.	ANNUALLY, OR AS NEEDED
CUT AND REMOVE VEGETATION FROM GRAVEL WETLAND SYSTEM AND FOREBAY IN ORDER TO MAINTAIN NITROGEN REMOVAL PERFORMANCE REMEDY: THE VEGETATION SHOULD BE CUT AND REMOVED FROM THE SYSTEM TO PREVENT NITROGEN FROM CYCLING BACK INTO THE SYSTEM	ONCE EVERY 3 YEARS

3/8" WASHED CRUSHED STONE*		1-1/2" WASHED CRUSHED STONE*	
SIEVE SIZE	% PASSING BY WEIGHT	SIEVE SIZE	% PASSING BY WEIGHT
1/2"	100	2"	100
3/8"	95 - 100	1-1/2"	90 - 100
# 4	22 - 55	1"	20 - 55
# 8	0 - 10	1-1/2"	0 - 15
		3/8"	0 - 5

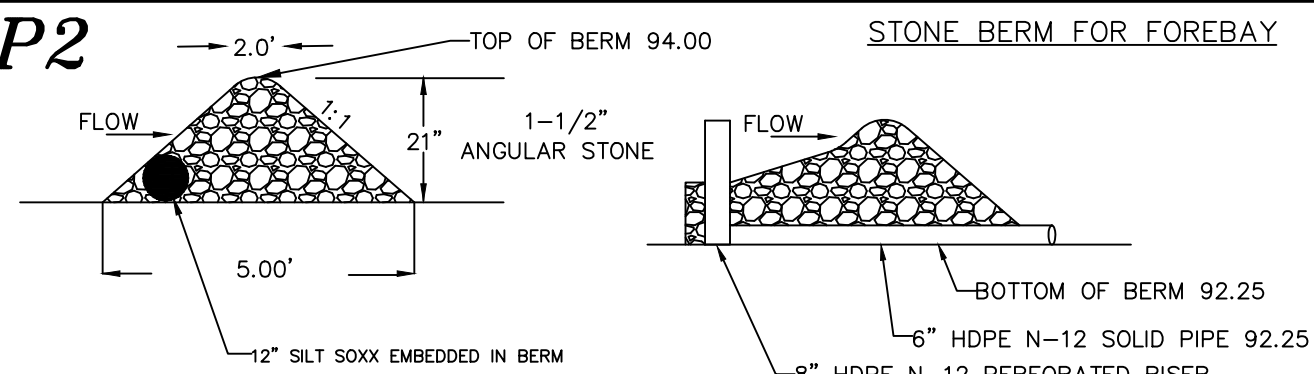
WETLAND SOIL	
SIEVE SIZE	% PASSING BY WEIGHT
0.5	100
#10"	90 - 75
#100	40 - 50
#200	25 - 50
SIEVE SIZE	% PASSING TOLERANCES
0.5	±10.0
#10	±5.0
#100	±5.0
#200	±5.0

DESIGN REFERENCES

1 UNH STORMWATER CENTER

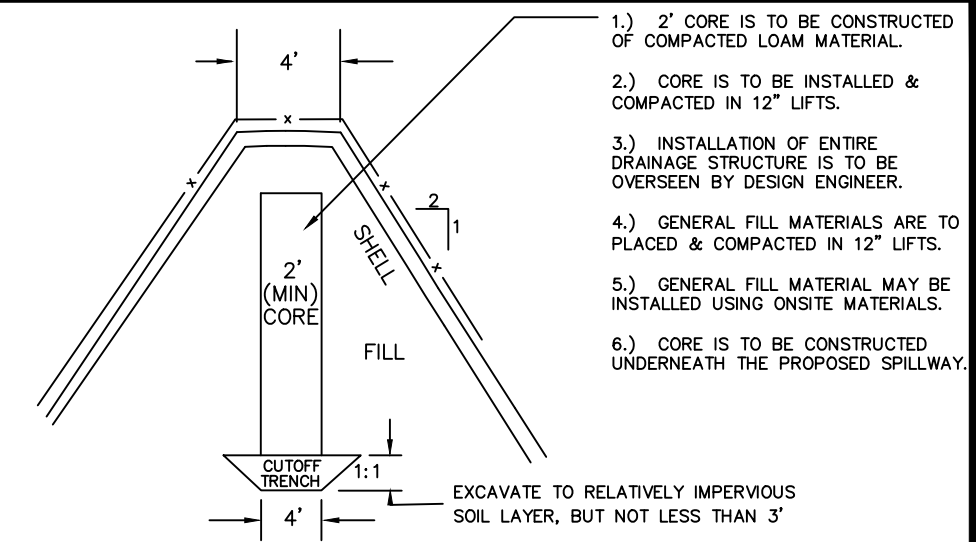
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P2



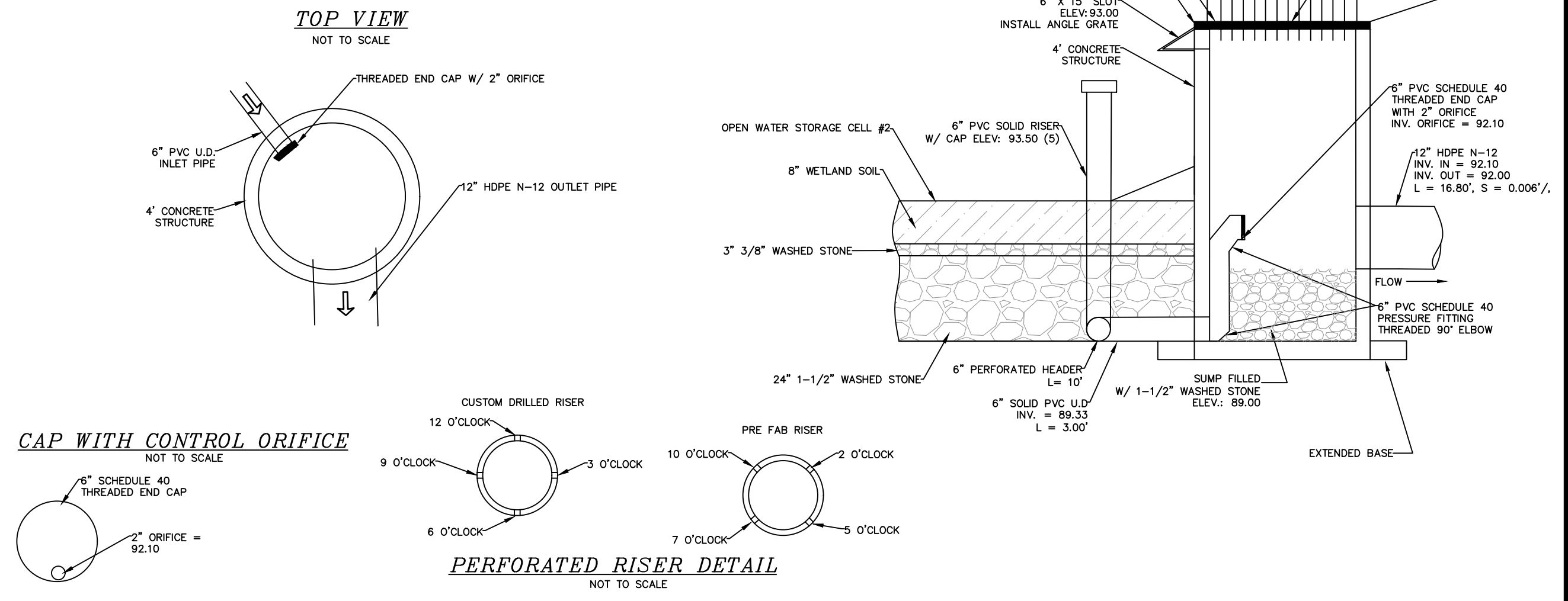
P3

LOW PERMEABILITY MATERIAL GRADATION	
SIEVE SIZE	% PASSING BY WEIGHT
#4	95 - 100
#40	60 - 95
#100	40 - 60
#200	25 - 45



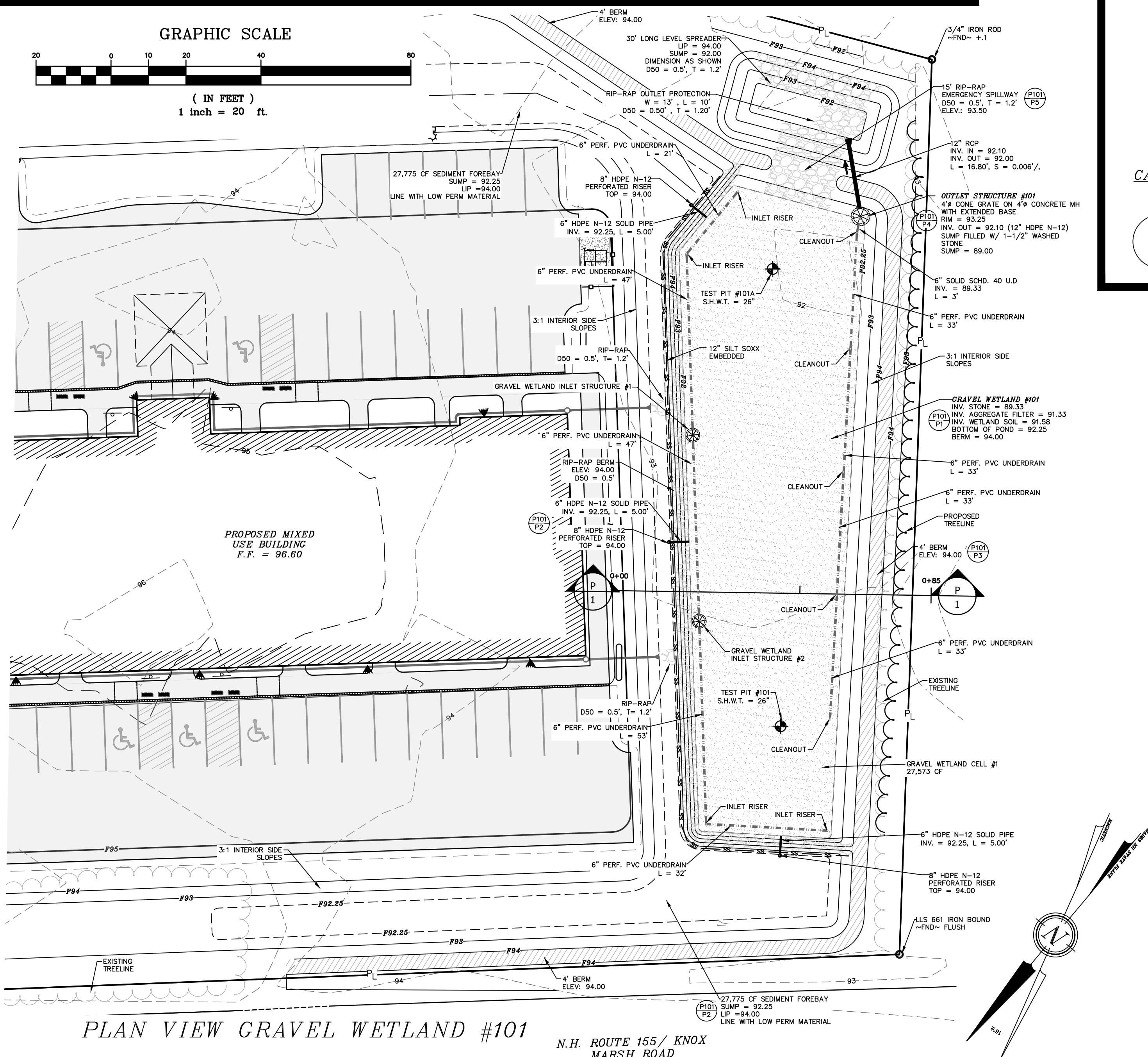
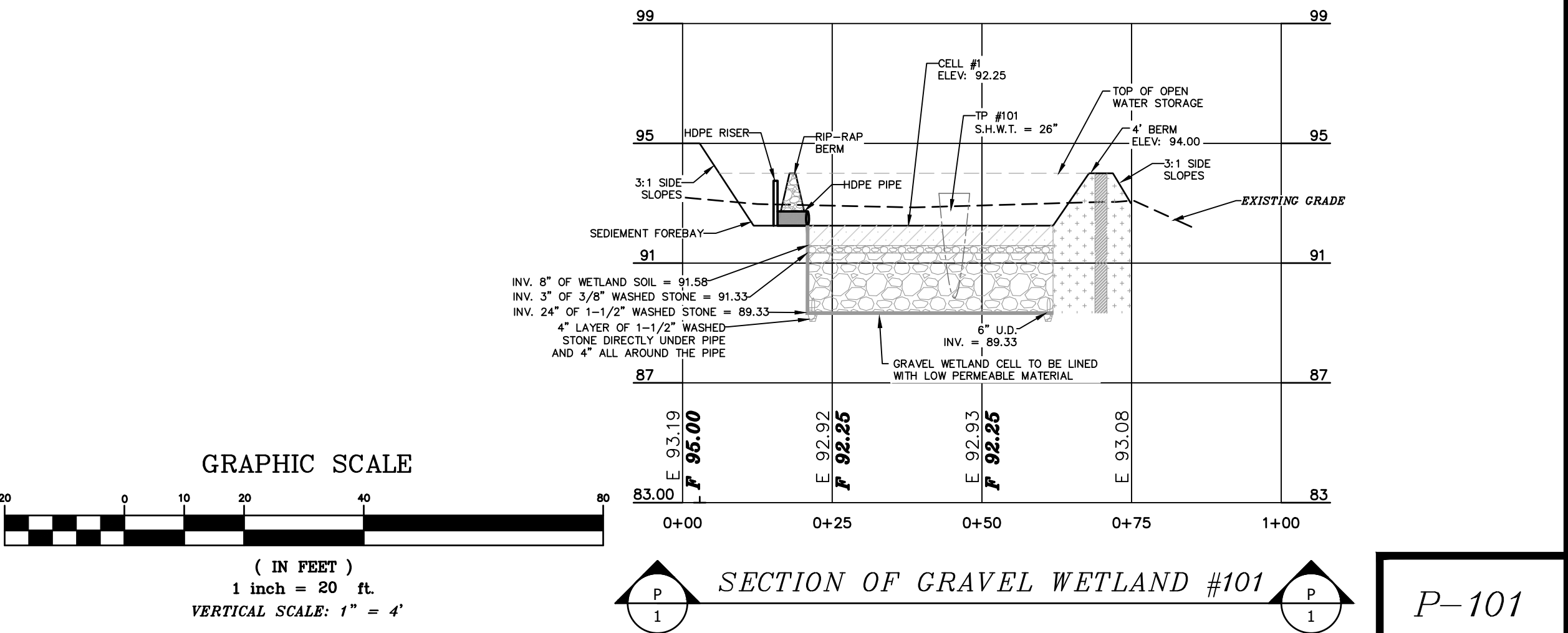
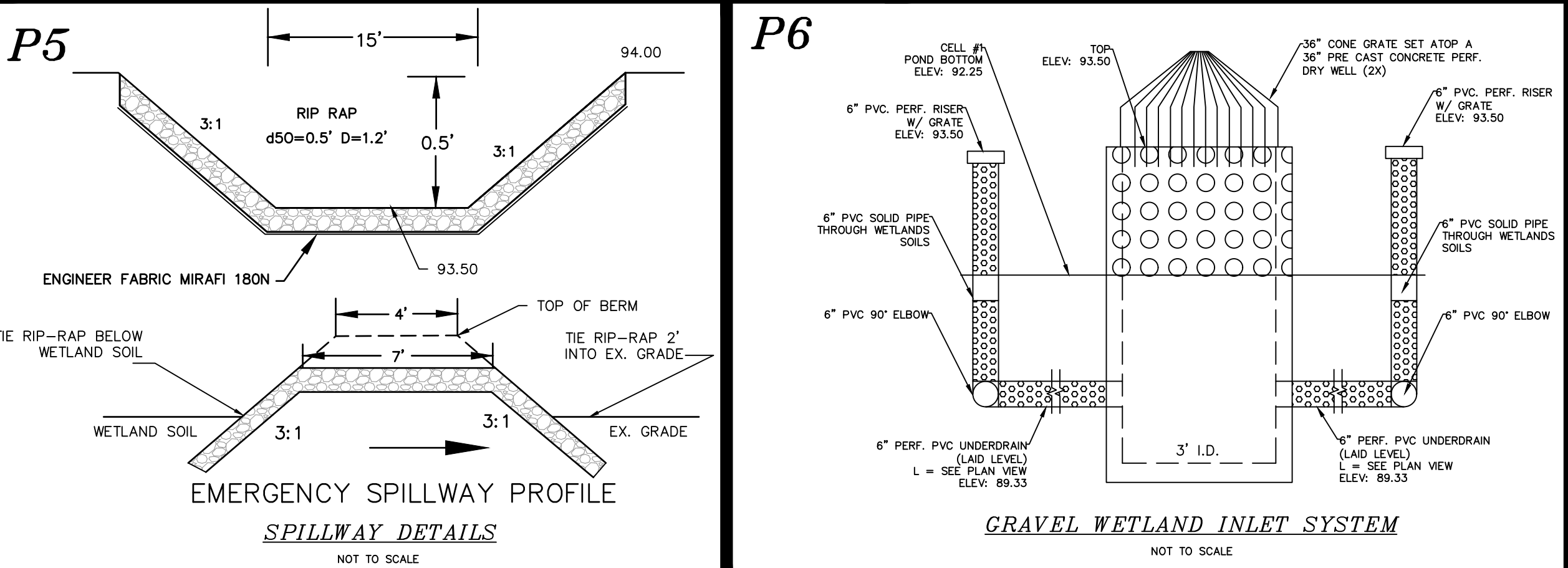
P4

OUTLET STRUCTURE #101



P5

P6



PLAN VIEW GRAVEL WETLAND #101

N.H. ROUTE 155/ KNOX MARSH ROAD

PLANNING FILE #	DESCRIPTION
REVISION	DATE

GRAVEL WETLAND #101
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37.4

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
SCALE : 1 IN. EQUALS 20 FT.
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066

KENNETH A. BERRY
REGISTERED PROFESSIONAL ENGINEER
STATE OF NEW HAMPSHIRE
NO. 10442

SHEET 12 OF 38

P1

LOW PERMEABILITY MATERIAL GRADATION

SIEVE SIZE	% PASSING BY WEIGHT
#4	95 - 100
#40	60 - 95
#100	40 - 60
#200	25 - 45

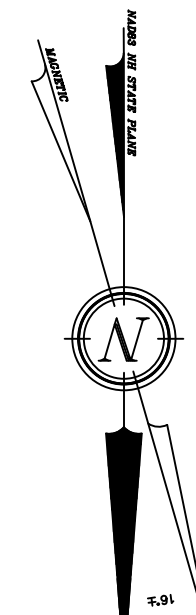
1-1/2" WASHED CRUSHED STONE*

SIEVE SIZE	% PASSING BY WEIGHT
2"	100
1-1/2"	90 - 100
1"	20 - 55
1-1/2"	0 - 15
3/8"	0 - 5

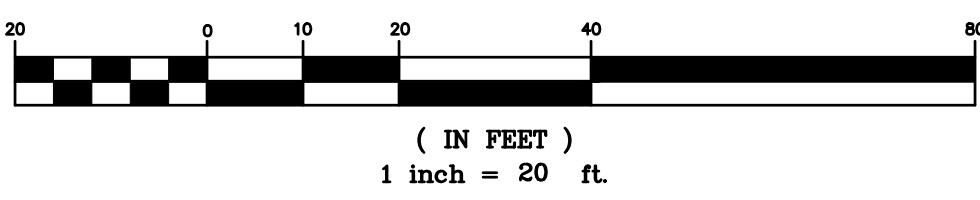
* EQUIVALENT TO STANDARD WASHED STONE - SECTION 702 OF NHDOT STANDARD SPECIFICATIONS

ASTM C-33 FINE AGGREGATE

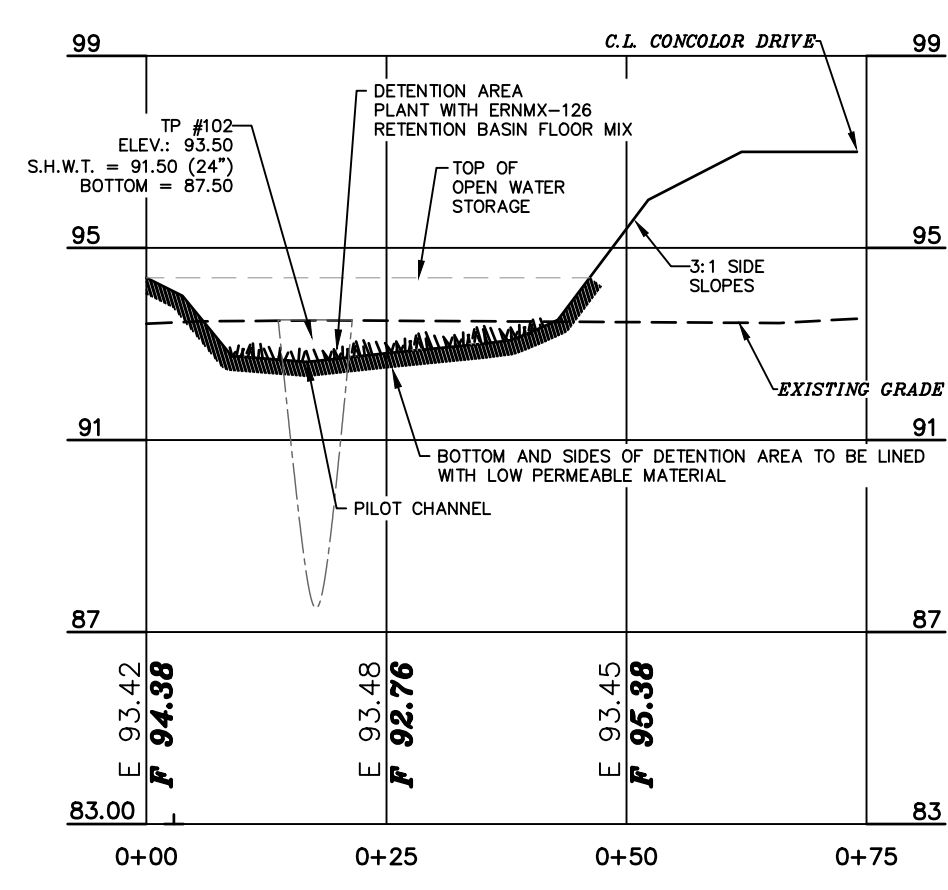
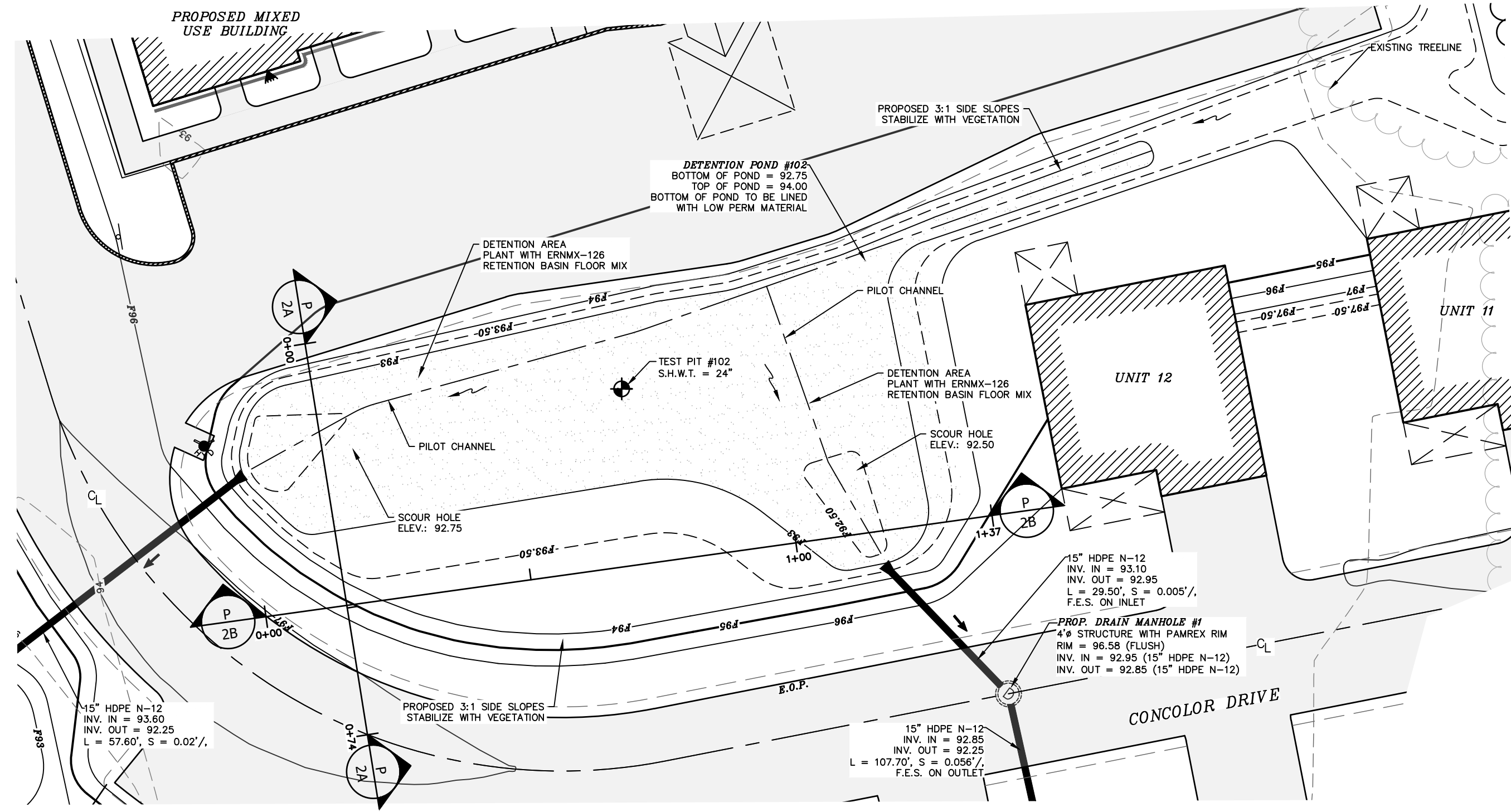
SIEVE SIZE	% PASSING BY WEIGHT
3/8"	100
#4	95 - 100
#8	80 - 100
#16	50 - 85
#30	25 - 60
#60	10 - 30
#120	2 - 10



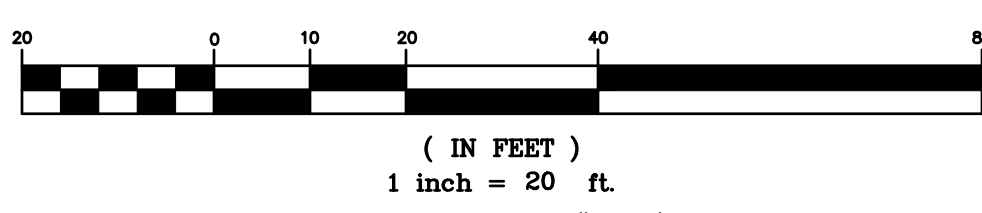
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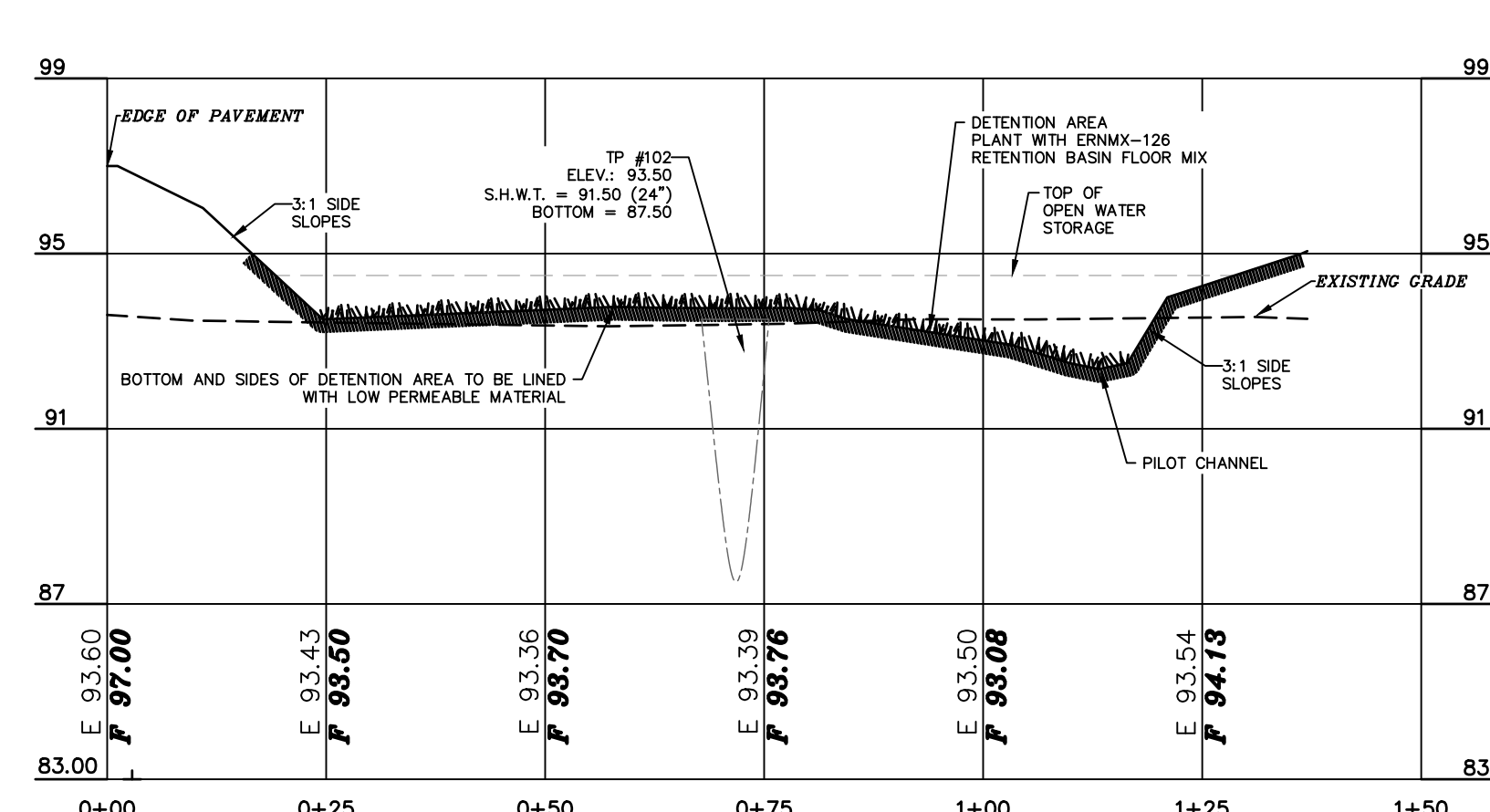
PLAN VIEW DETENTION POND #102



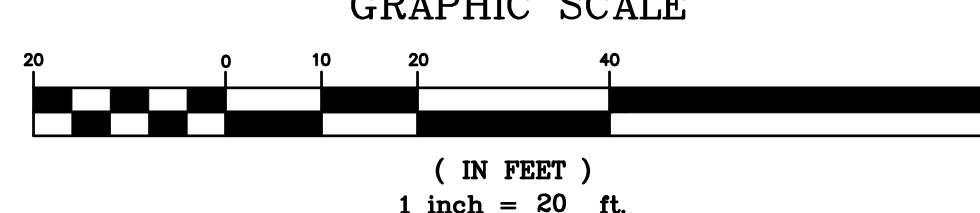
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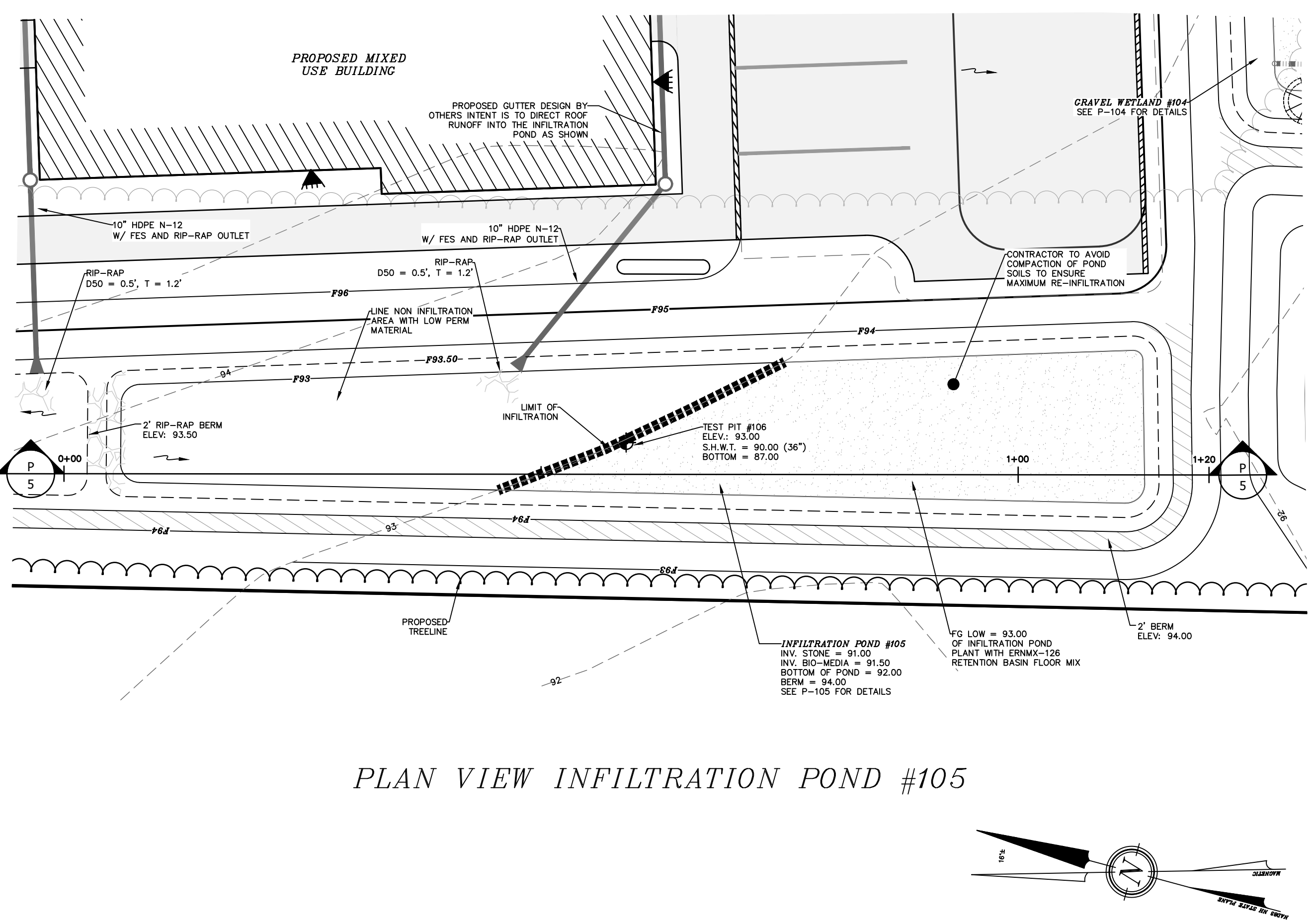
SECTION OF DETENTION POND #102



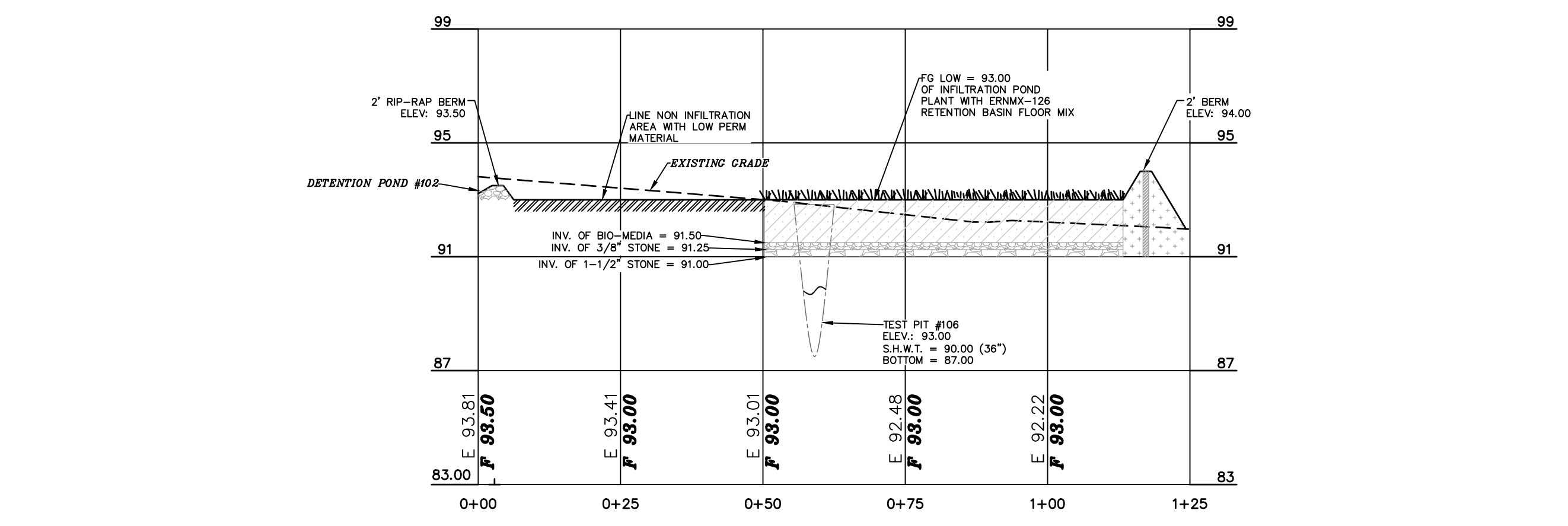
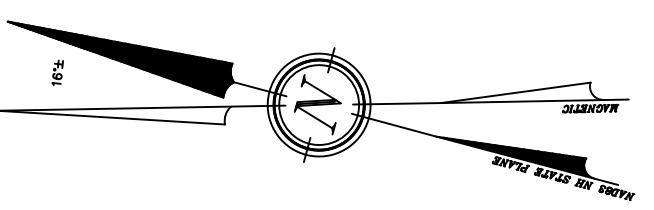
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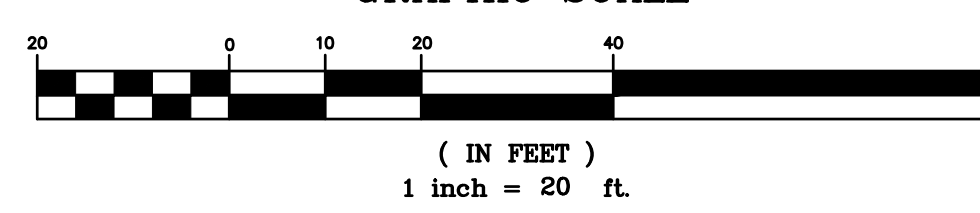
SECTION OF DETENTION POND #102



PLAN VIEW INFILTRATION POND #105



GRAPHIC SCALE



SECTION OF INFILTRATION POND #105

P-102 & P-105

PLANNING FILE #	REVISION	DATE	DESCRIPTION

DETENTION POND #102 & INFILTRATION POND #105
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37.4

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
SCALE : AS SHOWN
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066

STATE OF NEW HAMPSHIRE
KENNETH A. BERRY
REGISTERED PROFESSIONAL ENGINEER
No. 12442

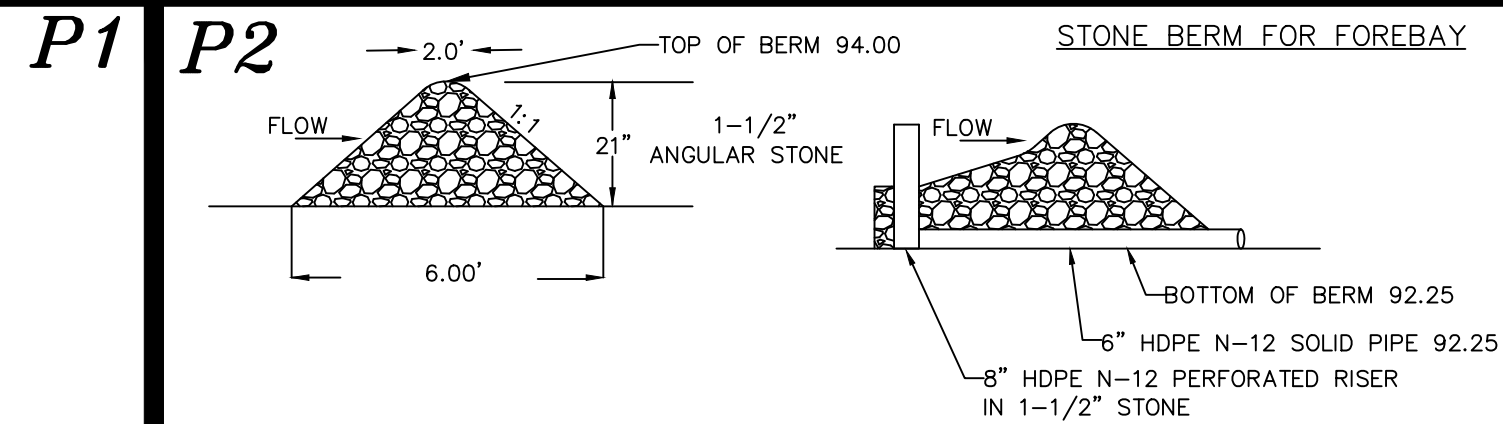
SHEET 13 OF 38

<u>ACTIVITY</u>	<u>FREQUENCY</u>
<u>CLOGGING AND SYSTEM PERFORMANCE</u>	
INSPECT INLETS AND OUTLETS TO ENSURE GOOD CONDITION AND NO EVIDENCE OF DETEIORATION. CHECK TO SEE IF HIGH-FLOW BYPASS IS FUNCTIONING. <u>REMEDY:</u> REPAIR OR REPLACE ANY DAMAGED STRUCTURAL PARTS, INLETS AND OUTLETS. CLEAR OR REMOVE DEBRIS OR RESTRICTIONS.	ANNUALLY, MORE FREQUENTLY IN THE FIRST YEAR OF OPERATION
CHECK FOR INTERNAL EROSION, EVIDENCE OF SHORT-CIRCUITING, AND ANIMAL BOROUGHS. <u>REMEDY:</u> SOIL EROSION FROM SHORT-CIRCUITING OR ANIMAL BOROUGHS SHOULD BE REPAIRED WHEN THEY OCCUR.	
CHECK THAT THE SYSTEM IS FULLY DRAINING WITHIN A 24-48 HOUR PERIOD AFTER RAIN EVENTS. <u>REMEDY:</u> REPAIR OR RESTORE HYDRAULIC INLET OR OUTLET CONFIGURATION.	
<u>VEGETATION</u>	
CHECK FOR ROBUST VEGETATION COVER THROUGHOUT THE SYSTEM AND DEAD OR DYING PLANTS <u>REMEDY:</u> VEGETATION SHOULD COVER > 75% OF THE SYSTEM AND SHOULD BE RESEEDED AND CARED FOR AS NEEDED CUT AND REMOVE VEGETATION FROM GRAVEL WETLAND SYSTEM AND FOREBAY IN ORDER TO MAINTAIN NITROGEN REMOVAL PERFORMANCE. <u>REMEDY:</u> THE VEGETATION SHOULD BE CUT AND REMOVED FROM THE SYSTEM TO PREVENT NITROGEN FROM CYCLING BACK INTO THE SYSTEM	ANNUALLY, OR AS NEEDED ONCE EVERY 3 YEARS

3/8" WASHED CRUSHED STONE*		1-1/2" WASHED CRUSHED STONE*	
SIEVE SIZE	% PASSING BY WEIGHT	SIEVE SIZE	% PASSING BY WEIGHT
1/2"	100	2"	100
3/8"	95 - 100	1-1/2"	90 - 100
# 4	22 - 55	1"	20 - 55
# 10	0 - 10	1-1/2"	0 - 15
		3/8"	0 - 5
* EQUIVALENT TO STANDARD WASHED STONE - SECTION 702 OF NHDOT STANDARD SPECIFICATIONS		* EQUIVALENT TO STANDARD WASHED STONE - SECTION 702 OF NHDOT STANDARD SPECIFICATIONS	

<u>WETLAND SOIL</u>	
<u>SIEVE SIZE</u>	<u>% PASSING BY WEIGHT</u>
0.5	100
#10"	90 - 75
#100	40 - 50
#200	25 - 50
<u>SIEVE SIZE</u>	<u>% PASSING TOLERANCES</u>
0.5	±10.0
#10	±5.0
#100	±5.0
#200	±5.0

1 UNH STORMWATER CENTER



LOW PERMEABILITY MATERIAL GRADATION	
<u>SIEVE SIZE</u>	<u>% PASSING BY WEIGHT</u>
#4	95 - 100
#40	60 - 95
#100	40 - 60
#200	25 - 45

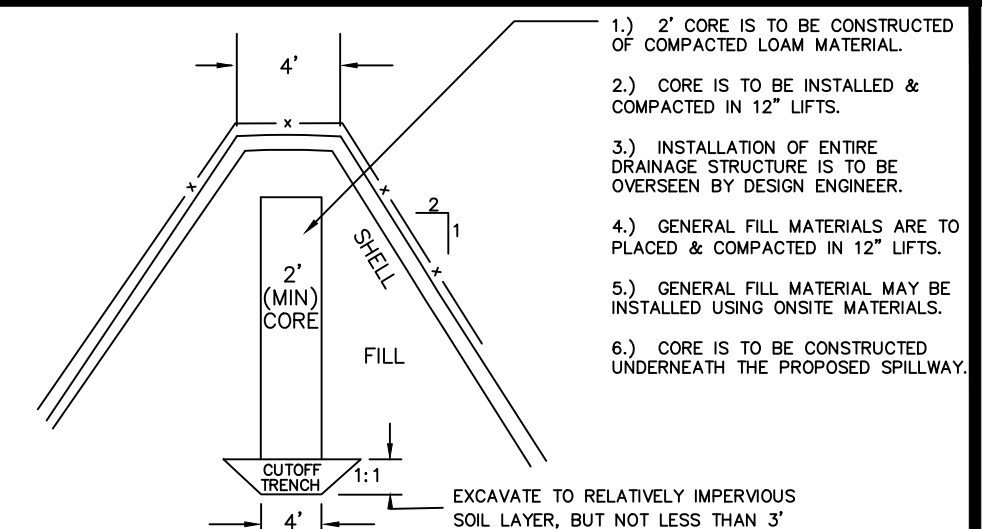
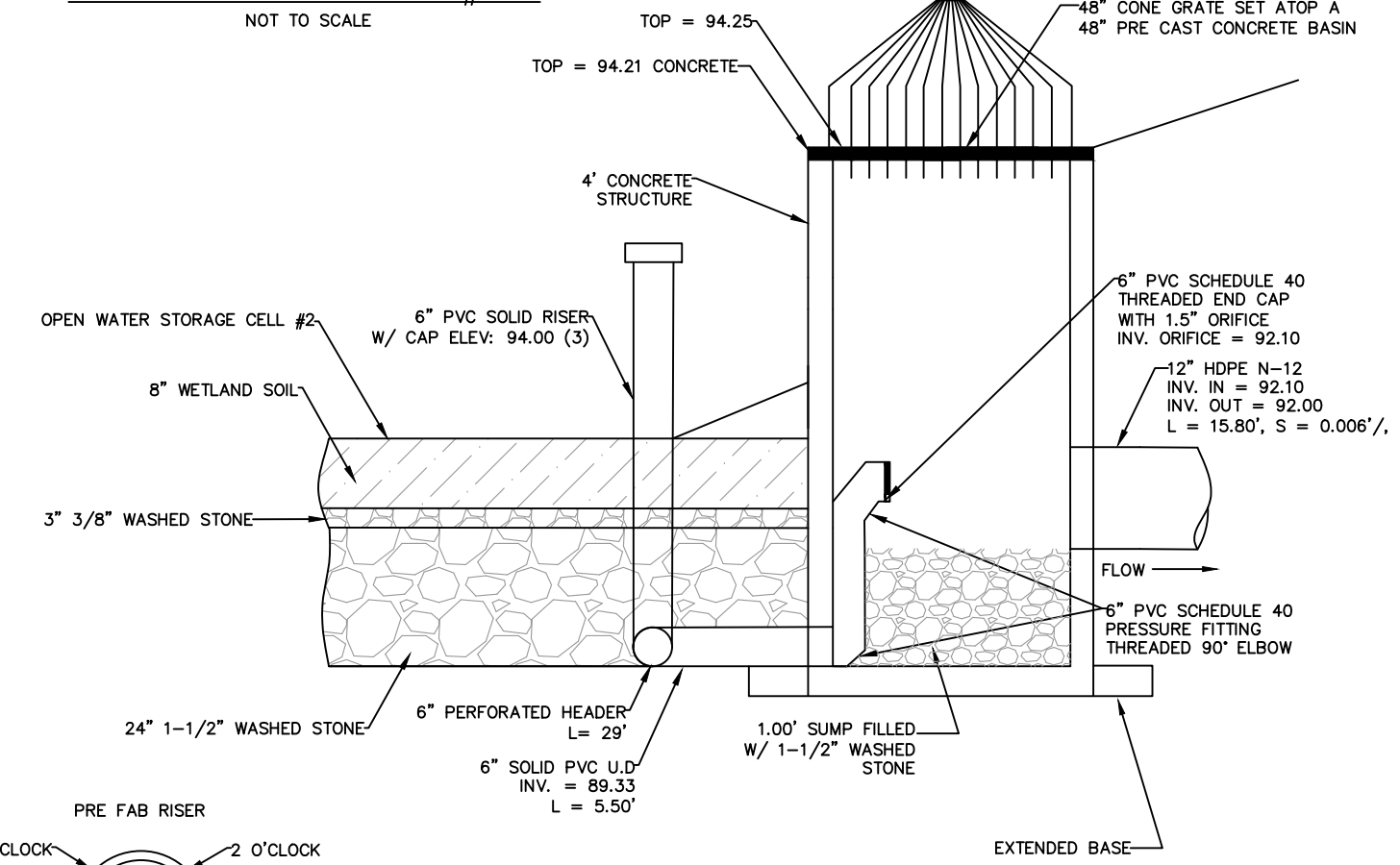


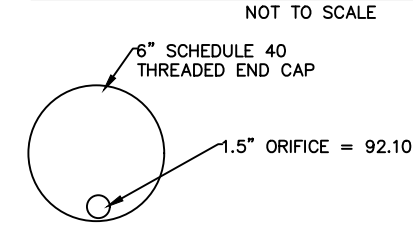
Diagram illustrating the components of a 12" HDPE N-12 Outlet Pipe:

- 6" PVC U.D. INLET PIPE
- THREADED END CAP W/ 1.5" ORIFICE
- 4" CONCRETE STRUCTURE
- 12" HDPE N-12 OUTLET PIPE

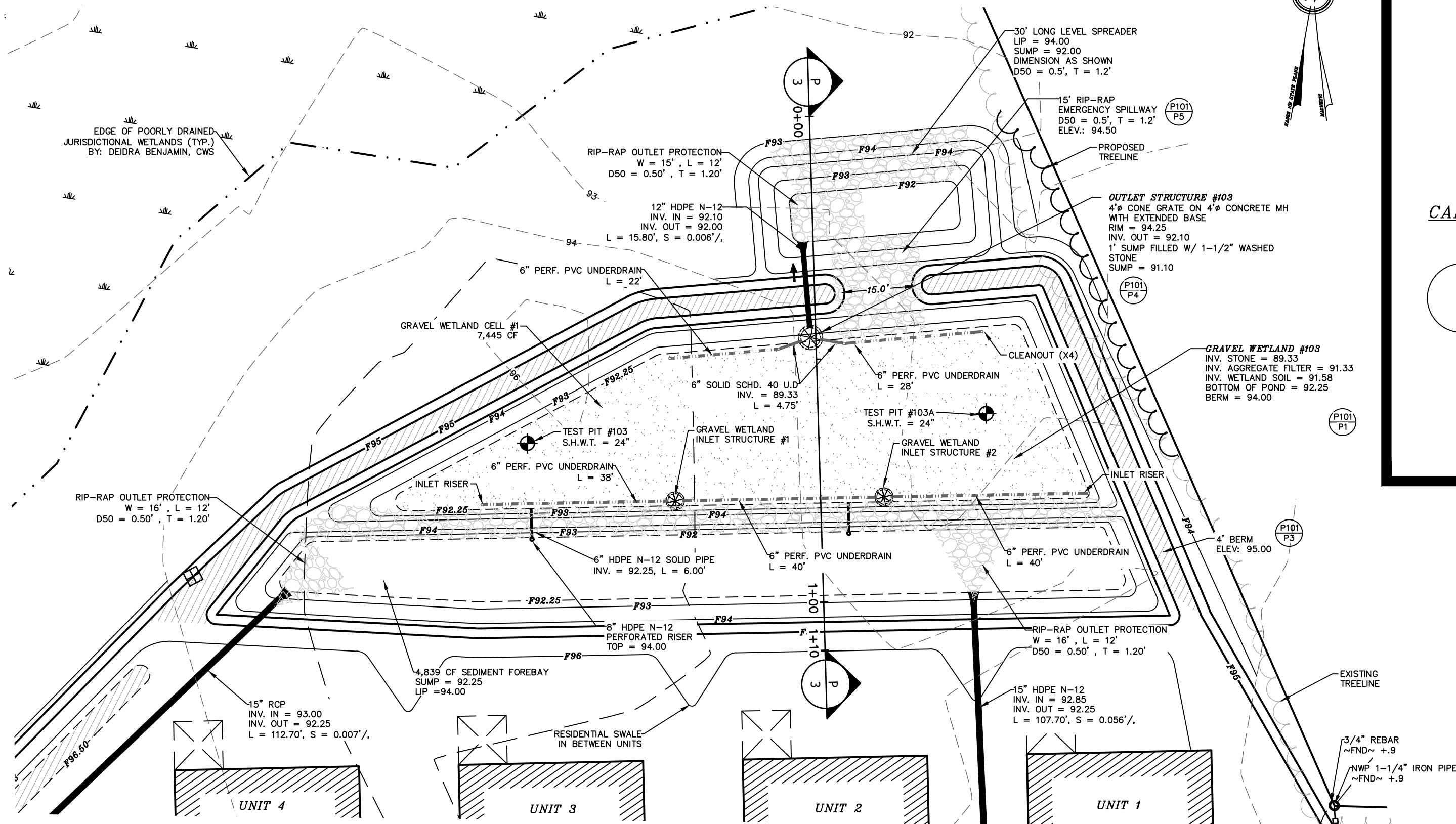
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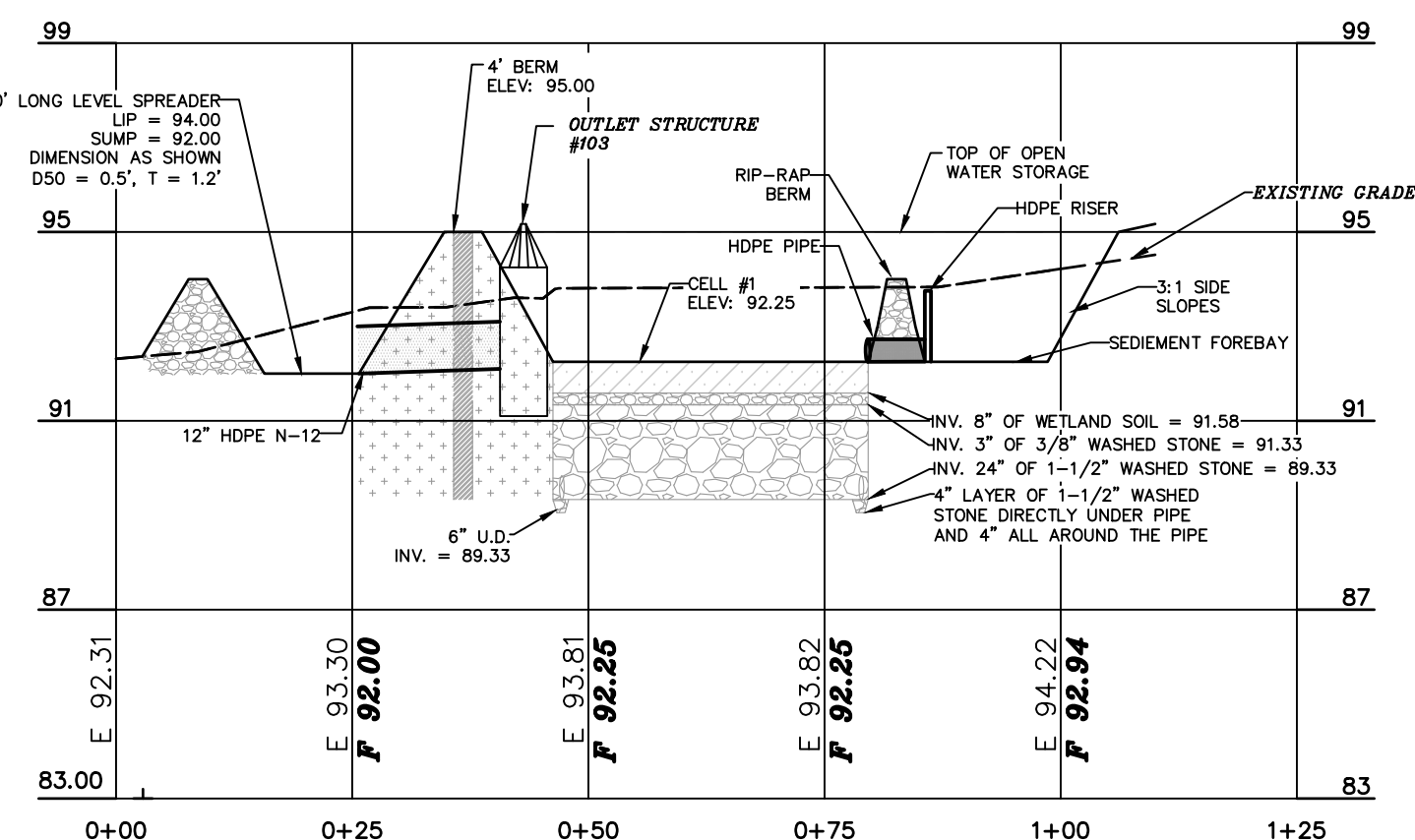
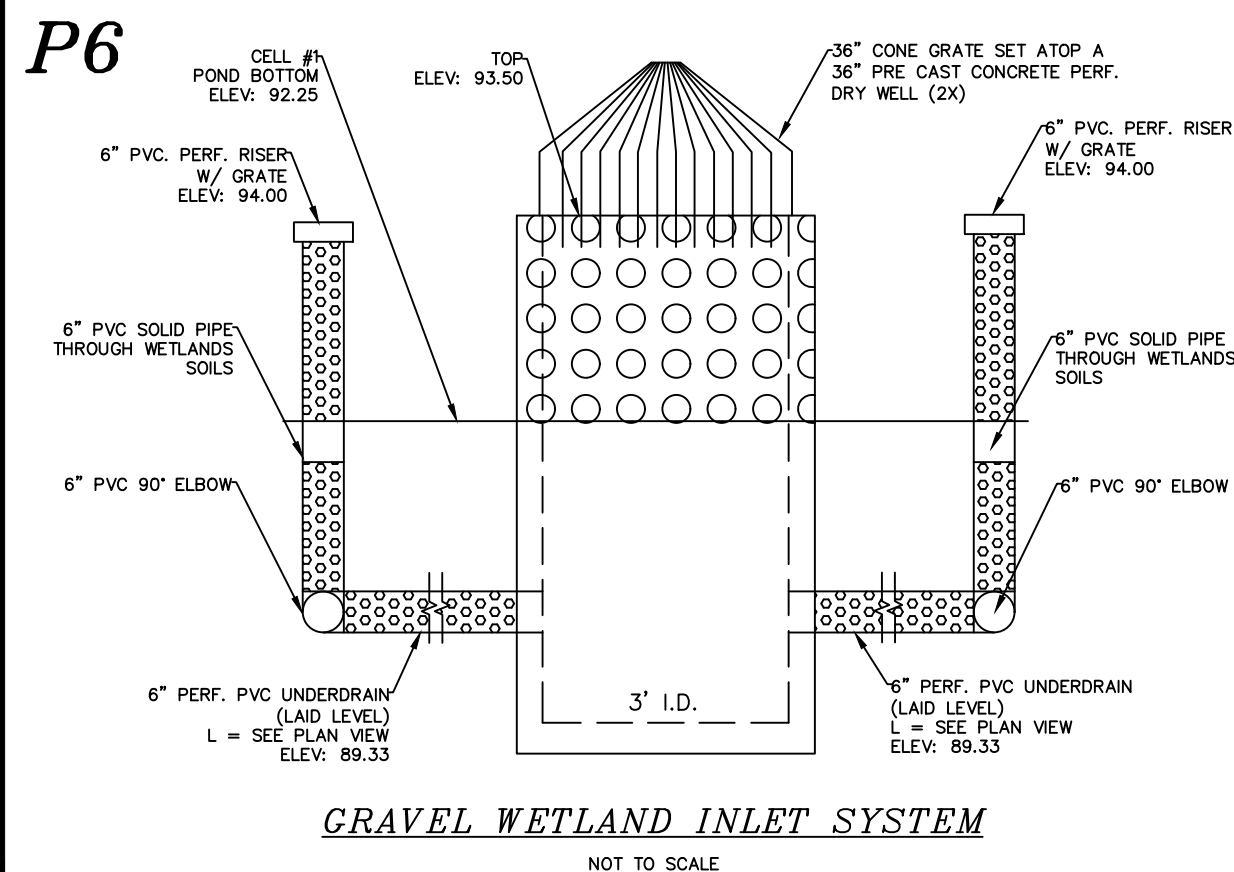
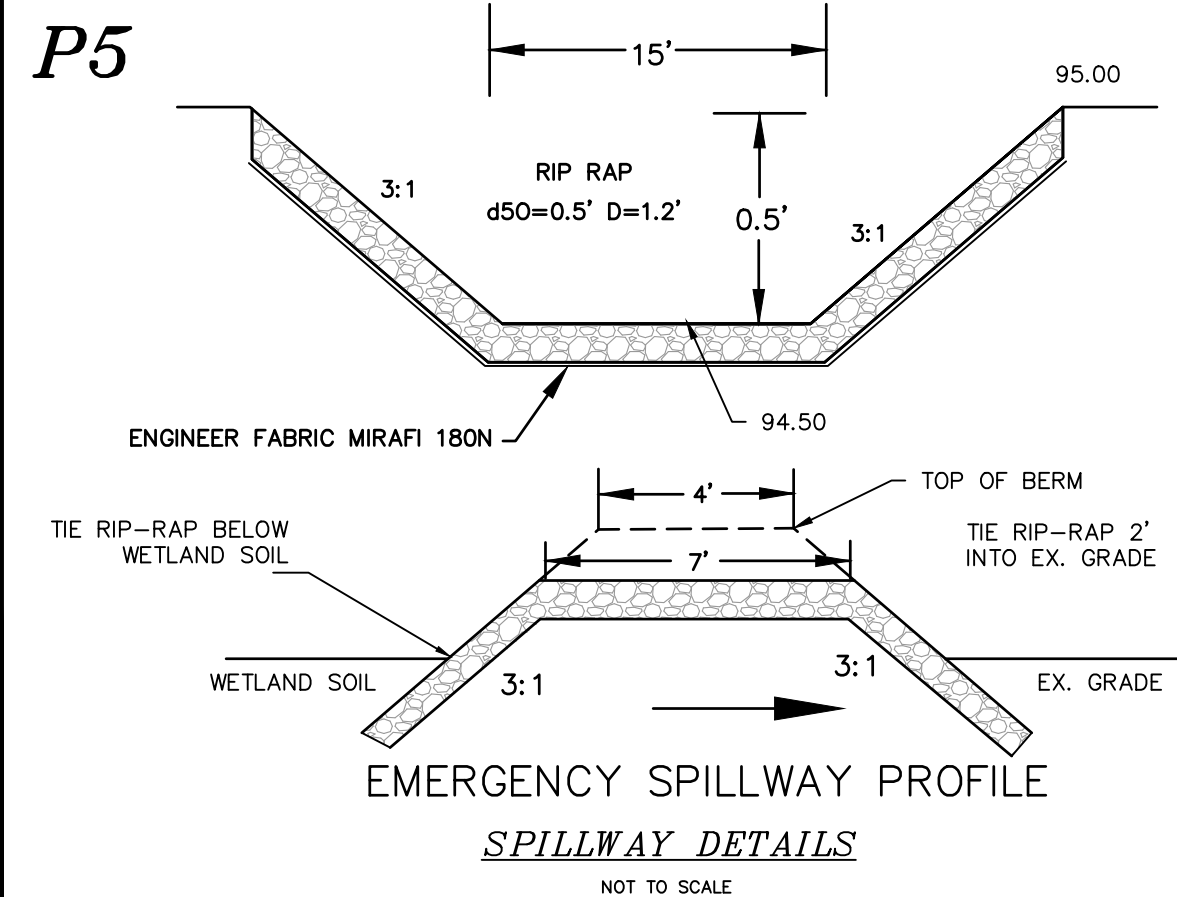
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NOT TO SCALE



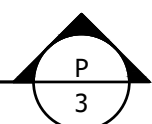
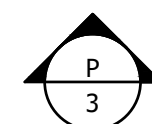
PLAN VIEW GRAVEL WETLAND #103



(IN FEET)
1 inch = 20 ft.

VERTICAL SCALE: 1" = 4'

SECTION OF GRAVEL WETLAND #103



P-103

REVISION	DATE	DESCRIPTION

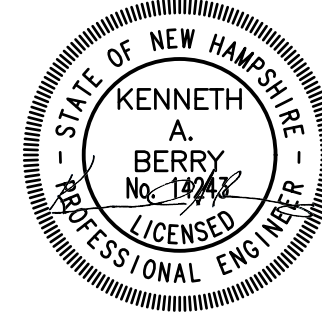
GRAVEL WETLAND #103
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
 335 SECOND CROWN POINT ROAD
 BARRINGTON, NH 03825 (603) 332-2863

SCALE : 1 IN. EQUALS 20 FT.

DATE : JANUARY 21, 2021

FILE NO. : DB 2020 - 066



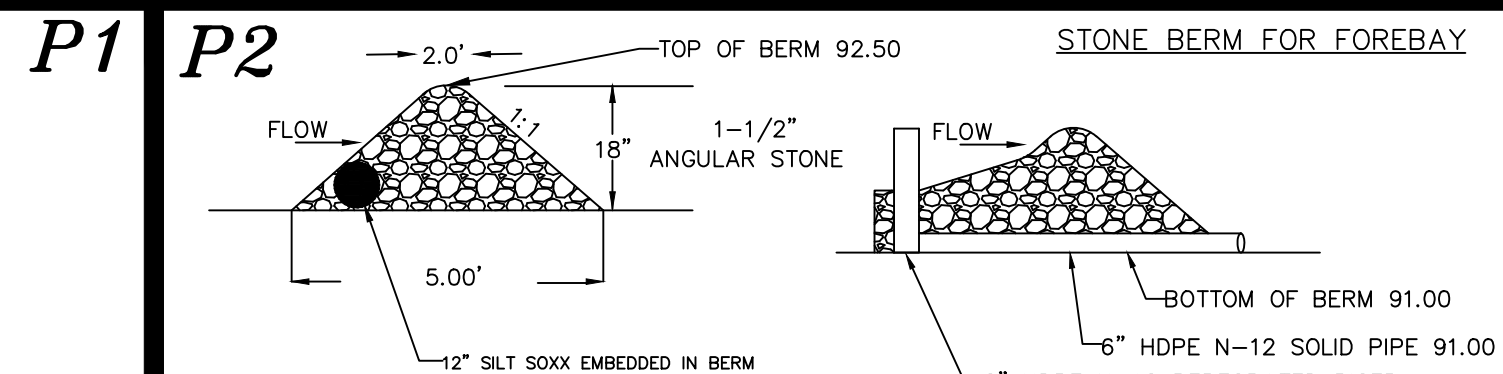
SHEET 14 OF 38

<u>ACTIVITY</u>	<u>FREQUENCY</u>
<u>CLOGGING AND SYSTEM PERFORMANCE</u>	
INSPECT INLETS AND OUTLETS TO ENSURE GOOD CONDITION AND NO EVIDENCE OF DETEIORATION. CHECK TO SEE IF HIGH-FLOW BYPASS IS FUNCTIONING. <u>REMEDY:</u> REPAIR OR REPLACE ANY DAMAGED STRUCTURAL PARTS, INLETS AND OUTLETS. CLEAR OR REMOVE DEBRIS OR RESTRICTIONS.	ANNUALLY, MORE FREQUENTLY IN THE FIRST YEAR OF OPERATION
CHECK FOR INTERNAL EROSION, EVIDENCE OF SHORT-CIRCUITING, AND ANIMAL BOURHOUS. <u>REMEDY:</u> SOIL EROSION FROM SHORT-CIRCUITING OR ANIMAL BOURHOUS SHOULD BE REPAIRED WHEN THEY OCCUR.	
CHECK THAT THE SYSTEM IS FULLY DRAINING WITHIN A 24-48 HOUR PERIOD AFTER RAIN EVENTS. <u>REMEDY:</u> REPAIR OR RESTORE HYDRAULIC INLET OR OUTLET CONFIGURATION.	
<u>VEGETATION</u>	
CHECK FOR ROBUST VEGETATION COVER THROUGHOUT THE SYSTEM AND DEAD OR DYING PLANTS <u>REMEDY:</u> VEGETATION SHOULD COVER > 75% OF THE SYSTEM AND SHOULD BE RESEEDED AND CARED FOR AS NEEDED CUT AND REMOVE VEGETATION FROM GRAVEL WETLAND SYSTEM AND FOREBAY IN ORDER TO MAINTAIN NITROGEN REMOVAL PERFORMANCE. <u>REMEDY:</u> THE VEGETATION SHOULD BE CUT AND REMOVED FROM THE SYSTEM TO PREVENT NITROGEN FROM CYCLING BACK INTO THE SYSTEM	ANNUALLY, OR AS NEEDED ONCE EVERY 3 YEARS

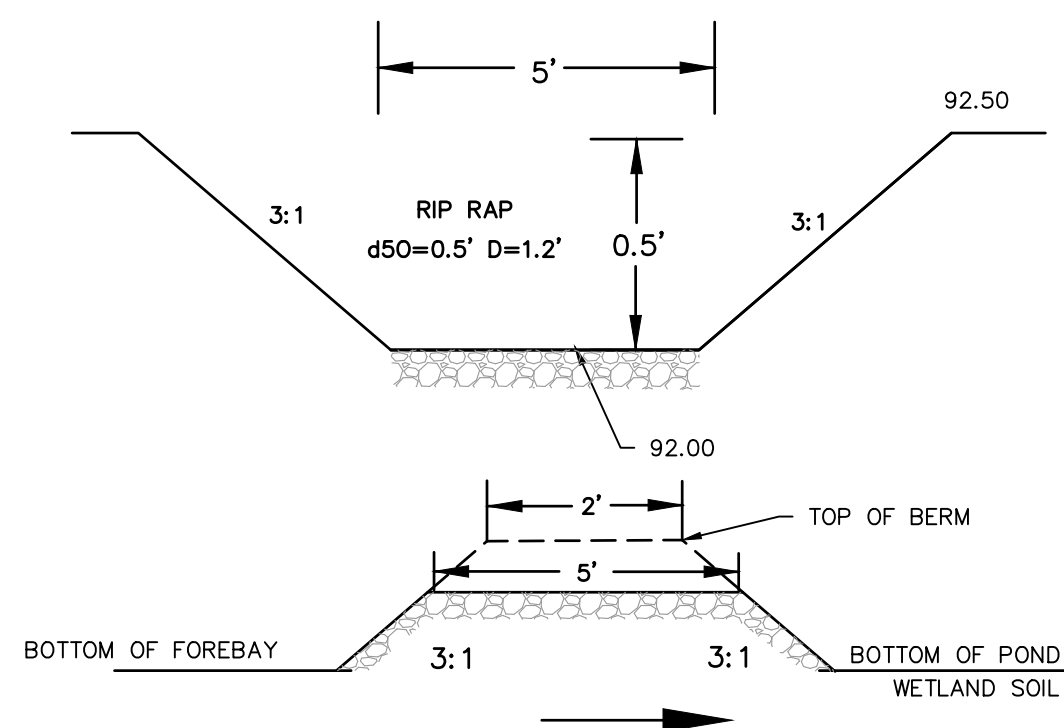
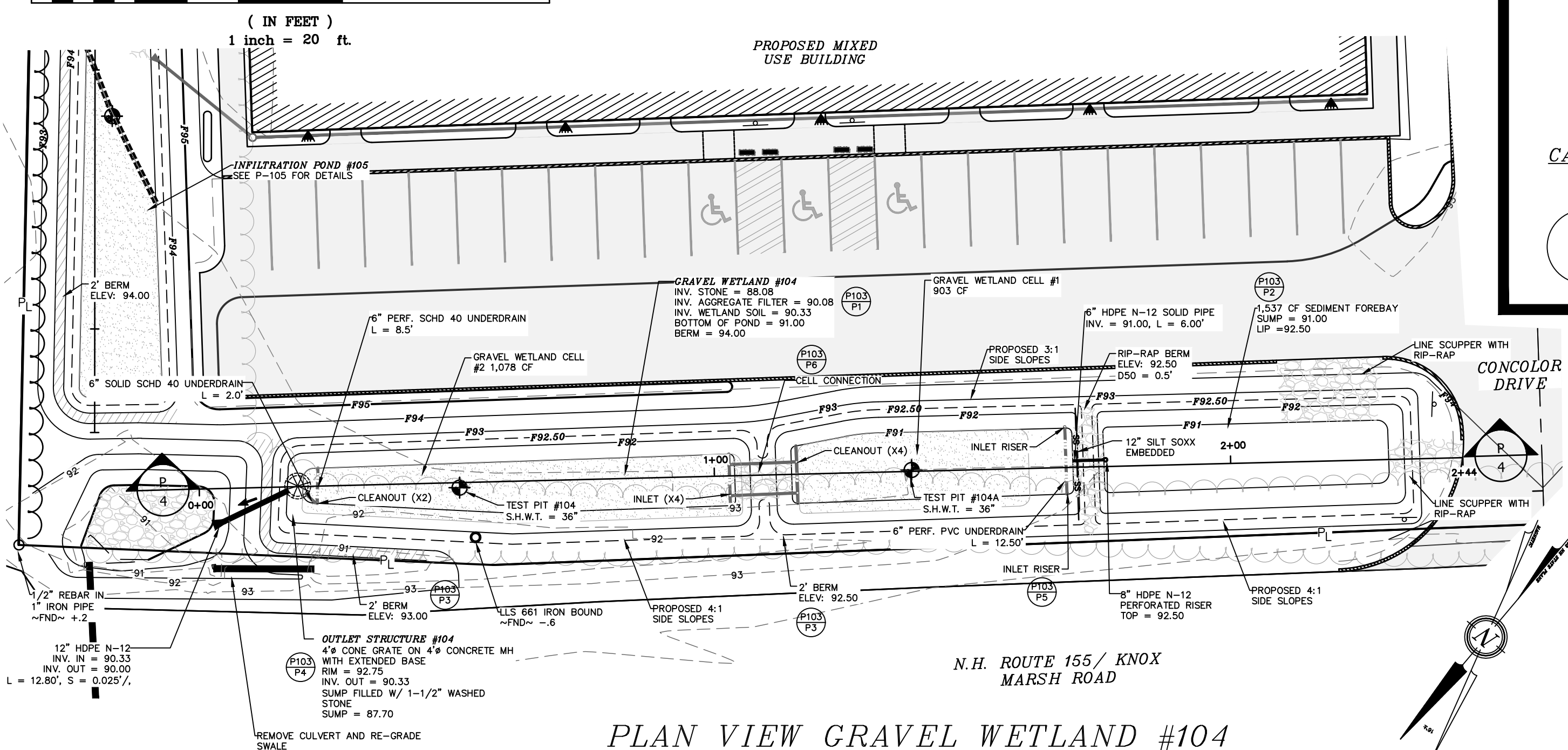
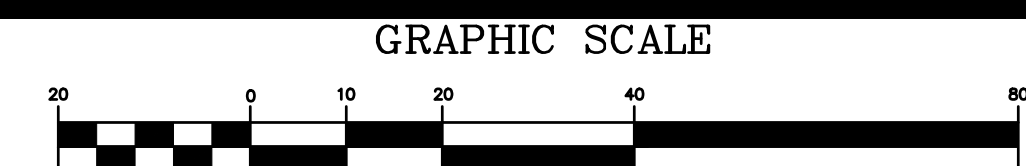
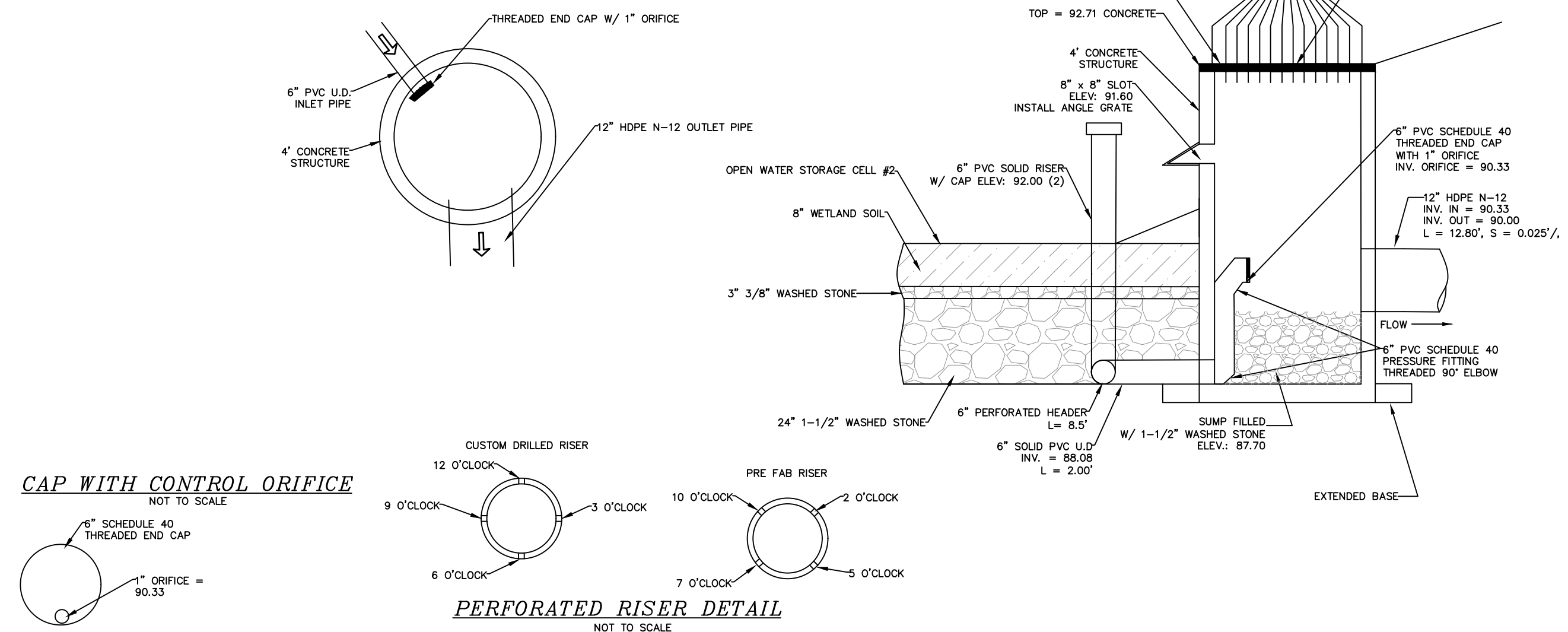
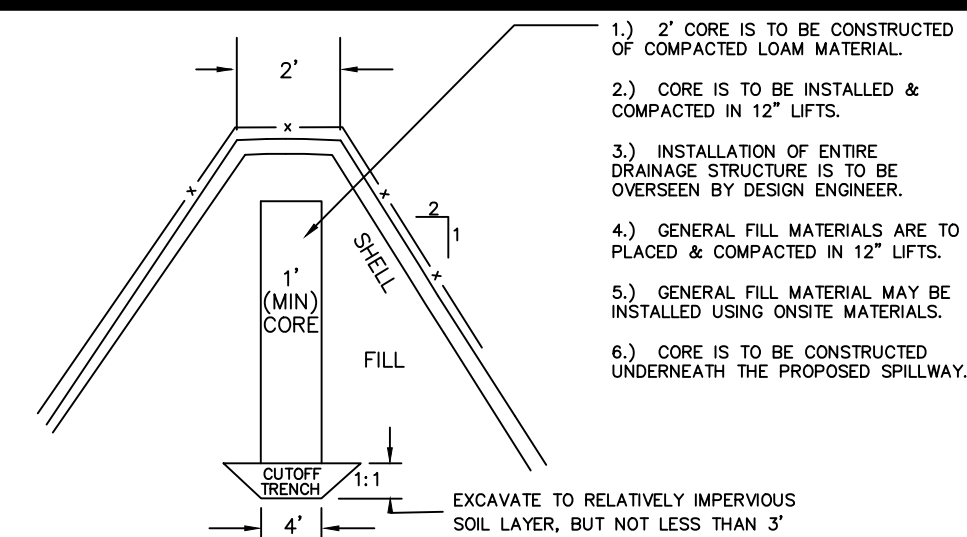
3/8" WASHED CRUSHED STONE*		1-1/2" WASHED CRUSHED STONE*	
sieve size	% passing by weight	sieve size	% passing by weight
1/2"	100	2"	100
3/8"	95 - 100	1-1/2"	90 - 100
# 4	22 - 55	1"	20 - 55
# 8	0 - 10	1-1/2"	0 - 15
		3/8"	0 - 5

<u>WETLAND SOIL</u>	
<u>SIEVE SIZE</u>	<u>% PASSING BY WEIGHT</u>
0.5	100
#10"	90 - 75
#100	40 - 50
#200	25 - 50
<u>SIEVE SIZE</u>	<u>% PASSING TOLERANCES</u>
0.5	±10.0
#10	±5.0
#100	±5.0
#200	±5.0

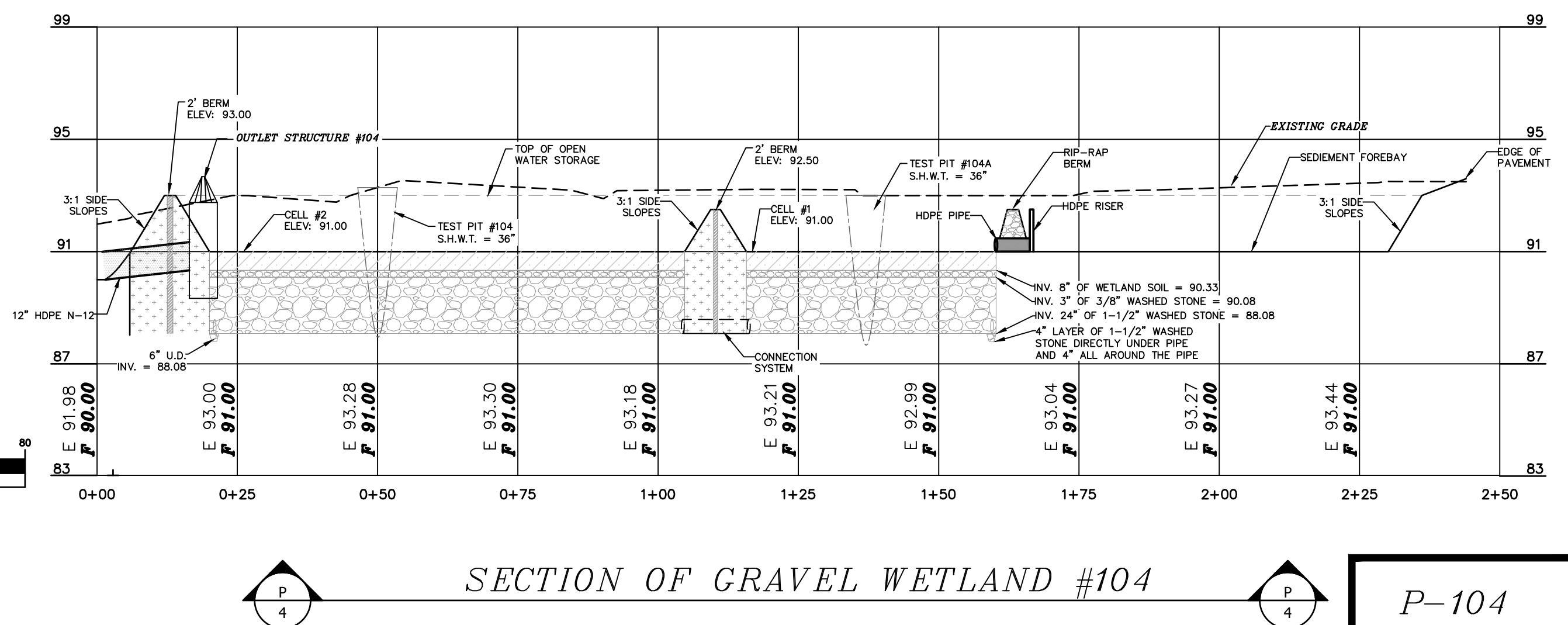
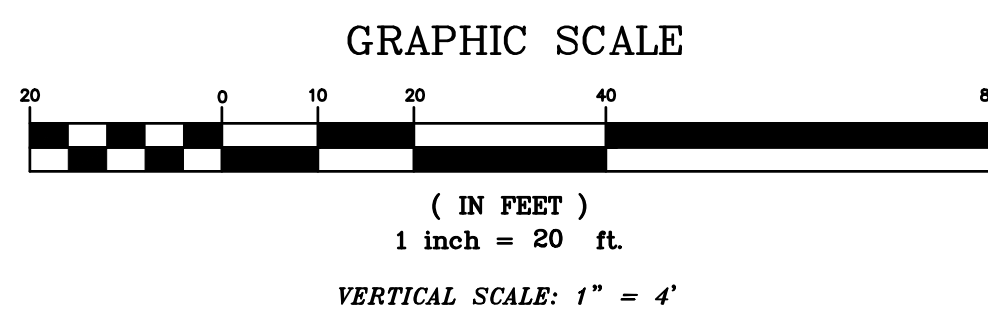
1 UNH STORMWATER CENTER



LOW PERMEABILITY MATERIAL GRADATION	
SIEVE SIZE	% PASSING BY WEIGHT
#4	95 - 100
#40	60 - 95
#100	40 - 60
#200	25 - 45



GRAVEL WETLAND CELL SPILLWAY PROFILE



SECTION OF GRAVEL WETLAND #104

P-104

REVISION	DATE	DESCRIPTION

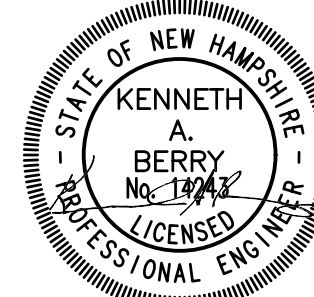
GRAVEL WETLAND #104
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
 335 SECOND CROWN POINT ROAD
 BARRINGTON, NH 03825 (603) 332-2863

SCALE : 1 IN. EQUALS 20 FT.

DATE : JANUARY 21, 2021

FILE NO. : DB 2020 - 066



SOILS & DEWATERING:

WFA	WINDSOR	VARIANT	K= 0.17
WFB	WINDSOR	VARIANT	K= 0.17
WFC	WINDSOR	VARIANT	K= 0.17
B6A	BUXTON	SILT LOAM	K= 0.28
B6B	BUXTON	SILT LOAM	K= 0.49
B6C	BUXTON	SILT LOAM	K= 0.49
S6A-P	SCANTIC	POORLY DRAINED	K= 0.49
S6B-P	SCANTIC	POORLY DRAINED	K= 0.43
S6A	SUFFIELD	SILT LOAM	K= 0.20
W6A	WINDSOR	LOAMY SAND	K= 0.17
W6B	WINDSOR	LOAMY SAND	K= 0.17

SEE SITE SPECIFIC SOILS MAP (SSSM)
SEE WEBSOIL USDA-NRCS
ERODIBILITY FACTOR - K, CPESC MANUAL, ENVIROCERT INTERNATIONAL INC. &
ROCKINGHAM COUNTY SOIL SURVEY, ROCKWEB SOIL ATTRIBUTES.

CONTRACTOR TO BE AWARE OF THE SOIL PROFILES AND ENSURE THAT PROPER EROSION
PREVENTION AND SEDIMENT CONTROL MEASURES ARE TAKEN AT ALL TIMES. ANY
DEWATERING REQUIREMENTS IN NEW HAMPSHIRE REQUIRE SPECIAL PROVISIONS IN
ACCORDANCE WITH THE "CLARIFICATION OF SECTION 9.1.2 (STATE OF NEW HAMPSHIRE
CONDITIONS) AND OTHER NH SPECIFIC INFORMATION FOR THE U.S. EPA 2012 NPDES
CONSTRUCTION GENERAL PERMIT (CGP)" DATED MAY 3, 2012 INCLUDED IN THE SWPPP.

COVER MANAGEMENT DURING CONSTRUCTION FOR EXPOSED SOIL WILL INCLUDE HAY /
STRAW APPLIED AT A RATE OF 2.0 TONS PER ACRE, TEMPORARY SEEDING OF ANNUAL
RYE GRASS, AND PERMANENT SEEDING AT THE EARLIES OPPORTUNITY. SEE ADDITIONAL
REQUIREMENT FOR STABILIZATION ON THE EROSION AND SEDIMENT CONTROL DETAIL
SHEETS, E-101 AND E-102.

THE CONSTRUCTION SCHEDULE WILL BE MANAGED SO THAT ALL STORMWATER
STRUCTURES WILL BE BUILT AND STABILIZED PRIOR TO RECEIVING SURFACE WATER
RUNOFF. CONTRACTOR TO BE RESPONSIBLE FOR ALL DIVERSIONS DURING
CONSTRUCTION AND FOR INTERIM SEDIMENT AND EROSION CONTROL MEASURES.

LEGEND:

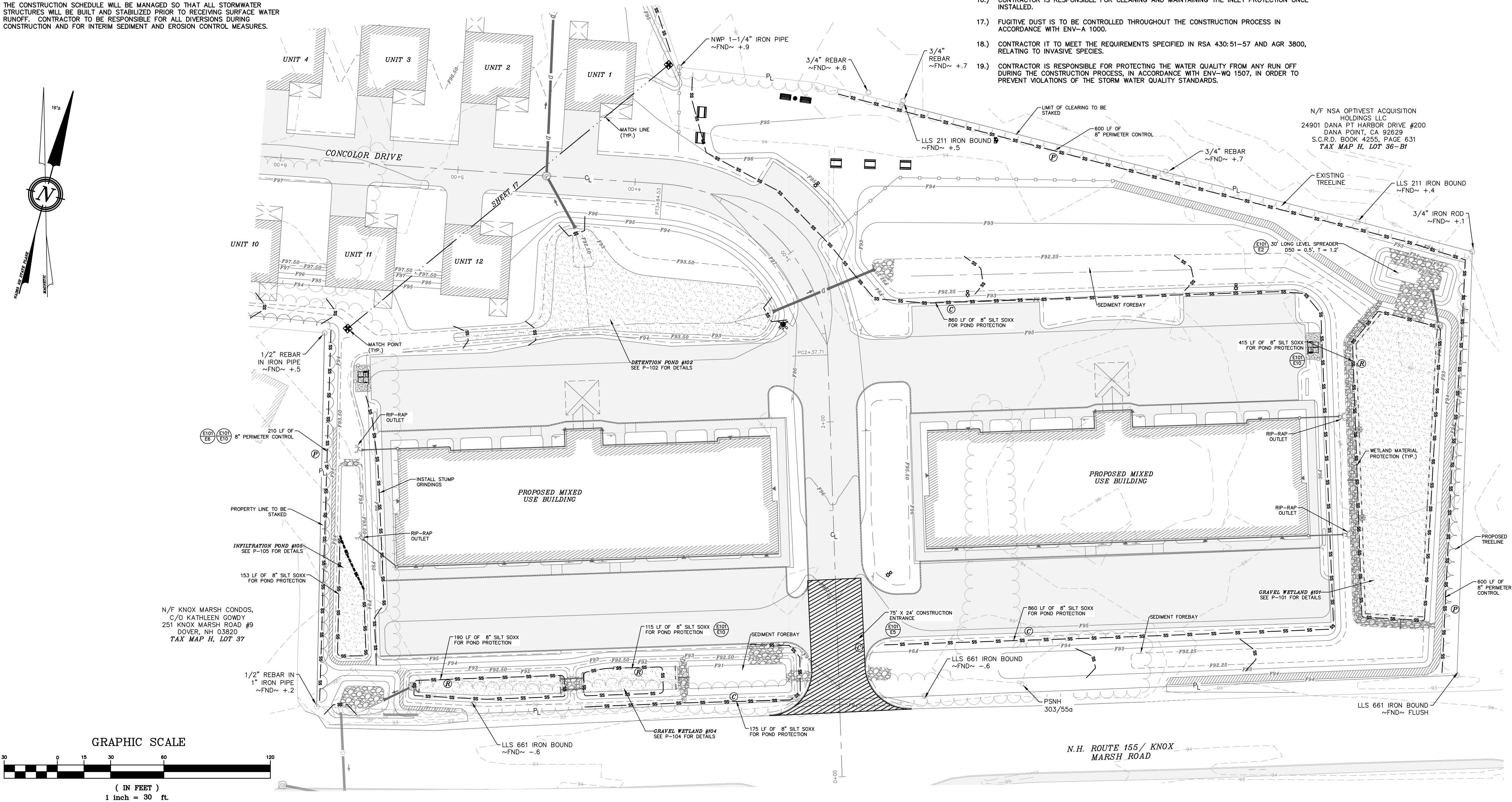
- Ⓡ POND PROTECTION
- Ⓟ PERIMETER CONTROL
- Ⓢ RESIDENTIAL/ROADWAY CONSTRUCTION
- Ⓣ IRON PIPE (FND)
- Ⓤ REBAR (FND)
- Ⓥ UTILITY POLE
- Ⓦ BENCHMARK
- SILT FENCE
- FILTREXX SILT SOXX
- TREE LINE

NOTES:

- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPIPING ROAD SUITE 2A
EXETER, NH 03833
- 2.) TAX MAP H, LOT 37A
- 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac..
- 4.) S.C.R.D. BOOK 4783, PAGE 326
- 5.) THE INTENT OF THIS PLAN IS TO SHOW THE EASTERN EROSION AND SEDIMENT
CONTROL DETAIL.
- 5.) UNDERGROUND UTILITY LOCATIONS ARE BASED UPON BEST AVAILABLE EVIDENCE AND
ARE NOT FIELD VERIFIED. LOCATING AND PROTECTING ANY ABOVE AND BELOW
GROUND UTILITIES IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR. ANY UTILITY
CONFLICTS SHOULD BE REPORTED IMMEDIATELY TO THE DESIGN ENGINEER.
- 6.) THE CONTRACTOR SHALL CALL AND COORDINATE WITH DIGSAFE AT 1-888-344-7233
AT LEAST 72 HOURS PRIOR TO COMMENCING ANY EXCAVATION ON PUBLIC OR PRIVATE
PROPERTY.
- 7.) ALL DRAINAGE PIPE IS TO BE HDPE N-12. INDIVIDUAL PIPE SIZES ARE SPECIFIED ON
GRADING AND DETAIL PLAN SHEETS, GREEN PIPE.
- 8.) ALL ELEVATIONS TO BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. THE
DESIGN ENGINEER IS TO BE NOTIFIED IMMEDIATELY OF ANY DISCREPANCY.
TEMPORARY BENCHMARKS (T.B.M.) ARE TO BE PROVIDED BY THE DESIGN ENGINEER.

NOTES CONTINUED:

- 10.) UPON FINAL COMPLETION AND 85% STABILIZATION, THE DRAINAGE SYSTEM IS TO BE CLEANED
OF ALL DEBRIS. SEDIMENT CONTROL PRACTICES REMOVED AND DISPOSED OF PROPERLY, AND
ANNUAL MAINTENANCE PERFORMED ON ALL DRAINAGE PRACTICES.
- 10.) EROSION AND SEDIMENT CONTROL INSPECTIONS TO BE CONDUCTED ONCE PER EVERY SEVEN
DAYS AND AT AN INCREASED FREQUENCY INCLUDING WITHIN 24-HOURS OF A 0.25 INCH RAIN
EVENT. INSPECTIONS TO BE CONDUCTED BY A "QUALIFIED PERSON" AS DEFINED BY EPA CGP
4.1.1 AND INSPECTION REPORTS SUBMITTED TO THE CITY OF DOVER, NH, ENGINEERING
DEPARTMENT WITHIN 24 HOURS IN ACCORDANCE WITH CGP 4.1.7 AND MAINTAINED BY THE
OWNER FOR A PERIOD OF THREE YEARS AFTER THE PROJECT IS COMPLETED. SEE ALSO CITY
OF DOVER ADDITIONAL INSPECTION REQUIREMENTS BELOW.
- 11.) SILT FENCE MAY BE SUBSTITUTED WITH FILTREXX SILT SOXX OR EROSION CONTROL MIX BERM.
SILT FENCE IS NOT A SUBSTITUTE FOR FILTREXX SILT SOXX OR APPROVED EQUAL.
- 12.) PER EPA CGP 2.1.2.2 (INSTALL PERIMETER CONTROL), "YOU MUST INSTALL SEDIMENT CONTROLS
ALONG THOSE PERIMETER AREAS OF YOUR SITE THAT WILL RECEIVE STORMWATER FROM EARTH
DISTURBING ACTIVITIES." AS A RESULT OF SWPPP INSPECTIONS, THE CONTRACTOR MAY HAVE
TO EXPAND PERIMETER CONTROLS TO MEET THIS REQUIREMENT. THE E&SC PLAN IS INITIATING
GUIDANCE AS TO THE ANTICIPATED REQUIREMENTS AND IT THE CONTRACTORS RESPONSIBILITY
TO ENSURE THAT STORMWATER VIOLATION DO NOT OCCUR.
- 14.) CONTRACTOR IS REQUIRED TO INSTALL A CONSTRUCTION ENTRANCE PRIOR TO ANY EARHT
DISTURBING ACTIVITIES.
- 15.) CONTRACTOR IS RESPONSIBLE FOR SWEEPING THE PARKING LOT, SIDEWALKS AND ANYTHING
DISTURBED, TO ENSURE THAT NO SEDIMENT IS BEING TRACKED ONTO KNOX MARSH ROAD.
- 16.) CONTRACTOR IS RESPONSIBLE FOR CLEANING AND MAINTAINING THE INLET PROTECTION ONCE
INSTALLED.
- 17.) FUGITIVE DUST IS TO BE CONTROLLED THROUGHOUT THE CONSTRUCTION PROCESS IN
ACCORDANCE WITH ENV-A 1000.
- 18.) CONTRACTOR IT TO MEET THE REQUIREMENTS SPECIFIED IN RSA 430:51-57 AND AGR 3800,
RELATING TO INVASIVE SPECIES.
- 19.) CONTRACTOR IS RESPONSIBLE FOR PROTECTING THE WATER QUALITY FROM ANY RUN OFF
DURING THE CONSTRUCTION PROCESS, IN ACCORDANCE WITH ENV-WQ 1507, IN ORDER TO
PREVENT VIOLATIONS OF THE STORM WATER QUALITY STANDARDS.



PLANNING FILE #	DESCRIPTION

REVISION	DATE

EROSION AND SEDIMENT CONTROL PLAN EAST

LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
SCALE : 1 IN. EQUALS 30 FT.
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066

KENNETH A. BERRY
REGISTERED PROFESSIONAL ENGINEER
NO. 12442

SHEET 16 OF 38

SOILS & DEWATERING:

W/A	WINDSOR	VARIANT	K= 0.17
W/B	WINDSOR	VARIANT	K= 0.17
W/C	WINDSOR	VARIANT	K= 0.17
B/A	BUXTON	SILT LOAM	K= 0.28
B/B	BUXTON	SILT LOAM	K= 0.49
B/C	BUXTON	SILT LOAM	K= 0.49
S/A-P	SCANTIC	POORLY DRAINED	K= 0.49
S/B-P	SCANTIC	POORLY DRAINED	K= 0.43
S/A	SUFFIELD	SILT LOAM	K= 0.20
W/A	WINDSOR	LOAMY SAND	K= 0.17
W/B	WINDSOR	LOAMY SAND	K= 0.17

SEE SITE SPECIFIC SOILS MAP (SSSM)
SEE WEBSOIL USDA-NRCS
ERODIBILITY FACTOR - K, CPESC MANUAL, ENVIROCERT INTERNATIONAL INC. &
ROCKINGHAM COUNTY SOIL SURVEY, ROCKWEB SOIL ATTRIBUTES.

CONTRACTOR TO BE AWARE OF THE SOIL PROFILES AND ENSURE THAT PROPER EROSION
PREVENTION AND SEDIMENT CONTROL MEASURES ARE TAKEN AT ALL TIMES. ANY
DEWATERING REQUIREMENTS IN NEW HAMPSHIRE REQUIRE SPECIAL PROVISIONS IN
ACCORDANCE WITH THE "CLARIFICATION OF SECTION 91.2 (STATE OF NEW HAMPSHIRE
CONDITIONS) AND OTHER NH SPECIFIC INFORMATION FOR THE U.S. EPA 2012 NPDES
CONSTRUCTION GENERAL PERMIT (CGP)" DATED MAY 3, 2012 INCLUDED IN THE SWPPP.

COVER MANAGEMENT DURING CONSTRUCTION FOR EXPOSED SOIL WILL INCLUDE HAY /
STRAW APPLIED AT A RATE OF 2.0 TONS PER ACRE, TEMPORARY SEEDING OF ANNUAL
RYE GRASS, AND PERMANENT SEEDING AT THE EARLIES OPPORTUNITY. SEE ADDITIONAL
REQUIREMENT FOR STABILIZATION ON THE EROSION AND SEDIMENT CONTROL DETAIL
SHEETS, E-101 AND E-102.

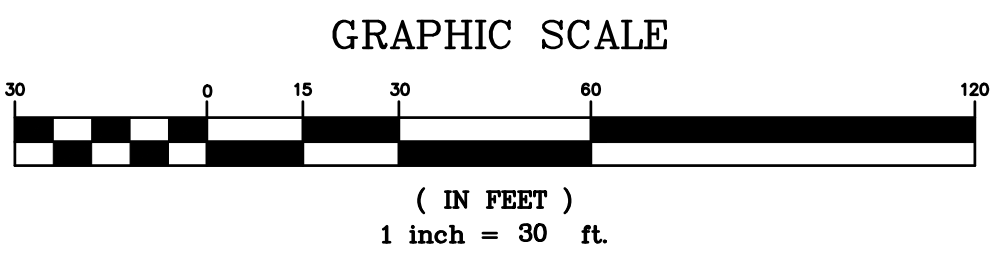
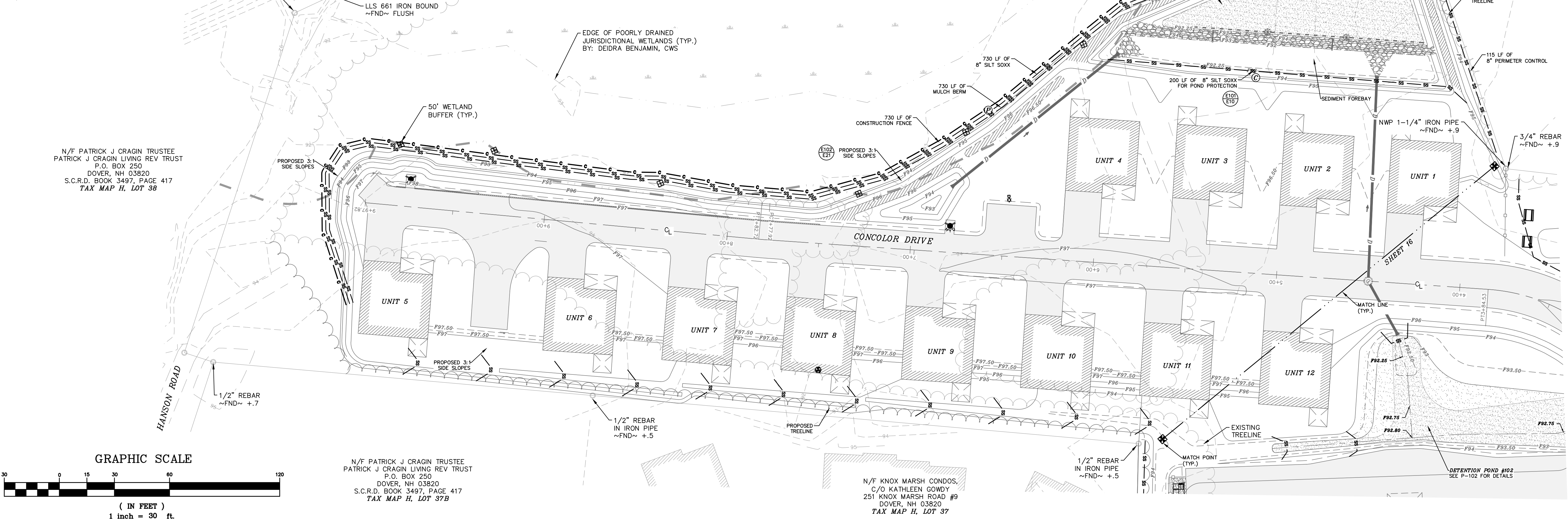
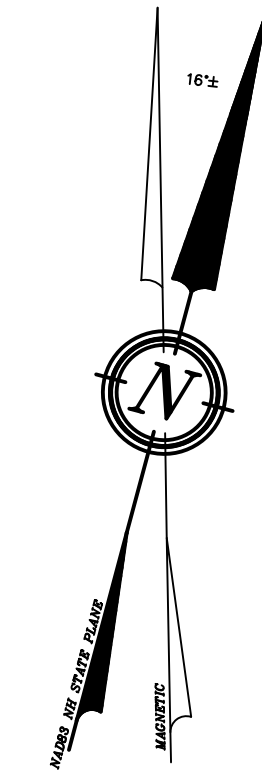
THE CONSTRUCTION SCHEDULE WILL BE MANAGED SO THAT ALL STORMWATER
STRUCTURES WILL BE BUILT AND STABILIZED PRIOR TO RECEIVING SURFACE WATER
RUNOFF. CONTRACTOR TO BE RESPONSIBLE FOR ALL DIVERSIONS DURING
CONSTRUCTION AND FOR INTERIM SEDIMENT AND EROSION CONTROL MEASURES.

LEGEND:

- Ⓡ POND PROTECTION
- Ⓟ PERIMETER CONTROL
- Ⓢ RESIDENTIAL/ROADWAY CONSTRUCTION
- IRON PIPE (FND)
- REBAR (FND)
- UTILITY POLE
- ⊕ BENCHMARK
- SF SILT FENCE
- SS FILTREXX SILT/SOXX / MULCH BERM
- TREE LINE

NOTES:

- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD, SUITE 2A
EXETER, NH 03833
- 2.) TAX MAP H, LOT 37A
- 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
- 4.) S.C.R.D. BOOK 4783, PAGE 326
- 5.) THE INTENT OF THIS PLAN IS TO SHOW THE WESTERN EROSION AND SEDIMENT
CONTROL DETAIL.
- 6.) SEE SHEET 15 FOR ALL OTHER STANDARD EROSION AND SEDIMENT CONTROL NOTES.



N/F PATRICK J CRAGIN TRUSTEE
PATRICK J CRAGIN LIVING REV TRUST
P.O. BOX 250
DOVER, NH 03820
S.C.R.D. BOOK 3497, PAGE 417
TAX MAP H, LOT 37B

N/F KNOX MARSH CONDOS,
C/O KATHLEEN COWDY
251 KNOX MARSH ROAD #9
DOVER, NH 03820
TAX MAP H, LOT 37

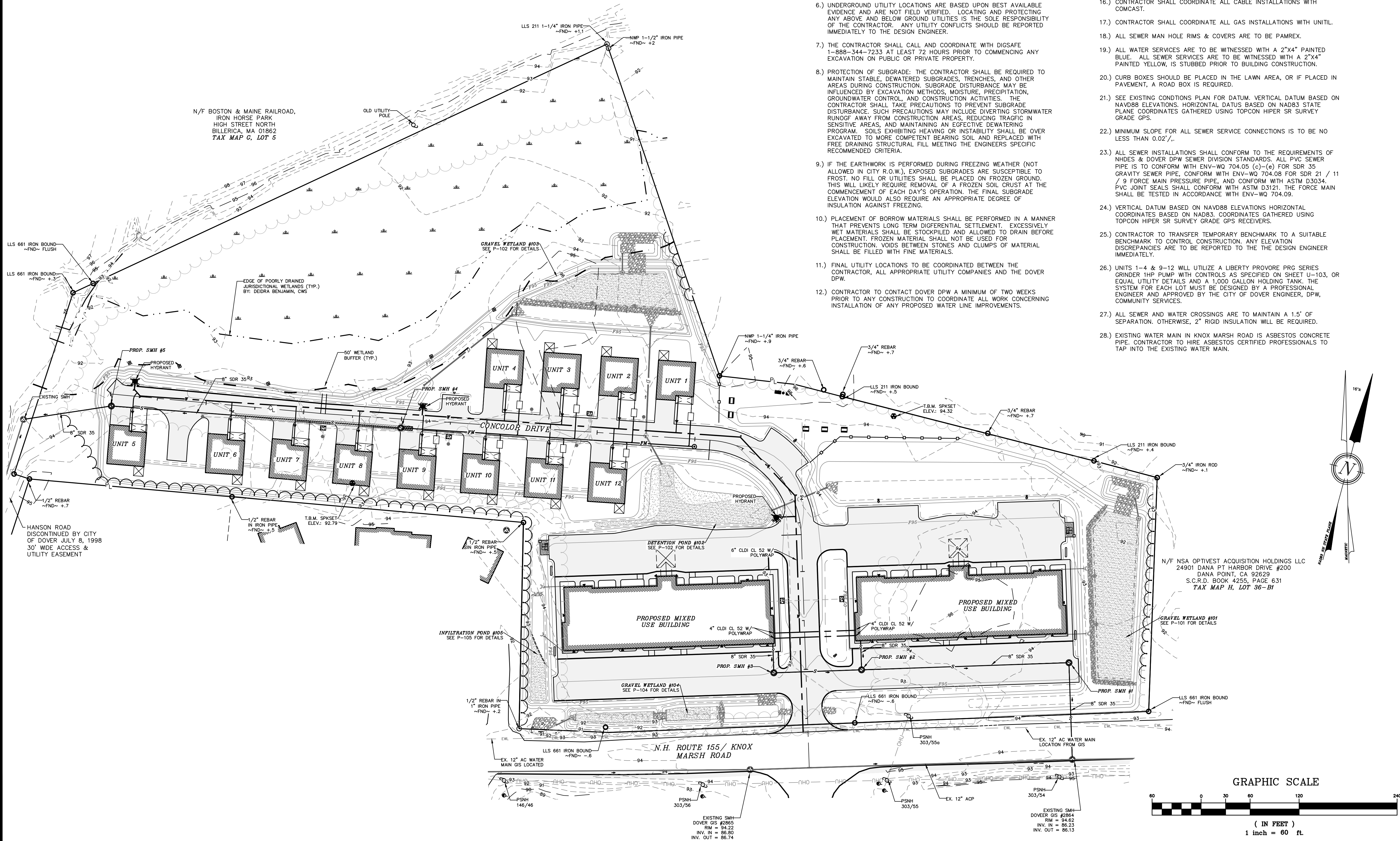
PLANNING FILE #		
REVISION	DATE	DESCRIPTION

EROSION AND SEDIMENT CONTROL PLAN WEST
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
SCALE : 1 IN. EQUALS 30 FT.
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066

KENNETH A. BERRY
REGISTERED PROFESSIONAL ENGINEER
STATE OF NEW HAMPSHIRE
NO. 10442

SHEET 17 OF 38



NOTES:

- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
- 2.) TAX MAP H, LOT 37A
- 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
- 4.) S.C.R.D. BOOK 4783, PAGE 326
- 5.) THE INTENT OF THIS PLAN IS TO SHOW THE PROPOSED OVERVIEW UTILITY DESIGN.
- 6.) UNDERGROUND UTILITY LOCATIONS ARE BASED UPON BEST AVAILABLE EVIDENCE AND ARE NOT FIELD VERIFIED. LOCATING AND PROTECTING ANY ABOVE AND BELOW GROUND UTILITIES IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR. ANY UTILITY CONFLICTS SHOULD BE REPORTED IMMEDIATELY TO THE DESIGN ENGINEER.
- 7.) THE CONTRACTOR SHALL CALL AND COORDINATE WITH DIGSAFE 1-888-344-7233 AT LEAST 72 HOURS PRIOR TO COMMENCING ANY EXCAVATION ON PUBLIC OR PRIVATE PROPERTY.
- 8.) PROTECTION OF SUBGRADE: THE CONTRACTOR SHALL BE REQUIRED TO MAINTAIN STABLE, DEWATERED SUBGRADES, TRENCHES, AND OTHER AREAS DURING CONSTRUCTION. SUBGRADE DISTURBANCE MAY BE INFLUENCED BY EXCAVATION METHODS, MOISTURE, PRECIPITATION, GROUNDWATER CONTROL, AND CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL TAKE PRECAUTIONS TO PREVENT SUBGRADE DISTURBANCE. SUCH PRECAUTIONS MAY INCLUDE DIVERTING STORMWATER RUNOFF AWAY FROM CONSTRUCTION AREAS, REDUCING TRAFFIC IN SENSITIVE AREAS, AND MAINTAINING AN EFFECTIVE DEWATERING PROGRAM. SOILS EXHIBITING HEAVING OR INSTABILITY SHALL BE OVER EXCAVATED TO MORE COMPETENT BEARING SOIL AND REPLACED WITH FREE DRAINING STRUCTURAL FILL MEETING THE ENGINEERS SPECIFIC RECOMMENDED CRITERIA.
- 9.) IF THE EARTHWORK IS PERFORMED DURING FREEZING WEATHER (NOT ALLOWED IN CITY R.O.W.), EXPOSED SUBGRADES ARE SUSCEPTIBLE TO FROST. NO FILL OR UTILITIES SHALL BE PLACED ON FROZEN GROUND. THIS WILL LIKELY REQUIRE REMOVAL OF A FROZEN SOIL CRUST AT THE COMMENCEMENT OF EACH DAY'S OPERATION. THE FINAL SUBGRADE ELEVATION WOULD ALSO REQUIRE AN APPROPRIATE DEGREE OF INSULATION AGAINST FREEZING.
- 10.) PLACEMENT OF BORROW MATERIALS SHALL BE PERFORMED IN A MANNER THAT PREVENTS LONG TERM DIFFERENTIAL SETTLEMENT. EXCESSIVELY WET MATERIALS SHALL BE STOCKPILED AND ALLOWED TO DRAIN BEFORE PLACEMENT. FROZEN MATERIAL SHALL NOT BE USED FOR CONSTRUCTION. Voids BETWEEN STONES AND CLUMPS OF MATERIAL SHALL BE FILLED WITH FINE MATERIALS.
- 11.) FINAL UTILITY LOCATIONS TO BE COORDINATED BETWEEN THE CONTRACTOR, ALL APPROPRIATE UTILITY COMPANIES AND THE DOVER DPW.
- 12.) CONTRACTOR TO CONTACT DOVER DPW A MINIMUM OF TWO WEEKS PRIOR TO ANY CONSTRUCTION TO COORDINATE ALL WORK CONCERNING INSTALLATION OF ANY PROPOSED WATER LINE IMPROVEMENTS.

NOTES CONTINUED:

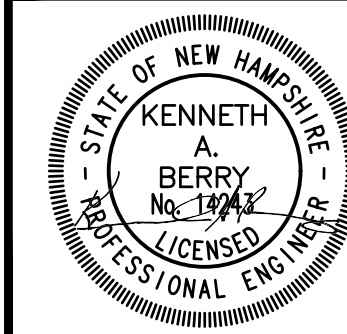
- 13.) ALL WATER MAIN AND SERVICE INSTALLATIONS SHALL CONFORM TO CITY OF DOVER STANDARDS. ALL HIGHWAY CONSTRUCTION WILL MEET THE CITY OF DOVER STANDARDS.
- 14.) CONTRACTOR SHALL COORDINATE ALL ELECTRICAL INSTALLATIONS WITH EVERSOURCE AT (800) 682-7764. ALL ELECTRIC CONDUIT INSTALLATION SHALL BE INSPECTED BY EVERSOURCE PRIOR TO BACKFILL. A 48-HOUR MINIMUM NOTICE IS REQUIRED.
- 15.) CONTRACTOR SHALL COORDINATE ALL TELECOMMUNICATIONS INSTALLATIONS WITH FAIRPOINT COMMUNICATIONS AT (603) 427-5525.
- 16.) CONTRACTOR SHALL COORDINATE ALL CABLE INSTALLATIONS WITH COMCAST.
- 17.) CONTRACTOR SHALL COORDINATE ALL GAS INSTALLATIONS WITH UNITIL.
- 18.) ALL SEWER MAN HOLE RIMS & COVERS ARE TO BE PAMREX.
- 19.) ALL WATER SERVICES ARE TO BE WITNESSED WITH A 2"x4" PAINTED BLUE. ALL SEWER SERVICES ARE TO BE WITNESSED WITH A 2"x4" PAINTED YELLOW, IS STUBBED PRIOR TO BUILDING CONSTRUCTION.
- 20.) CURB BOXES SHOULD BE PLACED IN THE LAWN AREA, OR IF PLACED IN PAVEMENT, A ROAD BOX IS REQUIRED.
- 21.) SEE EXISTING CONDITIONS PLAN FOR DATUM. VERTICAL DATUM BASED ON NAVD88 ELEVATIONS. HORIZONTAL DATUM BASED ON NAD83 STATE PLANE COORDINATES GATHERED USING TOPCON HIPER SR SURVEY GRADE GPS.
- 22.) MINIMUM SLOPE FOR ALL SEWER SERVICE CONNECTIONS IS TO BE NO LESS THAN 0.02'./.
- 23.) ALL SEWER INSTALLATIONS SHALL CONFORM TO THE REQUIREMENTS OF NHDES & DOVER DPW SEWER DIVISION STANDARDS. ALL PVC SEWER PIPE IS TO CONFORM WITH ENV-WQ 704.05 (c)-(e) FOR SDR 35 GRAVITY SEWER PIPE, CONFORM WITH ENV-WQ 704.08 FOR SDR 21 / 11 / 9 FORCE MAIN PRESSURE PIPE, AND CONFORM WITH ASTM D3034. PVC JOINT SEALS SHALL CONFORM WITH ASTM D3121. THE FORCE MAIN SHALL BE TESTED IN ACCORDANCE WITH ENV-WQ 704.09.
- 24.) VERTICAL DATUM BASED ON NAVD88 ELEVATIONS HORIZONTAL COORDINATES BASED ON NAD83. COORDINATES GATHERED USING TOPCON HIPER SR SURVEY GRADE GPS RECEIVERS.
- 25.) CONTRACTOR TO TRANSFER TEMPORARY BENCHMARK TO A SUITABLE BENCHMARK TO CONTROL CONSTRUCTION. ANY ELEVATION DISCREPANCIES ARE TO BE REPORTED TO THE THE DESIGN ENGINEER IMMEDIATELY.
- 26.) UNITS 1-4 & 9-12 WILL UTILIZE A LIBERTY PROVORE PRG SERIES GRINDER 1HP PUMP WITH CONTROLS AS SPECIFIED ON SHEET U-103, OR EQUAL UTILITY DETAILS AND A 1,000 GALLON HOLDING TANK. THE SYSTEM FOR EACH LOT MUST BE DESIGNED BY A PROFESSIONAL ENGINEER AND APPROVED BY THE CITY OF DOVER ENGINEER, DPW, COMMUNITY SERVICES.
- 27.) ALL SEWER AND WATER CROSSINGS ARE TO MAINTAIN A 1.5' OF SEPARATION. OTHERWISE, 2" RIGID INSULATION WILL BE REQUIRED.
- 28.) EXISTING WATER MAIN IN KNOX MARSH ROAD IS ASBESTOS CONCRETE PIPE. CONTRACTOR TO HIRE ASBESTOS CERTIFIED PROFESSIONALS TO TAP INTO THE EXISTING WATER MAIN.

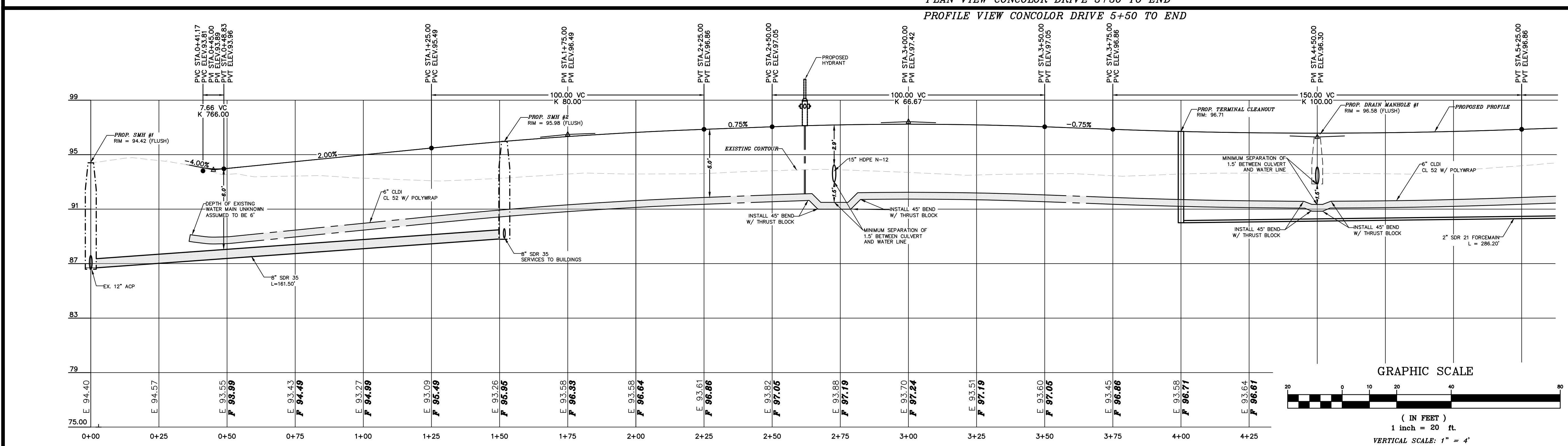
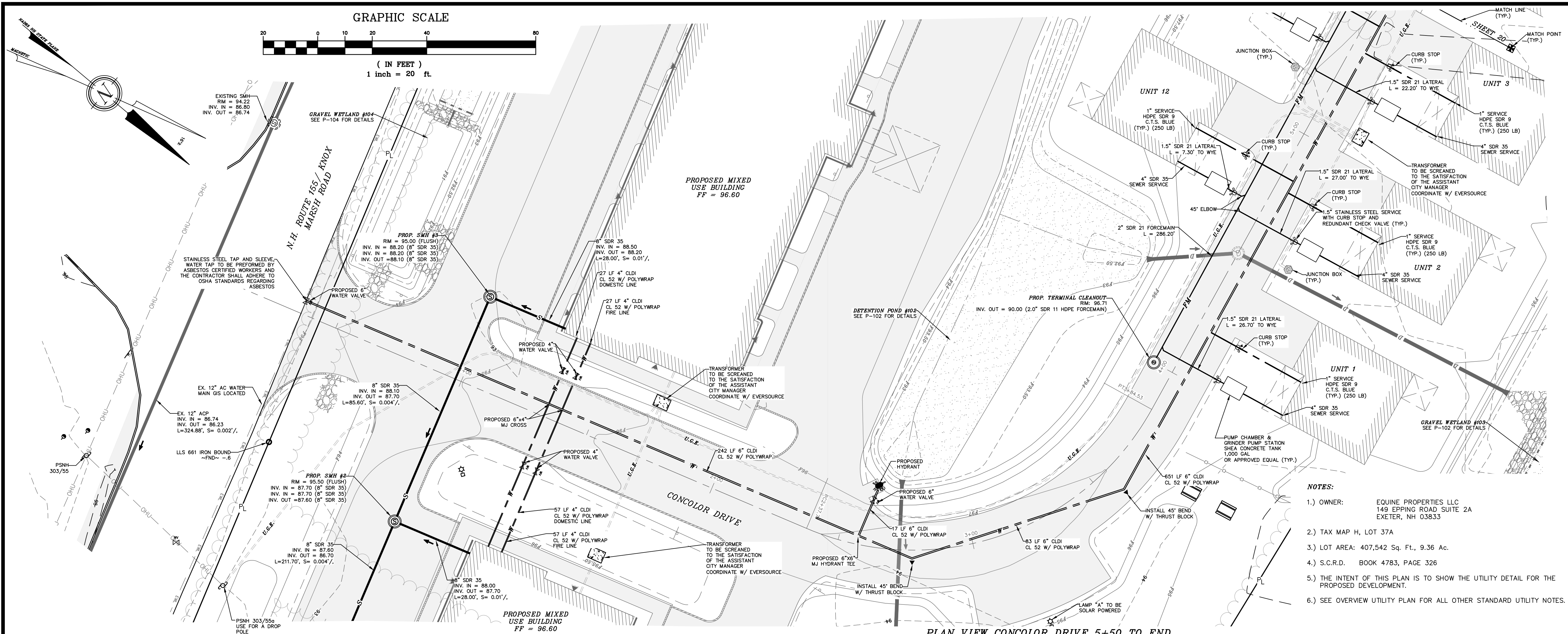
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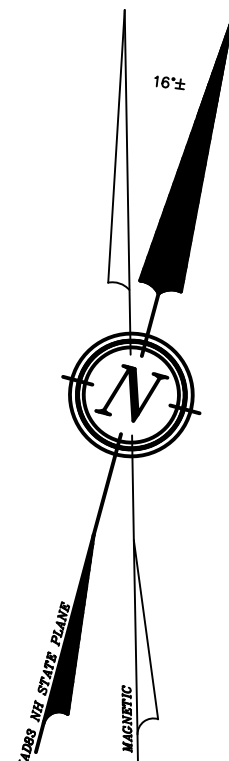
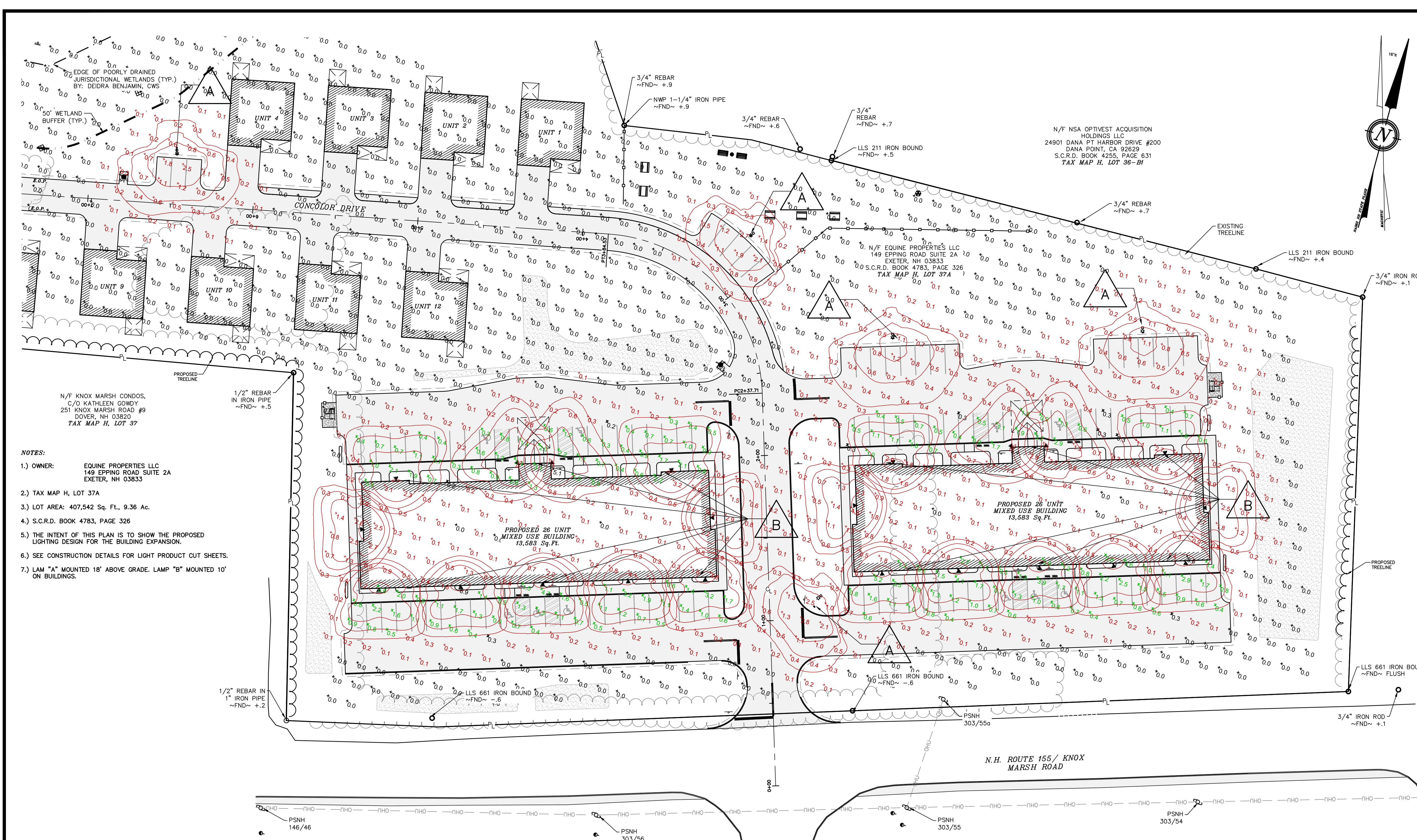
OVERVIEW UTILITY PLAN	
LAND OF EQUINE PROPERTIES LLC 239 KNOX MARSH ROAD DOVER, N.H. TAX MAP H, LOT 37A	
REVISION	DATE

OVERVIEW UTILITY PLAN	
LAND OF EQUINE PROPERTIES LLC 239 KNOX MARSH ROAD DOVER, N.H. TAX MAP H, LOT 37A	
REVISION	DATE

BERRY SURVEYING & ENGINEERING 335 SECOND CROWN POINT ROAD BARRINGTON, NH 03825 (603)332-2863 SCALE : 1 IN. EQUALS 50 FT. DATE : JANUARY 21, 2021 FILE NO. : DB 2020 - 066	
N/F NSA OPTIVEST ACQUISITION HOLDINGS LLC 24901 DANA PT HARBOR DRIVE #200 DANA POINT, CA 92629 S.C.R.D. BOOK 4255, PAGE 631 TAX MAP H, LOT 36-B1	

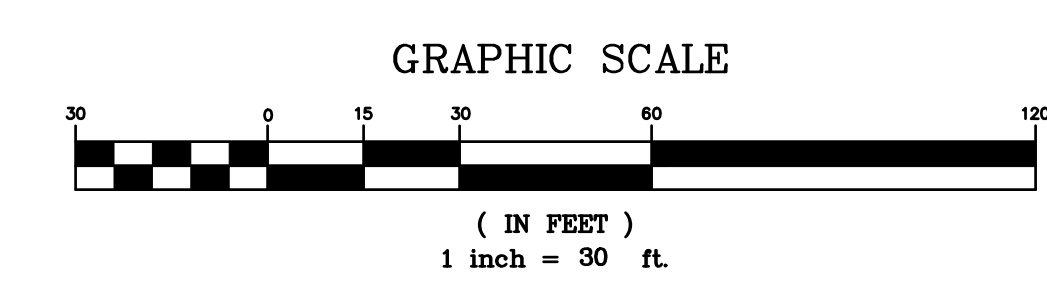






- NOTES:
- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
 - 2.) TAX MAP H, LOT 37A
 - 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
 - 4.) S.C.R.D. BOOK 4783, PAGE 326
 - 5.) THE INTENT OF THIS PLAN IS TO SHOW THE PROPOSED LIGHTING DESIGN FOR THE BUILDING EXPANSION.
 - 6.) SEE CONSTRUCTION DETAILS FOR LIGHT PRODUCT CUT SHEETS.
 - 7.) LAM "A" MOUNTED 18' ABOVE GRADE. LAMP "B" MOUNTED 10' ON BUILDINGS.

Schedule							
Symbol	Label	QTY	Catalog Number	Description	Lamp	Number Lamps	Lumens per Lamp
	A	5	ATB0 10BLEDE70 XXXXX R4 4K/5K	ATB0 SERIES LED 700MA TYPE 4 4000K/5000K CCT	LED Array	1	2992
	B	22	WSQ LED P2 SR4 40K MVOLT	WSQ LED WITH P2-PERFORMANCE PACKAGE, 4000K, AND SR4 OPTIC TYPE	LED	1	3053



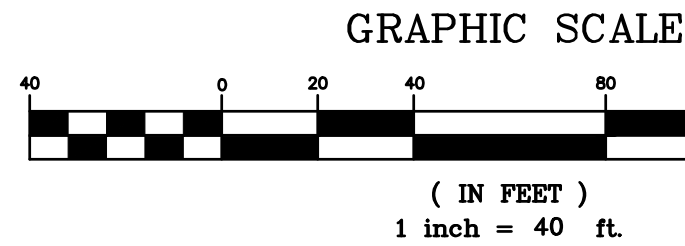
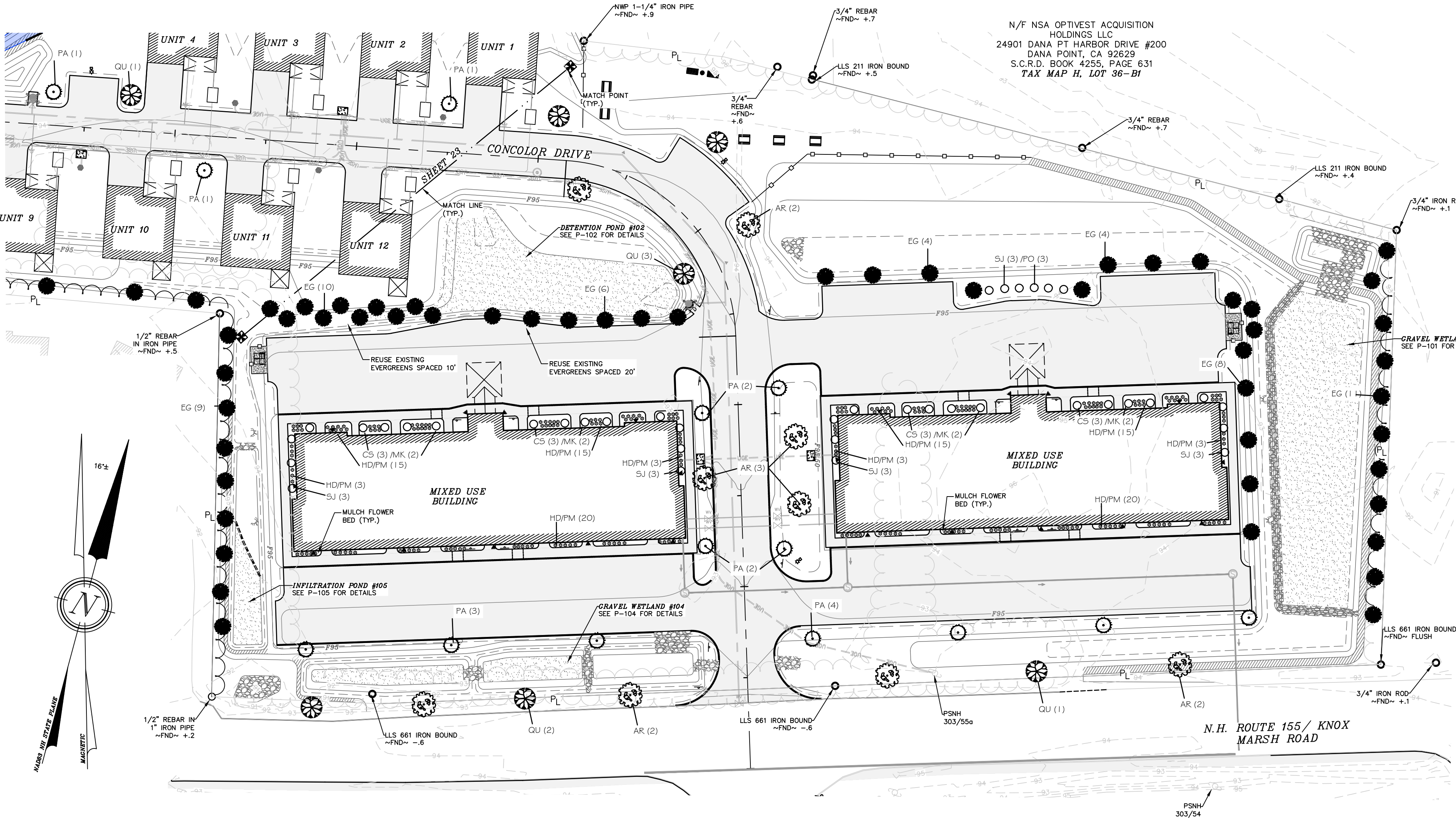
PLANNING FILE #

REVISION	DATE	DESCRIPTION

LIGHTING PLAN
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
SCALE : 1 IN. EQUALS 30 FT.
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066

SHEET 21 OF 38



- NOTES:**
- CALL DIG SAFE PRIOR TO BEGINNING WORK. (1-888-344-7233). THE LANDSCAPE CONTRACTOR IS ADVISED OF THE PRESENCE OF UNDERGROUND UTILITIES AND SHALL VERIFY THE EXISTENCE AND LOCATION OF THE SAME BEFORE COMMENCING AND DIGGING OPERATIONS. THE LANDSCAPE CONTRACTOR SHALL REPLACE OR REPAIR UTILITIES, PAVING, WALKS, CURBING, ETC DAMAGED IN PERFORMANCE OF THIS JOB AT NO ADDITIONAL COST TO THE OWNER OR GENERAL CONTRACTOR.
 - CONTRACTOR SHALL THOROUGHLY FAMILIARIZE THEMSELVES WITH ALL SITE CONDITIONS PRIOR TO CONSTRUCTION BIDDING.
 - THE CONTRACTOR SHALL SUPPLY ALL PLANT MATERIALS IN QUANTITIES SUFFICIENT TO COMPLETE THE PLANTINGS SHOWN ON THE DRAWINGS. VARIATIONS IN QUANTITIES ARE TO BE APPROVED BY THE DESIGN ENGINEER.
 - PROVIDED SMOOTH TRANSITION WHERE NEW WORK MEETS EXISTING CONDITIONS.
 - ALL PLANT MATERIAL INSTALLED SHALL MEET THE SPECIFICATIONS OF "AMERICAN STANDARD FOR NURSERY STOCK" BY THE AMERICAN ASSOCIATION OF NURSERYMEN
 - ALL PLANT MATERIALS SHALL BE FREE FROM INSECTS AND DISEASE.
 - ALL PLANTINGS SHALL BE DONE IN ACCORDANCE WITH ACCEPTABLE HORTICULTURAL PRACTICES. THIS IS TO INCLUDE PROPER PLANTING MIX, PLANT BED AND TREE PIT PREPARATION, PRUNING STAKING OR GUYING, WRAPPING, SPRAYING, FERTILIZATION, PLANTING AND ADEQUATE MAINTENANCE UNTIL ACCEPTANCE FROM OWNER.
 - ALL GRASS, OTHER VEGETATION AND DEBRIS SHALL BE REMOVED FROM ALL PLANTING AREAS PRIOR TO PLANTING.
 - THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF EXISTING AND NEWLY PLANTED TREES AND SHRUBS DURING THE CONSTRUCTION PROCESS. WHERE REQUIRED, THE CONTRACTOR SHALL INSTALL TEMPORARY FENCING (SNOW OR EQUAL) AROUND EXISTING TREES AND SHRUBS THAT COULD BE IMPACTED BY THE CONSTRUCTION PROCESS. STORAGE OF CONSTRUCTION EQUIPMENT, CONSTRUCTION MATERIALS, SNOW STORAGE AND OR VEHICLE PARKING SHALL NOT BE PERMITTED WITHIN THE DRIP LINE OF TREES OR TWENTY FEET WHICH EVER IS GREATER.
 - NEW PLANTINGS SHALL BE INSTALLED PER PROJECT DRAWINGS AND SPECIFICATION THAT INCLUDE FERTILIZATION AND MULCHING AS REQUIRED.
 - ALL SHRUB BEDS AND TREE PITS SHALL BE MULCHED WITH 3" CLEAN SHREDDED BLACK MULCH
 - WHERE INDICATED ON PLAN, PLANTING SOIL MIXTURE FOR GROUND COVER AND PERENNIAL BED AREAS SHALL CONSIST OF FOUR PARTS TOPSOIL, TWO PARTS SPHAGNUM PEAT MOSS, AND ONE PART HORTICULTURAL PERLITE BY VOLUME. PEAT MOSS MAY BE SUBSTITUTED WITH WELL-ROTTED OR DEHYDRATED MANURE OR COMPOST. ROTOTILL BEDS TO A DEPTH OF 8 INCHES.
 - MAINTENANCE OF NEW PLANTINGS AND LAWNS SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR AND OR LANDSCAPE SUBCONTRACTOR UNTIL ACCEPTANCE BY THE OWNER. RESPONSIBILITIES SHALL INCLUDE WATERING WEEDING AND MOWING AS NECESSARY. ALL PLANT MATERIAL SHALL BE GUARANTEED FOR A PERIOD OF ONE YEAR FROM THE DATE OF ACCEPTANCE, REPLACEMENT MATERIAL SHALL BE GUARANTEED FOR AND ADDITIONAL YEAR FROM TIME OF INSTALLATION.
 - THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL TEMPORARY EROSION CONTROL MEASURES DURING THE CONSTRUCTION PHASE AND UNTIL ALL AREAS HAVE BEEN STABILIZED AND ACCEPTED BY THE OWNER. THE GENERAL CONTRACTOR SHALL PROVIDE WEEKLY INSPECTIONS OF EROSION MEASURE AND IMMEDIATELY AFTER STORM EVENTS AND REPAIR AS NECESSARY.
 - THE GENERAL CONTRACTOR AND OR THE LANDSCAPE SUBCONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL THREE GUYING MATERIAL ONCE PLANT MATERIAL HAS BEEN ESTABLISHED. (MINIMUM OF ONE GROWING SEASON). ALL TEMPORARY EROSION CONTROL MEASURE SHALL BE REMOVED ONCE STABILIZATION OF DISTURBANCE HAS BEEN ACCEPTED BY OWNER.
 - THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR A MINIMUM OF TWO MOWINGS FOR ALL TURF AREAS OR UNTIL ACCEPTANCE BY THE OWNER. A MINIMUM UNIFORM 75% CATCH OF TURF IS REQUIRED FOR ACCEPTANCE.
 - ALL PLANTINGS SHALL BE WATERED REGULARLY DURING THEIR FIRST YEAR AND MAINTAINED PERMANENTLY IN GOOD GROWING CONDITION AS AN EFFECTIVE VISUAL SCREEN.
 - SHRUBS OR TREES WHICH DIE SHALL BE REPLACED WITHIN ONE GROWING SEASON WITH NEW SHRUBS OR TREES TO ENSURE CONTINUED COMPLIANCE WITH APPLICABLE LANDSCAPING REQUIREMENTS.
 - ALL REQUIRED LANDSCAPING SHALL BE INSTALLED BEFORE OCCUPANCY, OR WITHIN SIX MONTHS IF OCCUPANCY OCCURS DURING WINTER CONDITIONS.
 - TREES ARE TO BE 6' TALL AT PLANTING.
 - ALL PLANT STOCK SHALL CONFORM TO ANSI Z260.1 - NURSERY STOCK, LATEST EDITIONS (AMERICAN ASSOCIATION OF NURSERYMEN, INC.)
 - 4" AGED PINEBARK MULCH AND A WEED BARRIER (TY-PAR FABRIC OR APPROVED EQUAL)
 - SHALL BE APPLIED TO ALL SHRUB AND GROUND COVER BEDS. INSTALL WEED BARRIER AS PER MANUFACTURERS RECOMMENDATIONS.
 - PLANT-PIT BACK-FILL SHALL BE MIXED AT A RATE OF 7 PARTS OF TOPSOIL TO 2 PARTS OF DEHYDRATED COW MANURE. SLOW RELEASE FERTILIZER SHALL BE APPLIED AS PER MANUFACTURERS RECOMMENDATIONS. USE EXISTING ON-SITE TOPSOIL AS PART OF BACK FILL WHEN AVAILABLE.
 - ALL LANDSCAPED AREAS NOT PLANTED WITH TREES, SHRUBS OR GROUND COVER SHALL BE RESTORED WITH SEED OR SOD AS INDICATED ON PLANS.
 - TOPSOIL WILL BE TESTED FOR FERTILIZATION REQUIREMENTS, AND SLOW RELEASE ENVIRONMENTALLY FRIENDLY FERTILIZER WILL BE APPLIED AT THE RECOMMENDED RATES.
 - ALL DISTURBED WETLAND BUFFER AREAS, EXCEPT FOR AREAS THAT ARE PART OF THE DRAINAGE SYSTEM, ARE TO BE RESEED WITH A CONSERVATION SEED MIX AND ONLY MOWED TWICE PER YEAR.
 - ALL PLANT SUBSTITUTIONS MUST BE APPROVED BY THE ENGINEER.
 - PLANTS SHALL BE SUBJECT TO INSPECTION AND APPROVAL AT THE PLACE OF GROWTH, UPON DELIVERY OR AT THE JOB SITE WHILE WORK IS ONGOING TO CONFORMITY TO SPECIFIED QUALITY, SIZE AND VARIETY.
 - PLANTS FURNISHED IN CONTAINERS SHALL HAVE THE ROOTS WELL ESTABLISHED IN THE SOIL MASS AND SHALL HAVE AT LEAST ONE (1) GROWING SEASON. ROOT-BOUND PLANTS OR INADEQUATELY SIZED CONTAINERS TO SUPPORT THE PLANT MAY BE DEEMED UNACCEPTABLE.
 - ALL PLANTS SHALL BE GUARANTEED BY THE CONTRACTOR FOR NO LESS THAN ONE FULL YEAR FROM THE TIME OF INSTALLATION. DURING THIS TIME, THE OWNER SHALL MAINTAIN ALL PLANT MATERIALS IN THE ABOVE MANNER. IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSPECT THE PLANTS TO ENSURE PROPER CARE. IF THE CONTRACTOR IS DISSATISFIED WITH THE CARE GIVEN, HE SHALL IMMEDIATELY, AND IN SUFFICIENT TIME TO PERMIT THE CONDITION TO BE RECTIFIED, NOTIFY THE OWNER IN WRITING OR OTHERWISE FORFEIT HIS CLAIM.
 - BY THE END OF THE GUARANTEE PERIOD, THE CONTRACTOR SHALL HAVE REPLACED ANY PLANT MATERIAL THAT IS MISSING, NOT TRUE TO SIZE AS SPECIFIED, THAT HAS DIED, THAT HAS LOST NATURAL SHAPE DUE TO DEAD BRANCHES, EXCESS PRUNING OR INADEQUATE OR IMPROPER CARE, OR IS, IN THE OPINION OF THE OWNER, IN UNHEALTHY OR UNSIGHTLY CONDITION.
 - THE CONTRACTOR IS TO USE TEMPORARY MEASURES FOR WATERING PLANTS DURING THE ESTABLISHMENT PERIOD. INCLUDING CONNECTING TEMPORARY HOSES TO THE STRUCTURE WATER SUPPLY LINE AND UTILIZING SPRINKLERS UNTIL 85% GROWTH OCCURS.

PLANTING NOTES

- CONTRACTOR SHALL OBTAIN APPROVAL FROM L.A. PRIOR TO PURCHASING &/OR INSTALLING SUBSTITUTE PLANT MATERIAL PRIOR TO PURCHASE OF ANY SUBSTITUTE MATERIALS.
- CONSTRUCTION ACCESS WILL BE AS DIRECTED BY L.A. CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF ACCESS ROUTE AND ALL AREAS DISTURBED BY PLANTING OPERATIONS UPON COMPLETION OF CONSTRUCTION OPERATIONS, AT NO ADDITIONAL COST TO THE OWNER.
- LAYOUT OF ALL PLANTING BEDS AND LOCATION OF PLANTS TO BE APPROVED BY L.A. ON SITE PRIOR TO CONSTRUCTION AND INSTALLATION.
- CONTRACTOR TO REMOVE ALL DEBRIS GENERATED BY PLANT INSTALLATION. DEBRIS TO BE DISPOSED OF IN A LEGAL MANNER.
- ALL PLANT MATERIAL SHALL BE GUARANTEED TO BE IN GOOD, HEALTHY & FLOURISHING CONDITION FOR ONE YEAR FROM THE DATE OF FINAL INSTALLATION APPROVAL BY L.A. CONTRACTOR SHALL REPLACE, WITHOUT COST TO OWNER, AND AS SOON AS WEATHER CONDITIONS PERMIT, ALL DEAD AND NON-FLOURISHING PLANTS AS DETERMINED BY THE L.A. REPLACEMENT PLANTS SHALL BE GUARANTEED IDENTICALLY TO ORIGINAL PLANTS, TIME PERIOD COMMENCING FROM DATE OF REPLACEMENT PLANTING APPROVAL BY L.A.
- ALL BEDS TO BE MULCHED WITH 3" DEPTH SHREDDED BARK MULCH UNLESS NOTED OTHERWISE.
- CONTRACTOR TO PROVIDE NECESSARY TEMPORARY IRRIGATION IF NEEDED BASED ON TIME OF YEAR THE PROJECT IS IMPLEMENTED.
- ALL PLANT MATERIAL TO COMPLY WITH THE CITY OF DOVER'S SITE REVIEW REGULATIONS, 149-14(G), SUCH THAT THERE SHALL BE DECIDUOUS SHADE TREES PLANTED 40 FEET O.C. ALONG THE PERIMETER OF THE PARKING LOTS AND SHRUBS PLANTED 5 FEET O.C. WITHIN THE PERIMETER BUFFER. SEE PLANT LIST FOR SPECIES AND SIZE OF PLANTS.

TEMPORARY WATERING NOTES

- CONTRACTOR IS RESPONSIBLE FOR MAKING SURE ALL PLANT MATERIAL HAS ADEQUATE WATER DURING THE ESTABLISHMENT PERIOD.
- THE USE OF GATOR BAGS, SOAKER HOSE, HAND WATERING AND OTHER TECHNIQUES SHOULD BE USED TO ASSURE PROPER HYDRATION OF THE PLANTINGS IS MAINTAINED.
- TEMPORARY IRRIGATION SYSTEMS CAN BE SET UP TO ASSIST IN WATERING ACTIVITIES.

PLANTING SCHEDULE Knox Marsh Road Botanical Name/ Common Name

Trees	Size	Qty	Label
Plantanus acerifolia/London Planetree	3" Cal.	15	PA
Acer Rubrum / Red maple	3" Cal.	17	AR
Resue Evergreens on site	3" Cal.	94	EG
Quercus/ White Oak	3" Cal.	9	QU
Shrubs			
Cornus sanguina 'Winter Flame' / Winter Flame Dogwood	2-3' B&B	22	CS
Physocarpus opulifolius 'Summer Wine' / Summer Wine Ninebark	2-3' B&B	15	PO
Spiraea japonica 'Neon Flash' / Neon Flash Spirea	#3	40	SJ
Syringa patula 'Miss Kim' / Miss Kim Lilac	2-3' B&B	12	MK
Vaccinium Corymbosum/Highbush blueberry	2-3' B&B	17	HB
Ilex Glabra / Ink berry	2-3' B&B	17	IG
Perennials			
Hemerocallis 'Big Time Happy' / Big Time Happy Daylily	#1	60	HD
Hemerocallis 'Pardon Me' / Pardon Me Daylily	#1	60	PM



General Plant Maintenance Guide

General Plant Bed Maintenance:

- All plant maintenance should be performed by a qualified horticulturalist or licensed arborist. Cleaning the dead material out of the planting bed in the fall helps keep litter from building up around the plants and in some cases killing the plants. Watering the first year during dry periods will help get the plants established. Mulching every year is not necessary. Raking the old mulch and turning it over is all that is needed. When necessary only install one inch of mulch and do not place the mulch closer than 3" to the trunks or stems of woody plants.

Trees

- The first year watering during dry periods will be necessary.
- 3" inches of mulch maybe used. The mulch should be kept 3 inches from the trunk.
- Fertilizing is not necessary for the first year. Fertilizing in subsequent years only when and if the foliage is looking weak.
- Fertilization should occur prior to Mat 31" or after trees have dropped their leaves for the year.
- Prune dead wood once a year.
- Depending on the amount of compaction the bed area receives, deep root aeration may be needed over time.

Woody Shrubs

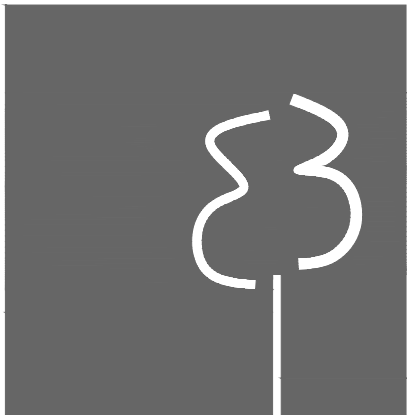
- The first year watering during dry periods will be necessary.
- 3" inches of mulch maybe used. The mulch should be kept 3 inches from the stems.
- Fertilizing is not necessary for the first year. Fertilizing in subsequent years only when and if the foliage is looking weak.
- Fertilization should occur prior to Mat 31" or after shrubs have dropped their leaves or gone dormant for the year.
- Prune dead wood once a year.

Grasses

- Grasses only need to be clipped back at the end of the growing season and all the clippings removed from the area.
- Do not over mulch. Too much mulch will prohibit the grass from developing into a strong clump.

Perennials

- All perennials need to be pruned back after the first or second hard frost. A two-step method: first dead head all the flower heads and let drop to the ground for re-seeding. Second cut the stems back to 3" above the ground and remove the stem and leaf litter and place in compost. Do not over mulch. Too much mulch will prohibit the growth and development.
- Fertilizing perennials once in the spring with a low phosphate fertilizer will help the plants to get started in the spring.



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311 kast hill road
hopkinton, nh 03229
603. 491. 2322
terrainplanning.com

239 KNOX MARSH
ROAD

Site Location:
239 KNOX MARSH ROAD
Dover, NH
Tax Map: H, Lot 37-A

Prepared For:
Berry Surveying & Engineering Inc
335 Second Crown Point Rd
Barrington, NH 03825

LANDSCAPE PLAN

DATE: JANUARY 21, 2020

SCALE: 1" = 40'

PROJECT #: 20-066

Drawn By: ID

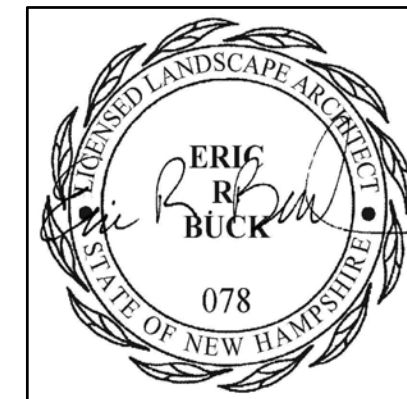
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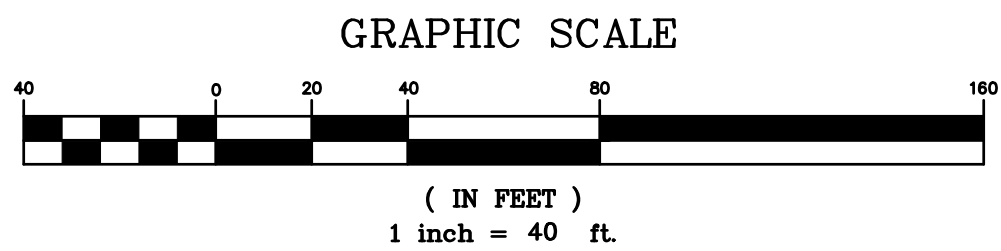
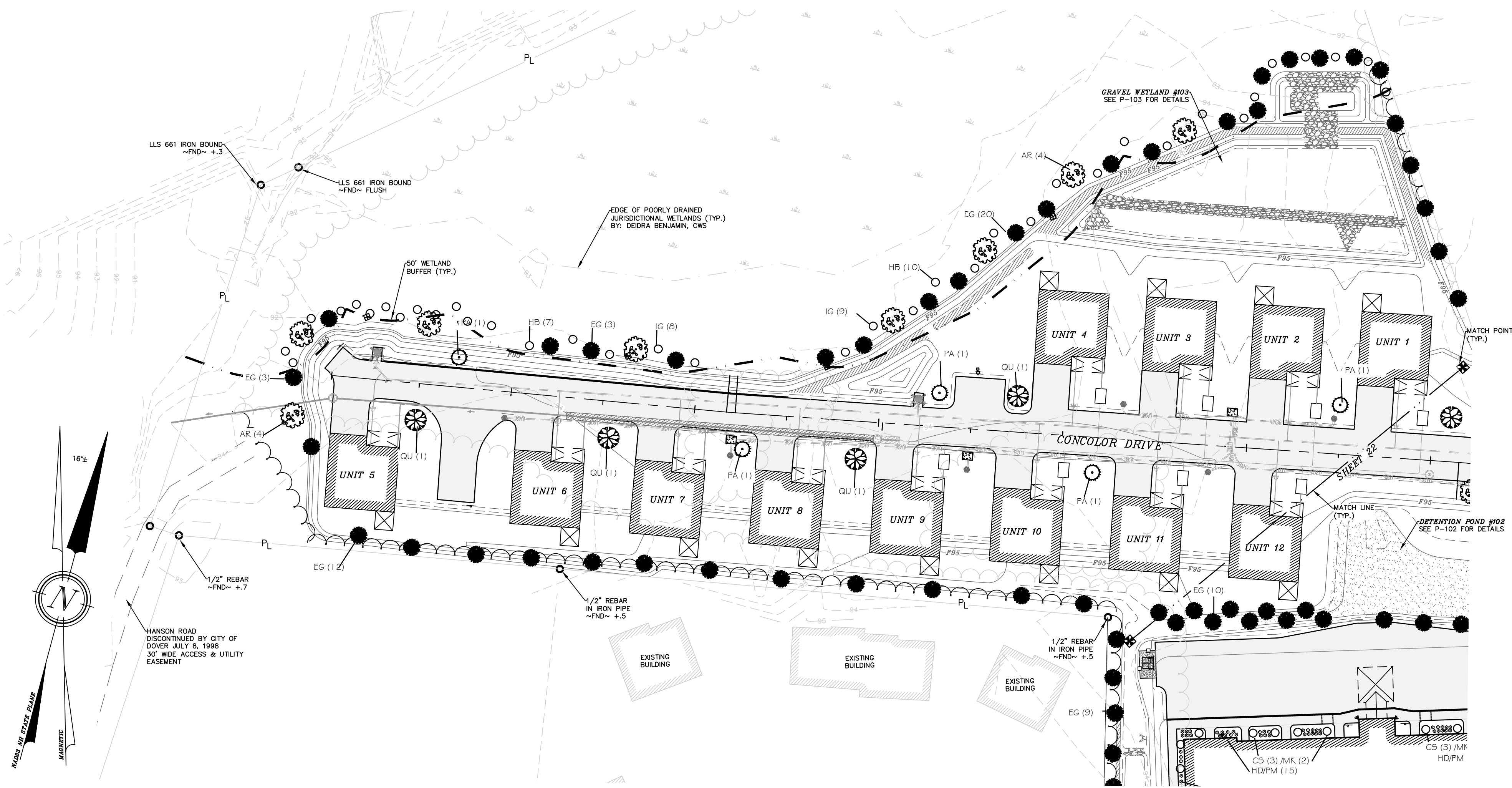
REVISIONS: DATE:
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SHEET 22 OF 38





- NOTES:**
- CALL DIG SAFE PRIOR TO BEGINNING WORK. (1-888-344-7233). THE LANDSCAPE CONTRACTOR IS ADVISED OF THE PRESENCE OF UNDERGROUND UTILITIES AND SHALL VERIFY THE EXISTENCE AND LOCATION OF THE SAME BEFORE COMMENCING AND DIGGING OPERATIONS. THE LANDSCAPE CONTRACTOR SHALL REPLACE OR REPAIR UTILITIES, PAVING, WALKS, CURBING, ETC DAMAGED IN PERFORMANCE OF THIS JOB AT NO ADDITIONAL COST TO THE OWNER OR GENERAL CONTRACTOR.
 - CONTRACTOR SHALL THOROUGHLY FAMILIARIZE THEMSELVES WITH ALL SITE CONDITIONS PRIOR TO CONSTRUCTION BIDDING.
 - THE CONTRACTOR SHALL SUPPLY ALL PLANT MATERIALS IN QUANTITIES SUFFICIENT TO COMPLETE THE PLANTINGS SHOWN ON THE DRAWINGS. VARIATIONS IN QUANTITIES ARE TO BE APPROVED BY THE DESIGN ENGINEER.
 - PROVIDED SMOOTH TRANSITION WHERE NEW WORK MEETS EXISTING CONDITIONS.
 - ALL PLANT MATERIAL INSTALLED SHALL MEET THE SPECIFICATIONS OF "AMERICAN STANDARD FOR NURSERY STOCK" BY THE AMERICAN ASSOCIATION OF NURSERYMEN
 - ALL PLANT MATERIALS SHALL BE FREE FROM INSECTS AND DISEASE.
 - ALL PLANTINGS SHALL BE DONE IN ACCORDANCE WITH ACCEPTABLE HORTICULTURAL PRACTICES. THIS IS TO INCLUDE PROPER PLANTING MIX, PLANT BED AND TREE PIT PREPARATION, PRUNING STAKING OR GUYING, WRAPPING, SPRAYING, FERTILIZATION, PLANTING AND ADEQUATE MAINTENANCE UNTIL ACCEPTANCE FROM OWNER.
 - ALL GRASS, OTHER VEGETATION AND DEBRIS SHALL BE REMOVED FROM ALL PLANTING AREAS PRIOR TO PLANTING.
 - THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF EXISTING AND NEWLY PLANTED TREES AND SHRUBS DURING THE CONSTRUCTION PROCESS. WHERE REQUIRED, THE CONTRACTOR SHALL INSTALL TEMPORARY FENCING (SNOW OR EQUAL) AROUND EXISTING TREES AND SHRUBS THAT COULD BE IMPACTED BY THE CONSTRUCTION PROCESS. STORAGE OF CONSTRUCTION EQUIPMENT, CONSTRUCTION MATERIALS, SNOW STORAGE AND OR VEHICLE PARKING SHALL NOT BE PERMITTED WITHIN THE DRIP LINE OF TREES OR TWENTY FEET WHICH EVER IS GREATER.
 - NEW PLANTINGS SHALL BE INSTALLED PER PROJECT DRAWINGS AND SPECIFICATION THAT INCLUDE FERTILIZATION AND MULCHING AS REQUIRED.
 - ALL SHRUB BEDS AND TREE PITS SHALL BE MULCHED WITH 3" CLEAN SHREDDED BLACK MULCH
 - WHERE INDICATED ON PLAN, PLANTING SOIL MIXTURE FOR GROUND COVER AND PERENNIAL BED AREAS SHALL CONSIST OF FOUR PARTS TOPSOIL, TWO PARTS SPHAGNUM PEAT MOSS, AND ONE PART HORTICULTURAL PERLITE BY VOLUME. PEAT MOSS MAY BE SUBSTITUTED WITH WELL-ROTTED OR DEHYDRATED MANURE OR COMPOST. ROTOTILL BEDS TO A DEPTH OF 8 INCHES.
 - MAINTENANCE OF NEW PLANTINGS AND LAWNS SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR AND OR LANDSCAPE SUBCONTRACTOR UNTIL ACCEPTANCE BY THE OWNER. RESPONSIBILITIES SHALL INCLUDE WATERING WEEDING AND MOWING AS NECESSARY. ALL PLANT MATERIAL SHALL BE GUARANTEED FOR A PERIOD OF ONE YEAR FROM THE DATE OF ACCEPTANCE, REPLACEMENT MATERIAL SHALL BE GUARANTEED FOR AND ADDITIONAL YEAR FROM TIME OF INSTALLATION.
 - THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL TEMPORARY EROSION CONTROL MEASURES DURING THE CONSTRUCTION PHASE AND UNTIL ALL AREAS HAVE BEEN STABILIZED AND ACCEPTED BY THE OWNER. THE GENERAL CONTRACTOR SHALL PROVIDE WEEKLY INSPECTIONS OF EROSION MEASURE AND IMMEDIATELY AFTER STORM EVENTS AND REPAIR AS NECESSARY.
 - THE GENERAL CONTRACTOR AND OR THE LANDSCAPE SUBCONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL THREE GUYING MATERIAL ONCE PLANT MATERIAL HAS BEEN ESTABLISHED. (MINIMUM OF ONE GROWING SEASON). ALL TEMPORARY EROSION CONTROL MEASURE SHALL BE REMOVED ONCE STABILIZATION OF DISTURBANCE HAS BEEN ACCEPTED BY OWNER.
 - THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR A MINIMUM OF TWO MOWINGS FOR ALL TURF AREAS OR UNTIL ACCEPTANCE BY THE OWNER. A MINIMUM UNIFORM 75% CATCH OF TURF IS REQUIRED FOR ACCEPTANCE.
 - ALL PLANTINGS SHALL BE WATERED REGULARLY DURING THEIR FIRST YEAR AND MAINTAINED PERMANENTLY IN GOOD GROWING CONDITION AS AN EFFECTIVE VISUAL SCREEN.
 - SHRUBS OR TREES WHICH DIE SHALL BE REPLACED WITHIN ONE GROWING SEASON WITH NEW SHRUBS OR TREES TO ENSURE CONTINUED COMPLIANCE WITH APPLICABLE LANDSCAPING REQUIREMENTS.
 - ALL REQUIRED LANDSCAPING SHALL BE INSTALLED BEFORE OCCUPANCY, OR WITHIN SIX MONTHS IF OCCUPANCY OCCURS DURING WINTER CONDITIONS.
 - TREES ARE TO BE 6' TALL AT PLANTING.
 - ALL PLANT STOCK SHALL CONFORM TO ANSI Z260.1 – NURSERY STOCK, LATEST EDITIONS (AMERICAN ASSOCIATION OF NURSERYMEN, INC.)
 - 4" AGED PINEBARK MULCH AND A WEED BARRIER (TY-PAR FABRIC OR APPROVED EQUAL)

- PLANTING NOTES**
- CONTRACTOR SHALL OBTAIN APPROVAL FROM L.A. PRIOR TO PURCHASING &/OR INSTALLING SUBSTITUTE PLANT MATERIAL PRIOR TO PURCHASE OF ANY SUBSTITUTE MATERIALS.
 - CONSTRUCTION ACCESS WILL BE AS DIRECTED BY L.A. CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF ACCESS ROUTE AND ALL AREAS DISTURBED BY PLANTING OPERATIONS UPON COMPLETION OF CONSTRUCTION OPERATIONS, AT NO ADDITIONAL COST TO THE OWNER.
 - LAYOUT OF ALL PLANTING BEDS AND LOCATION OF PLANTS TO BE APPROVED BY L.A. ON SITE PRIOR TO CONSTRUCTION AND INSTALLATION.
 - CONTRACTOR TO REMOVE ALL DEBRIS GENERATED BY PLANT INSTALLATION. DEBRIS TO BE DISPOSED OF IN A LEGAL MANNER.
 - ALL PLANT MATERIAL SHALL BE GUARANTEED TO BE IN GOOD, HEALTHY & FLOURISHING CONDITION FOR ONE YEAR FROM THE DATE OF FINAL INSTALLATION APPROVAL BY L.A. CONTRACTOR SHALL REPLACE, WITHOUT COST TO OWNER, AND AS SOON AS WEATHER CONDITIONS PERMIT, ALL DEAD AND NON-FLOURISHING PLANTS AS DETERMINED BY THE L.A. REPLACEMENT PLANTS SHALL BE GUARANTEED IDENTICALLY TO ORIGINAL PLANTS, TIME PERIOD COMMENCING FROM DATE OF REPLACEMENT PLANTING APPROVAL BY L.A.
 - ALL BEDS TO BE MULCHED WITH 3" DEPTH SHREDDED BARK MULCH UNLESS NOTED OTHERWISE.
 - CONTRACTOR TO PROVIDE NECESSARY TEMPORARY IRRIGATION IF NEEDED BASED ON TIME OF YEAR THE PROJECT IS IMPLEMENTED.
 - ALL PLANT MATERIAL TO COMPLY WITH THE CITY OF DOVER'S SITE REVIEW REGULATIONS, 149-14(G), SUCH THAT THERE SHALL BE DECIDUOUS SHADE TREES PLANTED 40 FEET O.C. ALONG THE PERIMETER OF THE PARKING LOTS AND SHRUBS PLANTED 5 FEET O.C. WITHIN THE PERIMETER BUFFER. SEE PLANT LIST FOR SPECIES AND SIZE OF PLANTS.
- TEMPORARY WATERING NOTES**
- CONTRACTOR IS RESPONSIBLE FOR MAKING SURE ALL PLANT MATERIAL HAS ADEQUATE WATER DURING THE ESTABLISHMENT PERIOD.
 - THE USE OF GATOR BAGS, SOAKER HOSE, HAND WATERING AND OTHER TECHNIQUES SHOULD BE USED TO ASSURE PROPER HYDRATION OF THE PLANTINGS IS MAINTAINED.
 - TEMPORARY IRRIGATION SYSTEMS CAN BE SET UP TO ASSIST IN WATERING ACTIVITIES.

PLANTING SCHEDULE			
Knox Marsh Road			
Botanical Name/ Common Name			
Trees			
Plantanus acerifolia/London Planetree	Size	Qty	Label
Acer Rubrum / Red maple	3" Cal.	15	PA
Resue Evergreens on site	3" Cal.	17	AR
Quercus/ White Oak	3" Cal.	94	EG
	3" Cal.	9	QU
Shrubs			
Cornus sanguina 'Winter Flame' / Winter Flame Dogwood	2-3' B&B	22	CS
Physocarpus opulifolius 'Summer Wine' / Summer Wine Ninebark	2-3' B&B	15	PO
Spiraea japonica 'Neon Flash' / Neon Flash Spirea	#3	40	SJ
Syringa patula 'Miss Kim' / Miss Kim Lilac	2-3' B&B	12	MK
Vaccinium Corymbosum/Highbush blueberry	2-3' B&B	17	HB
Ilex Glabra / Ink berry	2-3' B&B	17	IG
Perennials			
Hemerocallis 'Big Time Happy' / Big Time Happy Daylily	#1	60	HD
Hemerocallis 'Pardon Me' / Pardon Me Daylily	#1	60	PM



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General Plant Maintenance Guide

General Plant Bed Maintenance:

- All plant maintenance should be performed by a qualified horticulturalist or licensed arborist. Cleaning the dead material out of the planting bed in the fall helps keep litter from building up around the plants and in some cases killing the plants. Watering the first year during dry periods will help get the plants established. Mulching every year is not necessary. Raking the old mulch and turning it over is all that is needed. When necessary only install one inch of mulch and do not place the mulch closer than 3" to the trunks or stems of woody plants.

Trees

- The first year watering during dry periods will be necessary.
- 3" inches of mulch maybe used. The mulch should be kept 3 inches from the trunk.
- Fertilizing is not necessary for the first year. Fertilizing in subsequent years only when and if the foliage is looking weak.
- Fertilization should occur prior to Mat 31" or after trees have dropped their leaves for the year.
- Prune dead wood once a year.
- Depending on the amount of compaction the bed area receives, deep root aeration may be needed over time.

Woody Shrubs

- The first year watering during dry periods will be necessary.
- 3" inches of mulch maybe used. The mulch should be kept 3 inches from the stems.
- Fertilizing is not necessary for the first year. Fertilizing in subsequent years only when and if the foliage is looking weak.
- Fertilization should occur prior to Mat 31" or after shrubs have dropped their leaves or gone dormant for the year.
- Prune dead wood once a year.

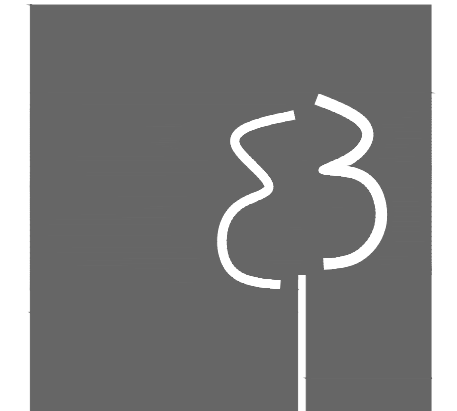
Grasses

- Grasses only need to be clipped back at the end of the growing season and all the clippings removed from the area.
- Do not over mulch. Too much mulch will prohibit the grass from developing into a strong clump.

Perennials

- All perennials need to be pruned back after the first or second hard frost. A two-step method: first dead head all the flower heads and let drop to the ground for re-seeding. Second cut the stems back to 3" above the ground and remove the stem and leaf litter and place in compost. Do not over mulch. Too much mulch will prohibit the growth and development.
- Fertilizing perennials once in the spring with a low phosphate fertilizer will help the plants to get started in the spring.

www.terrainplanning.com 311 kast hill road hopkinton nh 03229 T:603-491-2322



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311 kast hill road
hopkinton, nh 03229
603. 491. 2322
terrainplanning.com

239 KNOX MARSH
ROAD

Site Location:
239 KNOX MARSH ROAD
Dover, NH
Tax Map: H, Lot 37-A

Prepared For:
Berry Surveying & Engineering
335 Second Crown Point Rd
Barrington, NH 03825

LANDSCAPE
PLAN

DATE: JANUARY 21, 2020

SCALE: 1" = 40'

PROJECT #: 20-066

Drawn By: ID

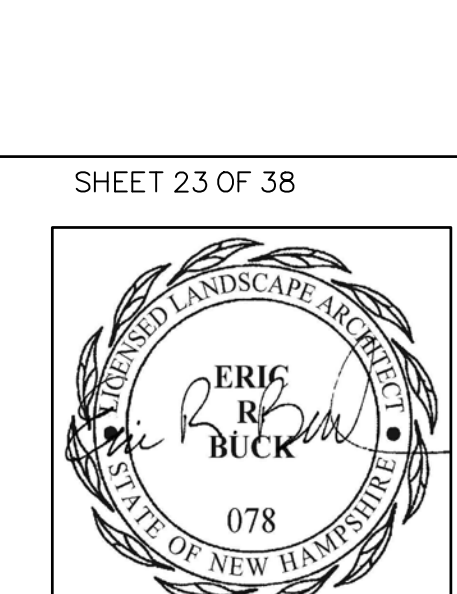
Checked By: ERB

REVISIONS: DATE:
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SHEET 23 OF 38



- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
- 2.) TAX MAP H, LOT 37A
- 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
- 4.) S.C.R.D. BOOK 4783, PAGE 326
- 5.) THIS IS PROPOSED TO BE A RESIDENTIAL AND COMMERCIAL DRIVEWAY.
- 6.) EXISTING CONDITIONS INFORMATION IS BASED ON A SURVEY PERFORMED BY BERRY SURVEYING & ENGINEERING AND IS ENCLOSED IN THIS PACKAGE.
- 7.) THIS PROJECT SHALL BE CONSTRUCTED IN ACCORDANCE WITH MHDOT STANDARD SPECIFICATIONS DATED 2010, CURRENT STANDARD PLANS, SUPPLEMENTAL SPECIFICATIONS AND SPECIAL PROVISIONS INCLUDED IN THE PROPOSAL.
- 8.) CONTRACTOR SHALL TAKE SPECIAL CARE IN NOT DISTURBING EXISTING MONUMENTS BOUNDS, AND OR BENCHMARKS WITHOUT FIRST MAKING PROVISIONS FOR RELOCATION.

9.) THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO LOCATE EXACTLY AND TO PRESERVE ANY AND ALL UNDERGROUND UTILITIES CALL "DIG-SAFE" 1-888-DIGSAFE (344-7233) AT LEAST 72 HOURS BEFORE COMMENCING CONSTRUCTION.

10.) WHERE AN EXISTING UNDERGROUND UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.

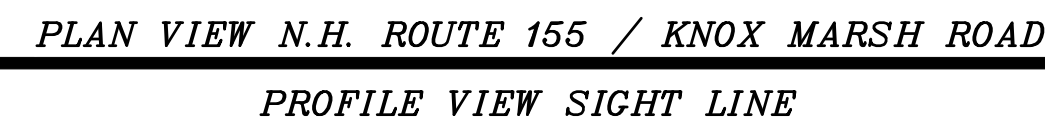
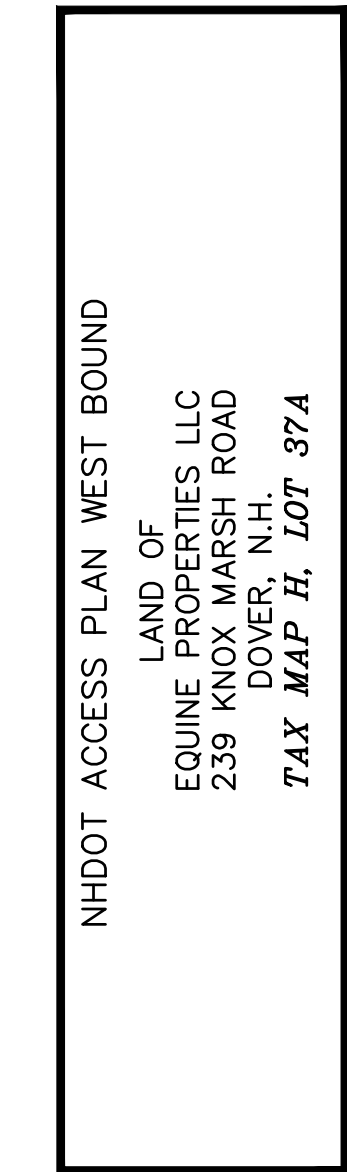
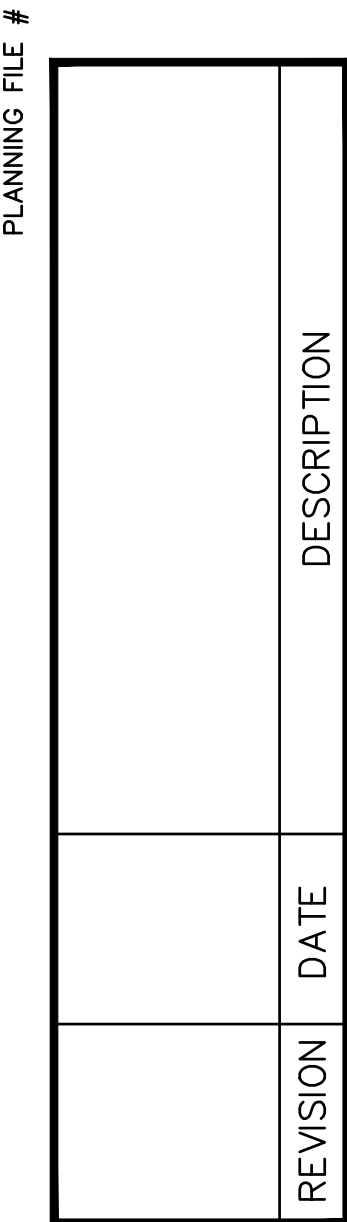
11.) THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES.

12.) AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.

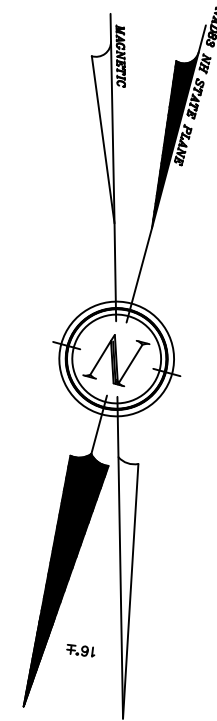
13.) THE TERM "PROPOSED" (PROP.) MEANS WORK TO BE CONSTRUCTED USING NEW MATERIALS, OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE & RESET" (R & R)

- 14.) ALL EXISTING SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS NOTED OTHERWISE.
- 15.) ALL DISTURBED AREAS NOT DESIGNATED TO BE PAVED SHALL HAVE LOAM PLACED AND SEEDDED. THE LOAM SHALL HAVE A MINIMUM DEPTH OF 4 INCHES AND SHALL BE PLACED FLUSH WITH THE TOP OF THE ADJACENT CURB, EDGING, BERM OR PAVEMENT SURFACE.
- 16.) THE SPEED LIMIT ON KNOX MARSH ROAD IS 40MPH.
- 17.) WORK WITHIN NHDOT R.O.W. WILL REQUIRE PROFESSIONAL FLAGGING SERVICES.
- 18.) DESIGN ENGINEER TO PROVIDE INSPECTION & OVERSIGHT OF ALL WORK WITHIN R.O.W.
- 19.) SEE SHEET 37 FOR ENTRANCE TURNING TEMPLATES.
- 20.) SEE SHEET 32 FOR SPOT GRADE DETAIL.

○ DRILL HOLE ~FND~
 ○ IRON PIPE ~FND~
 ○ IRON BOUND ~FND~
 ○ SIGNAGE
 -○- UTILITY POLE
 -○- GUY WIRE
 _____ OVERHEAD UTILITIES LINE
 _____ SHOWER
 _____ BUILDING SETBACK LINE
 _____ CENTER LINE
 _____ CLEAR ZONE LINE
 S.C.R.D. STAFFORD COUNTY REGISTRY OF DEEDS
 TYP. TYPICAL
 FND FOUND
 PL PROPERTY LINE
 EL EASEMENT LINE
 R.O.W. RIGHT OF WAY
 E.O.P. EDGE OF PAVEMENT
 SSL (W) SINGLE SOLID LINE (WHITE)
 SSL (Y) DOUBLE SOLID LINE (YELLOW)



- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
- 2.) TAX MAP H, LOT 37A
- 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
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- 7.) THIS PROJECT SHALL BE CONSTRUCTED IN ACCORDANCE WITH NHDOT STANDARD SPECIFICATIONS DATED 2010. CURRENT STANDARD PLANS, SUPPLEMENTAL SPECIFICATIONS AND SPECIAL PROVISIONS INCLUDED IN THE PROPOSAL.
- 8.) CONTRACTOR SHALL TAKE SPECIAL CARE IN NOT DISTURBING EXISTING MONUMENTS BOUNDS, AND OR BENCHMARKS WITHOUT FIRST MAKING PROVISIONS FOR RELOCATION.



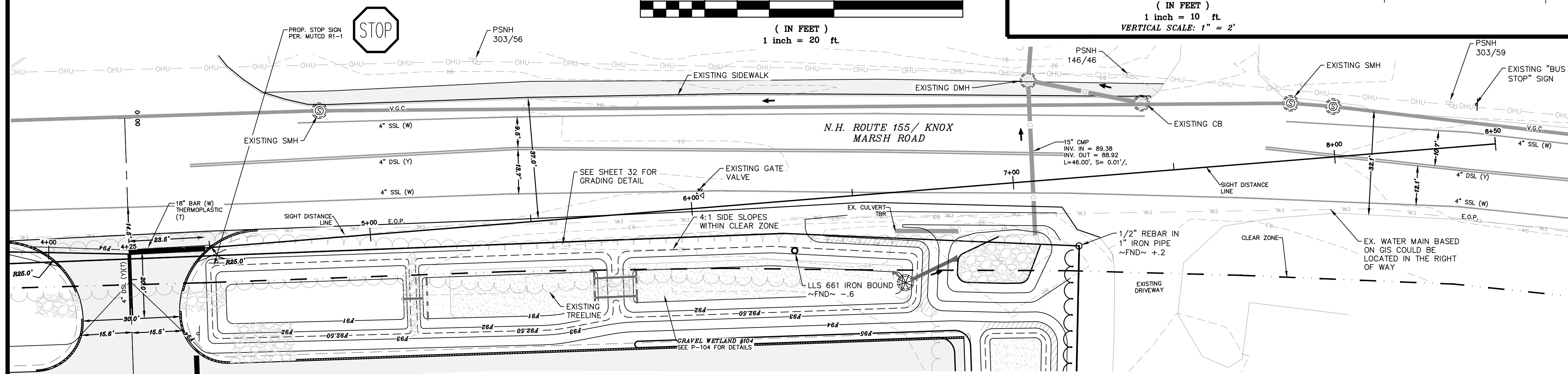
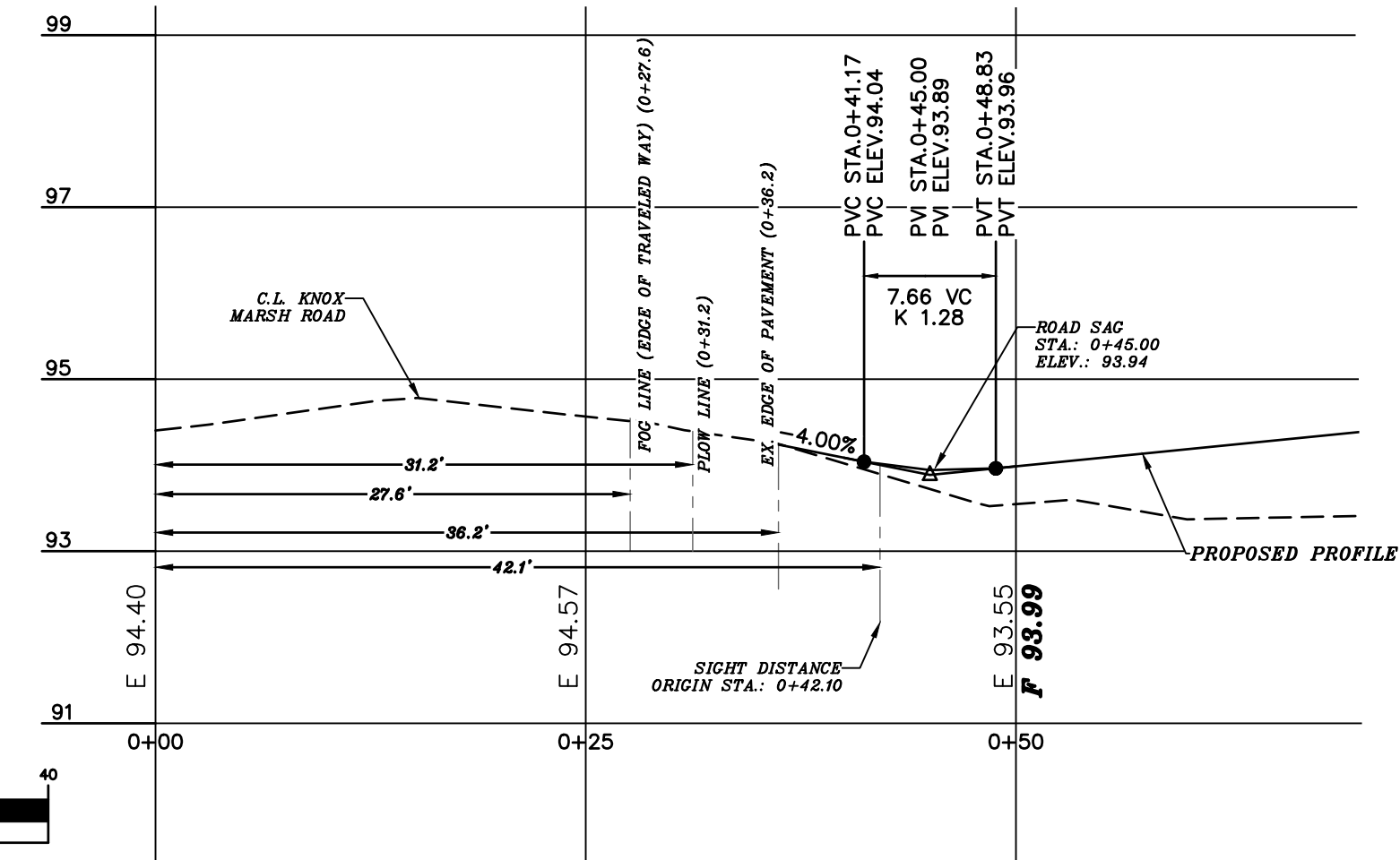
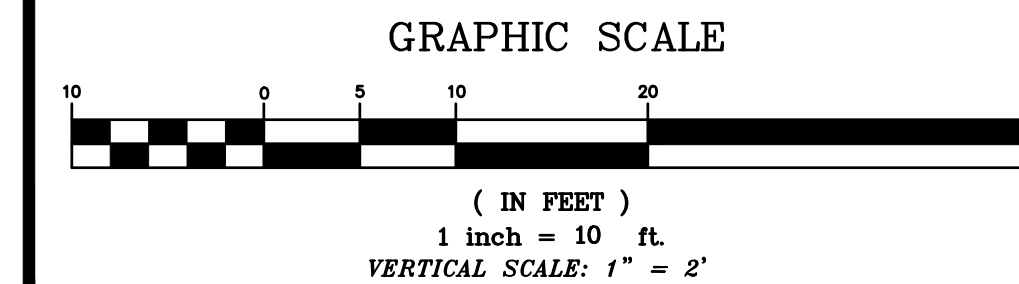
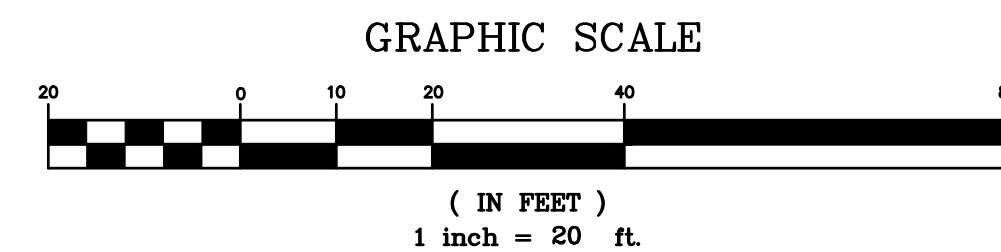
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(ACCURATE COUNTS)

WESTBOUND DESIGN ADT (2019): 12,546 (NHDOT)

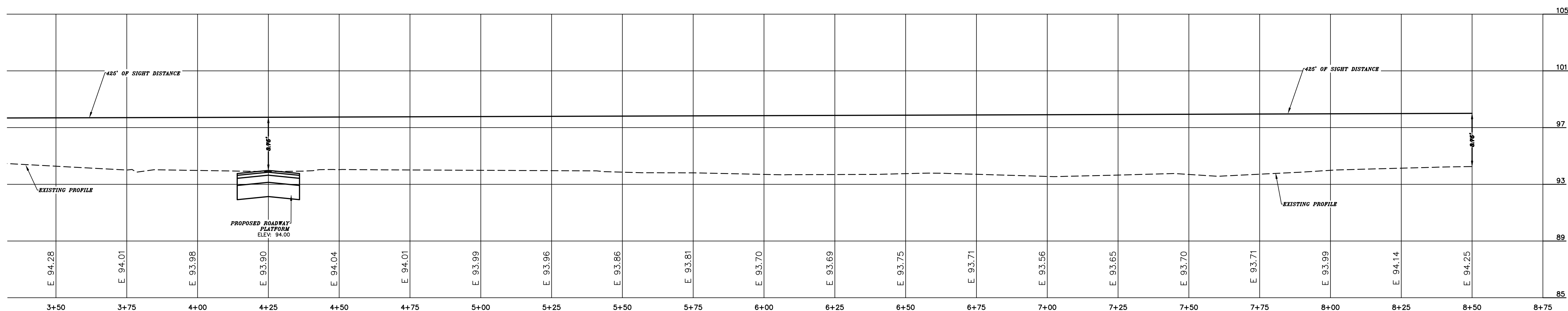
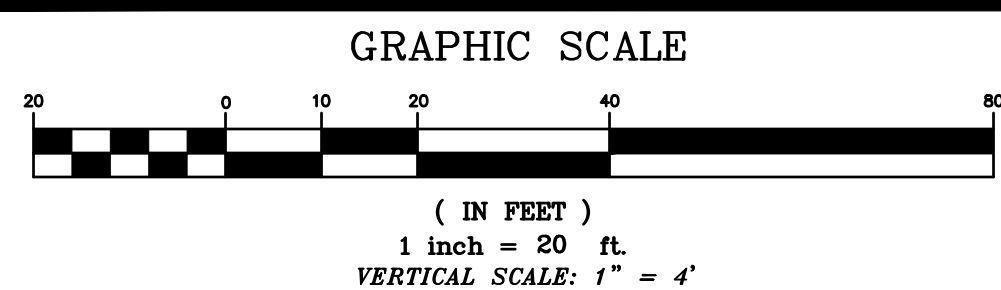
FROM AASHTO ROADSIDE DESIGN GUIDE (2011) TABLE 3.1 PAGE 3-3

CLEAR ZONE REQUIRED TO BE 24-28 FEET (1V:6H OR FLATTER)
-24 FEET HAS BEEN SELECTED

DESIGN SPEED: 40 MPH / 85TH ASSUMED 50 MPH (ACCURATE COUNTS)
WESTBOUND: DOWNGRADE <3%, 423.8 FEET REQUIRED (425 FEET PROVIDED)
EASTBOUND: UPGRADE <3%, 423.8 FEET REQUIRED (425 FEET PROVIDED)
FROM AASHTO GEOMETRIC DESIGN OF HIGHWAYS AND STREETS (2011) EXHIBIT 3.1
400' REQUIRED BY NHDOT



PROFILE VIEW SIGHT LINE



NHDOT-1

REVISION	DATE	DESCRIPTION

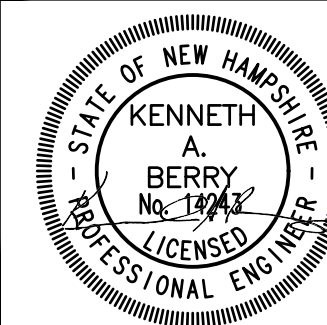
ACCESS PLAN EAST BOUND
LAND OF
EQUINE PROPERTIES LLC
2239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
 335 SECOND CROWN POINT ROAD
 BARRINGTON, NH 03825 (603) 332-2863

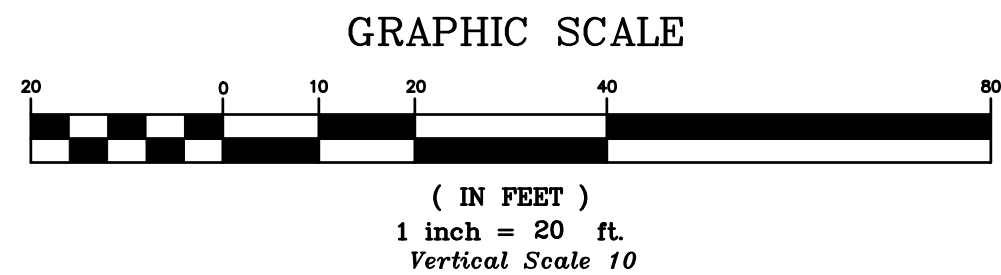
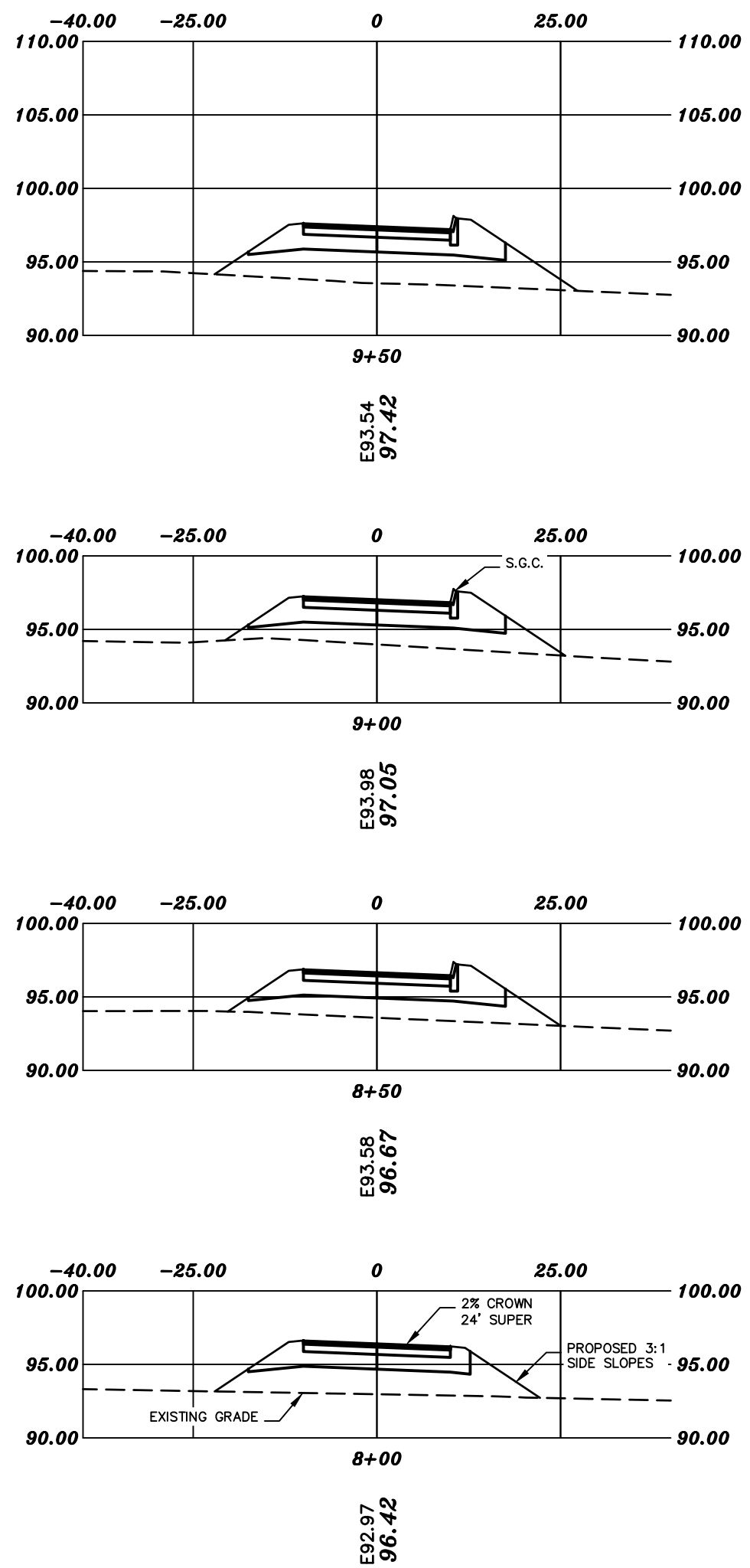
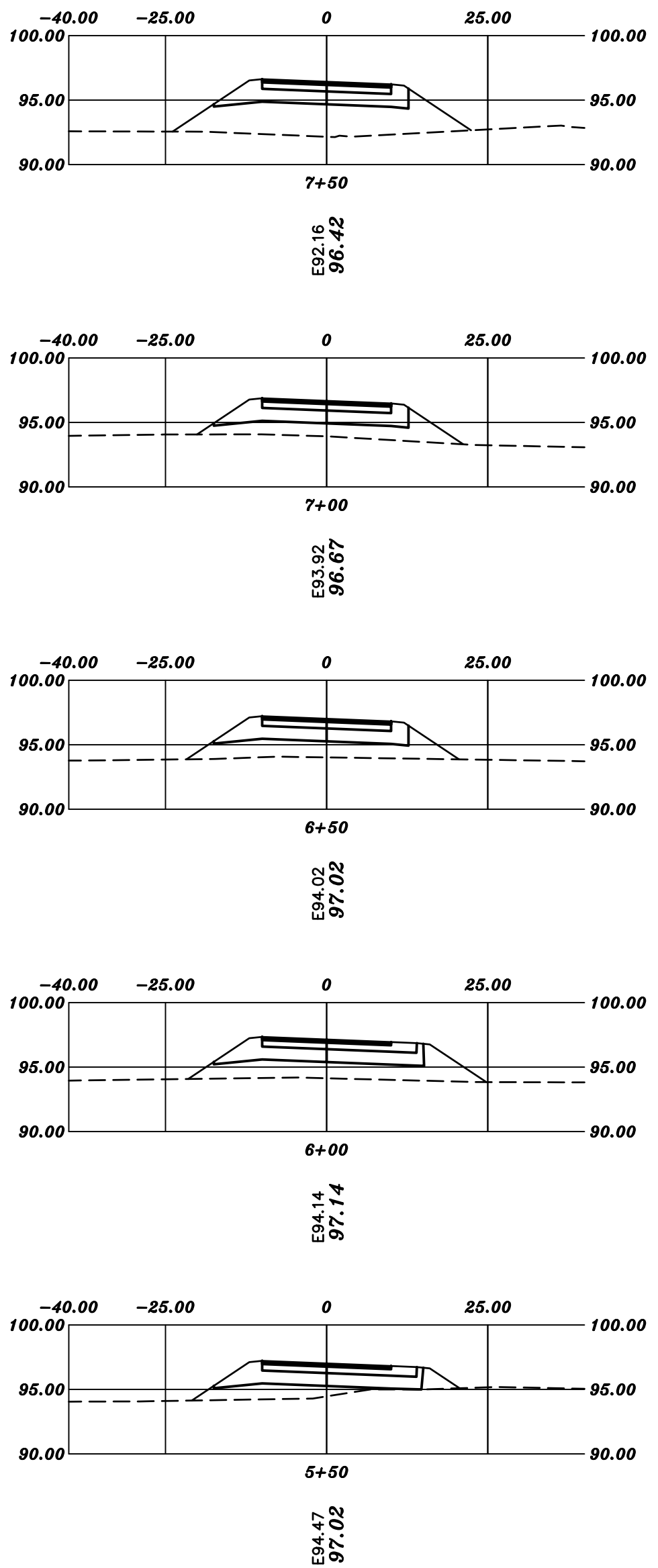
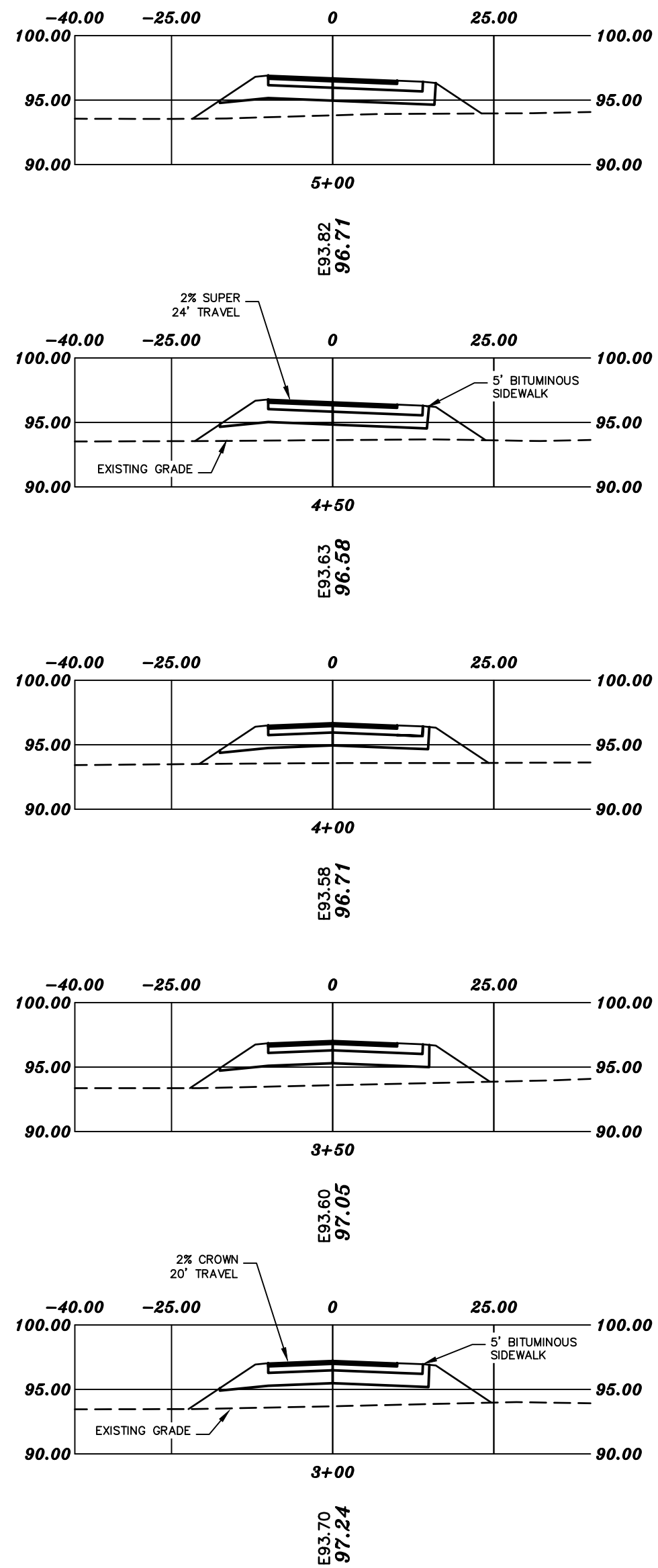
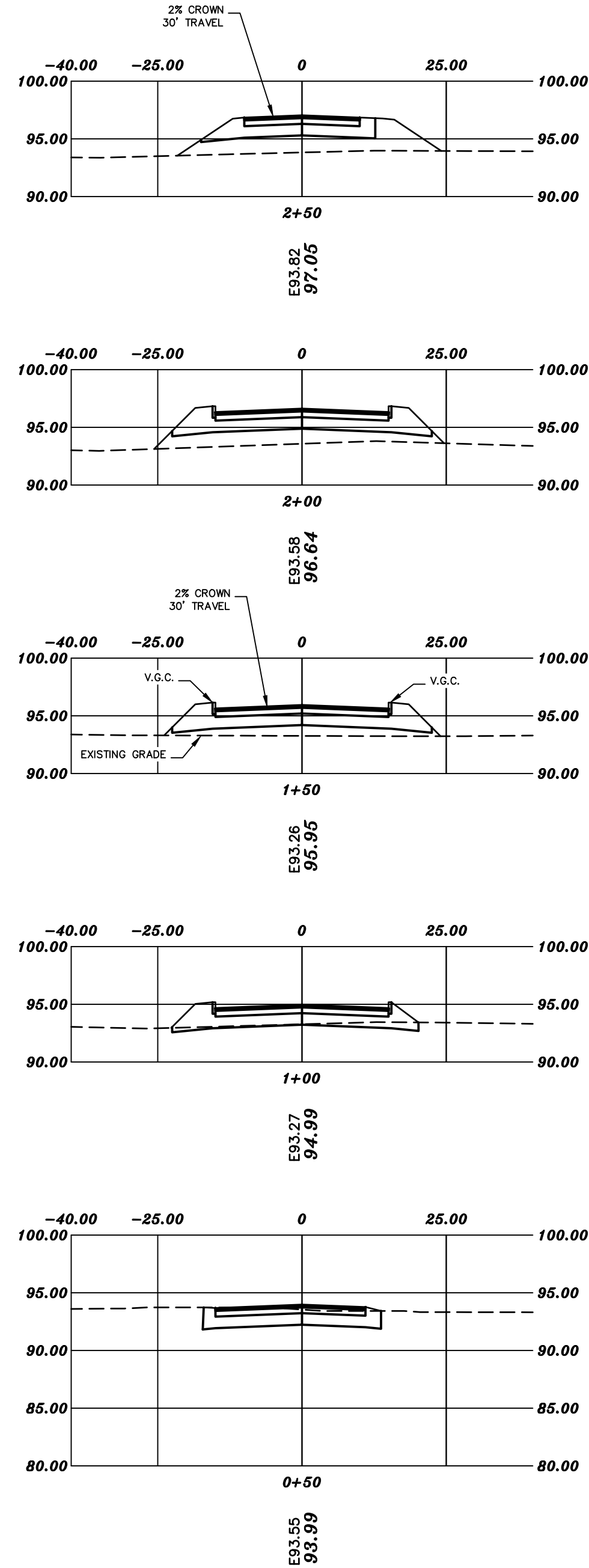
SCALE : 1 IN. EQUALS 20 FT.

DATE : JANUARY 21, 2021

FILE NO. : DB 2020 - 066



SHEET 25 OF 38



PLANNING FILE #

CROSS SECTIONS CONCOLOR DRIVE
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

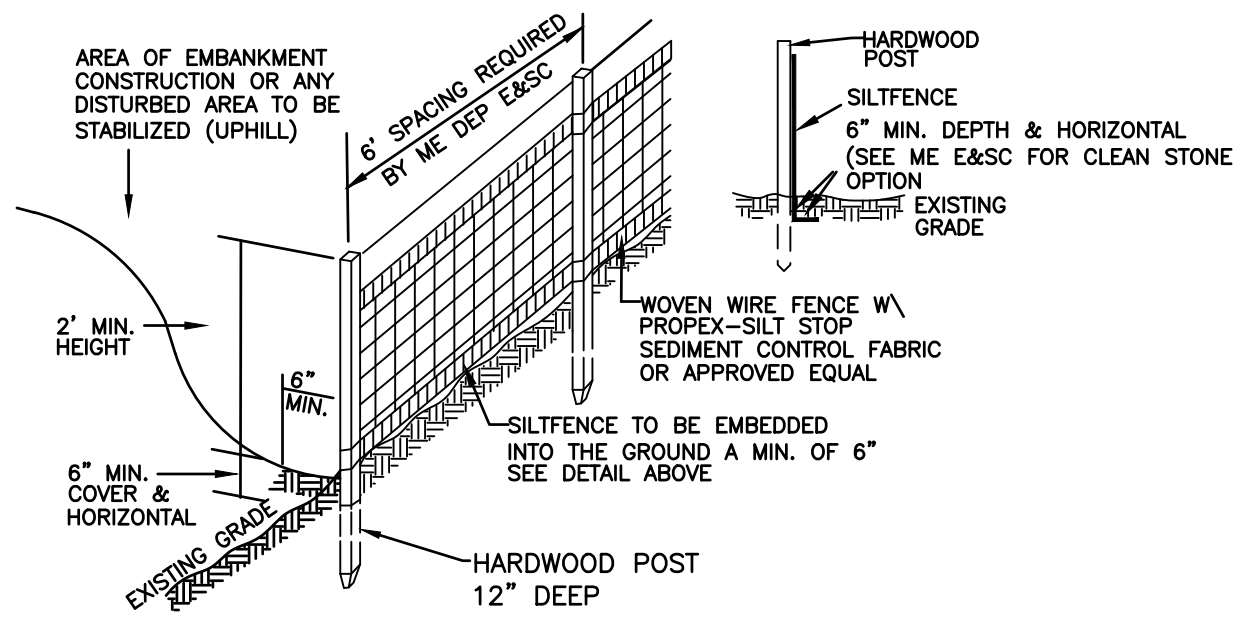
BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
SCALE : 1 IN. EQUALS 20 FT.
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066

STATE OF NEW HAMPSHIRE
KENNETH A. BERRY
No. 12442
LICENSED PROFESSIONAL ENGINEER

REVISION	DATE	DESCRIPTION
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SHEET 26 OF 38

E1

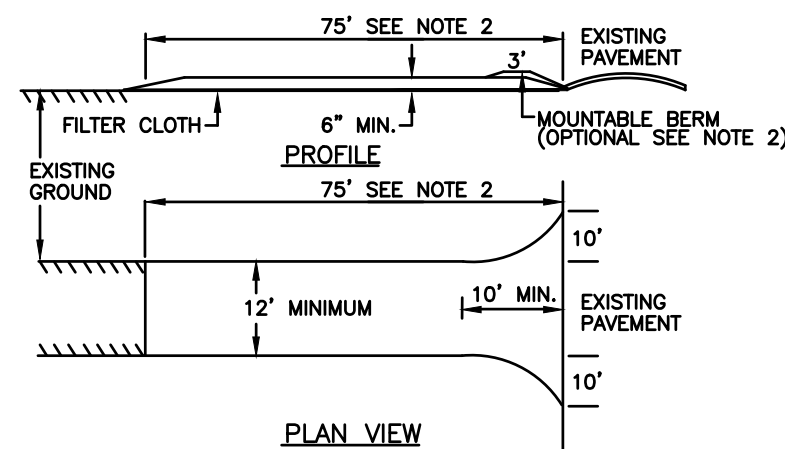


SILT FENCE CONSTRUCTION SPECIFICATIONS

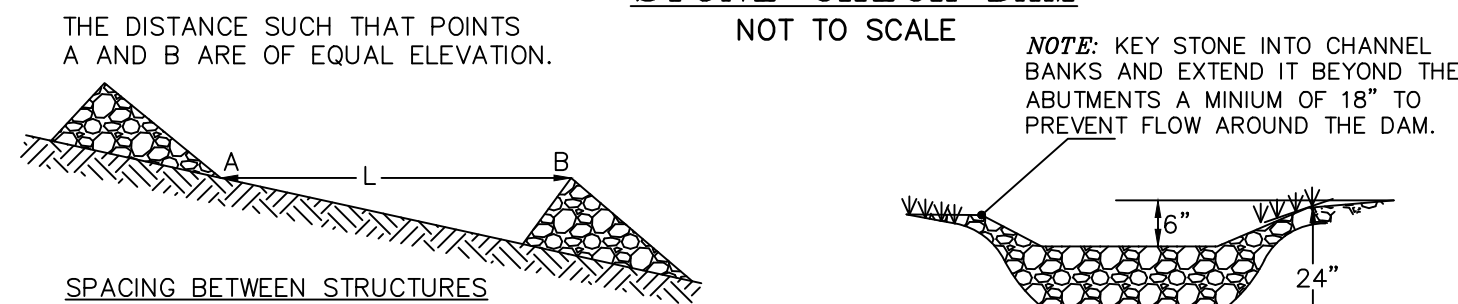
- WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES AND FILTER CLOTH SHALL BE FASTENED TO WOVEN WIRE EVERY 24" AT TOP MID AND BOTTOM SECTIONS AND BE EMBEDDED INTO GROUND A MINIMUM OF 12" THE FENCE POSTS SHALL BE A MINIMUM 48" LONG, SPACED A MAXIMUM 6' APART, AND DRIVEN A MINIMUM OF 12" INTO THE GROUND.
- WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THE ENDS OF THE FABRIC SHALL BE OVERLAPPED BY SIX INCHES, FOLDED AND STAPLED TO PREVENT SEDIMENT FROM BY-PASSING.
- MAINTENANCE SHALL BE PERFORMED AS NEEDED AND SEDIMENT REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE AND PROPERLY DISPOSED OF. SEE MAINTENANCE NOTE BELOW, REMOVAL OF SEDIMENT REQUIRED AT A DEPTH OF 6-INCHES.
- PLACE THE ENDS OF THE SILT FENCE UP CONTOUR TO PROVIDE FOR SEDIMENT STORAGE.
- SILT FENCES SHALL BE REMOVED WHEN NO LONGER NEEDED AND THE SEDIMENT COLLECTED SHALL BE DISPOSED AS DIRECTED BY THE ENGINEER.
- THE AREA DISTURBED BY THE REMOVAL SHALL BE SMOOTHED AND RE-VEGETATED.
- TO BE CONSTRUCTED IAW ME E&SC BMPs B1 SEDIMENT CONTROLS, SILT FENCE, PAGE 23.

SILT FENCE MAINTENANCE

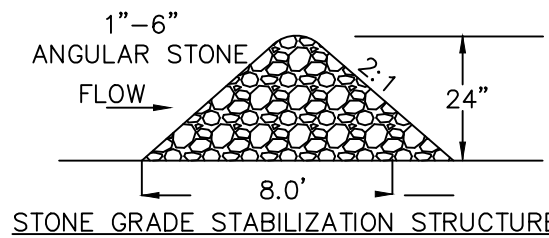
- SILT FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REPAIRS THAT ARE REQUIRED SHALL BE MADE IMMEDIATELY.
- IF THE FABRIC ON A SILT FENCE SHOULD DECOMPOSE OR BECOME INEFFECTIVE DURING THE EXPECTED LIFE OF THE FENCE, THE FABRIC SHALL BE REPLACED PROMPTLY.
- SEDIMENT DEPOSITS SHOULD BE REMOVED WHEN THEY REACH SIX-INCHES IN DEPTH.
- SEDIMENT DEPOSITS THAT ARE REMOVED OR LEFT IN PLACE AFTER THE FABRIC HAS BEEN REMOVED SHALL BE GRADED TO CONFORM WITH THE EXISTING TOPOGRAPHY AND VEGETATED.

SILT FENCE DETAIL
NOT TO SCALEE5 STABILIZED CONSTRUCTION ENTRANCE
NOT TO SCALE

- STONE FOR A STABILIZED CONSTRUCTION ENTRANCE SHALL BE 2 - 3 INCH STONE, RECLAIMED STONE, OR RECYCLED CONCRETE EQUIVALENT.
- THE LENGTH OF THE STABILIZED ENTRANCE SHALL NOT BE LESS THAN 75 FEET, EXCEPT THAT THE MINIMUM LENGTH MAY BE REDUCED TO 50 FEET IF A 3-INCH TO 6-INCH BERM IS INSTALLED AT THE ENTRANCE OF THE PROJECT SITE.
- THE THICKNESS OF THE STONE FOR THE STABILIZED ENTRANCE SHALL NOT BE LESS THAN 6 INCHES.
- THE WIDTH OF THE ENTRANCE SHALL NOT BE LESS THAN THE FULL WIDTH OF THE ENTRANCE WHERE INGRESS OR EGRESS OCCURS OR 10 FEET, WHICHEVER IS GREATER.
- GEOTEXTILE FILTER CLOTH SHALL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE.
- ALL SURFACE WATER THAT IS FLOWING TO OR DIVERTED TOWARD THE CONSTRUCTION ENTRANCE SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A BERM WITH 5:1 SLOPES THAT CAN BE CROSSED BY VEHICLES MAY BE SUBSTITUTED FOR THE PIPE.
- THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEAN OUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, WASHED, OR TRACKED ONTO PUBLIC RIGHT-OF-WAY MUST BE REMOVED PROMPTLY.
- TO BE CONSTRUCTED IAW ME E&SC SITE DEVELOPMENT #2 CONSTRUCTION ENTRANCE / EXIT, PAGE 8.

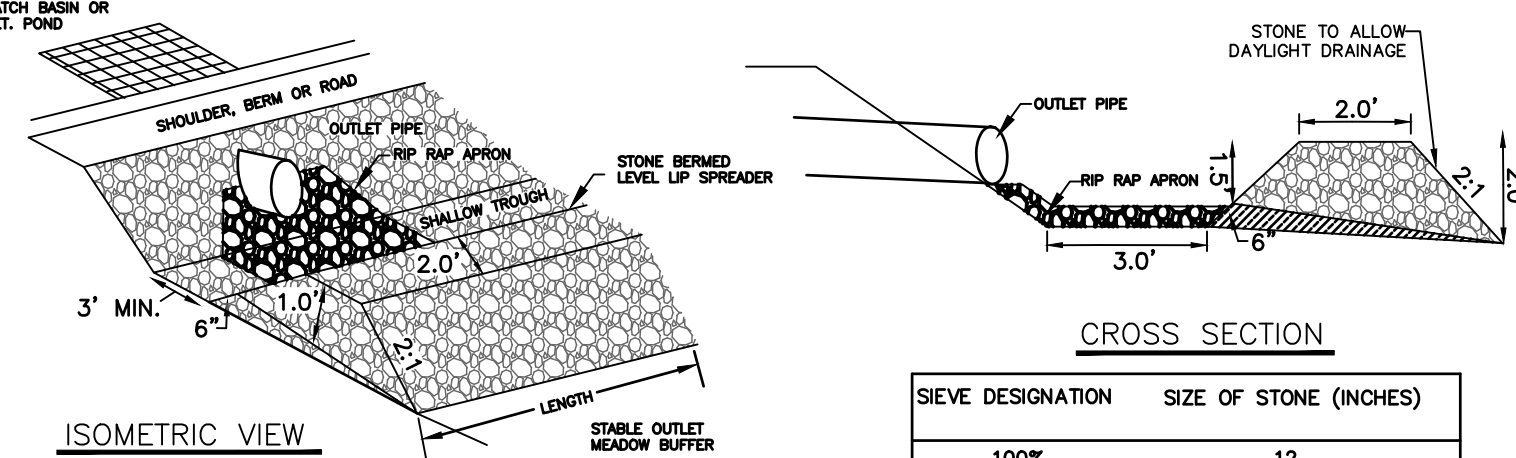
STONE CHECK DAM
NOT TO SCALE

- CHECK DAMS SHOULD BE INSTALLED BEFORE RUNOFF IS DIRECTED TO THE SWALE OR DRAINAGE DITCH.
- THE MAXIMUM CONTRIBUTING DRAINAGE AREA TO THE DAM SHOULD BE LESS THAN ONE ACRE.
- THE MAXIMUM HEIGHT OF THE DAM SHOULD BE TWO FEET.
- THE CENTER OF THE DAM SHOULD BE AT LEAST SIX INCHES LOWER THAN THE OUTER EDGES.
- THE MAXIMUM SPACING IS AS SHOWN ON THE PROJECT SITE PLANS.
- CHECK DAMS WILL NOT BE USED IN A FLOWING STREAM.
- TEMPORARY CHECK DAMS WILL BE REMOVED ONCE THE SWALE OR DITCH IS DETERMINED STABLE.
- TO BE CONSTRUCTED IAW ME E&SC B4 4-2 SEDIMENT CONTROLS, STONE CHECK DAMS, PAGE 26.



STONE GRADE STABILIZATION STRUCTURE

E2

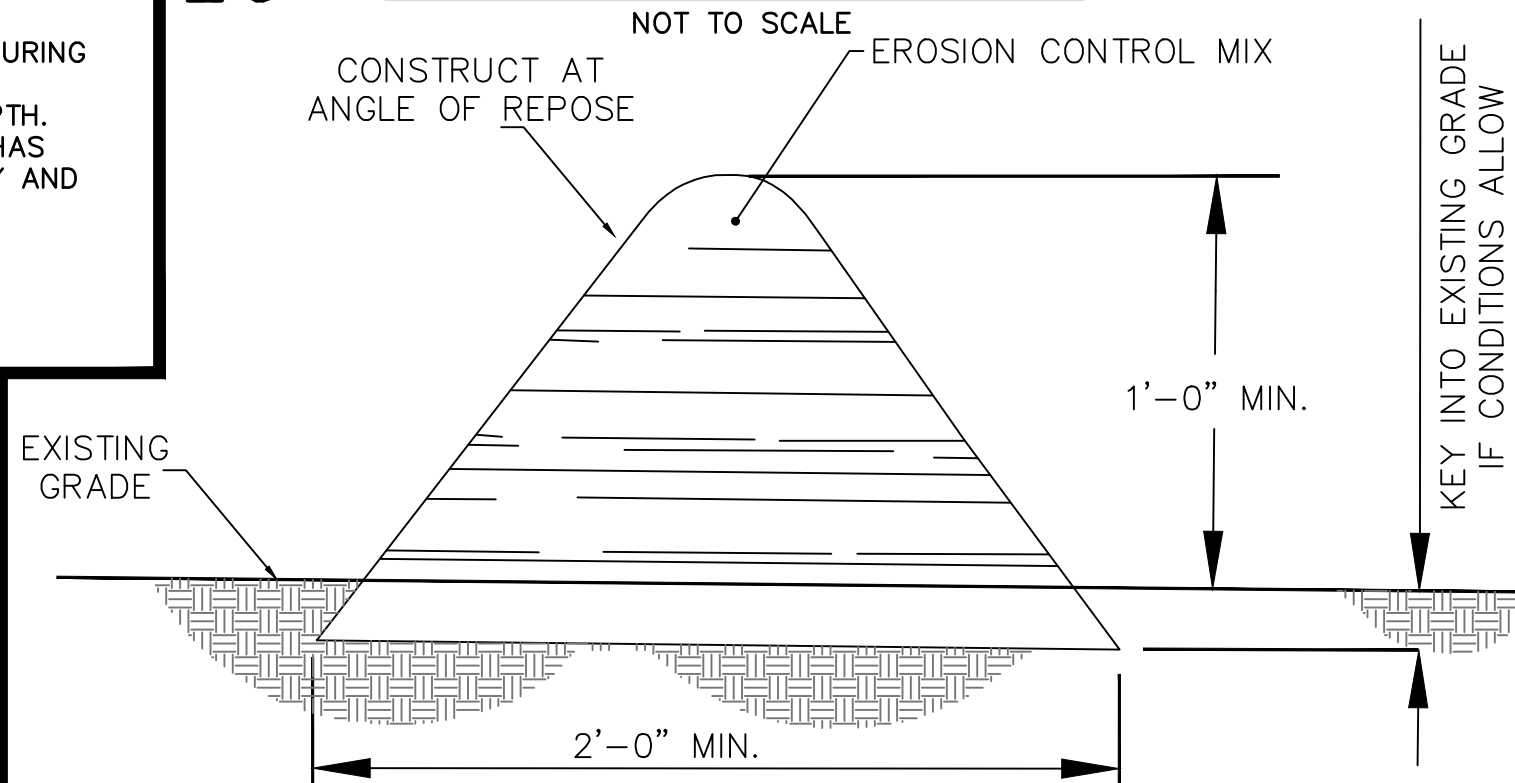


SIEVE DESIGNATION	SIZE OF STONE (INCHES)
100%	12
84-100%	6
68-83%	3
42-55%	1
8-12%	NO. 4

- CONSTRUCT THE LEVEL SPREADER LIP ON A 0% GRADE TO INSURE UNIFORM SPREADING OF RUNOFF.
- LEVEL SPREADER SHALL BE CONSTRUCTED ON UNDISTURBED SOIL AND NOT ON FILL.
- THE ENTIRE LEVEL LIP AREA SHALL BE PROTECTED BY PLACING EXCELSIOR ENFORCER MATTING BENEATH THE STONE. EACH STRIP SHALL OVERLAP BY AT LEAST SIX INCHES.
- THE FLOW FROM THE LEVEL SPREADER SHALL OUTLET ONTO STABILIZED AREAS. WATER SHOULD NOT RE-CONCENTRATE IMMEDIATELY BELOW THE SPREADER.
- MAINTENANCE: THE LEVEL SPREADER SHOULD BE CHECKED PERIODICALLY AND AFTER EVERY MAJOR STORM TO DETERMINE IF THE LIP HAS BEEN DAMAGED AND THE DESIGN CONDITIONS HAVE NOT CHANGED. ANY DETRIMENTAL SEDIMENT ACCUMULATION SHOULD BE REMOVED. IF STONE REMOVAL HAS TAKEN PLACE ON THE LIP, THEN THE DAMAGE SHOULD BE REPAIRED.
- REFERENCE IS MADE TO ME E&SC SECTION G SWALES AND DITCHES #4 LEVEL SPREADERS, PAGE 77 AND ME SWM CHAPTER 8 CONVEYANCE SYSTEMS 8.3 LEVEL SPREADERS.

STONE BERM LEVEL SPREADER
NOT TO SCALE

E6

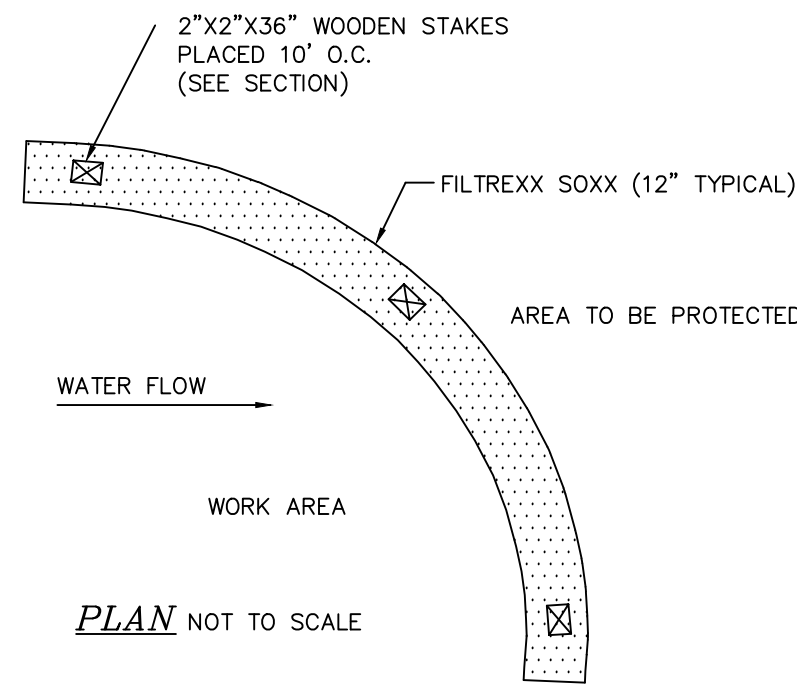
EROSION CONTROL MIX BERM
NOT TO SCALE

EROSION CONTROL MIX BERMS SHALL BE USED ONLY AS FOLLOWS:

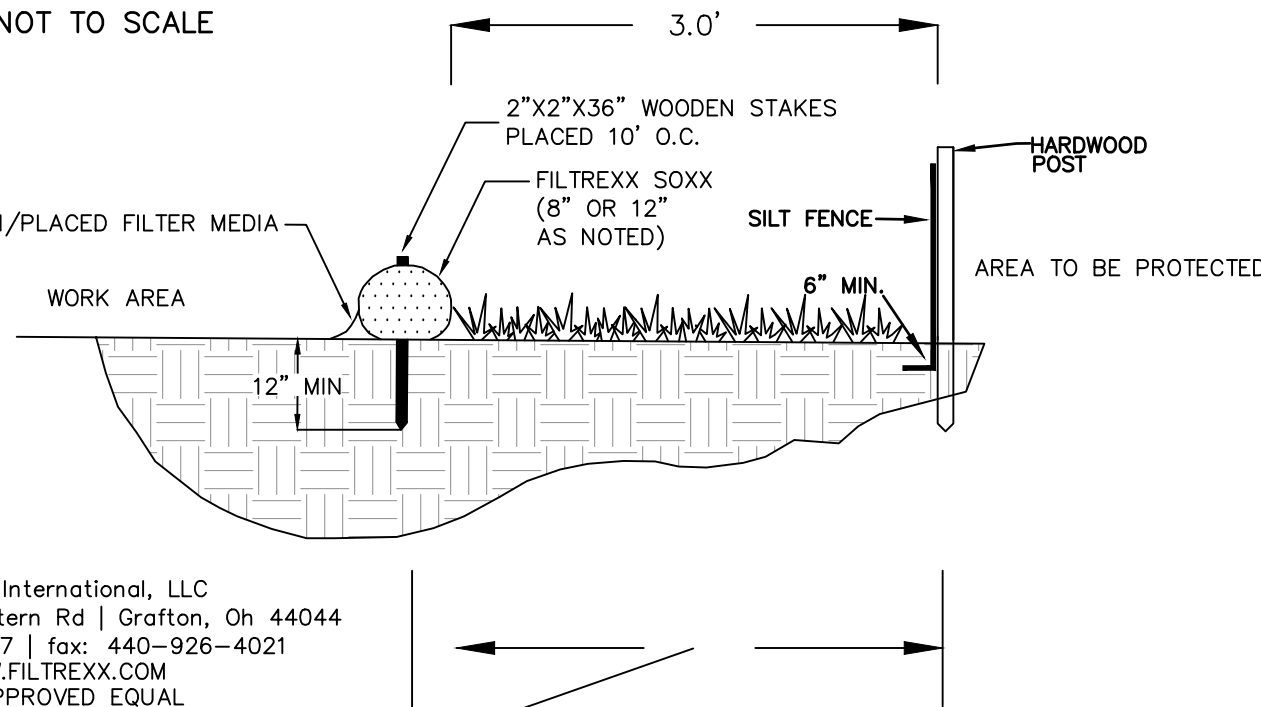
- BERMS SHALL BE USED IN AREAS WHERE EROSION WILL OCCUR ONLY IN THE FORM OF SHEET EROSION AND THERE IS NO CONCENTRATION OF WATER IN A CHANNEL OR DRAINAGE WAY ABOVE THE BERM.
- THE BERMS SHALL BE INSTALLED FOLLOWING THE CONTOUR OF THE LAND AS CLOSELY AS POSSIBLE.
- THE BERMS SHALL BE INSTALLED ON SLOPES LESS THAN 5%.
- SUBJECT TO (E), BELOW, THE MIX SHALL HAVE AN ORGANIC PORTION BETWEEN 80 AND 100% DRY WEIGHT BASIS, AND BE FIBROUS AND ELONGATED SUCH AS FROM SHREDDED BARK, STUMP GRINDINGS, COMPOSED BARK, OR EQUIVALENT MANUFACTURED PRODUCTS. WOOD AND BARK CHIPS, GROUND CONSTRUCTION DEBRIS, OR REPROCESSED WOOD PRODUCTS SHALL NOT BE USED AS ORGANIC MATERIAL.
- THE MIX SHALL NOT CONTAIN SILTS, CLAY, OR FINE SANDS.
- THE MIX SHALL HAVE A PARTICLE SIZE BY WEIGHT OF 70 TO 85% PASSING A 6-INCH SCREEN AND A MAXIMUM OF 85% PASSING THE 0.75-INCH SCREEN.
- THE MIX PH SHALL BE BETWEEN 5.0 AND 8.0.
- THE BERM SHALL BE AT LEAST 12 INCHES HIGH AND AT LEAST 2 FEET WIDE.
- TO BE CONSTRUCTED IAW ME E&SC SECTION B SEDIMENT CONTROLS, #2 EROSION CONTROL MIX BERM, PAGE 24.

E9

E10



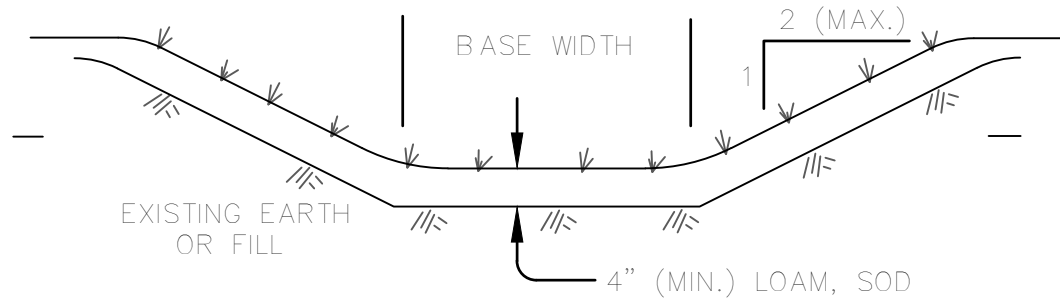
- NOTES**
- ALL MATERIAL TO MEET FILTERREXX SPECIFICATIONS.
 - FILTER MEDIA FILL TO MEET APPLICATION REQUIREMENTS.
 - COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.
 - SILT SOCKS MAY BE USED IN PLACE OF SILT FENCE OR OTHER SEDIMENT BARRIERS.
 - SILT SOCK COMPOST/SOIL/ROCK/SEED FILL MATERIAL SHALL BE ADJUSTED AS NECESSARY TO MEET THE REQUIREMENTS OF THE SPECIFIC APPLICATION.
 - FILTERREXX SOXX IS A REGISTERED TRADEMARK OF FILTERREXX INTERNATIONAL, LLC.
 - SILT FENCE IS NOT A SUBSTITUTION FOR SILT SOCKS AND ANY EQUAL SUBSTITUTION TO BE APPROVED.
 - TO BE CONSTRUCTED IAW FILTERREXX, SECTION 1: EROSION & SEDIMENT CONTROL (PAGE 323) - CONSTRUCTION ACTIVITIES, SWPPP OUT SHEET: FILTERREXX SEDIMENT CONTROL AND ME E&SC SEDIMENT CONTROLS B3 FILTER SOCKS, PAGE 25.

FILTERREXX SEDIMENT CONTROL
NOT TO SCALE

NOTE: FOR AREAS REQUIRING DOUBLE PERIMETER CONTROL WITHIN 50' OF JURISDICTIONAL WETLANDS AND NOT FOR ALL SILT SOCK APPLICATIONS, THIS DUPLICATION MAY BE SPECIFIED AS 12" SILT SOCK OR ORANGE CONSTRUCTION FENCE AS NOTED.

SECTION NOT TO SCALE

E3

GRASS DIVERSION SWALE
NOT TO SCALE

INSPECT ANNUALLY FOR EROSION, SEDIMENT ACCUMULATIONS, VEGETATION LOSS, & INVASIVE SPECIES. REPAIR AS NECESSARY.

MOW GRASS ANNUALLY TO A DEPTH OF 4".

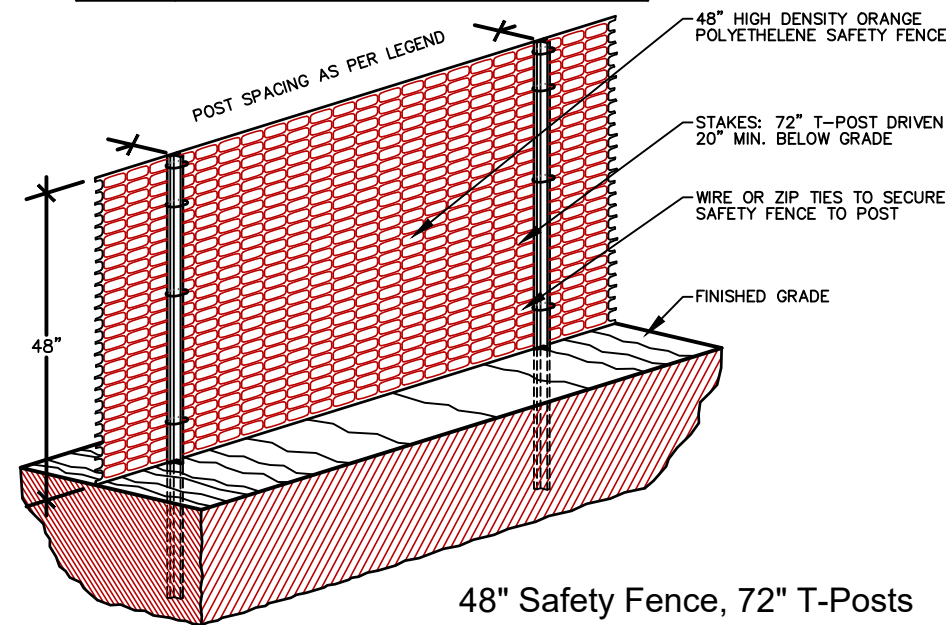
INSTALL STABILIZATION MATTING DURING CONSTRUCTION

TO BE CONSTRUCTED IAW ME SWM SECTION 8, #1 VEGETATED SWALES AND ME E&SC SITE DEVELOPMENT, A4 WATER DIVERSION, PAGE 11.

E4

CONSTRUCTION SAFETY FENCE
NOT TO SCALE

LEGEND
SAF12 48" ORANGE FENCE, 12 FEET O.C.
SAF11 48" ORANGE FENCE, 11 FEET O.C.
SAF10 48" ORANGE FENCE, 10 FEET O.C.
SAF9 48" ORANGE FENCE, 9 FEET O.C.
SAF8 48" ORANGE FENCE, 8 FEET O.C.
SAF7 48" ORANGE FENCE, 7 FEET O.C.
SAF6 48" ORANGE FENCE, 6 FEET O.C.



48" Safety Fence, 72" T-Posts

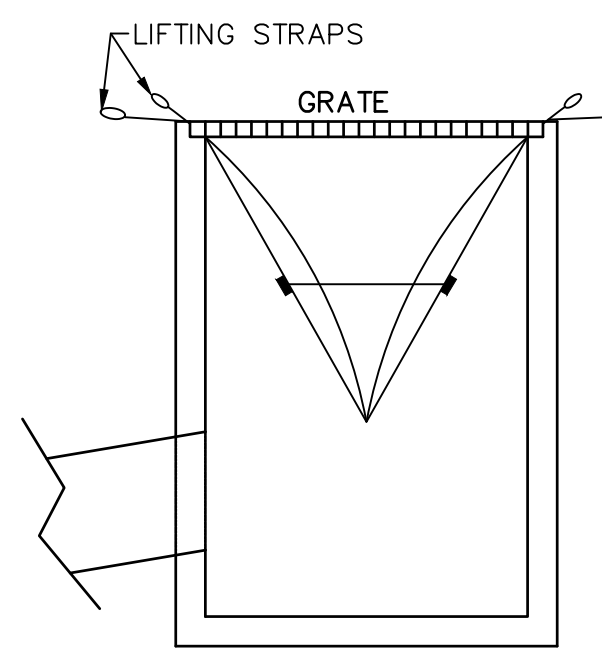
- ALL SENSITIVE AREAS SHALL BE PROTECTED AS PER PLAN.
- ALL TREES IN THE CONSTRUCTION AREA NOT SPECIFICALLY DESIGNATED FOR REMOVAL SHALL BE PRESERVED AND PROTECTED WITH HIGH VISIBILITY FENCE AS PER PLAN.
- WHEN PRACTICABLE, INSTALL HIGH VISIBILITY 3 FEET OUTSIDE OF THE DRIP LINE OF THE TREE.
- SAFETY FENCE SHOULD BE FASTENED SECURELY TO THE T-POSTS.
- THE FENCING MUST REMAIN IN PLACE DURING ALL PHASES OF CONSTRUCTION; ANY CHANGE OF THE PROTECTIVE FENCING MUST BE APPROVED.

E8

TEMPORARY EROSION CONTROL MEASURES

- THE SMALLEST PRACTICAL AREA OF LAND SHALL BE EXPOSED AT ANY ONE TIME.
- EROSION, SEDIMENT AND DETENTION MEASURES SHALL BE INSTALLED AS SHOWN ON THE PLANS AND AT LOCATIONS AS REQUIRED, DIRECTED BY THE ENGINEER.
- ALL DISTURBED AREAS SHALL BE RETURNED TO ORIGINAL GRADES AND ELEVATIONS. DISTURBED AREAS SHALL BE LOADED WITH A MINIMUM OF 4" OF LOAM AND SEEDING WITH NOT LESS THAN ONE POUND OF SEED PER 50 SQUARE YARDS OF AREA. (SEE SEED SPECIFICATIONS THIS SHEET)
- ALL DISTURBED AREAS WILL BE RESTABILIZED WITHIN 45 DAYS. AT ANY ONE TIME, NO MORE THAN 5 ACRES, (217,800 Sq. Ft.) WILL BE DISTURBED.
- SILT FENCES AND PERIMETER BARRIERS SHALL BE INSPECTED PERIODICALLY AND AFTER EVERY RAIN DURING THE LIFE OF THE PROJECT. ALL DAMAGED AREAS SHALL BE REPAIRED, SEDIMENT DEPOSITS SHALL PERIODICALLY BE REMOVED AND DISPOSED OF.
- AFTER ALL DISTURBED AREAS HAVE BEEN STABILIZED, THE TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE REMOVED AND THE AREA DISTURBED BY THE REMOVAL SMOOTHED AND RE-VEGETATED.
- PER THE EPA CGP REQUIREMENTS THERE WILL BE REPORTS OF THE EROSION CONTROL INSPECTIONS IAW SWPPP PREPARED BY BS&E. ALL EROSION CONTROLS SHALL BE INSPECTED WEEKLY AND WITHIN 24 HOURS AFTER 0.25" OR GREATER RAIN EVENT.
- DITCHES, SWALES, AND BASINS SHALL BE STABILIZED PRIOR TO DIRECTING RUNOFF TO THEM.
- DO NOT TRAFFIC EXPOSED SOIL SURFACES WITH CONSTRUCTION EQUIPMENT. IF FEASIBLE, PERFORM EXCAVATIONS WITH EQUIPMENT POSITIONED OUTSIDE THE LIMITS OF THE INFILTRATION SYSTEM.
- DRIVEWAYS AND CUT AND FILL SLOPES MUST BE STABILIZED WITHIN 72 HOURS OF ACHIEVING FINAL GRADE.
- STABILIZATION MEANS:
 - A MINIMUM OF 85% OF VEGETATIVE COVER HAS BEEN ESTABLISHED.
 - A MINIMUM OF 3 INCHES OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIP RAP HAS BEEN INSTALLED, OR
 - EROSION CONTROL BLANKETS HAVE BEEN INSTALLED.
- THIS PROJECT IS TO BE MANAGED IN A MANNER THAT MEETS THE REQUIREMENTS AND INTENT OF RSA 430:53 AND CHAPTER AGR 3800 RELATIVE TO INVASIVE SPECIES.
- THE NHDES STORMWATER MANUAL, IN THREE VOLUMES, DATED DECEMBER 2008, IS A PART OF THIS PLAN SET AND THE MORE RESTRICTIVE WILL GOVERN. (NH SWM)

E11

STORM DRAIN INLET PROTECTION
DETAIL
NOT TO SCALERECOMMENDED MAINTENANCE SCHEDULE
-EACH SILTSACK SHOULD BE INSPECTED AFTER EVERY MAJOR RAIN EVENT, AND MUST BE MAINTAINED.
-IF THERE HAVE BEEN NO MAJOR EVENTS, SILTSACK SHOULD BE INSPECTED EVERY 2-3 WEEKS.
-THE RESTRAINT CORD SHOULD BE VISIBLE AT ALL TIMES. IF CORD IS COVERED WITH SEDIMENT, THE SILTSACK SHOULD BE EMPTIED.
-TO BE USED IN ALL AREAS WHERE THERE WILL BE TRAFFIC.
-ARE SUBJECT TO DAMAGE BY SNOW PLOWS, AND MUST BE INSPECTED AFTER ANY SNOW EVENT AND REPLACED AS REQUIRED.
-TO BE CONSTRUCTED IAW ME E&SC SEDIMENT CONTROLS B5, STORM DRAIN INLET PROTECTION, PAGE 27.

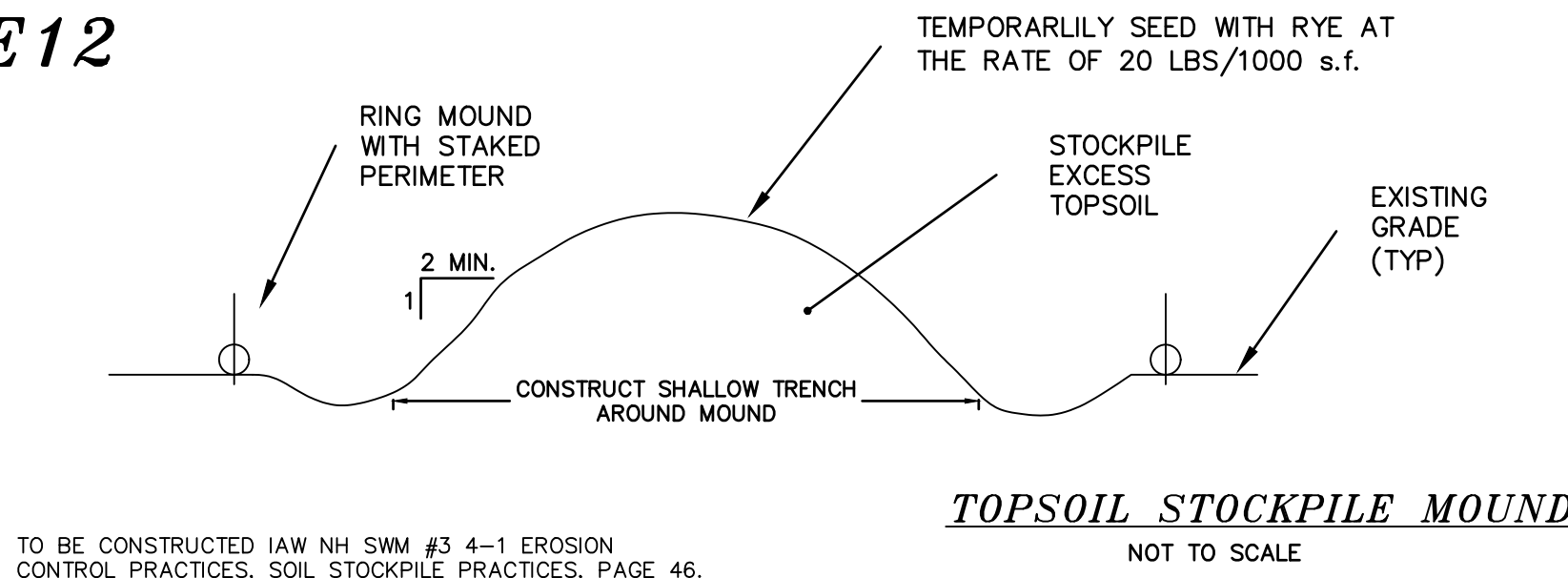
E-101

PLANNING FILE #	DESCRIPTION
REVISION	DATE

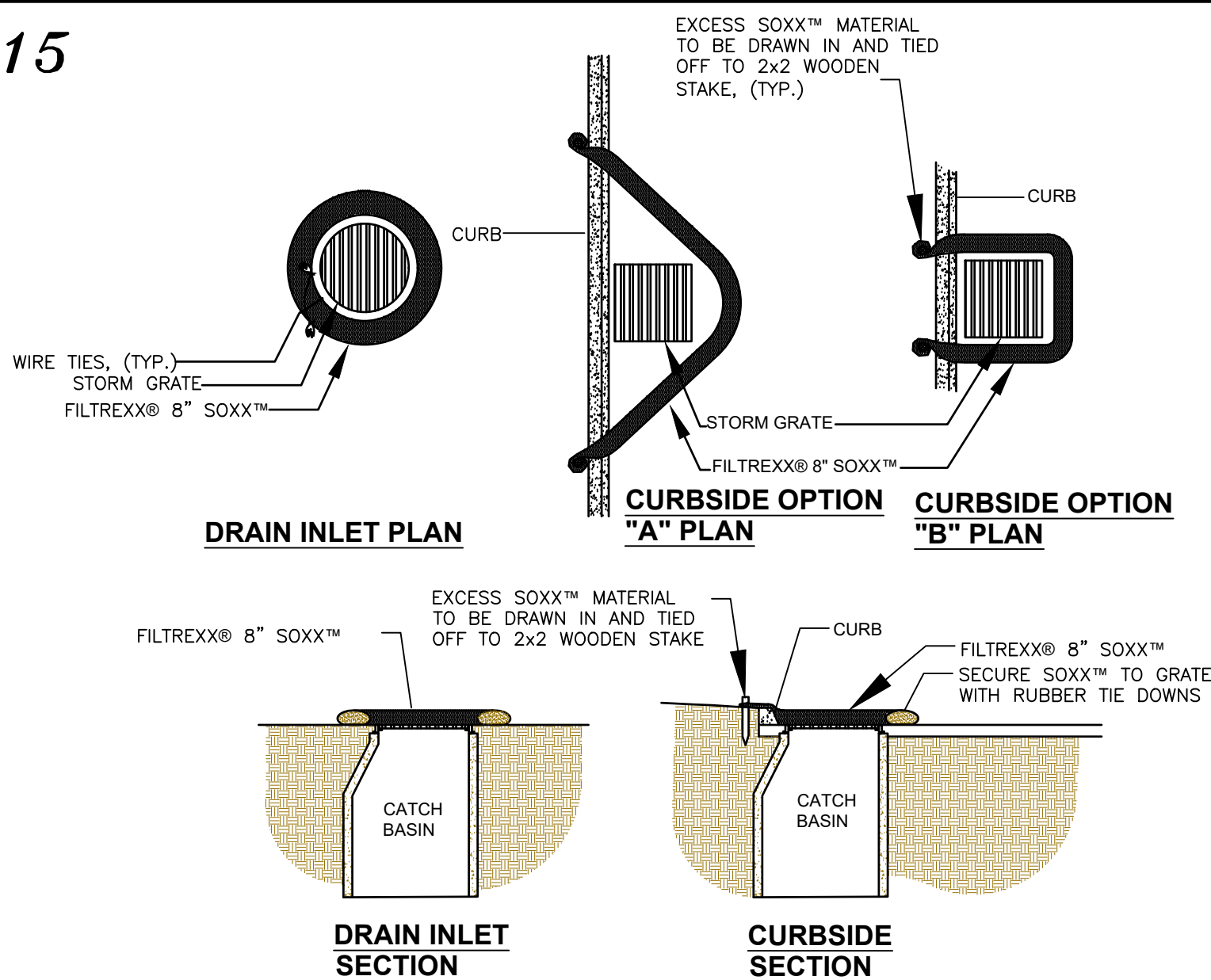
EROSION & SEDIMENT CONTROL DETAILS
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
AS NOTED
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066
KENNETH A. BERRY
REGISTERED PROFESSIONAL ENGINEER
SHEET 27 OF 38

E12



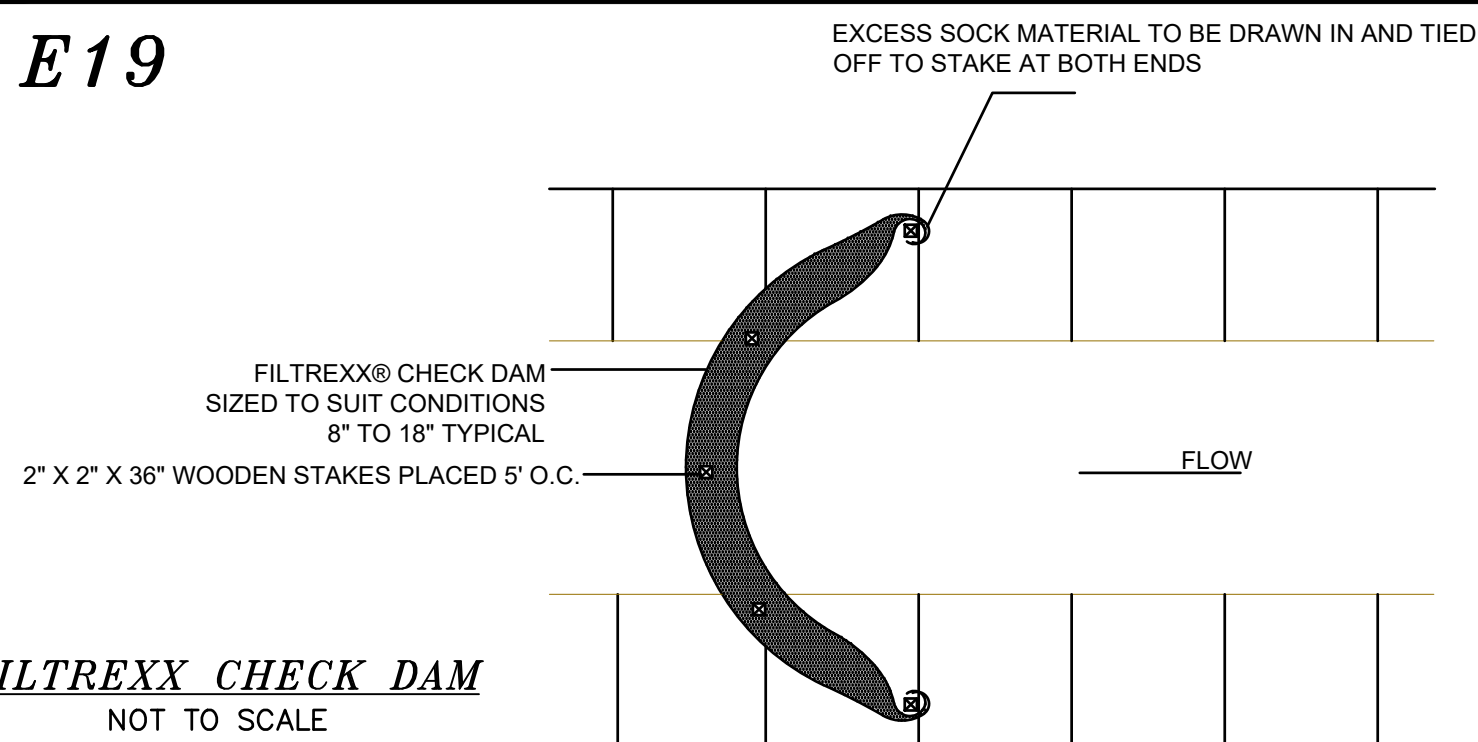
E15



FILTREXX INLET PROTECTION

NOT TO SCALE

E19



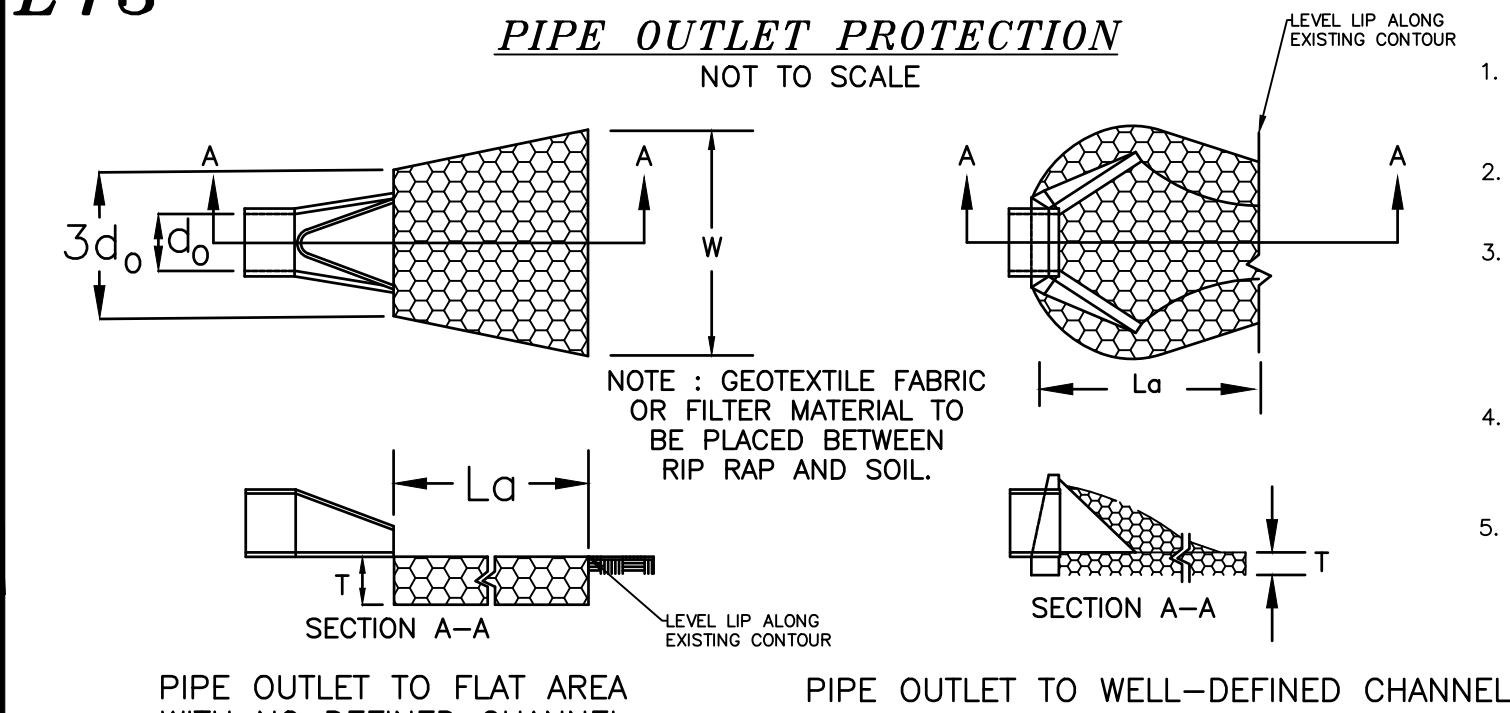
E20

STAKED HAYBALE DETAIL

NOT TO SCALE

- 1.) HAY BALES BARRIERS MAY ONLY BE USED FOR A MAXIMUM OF 60 DAYS AND ARE NOT RECOMMENDED FOR PERIMETER CONTROL.
- 2.) TO BE INSTALLED IAW NH SWM #3, 4-2 SEDIMENT CONTROL, STRAW OR HAY BALE BARRIER.
- 3.) REQUIRED TO SHOW DETAIL, BUT DO NOT RECOMMEND USE OF HAY BALES FOR EROSION CONTROL.

E13



E16

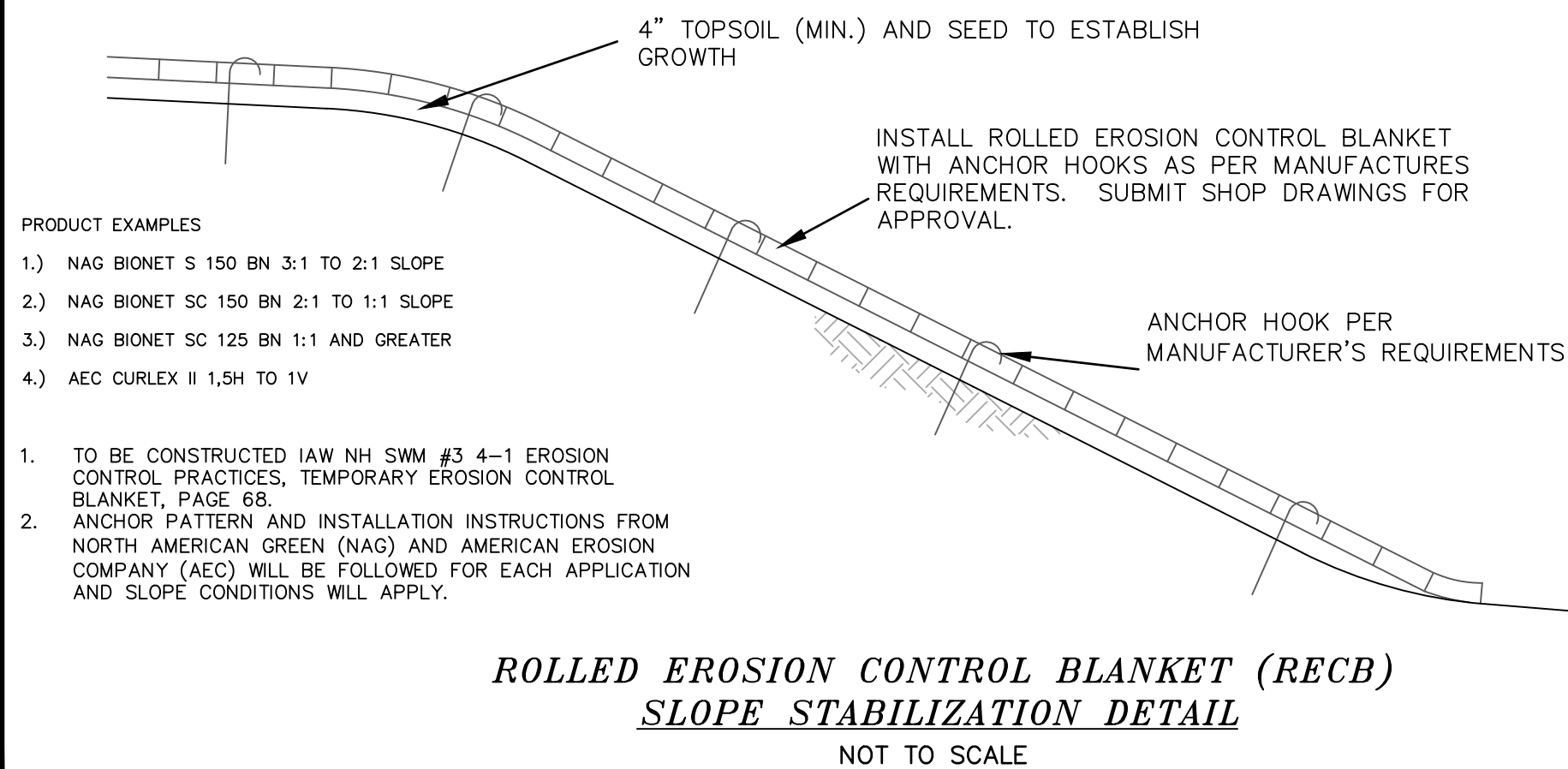
NOTE: Temporary seed mix for stabilization of turf shall be winter type or oats at a rate of 2.5 lbs. per 1000 s.f. and shall be placed prior to OCT. 15, if permanent seeding not yet complete.

SEEDING GUIDE					
USE	SEEDING MIXTURE 1/	DROUGHTY	WELL DRAINED	MODERATELY WELL DRAINED	POORLY DRAINED
STEEP CUTS AND FILLS, BORROW AND DISPOSAL AREAS	A	FAIR	GOOD	GOOD	FAIR
	B	POOR	GOOD	EXCELLENT	POOR
	C	FAIR	EXCELLENT	EXCELLENT	EXCELLENT
	D	FAIR	EXCELLENT	EXCELLENT	EXCELLENT
WATERWAYS, EMERGENCY SPILLWAYS, AND OTHER CHANNELS WITH FLOWING WATER	A	GOOD	GOOD	GOOD	FAIR
	B	GOOD	EXCELLENT	EXCELLENT	FAIR
	C	GOOD	EXCELLENT	EXCELLENT	FAIR
	D	GOOD	EXCELLENT	EXCELLENT	FAIR
LIGHTLY USED PARKING LOTS, GOOD AREAS, UNUSED LANDS, AND LOW INTENSITY USE RECREATION SITES	A	GOOD	GOOD	GOOD	FAIR
	B	GOOD	EXCELLENT	EXCELLENT	FAIR
	C	GOOD	EXCELLENT	EXCELLENT	FAIR
	D	GOOD	EXCELLENT	EXCELLENT	FAIR
PLAY AREAS AND ATHLETIC FIELDS (TOPSOIL IS ESSENTIAL FOR GOOD TURF)	F	FAIR	EXCELLENT	EXCELLENT	EXCELLENT
	G	FAIR	EXCELLENT	EXCELLENT	EXCELLENT

SEEDING SPECIFICATIONS

1. GRADING AND SHAPING
A. SLOPES SHALL NOT BE STEEPER THAN 2:1; 3:1 SLOPES OR FLATTER ARE PREFERRED.
WHERE MOWING WILL BE DONE, 3:1 SLOPES OR FLATTER ARE RECOMMENDED.
2. SEEDBED PREPARATION
A. SURFACE AND SEEPAGE WATER SHOULD BE DRAINED OR DIVERTED FROM THE SITE TO PREVENT DROWNING OR WINTER KILLING OF THE PLANTS.
B. STONES LARGER THAN 4 INCHES AND TRASH SHOULD BE REMOVED BECAUSE THEY INTERFERE WITH SEEDING AND FUTURE MAINTENANCE OF THE AREA. WHERE FEASIBLE, THE SOIL SHOULD BE TILLED TO A DEPTH OF ABOUT 4 INCHES TO PREPARE A SEED BED AND MIX FERTILIZER AND LIME INTO THE SOIL. THE SEEDBED SHOULD BE LEFT IN REASONABLY FIRM AND SMOOTH CONDITION. THE LAST TILLAGE OPERATION SHOULD BE PERFORMED ACROSS THE SLOPE WHEREVER PRACTICAL.
3. ESTABLISHING A STAND
A. LIME AND FERTILIZER SHOULD BE APPLIED PRIOR TO OR AT THE TIME OF SEEDING AND INCORPORATED INTO THE SOIL KINDS AND AMOUNTS OF LIME AND FERTILIZER SHOULD BE BASED ON AN EVALUATION OF SOIL TESTS. WHEN A SOIL TEST IS NOT AVAILABLE, THE FOLLOWING MINIMUM AMOUNTS SHOULD BE APPLIED:
AGRICULTURAL LIMESTONE, 2 TONS PER ACRE OR 100LBS. PER 1,000 SQ.FT.
NITROGEN(N), 50LBS. PER ACRE OR 1.1LBS. PER 1,000 SQ.FT.
PHOSPHATE(P2O5), 100LBS. PER ACRE OR 2.2LBS. PER 1,000 SQ.FT.
POTASH(K2O), 100LBS. PER ACRE OR 2.2LBS. PER 1,000 SQ.FT.
(NOTE: THIS IS THE EQUIVALENT OF 500LBS. PER ACRE OF 10-20-20 FERTILIZER OR 1,000LBS. PER ACRE OF 5-10-10.)
4. MULCH
A. HAY, STRAW, OR OTHER MULCH, WHEN NEEDED, SHOULD BE APPLIED IMMEDIATELY AFTER SEEDING.
B. MULCH WILL BE HELD IN PLACE USING APPROPRIATE TECHNIQUES FROM THE BEST MANAGEMENT PRACTICE FOR MULCHING. HAY OR STRAW MULCH SHALL BE PLACED AT A RATE OF 90LBS PER 1000 S.F.
5. MAINTENANCE TO ESTABLISH A STAND
A. PLANTED AREA SHOULD BE PROTECTED FROM DAMAGE BY FIRE, GRAZING, TRAFFIC, AND DENSE WEED GROWTH.
B. FERTILIZATION NEEDS SHOULD BE DETERMINED BY ONSITE INSPECTIONS. SUPPLEMENTAL FERTILIZER IS USUALLY THE KEY TO FULLY COMPLETE THE ESTABLISHMENT OF THE STAND BECAUSE MOST PERENNIAL STAKE 2 TO 3 YEARS TO BECOME ESTABLISHED.
C. IN WATERWAYS, CHANNELS, OR SWALES WHERE UNIFORM FLOW CONDITIONS ARE ANTICIPATED, OCCASIONAL MOWING MAY BE NECESSARY TO CONTROL GROWTH OF WOODY VEGETATION.
6. TO BE CONSTRUCTED IAW NH SWM #3 4-1 EROSION CONTROL PRACTICES, PERMANENT VEGETATION, PAGE 60.

E21



- PRODUCT EXAMPLES
- 1.) NAG BIONET S 150 BN 3:1 TO 2:1 SLOPE
 - 2.) NAG BIONET SC 150 BN 2:1 TO 1:1 SLOPE
 - 3.) NAG BIONET SC 125 BN 1:1 AND GREATER
 - 4.) AEC CUREX II 1.5H TO 1V

1. TO BE CONSTRUCTED IAW NH SWM #3 4-1 EROSION CONTROL PRACTICES, TEMPORARY EROSION CONTROL BLANKET, PAGE 60.
2. ANCHOR PATTERN AND INSTALLATION INSTRUCTIONS FROM NORTH AMERICAN GREEN (NAG) AND AMERICAN EROSION COMPANY (AEC) WILL BE FOLLOWED FOR EACH APPLICATION AND SLOPE CONDITIONS WILL APPLY.

PIPE OUTLET PROTECTION CONSTRUCTION SPECIFICATIONS

1. THE SUB GRADE FOR THE FILTER MATERIAL, GEOTEXTILE FABRIC, AND RIP RAP SHALL BE PREPARED TO THE LINES AND GRADES SHOWN ON THE PLANS. SPECIFIED GRADATION.
2. THE ROCK OR GRAVEL USED FOR FILTER OF RIP RAP SHALL CONFORM TO NHDOT SECTION 583.
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 FABRIC OVER THE DAMAGED AREA OR BY COMPLETE REPLACEMENT 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. TO BE CONSTRUCTED IAW NH SWM #2 4-6 CONVEYANCE PRACTICES, 6. OUTLET PROTECTION, PAGE 172.

E14

TABLE 7-24---RECOMMENDED RIP RAP GRADATION RANGES			
d50 SIZE=	0.5	FEET	6
INCHES			
% OF WEIGHT SMALLER THAN THE GIVEN d50 SIZE		SIZE OF STONE (INCHES) FROM	TO
100%		9	12
85%		8	11
50%		6	9
15%		2	3

E17

CONSTRUCTION SEQUENCE:

- 1.) CUT AND REMOVE TREES IN CONSTRUCTION AREA ONLY AS REQUIRED; RELOCATE ANY PROJECT T.B.M.
- 2.) CONSTRUCT AND/OR INSTALL TEMPORARY AND PERMANENT SEDIMENT EROSION AND DETENTION CONTROL FACILITIES AS SPECIFIED. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED PRIOR TO ANY SOIL LAND DISTURBANCE AND MUST BE REVIEWED AND APPROVED BY THE COMMUNITY SERVICES DEPARTMENT.
- 3.) EROSION, SEDIMENT AND DETENTION CONTROL FACILITY SHALL BE INSTALLED & STABILIZED PRIOR TO DIRECTING RUNOFF TO THEM. TEMPORARY DIVERSIONS MAY BE REQUIRED. POST CONSTRUCTION STORM WATER MANAGEMENT PRACTICES MUST BE INITIATED AND STABILIZED EARLY IN THE PROCESS.
- 4.) CLEAR, CUT AND DISPOSE OF DEBRIS IN APPROVED FACILITY
- 5.) CONSTRUCT TEMPORARY CULVERTS AS REQUIRED, OR DIRECTED
- 6.) CONSTRUCT ROADWAYS FOR ACCESS TO DESIRED CONSTRUCTION AREAS. ALL ROADS SHALL BE STABILIZED IMMEDIATELY
- 7.) START BUILDING CONSTRUCTION
- 8.) INSTALL PIPE AND CONSTRUCTION ASSOCIATED APPURTENANCES AS REQUIRED OR DIRECTED. INSTALL RAIN GARDENS. ALL DISTURBED AREAS SHALL STABILIZED IMMEDIATELY AFTER GRADING.
- 9.) BEGIN PERMANENT AND TEMPORARY SEEDING AND MULCHING. ALL CUT AND FILL SLOPES AND DISTURBED AREAS SHALL BE SEED OR MULCHED AS REQUIRED, OR DIRECTED. NO AREA IS ALLOWED TO BE DISTURBED FOR A LENGTH OF TIME THAT EXCEEDS 60 DAYS BEFORE BEING STABILIZED. DAILY, OR AS REQUIRED. ALL ROADWAYS AND PARKING AREAS SHALL BE STABILIZED WITHIN 72 HOURS OF ACHIEVING FINISHED GRADES. ALL CUT AND FILL SLOPES SHALL BE STABILIZED WITHIN 72 HOURS OF ACHIEVING FINISHED GRADES.
- 10.) CONSTRUCT TEMPORARY BERMS, DRAINS, DITCHES, SILT FENCES, SEDIMENT TRAPS, ETC. MULCH AND SEED AS REQUIRED.
- 11.) INSPECT AND MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES DURING CONSTRUCTION. ALL SWPPP INSPECTIONS MUST BE CONDUCTED BY A QUALIFIED PROFESSIONAL SUCH AS A PROFESSIONAL ENGINEER (PE), A CERTIFIED PROFESSIONAL IN EROSION AND SEDIMENT CONTROL (CPESC), A CERTIFIED EROSION SEDIMENT AND STORM WATER INSPECTOR (CESSWI), OR A CERTIFIED PROFESSIONAL IN STORM WATER QUALITY (CPSWQ). INSPECTION REPORTS SHALL BE SUBMITTED TO THE COMMUNITY SERVICES DEPARTMENT.
- 12.) COMPLETE PERMANENT SEEDING AND LANDSCAPING.
- 13.) REMOVE TEMPORARY EROSION CONTROL MEASURES AFTER SEEDING AREAS HAVE ESTABLISHED THEMSELVES AND SITE IMPROVEMENTS ARE COMPLETE.
- 14.) SMOOTH AND REVEGETATE ALL DISTURBED AREAS.
- 15.) FINISH PAVING ALL ROADWAYS.

E18 DEFINITION OF STABLE:

PER ENV-WQ 1500 ALTERATION OF TERRAIN

1. BASE COURSE GRAVELS HAVE BEEN INSTALLED IN AREAS TO BE PAVED.
2. A MINIMUM OF 85 PERCENT VEGETATED GROWTH HAS BEEN ESTABLISHED..
3. A MINIMUM OF 3 INCHES OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIP-RAP HAS BEEN INSTALLED.
- OR, EROSION CONTROL BLANKETS HAVE BEEN PROPERLY INSTALLED.

ADDITION STABILIZATION NOTES:

5. HAY MULCH OR OTHER APPROVED METHODS SHALL BE USED TO CONTROL EROSION OF NEWLY GRADED AREAS. ALL CUT AND FILL SLOPES SHALL BE SEED AND MULCHED WITHIN 72 HOURS AFTER THEIR CONSTRUCTION.
6. DISTURBED SOIL AREAS SHALL BE EITHER TEMPORARILY OR PERMANENTLY STABILIZED. IN AREAS WHERE FINAL GRADING HAS NOT OCCURRED, TEMPORARY STABILIZATION MEASURES SHOULD BE IN PLACE WITHIN SEVEN (7) CALENDAR DAYS FOR EXPOSED SOIL AREAS THAT ARE WITHIN ONE HUNDRED (100) FEET OF A SURFACE WATER BODY OR A WETLAND AND NO MORE THAN 14 CALENDAR DAYS FOR ALL OTHER AREAS. PERMANENT STABILIZATION SHOULD BE IN PLACE WITHIN THREE (3) CALENDAR DAYS FOLLOWING COMPLETION OF FINAL GRADING OF EXPOSED SOIL AREAS.

E22

WINTER STABILIZATION NOTES

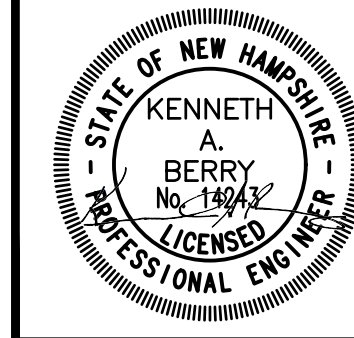
1. ALL DISTURBED AREAS THAT DO NOT HAVE AT LEAST 85% VEGETATIVE COVERAGE PRIOR TO OCTOBER 15TH SHALL BE STABILIZED BY APPLYING MULCH AT A RATE OF 3-4 TONS PER ACRE. ALL SIDE SLOPES, STEEPER THAN 4:1, THAT ARE NOT DIRECTED TO SWALES OR DETENTION BASINS, SHALL BE LINED WITH BIODEGRADABLE/PHOTODEGRADABLE "JUTE MATTING" (EXCELRIOR'S CUREX II OR EQUAL). ALL OTHER SLOPES SHALL BE MULCHED AND TACKED AT A RATE OF 3-4 TONS PER ACRE. THE APPLICATION OF MULCH AND/OR JUTE MATTING SHALL NOT OCCUR OVER EXISTING SNOW COVER. IF THE SITE IS ACTIVE AFTER OCTOBER 15TH, ANY SNOW THAT ACCUMULATES ON DISTURBED AREAS SHALL BE REMOVED. PRIOR TO SPRING THAW ALL AREAS WILL BE STABILIZED, AS DIRECTED ABOVE.
2. ALL SWALES THAT DO NOT HAVE FULLY ESTABLISHED VEGETATION SHALL BE EITHER LINED WITH TEMPORARY JUTE MATTING OR TEMPORARY STONE CHECK DAMS (APPROPRIATELY SPACED). STONE CHECK DAMS WILL BE MAINTAINED THROUGHOUT THE WINTER MONTHS. IF THE SWALES ARE TO BE MATTED WITH PERMANENT LINERS OR RIPRAP WITH ENGINEERING FABRIC, THIS SHALL BE COMPLETED PRIOR TO WINTER SHUTDOWN OR AS SOON AS THEY ARE PROPERLY GRADED AND SHAPED.
3. PRIOR TO OCT. 15TH ALL ROADWAY AND PARKING AREAS SHALL BE BROUGHT UP TO AND THROUGH THE BANK RUN GRAVEL APPLICATION. IF THESE AREAS' ELEVATIONS ARE PROPOSED TO REMAIN BELOW THE PROPOSED SUBGRADE ELEVATION, THE SUBGRADE MATERIAL SHALL BE ROUGHLY CROWNED AND A 3" LAYER OF CRUSHED GRAVEL SHALL BE PLACED AND COMPACTED. THIS WILL ALLOW THE SUBGRADE TO SHED RUNOFF AND WILL REDUCE ROADWAY EROSION. THIS CRUSHED GRAVEL DOES NOT HAVE TO CONFORM TO NH DOT 304.3, BUT SHALL HAVE BETWEEN 15-25% PASSING THE #200 SIEVE AND THE LARGEST STONE SIZE SHALL BE 2". IF THE SITE IS ACTIVE AFTER OCTOBER 15TH, ANY ACCUMULATED SNOW SHALL BE REMOVED FROM ALL ROADWAY AND PARKING AREAS.
4. AFTER OCTOBER 15TH, THE END OF NEW HAMPSHIRE'S AVERAGE GROWING SEASON, NO ADDITIONAL LOAM SHALL BE SPREAD ON SIDE SLOPES AND SWALES. THE STOCKPILES THAT WILL BE LEFT UNDISTURBED UNTIL SPRING SHALL BE SEED BY THIS DATE. AFTER OCTOBER 15TH, ANY NEW OR DISTURBED PILES SHALL BE MULCHED AT A RATE OF 3-4 TONS PER ACRE. ALL STOCKPILES THAT WILL REMAIN THROUGHOUT THE WINTER SHALL BE SURROUNDED WITH SILT FENCING.

E-102

PLANNING FILE #	
REVISION	DATE
DESCRIPTION	

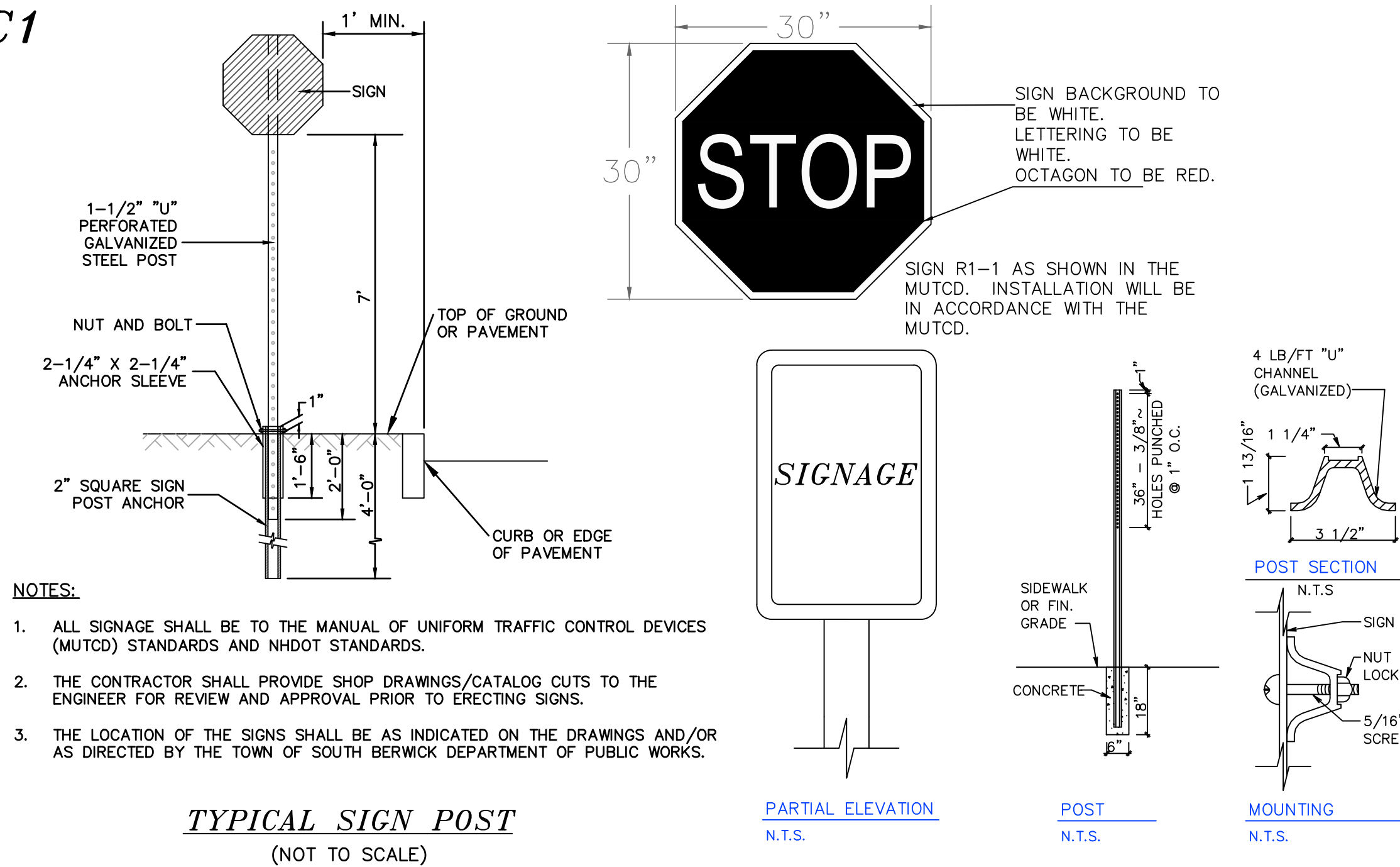
EROSION & SEDIMENT CONTROL DETAILS
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING 335 SECOND CROWN POINT ROAD BARRINGTON, NH 03825 (603)332-2863	AS NOTED	JANUARY 21, 2021	DB 2020 - 066
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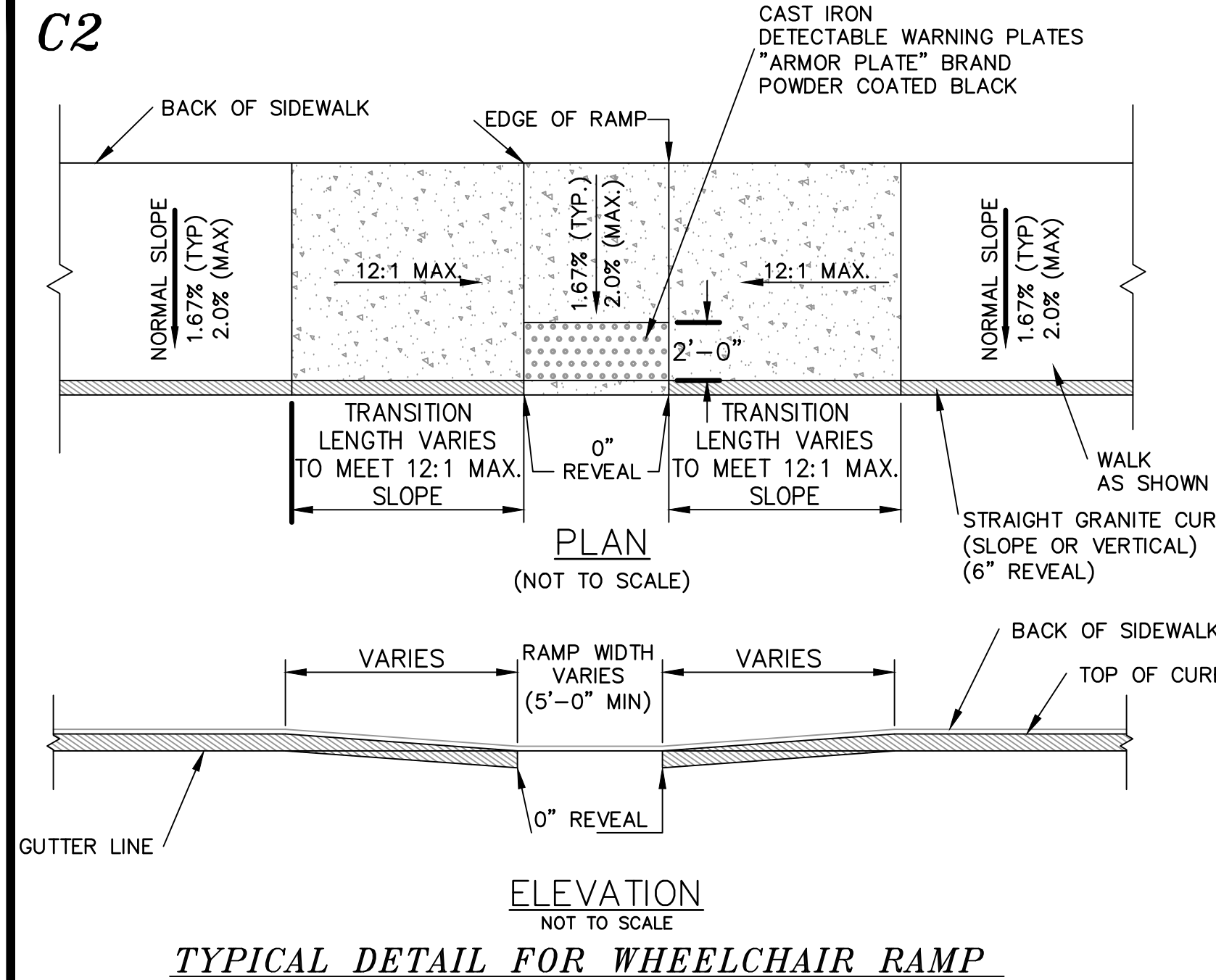


SHEET 28 OF 38

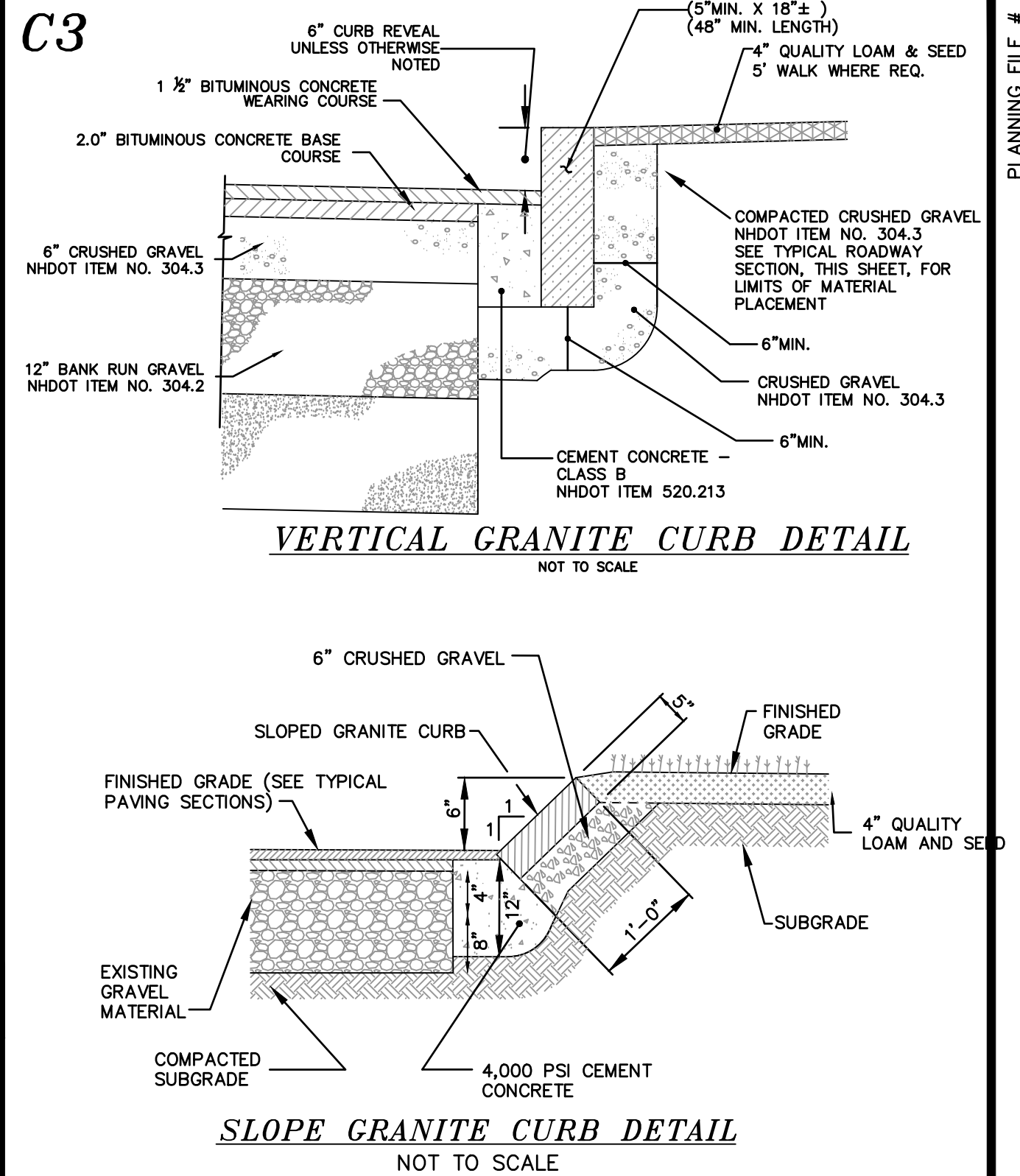
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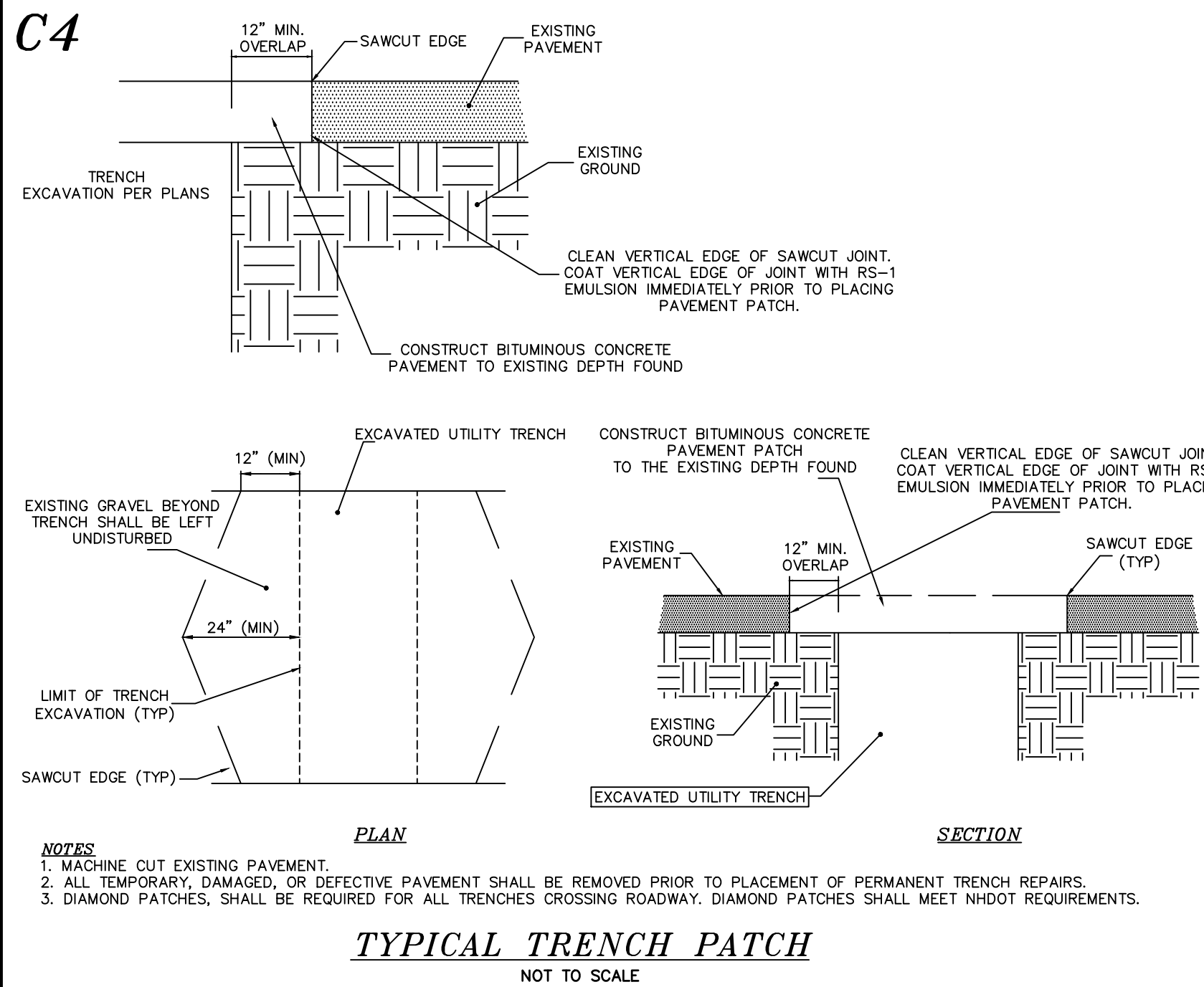
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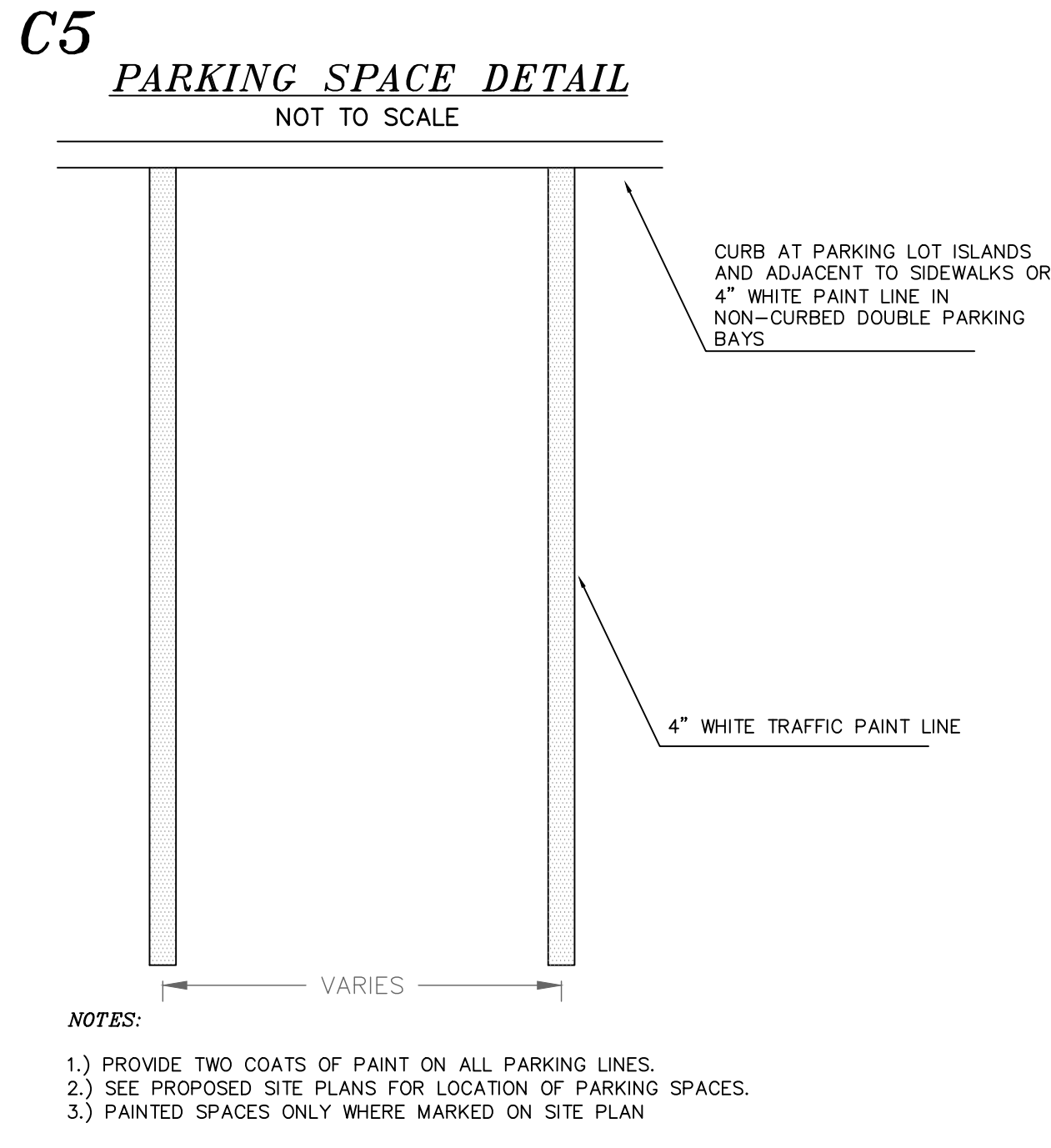
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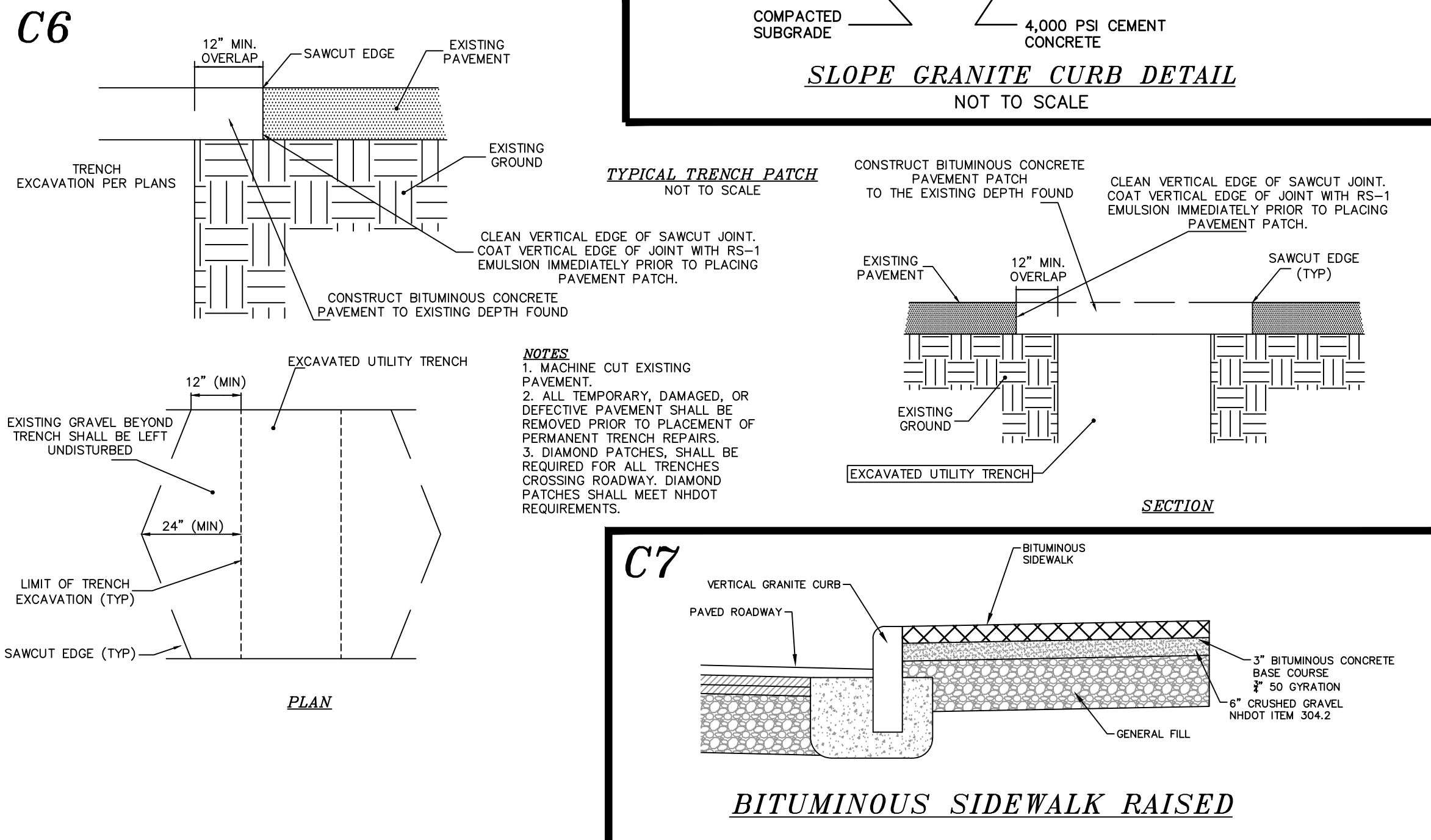
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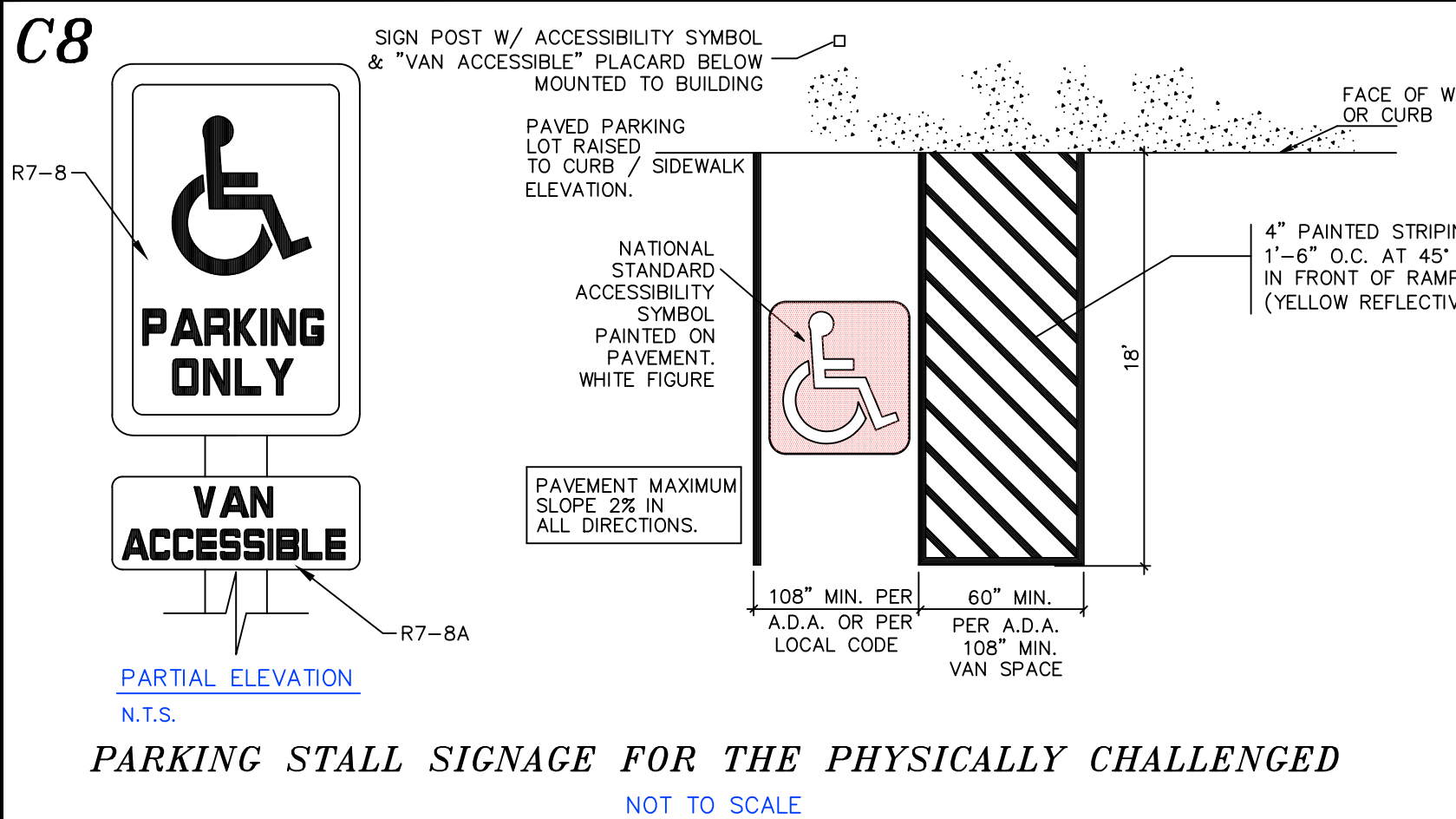
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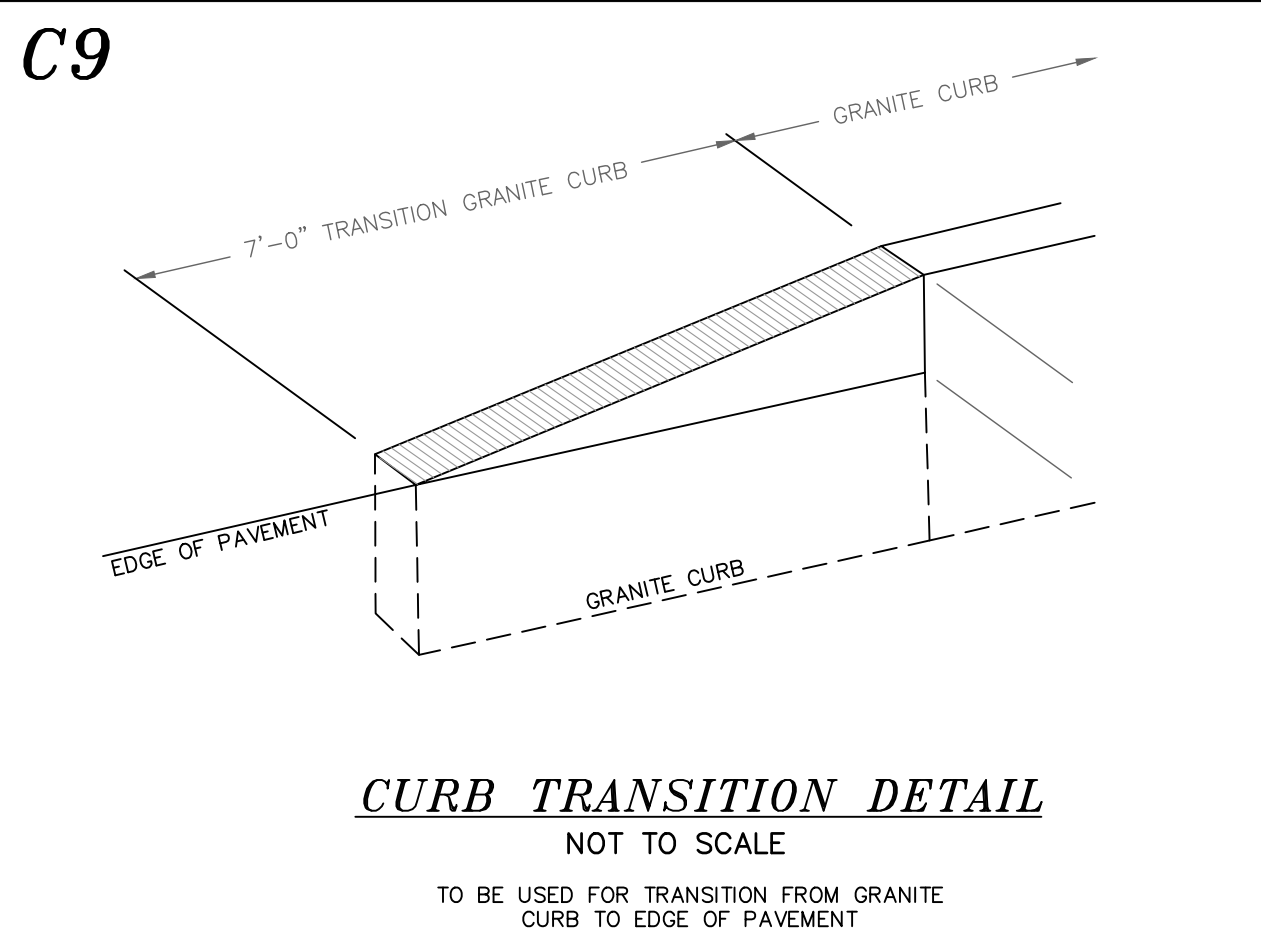
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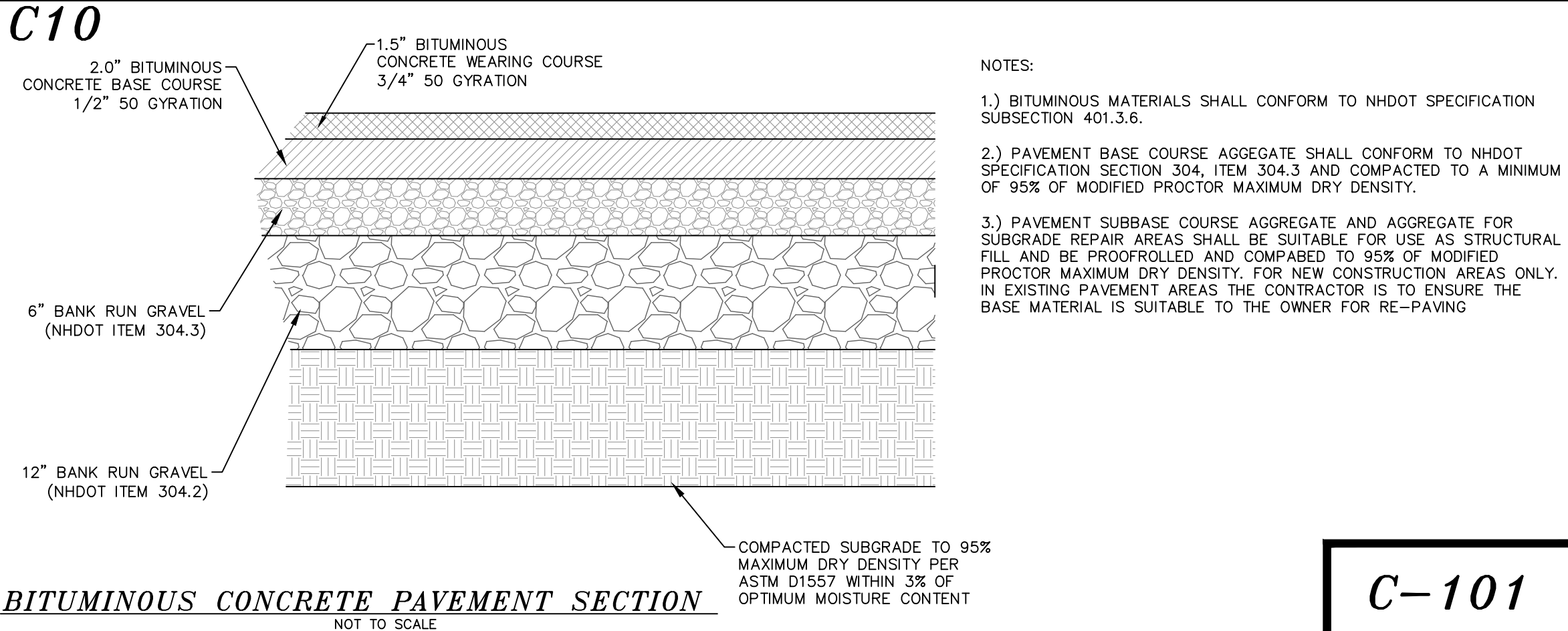
C8



C9



C10



PLANNING FILE #	REVISION	DATE	DESCRIPTION

CONSTRUCTION DETAILS
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37.4

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863

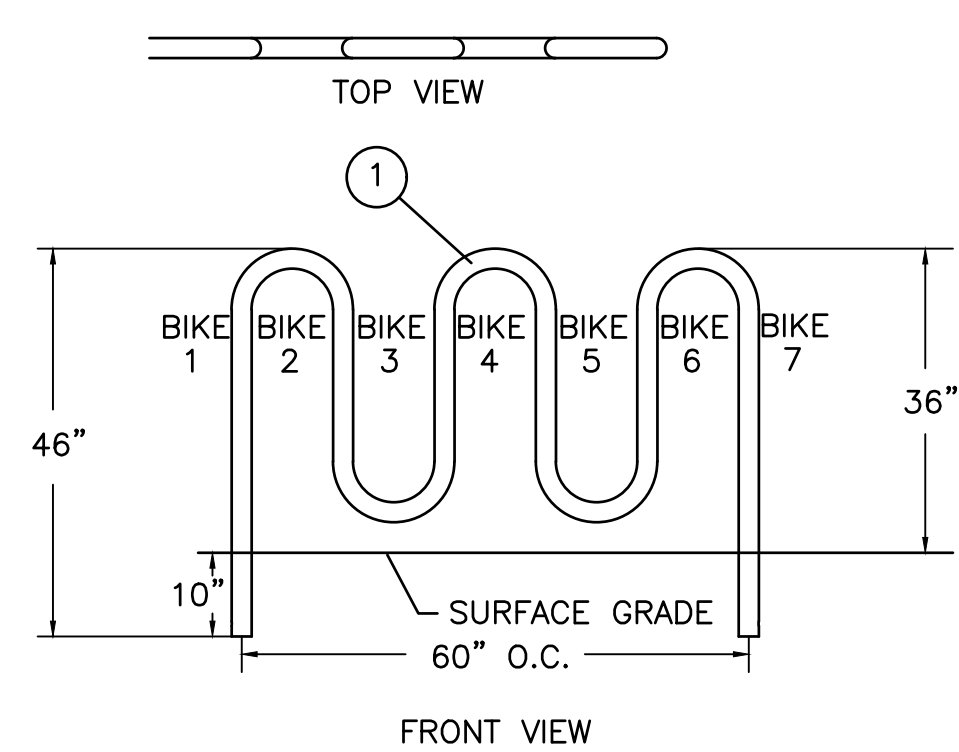
AS NOTED
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066

STATE OF NEW HAMPSHIRE
KENNETH A. BERRY
REGISTERED PROFESSIONAL ENGINEER
No. 14242

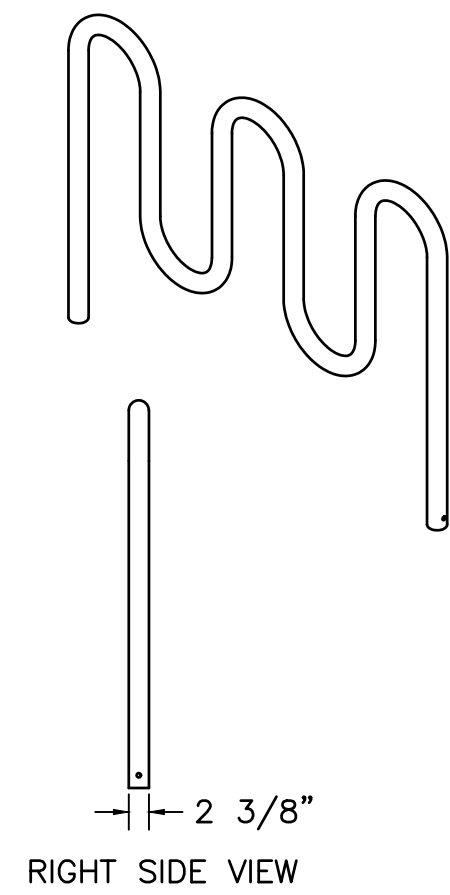
SHEET 29 OF 38

C11

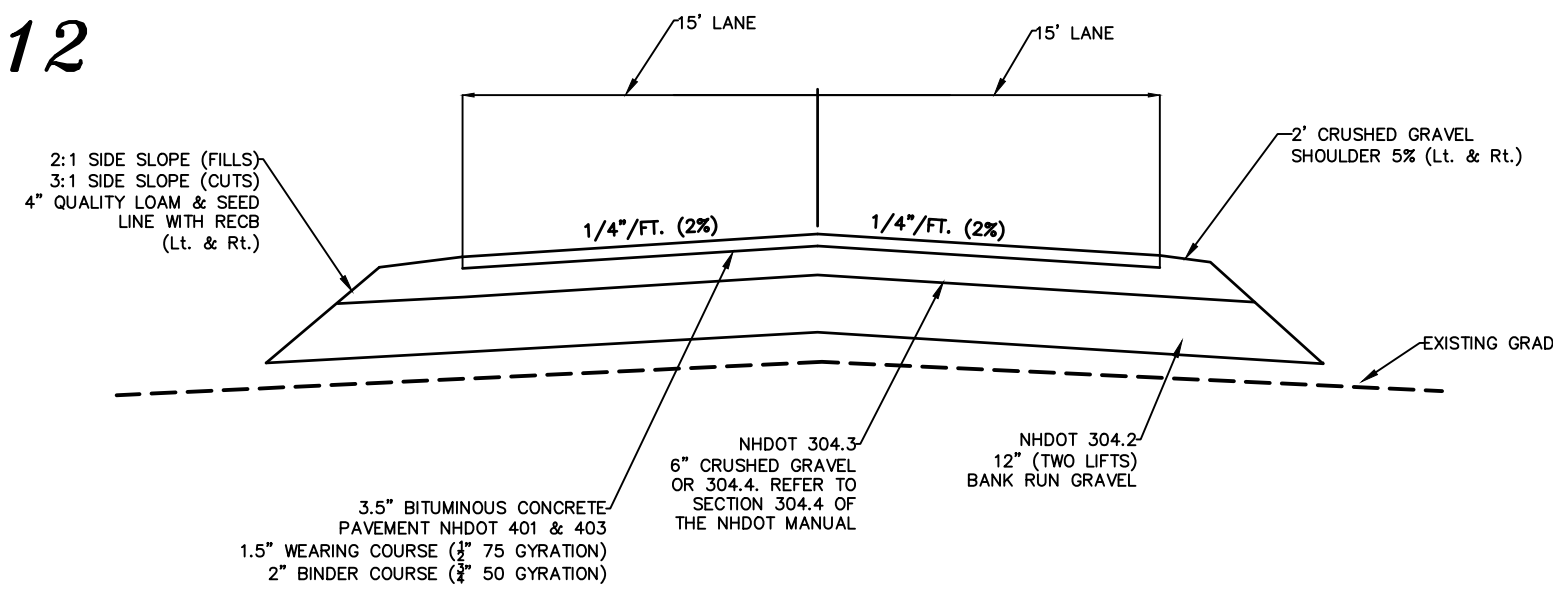
MATERIALS LIST
(1) .TUBING - Ø 2 3/8" x .154" Wall Steel Tubing



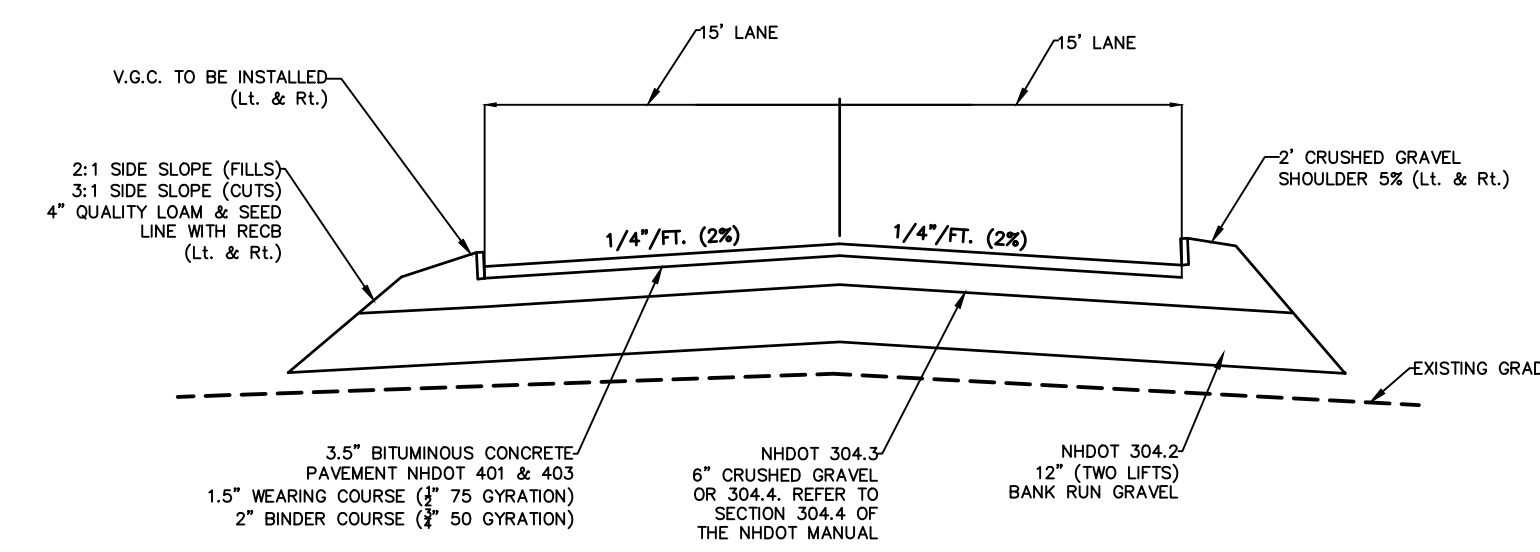
BIKE RACK
NOT TO SCALE



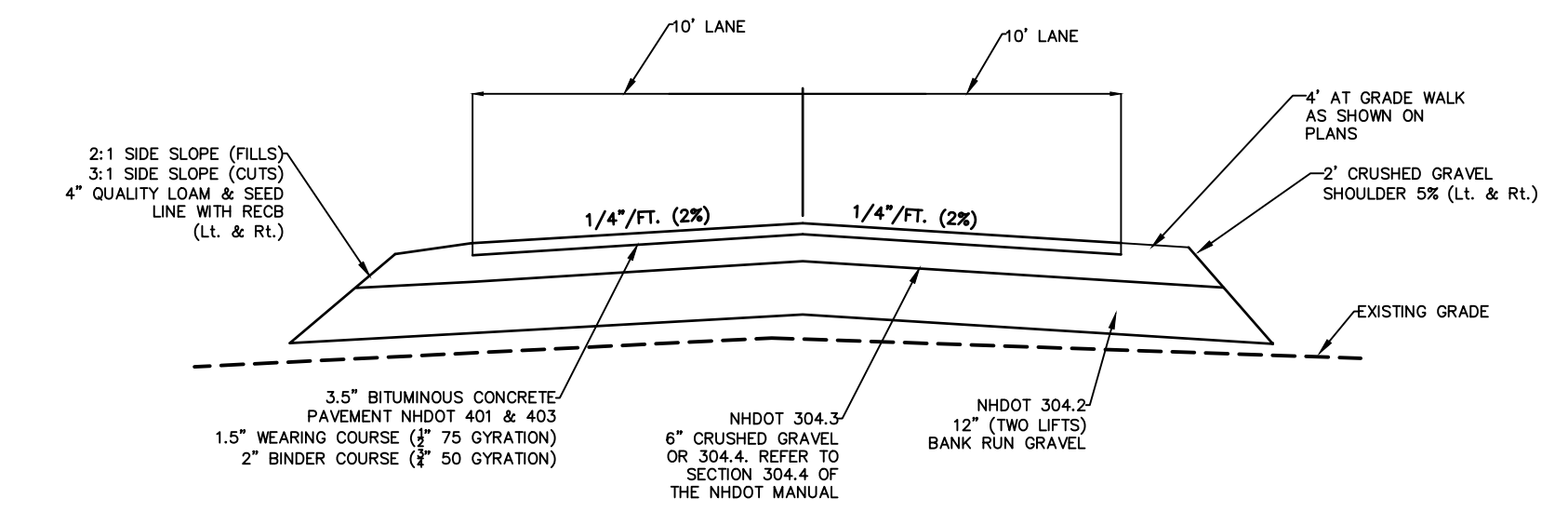
C12



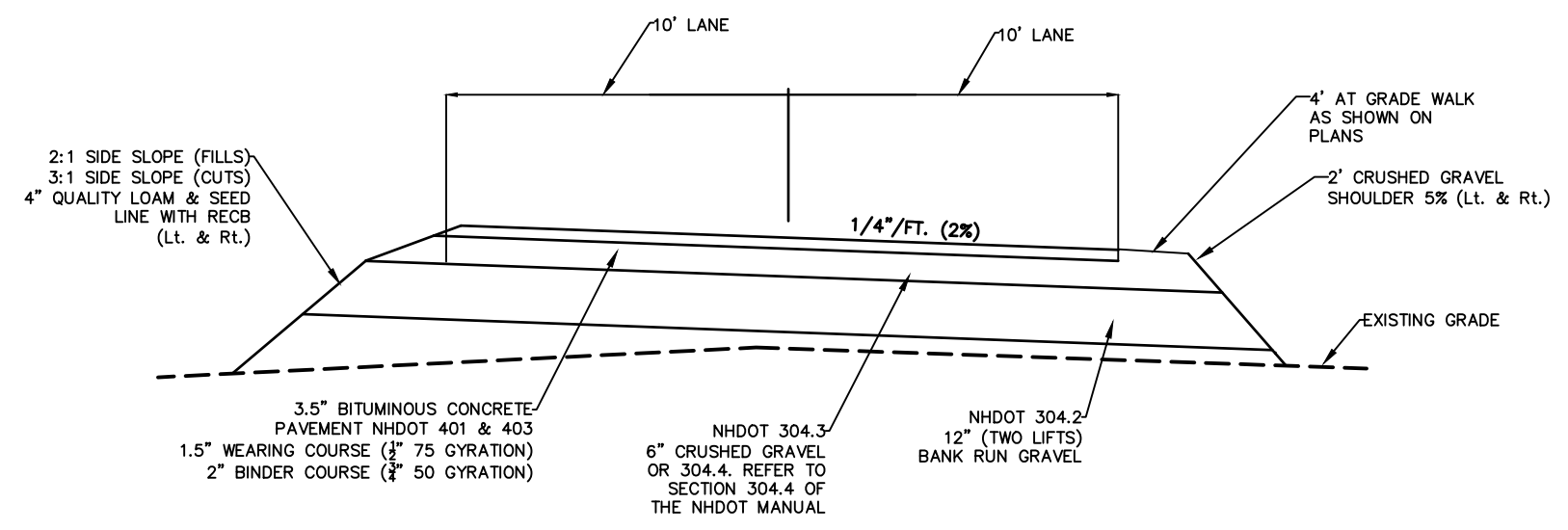
TYPICAL ROADWAY SECTION CONCOLOR DRIVE
0+35.76-0+99.05 & 2+16.94-2+42.09



TYPICAL ROADWAY SECTION CONCOLOR DRIVE
0+99.05-2+15.94



TYPICAL ROADWAY SECTION CONCOLOR DRIVE 2+42.09-4+00



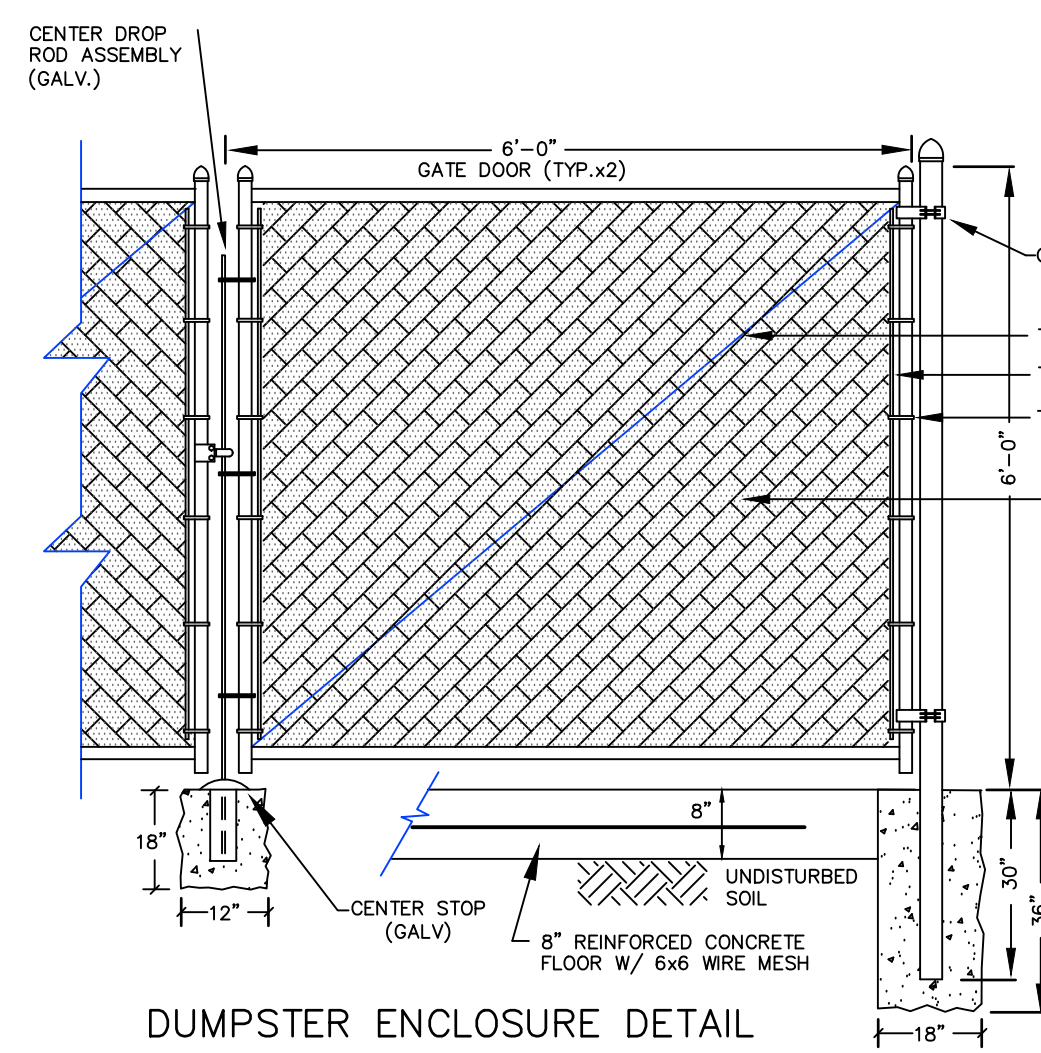
TYPICAL ROADWAY SECTION CONCOLOR DRIVE 4+00-END

CROSS SECTION NOTES

1. ALL ROADWAY FILL TO BRING ROAD TO SUBGRADE SHALL BE INSTALLED IN LIFTS NO GREATER THAN 12".
2. ALL FILL SHALL BE COMPACTED TO 95% MINIMUM. COMPACTION TESTS TO BE CONDUCTED AT THE START OF THE PROJECT AND NO FURTHER THAN 100 FEET APART.
3. GUARD RAIL REQUIRED AS NOTED ON PLAN & PROFILE SHEETS.
4. TEST PITTING WAS DONE WITHIN THE ROADWAY ALIGNMENT BY STONEY RIDGE ENVIRONMENTAL, AND NO UNSUITABLE MATERIALS WERE ENCOUNTERED IN THOSE TEST PITS.

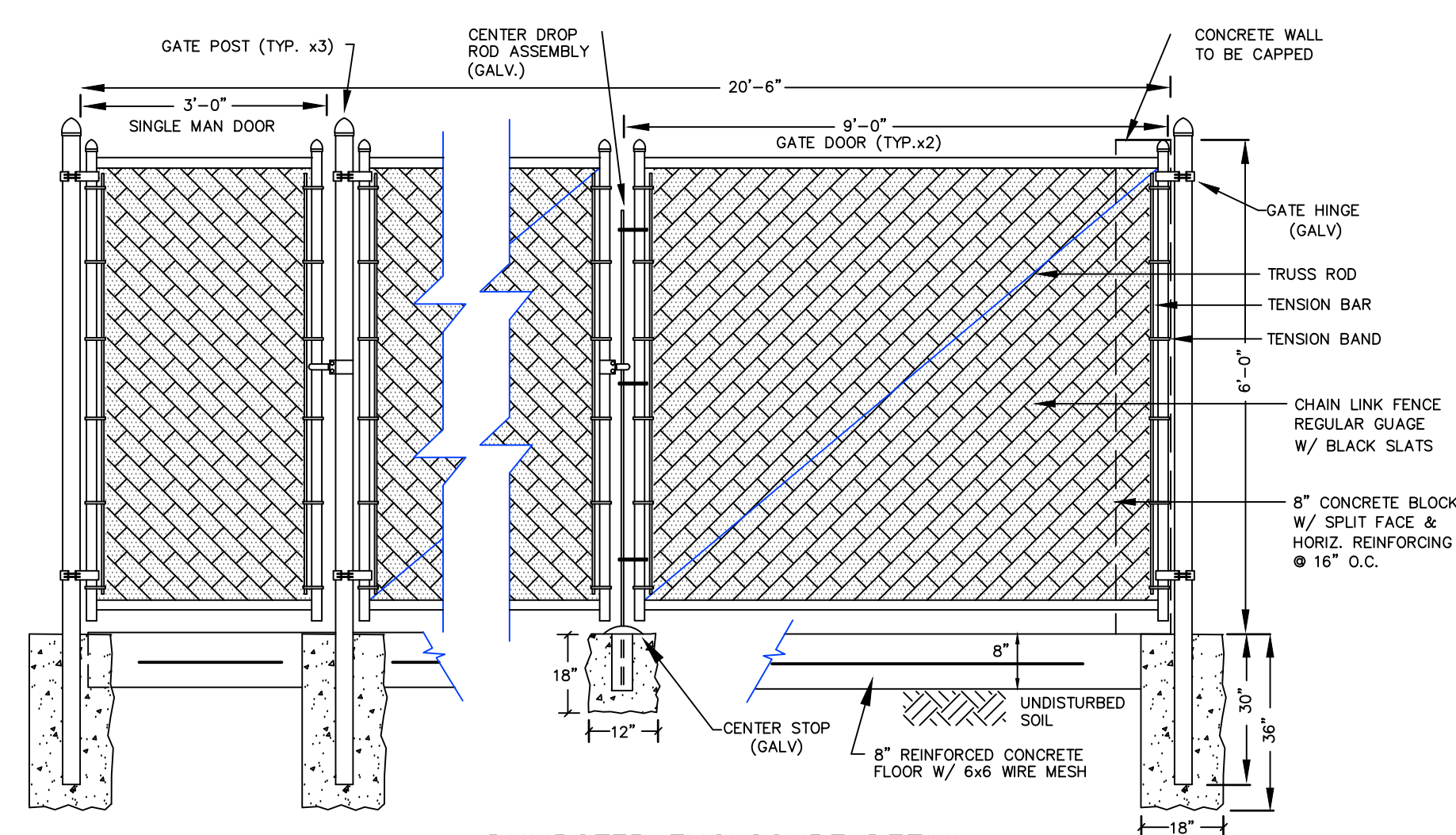
COMPACTED SUBGRADE - CONTRACTOR SHALL SCARIFY SUBGRADE TO A DEPTH OF 30 INCHES BELOW F-GRADE. ALL STONES GREATER THAN 6" IN DIAMETER SHALL BE REMOVED FROM THE SCARIFIED LAYER. ANY IMPORTED FILL SHALL BE FREE OF ORGANICS AND FROST AND SHALL HAVE NO ROCKS LARGER THAN 6" IN DIAMETER. FILL MATERIAL SHALL BE APPROVED BY THE TOWNS AGENT AND/OR THE TOWNS ENGINEER.

C13



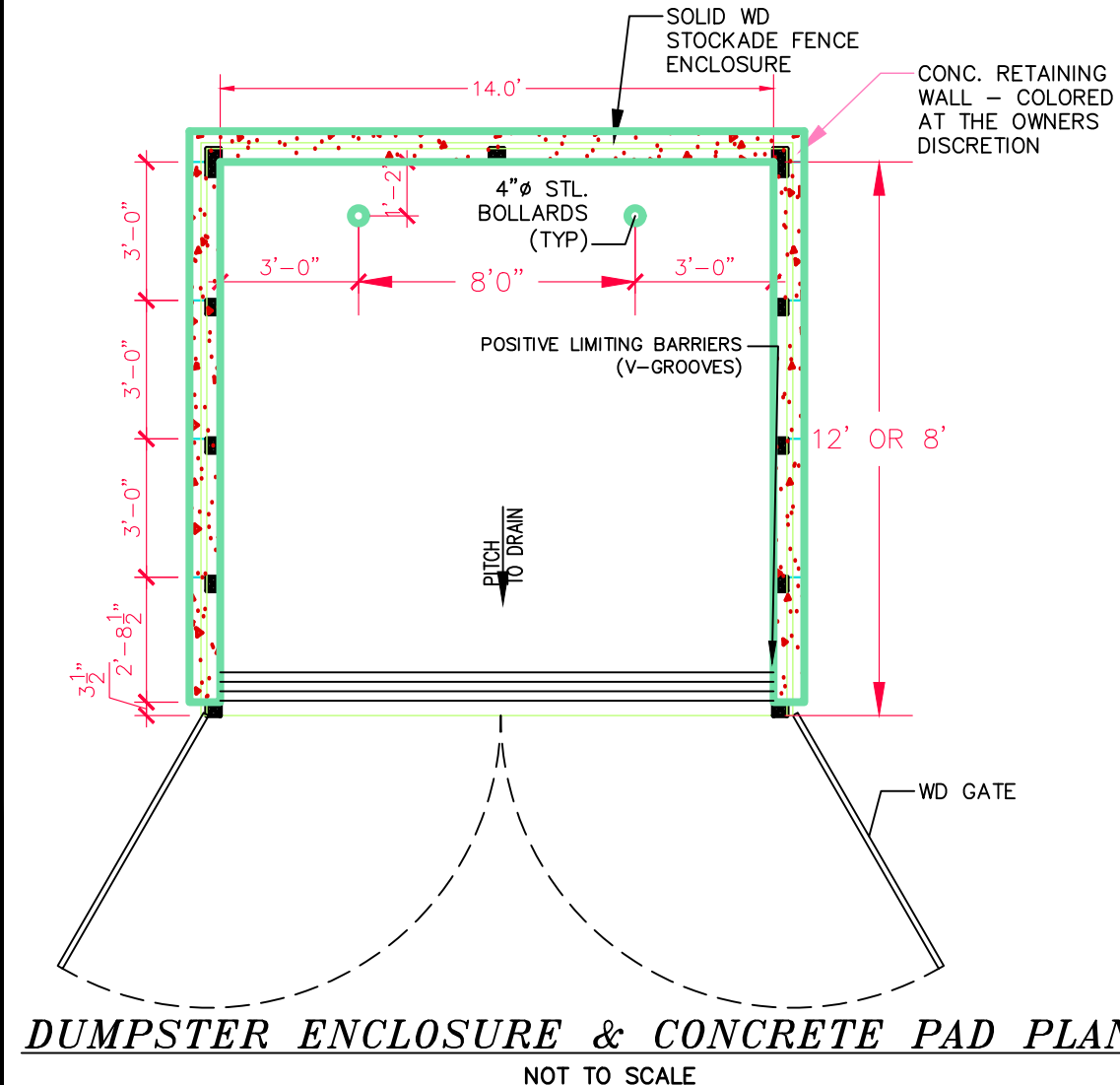
DUMPSTER ENCLOSURE DETAIL

SCALE: 1/2" = 1'-0"

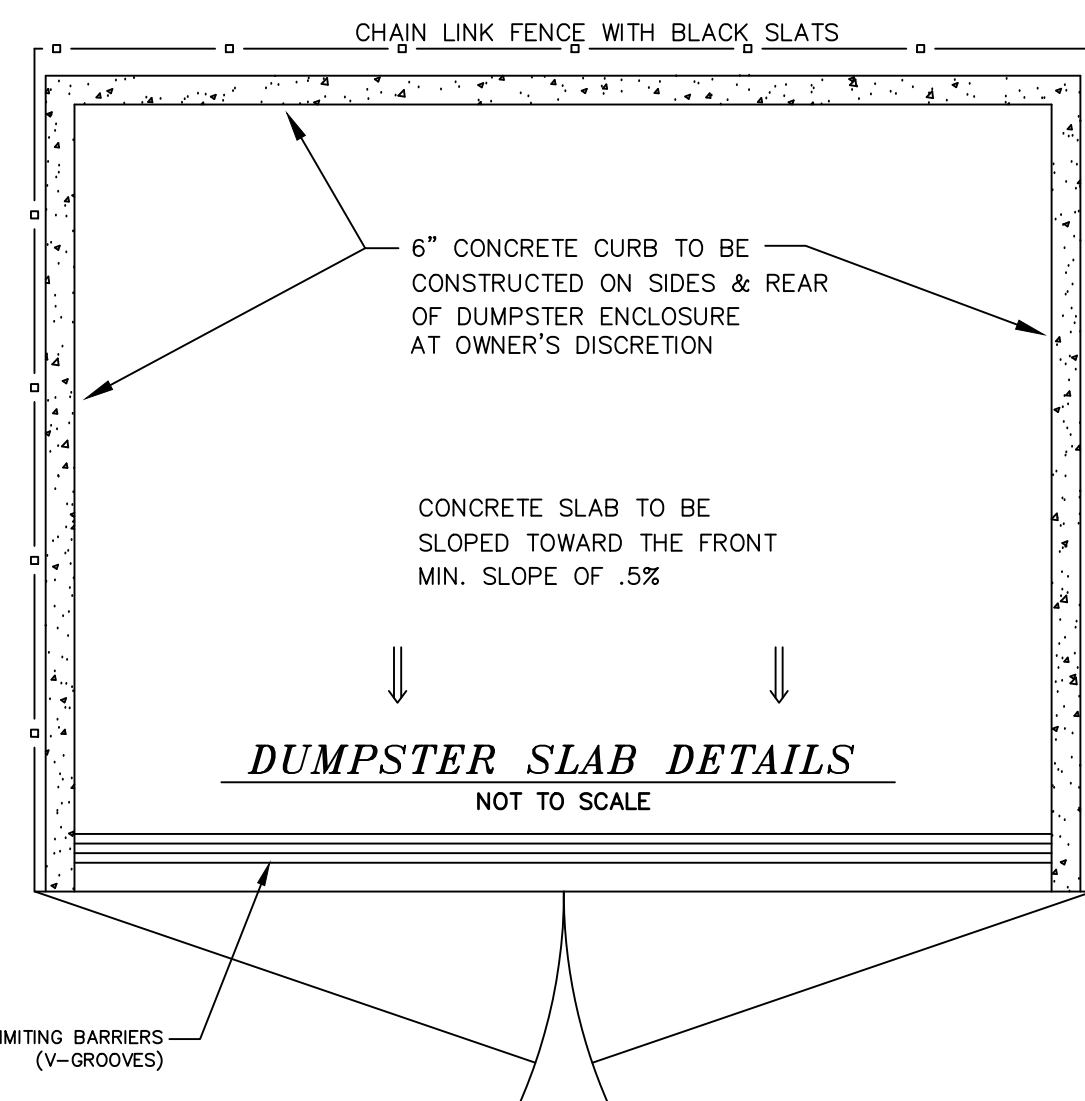


DUMPSTER ENCLOSURE DETAIL

SCALE: 1/2" = 1'-0"



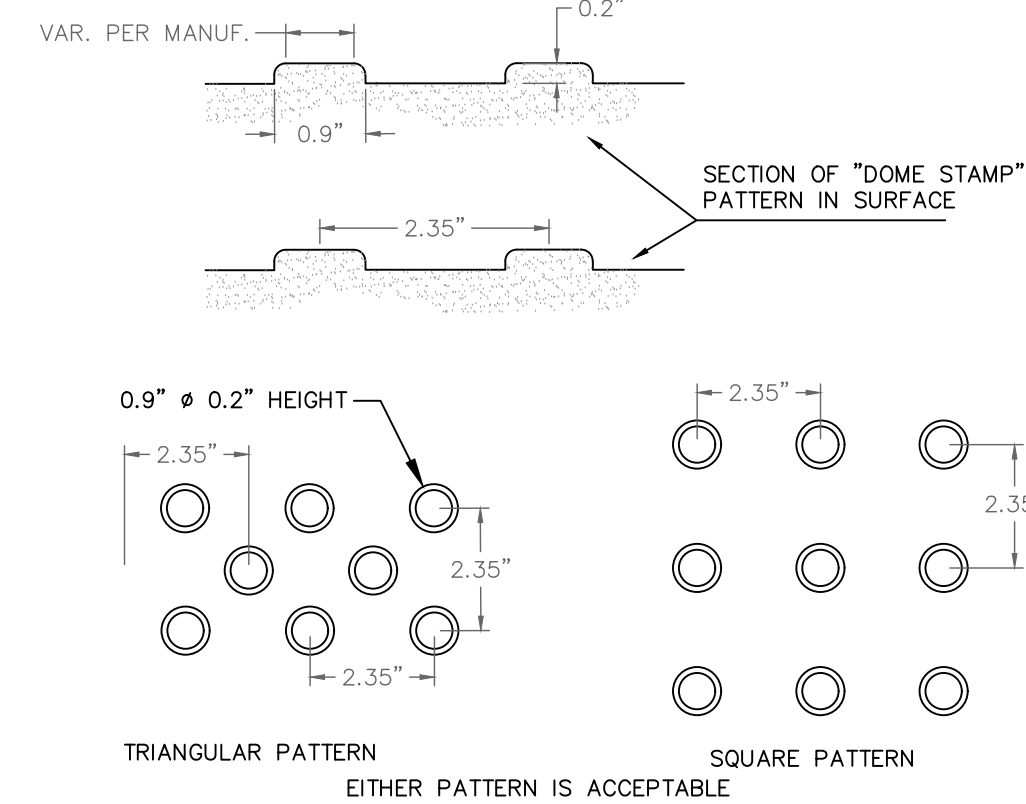
DUMPSTER ENCLOSURE & CONCRETE PAD PLAN
NOT TO SCALE



DUMPSTER SLAB DETAILS

NOT TO SCALE

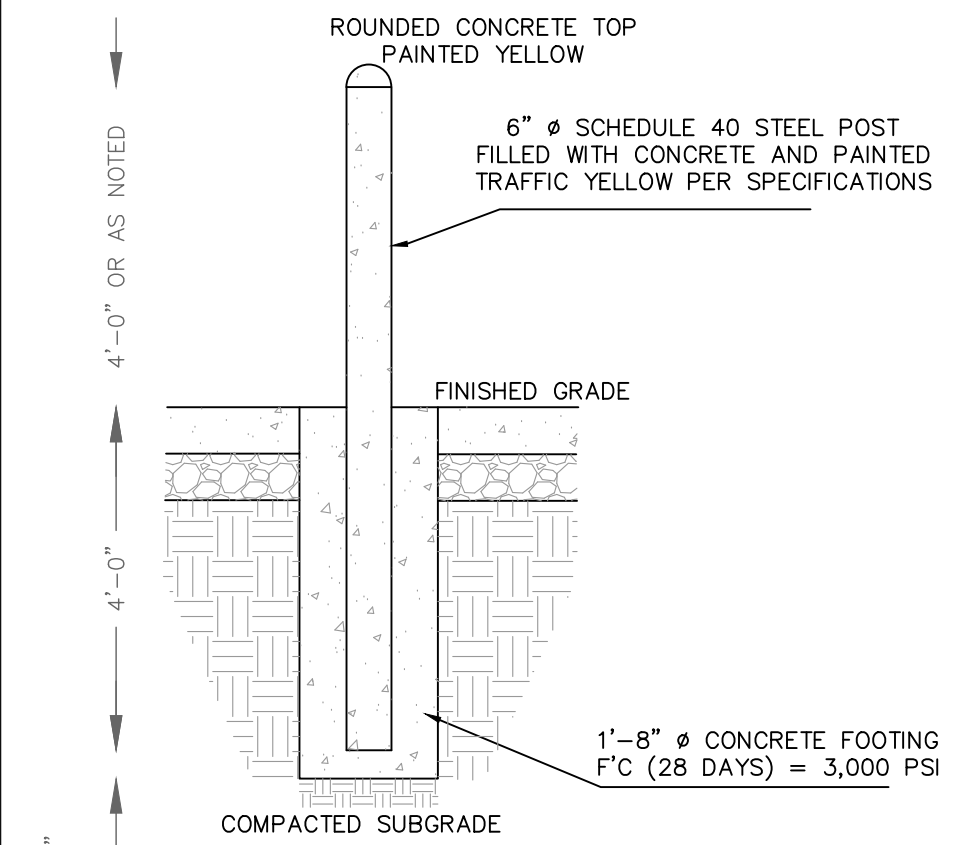
C14



DETECTABLE WARNING SURFACE

NOT TO SCALE

C15



BOLLARD DETAIL

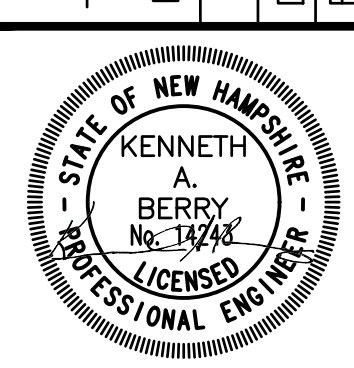
NOT TO SCALE

C-102

PLANNING FILE #	DESCRIPTION
REVISION	DATE

CONSTRUCTION DETAILS
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
AS NOTED
DATE : JANUARY 21, 2021
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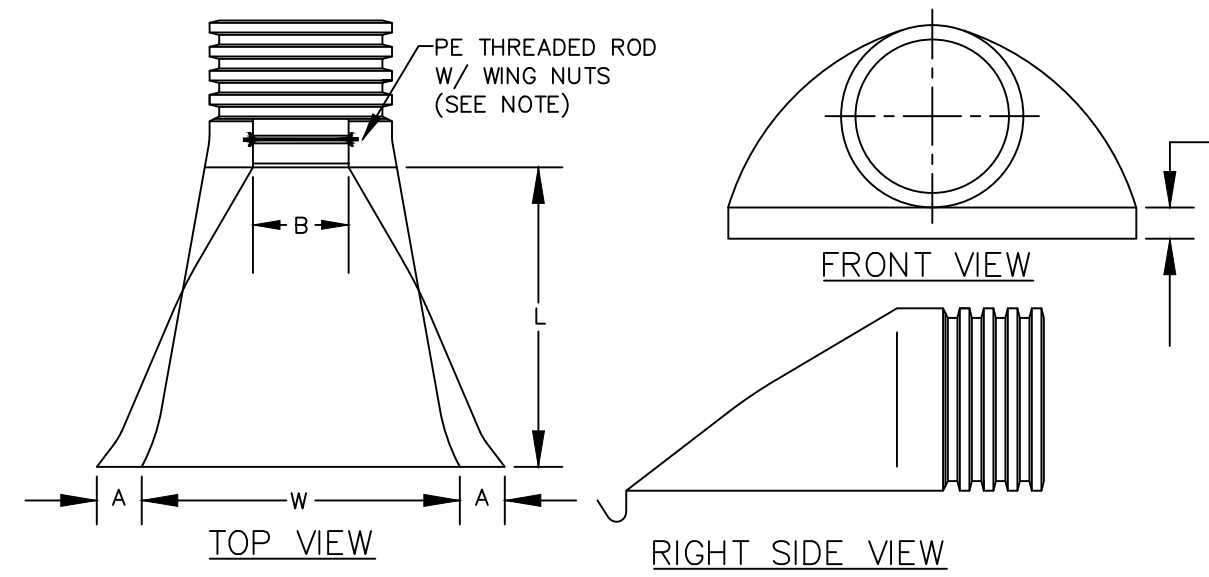
SHEET 30 OF 38

D 1

PART No.	PIPE SIZE	A	B(MAX)	H	L	W
1510-NP	15" 375 mm	6.5" 165 mm	10" 254 mm	6.5" 165 mm	25" 635 mm	29" 735 mm
1810-NP	18" 450 mm	7.5" 190 mm	15" 380 mm	6.5" 165 mm	32" 812 mm	35" 890 mm
2410-NP	24" 600 mm	7.5" 190 mm	18" 450 mm	6.5" 165 mm	36" 900 mm	45" 1140 mm
3010-NP	30" 750 mm	10.5" 266 mm	N/A	7.0" 178 mm	53" 1345 mm	68" 1725 mm
3610-NP	36" 900 mm	10.5" 266 mm	N/A	7.0" 178 mm	53" 1345 mm	68" 1725 mm

NOTE: PE THREADED ROD W/ WING NUTS PROVIDED FOR END SECTIONS 15"-24".
30" & 36" END SECTIONS TO BE WELDED PER MANUFACTURER'S
RECOMMENDATIONS.

ADS N-12 FLARED END SECTIONS
NOT TO SCALE (ALL DIMENSIONS ARE NOMINAL)



D2

ANGLE GRATE
NOT TO SCALE

NOTE:
MUST BE HAALA INDUSTRIES INC.
OR EQUAL.



AG0808-58
Part No. AG0808-58

Save Trees

Angle Grates are designed to cover inlet orifices and prevent small to medium debris from passing through. The top angled design helps to minimize the amount of debris that settles on top after the water recedes. All grates are made from plate for a clean and smooth contact surface.

- Plate design for a clean appearance
- Standard 2" openings (other sizes can be made)
- Angled top/front plate to maximize debris deflection
- Mounting flanges on 3 sides allows grate to be mounted at floor level inverts
- Galvanized steel construction. Can be made from aluminum or stainless steel.

D3

CONE GRATE
NOT TO SCALE

NOTE:
MUST BE HAALA INDUSTRIES INC.
OR EQUAL.



CG12TM
Part No. CG12TM

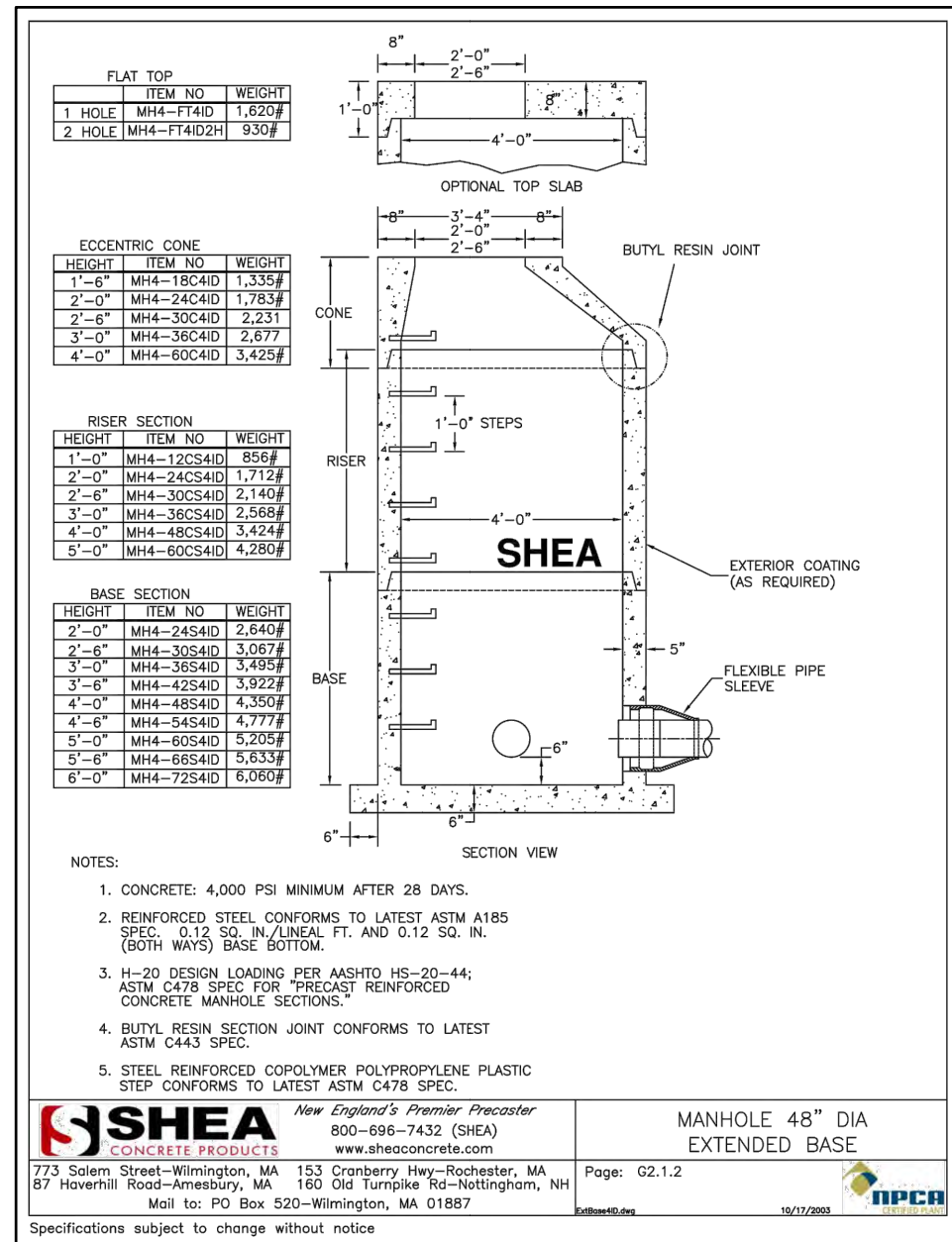
Save Trees

Top Mount Cone Grates are designed to mount on the top of round manhole inlet or outlet structures to keep debris from entering the storm water system. Top mount cone grates are easy to install and allow for at grade manhole installations but can be used in a variety of applications. Grates 96" and larger are made as a two piece, bolt together design.

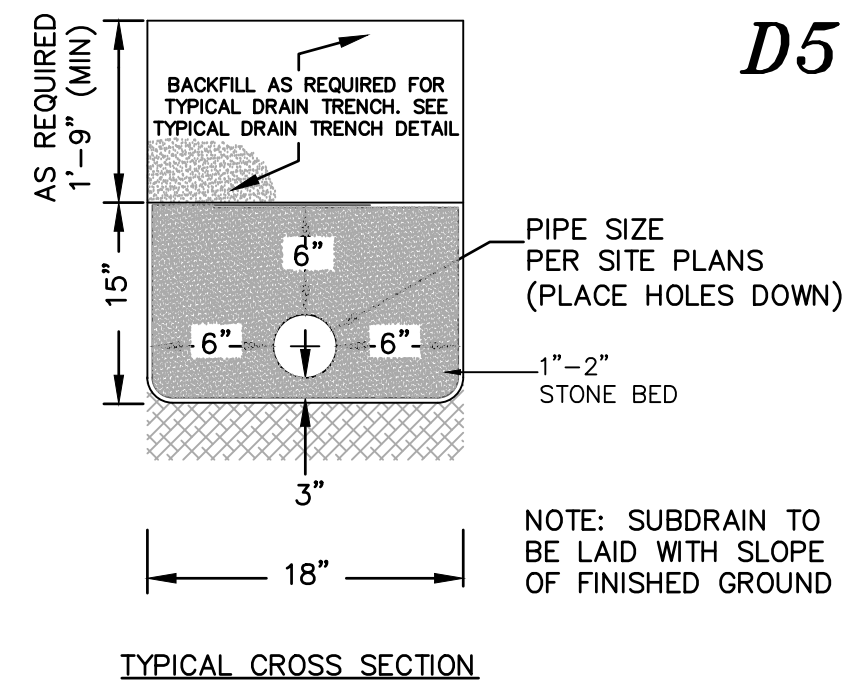
- Plate and bar hybrid design is both clean and cost effective
- Made from 1/2" plate with 3/4" or 1" round bars depending on grate size
- Anti vortex plate can be added upon request
- Hinged and lockable access doors can be added upon request
- Galvanized steel construction. Can be made from aluminum or stainless steel.

D4

48" MANHOLE ROUND EXTENDED BASE
NOT TO SCALE



SUBDRAIN PIPE TO
BE ADS N-12
PERFORATED
(CORRUGATED
EXTERIOR/ SMOOTH
INTERIOR) MEETING
AASHTO M-252
WITH FILTER SOCK



NOTES:

CROWN OF 6" SUBDRAIN PIPES TO MATCH CROWN
OF DRAIN PIPES IN CATCH BASINS

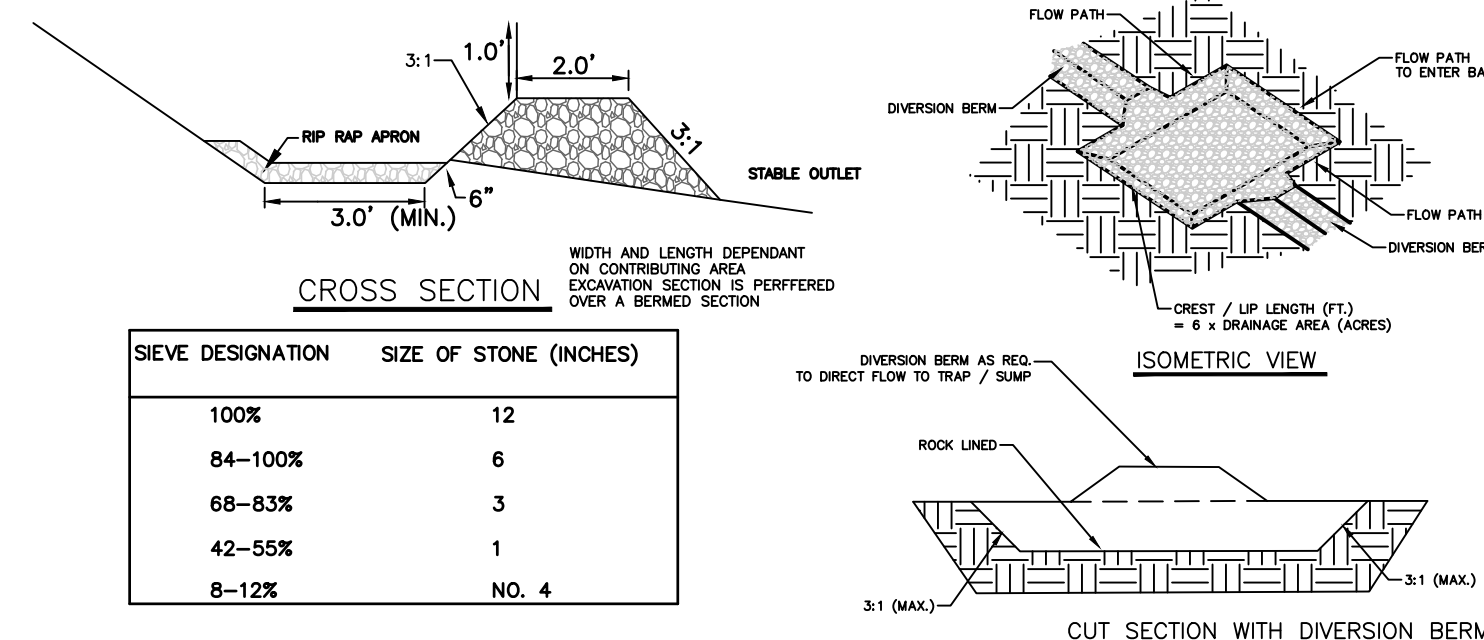
SUBDRAIN TO BE INSTALLED AS INDICATED ON THE
DRAWINGS AND AS DIRECTED BY THE ENGINEER.

SHORING AND STABILIZING OF TRENCH
SIDEWALLS DURING EXCAVATION SHALL BE THE
RESPONSIBILITY OF THE CONTRACTOR. NO
ADDITIONAL COMPENSATION WILL BE ALLOWED
FOR ANY TRENCH EXCAVATION BEYOND THE
LIMITS OF PAY EXCAVATION INDICATED.

SUBDRAIN DETAIL TYPICAL
NOT TO SCALE

D5

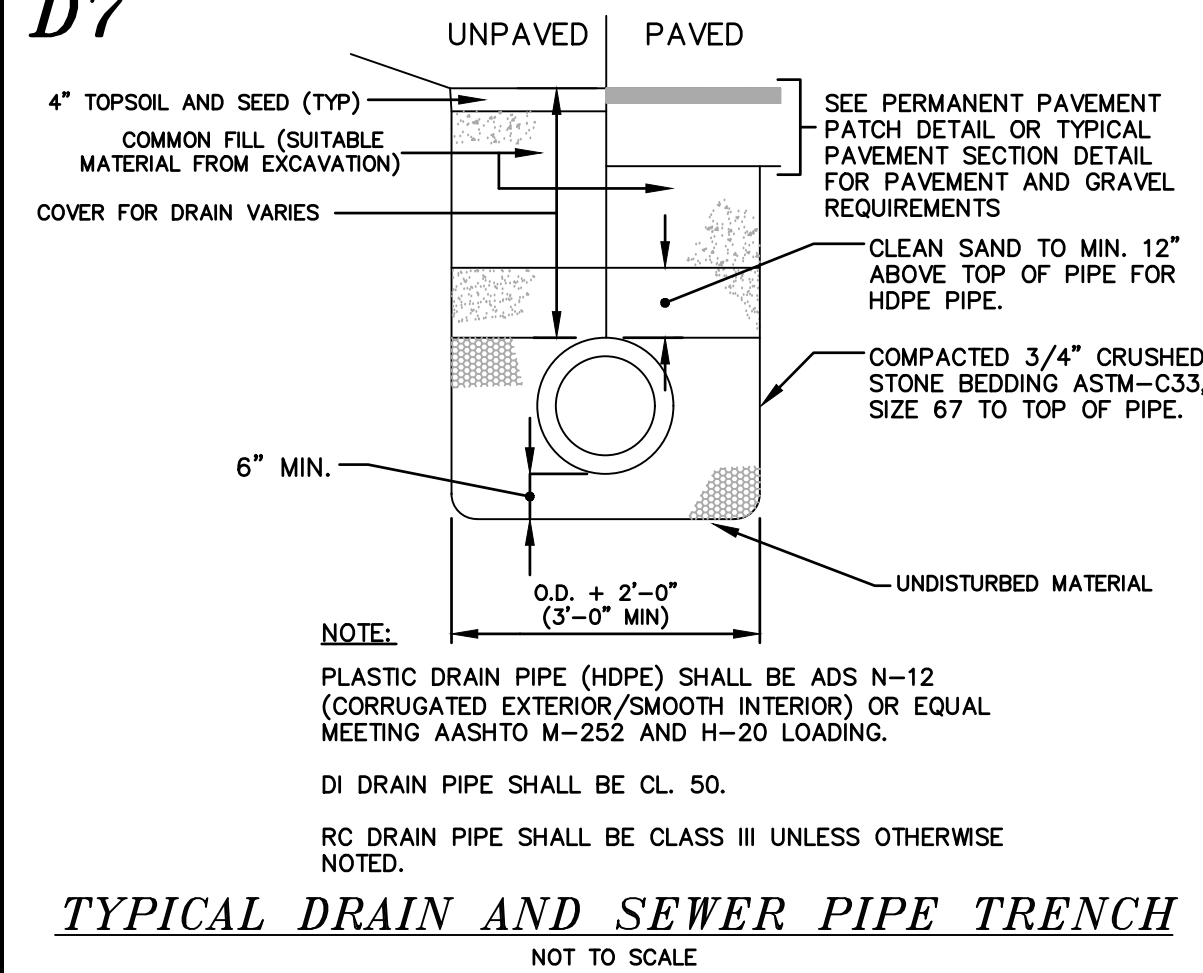
D6



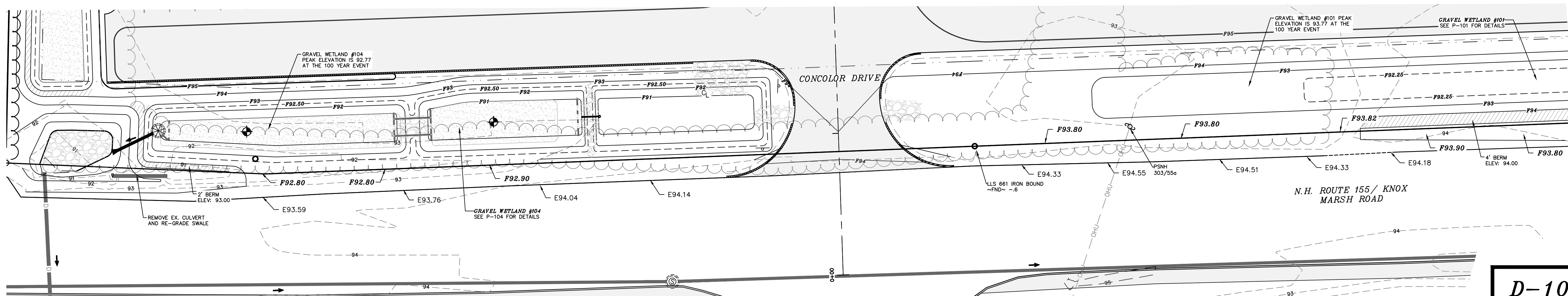
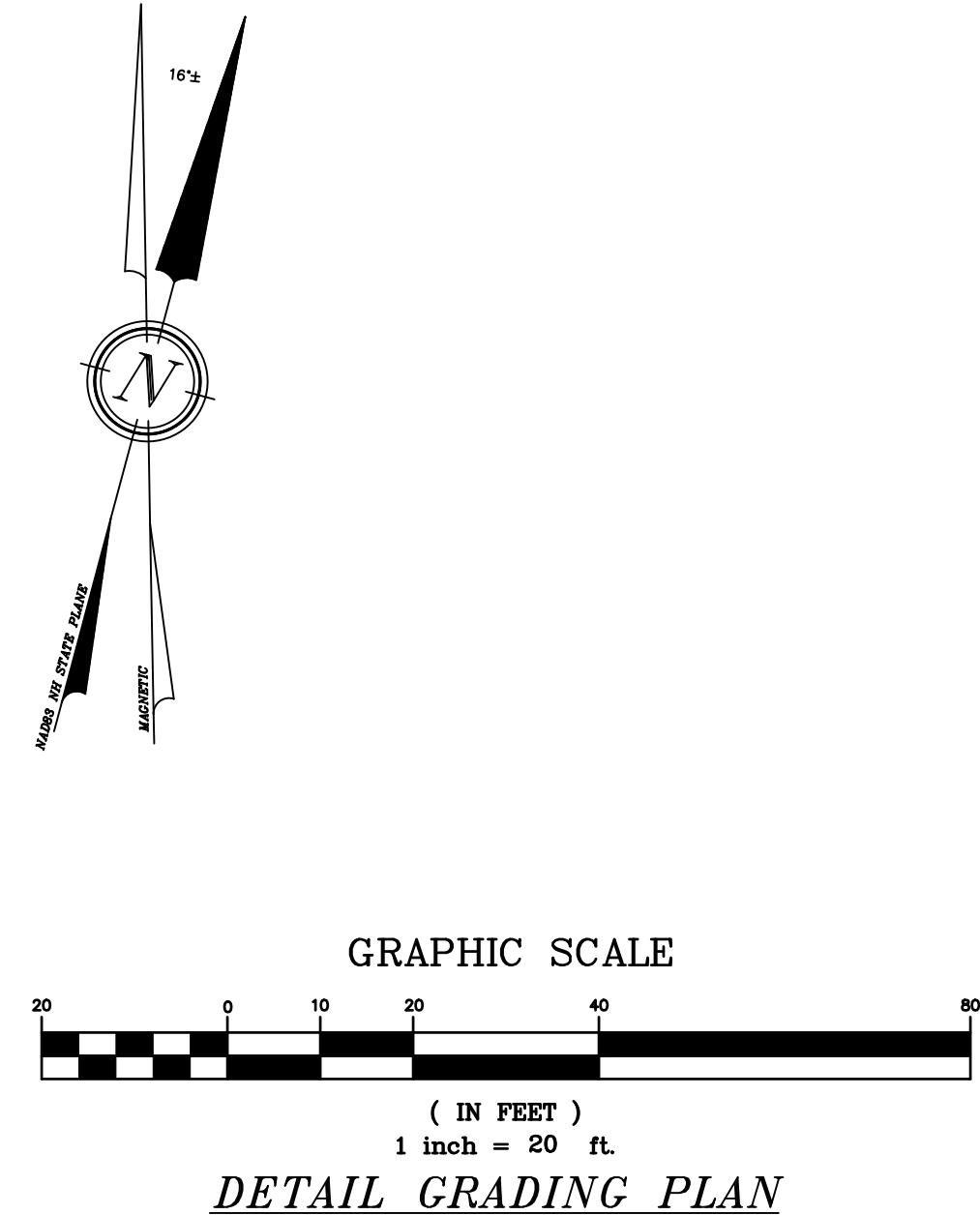
1. TRAP TO BE INSTALLED AS CLOSE TO THE DISTURBED AREA OR SOURCE OF SEDIMENT AS POSSIBLE.
2. THE MAXIMUM CONTRIBUTING DRAINAGE AREA TO THE TRAP SHALL BE LESS THAN 5 ACRES.
3. THE MINIMUM VOLUME OF THE TRAP SHALL BE 3,600 CUBIC FEET OF STORAGE FOR EACH ACRE OF DRAINAGE AREA.
4. THE SIDE SLOPES OF THE TRAP SHALL BE 3:1 OR FLATTER AND SHALL BE STABILIZED IMMEDIATELY AFTER THE CONSTRUCTION.
5. THE OUTLET OF THE TRAP SHALL BE A MINIMUM OF ONE FOOT BELOW THE CREST OF THE TRAP AND SHALL DISCHARGE TO A STABILIZED AREA.
6. THE TRAP SHALL BE CLEANED WHEN 50 PERCENT OF THE ORIGINAL VOLUME IS FILLED.
7. THE MATERIALS REMOVED FROM THE TRAP SHALL BE PROPERLY DISPOSED OF AND STABILIZED.

STONE LINED SEDIMENT TRAP

D7



TYPICAL DRAIN AND SEWER PIPE TRENCH
NOT TO SCALE

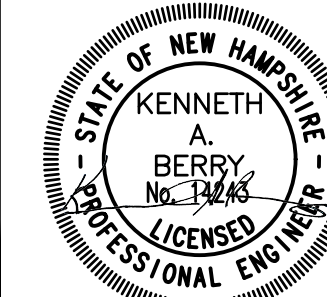


D-101

DRAINAGE DETAILS
LAND OF
EQUINE PROPERTIES LLC
2239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863

AS NOTED
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066



- 3) IT IS THE INTENTION THAT THE MANHOLE, INCLUDING ALL COMPONENT PARTS, HAVE ADEQUATE SPACE, STRENGTH AND LEAKPROOF QUALITIES CONSIDERED NECESSARY FOR THE INTENDED SERVICE. SPACE REQUIREMENTS AND STRENGTH REQUIREMENTS SHALL BE SHOWN ON THE DRAWING. MANHOLES SHALL BE AN ASSEMBLY OF PRECAST SECTIONS, WITH STEEL REINFORCEMENT AND ADEQUATE JOINTING. THE COMPLETE STRUCTURE SHALL BE OF SUCH MATERIAL AND QUALITY AS TO WITHSTAND HS-20-44 LOADING, INCLUDING THE FOLLOWING. SMH CONSTRUCTION AND MATERIALS WILL BE IAW ENV-WQ 704.13 ADOPTED OCTOBER 15, 2014.
- 2) BARRELS AND CONE SECTIONS SHALL BE PRECAST REINFORCED CONCRETE. (IAW ENV-WQ 704.12 (d))
- 3) SEWER MANHOLE DIAMETER SHALL BE AS INDICATED ON THE PLANS.
- 4) PRECAST CONCRETE BARREL SECTIONS, CONES AND BASES SHALL CONFORM TO ASTM C478.
- 5) GRAVITY SEWER PIPE TESTING WILL BE IN ACCORDANCE WITH ENV-WQ 704.06 AND MAN HOLE TESTING IAW ENV-WQ 704.17 ADOPTED OCTOBER 15, 2014.
- 6) INVERTS AND SHELVES: MANHOLES SHALL HAVE A BRICK PAVED SHELF AND INVERT, CONSTRUCTED TO CONFORM TO THE FOLLOWING. INVERT BRICKS SHALL BE LAID ON EDGE AND THE BASE SECTION SHALL BE FULL AT CHANGES IN DIRECTIONS. THE INVERTS SHALL BE LAID OUT IN CURVES OF THE LONGEST RADIUS POSSIBLE TANGENT TO THE CENTER LINE OF THE SEWER PIPES. CARE SHALL BE TAKEN TO INSURE THAT THE BRICK INVERT IS A SMOOTH CONTINUATION OF THE SEWER INVERT. SHELVES SHALL BE CONSTRUCTED TO THE ELEVATION OF THE HIGHEST PIPE CROWN AND SLOPE TO DRAIN TOWARD THE FLOWING THROUGH CHANNEL. UNDERLAYMENT OF INVERT AND SHELF SHALL CONSIST OF BRICK MASONRY. (IAW ENV-WQ 704.13 (c) (9)), MORTAR SHALL CONFORM WITH REQUIREMENTS OF IAW ENV-WQ 704.13 (c).
- 7) FRAMES AND COVERS: MANHOLE FRAMES AND COVERS SHALL BE OF HEAVY DUTY DESIGN AND PROVIDE A 30-INCH CLEAR OPENING. 3-INCH (MINIMUM HEIGHT) LETTERS WITH THE WORD "SEWER" SHALL BE PLAINLY CAST INTO THE CENTER OF EACH MANHOLE COVER. (IAW ENV-WQ 704.13 (g) (4-6)) SEWER MAN HOLE COVERS ARE TO PAMFEX.
- 8) SHALLOW MANHOLE: IN LIEU OF A CONE SECTION, WHEN MANHOLE DEPTH IS LESS THAN 6 FEET, A REINFORCED CONCRETE SLAB COVER MAY BE USED HAVING AN ECCENTRIC ENTRANCE OPENING AND CAPABLE OF SUPPORTING H-20 LOADS.
- 9) HORIZONTAL JOINTS BETWEEN SECTIONS OF PRECAST CONCRETE BARRELS SHALL BE OF A TYPE APPROVED BY THE CITY OF DOVER. THE TYPE SHALL, IN GENERAL, DEPEND FOR WATER-TIGHTNESS UPON A DOUBLE ROW OF AN OVERLAPPING TYPE ELASTOMERIC OR MASTIC-LIKE GASKET. APPROVED ELASTOMERIC SEALANTS ARE: RAM-NEK, KENT SEAL NO. 2, EZ, OR EQUAL.
- 10) IN CROSS COUNTRY AREAS OUTSIDE OF THE PAVED ROADWAY SURFACE, THE MANHOLE FRAME ELEVATION SHALL BE A MINIMUM OF 6" ABOVE FINISHED GRADE. GRADE TO PROVIDE POSITIVE DRAINAGE AWAY FROM THE MANHOLE. SEE TYPICAL TRENCH DETAIL ON SHEET D-102.
- 11) ALL FRAMES AND GRATES ARE TO BE U.S.A. MADE. MANHOLE STEPS ARE REQUIRED IN THIS MUNICIPALITY AND MUST CONFORM TO THE REQUIREMENTS OF ENV-WQ 704.14.
- 12) THE CONTRACTOR TO WORK WITH CITY OF DOVER REVIEW ENGINEER AND SEWER DEPARTMENT ON THE MEANS AND METHODS USED TO INSTALL ALL SEWER STRUCTURES.
- 13) ANY WORK INVOLVING THE CUTTING INTO THE EXISTING A.C. PIPE SHALL MEET THE REQUIREMENTS OF ENV-A 1800.
- 14) THE "CITY OF DOVER, NEW HAMPSHIRE, DEPARTMENT OF COMMUNITY SERVICES, CONSTRUCTION GUIDELINES, PERMITS, RULES, AND REGULATIONS" (DATED MARCH 13, 2018) ARE A PART OF THE CONSTRUCTION DETAILS AND IS TO BE FOLLOWED. SEE APPENDIX B, PAGE 14 FOR INTERNAL DROP DETAILS.

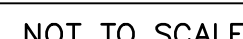
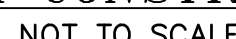


U2

SEWER MANHOLE COVER DETAIL
NOT TO SCALE



1. PAVEMENT REPAIR IN EXISTING ROADWAYS SHALL CONFORM TO STREET OPENING REGULATIONS.
2. NEW ROADWAY CONSTRUCTION SHALL CONFORM TO SUBDIVISION SPEC'S.
3. ANTI-SLEEP COLLARS OR CLAY CHECK DAMS ON STEEP RUNS IN WET CONDITIONS.
4. ALL SEWER INSTALLATIONS SHALL CONFORM TO THE REQUIREMENTS OF NHDES & MUNICIPAL DPW SEWER DIVISION STANDARDS. ALL PVC SEWER PIPE IS TO CONFORM WITH ENV-WQ 704.05 (c)-(e) AND CONFORM WITH ASTM D3034. PVC JOINT SEALS SHALL CONFORM WITH ASTM D3121. SDR-21 PVC FORCE MAIN PIPE MATERIAL IS REQUIRED IN LOCATIONS AS SHOWN. SDR-21 PVC FORCEMAIN PIPE WILL CONFORM TO ENV-WQ 704.08.



NOT TO SCALE

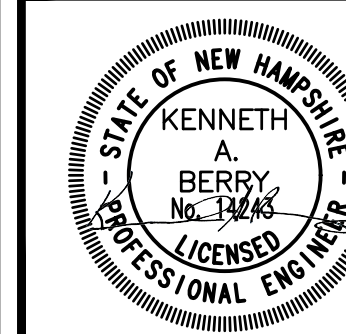
U-101

UTILITY DETAILS
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

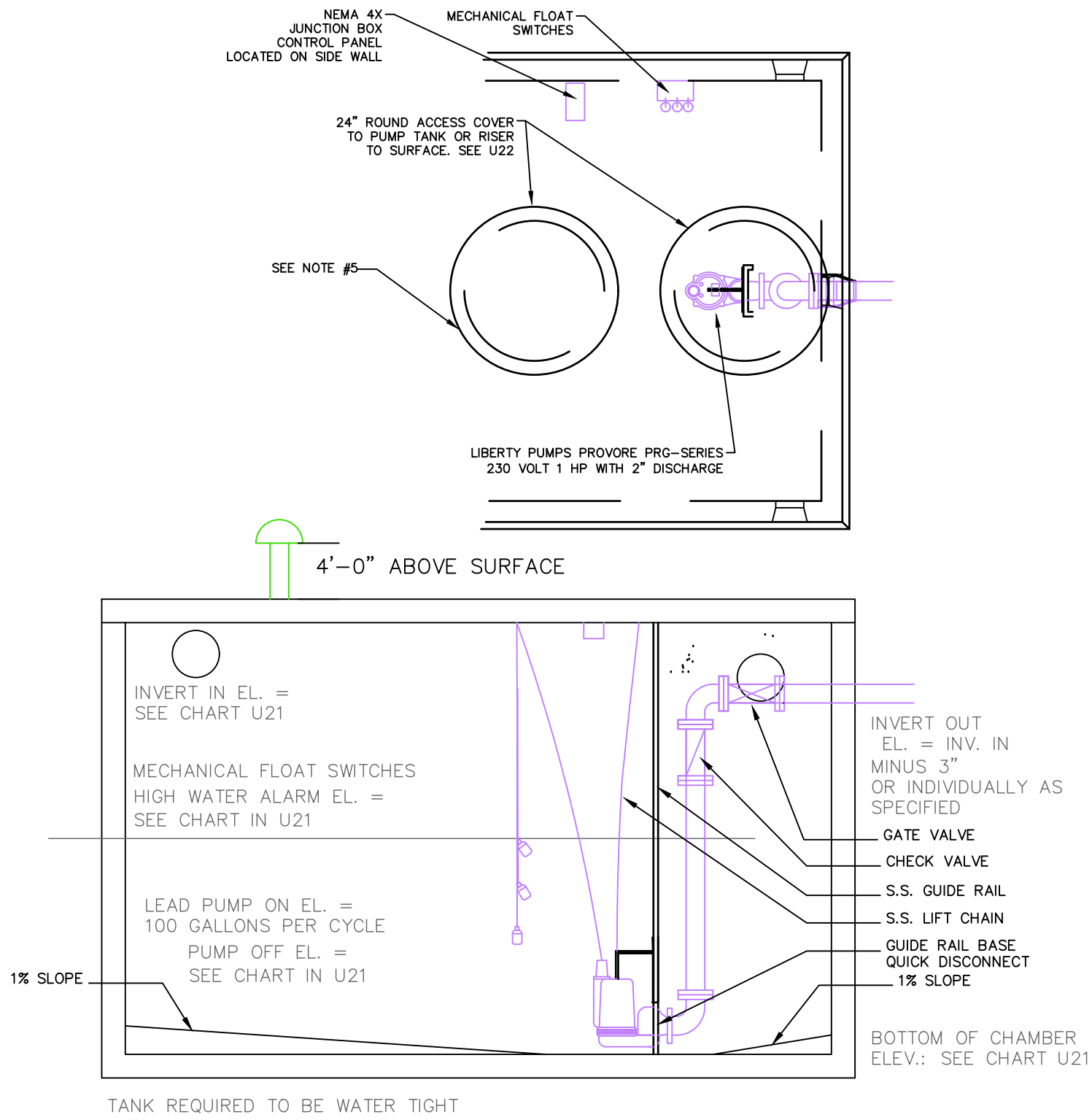
BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863

AS NOTED

DATE : JANUARY 21, 2021



U20



- NOTES:
1. THE BOTTOM OF THE PUMP CHAMBER WILL BE SLOPED AT A 1% SLOPE IN ALL DIRECTIONS CREATING A SUMP AROUND THE BASE OF THE PUMP. THE LIFT STATION WILL BE EQUIPPED WITH A GR20 GUIDE RAIL BASE AND RAIL SYSTEM AND LIFT CHAIN. THE PUMP DISCHARGE WILL BE EQUIPPED WITH A CHECK VALVE AND A GATE VALVE BETWEEN THE PUMP AND THE TANK WALL, IN THAT ORDER. THE DISCHARGE WILL LEAVE THE TANK AT A POINT FOUR-FEET BELOW GRADE, INSULATED OR SIX-FEET IF UNDER PAVEMENT, AND THE FORCE MAIN WILL BE DESIGNED UP-HILL TO THE IN-LINE RELIEF VALVE.
 2. WET WELL/SEPTIC TANK SHALL BE LEAK TESTED USING METHOD ACI 350.1 METHOD HST-NML.
 3. SUBMERSIBLE PUMPS AND ALL OTHER ELECTRICAL SYSTEMS/COMPONENTS IN THE WET WELL/SEPTIC TANK SHALL MEET NEC REQUIREMENTS FOR CLASS I, DIVISION I ENVIRONMENT.
 4. POWER SOURCE FOR ALARM SYSTEM SHALL BE AN INDEPENDENT BATTERY WITH CONTINUOUS CHARGE, OR MAIN LINE POWER WITH BACK UP BATTERY SYSTEM.
 5. 36" CONCRETE RISER TO SURFACE. NORTH AMERICAN MADE, RIM & COVER.

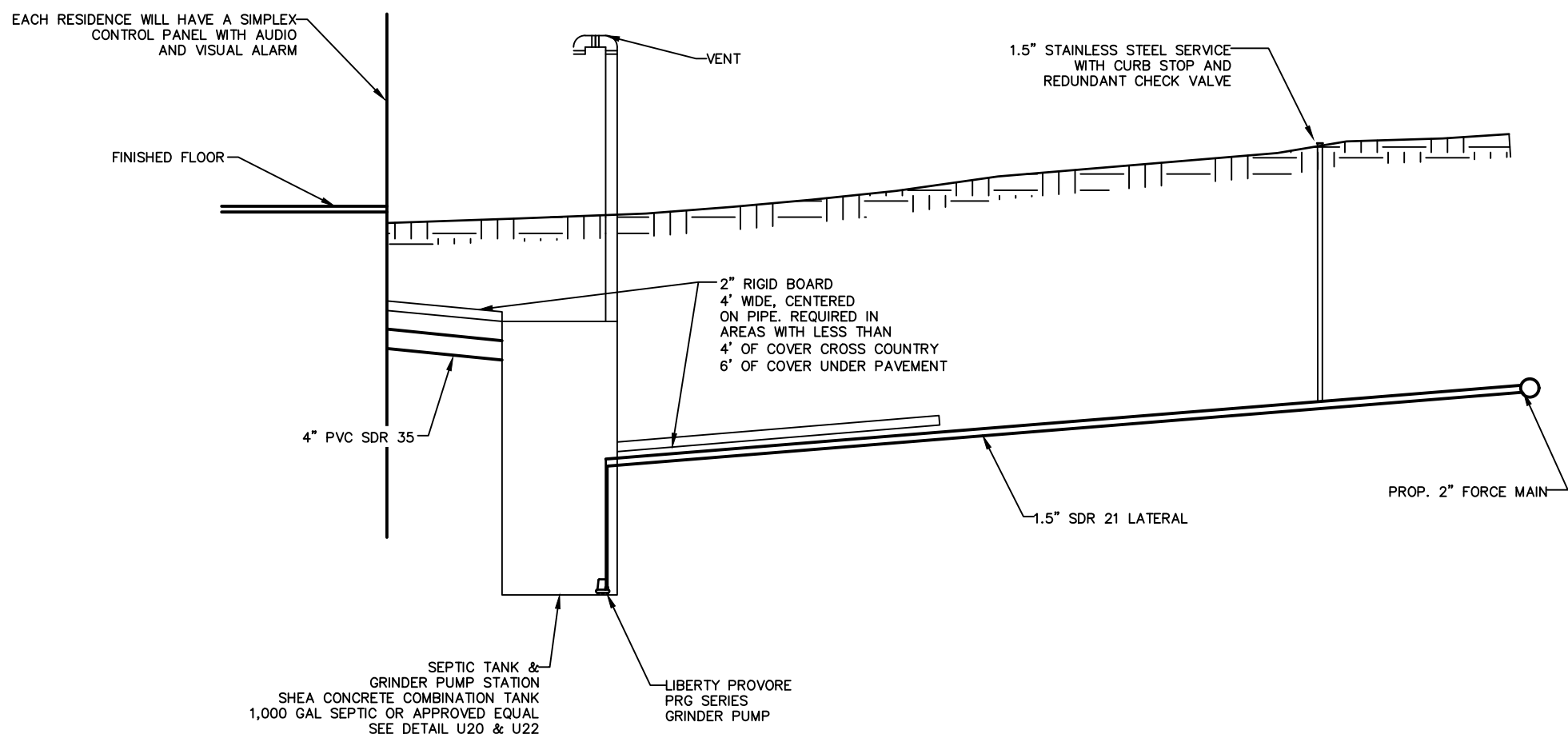
PUMP CHAMBER & PUMP DETAILS

NOT TO SCALE

U21

UNIT #	TOTAL DYNAMIC HEAD	PUMP RATE	1.5" SERVICE (SDR 21)	PUMP CHAMBER BOTTOM	PUMP CHAMBER INVERT IN	PUMP OFF ELEVATION	PUMP ON ELEVATION	ALARM ON ELEVATION	FLOW (GPD)
3	9.5'	43.5 GPM	65.0'	66.29'	70.29'	67.62'	68.00'	68.10'	450
4	14.5'	40.0 GPM	145.0'	65.29'	69.29'	66.62'	67.00'	67.10'	450
5	16.0'	40.0 GPM	170.0'	66.30'	70.30'	67.63'	68.01'	68.11'	450
6	15.5'	40.0 GPM	161.3'	65.80'	69.80'	67.13'	67.51'	67.61'	450
7	14.0'	41.0 GPM	147.1'	65.80'	69.80'	67.13'	67.51'	67.61'	450
8	14.0'	41.0 GPM	126.1'	65.85'	69.85'	67.18'	67.56'	67.66'	450

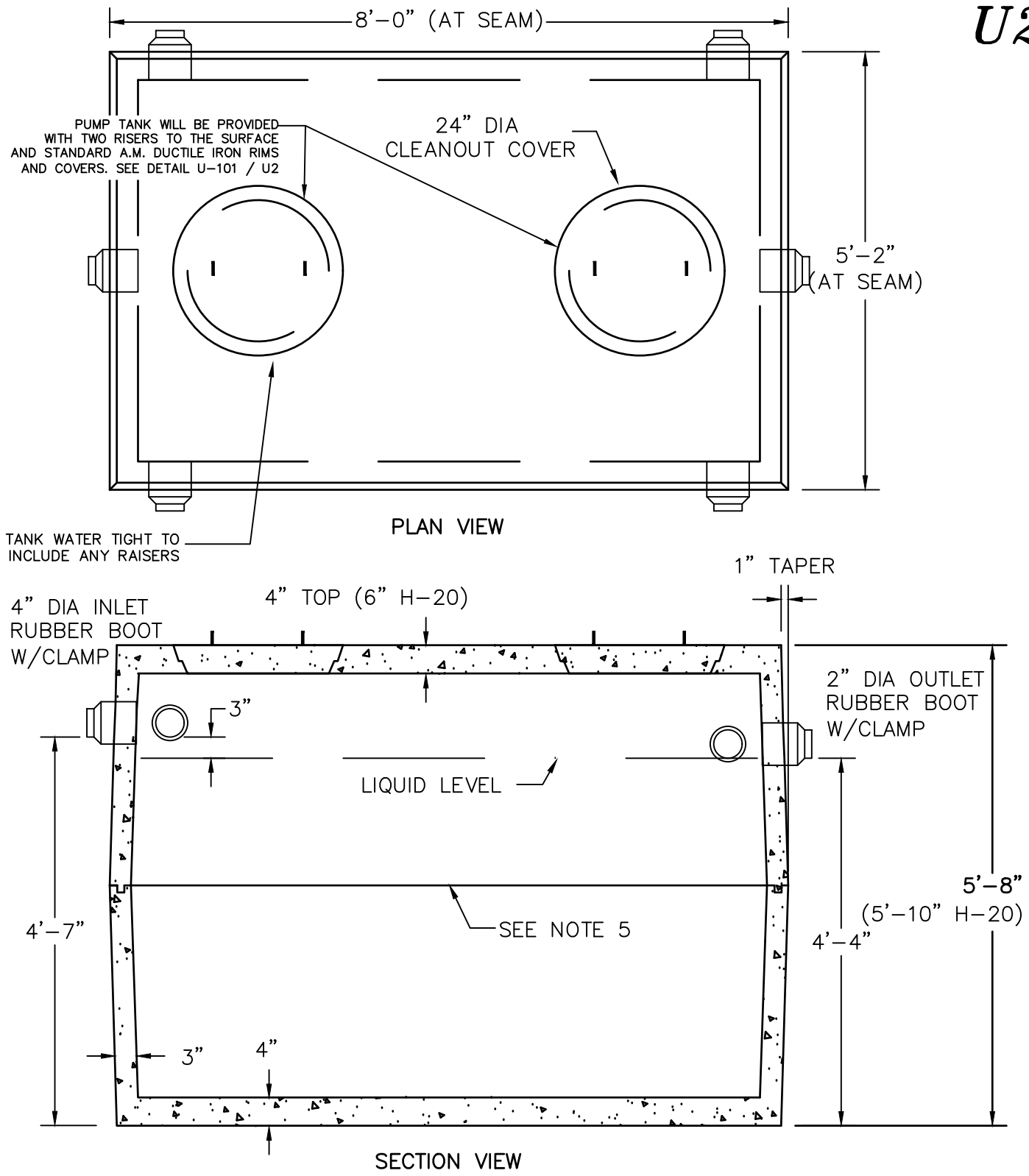
DESIGNERS NOTE: SEE THE FORCE MAIN PROFILE ON THE UTILITIES PLAN. ALL UNITS WILL UTILIZE A LIBERTY PUMPS PRG SERIES 1HP SUBMERSIBLE GRINDER PUMP, OR APPROVED EQUAL. ALL DWELLING UNITS WILL HAVE A LIBERTY PUMPS SX-SERIES SIMPLEX CONTROL PANEL WITH ALARM BELL AND FLASHER. IT IS HIGHLY RECOMMENDED THAT A GENERATOR HOOKUP BE AVAILABLE FOR EMERGENCY POWER SUPPLY.



TYPICAL RESIDENTIAL FORCE MAIN CONNECTION

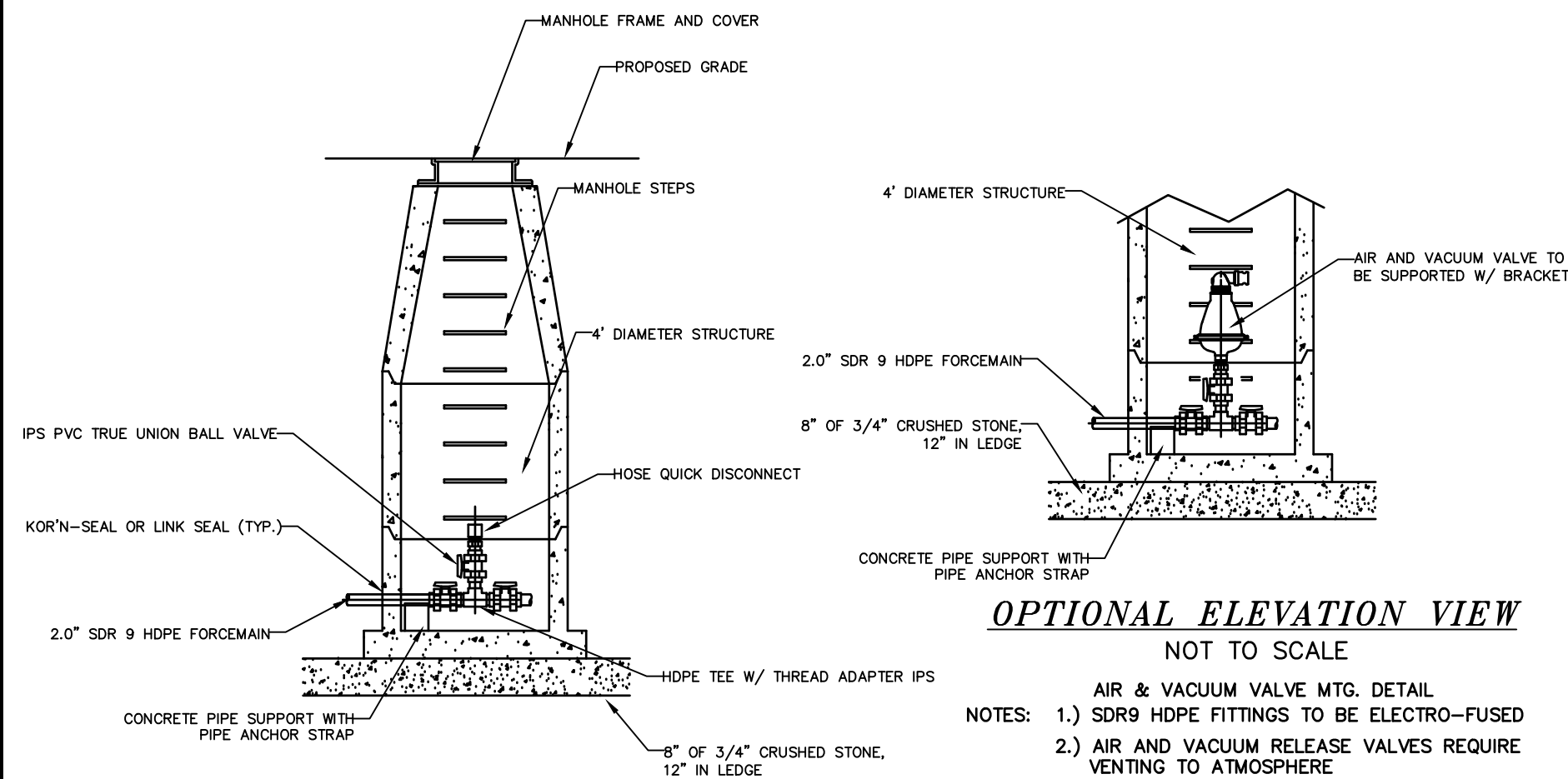
NOT TO SCALE

U22



- NOTES:
1. CONCRETE: 4,000 PSI MINIMUM AFTER 28 DAYS.
 2. CONSTRUCTION OF SEPTIC TANK CONFORMS WITH DEP TITLE 5 REGS, 310 CMR, SECTION 15.226.
 3. ALL REINFORCEMENT PER ASTM C1227.
 4. TEES AND GAS BAFFLE SOLD SEPARATELY.
 5. TONGUE & GROOVE JOINT SEALED WITH BUTYL RESIN.
 6. IF COVER EXCEEDS 4 FEET, HEAVY DUTY TANK REQUIRED. ALSO AVAILABLE IN AASHTO HS-20 LOADING.

U23



TERMINAL FLUSHING MANHOLE DETAIL

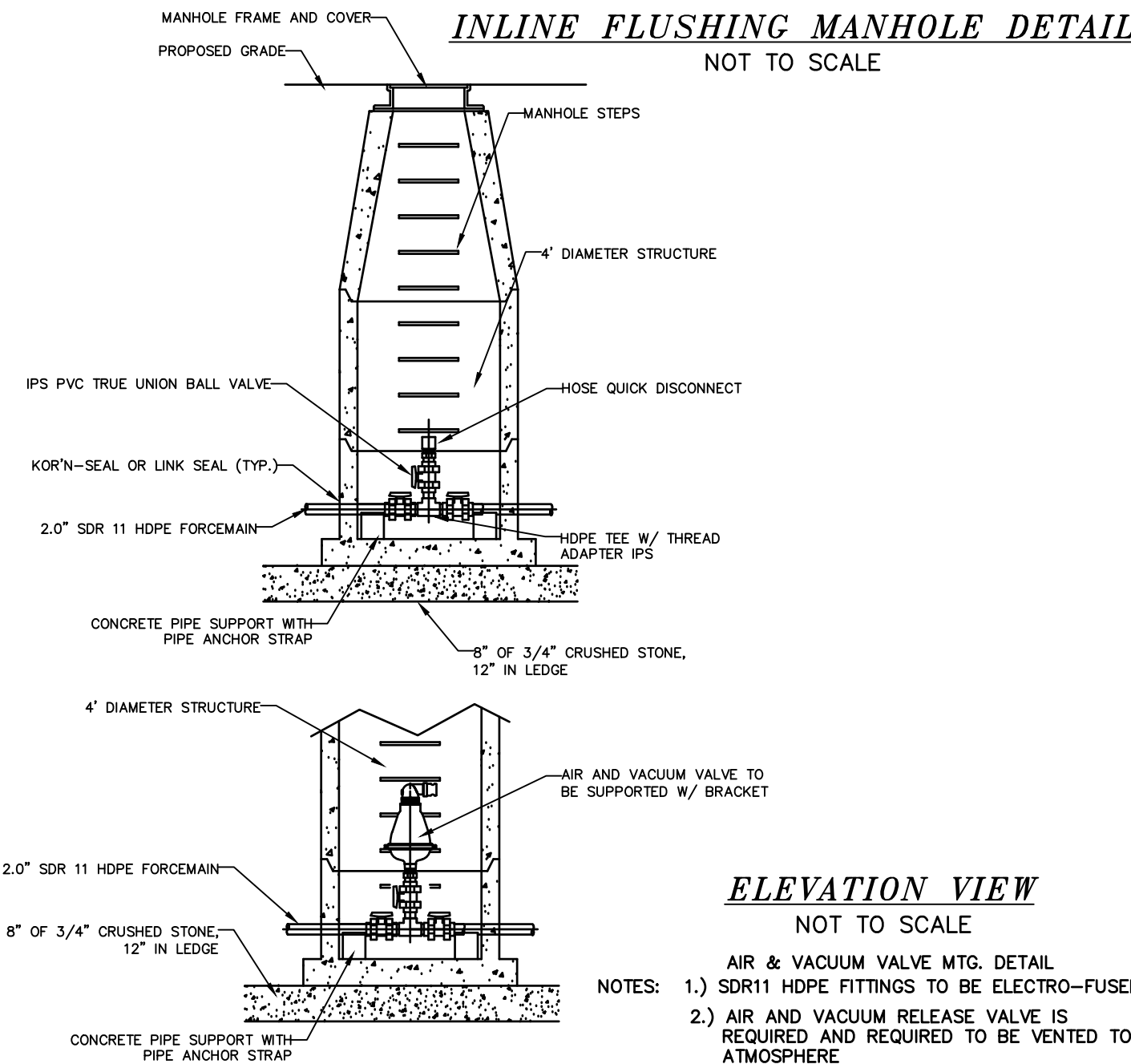
NOT TO SCALE

OPTIONAL ELEVATION VIEW

NOT TO SCALE

- NOTES:
- 1.) SDR9 HDPE FITTINGS TO BE ELECTRO-FUSED
 - 2.) AIR AND VACUUM RELEASE VALVES REQUIRE VENTING TO ATMOSPHERE

U24



ELEVATION VIEW

NOT TO SCALE

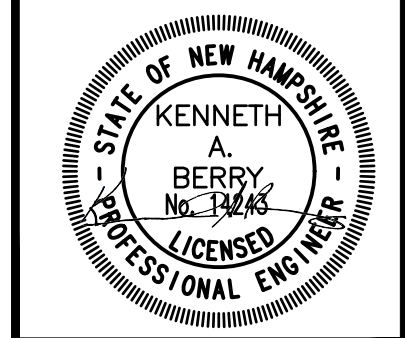
- NOTES:
- 1.) SDR11 HDPE FITTINGS TO BE ELECTRO-FUSED
 - 2.) AIR AND VACUUM RELEASE VALVE IS REQUIRED AND REQUIRED TO BE VENTED TO ATMOSPHERE

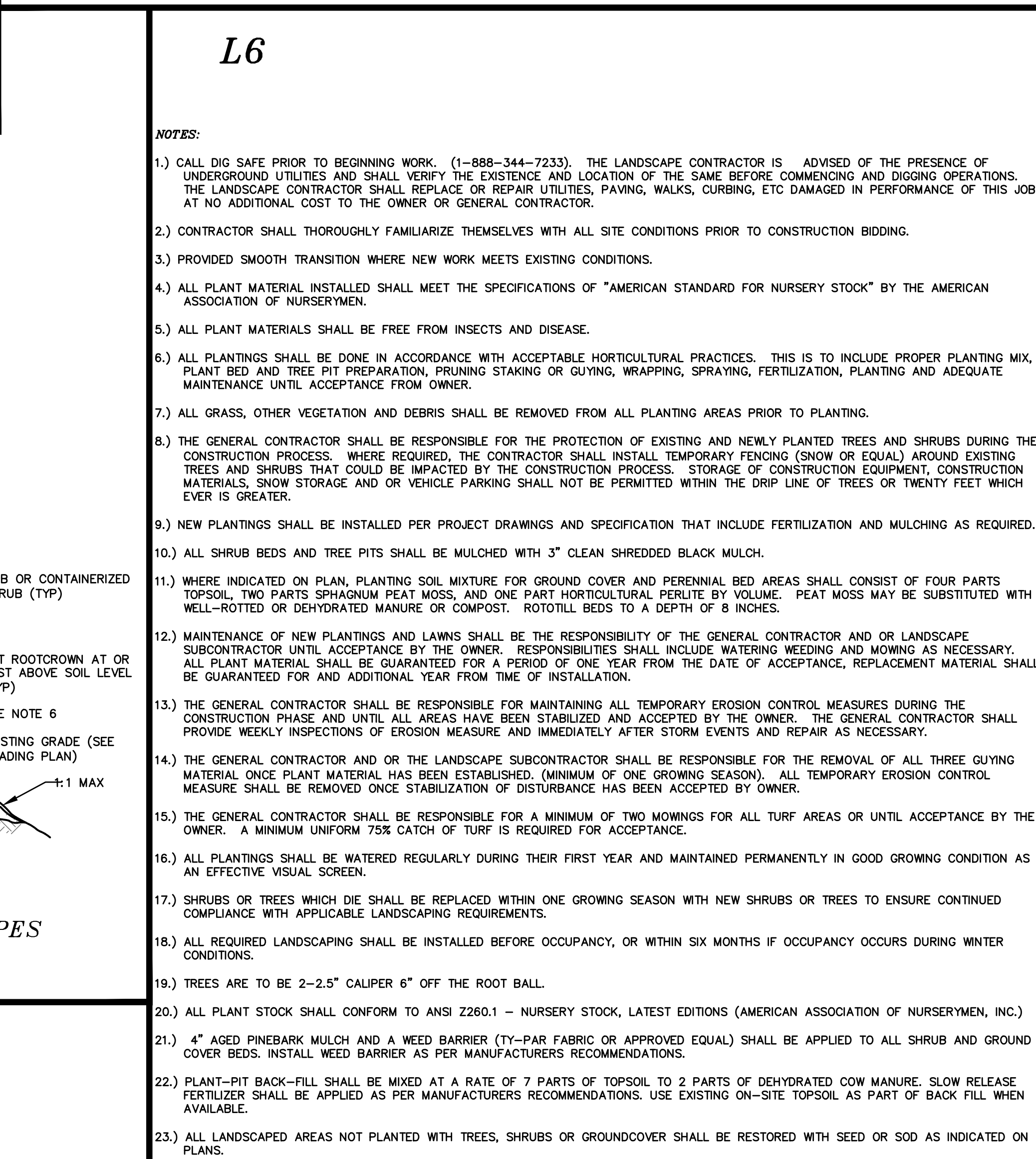
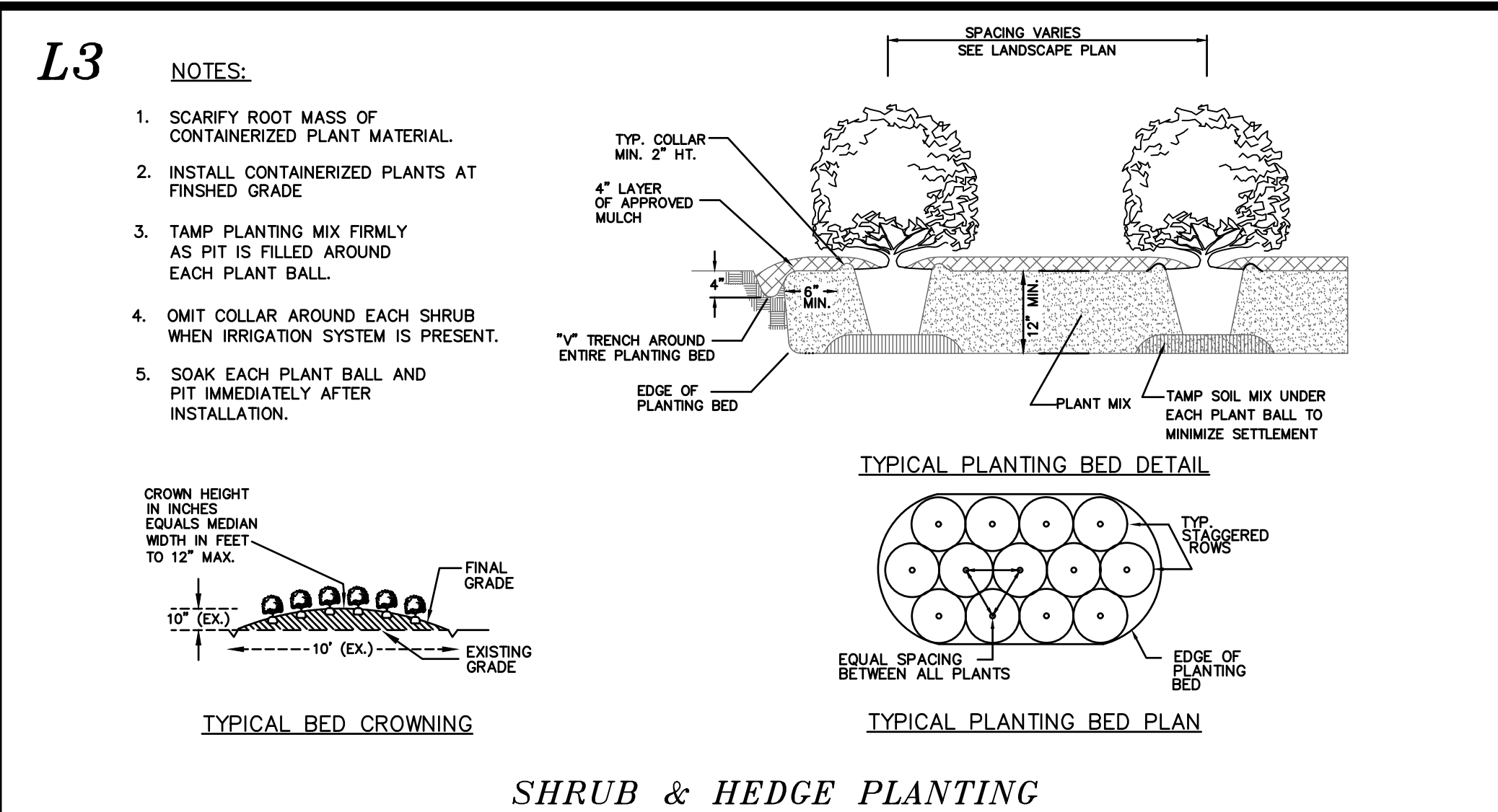
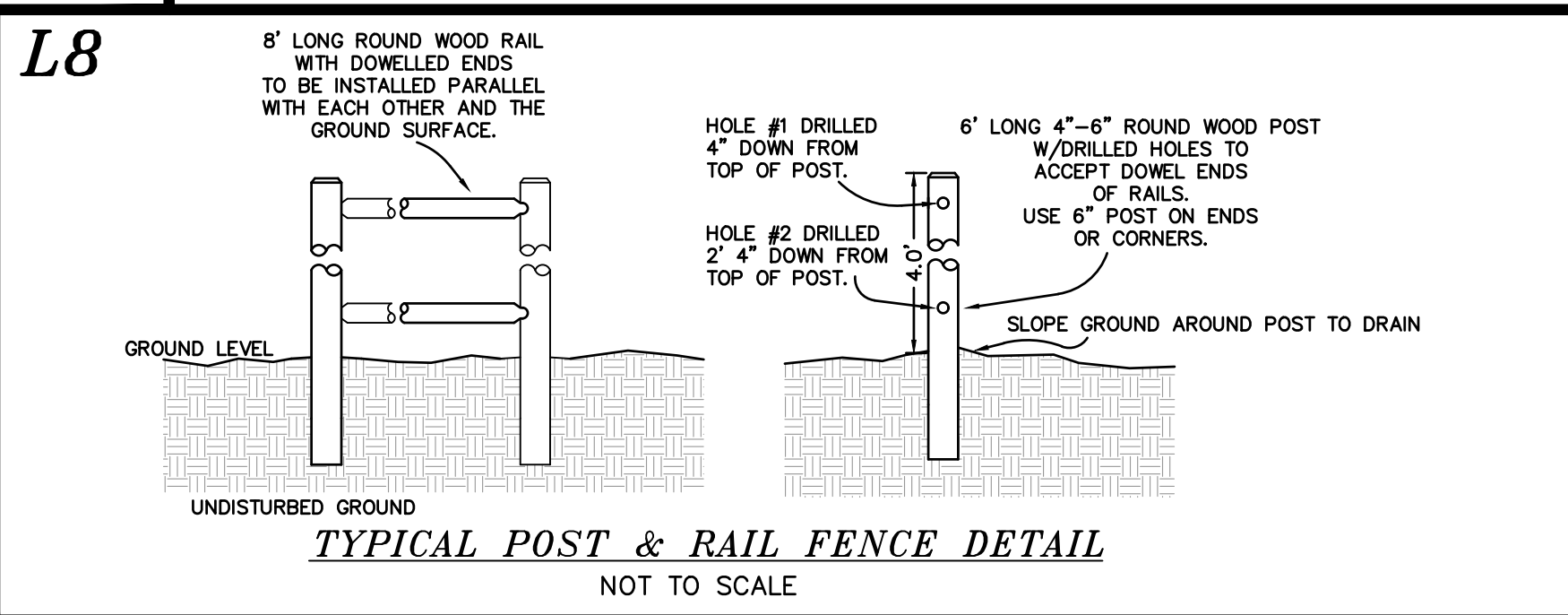
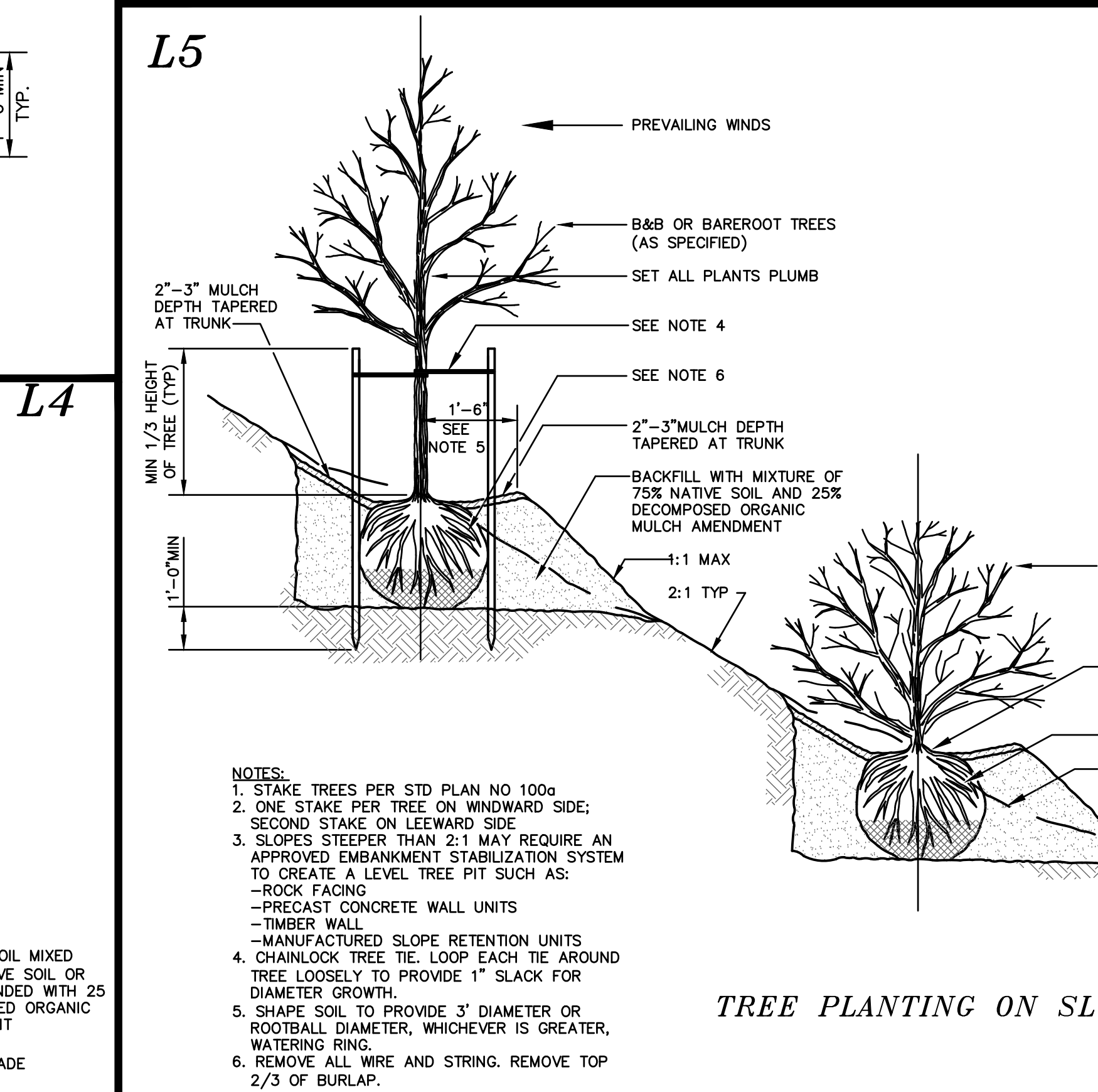
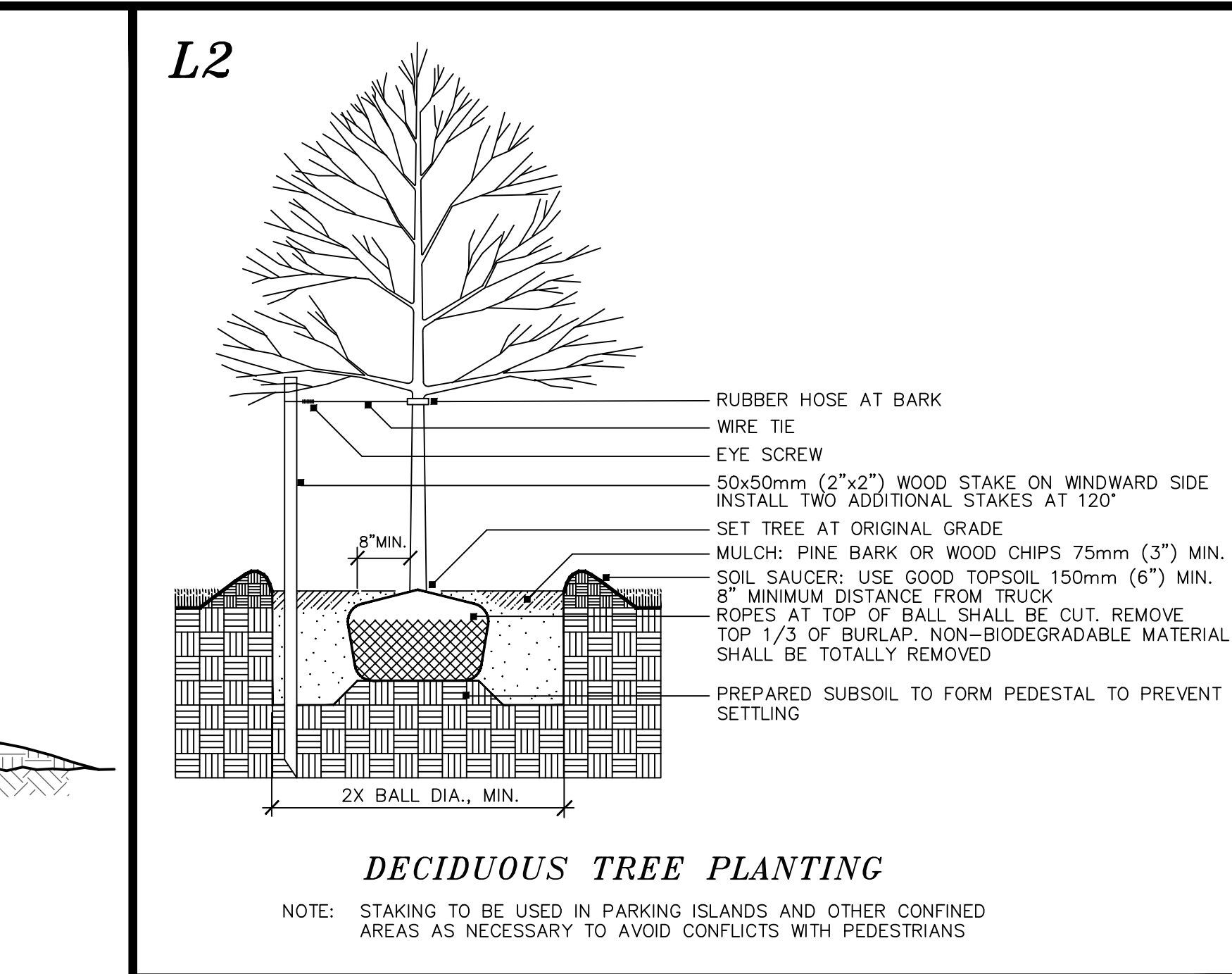
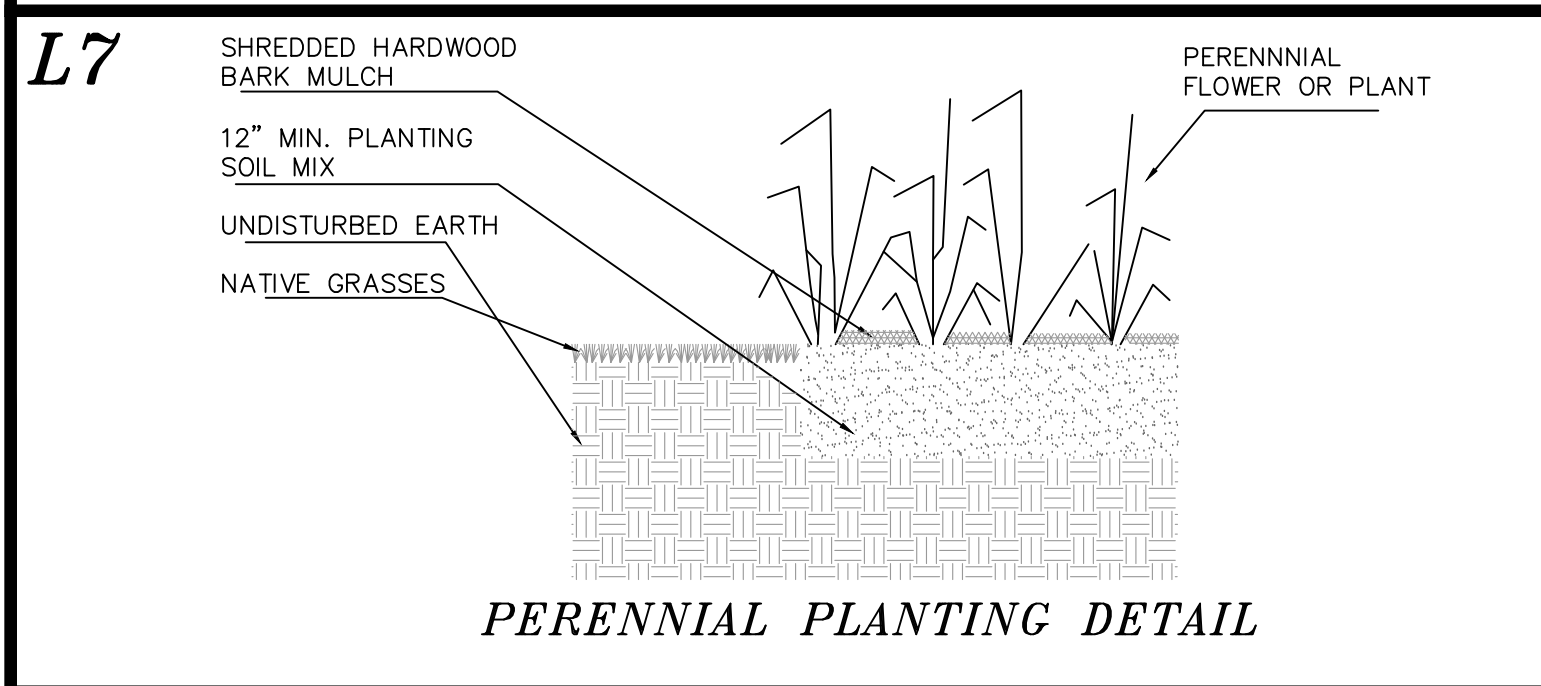
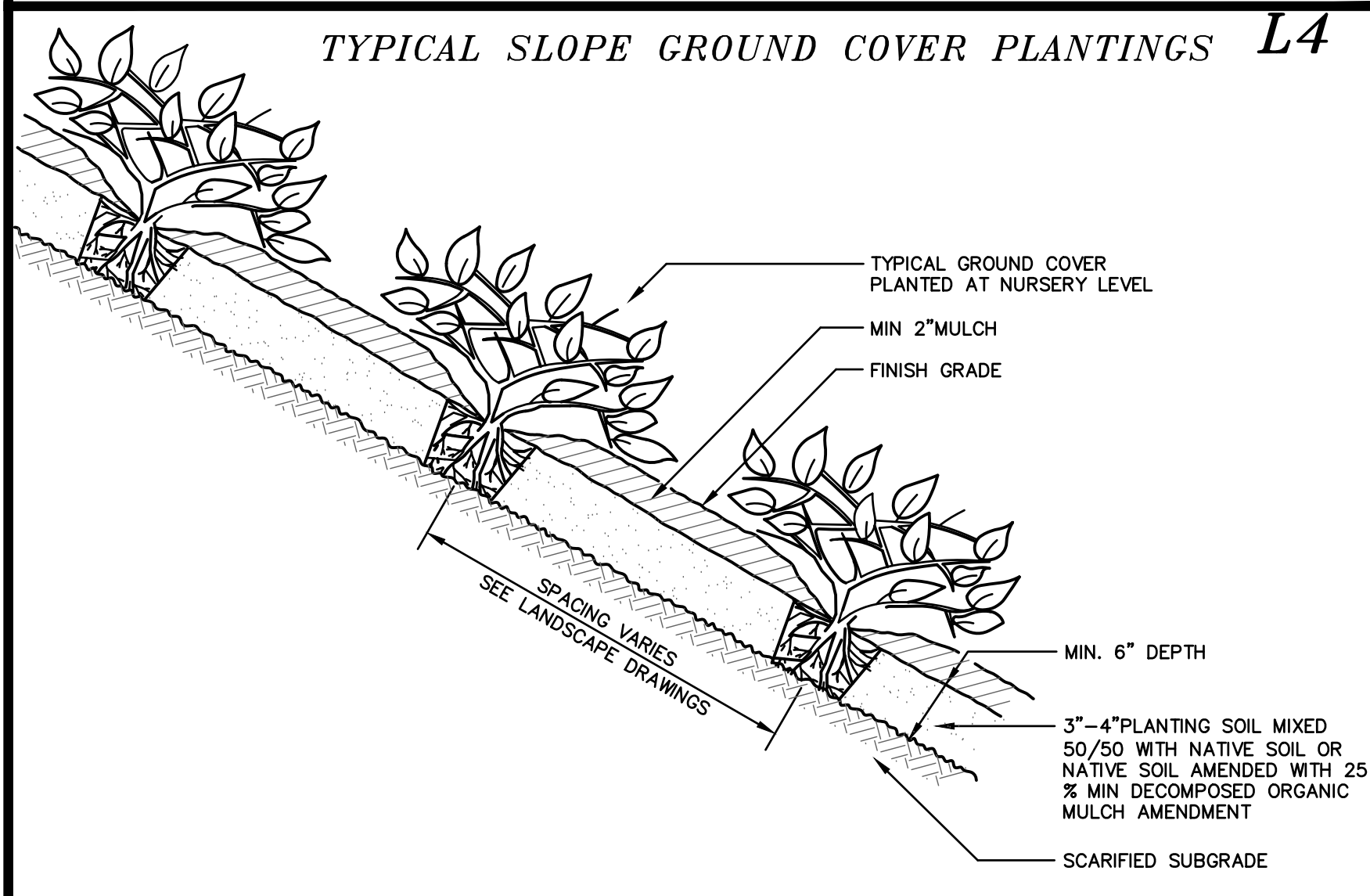
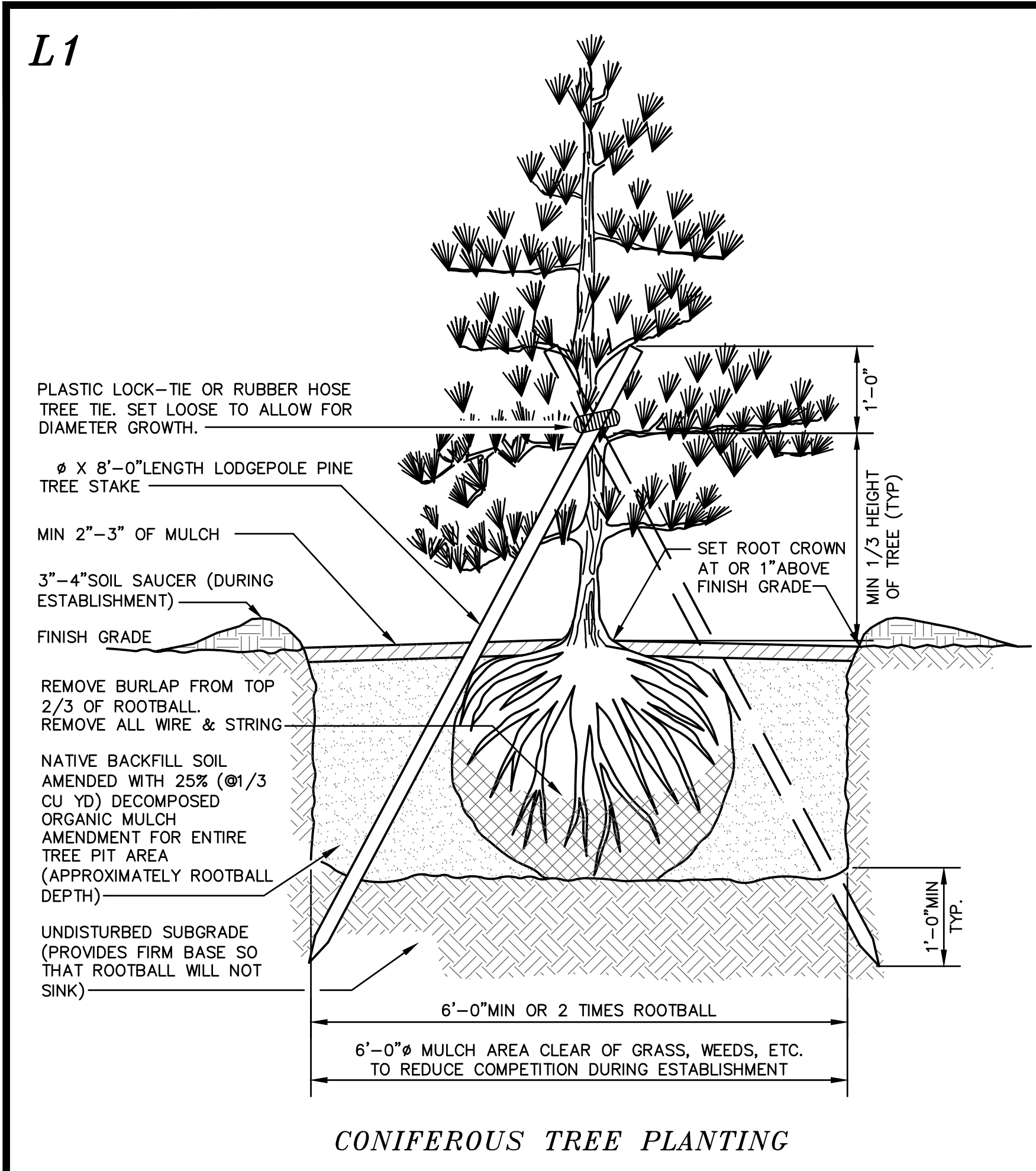
PLANNING FILE #

REVISION	DATE	DESCRIPTION

UTILITY DETAILS LAND OF EQUINE PROPERTIES LLC 239 KNOX MARSH ROAD DOVER, N.H. TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING 335 SECOND CROWN POINT ROAD BARRINGTON, NH 03825 (603)332-2863 AS NOTED	DATE : JANUARY 21, 2021 FILE NO. : DB 2020 - 066
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PLANNING FILE #

REVISION	DATE	DESCRIPTION

LANDSCAPING DETAILS

LAND OF EQUINE PROPERTIES LLC

239 KNOX MARSH ROAD

DOVER, N.H.

TAX MAP H, LOT 37.4

BERRY SURVEYING & ENGINEERING

335 SECOND CROWN POINT ROAD

BARRINGTON, NH 03825 (603)332-2863

AS NOTED

DATE : JANUARY 21, 2021

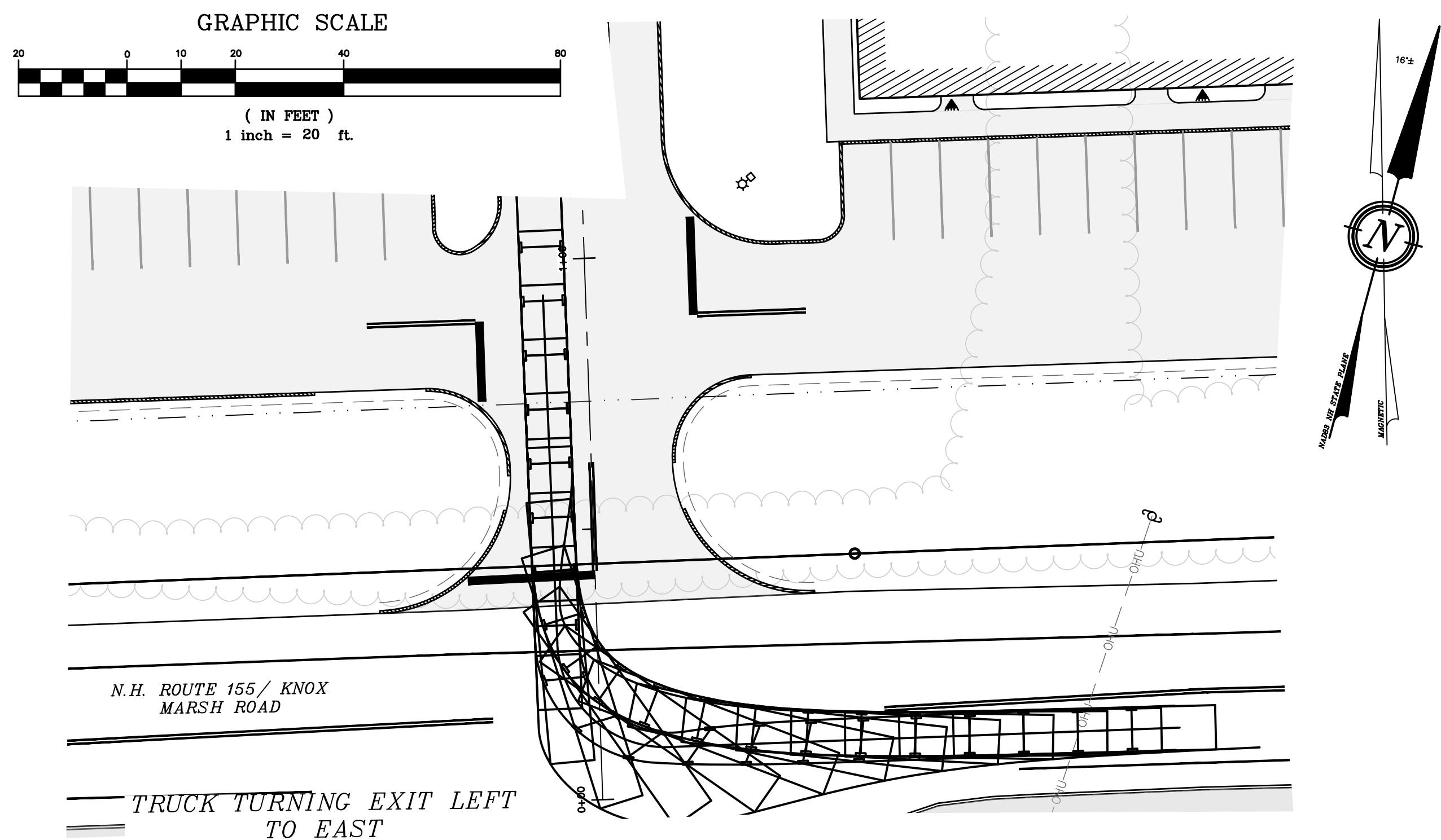
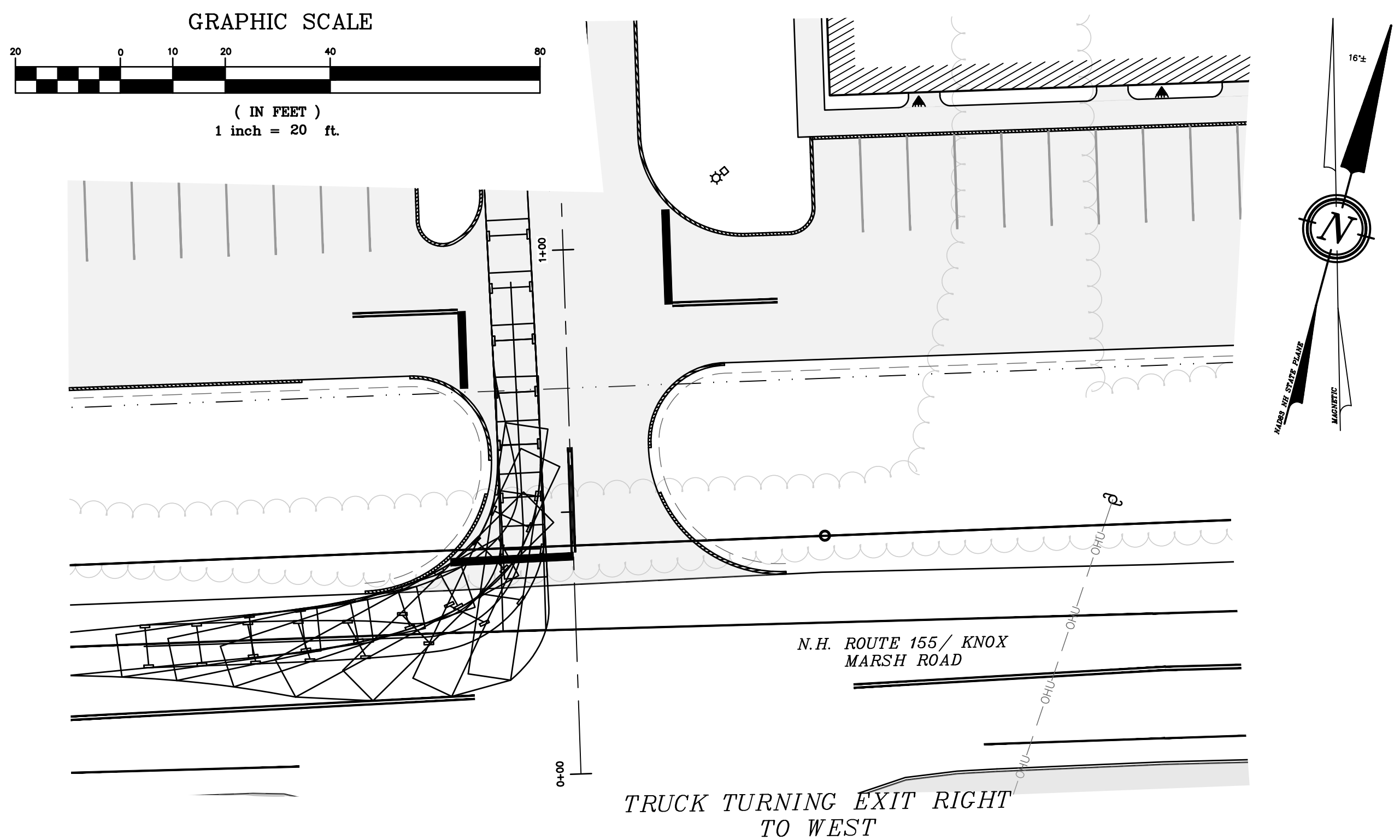
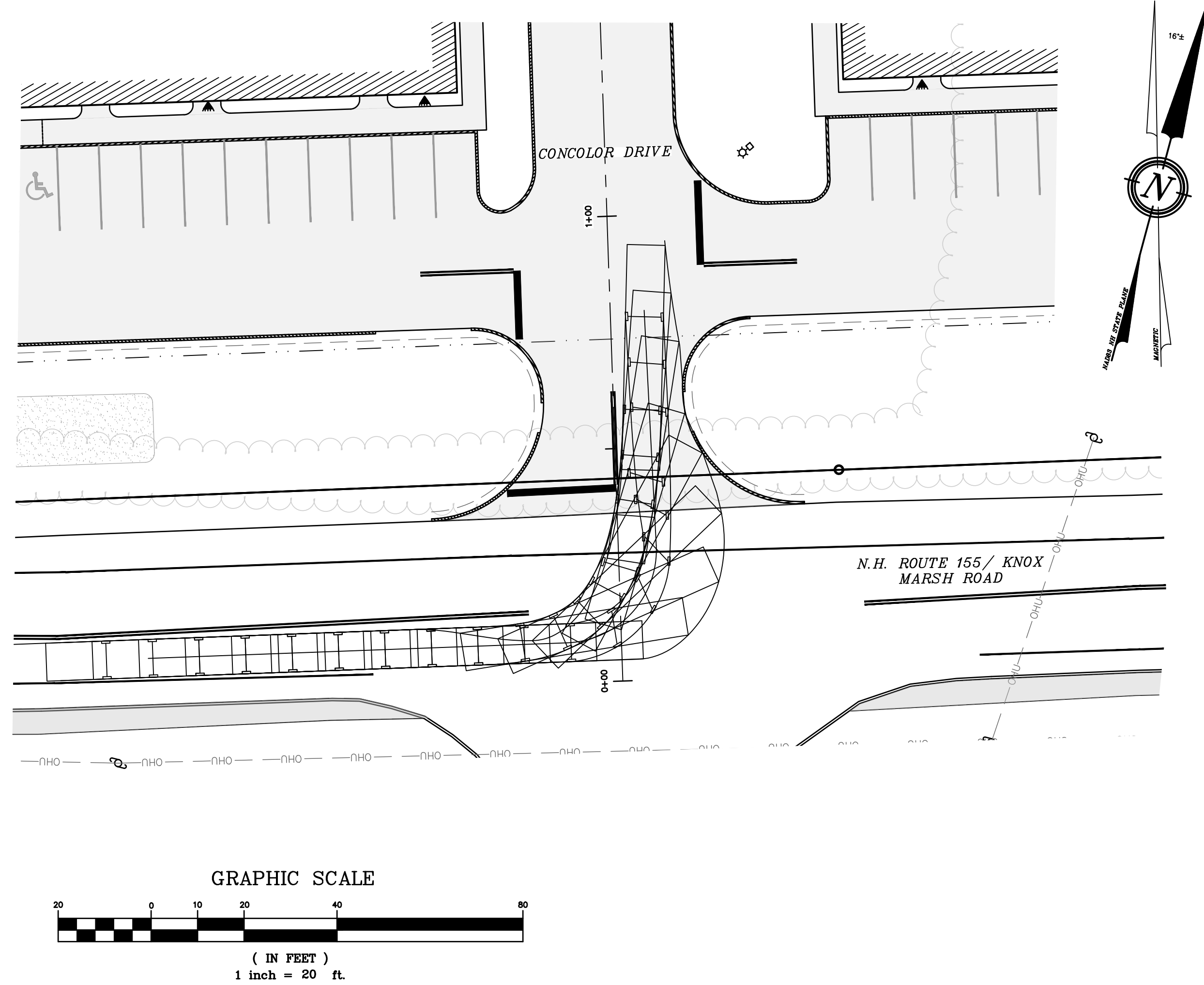
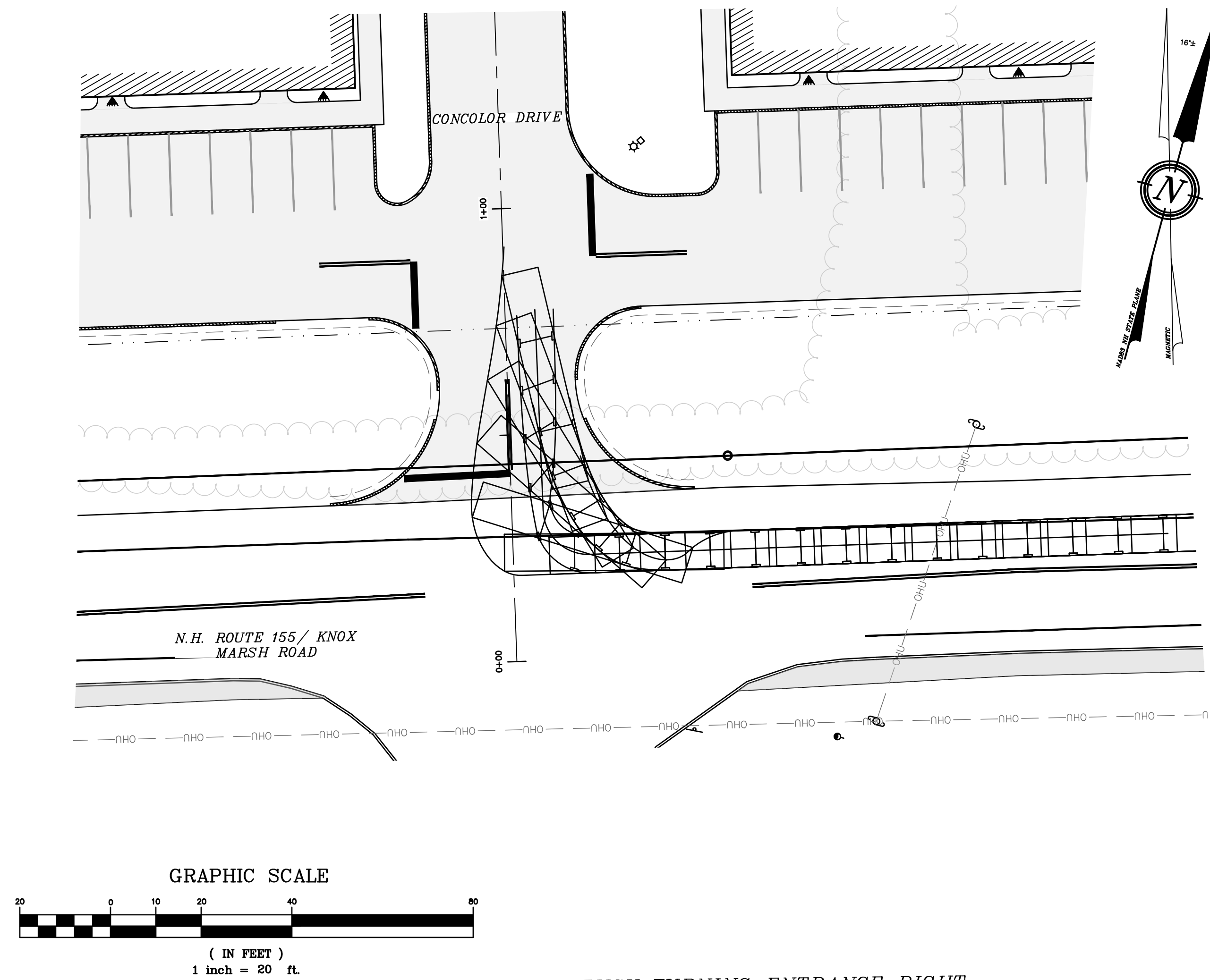
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STATE OF NEW HAMPSHIRE

KENNETH A. BERRY

PROFESSIONAL ENGINEER

SHEET 36 OF 38



PLANNING FILE #		
REVISION	DATE	DESCRIPTION

TRUCK TURNING ENTRANCE DOVER, NH FIRE T1 TEMPLATE

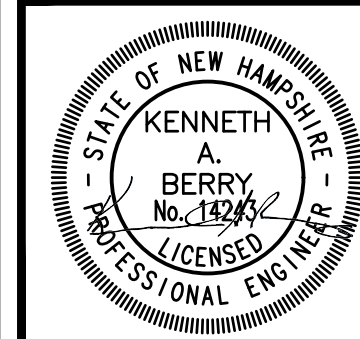
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

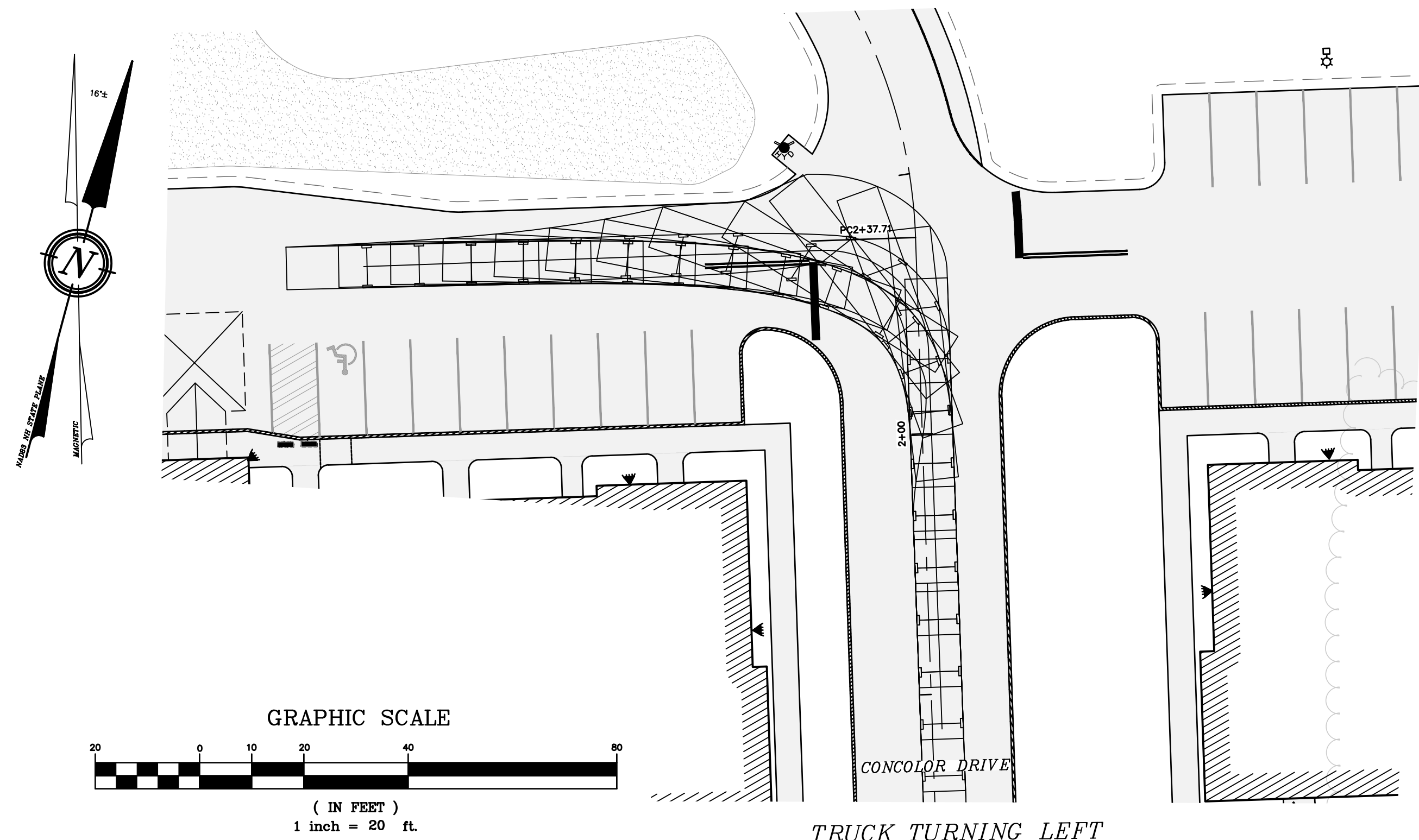
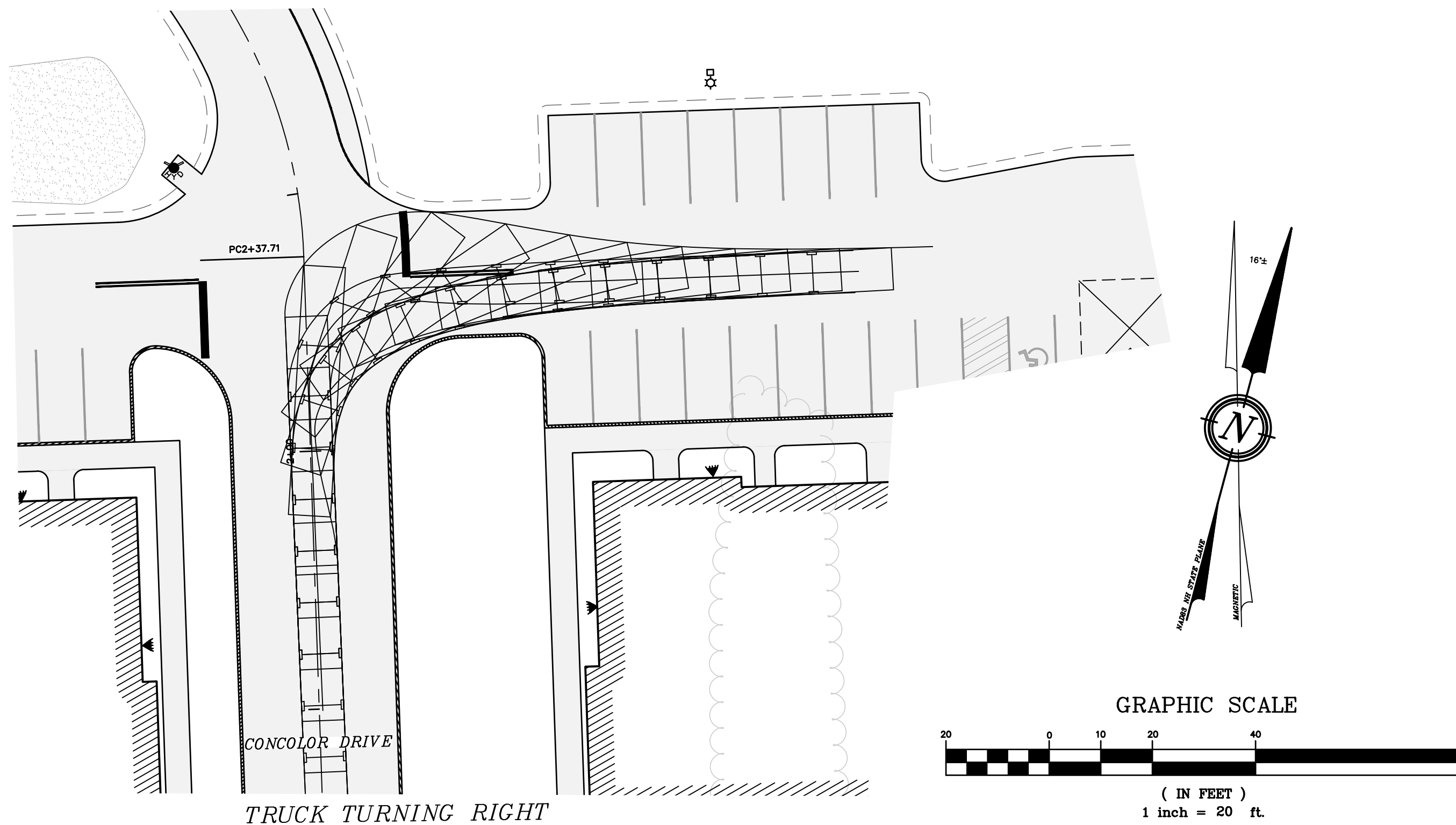
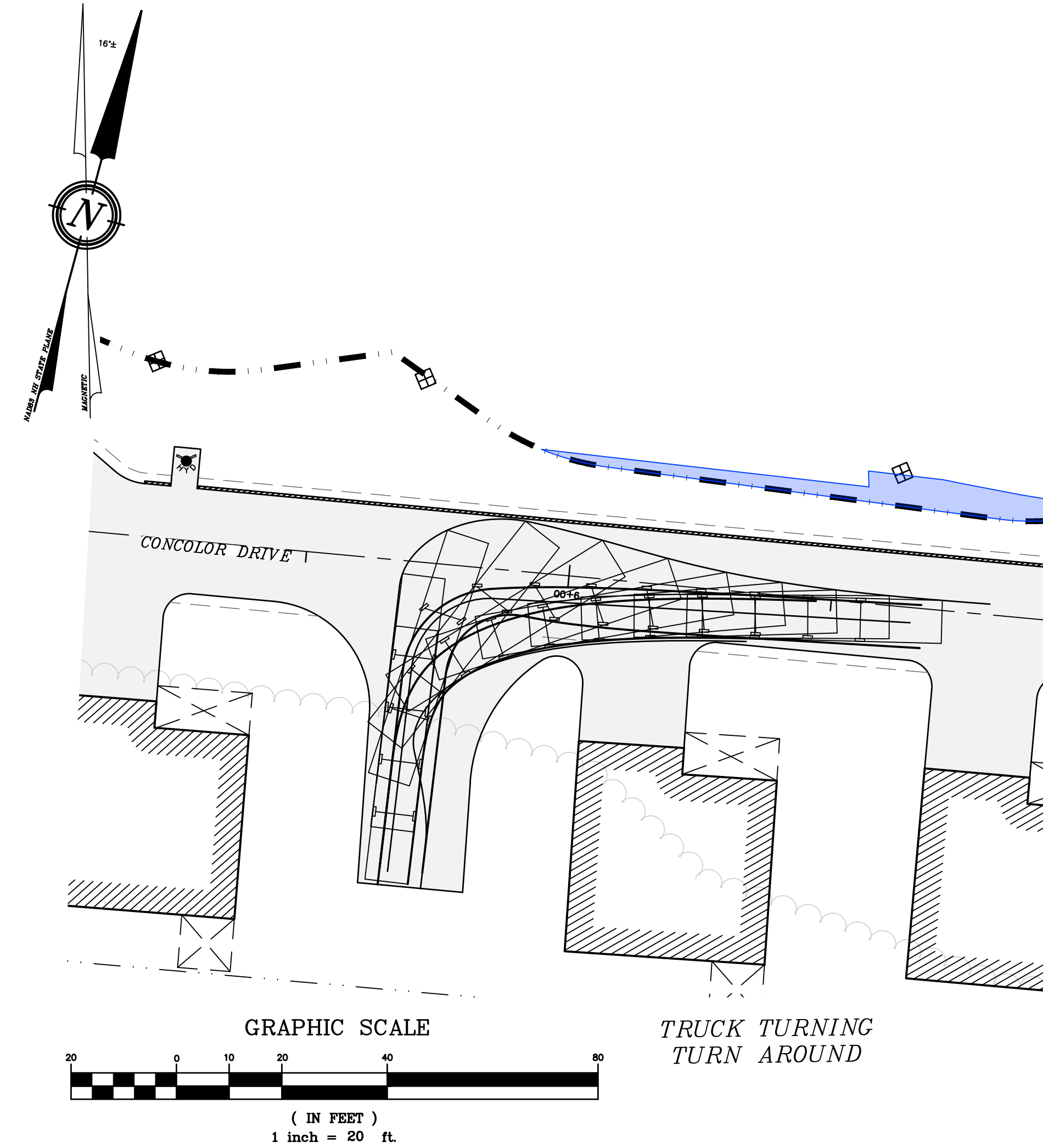
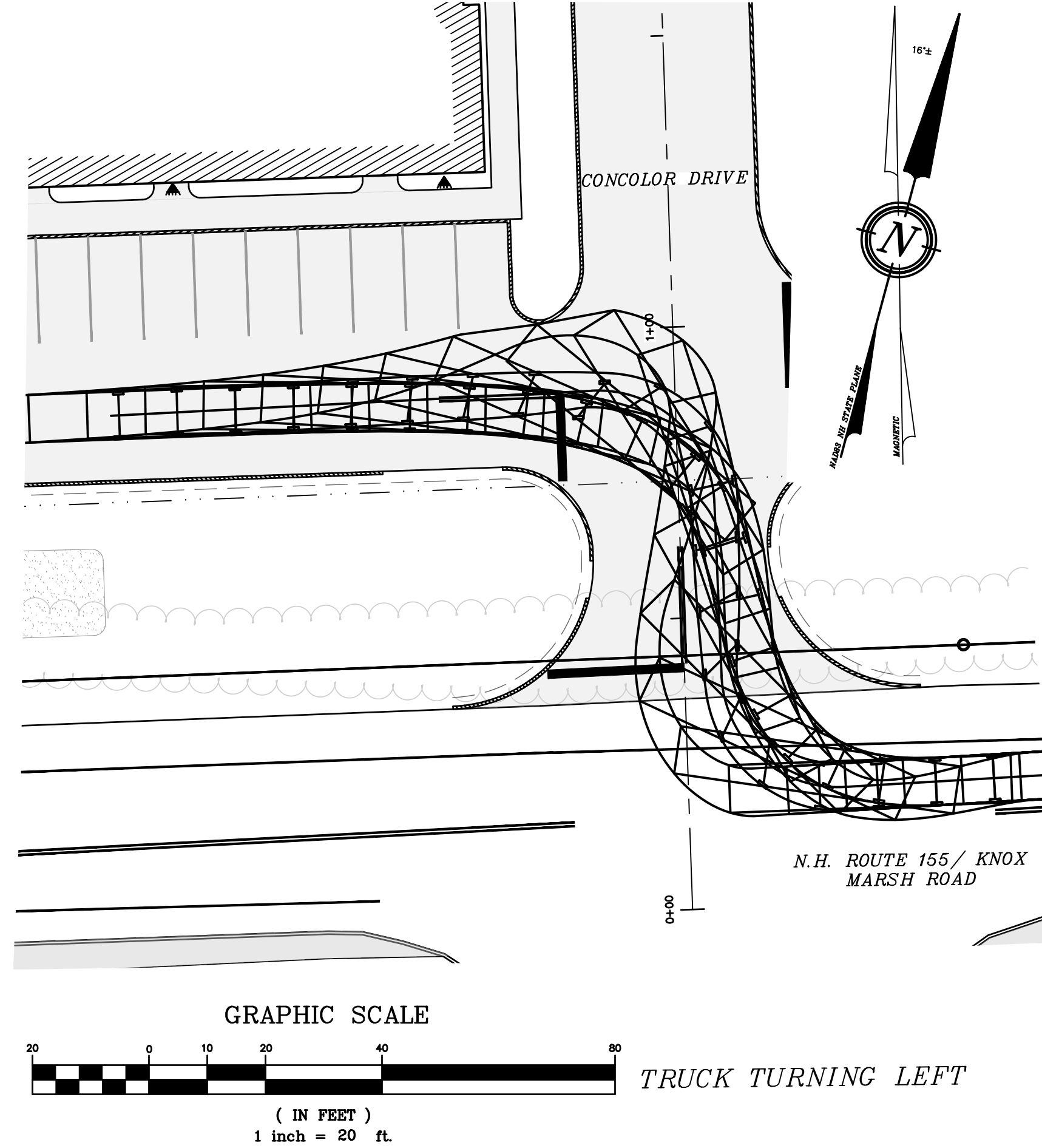
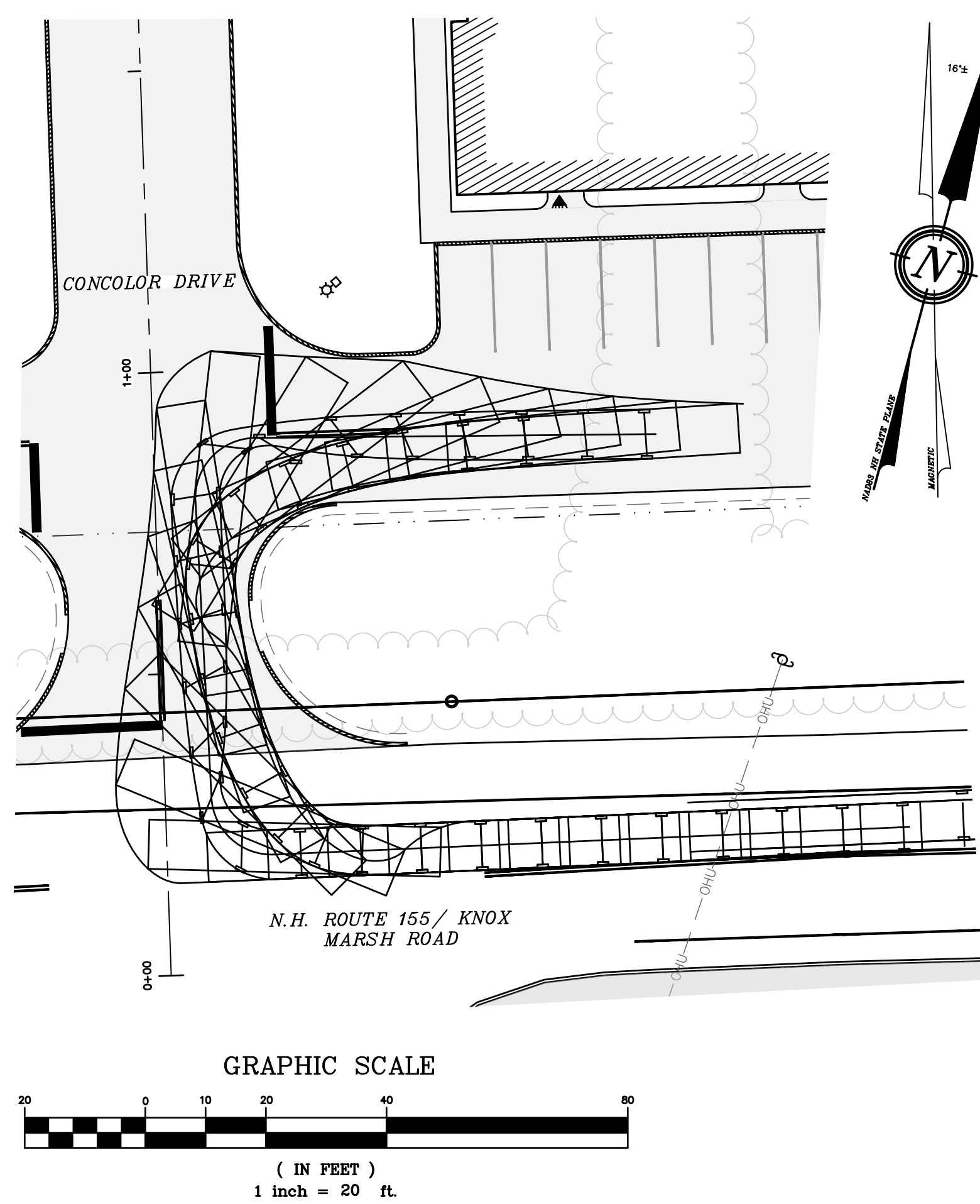
BERRY SURVEYING & ENGINEERING
 335 SECOND CROWN POINT ROAD
 BARRINGTON, NH 03825 (603)352-2863

SCALE : 1 IN. EQUALS 20 FT.

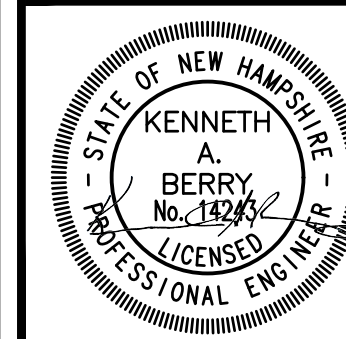
DATE : JANUARY 21, 2021

FILE NO. : DB 2020 - 066





BERRY SURVEYING & ENGINEERING
 335 SECOND CROWN POINT ROAD
 BARRINGTON, NH 03825 (603)332-2863
 SCALE : 1 IN. EQUALS 20 FT.
 DATE : JANUARY 21, 2021
 EUP NO : DR 2020 - 066



SHEET 38 OF 38

TRUCK TURNING SITE CITY OF DOVER, NH FIRE T1 TEMPLATE

PLANNING FILE #	REVISION	DATE	DESCRIPTION



1 Front Elevation
3/32\"/>



2 Left Elevation
3/32\"/>



3 Right Elevation
3/32\"/>

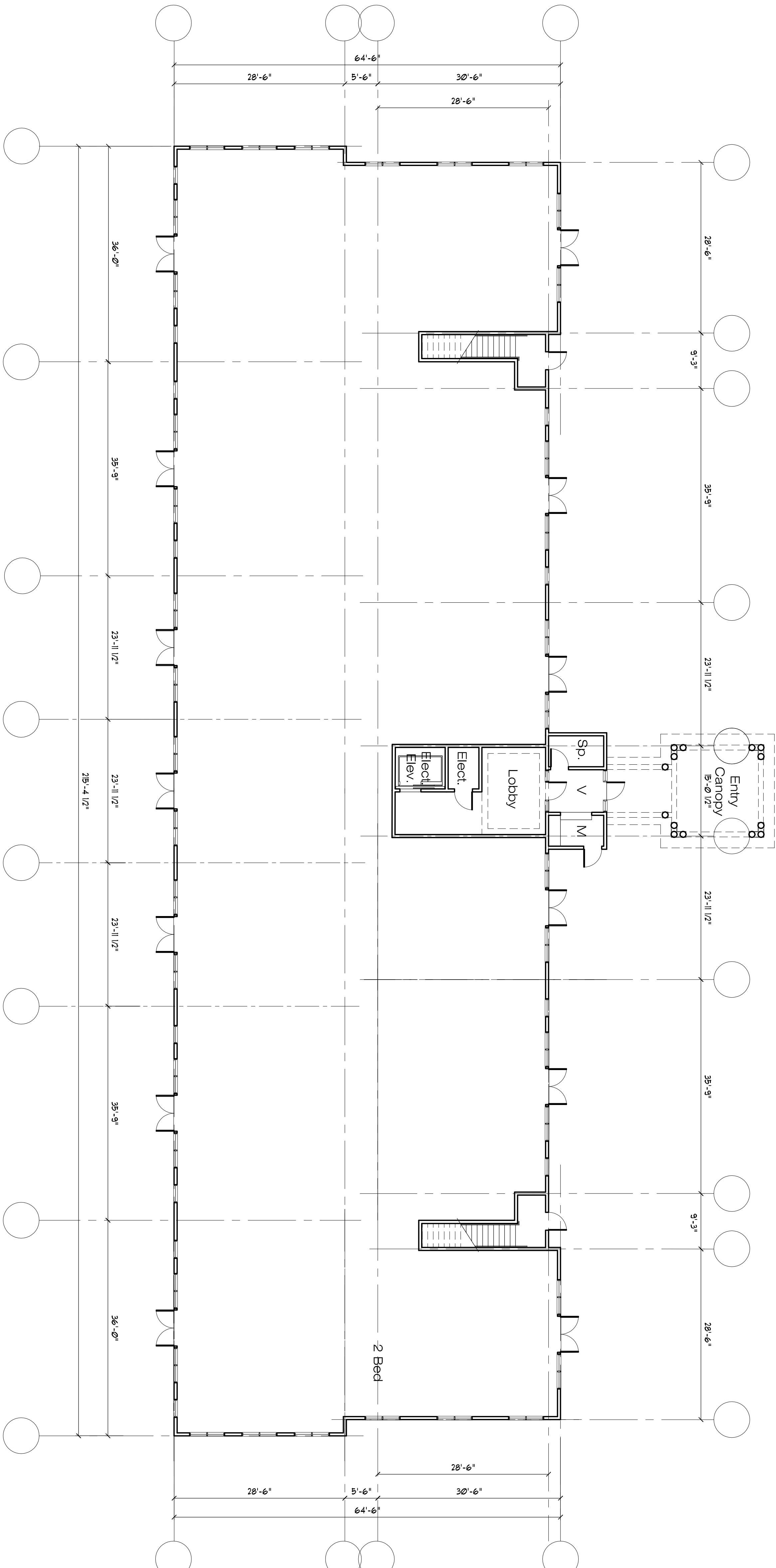


4 Rear Elevation
3/32\"/>

McCrone Place
Dover, NH
January 21, 2021



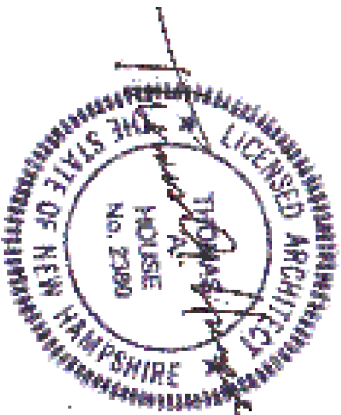
THA ARCHITECTS, LLC
ARCHITECTURE • PLANNING • CONSULTING • INTERIOR DESIGN
89 WILLOWBROOK AVENUE • STRATHAM, NH 03885
Tel: (603) 770-249 • Fax: (603) 770-249 • WWW.THAARC.COM



1 First Floor Plan

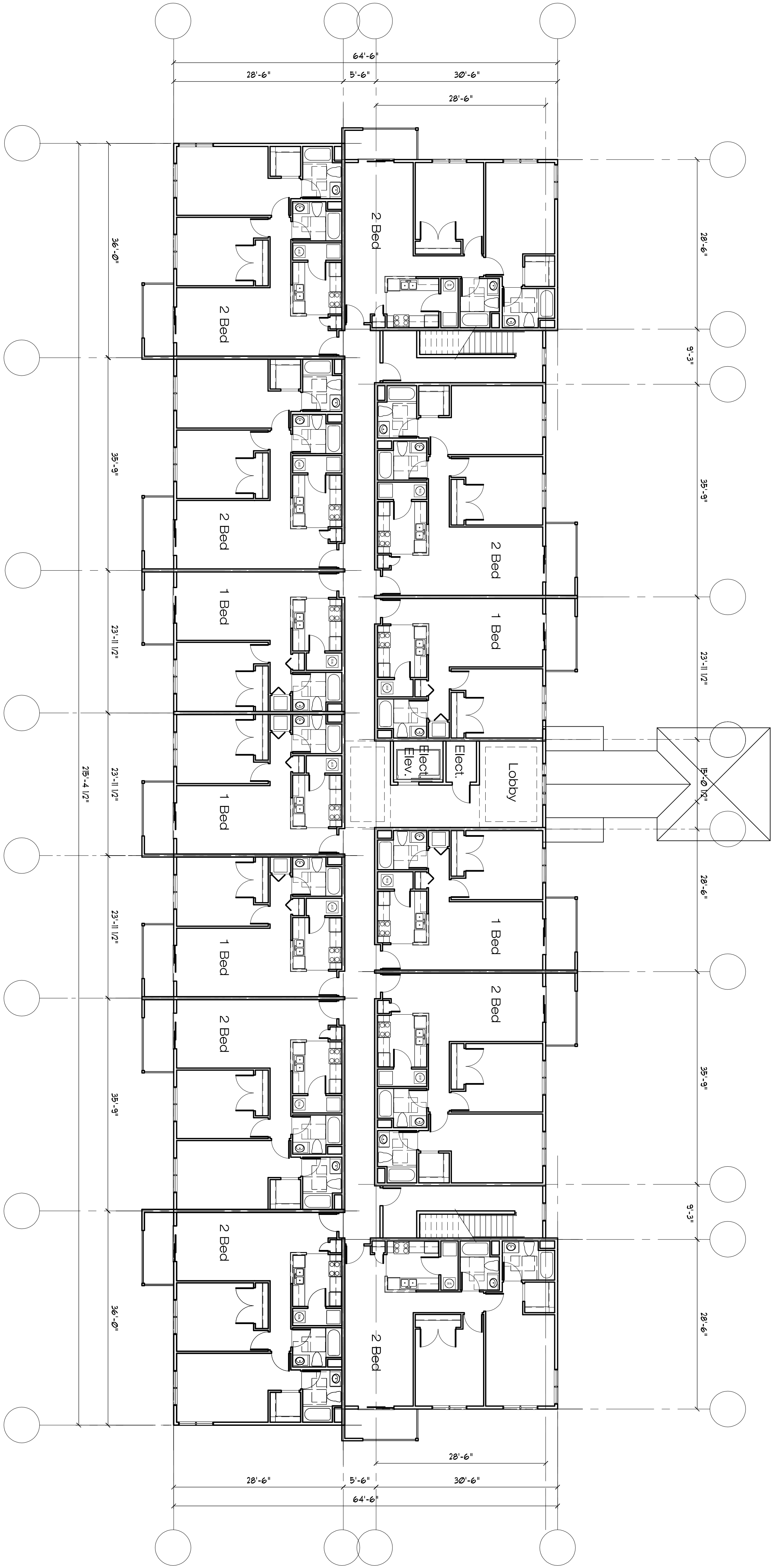
3/32"=1'-0"

McCrone Place
Dover, NH
January 21, 2021



THA ARCHITECTS, LLC
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89 WILLOWBROOK AVENUE • STRATHAM, NH 03885
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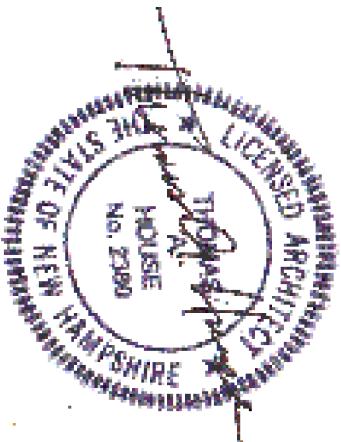
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1 Second Floor Plan

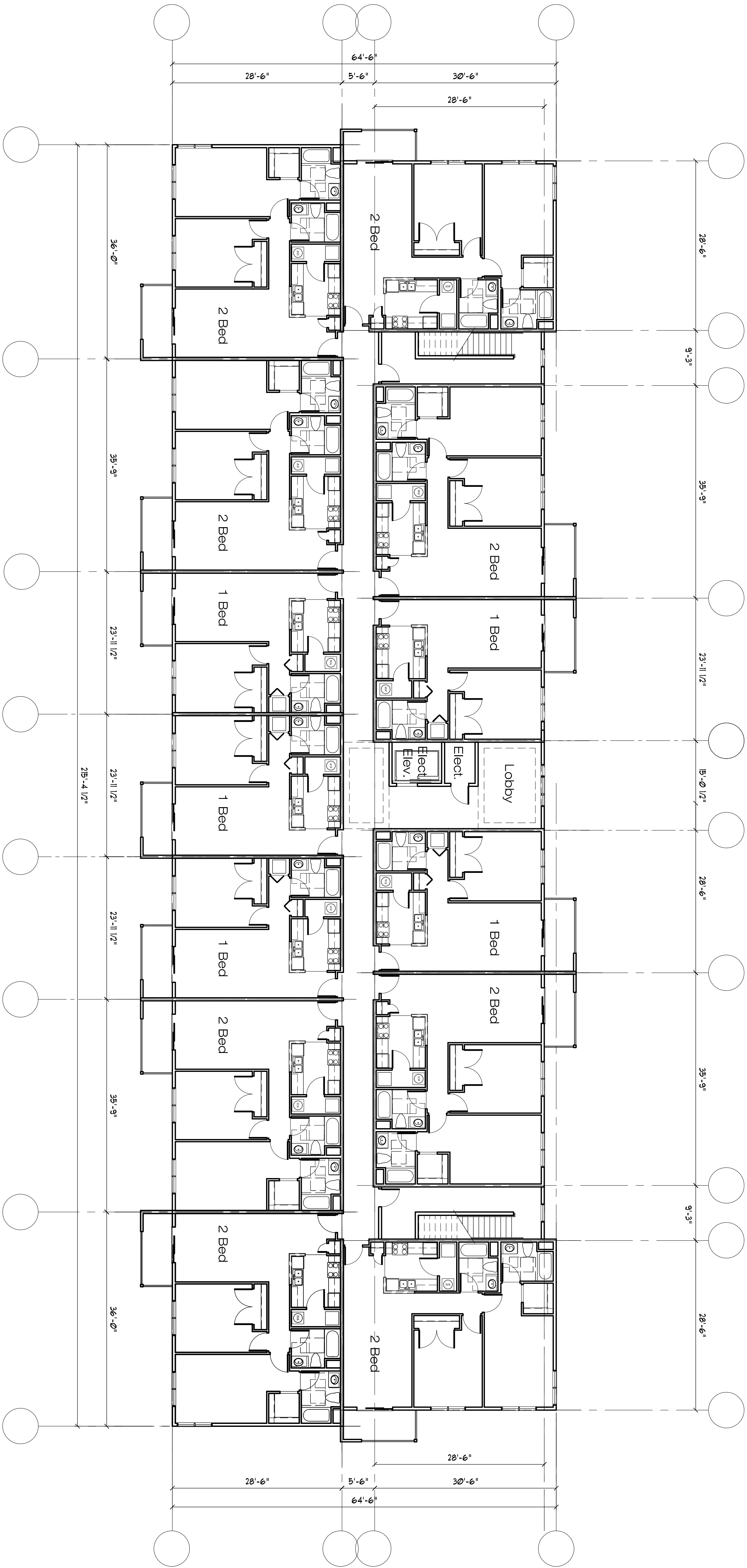
3/82" = 1'-0"

McCrone Place
Dover, NH
January 21, 2021



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ARCHITECTURE • PLANNING • CONSULTING • INTERIOR DESIGN
89 WILLOWBROOK AVENUE • STRATHAM, NH 03885
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WWW.THAAARC.COM

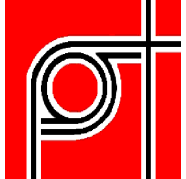
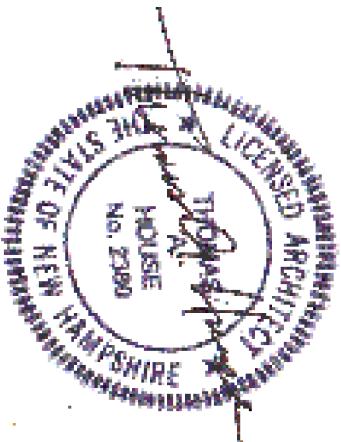
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1 Third Floor Plan

3/32"=1'-0"

McCrone Place
Dover, NH
January 21, 2021



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Tel: (603) 770-249 • Fax: (603) www.thaarc.com

**DRAINAGE ANALYSIS
&
EROSION & SEDIMENT
CONTROL PLAN**

Prepared for:

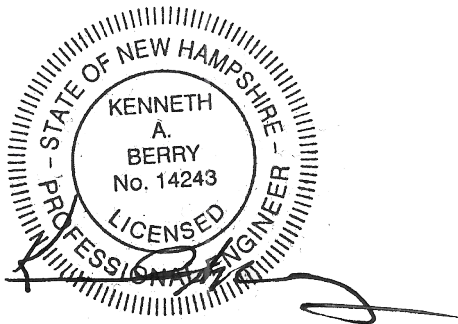
Equine Properties, LLC
149 Epping Road Suite 2A
Exeter, NH 03833

LOCATION

**Proposed Mixed Use Site Plan
McCrone Place and Concolor Drive
Tax Map H, Lot 37A**

Prepared by:

**Berry Surveying & Engineering
335 Second Crown Point Road
Barrington, NH 03825**



Project Number:
DB 2020-066

January 21, 2021

Table of Contents

USGS Quadrangle Location Map

Design Method Objectives	Page 2
1.0 Existing Conditions Analysis	Page 2
2.0 Proposed Subdivision Analysis	Page 3
3.0 Full Comparative Analysis	Page 5
4.0 Erosion and Sediment Control, BMP's	Page 6
5.0 Conclusion	Page 10

Appendix I - Existing Conditions Analysis

25 Yr - 24 Hr. Full Summary
2 Yr - 24 Hr. Node Listing
10 Yr - 24 Hr. Node Listing
25 Yr - 24 Hr. Node Listing
50 Yr - 24 Hr. Node Listing
100 Yr - 24 Hr. Node Listing

Appendix II - Proposed Conditions Analysis

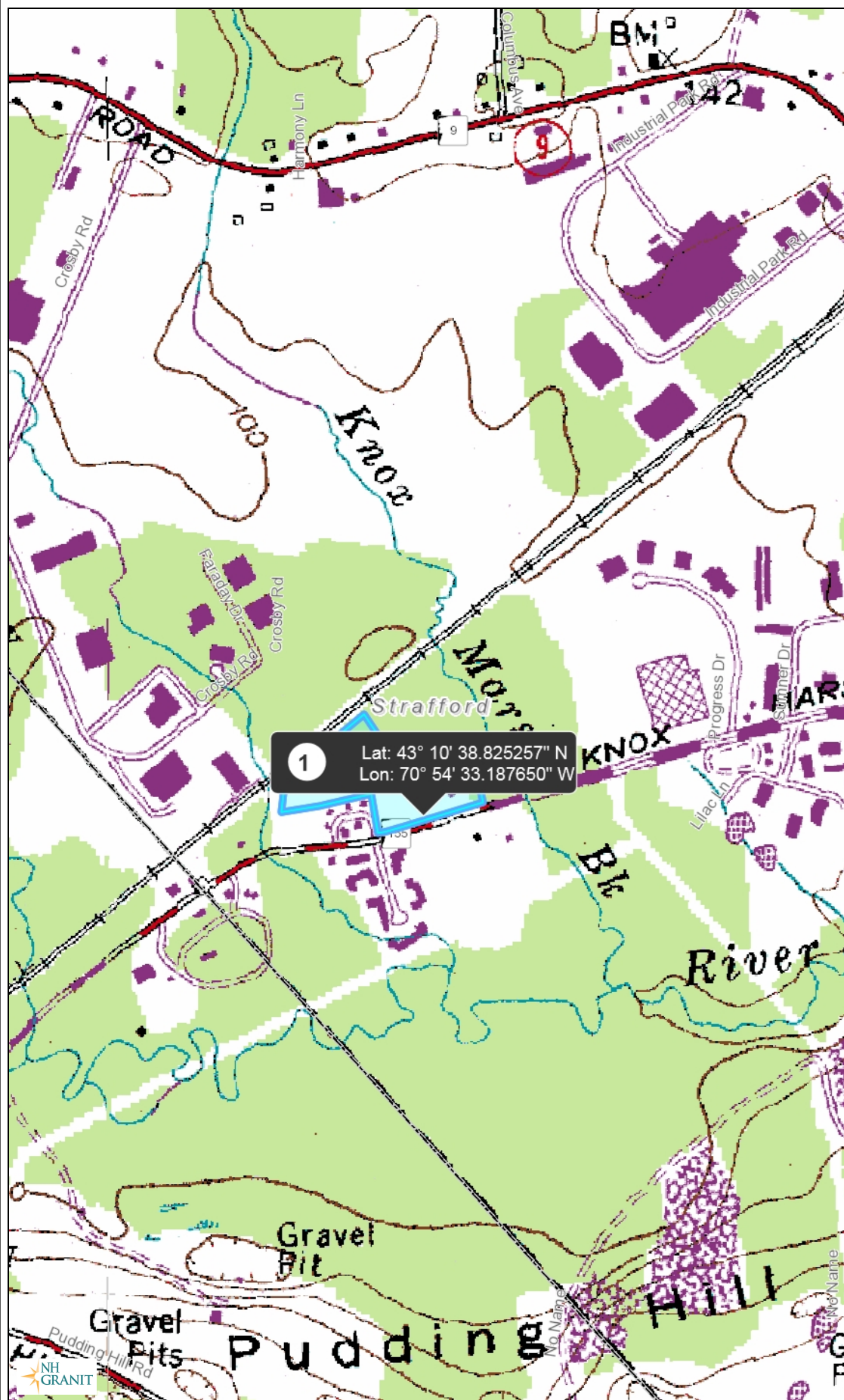
25 Yr - 24 Hr. Full Summary
2 Yr - 24 Hr. Node Listing
10 Yr - 24 Hr. Node Listing
25 Yr - 24 Hr. Node Listing
50 Yr - 24 Hr. Node Listing
100 Yr - 24 Hr. Node Listing

Appendix III - Calculations, Charts, & Graphs

Extreme Precipitation Tables
Rip Rap Calculations
AoT Stormwater Treatment Spreadsheets
NCRS USDA Web-soil Map
Inspection and Maintenance Manual Stormwater System Management
Infiltration Feasibility Study
Ksat Values in N.H., SSSNNE
Watershed Report Card, 303(d) List, & ORW List
Filtrexx Silt Soxx Specification Sheets

Enclosed:	W-1 Sheet	Existing Conditions Watershed Plan	Sheet 1
	W-2 Sheet	Post Construction Watershed Plan	Sheet 2
	Erosion & Sediment Control Plan		

Map by NH GRANIT



Legend

- State
- County
- City/Town

Map Scale

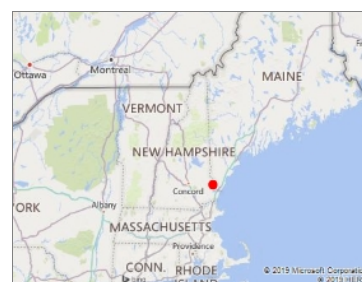
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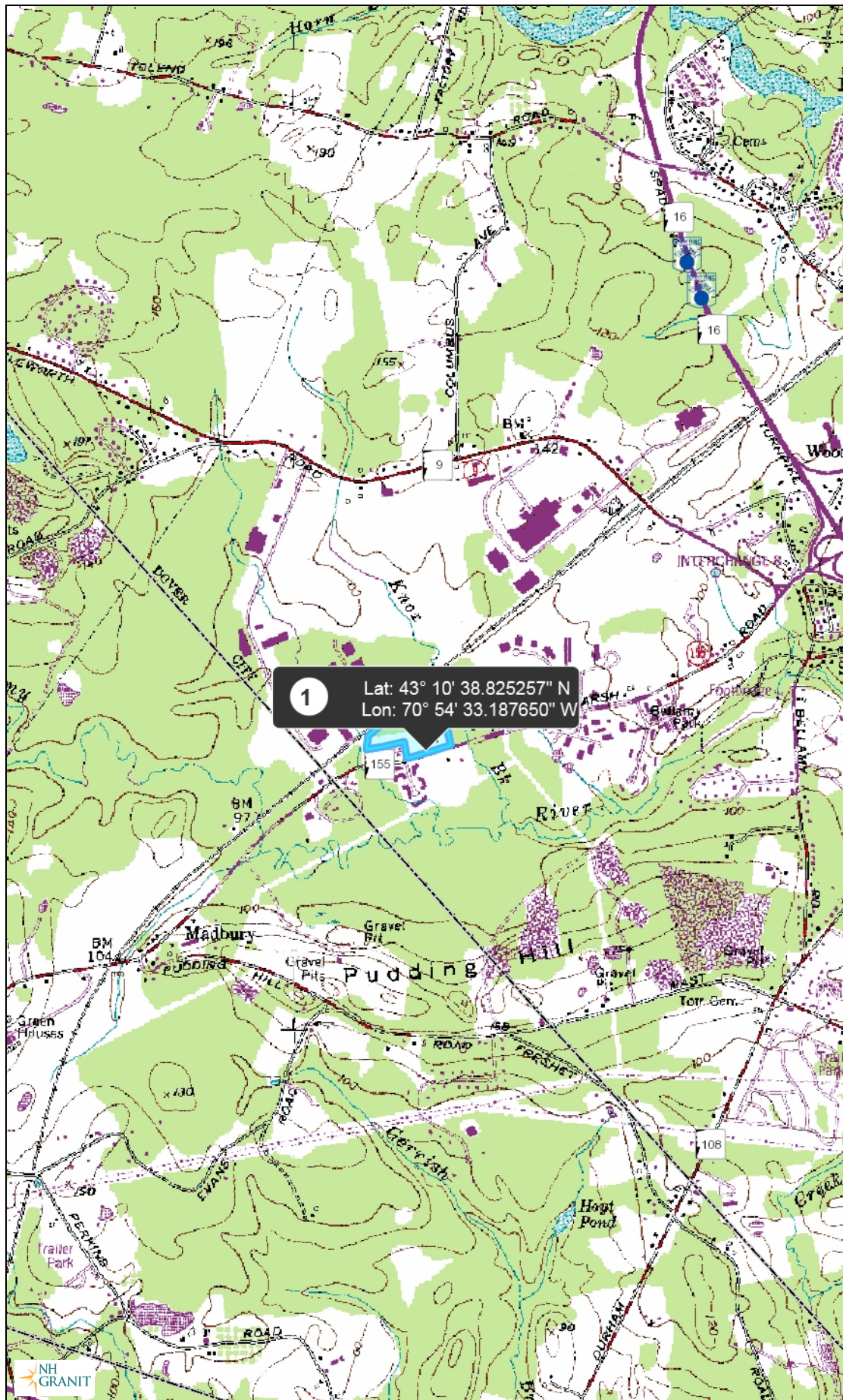
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Notes

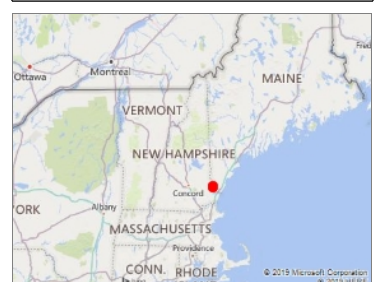


Map by NH GRANIT



Legend

- State
- County
- City/Town



DESIGN METHOD OBJECTIVES

The owner / developer of Tax Map H, Lot 37A, Equine Properties, LLC is proposing to develop the property at 239 Knox Marsh Road. The site currently is the location of a single residential structure.

An Existing and Proposed Conditions analysis was conducted for the purpose of estimating the peak rate of stormwater run-off and to subsequently design adequate mitigation of drainage. There are two existing drainage discharge points which was identified in the existing analysis and duplicated in the proposed conditions analysis. There are also two depressions in the existing analysis that capture and hold surface water runoff. Designing two watershed models we have compared the differences in these rates of peak run-off and surface water volume. Sheet W1, Existing Conditions Watershed Plan, outlines the characteristics of the site in its existing or pre-construction conditions. The second analysis displays the proposed (post-construction) conditions (See Sheet W2). The analysis was conducted using data for; 2 Yr – 24 Hr (3.60”), 10 Yr – 24 Hr (5.44”), 25 Yr -24 Hr (6.88”), 50 Yr – 24 Hr (8.23”), and 100 YR-24 Hr (9.84”) storm events. Storm event analysis was accomplished using the USDA SCS TR-20 method within the HydroCAD Stormwater Modeling System environment. Rainfall quantities are based on the Extreme Precipitation Table for this location from the Northeast Regional Climate Center / Cornell University (<http://precip.eas.cornell.edu>). As Dover is considered a part of the Coastal Region, a 15% escalation on rain fall depths has been applied to this application.

1.0 Existing Conditions Analysis:

Reference: Sheet W1 - Existing Conditions Watershed Plan (Enclosed)
Existing Conditions Plan

The existing parcel of land is used for residential and Christmas Tree Farm purposes. The soils within the watershed are made up of multiple soil types, containing Hydrologic Soil Group (HSG) A, C & D. See Site Specific Soils Map and report for more information. The parcel consists of Windsor Variant Well Drained soils, Buxton Moderately Drained soils as well as Scantic Poorly Drained soils.

The land area analyzed consists of 8.46 acres of the 9.29 acres of land area ownership. The parcel is naturally divided into four subcatchments by existing topography. Each of the four existing Subcatchments are analyzed with an individual final reach. The limit of the poorly drained jurisdictional wetlands is the limit of the drainage analysis.

Final Reach #100

Subcatchment #1 is land area in the eastern portion of the property and drains off site. **Final Reach #100** is a nonpoint reach to the north and east of the parcel, generally following the property line.

Final Reach #200

Subcatchment #2 is land area in the center portion of the property extending nearly to the edge of Knox Marsh Road and drains off site to the north. **Final Reach #200** is a nonpoint reach to the north and northeast of the parcel, generally following the property line.

Final Reach #300

Subcatchment #3 is made up of a portion of land in the western half of the property with the limit of the subcatchment being the delineated wetland line. Runoff generally flows northerly toward the delineated wetlands which are being analyzed as **Final Reach #300**.

Final Reach #400

Subcatchment #4 is made up of a portion of Knox Marsh Road (NH Route 155) and the adjacent land extending just over the property line. Runoff flows toward a cross culvert near a southwestern corner of the parcel which flows under Knox Marsh Road (**Pond #4**) to a stormwater pond being analyzed as **Final Reach #400**.

2.0 Proposed Conditions Analysis:

Reference: Sheet W2 - Proposed Conditions Watershed Plan (Enclosed)
Proposed Grading & Drainage Plan

The proposal for development in the Open Space Subdivision includes 12 dwelling units, a road consisting of 998 feet of roadway, and two mixed use buildings with a total of 52 units and the associated parking. The proposal is supported by a detention ponds, three subsurface gravel wetlands and an Infiltration Pond.

Final Reach #100

Subcatchment #1, from the Existing conditions analysis is divided into multiple subcatchments by the road network, **Subsurface Gravel Wetland (Pond #101)**, and discharge level spreader. Subcatchment #1 is the area remaining after the proposal is constructed. The easterly multi-use building and supporting parking drains to the sediment forebay and subsequently to SGW #101. The westerly multi-use building drains into the **Infiltration Pond (Pond #105)** which overflows into **Detention Pond #102**. A portion of Detention Pond #102 drains to the same sediment forebay. SGW #101 discharges into a level spreader that drains to **Analysis Reach #100**.

Final Reach #200

Subcatchment #2, from the from the Existing Condition Analysis is divided into multiple subcatchments (#13 & #17) again by the proposed roadway, proposed residential dwelling units, and infrastructure. This roadway and infrastructure drain overland and through a culvert pipe into the sediment forebay and subsequently into **Subsurface Gravel Wetland #103 (Pond #103)**. Also draining into SGW #103 is a portion of **Detention Pond #102 (Pond #102)**. Discharge from SGW #103, through an outlet structure and spillway, is routed through a level spreader prior to discharge to **Final Reach #200**.

Final Reach #300

Subcatchment #3 is reduced in size and contributes to the same Analysis Reach #300.

Final Reach #400

Subcatchment #14, consisting of the parking in support of the westerly multi-use building has surface water that is routed to Subsurface Gravel Wetland #104 (Pond #104) which discharges through an outlet structure into **Subcatchment / Pond #4** prior to discharge through the existing NHDOT culvert and **Final Reach #400**.

Stormwater Treatment:

Treatment takes place within the subsurface gravel wetlands designed to support the development on site. Pre-treatment will be provided in the sediment forebay's of the subsurface gravel wetlands. The stormwater quality volume capability is treated within provided treatment area of the practice.

Stormwater Infiltration:

Stormwater from the easterly multi-use building is routed to the Infiltration Pond #105 (Pond #105). See separate Infiltration Feasibility Study attached.

3.0 FULL COMPARATIVE ANALYSIS

Peak Rate of Discharge

<u>ANALYSIS</u>	<u>COMPONENT</u>	<u>PEAK RATE DISCHARGE (Cubic Feet / Second)</u>				
		2 Yr	10 Yr	25 Yr	50 Yr.	100 Yr.
Final Reach #100	Existing	2.18	4.72	6.86	8.92	11.40
	Proposed	0.73	1.39	2.70	6.62	10.85
Final Reach #200	Existing	1.24	3.82	6.26	8.75	11.89
	Proposed	0.73	1.39	2.70	6.62	10.85
Final Reach #300	Existing	1.44	3.38	5.08	6.75	8.79
	Proposed	1.06	2.31	3.38	4.42	5.67
Final Reach #400	Existing	0.32	0.89	1.40	1.92	2.56
	Proposed	0.11	0.73	1.37	1.87	2.42

<u>ANALYSIS</u>	<u>COMPONENT</u>	<u>VOLUME (ACRE FEET)</u>				
		2 Yr	10 Yr	25 Yr	50 Yr.	100 Yr.
Final Reach #100	Existing	0.198	0.411	0.596	0.776	0.998
	Proposed	0.178	0.652	1.059	1.459	1.995
Final Reach #200	Existing	0.204	0.530	0.839	1.156	1.558
	Proposed	0.111	0.350	0.628	0.895	1.212
Final Reach #300	Existing	0.216	0.479	0.712	0.944	1.232
	Proposed	0.090	0.190	0.277	0.362	0.467
Final Reach #400	Existing	0.030	0.074	0.113	0.154	0.205
	Proposed	0.060	0.151	0.230	0.309	0.405

4.0 EROSION and SEDIMENT CONTROL PLAN & BEST MANAGEMENT PRACTICES (BMP's)

Reference: Proposed Site Plan and Grading Plan
Erosion & Sediment Control Plan
Erosion & Sediment Control Details

The proposed site development is protected from erosion and the abutting properties are protected from sediment by the use of Best Management Practices as outlined in the New Hampshire Stormwater Manual, Volume 2, Post-Construction Best Management Practices Selection & Design (December 2008, NHDES & US EPA). Any area disturbed by construction will be re-stabilized within 14 calendar days (**City of Dover**) and abutting properties will not be adversely affected by this development. All swales and drainage structures will be constructed and stabilized prior to having run-off directed to them. Reference is also made to the Stormwater System Operation and Maintenance Plan / Inspection & Maintenance Manual which has been written specifically for this project and available to the owner.

Perimeter Control (Silt Fence / SiltSoxx / Erosion Control Mix Berm)

The plan set demonstrates the location of perimeter sediment control. The Erosion and Sediment Control Details, Sheet E-101, has the specifications for installation and maintenance of the silt fence, Filtrexx mulch filled SiltSoxx (or approved equal), and Erosion Control Mix Berm. There are locations on the site, for example bio-media rain garden protection, where SiltSoxx protection is specified

Detention Ponds

Description: Detention Ponds are also constructed ponds with the purpose of detaining runoff but not necessarily for infiltration purposes. During construction it is important that the ground surface not be exposed to traffic or construction equipment to preserve the infiltration capabilities of the existing soil. Construction specifications are included in the plan set and New Hampshire Stormwater Manual, Volume 2, 4-3 Treatment Practices, 3B, In-ground Infiltration Basin and Section 4-6, Conveyance Practices, 2. Detention Basins.

Maintenance Considerations:

Infiltration Basins and Detention Ponds should be inspected at least twice annually and following any rainfall event exceeding 0.25 inches in a twenty-four hour period. Maintenance rehabilitation will be conducted as warranted by each inspection. Trash and debris will be removed at each inspection.

On an annual basis the infiltration capabilities need to be confirmed by evaluation the drawdown time. If the infiltration system does not drain within 72-hours following a

rainfall event, a qualified professional will assess the condition of the basin to determine measures required to restore the infiltration function. This is normally the direct result of sediment accumulation which will be removed to restore the filter media ratio.

Also on an annual basis the vegetation should be inspected to ensure healthy condition. Invasive species need to be removed along with dead or diseased vegetation.

Subsurface Gravel Wetland

Description: A Gravel Wetland (NHDES SWM 4-3 Treatment Practice 2D) or Subsurface Gravel Wetland consists of a forebay and multiple flow-through treatment cells. During smaller rain events, the surface water runoff is intended to pass from the forebay, into the gravel media through perforated pipes and structures where it passes through an anaerobic environment where the Water Quality Volume will have 24-72 hours of contact time. The forebay is required to contain 10% of the WQV and each of the two cell must contain 45% of the WQV. During larger storm events, the system works as a detention pond. The design of a Subsurface Gravel Wetland will be constructed in accordance with the most current version of the Design Specifications provided by the UNH Stormwater Center and SWM Volume 2, Section 4-3 Treatment Practices, 2d Gravel Wetlands.

Maintenance Considerations: The outlet configuration of the anaerobic subsurface gravel consists of a small discharge orifice that is located in a threaded cap. This goose-neck feature is designed to be disassembled to allow cleaning. This outlet orifice is located within a concrete outlet structure that also contains a control stack used to control and detain runoff in the system. Although this is designed to be "clean water" after the filtering process, the outlet structure in general is going to require periodic maintenance to ensure that it is discharging runoff properly. If the Subsurface Gravel Wetland retains runoff on the surface for more than 72 hours the performance is not correct and maintenance is required.

Debris will need to be removed from the inlet and outlet structures as well as any buildup of sediment. The surface of the ponded area is intended to have wetland plants which may require periodic replanting, depending on the sediment loading. Sediment buildup in the forebay must be removed to maintain the minimum required volume. See also 9 and 10 of the attached UNHSC Subsurface Gravel Wetland Design Specifications 2009, and / or UNHSC Subsurface Gravel Wetland Design Specifications 2016 with Maintenance Guidelines and Checklist. See also Design and Maintenance of Subsurface Gravel Wetlands, (for NHDOT) by UNHSC. (Check List, Page 24 & 25, Attached)

Vegetated Stabilization

All areas that are disturbed during construction will be stabilized with vegetated material within 30 days of breaking ground. Construction will be managed in such a manner that erosion is prevented and that no abutter's property will be subjected to any siltation, unless otherwise permitted. All areas to be planted with grass for long-term cover will follow the specification and on Sheet E-102 using seeding mixture C, as follows:

Mixture	Pounds per Acre	Pounds per 1,000 Sq. Ft.
Tall Fescue	24	0.55
Creeping Red Fescue	24	0.55
Total	48	1.10

Conservation Mix

Tall Fescue	15	0.35
Creeping Red Fescue	15	0.35
Annual Ryegrass	5	0.12
Perennial Ryegrass	5	0.12
Kentucky Bluegrass	15	0.35
White Clover	7	0.16
Total	62	1.45

Conservation Mix will be used to stabilize all 2:1 slopes and all land area disturbed within the wetland buffer. (If applicable).

Stabilized Construction Entrance

A temporary gravel construction entrance provides an area where mud can be dislodged from tires before the vehicle leaves the construction site to reduce the amount of mud and sediment transported onto paved municipal and state roads. The stone size for the pad should be 3" coarse aggregate, and the pad itself constructed to a minimum length of 75' for the full width of the access road. The aggregate should be placed at least six inches thick. A plan view and profile are shown on Sheet E-101- Erosion & Sediment Control Detail Plan. (If applicable).

Environmental Dust Control

Dust will be controlled on the site by the use of multiple Best Management Practices. Mulching and temporary seeding will be the first line of protection to be utilized where problems occur. If dust problems are not solved by these applications, the use of water and calcium chloride can be applied. Calcium chloride will be applied at a rate that will keep the surface moist but not cause pollution.

Vegetated Filter Strips / Buffers

Filter strips are areas of land with natural or planted vegetation designed to receive sheet run-off from up gradient development. These natural areas, preferably wooded, are effective in removing sediment and sediment-laden pollutants from such run-off, although their effectiveness is severely diminished when forced to deal with concentrated flow and must therefore be equipped with a level-spreading device. Filter strips should not have a slope exceeding fifteen percent and have a minimum length of seventy-five feet. Each buffer is individually specified and limits are located on the Sediment & Erosion Control Plan

Drainage Swales / Stormwater Conveyance Channels

Drainage swales will be stabilized with vegetation for long term cover as outlined below, and on Sheet E-102 using seed mixture C. As a general rule, velocities in the swale should not exceed 3.0 feet per second for a vegetated swale although velocities as high as 4.5 FPS are allowed under certain soil conditions (If applicable).

Construction Sequence

1. Cut and remove trees in construction area only as required.
2. Construct and/or install temporary and permanent sediment erosion and detention control facilities as required.
3. Erosion, sediment and detention control facility shall be installed & stabilized prior to any earth moving operation & or directing runoff to them.
4. Clear, cut and dispose of debris in approved facility.
5. Construct temporary culverts as required, or directed.
6. Construct roadways for access to desired construction areas. All roads shall be stabilized immediately.
7. Install pipe and construction associated appurtenances as required or directed. Install rain gardens. All disturbed areas shall be stabilized immediately after grading.
8. Begin permanent and temporary seeding and mulching. All cut and fill slopes and disturbed areas shall be seeded or mulched as required, or directed. No area is allowed to be disturbed for a length of time that exceeds 60 days before being stabilized. Daily, or as required. All roadways and parking areas shall be stabilized within 72 hours of

achieving finished grades. All cut and fill slopes shall be stabilized within 72 hours of achieving finished grades.

9. Construct temporary berms, drains ditches, silt fences, sediment traps, etc. mulch and seed as required.
10. Inspect and maintain all erosion and sediment control measures during construction.
11. Complete permanent seeding and landscaping.
12. Remove temporary erosion control measures after seeding areas have established themselves and site improvements are complete.
13. Smooth and revegetate all disturbed areas.
14. Finish paving all roadways.

Temporary Erosion Control Measures

1. The smallest practical area of land shall be exposed at any one time.
2. Erosion, sediment control measures shall be installed as shown on the plans and at locations as required, or directed by the engineer.
3. All disturbed areas shall be returned to original grades and elevations. Disturbed areas shall be loamed with a minimum of 4" of loam and seeded with not less than 1.10 pound of seed per 1,000 square feet (48 pounds per acre) of area.
4. Silt fences and other barriers shall be inspected periodically and after every rainstorm during the life of the project. All damaged areas shall be repaired, sediment deposits shall periodically be removed and properly disposed of.
5. After all disturbed areas have been stabilized, the temporary erosion control measures are to be removed and the area disturbed by the removal smoothed and re-vegetated.
6. Areas must be seeded and mulched within 5 days of final grading, permanently stabilized within 15 days of final grading, or temporarily stabilized within 30 days of initial disturbance of soil.

Inspection and Maintenance Schedule

Fencing (if used) will be inspected during and after storm events to ensure that the fence still has integrity and is not allowing sediment to pass. Depending on SWPPP criteria, all controls will be inspected either once every 7 days and after storm events. Inspection reports must be submitted to City of Dover Engineering Department. See also Stormwater System Operation & Maintenance Plan and Inspection & Maintenance Manual published separately also by Berry Surveying & Engineering. See also Storm Water Pollution Prevention Plan (SWPPP) developed in accordance with EPA NPDES requirements & the City of Dover Stormwater regulations. Stabilization is required within 14 calendar days IAW Chapter 149-14, Site Development Criteria.

Corrective Action measures will be made in accordance with SWPPP requirements and records maintained on site by the Contractor.

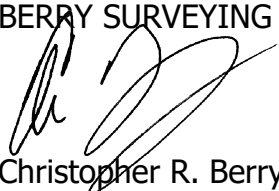
5.0 CONCLUSION

Peak rates of runoff flow are modeled to be reduced in the post-construction analysis / condition, as compared to the pre-construction peak rates of runoff flow. This reduction occurs during the 10 Yr, 25 Yr, 50 Yr, and 100 Yr/24 Hr. extreme storm events due to the installation of the low impact development stormwater devices.

The volume of stormwater discharge from the site at is reduced due to construction grading, the detention in the detention ponds, and retention in the subsurface gravel wetlands. The gravel wetlands are designed to manage the stormwater volume to threat the runoff.

A Site Specific, Terrain Alteration Permit (RSA 485: A-17) is required for this site plan due to the area of disturbance being greater than 100,000 SF. The impact is approximately **87,000** square feet, so that an EPA Notice of Intent will be required to be filed prior to construction and a Stormwater Pollution Prevention Plan prepared.

Respectfully Submitted,
BERRY SURVEYING & ENGINEERING



Christopher R. Berry, SIT 567
Principal, President



Kenneth A. Berry PE, LLS,
CPSWQ, CPESC, CESSWI
Principal, VP - Technical Operations

James F. Hayden
Design Engineer / Project Manager

<u>S.S.S.M. SOILS LEGEND</u>		
<u>SYMBOL</u>	<u>SOIL TAXONOMIC NAME</u>	<u>HYDROLOGIC SOIL GROUP</u>
WfA	WINDSOR VARIANT	A
WfB	WINDSOR VARIANT	A
WfC	WINDSOR VARIANT	A
BzA	BUXTON MODERATELY DRAINED	C
BzB	BUXTON MODERATELY DRAINED	C
BzC	BUXTON MODERATELY DRAINED	C
ScA/P	SCANTIC POORLY DRAINED	D
ScB/P	SCANTIC POORLY DRAINED	D

SLOPE: A = 0-3% B = 3-8% C = 8-15% D = 15-25% E = 25-50% F = 50%+

DENOMINATOR: /VPD = VERY POORLY DRAINED /PD = POORLY DRAINED
 /SWPD = SOMEWHAT POORLY DRAINED /MWD = MODERATELY WELL DRAINED

NRCS SOILS LEGEND		
SYMBOL	SOIL TAXONOMIC NAME	HYDROLOGIC SOIL GROUP
WdA	WINDSOR LOAMY SAND	A
WFB	WINDSOR LOAMY SAND	A
BzA	BUXTON SILT LOAM	C
ScA	SUFFIELD SILT LOAM	D

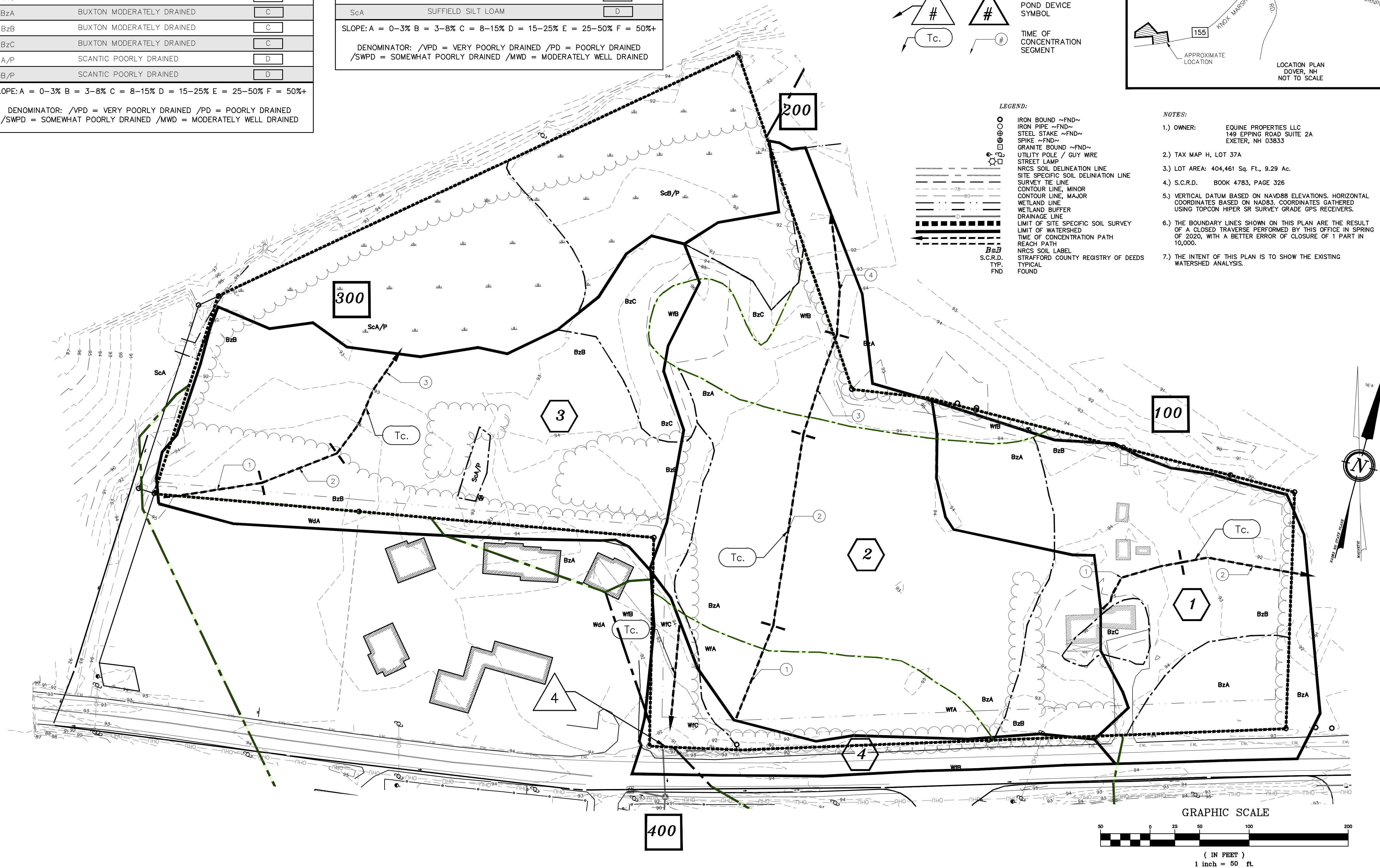
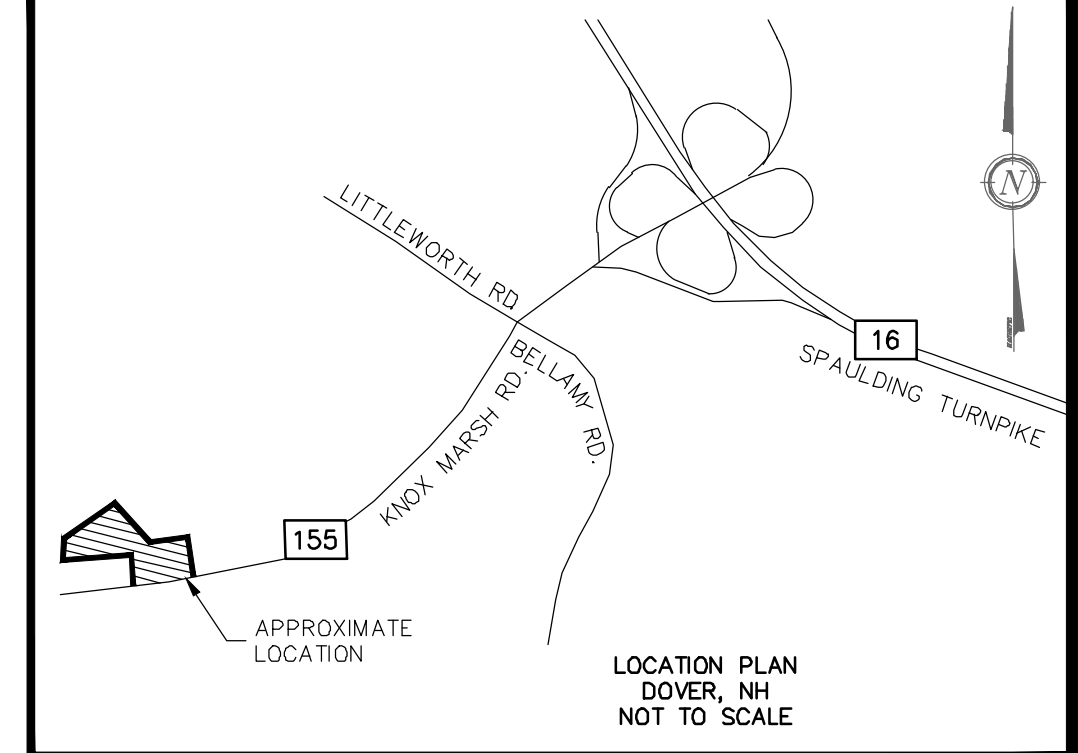
SLOPE: A = 0–3% B = 3–8% C = 8–15% D = 15–25% E = 25–50% F = 50%+

DENOMINATOR: /VPD = VERY POORLY DRAINED /PD = POORLY DRAINED
 /SWPD = SOMEWHAT POORLY DRAINED /MWD = MODERATELY WELL DRAINED

		SUBCATCHMENT AREA SYMBOL
		FLOW REACH SYMBOL
		POND DEVICE SYMBOL
		TIME OF CONCENTRATION SEGMENT

○ IRON BOUND ~FND~
 ○ IRON PIPE ~FND~
 ⊗ STEEL STAKE ~FND~
 ⊕ SPIKE ~FND~
 □ GRANITE BOUND ~FND~
 ○ □ UTILITY POLE / GUY WIRE
 ○ □ STREET LAMP
 --- NRCS SOIL DELINEATION LINE
 --- SITE SPECIFIC SOIL DELINEATION LINE
 --- SURVEY TIE LINE
 ---78--- CONTOUR LINE, MINOR
 ---60--- CONTOUR LINE, MAJOR
 --- WETLAND LINE
 --- WETLAND BUFFER
 --- DRAINAGE LINE
 --- LIMIT OF SITE SPECIFIC SOIL SURVEY
 --- LIMIT OF WATERSHED
 --- TIME OF CONCENTRATION PATH
 --- REACH PATH
 --- NRCS SOIL LABEL
 --- STRAFFORD COUNTY REGISTRY OF DEEDS
 B±B
 S.C.R.D.
 TYP.
 FND

- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
- 2.) TAX MAP H, LOT 37A
- 3.) LOT AREA: 404,461 Sq. Ft., 9.29 Ac.
- 4.) S.C.R.D. BOOK 4783, PAGE 326
- 5.) VERTICAL DATUM BASED ON NAVD88 ELEVATIONS. HORIZONTAL COORDINATES BASED ON NAD83. COORDINATES GATHERED USING TOPCON HIPER SR SURVEY GRADE GPS RECEIVERS.
- 6.) THE BOUNDARY LINES SHOWN ON THIS PLAN ARE THE RESULT OF A CLOSED TRAVERSE PERFORMED BY THIS OFFICE IN SPRING OF 2020, WITH A BETTER ERROR OF CLOSURE OF 1 PART IN 10,000.
- 7.) THE INTENT OF THIS PLAN IS TO SHOW THE EXISTING WATERSHED ANALYSIS.



PLANNING FILE #		
REVISION	DATE	DESCRIPTION

W-1 EXISTING WATERSHED PLAN

LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603) 332-2863
SCALE : 1 IN. EQUALS 50 FT.
DATE : JANUARY 21, 2021
EJF NO. : DR 2020 - 066

SEAL: KENNETH A. BERRY, PROFESSIONAL ENGINEER, STATE OF NEW HAMPSHIRE, LICENSE NO. 10000

WJA	WINDSOR	VARIANT	K= 0.17
WJB	WINDSOR	VARIANT	K= 0.17
WJC	WINDSOR	VARIANT	K= 0.17
BzA	BUXTON	SILT LOAM	K= 0.28
BzB	BUXTON	SILT LOAM	K= 0.43
BzC	BUXTON	SILT LOAM	K= 0.43
SCA-P	SCANTY	POORLY DRAINED	K= 0.43
SCB-P	SCANTY	POORLY DRAINED	K= 0.43
SCA	SUFFIELD	SILT LOAM	K= 0.20
WdA	WINDSOR	LOAMY SAND	K= 0.17
WdB	WINDSOR	LOAMY SAND	K= 0.17

CONTRACTOR TO BE AWARE OF THE SOIL PROFILES AND ENSURE THAT PROPER EROSION PREVENTION AND SEDIMENT CONTROL MEASURES ARE TAKEN AT ALL TIMES. ANY DEWATERING REQUIREMENTS IN NEW HAMPSHIRE REQUIRE SPECIAL PROVISIONS IN ACCORDANCE WITH THE "CLARIFICATION OF SECTION 9.1.2 (STATE OF NEW HAMPSHIRE CONDITIONS) AND OTHER NH SPECIFIC INFORMATION FOR THE U.S. EPA 2012 NPDES CONSTRUCTION GENERAL PERMIT (CGP)" DATED MAY 3, 2012 INCLUDED IN THE SWPPP.

COVER MANAGEMENT DURING CONSTRUCTION FOR EXPOSED SOIL WILL INCLUDE HAY / STRAW APPLIED AT A RATE OF 2.0 TONS PER ACRE, TEMPORARY SEEDING OF ANNUAL RYE GRASS, AND PERMANENT SEEDING AT THE EARLIEST OPPORTUNITY. SEE ADDITIONAL REQUIREMENT FOR STABILIZATION ON THE EROSION AND SEDIMENT CONTROL DETAIL SHEETS, E-101 AND E-102.

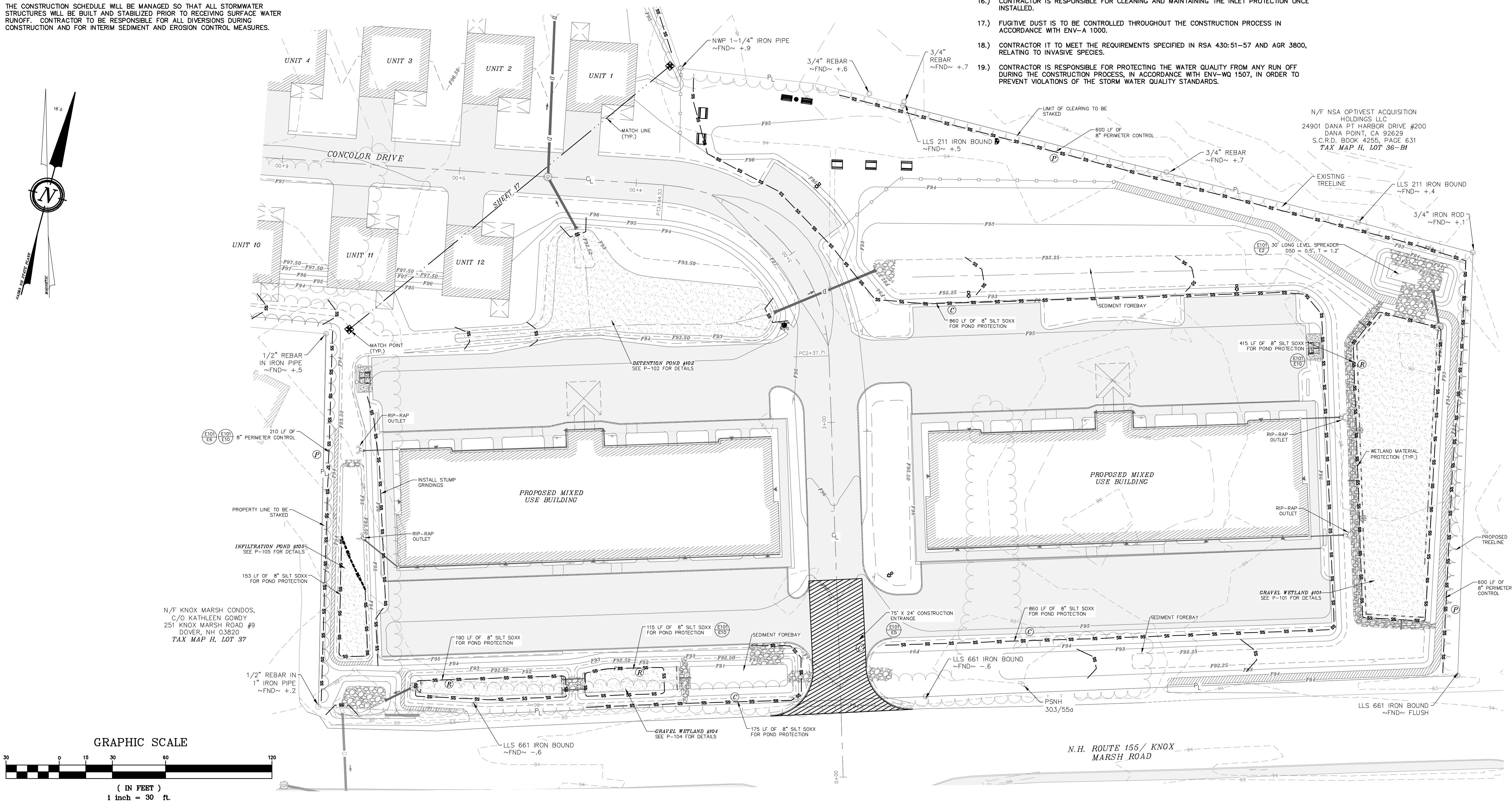
THE CONSTRUCTION SCHEDULE WILL BE MANAGED SO THAT ALL STORMWATER STRUCTURES WILL BE BUILT AND STABILIZED PRIOR TO RECEIVING SURFACE WATER RUNOFF. CONTRACTOR TO BE RESPONSIBLE FOR ALL DIVERSIONS DURING CONSTRUCTION AND FOR INTERIM SEDIMENT AND EROSION CONTROL MEASURES.

	POND PROTECTION
	PERIMETER CONTROL
	RESIDENTIAL/ROADWAY CONSTRUCTION
	IRON PIPE (FND)
	IRON BOUND (FND)
	REBAR (FND)
	UTILITY POLE
	BENCHMARK

SILT FENCE
FILTREXX SILTSOXX
TREE LINE

- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
- 2.) TAX MAP H, LOT 37A
- 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac..
- 4.) S.C.R.D. BOOK 4783, PAGE 326
- 5.) THE INTENT OF THIS PLAN IS TO SHOW THE EASTERN EROSION AND SEDIMENT CONTROL DETAIL.
- 6.) UNDERGROUND UTILITY LOCATIONS ARE BASED UPON BEST AVAILABLE EVIDENCE AND ARE NOT FIELD VERIFIED. LOCATING AND PROTECTING ANY ABOVE AND BELOW GROUND UTILITIES IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR. ANY UTILITY CONFLICTS SHOULD BE REPORTED IMMEDIATELY TO THE DESIGN ENGINEER.
- 7.) THE CONTRACTOR SHALL CALL AND COORDINATE WITH DIGSAFE AT 1-888-344-7233 AT LEAST 72 HOURS PRIOR TO COMMENCING ANY EXCAVATION ON PUBLIC OR PRIVATE PROPERTY.
- 8.) ALL DRAINAGE PIPE IS TO BE HDPE N-12. INDIVIDUAL PIPE SIZES ARE SPECIFIED ON GRADING AND DETAIL PLAN SHEETS, GREEN PIPE.
- 9.) ALL ELEVATIONS TO BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. THE DESIGN ENGINEER IS TO BE NOTIFIED IMMEDIATELY OF ANY DISCREPANCY. TEMPORARY BENCHMARKS (T.B.M.) ARE TO BE PROVIDED BY THE DESIGN ENGINEER.

- 10.) UPON FINAL COMPLETION AND 85% STABILIZATION, THE DRAINAGE SYSTEM IS TO BE CLEANED OF ALL DEBRIS. SEDIMENT CONTROL PRACTICES REMOVED AND DISPOSED OF PROPERLY, AND ANNUAL MAINTENANCE PERFORMED ON ALL DRAINAGE PRACTICES.
- 10.) EROSION AND SEDIMENT CONTROL INSPECTIONS TO BE CONDUCTED ONCE PER EVERY SEVEN DAYS AND AT AN INCREASED FREQUENCY INCLUDING WITHIN 24-HOURS OF A 0.25-INCH RAIN EVENT. INSPECTIONS TO BE CONDUCTED BY A "QUALIFIED PERSON" AS DEFINED BY EPA CGP 4.1.1 AND INSPECTION REPORTS SUBMITTED TO THE CITY OF DOVER, NH, ENGINEERING DEPARTMENT WITHIN 24 HOURS IN ACCORDANCE WITH CGP 4.1.7 AND MAINTAINED BY THE OWNER FOR A PERIOD OF THREE YEARS AFTER THE PROJECT IS COMPLETED. SEE ALSO CITY OF DOVER ADDITIONAL INSPECTION REQUIREMENTS BELOW.
- 11.) SILT FENCE MAY BE SUBSTITUTED WITH FILTREXX SILT SOXX OR EROSION CONTROL MIX BERM. SILT FENCE IS NOT A SUBSTITUTE FOR FILTREXX SILT SOXX OR APPROVED EQUAL.
- 12.) PER EPA CGP 2.1.2.2 (INSTALL PERIMETER CONTROL), "YOU MUST INSTALL SEDIMENT CONTROL ALONG THOSE PERIMETER AREAS OF YOUR SITE THAT WILL RECEIVE STORMWATER FROM EARTH DISTURBING ACTIVITIES." AS A RESULT OF SWPPP INSPECTIONS, THE CONTRACTOR MAY HAVE TO EXPAND PERIMETER CONTROLS TO MEET THIS REQUIREMENT, THE EASC PLAN IS INITIATING GUIDANCE AS TO THE ANTICIPATED REQUIREMENTS AND IT THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT STORMWATER VIOLATION DO NOT OCCUR.
- 14.) CONTRACTOR IS REQUIRED TO INSTALL A CONSTRUCTION ENTRANCE PRIOR TO ANY EARTH DISTURBING ACTIVITIES.
- 15.) CONTRACTOR IS RESPONSIBLE FOR SWEEPING THE PARKING LOT, SIDEWALKS AND ANYTHING DISTURBED, TO ENSURE THAT NO SEDIMENT IS BEING TRACKED ONTO KNOX MARSH ROAD.
- 16.) CONTRACTOR IS RESPONSIBLE FOR CLEANING AND MAINTAINING THE INLET PROTECTION ONCE INSTALLED.
- 17.) FUGITIVE DUST IS TO BE CONTROLLED THROUGHOUT THE CONSTRUCTION PROCESS IN ACCORDANCE WITH ENV-A 1000.
- 18.) CONTRACTOR IT TO MEET THE REQUIREMENTS SPECIFIED IN RSA 430:51-57 AND AGR 3800, RELATING TO INVASIVE SPECIES.
- 19.) CONTRACTOR IS RESPONSIBLE FOR PROTECTING THE WATER QUALITY FROM ANY RUN OFF DURING THE CONSTRUCTION PROCESS, IN ACCORDANCE WITH ENV-WQ 1507, IN ORDER TO PREVENT VIOLATIONS OF THE STORM WATER QUALITY STANDARDS.



PLANNING FILE #

REVISION	DATE	DESCRIPTION

EROSION AND SEDIMENT CONTROL PLAN EAST

LAND OF
 EQUINE PROPERTIES LLC
 2239 KNOX MARSH ROAD
 DOVER, N.H.
 TAX MAP H, LOT 37A

DOVER, N.H.
TAX MAP H, LOT 37A

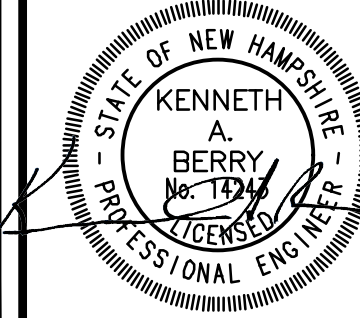
BERRY SURVEYING & ENGINEERING

335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863

SCALE : 1 IN. EQUALS 30 FT.

DATE : JANUARY 21, 2021

FILE NO. : DB 2020 - 066



SOILS & DEWATERING:

W/A	WINDSOR	VARIANT	K= 0.17
W/B	WINDSOR	VARIANT	K= 0.17
W/C	WINDSOR	VARIANT	K= 0.17
B/A	BUXTON	SILT LOAM	K= 0.28
B/B	BUXTON	SILT LOAM	K= 0.49
B/C	BUXTON	SILT LOAM	K= 0.49
S/A-P	SCANTIC	POORLY DRAINED	K= 0.49
S/B-P	SCANTIC	POORLY DRAINED	K= 0.43
S/A	SUFFIELD	SILT LOAM	K= 0.20
W/A	WINDSOR	LOAMY SAND	K= 0.17
W/B	WINDSOR	LOAMY SAND	K= 0.17

SEE SITE SPECIFIC SOILS MAP (SSSM)
SEE WEBSOIL USDA-NRCS
ERODIBILITY FACTOR - K, CPESC MANUAL, ENVIROCERT INTERNATIONAL INC. &
ROCKINGHAM COUNTY SOIL SURVEY, ROCKWEB SOIL ATTRIBUTES.

CONTRACTOR TO BE AWARE OF THE SOIL PROFILES AND ENSURE THAT PROPER EROSION
PREVENTION AND SEDIMENT CONTROL MEASURES ARE TAKEN AT ALL TIMES. ANY
DEWATERING REQUIREMENTS IN NEW HAMPSHIRE REQUIRE SPECIAL PROVISIONS IN
ACCORDANCE WITH THE "CLARIFICATION OF SECTION 9.1.2 (STATE OF NEW HAMPSHIRE
CONDITIONS) AND OTHER NH SPECIFIC INFORMATION FOR THE U.S. EPA 2012 NPDES
CONSTRUCTION GENERAL PERMIT (CGP)" DATED MAY 3, 2012 INCLUDED IN THE SWPPP.

COVER MANAGEMENT DURING CONSTRUCTION FOR EXPOSED SOIL WILL INCLUDE HAY /
STRAW APPLIED AT A RATE OF 2.0 TONS PER ACRE, TEMPORARY SEEDING OF ANNUAL
RYE GRASS, AND PERMANENT SEEDING AT THE EARLIES OPPORTUNITY. SEE ADDITIONAL
REQUIREMENT FOR STABILIZATION ON THE EROSION AND SEDIMENT CONTROL DETAIL
SHEETS, E-101 AND E-102.

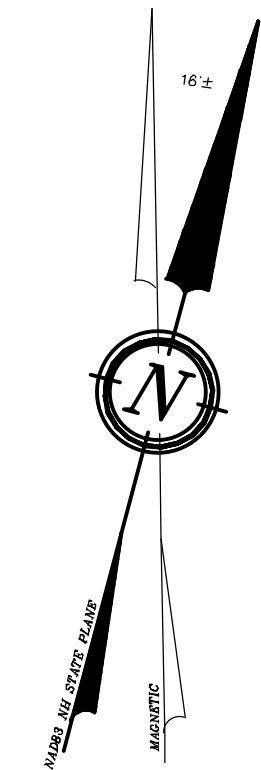
THE CONSTRUCTION SCHEDULE WILL BE MANAGED SO THAT ALL STORMWATER
STRUCTURES WILL BE BUILT AND STABILIZED PRIOR TO RECEIVING SURFACE WATER
RUNOFF. CONTRACTOR TO BE RESPONSIBLE FOR ALL DIVERSIONS DURING
CONSTRUCTION AND FOR INTERIM SEDIMENT AND EROSION CONTROL MEASURES.

LEGEND:

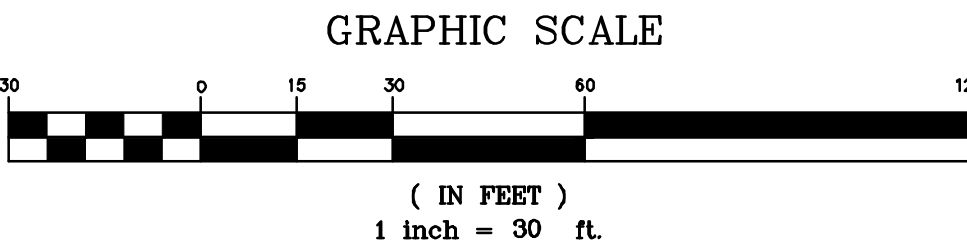
- (R) POND PROTECTION
- (P) PERIMETER CONTROL
- (C) RESIDENTIAL/ROADWAY CONSTRUCTION
- IRON PIPE (FND)
- REBAR (FND)
- UTILITY POLE
- ⊕ BENCHMARK
- SILT FENCE
- FILTREXX SILT/SOXX / MULCH BERM
- TREE LINE

NOTES:

- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
- 2.) TAX MAP H, LOT 37A
- 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
- 4.) S.C.R.D. BOOK 4783, PAGE 326
- 5.) THE INTENT OF THIS PLAN IS TO SHOW THE WESTERN EROSION AND SEDIMENT
CONTROL DETAIL.
- 6.) SEE SHEET 15 FOR ALL OTHER STANDARD EROSION AND SEDIMENT CONTROL NOTES.



N/F PATRICK J CRAGIN TRUSTEE
PATRICK J CRAGIN LIVING REV TRUST
P.O. BOX 250
DOVER, NH 03820
S.C.R.D. BOOK 3497, PAGE 417
TAX MAP H, LOT 38



N/F PATRICK J CRAGIN TRUSTEE
PATRICK J CRAGIN LIVING REV TRUST
P.O. BOX 250
DOVER, NH 03820
S.C.R.D. BOOK 3497, PAGE 417
TAX MAP H, LOT 37B

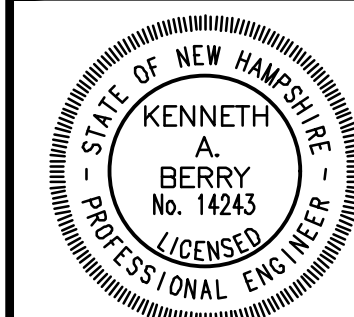
N/F KNOX MARSH CONDOS,
C/O KATHLEEN COWDY
251 KNOX MARSH ROAD #9
DOVER, NH 03820
TAX MAP H, LOT 37

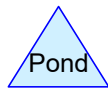
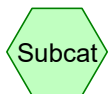
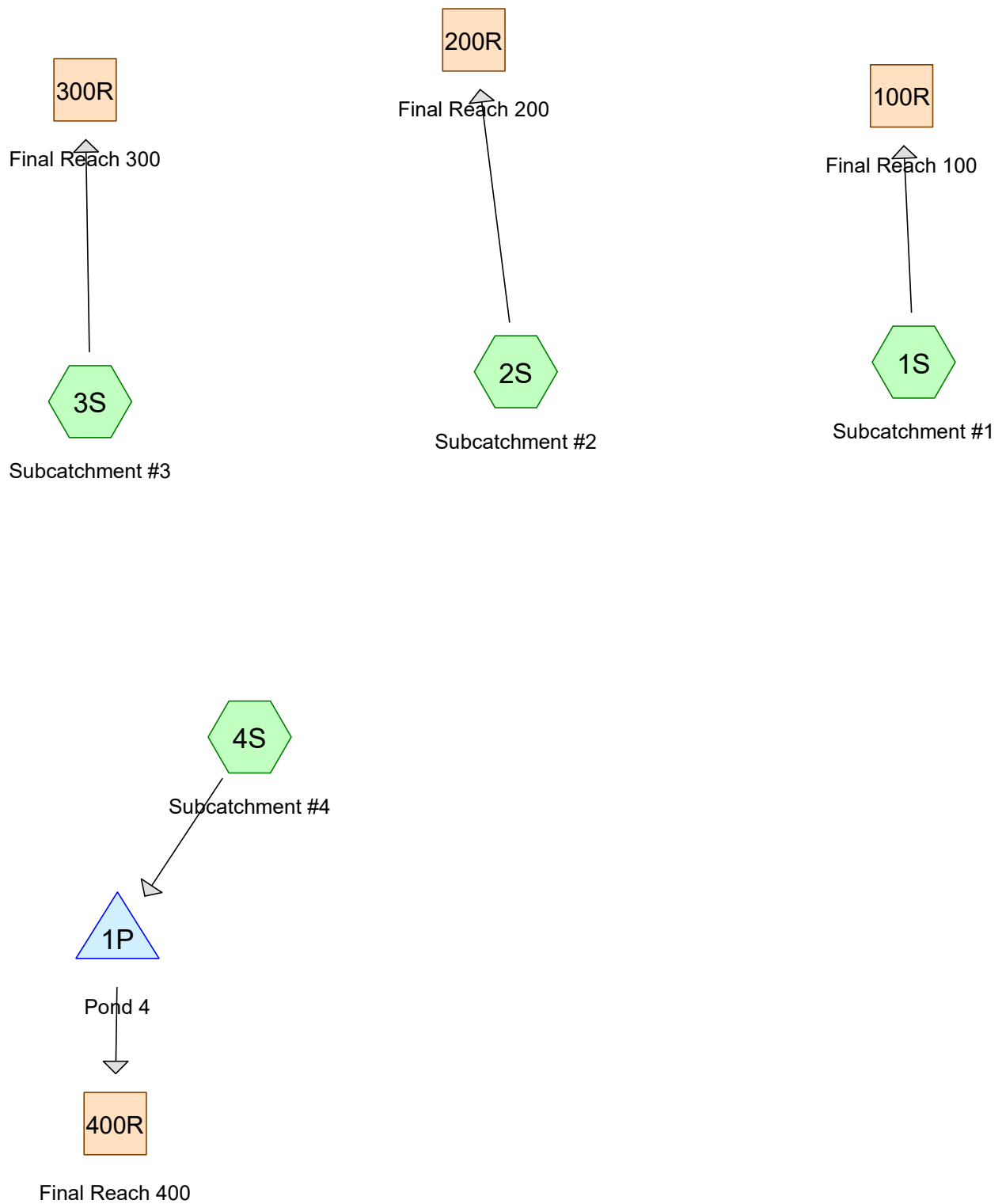


PLANNING FILE #		
REVISION	DATE	DESCRIPTION

EROSION AND SEDIMENT CONTROL PLAN WEST
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
SCALE : 1 IN. EQUALS 30 FT.
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066





20-066 Existing Conditions Analysis

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.688	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S, 4S)
2.646	74	>75% Grass cover, Good, HSG C (1S, 2S, 3S)
0.184	80	>75% Grass cover, Good, HSG D (2S)
0.227	98	Paved parking, HSG A (1S, 4S)
0.154	98	Paved parking, HSG C (1S, 2S)
0.065	98	Roofs, HSG C (1S, 2S)
0.370	30	Woods, Good, HSG A (1S, 2S, 3S, 4S)
1.298	70	Woods, Good, HSG C (1S, 2S, 3S, 4S)
0.004	77	Woods, Good, HSG D (2S)
0.463	32	Woods/grass comb., Good, HSG A (1S, 2S)
2.363	72	Woods/grass comb., Good, HSG C (1S, 2S)
8.461	67	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.748	HSG A	1S, 2S, 3S, 4S
0.000	HSG B	
6.526	HSG C	1S, 2S, 3S, 4S
0.188	HSG D	2S
0.000	Other	
8.461		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.688	0.000	2.646	0.184	0.000	3.517	>75% Grass cover, Good	1S, 2S, 3S, 4S
0.227	0.000	0.154	0.000	0.000	0.381	Paved parking	1S, 2S, 4S
0.000	0.000	0.065	0.000	0.000	0.065	Roofs	1S, 2S
0.370	0.000	1.298	0.004	0.000	1.672	Woods, Good	1S, 2S, 3S, 4S
0.463	0.000	2.363	0.000	0.000	2.826	Woods/grass comb., Good	1S, 2S
1.748	0.000	6.526	0.188	0.000	8.461	TOTAL AREA	

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	89.38	88.00	46.0	0.0300	0.024	15.0	0.0	0.0

20-066 Existing Conditions Analysis

Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 1S: Subcatchment #1 Runoff Area=79,230 sf 10.42% Impervious Runoff Depth>3.93"
Flow Length=230' Tc=12.0 min CN=74 Runoff=6.86 cfs 0.596 af

Subcatchment 2S: Subcatchment #2 Runoff Area=162,937 sf 1.01% Impervious Runoff Depth>2.69"
Flow Length=522' Tc=33.1 min CN=62 Runoff=6.26 cfs 0.839 af

Subcatchment 3S: Subcatchment #3 Runoff Area=106,672 sf 0.00% Impervious Runoff Depth>3.49"
Flow Length=300' Tc=38.1 min CN=70 Runoff=5.08 cfs 0.712 af

Subcatchment 4S: Subcatchment #4 Runoff Area=19,739 sf 48.38% Impervious Runoff Depth>3.00"
Flow Length=100' Slope=0.0210 '/' Tc=9.0 min CN=65 Runoff=1.40 cfs 0.113 af

Reach 100R: Final Reach 100 Inflow=6.86 cfs 0.596 af
Outflow=6.86 cfs 0.596 af

Reach 200R: Final Reach 200 Inflow=6.26 cfs 0.839 af
Outflow=6.26 cfs 0.839 af

Reach 300R: Final Reach 300 Inflow=5.08 cfs 0.712 af
Outflow=5.08 cfs 0.712 af

Reach 400R: Final Reach 400 Inflow=1.40 cfs 0.113 af
Outflow=1.40 cfs 0.113 af

Pond 1P: Pond 4 Peak Elev=89.95' Storage=9 cf Inflow=1.40 cfs 0.113 af
15.0" Round Culvert n=0.024 L=46.0' S=0.0300 '/' Outflow=1.40 cfs 0.113 af

Total Runoff Area = 8.461 ac Runoff Volume = 2.260 af Average Runoff Depth = 3.21"
94.72% Pervious = 8.015 ac 5.28% Impervious = 0.446 ac

20-066 Existing Conditions Analysis

Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Subcatchment 1S: Subcatchment #1

Runoff = 6.86 cfs @ 12.17 hrs, Volume= 0.596 af, Depth> 3.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
1,950	39	>75% Grass cover, Good, HSG A
337	98	Paved parking, HSG A
17	30	Woods, Good, HSG A
593	32	Woods/grass comb., Good, HSG A
1,532	98	Roofs, HSG C
26,326	74	>75% Grass cover, Good, HSG C
6,385	98	Paved parking, HSG C
5,986	70	Woods, Good, HSG C
36,104	72	Woods/grass comb., Good, HSG C
79,230	74	Weighted Average
70,976		89.58% Pervious Area
8,254		10.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.0215	0.19		Sheet Flow, Segment #1
					Grass: Short n= 0.150 P2= 3.62"
3.1	130	0.0101	0.70		Shallow Concentrated Flow, Segment #3
					Short Grass Pasture Kv= 7.0 fps
12.0	230	Total			

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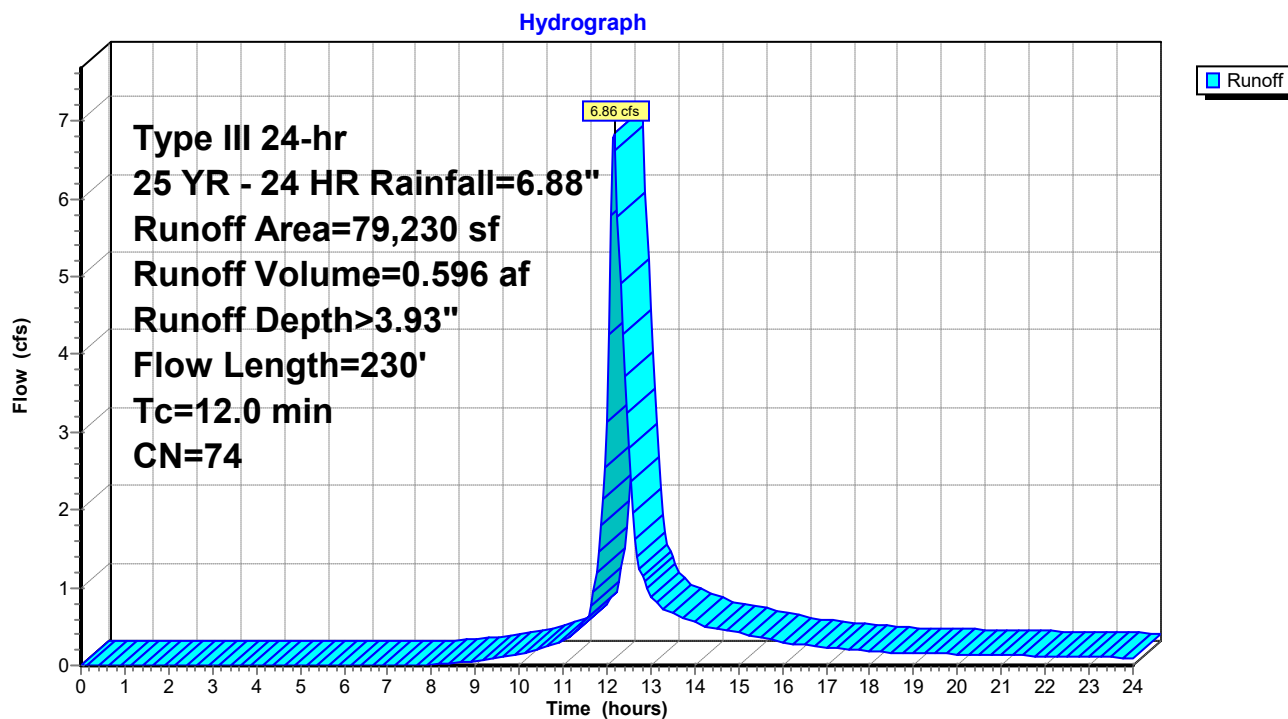
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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Subcatchment 1S: Subcatchment #1



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Subcatchment 2S: Subcatchment #2

Runoff = 6.26 cfs @ 12.49 hrs, Volume= 0.839 af, Depth> 2.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
22,489	39	>75% Grass cover, Good, HSG A
4,380	30	Woods, Good, HSG A
19,559	32	Woods/grass comb., Good, HSG A
1,307	98	Roofs, HSG C
22,647	74	>75% Grass cover, Good, HSG C
338	98	Paved parking, HSG C
17,198	70	Woods, Good, HSG C
66,830	72	Woods/grass comb., Good, HSG C
7,995	80	>75% Grass cover, Good, HSG D
194	77	Woods, Good, HSG D
162,937	62	Weighted Average
161,292		98.99% Pervious Area
1,645		1.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	100	0.1700	0.29		Sheet Flow, Segment #1 Grass: Dense n= 0.240 P2= 3.62"
15.5	195	0.0009	0.21		Shallow Concentrated Flow, Segment #2 Short Grass Pasture Kv= 7.0 fps
9.0	107	0.0008	0.20		Shallow Concentrated Flow, Segment #3 Short Grass Pasture Kv= 7.0 fps
2.9	120	0.0188	0.69		Shallow Concentrated Flow, Segment #4 Woodland Kv= 5.0 fps
33.1	522	Total			

20-066 Existing Conditions Analysis

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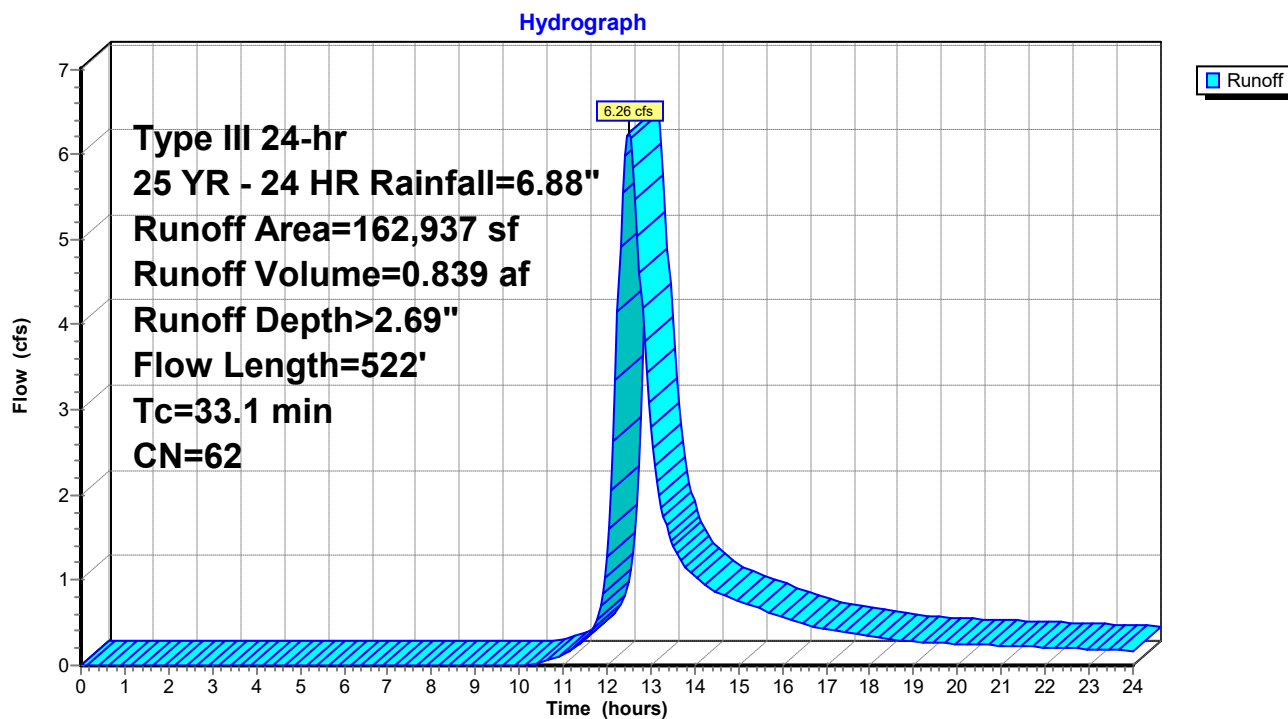
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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Subcatchment 2S: Subcatchment #2



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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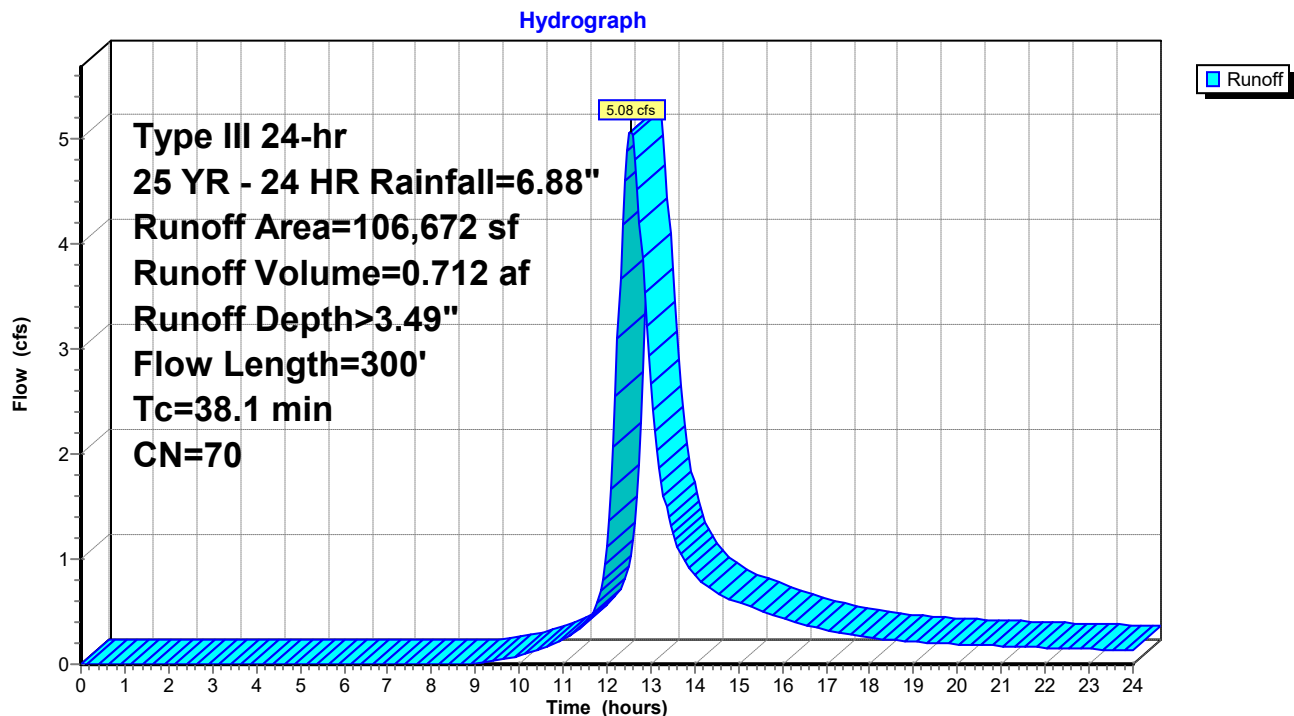
Summary for Subcatchment 3S: Subcatchment #3

Runoff = 5.08 cfs @ 12.54 hrs, Volume= 0.712 af, Depth> 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
1,994	39	>75% Grass cover, Good, HSG A
5,560	30	Woods, Good, HSG A
66,271	74	>75% Grass cover, Good, HSG C
32,847	70	Woods, Good, HSG C
106,672	70	Weighted Average
106,672		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.7	100	0.0065	0.05		Sheet Flow, Segment #1
					Woods: Light underbrush n= 0.400 P2= 3.62"
3.9	82	0.0049	0.35		Shallow Concentrated Flow, Segment #3
					Woodland Kv= 5.0 fps
2.5	118	0.0122	0.77		Shallow Concentrated Flow, Segment #3
					Short Grass Pasture Kv= 7.0 fps
38.1	300	Total			

Subcatchment 3S: Subcatchment #3

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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Subcatchment 4S: Subcatchment #4

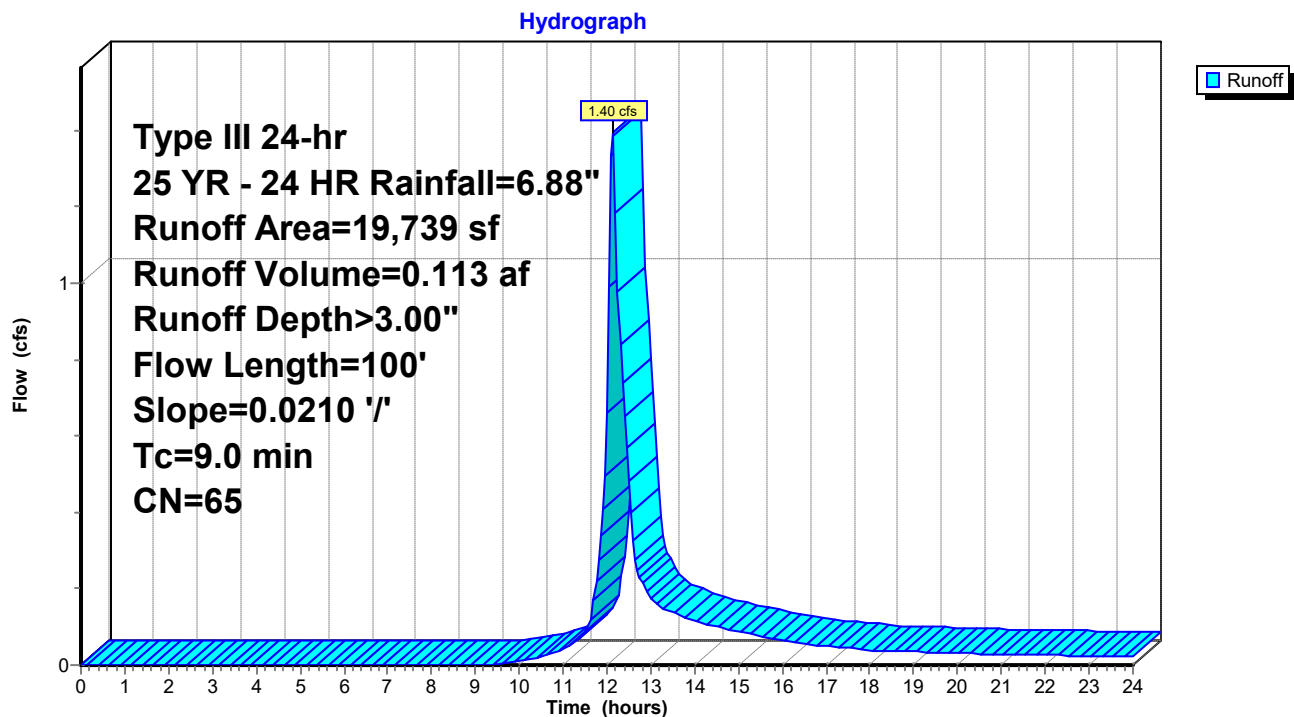
Runoff = 1.40 cfs @ 12.14 hrs, Volume= 0.113 af, Depth> 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
3,524	39	>75% Grass cover, Good, HSG A
9,550	98	Paved parking, HSG A
6,176	30	Woods, Good, HSG A
489	70	Woods, Good, HSG C
19,739	65	Weighted Average
10,189		51.62% Pervious Area
9,550		48.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.0210	0.18		Sheet Flow, Segment #1
					Grass: Short n= 0.150 P2= 3.62"

Subcatchment 4S: Subcatchment #4



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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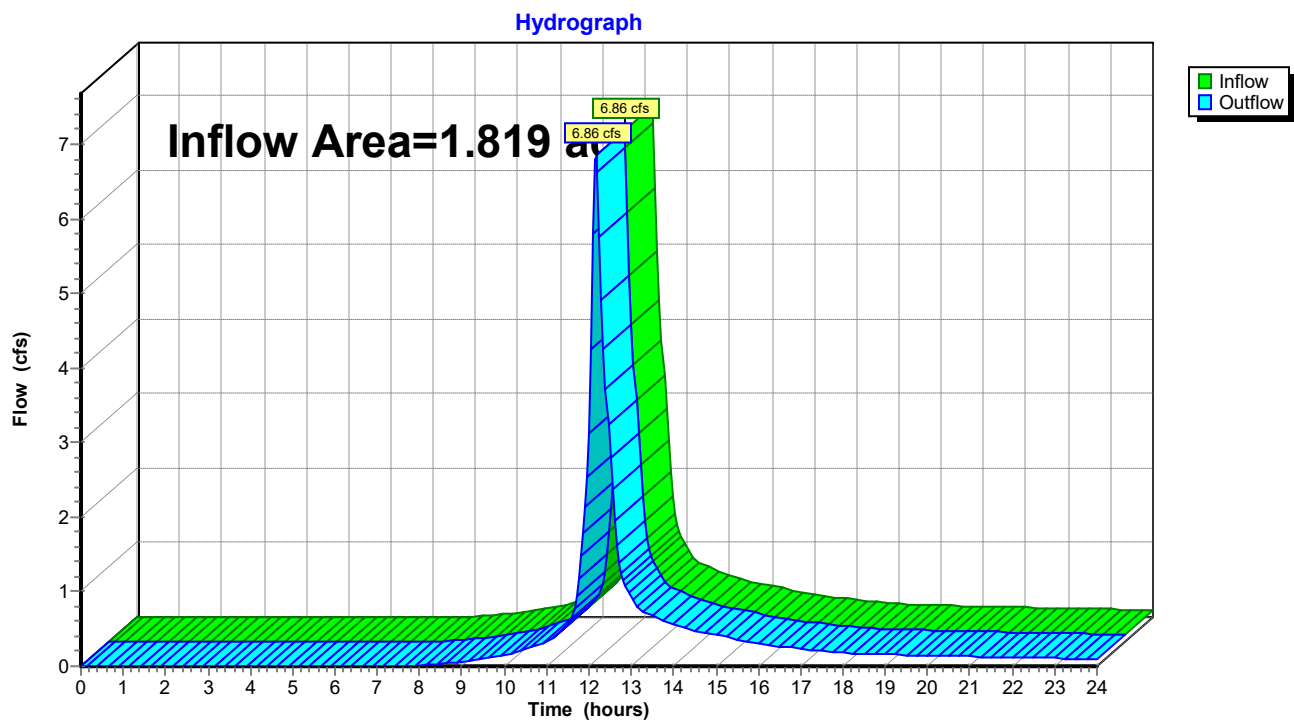
Summary for Reach 100R: Final Reach 100

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

Inflow Area = 1.819 ac, 10.42% Impervious, Inflow Depth > 3.93" for 25 YR - 24 HR event
Inflow = 6.86 cfs @ 12.17 hrs, Volume= 0.596 af
Outflow = 6.86 cfs @ 12.17 hrs, Volume= 0.596 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 100R: Final Reach 100



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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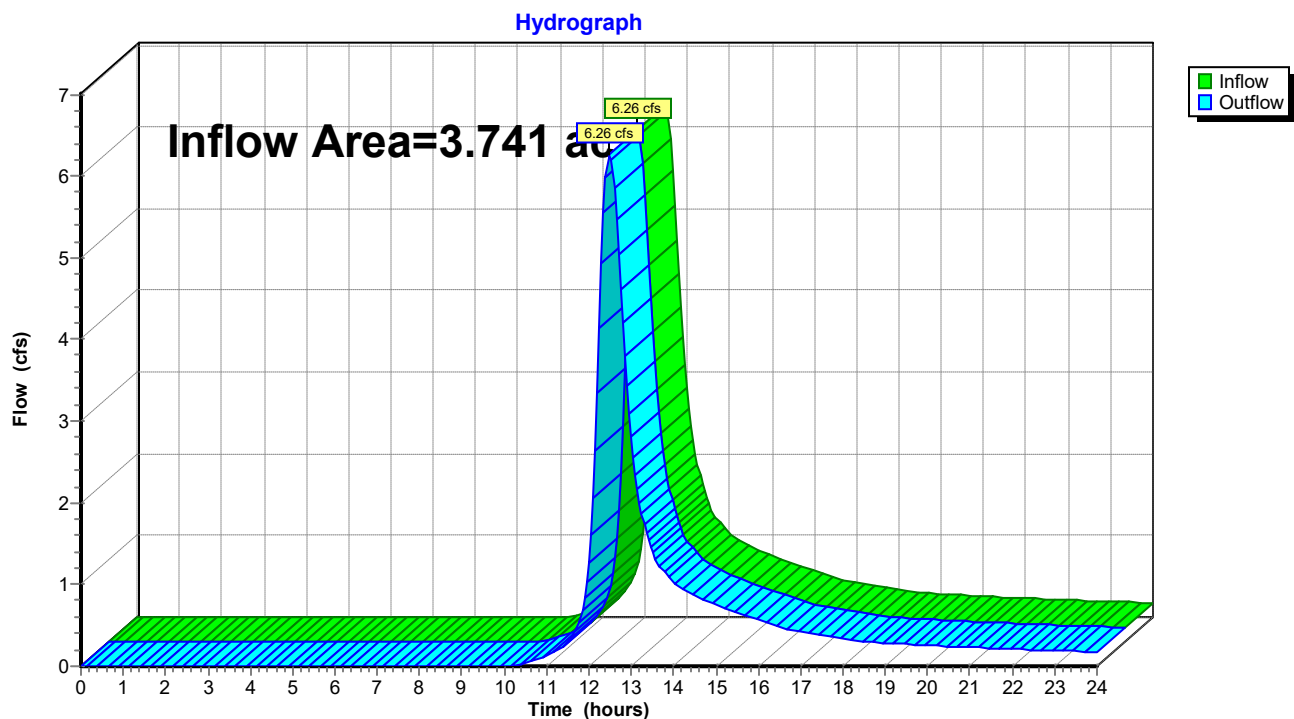
Summary for Reach 200R: Final Reach 200

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

Inflow Area = 3.741 ac, 1.01% Impervious, Inflow Depth > 2.69" for 25 YR - 24 HR event
Inflow = 6.26 cfs @ 12.49 hrs, Volume= 0.839 af
Outflow = 6.26 cfs @ 12.49 hrs, Volume= 0.839 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 200R: Final Reach 200



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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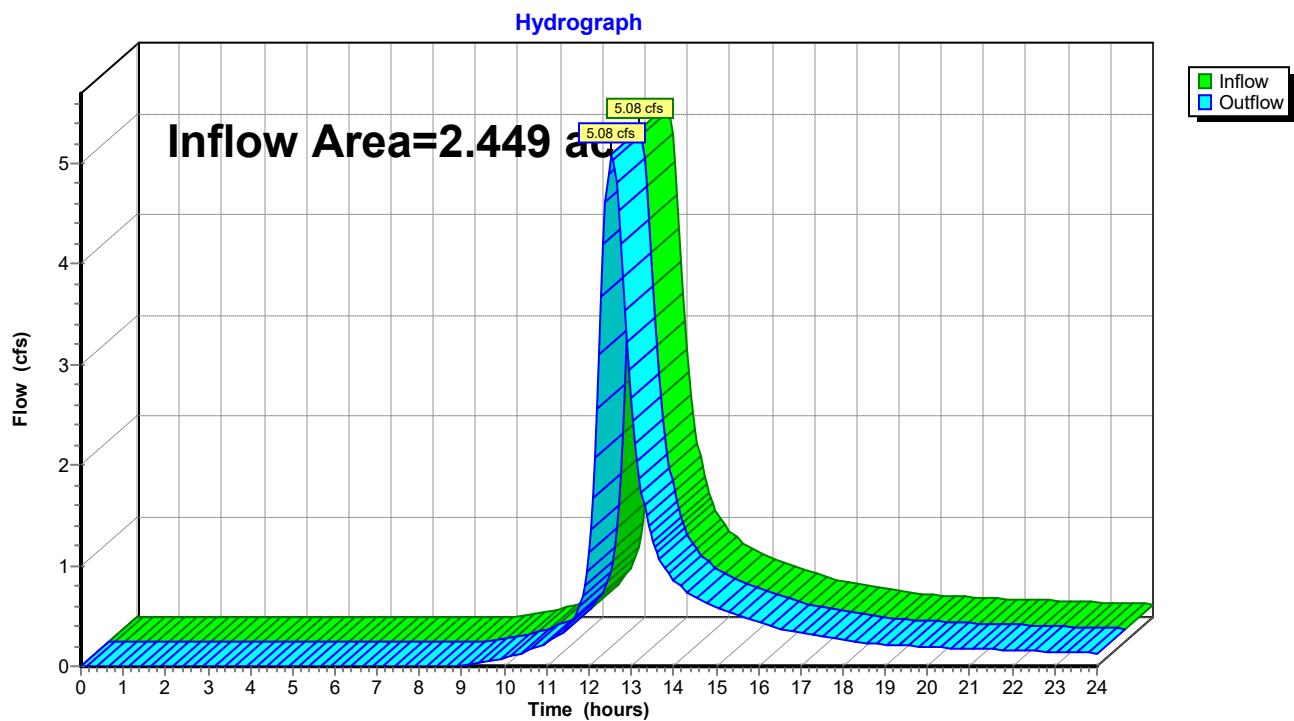
Summary for Reach 300R: Final Reach 300

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

Inflow Area = 2.449 ac, 0.00% Impervious, Inflow Depth > 3.49" for 25 YR - 24 HR event
Inflow = 5.08 cfs @ 12.54 hrs, Volume= 0.712 af
Outflow = 5.08 cfs @ 12.54 hrs, Volume= 0.712 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 300R: Final Reach 300



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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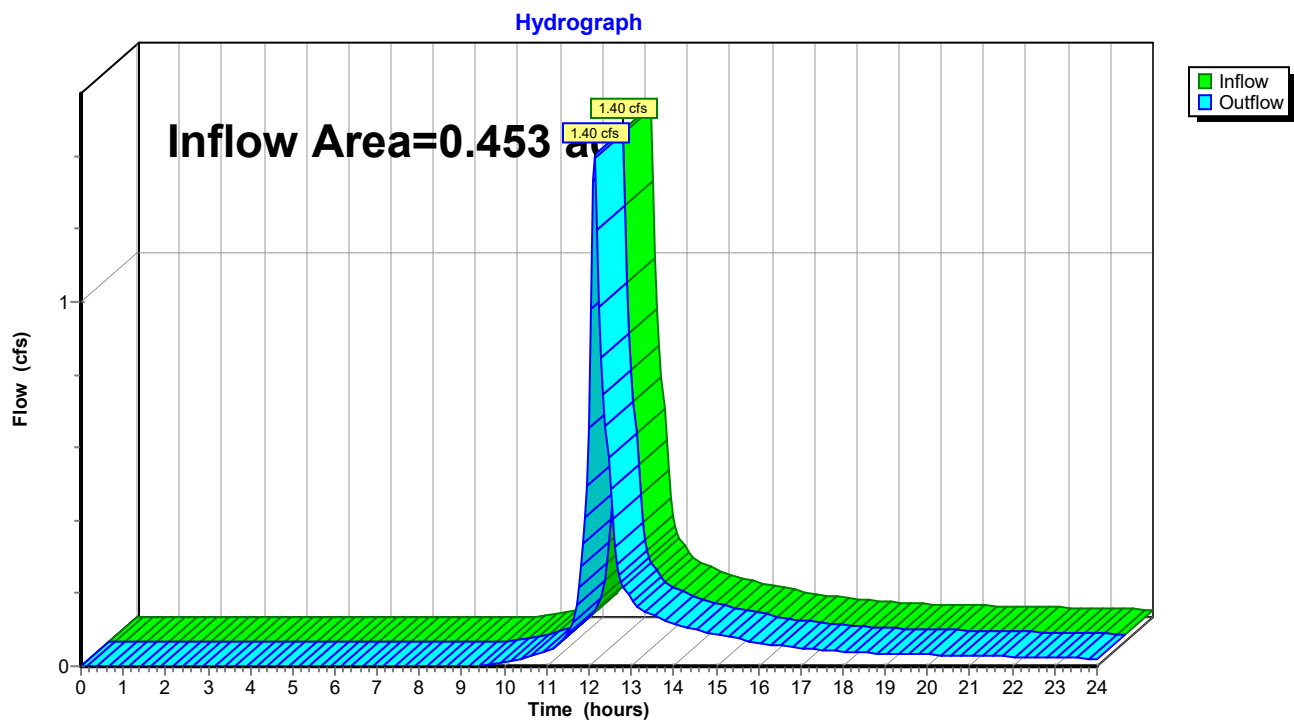
Summary for Reach 400R: Final Reach 400

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

Inflow Area = 0.453 ac, 48.38% Impervious, Inflow Depth > 3.00" for 25 YR - 24 HR event
Inflow = 1.40 cfs @ 12.14 hrs, Volume= 0.113 af
Outflow = 1.40 cfs @ 12.14 hrs, Volume= 0.113 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 400R: Final Reach 400



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Pond 1P: Pond 4

Inflow Area = 0.453 ac, 48.38% Impervious, Inflow Depth > 3.00" for 25 YR - 24 HR event
 Inflow = 1.40 cfs @ 12.14 hrs, Volume= 0.113 af
 Outflow = 1.40 cfs @ 12.14 hrs, Volume= 0.113 af, Atten= 0%, Lag= 0.1 min
 Primary = 1.40 cfs @ 12.14 hrs, Volume= 0.113 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 89.95' @ 12.14 hrs Surf.Area= 24 sf Storage= 9 cf

Plug-Flow detention time= 0.3 min calculated for 0.113 af (100% of inflow)
 Center-of-Mass det. time= 0.2 min (844.8 - 844.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	89.38'	631 cf	Open Water Storage (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
89.38	10	14.0	0	0	10
90.00	25	32.8	11	11	82
91.00	245	81.2	116	127	524
92.00	819	125.9	504	631	1,268

Device	Routing	Invert	Outlet Devices
#1	Primary	89.38'	15.0" Round 15" CMP ? L= 46.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 89.38' / 88.00' S= 0.0300 ' / Cc= 0.900 n= 0.024, Flow Area= 1.23 sf

Primary OutFlow Max=1.38 cfs @ 12.14 hrs HW=89.94' TW=0.00' (Dynamic Tailwater)
 ↑ **1=15" CMP ?** (Inlet Controls 1.38 cfs @ 2.56 fps)

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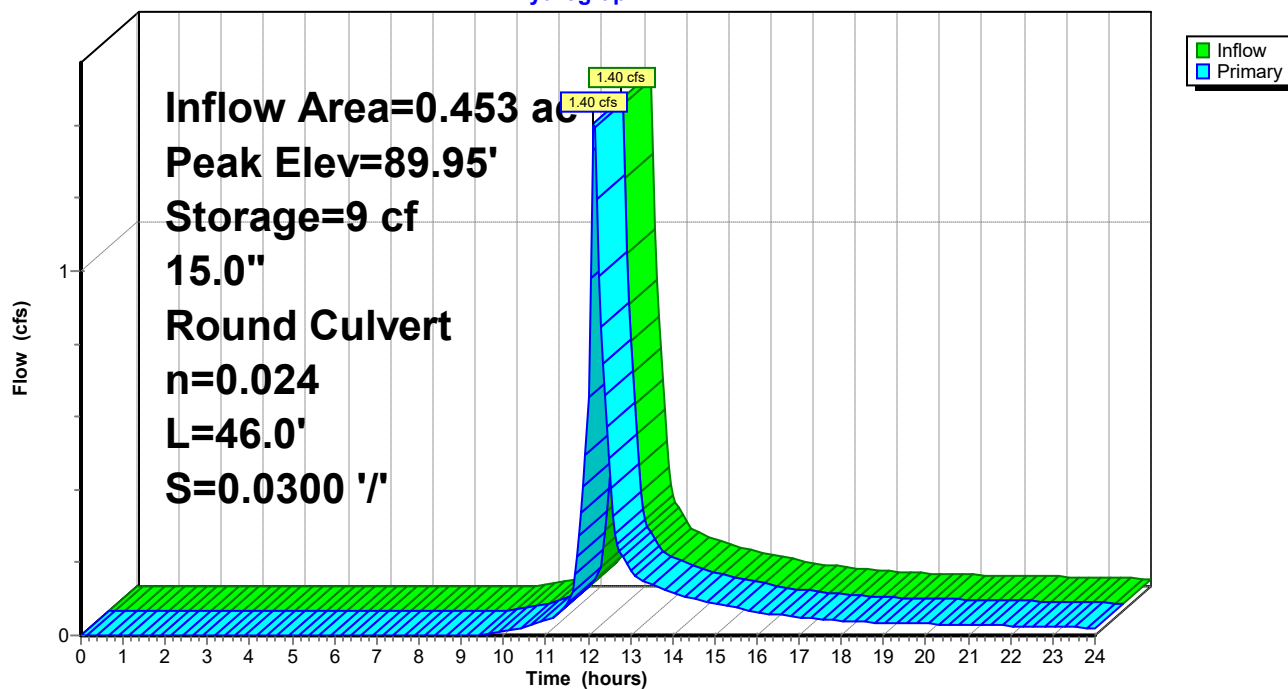
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

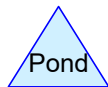
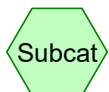
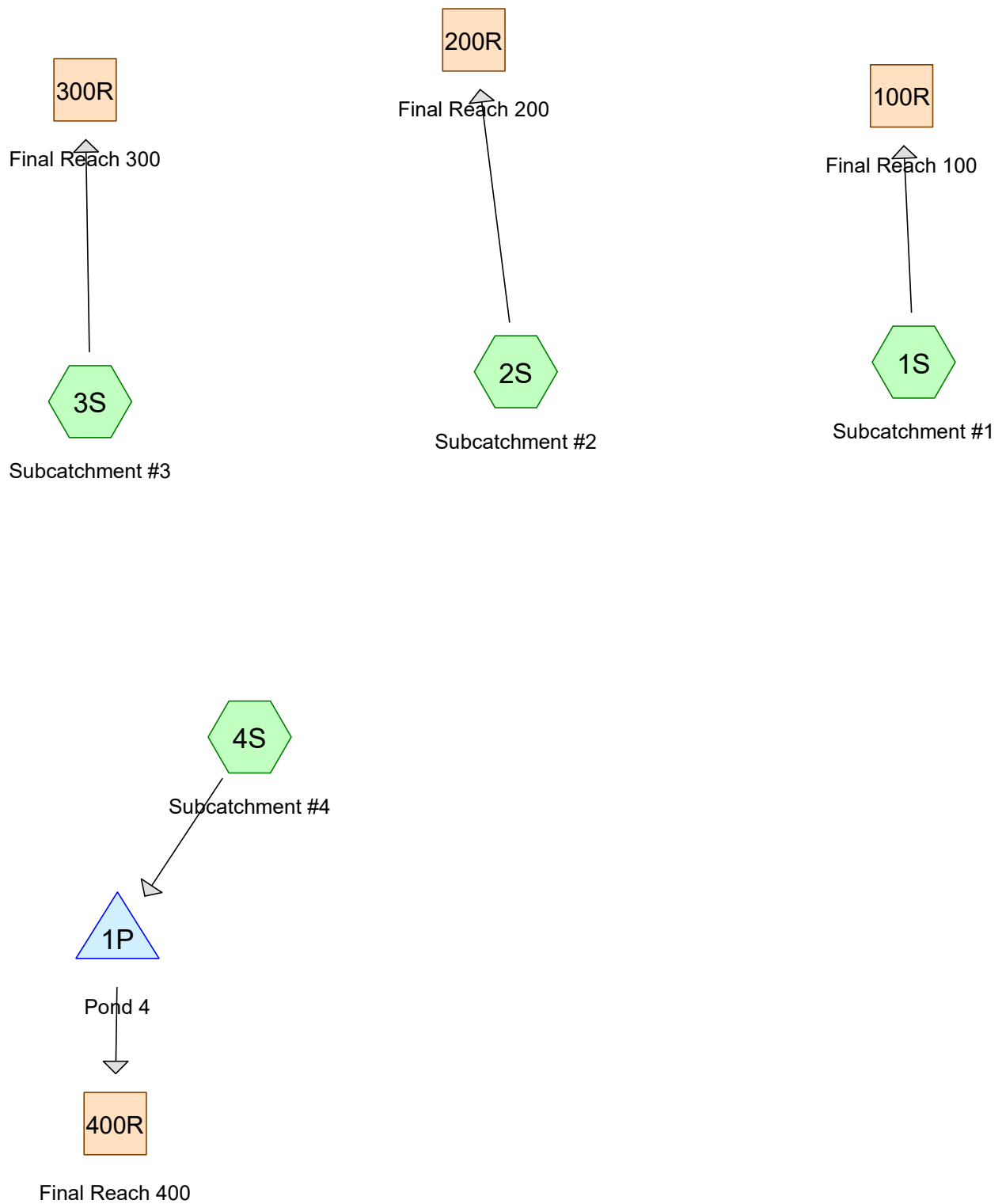
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Pond 1P: Pond 4

Hydrograph





20-066 Existing Conditions Analysis

Type III 24-hr 2 YR - 24 HR Rainfall=3.60"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 1S: Subcatchment #1	Runoff Area=79,230 sf 10.42% Impervious Runoff Depth>1.31" Flow Length=230' Tc=12.0 min CN=74 Runoff=2.18 cfs 0.198 af
Subcatchment 2S: Subcatchment #2	Runoff Area=162,937 sf 1.01% Impervious Runoff Depth>0.66" Flow Length=522' Tc=33.1 min CN=62 Runoff=1.24 cfs 0.204 af
Subcatchment 3S: Subcatchment #3	Runoff Area=106,672 sf 0.00% Impervious Runoff Depth>1.06" Flow Length=300' Tc=38.1 min CN=70 Runoff=1.44 cfs 0.216 af
Subcatchment 4S: Subcatchment #4	Runoff Area=19,739 sf 48.38% Impervious Runoff Depth>0.80" Flow Length=100' Slope=0.0210 '/' Tc=9.0 min CN=65 Runoff=0.32 cfs 0.030 af
Reach 100R: Final Reach 100	Inflow=2.18 cfs 0.198 af Outflow=2.18 cfs 0.198 af
Reach 200R: Final Reach 200	Inflow=1.24 cfs 0.204 af Outflow=1.24 cfs 0.204 af
Reach 300R: Final Reach 300	Inflow=1.44 cfs 0.216 af Outflow=1.44 cfs 0.216 af
Reach 400R: Final Reach 400	Inflow=0.32 cfs 0.030 af Outflow=0.32 cfs 0.030 af
Pond 1P: Pond 4	Peak Elev=89.65' Storage=3 cf Inflow=0.32 cfs 0.030 af 15.0" Round Culvert n=0.024 L=46.0' S=0.0300 '/' Outflow=0.32 cfs 0.030 af

20-066 Existing Conditions Analysis*Type III 24-hr 10 YR - 24 HR Rainfall=5.44"*

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 1S: Subcatchment #1	Runoff Area=79,230 sf 10.42% Impervious Runoff Depth>2.71" Flow Length=230' Tc=12.0 min CN=74 Runoff=4.72 cfs 0.411 af
Subcatchment 2S: Subcatchment #2	Runoff Area=162,937 sf 1.01% Impervious Runoff Depth>1.70" Flow Length=522' Tc=33.1 min CN=62 Runoff=3.82 cfs 0.530 af
Subcatchment 3S: Subcatchment #3	Runoff Area=106,672 sf 0.00% Impervious Runoff Depth>2.35" Flow Length=300' Tc=38.1 min CN=70 Runoff=3.38 cfs 0.479 af
Subcatchment 4S: Subcatchment #4	Runoff Area=19,739 sf 48.38% Impervious Runoff Depth>1.95" Flow Length=100' Slope=0.0210 '/' Tc=9.0 min CN=65 Runoff=0.89 cfs 0.074 af
Reach 100R: Final Reach 100	Inflow=4.72 cfs 0.411 af Outflow=4.72 cfs 0.411 af
Reach 200R: Final Reach 200	Inflow=3.82 cfs 0.530 af Outflow=3.82 cfs 0.530 af
Reach 300R: Final Reach 300	Inflow=3.38 cfs 0.479 af Outflow=3.38 cfs 0.479 af
Reach 400R: Final Reach 400	Inflow=0.89 cfs 0.074 af Outflow=0.89 cfs 0.074 af
Pond 1P: Pond 4	Peak Elev=89.82' Storage=7 cf Inflow=0.89 cfs 0.074 af 15.0" Round Culvert n=0.024 L=46.0' S=0.0300 '/' Outflow=0.89 cfs 0.074 af

20-066 Existing Conditions Analysis*Type III 24-hr 25 YR - 24 HR Rainfall=6.88"*

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 1S: Subcatchment #1	Runoff Area=79,230 sf 10.42% Impervious Runoff Depth>3.93" Flow Length=230' Tc=12.0 min CN=74 Runoff=6.86 cfs 0.596 af
Subcatchment 2S: Subcatchment #2	Runoff Area=162,937 sf 1.01% Impervious Runoff Depth>2.69" Flow Length=522' Tc=33.1 min CN=62 Runoff=6.26 cfs 0.839 af
Subcatchment 3S: Subcatchment #3	Runoff Area=106,672 sf 0.00% Impervious Runoff Depth>3.49" Flow Length=300' Tc=38.1 min CN=70 Runoff=5.08 cfs 0.712 af
Subcatchment 4S: Subcatchment #4	Runoff Area=19,739 sf 48.38% Impervious Runoff Depth>3.00" Flow Length=100' Slope=0.0210 '/' Tc=9.0 min CN=65 Runoff=1.40 cfs 0.113 af
Reach 100R: Final Reach 100	Inflow=6.86 cfs 0.596 af Outflow=6.86 cfs 0.596 af
Reach 200R: Final Reach 200	Inflow=6.26 cfs 0.839 af Outflow=6.26 cfs 0.839 af
Reach 300R: Final Reach 300	Inflow=5.08 cfs 0.712 af Outflow=5.08 cfs 0.712 af
Reach 400R: Final Reach 400	Inflow=1.40 cfs 0.113 af Outflow=1.40 cfs 0.113 af
Pond 1P: Pond 4	Peak Elev=89.95' Storage=9 cf Inflow=1.40 cfs 0.113 af 15.0" Round Culvert n=0.024 L=46.0' S=0.0300 '/' Outflow=1.40 cfs 0.113 af

20-066 Existing Conditions Analysis*Type III 24-hr 50 YR - 24 HR Rainfall=8.23"*

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 1S: Subcatchment #1	Runoff Area=79,230 sf 10.42% Impervious Runoff Depth>5.12" Flow Length=230' Tc=12.0 min CN=74 Runoff=8.92 cfs 0.776 af
Subcatchment 2S: Subcatchment #2	Runoff Area=162,937 sf 1.01% Impervious Runoff Depth>3.71" Flow Length=522' Tc=33.1 min CN=62 Runoff=8.75 cfs 1.156 af
Subcatchment 3S: Subcatchment #3	Runoff Area=106,672 sf 0.00% Impervious Runoff Depth>4.63" Flow Length=300' Tc=38.1 min CN=70 Runoff=6.75 cfs 0.944 af
Subcatchment 4S: Subcatchment #4	Runoff Area=19,739 sf 48.38% Impervious Runoff Depth>4.07" Flow Length=100' Slope=0.0210 '/' Tc=9.0 min CN=65 Runoff=1.91 cfs 0.154 af
Reach 100R: Final Reach 100	Inflow=8.92 cfs 0.776 af Outflow=8.92 cfs 0.776 af
Reach 200R: Final Reach 200	Inflow=8.75 cfs 1.156 af Outflow=8.75 cfs 1.156 af
Reach 300R: Final Reach 300	Inflow=6.75 cfs 0.944 af Outflow=6.75 cfs 0.944 af
Reach 400R: Final Reach 400	Inflow=1.92 cfs 0.154 af Outflow=1.92 cfs 0.154 af
Pond 1P: Pond 4	Peak Elev=90.06' Storage=12 cf Inflow=1.91 cfs 0.154 af 15.0" Round Culvert n=0.024 L=46.0' S=0.0300 '/' Outflow=1.92 cfs 0.154 af

20-066 Existing Conditions Analysis*Type III 24-hr 100 YR - 24 HR Rainfall=9.84"*

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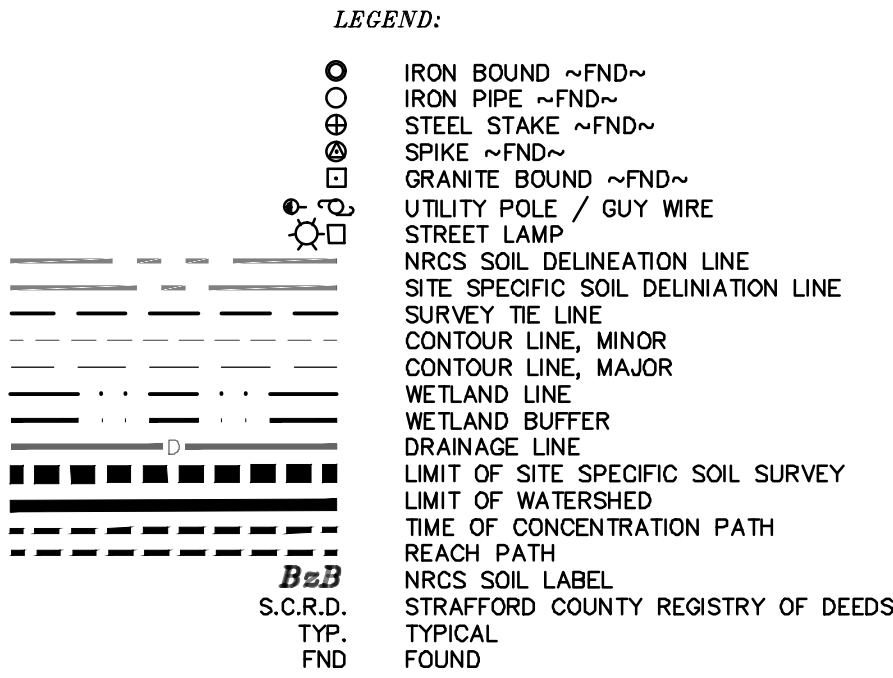
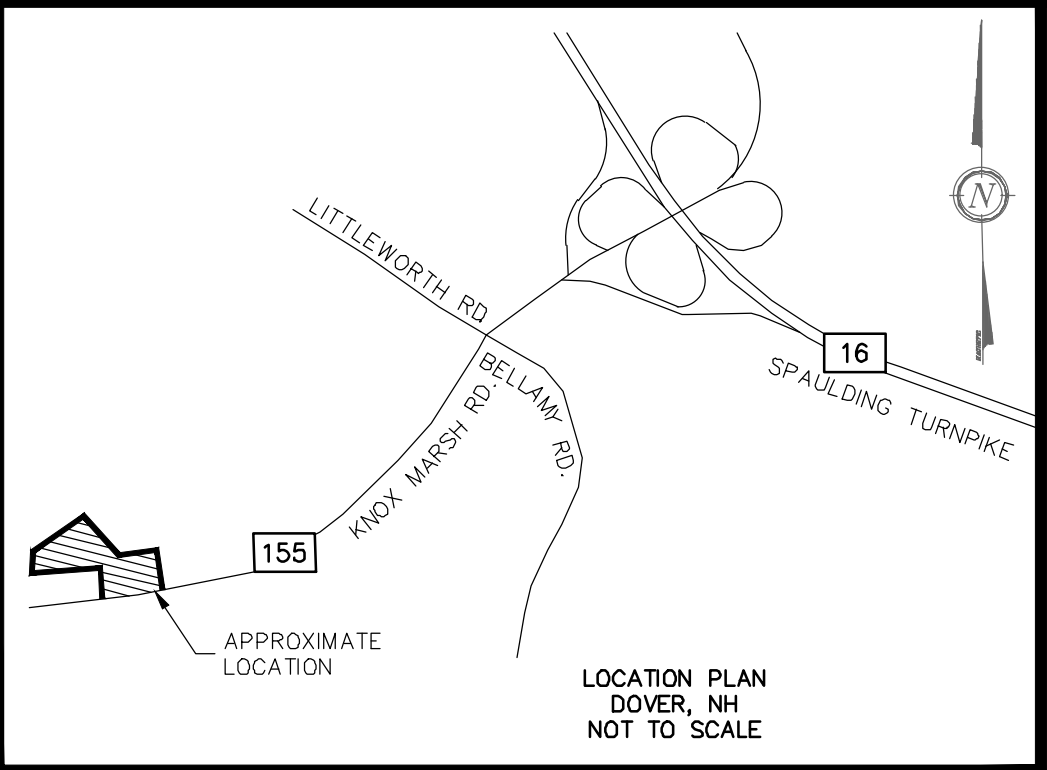
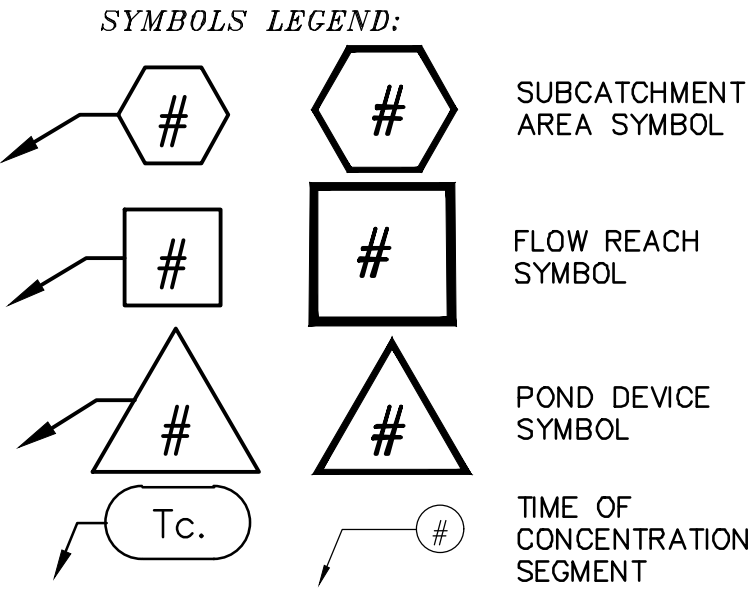
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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

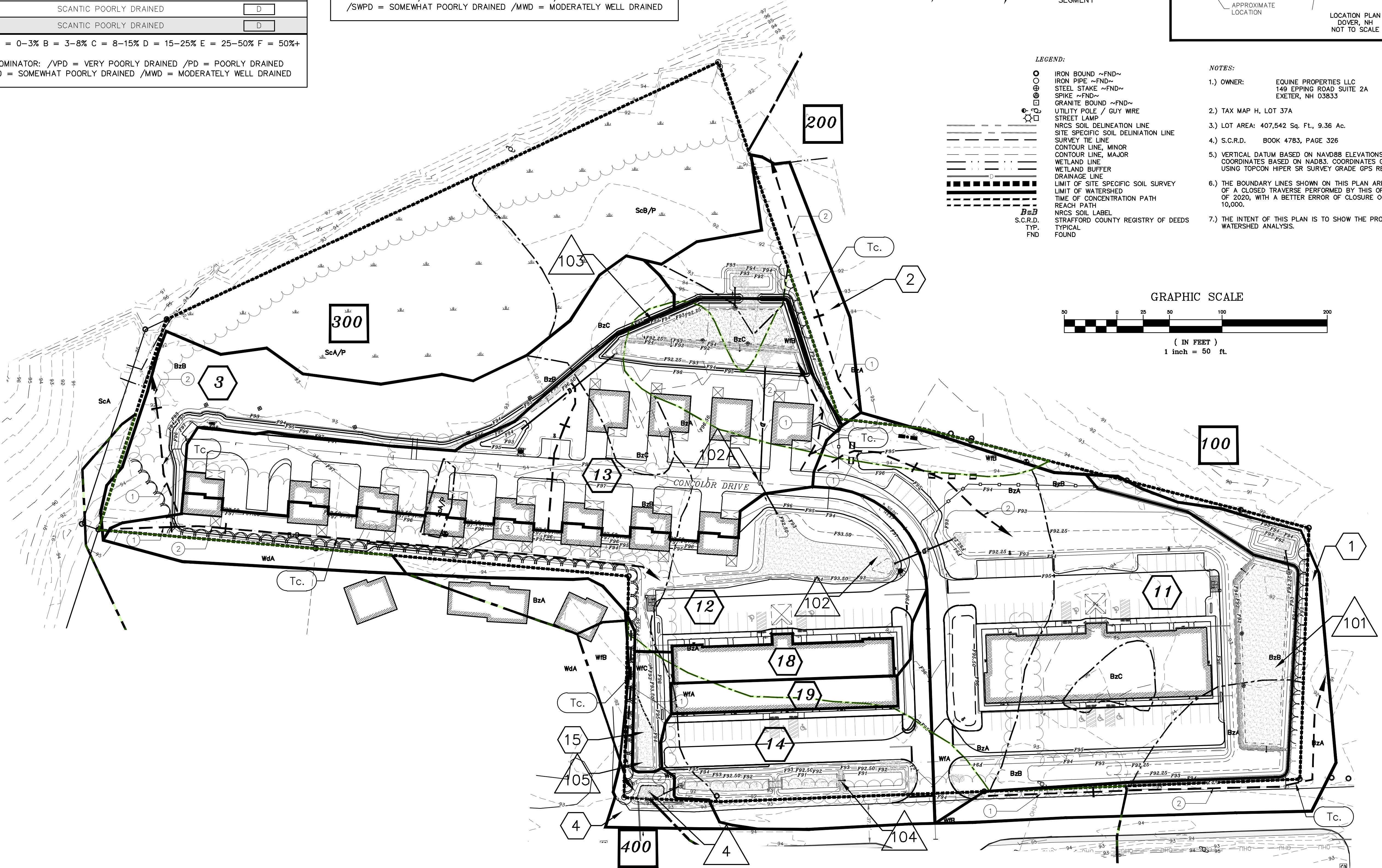
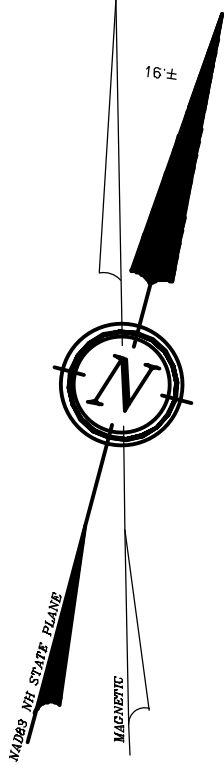
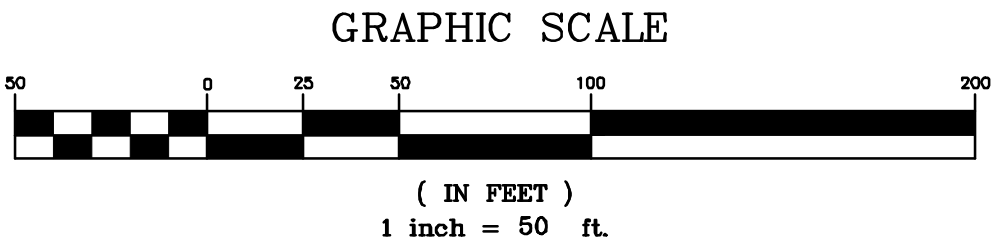
Subcatchment 1S: Subcatchment #1	Runoff Area=79,230 sf 10.42% Impervious Runoff Depth>6.59" Flow Length=230' Tc=12.0 min CN=74 Runoff=11.40 cfs 0.998 af
Subcatchment 2S: Subcatchment #2	Runoff Area=162,937 sf 1.01% Impervious Runoff Depth>5.00" Flow Length=522' Tc=33.1 min CN=62 Runoff=11.89 cfs 1.558 af
Subcatchment 3S: Subcatchment #3	Runoff Area=106,672 sf 0.00% Impervious Runoff Depth>6.04" Flow Length=300' Tc=38.1 min CN=70 Runoff=8.79 cfs 1.232 af
Subcatchment 4S: Subcatchment #4	Runoff Area=19,739 sf 48.38% Impervious Runoff Depth>5.42" Flow Length=100' Slope=0.0210 '/' Tc=9.0 min CN=65 Runoff=2.55 cfs 0.205 af
Reach 100R: Final Reach 100	Inflow=11.40 cfs 0.998 af Outflow=11.40 cfs 0.998 af
Reach 200R: Final Reach 200	Inflow=11.89 cfs 1.558 af Outflow=11.89 cfs 1.558 af
Reach 300R: Final Reach 300	Inflow=8.79 cfs 1.232 af Outflow=8.79 cfs 1.232 af
Reach 400R: Final Reach 400	Inflow=2.56 cfs 0.205 af Outflow=2.56 cfs 0.205 af
Pond 1P: Pond 4	Peak Elev=90.19' Storage=17 cf Inflow=2.55 cfs 0.205 af 15.0" Round Culvert n=0.024 L=46.0' S=0.0300 '/' Outflow=2.56 cfs 0.205 af

S.S.S.M. SOILS LEGEND		
SYMBOL	SOIL TAXONOMIC NAME	HYDROLOGIC SOIL GROUP
WfA	WINDSOR VARIANT	A
WfB	WINDSOR VARIANT	A
WfC	WINDSOR VARIANT	A
BzA	BUXTON MODERATELY DRAINED	C
BzB	BUXTON MODERATELY DRAINED	C
BzC	BUXTON MODERATELY DRAINED	C
ScA/P	SCANTIC POORLY DRAINED	D
ScB/P	SCANTIC POORLY DRAINED	D
SLOPE: A = 0-3% B = 3-8% C = 8-15% D = 15-25% E = 25-50% F = 50%+		
DENOMINATOR: /VPD = VERY POORLY DRAINED /PD = POORLY DRAINED /SWPD = SOMEWHAT POORLY DRAINED /MWD = MODERATELY WELL DRAINED		

NRCS SOILS LEGEND		
SYMBOL	SOIL TAXONOMIC NAME	HYDROLOGIC SOIL GROUP
WdA	WINDSOR LOAMY SAND	A
WfB	WINDSOR LOAMY SAND	A
BzA	BUXTON SILT LOAM	C
ScA	SUFFIELD SILT LOAM	D
SLOPE: A = 0-3% B = 3-8% C = 8-15% D = 15-25% E = 25-50% F = 50%+		
DENOMINATOR: /VPD = VERY POORLY DRAINED /PD = POORLY DRAINED /SWPD = SOMEWHAT POORLY DRAINED /MWD = MODERATELY WELL DRAINED		

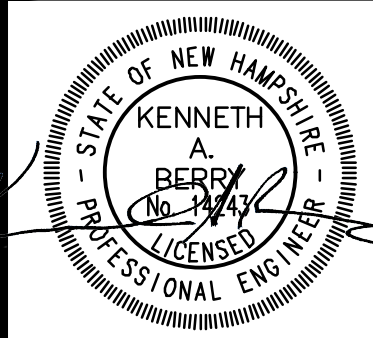


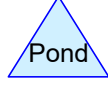
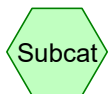
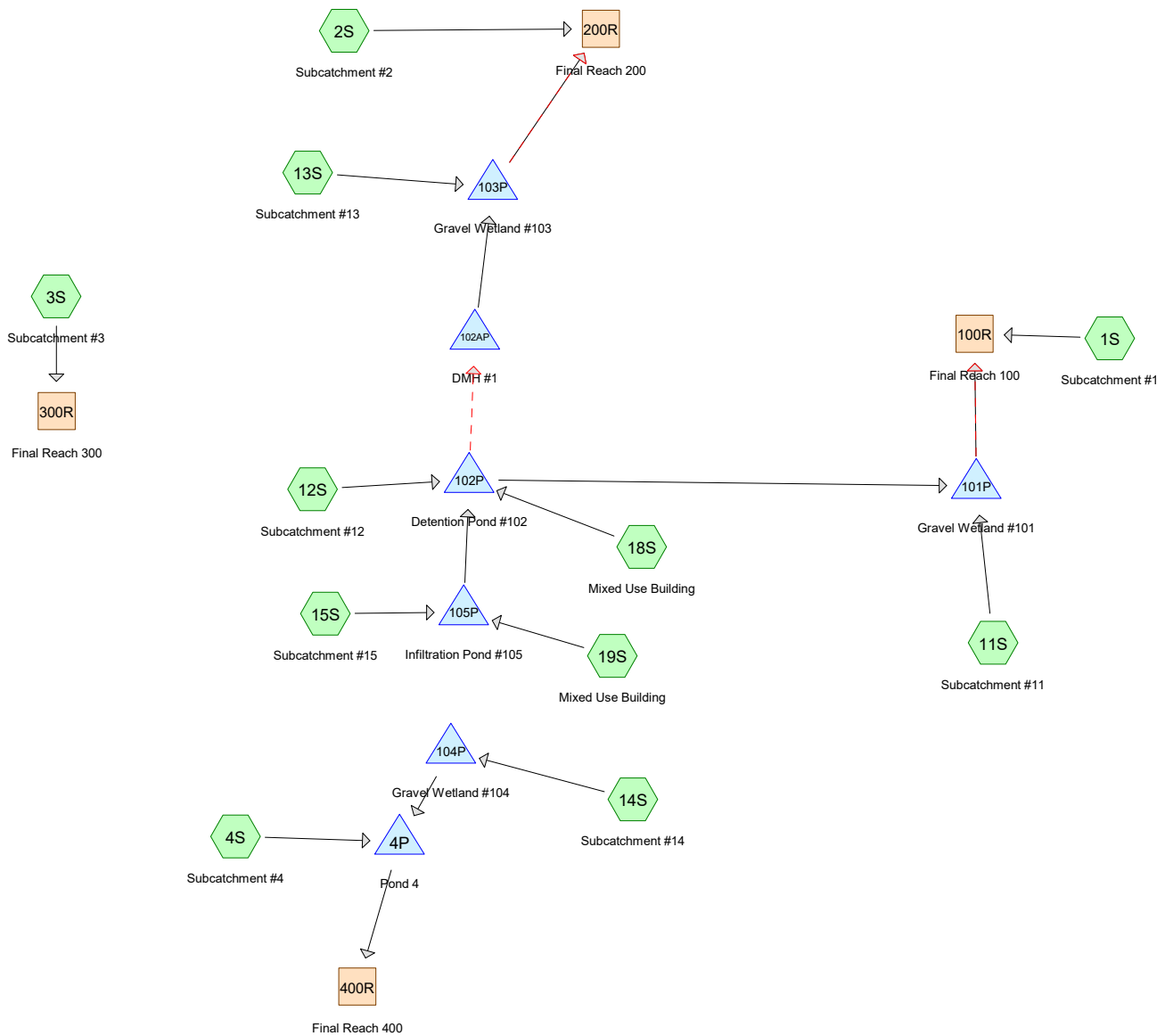
- NOTES:
- 1.) OWNER: EQUINE PROPERTIES LLC
149 EPPING ROAD SUITE 2A
EXETER, NH 03833
 - 2.) TAX MAP H, LOT 37A
 - 3.) LOT AREA: 407,542 Sq. Ft., 9.36 Ac.
 - 4.) S.C.R.D. BOOK 4783, PAGE 326
 - 5.) VERTICAL DATUM BASED ON NAVD88 ELEVATIONS. HORIZONTAL COORDINATES BASED ON NAD83. COORDINATES GATHERED USING TOPCON HIPER SR SURVEY GRADE GPS RECEIVERS.
 - 6.) THE BOUNDARY LINES SHOWN ON THIS PLAN ARE THE RESULT OF A CLOSED TRAVERSE PERFORMED BY THIS OFFICE IN SPRING OF 2020, WITH A BETTER ERROR OF CLOSURE OF 1 PART IN 10,000.
 - 7.) THE INTENT OF THIS PLAN IS TO SHOW THE PROPOSED WATERSHED ANALYSIS.



W-2 PROPOSED WATERSHED PLAN
LAND OF
EQUINE PROPERTIES LLC
239 KNOX MARSH ROAD
DOVER, N.H.
TAX MAP H, LOT 37A

BERRY SURVEYING & ENGINEERING
335 SECOND CROWN POINT ROAD
BARRINGTON, NH 03825 (603)332-2863
SCALE : 1 IN. EQUALS 50 FT.
DATE : JANUARY 21, 2021
FILE NO. : DB 2020 - 066





20-066 Proposed Conditions Analysis

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.906	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S, 4S, 11S, 12S, 13S, 14S, 15S)
3.506	74	>75% Grass cover, Good, HSG C (1S, 2S, 3S, 4S, 11S, 12S, 13S, 14S, 15S)
0.161	80	>75% Grass cover, Good, HSG D (2S, 12S, 13S)
0.548	98	Paved parking, HSG A (1S, 4S, 11S, 13S, 14S, 15S)
1.585	98	Paved parking, HSG C (1S, 11S, 12S, 13S, 14S)
0.009	98	Paved parking, HSG D (13S)
0.075	98	Roofs, HSG A (18S, 19S)
0.237	98	Roofs, HSG C (18S, 19S)
0.003	98	Unconnected pavement, HSG C (3S)
0.068	98	Unconnected roofs, HSG A (13S)
0.634	98	Unconnected roofs, HSG C (11S, 12S, 13S)
0.018	98	Unconnected roofs, HSG D (12S, 13S)
0.152	30	Woods, Good, HSG A (2S, 3S, 4S, 11S, 12S, 13S)
0.562	70	Woods, Good, HSG C (1S, 2S, 3S, 4S, 11S, 12S)
8.461	78	TOTAL AREA

20-066 Proposed Conditions Analysis

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.748	HSG A	1S, 2S, 3S, 4S, 11S, 12S, 13S, 14S, 15S, 18S, 19S
0.000	HSG B	
6.526	HSG C	1S, 2S, 3S, 4S, 11S, 12S, 13S, 14S, 15S, 18S, 19S
0.188	HSG D	2S, 12S, 13S
0.000	Other	
8.461		TOTAL AREA

20-066 Proposed Conditions Analysis

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.906	0.000	3.506	0.161	0.000	4.573	>75% Grass cover, Good	1S, 2S, 3S, 4S, 11S, 12S, 13S, 14S, 15S
0.548	0.000	1.585	0.009	0.000	2.141	Paved parking	1S, 4S, 11S, 12S, 13S, 14S, 15S
0.075	0.000	0.237	0.000	0.000	0.312	Roofs	18S, 19S
0.000	0.000	0.003	0.000	0.000	0.003	Unconnected pavement	3S
0.068	0.000	0.634	0.018	0.000	0.719	Unconnected roofs	11S, 12S, 13S
0.152	0.000	0.562	0.000	0.000	0.713	Woods, Good	1S, 2S, 3S, 4S, 11S, 12S, 13S
1.748	0.000	6.526	0.188	0.000	8.461	TOTAL AREA	

20-066 Proposed Conditions Analysis

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	4P	89.38	88.00	46.0	0.0300	0.024	15.0	0.0	0.0
2	101P	92.10	92.00	16.8	0.0060	0.010	12.0	0.0	0.0
3	102AP	92.85	92.25	107.7	0.0056	0.012	15.0	0.0	0.0
4	102P	93.25	92.25	57.6	0.0174	0.012	15.0	0.0	0.0
5	102P	93.10	92.95	29.5	0.0051	0.012	15.0	0.0	0.0
6	103P	92.10	92.00	15.8	0.0063	0.012	12.0	0.0	0.0
7	104P	90.33	90.00	12.8	0.0258	0.012	12.0	0.0	0.0

20-066 Proposed Conditions Analysis

Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 1S: Subcatchment #1	Runoff Area=21,574 sf 33.85% Impervious Runoff Depth>4.46" Flow Length=404' Tc=18.1 min CN=79 Runoff=1.81 cfs 0.184 af
Subcatchment 2S: Subcatchment #2	Runoff Area=17,079 sf 0.00% Impervious Runoff Depth>3.60" Flow Length=251' Tc=29.9 min CN=71 Runoff=0.94 cfs 0.118 af
Subcatchment 3S: Subcatchment #3	Runoff Area=37,818 sf 0.36% Impervious Runoff Depth>3.83" Flow Length=127' Tc=9.8 min CN=73 Runoff=3.38 cfs 0.277 af
Subcatchment 4S: Subcatchment #4	Runoff Area=5,487 sf 34.88% Impervious Runoff Depth>2.42" Flow Length=150' Tc=9.0 min CN=59 Runoff=0.30 cfs 0.025 af
Subcatchment 11S: Subcatchment #11	Runoff Area=105,633 sf 42.97% Impervious Runoff Depth>4.80" Flow Length=214' Tc=10.4 min CN=82 Runoff=11.51 cfs 0.969 af
Subcatchment 12S: Subcatchment #12	Runoff Area=60,942 sf 32.46% Impervious Runoff Depth>4.24" Flow Length=513' Tc=21.7 min CN=77 Runoff=4.53 cfs 0.494 af
Subcatchment 13S: Subcatchment #13	Runoff Area=73,726 sf 42.37% Impervious Runoff Depth>4.35" Flow Length=144' Tc=16.1 min CN=78 Runoff=6.34 cfs 0.614 af
Subcatchment 14S: Subcatchment #14	Runoff Area=29,122 sf 64.19% Impervious Runoff Depth>4.36" Tc=6.0 min CN=78 Runoff=3.34 cfs 0.243 af
Subcatchment 15S: Subcatchment #15	Runoff Area=3,609 sf 7.68% Impervious Runoff Depth>1.18" Tc=6.0 min CN=45 Runoff=0.08 cfs 0.008 af
Subcatchment 18S: Mixed Use Building	Runoff Area=7,390 sf 100.00% Impervious Runoff Depth>6.64" Tc=6.0 min CN=98 Runoff=1.12 cfs 0.094 af
Subcatchment 19S: Mixed Use Building	Runoff Area=6,193 sf 100.00% Impervious Runoff Depth>6.64" Tc=6.0 min CN=98 Runoff=0.94 cfs 0.079 af
Reach 100R: Final Reach 100	Inflow=2.70 cfs 1.059 af Outflow=2.70 cfs 1.059 af
Reach 200R: Final Reach 200	Inflow=3.16 cfs 0.628 af Outflow=3.16 cfs 0.628 af
Reach 300R: Final Reach 300	Inflow=3.38 cfs 0.277 af Outflow=3.38 cfs 0.277 af
Reach 400R: Final Reach 400	Inflow=1.37 cfs 0.230 af Outflow=1.37 cfs 0.230 af
Pond 4P: Pond 4	Peak Elev=89.94' Storage=60 cf Inflow=1.37 cfs 0.230 af 15.0" Round Culvert n=0.024 L=46.0' S=0.0300 ' Outflow=1.37 cfs 0.230 af

20-066 Proposed Conditions Analysis*Type III 24-hr 25 YR - 24 HR Rainfall=6.88"*

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Pond 101P: Gravel Wetland #101Peak Elev=93.54' Storage=27,948 cf Inflow=12.12 cfs 1.260 af
Primary=2.08 cfs 0.853 af Secondary=0.33 cfs 0.021 af Outflow=2.42 cfs 0.875 af**Pond 102AP: DMH #1**Peak Elev=94.66' Storage=25 cf Inflow=2.14 cfs 0.233 af
15.0" Round Culvert n=0.012 L=107.7' S=0.0056 ' / ' Outflow=1.97 cfs 0.234 af**Pond 102P: Detention Pond #102**Peak Elev=94.04' Storage=8,803 cf Inflow=4.99 cfs 0.588 af
Primary=1.94 cfs 0.291 af Secondary=2.14 cfs 0.233 af Outflow=3.87 cfs 0.524 af**Pond 103P: Gravel Wetland #103**Peak Elev=94.40' Storage=15,924 cf Inflow=7.29 cfs 0.848 af
Primary=2.51 cfs 0.511 af Secondary=0.00 cfs 0.000 af Outflow=2.51 cfs 0.511 af**Pond 104P: Gravel Wetland #104**Peak Elev=92.27' Storage=3,972 cf Inflow=3.34 cfs 0.243 af
Outflow=1.20 cfs 0.205 af**Pond 105P: Infiltration Pond #105**Peak Elev=93.00' Storage=1,148 cf Inflow=1.02 cfs 0.087 af
Discarded=0.19 cfs 0.087 af Primary=0.00 cfs 0.000 af Outflow=0.19 cfs 0.087 af**Total Runoff Area = 8.461 ac Runoff Volume = 3.105 af Average Runoff Depth = 4.40"**
62.47% Pervious = 5.286 ac 37.53% Impervious = 3.175 ac

20-066 Proposed Conditions Analysis

Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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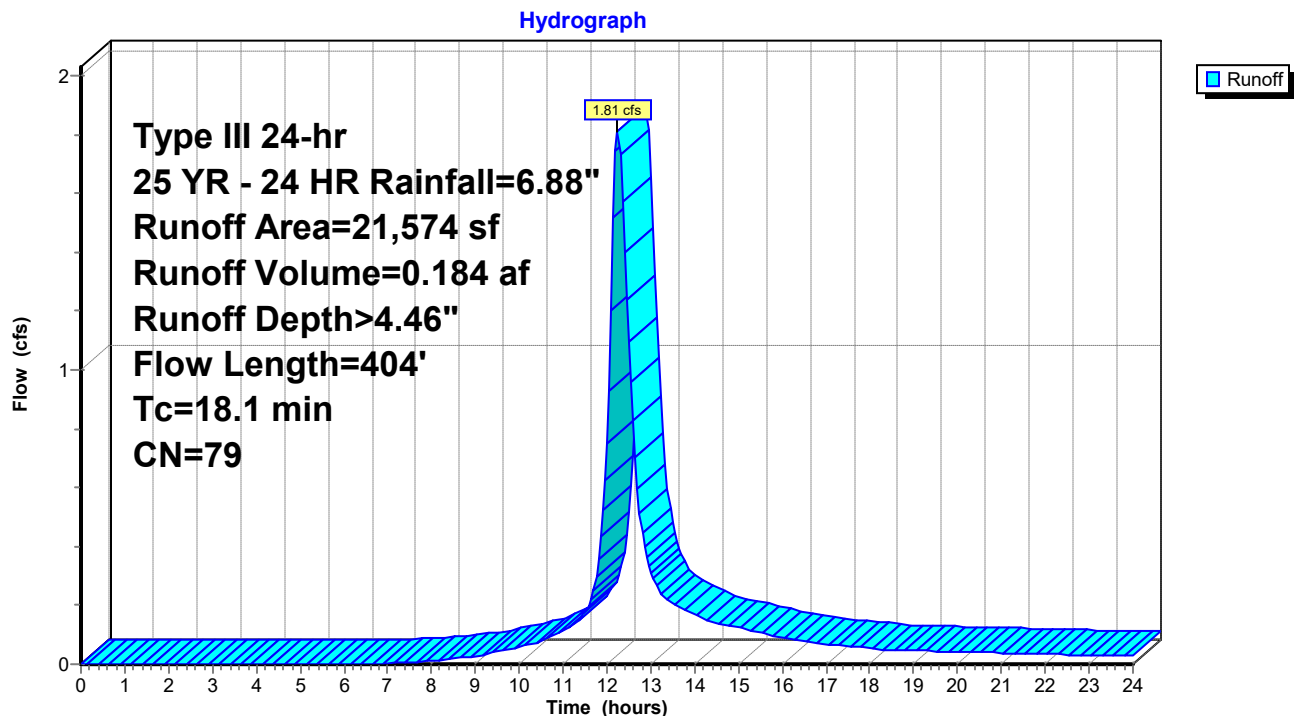
Summary for Subcatchment 1S: Subcatchment #1

Runoff = 1.81 cfs @ 12.25 hrs, Volume= 0.184 af, Depth> 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
1,076	39	>75% Grass cover, Good, HSG A
3,379	98	Paved parking, HSG A
6,769	74	>75% Grass cover, Good, HSG C
3,924	98	Paved parking, HSG C
6,426	70	Woods, Good, HSG C
21,574	79	Weighted Average
14,271		66.15% Pervious Area
7,303		33.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	100	0.0130	0.15		Sheet Flow, Segment #1
					Grass: Short n= 0.150 P2= 3.62"
7.2	304	0.0100	0.70		Shallow Concentrated Flow, Segment #2
					Short Grass Pasture Kv= 7.0 fps
18.1	404	Total			

Subcatchment 1S: Subcatchment #1

20-066 Proposed Conditions Analysis

Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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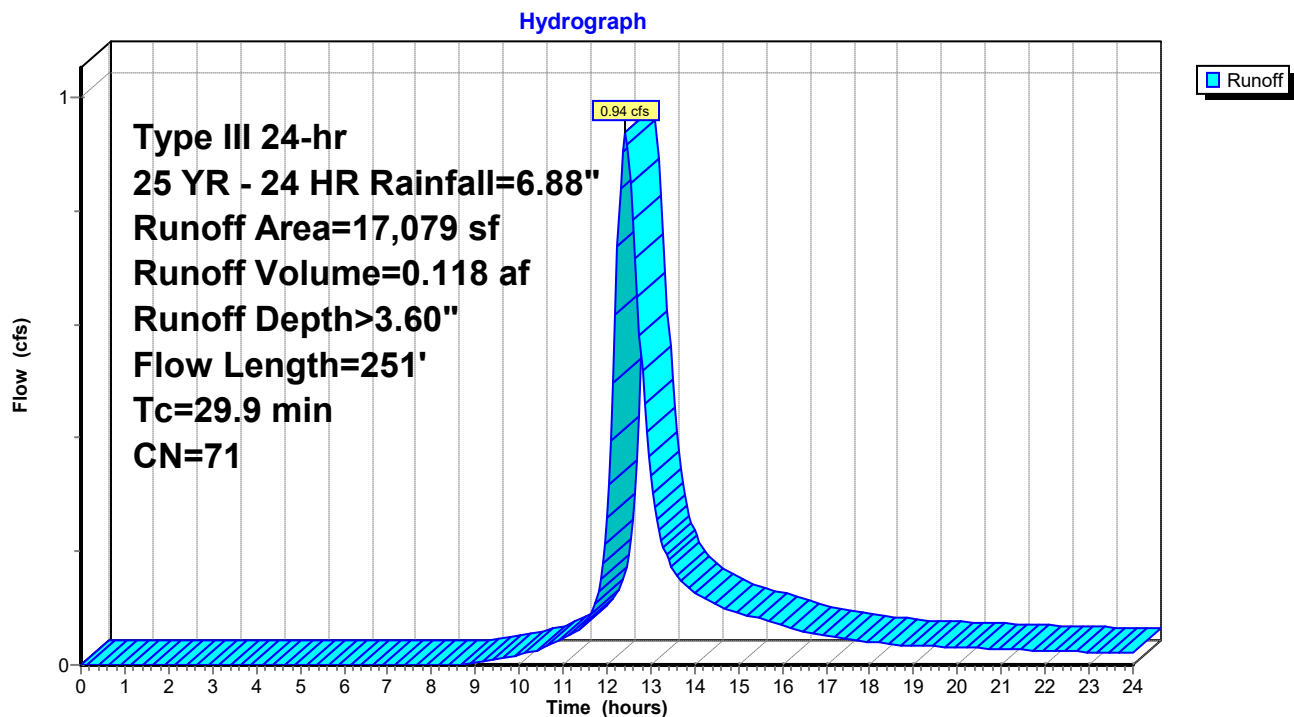
Summary for Subcatchment 2S: Subcatchment #2

Runoff = 0.94 cfs @ 12.42 hrs, Volume= 0.118 af, Depth> 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
851	39	>75% Grass cover, Good, HSG A
453	30	Woods, Good, HSG A
1,002	74	>75% Grass cover, Good, HSG C
8,866	70	Woods, Good, HSG C
5,907	80	>75% Grass cover, Good, HSG D
17,079	71	Weighted Average
17,079		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.6	100	0.0100	0.06		Sheet Flow, Segment #1
					Woods: Light underbrush n= 0.400 P2= 3.62"
3.3	151	0.0230	0.76		Shallow Concentrated Flow, Segment #2
					Woodland Kv= 5.0 fps
29.9	251	Total			

Subcatchment 2S: Subcatchment #2

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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Subcatchment 3S: Subcatchment #3

Runoff = 3.38 cfs @ 12.14 hrs, Volume= 0.277 af, Depth> 3.83"

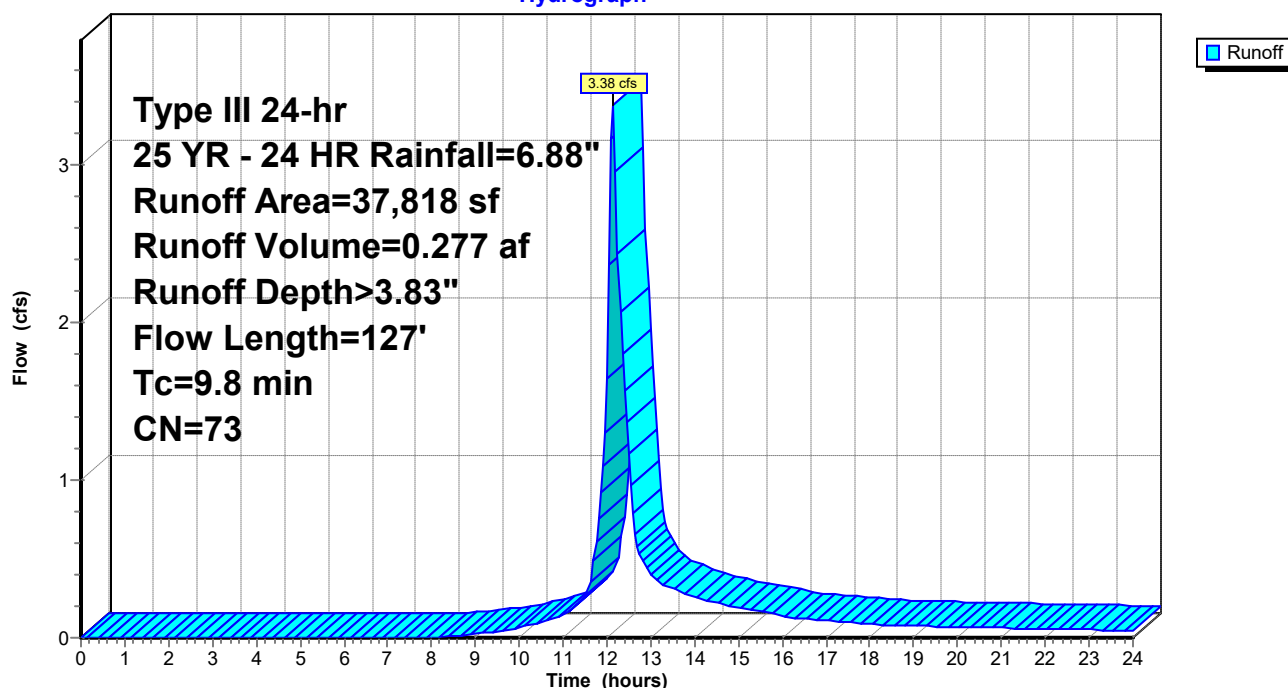
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
416	39	>75% Grass cover, Good, HSG A
30	30	Woods, Good, HSG A
33,570	74	>75% Grass cover, Good, HSG C
135	98	Unconnected pavement, HSG C
3,667	70	Woods, Good, HSG C
37,818	73	Weighted Average
37,683		99.64% Pervious Area
135		0.36% Impervious Area
135		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	100	0.0200	0.18		Sheet Flow, Segment #1
					Grass: Short n= 0.150 P2= 3.62"
0.6	27	0.0100	0.70		Shallow Concentrated Flow, Segment #2
					Short Grass Pasture Kv= 7.0 fps
9.8	127	Total			

Subcatchment 3S: Subcatchment #3

Hydrograph



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Subcatchment 4S: Subcatchment #4

Runoff = 0.30 cfs @ 12.14 hrs, Volume= 0.025 af, Depth> 2.42"

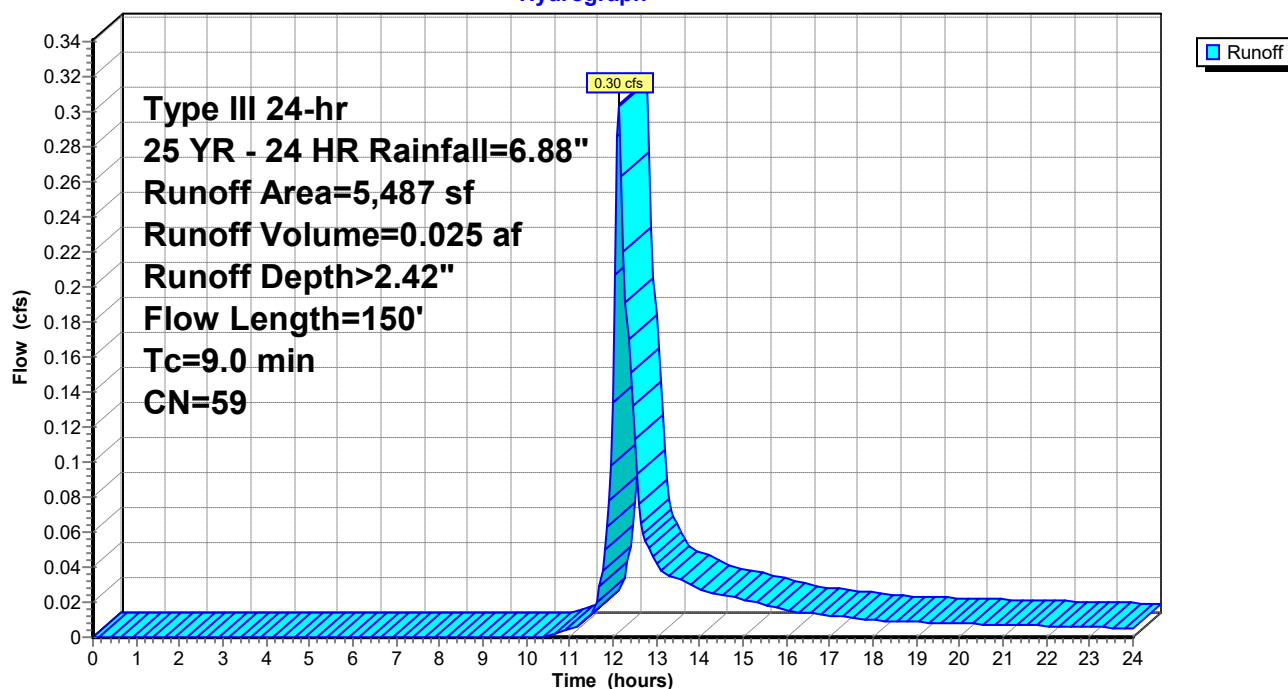
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
2,879	39	>75% Grass cover, Good, HSG A
1,914	98	Paved parking, HSG A
579	30	Woods, Good, HSG A
55	74	>75% Grass cover, Good, HSG C
60	70	Woods, Good, HSG C
5,487	59	Weighted Average
3,573		65.12% Pervious Area
1,914		34.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0300	0.21		Sheet Flow, Segment #1
					Grass: Short n= 0.150 P2= 3.62"
1.2	50	0.0100	0.70		Shallow Concentrated Flow, Segment #2
					Short Grass Pasture Kv= 7.0 fps
9.0	150	Total			

Subcatchment 4S: Subcatchment #4

Hydrograph



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Subcatchment 11S: Subcatchment #11

Runoff = 11.51 cfs @ 12.15 hrs, Volume= 0.969 af, Depth> 4.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
1,583	98	Paved parking, HSG A
6,694	39	>75% Grass cover, Good, HSG A
143	30	Woods, Good, HSG A
13,391	98	Unconnected roofs, HSG C
30,414	98	Paved parking, HSG C
53,178	74	>75% Grass cover, Good, HSG C
230	70	Woods, Good, HSG C
105,633	82	Weighted Average
60,245		57.03% Pervious Area
45,388		42.97% Impervious Area
13,391		29.50% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.0300	0.21		Sheet Flow, Segment 1
					Grass: Short n= 0.150 P2= 3.62"
2.6	114	0.0110	0.73		Shallow Concentrated Flow, Segment #2
					Short Grass Pasture Kv= 7.0 fps
10.4	214	Total			

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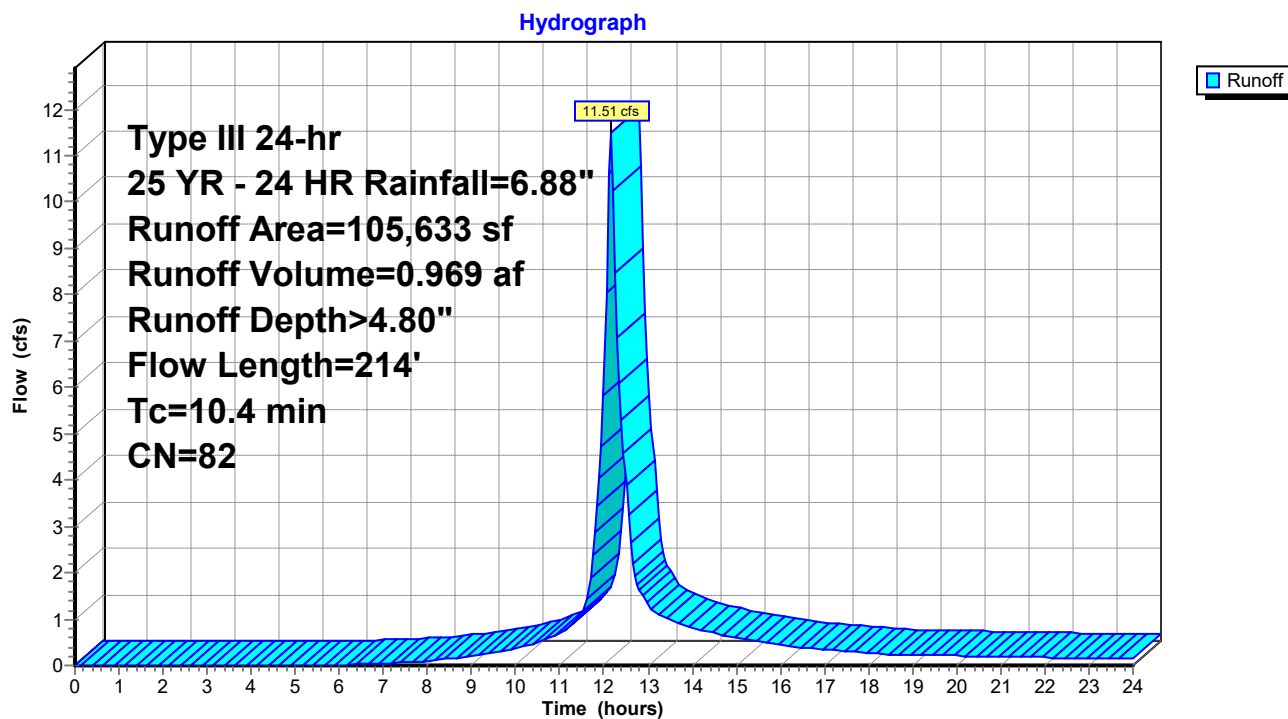
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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Subcatchment 11S: Subcatchment #11



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Subcatchment 12S: Subcatchment #12

Runoff = 4.53 cfs @ 12.30 hrs, Volume= 0.494 af, Depth> 4.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
338	39	>75% Grass cover, Good, HSG A
5,377	30	Woods, Good, HSG A
5,743	98	Unconnected roofs, HSG C
13,665	98	Paved parking, HSG C
30,170	74	>75% Grass cover, Good, HSG C
5,224	70	Woods, Good, HSG C
374	98	Unconnected roofs, HSG D
51	80	>75% Grass cover, Good, HSG D
60,942	77	Weighted Average
41,160		67.54% Pervious Area
19,782		32.46% Impervious Area
6,117		30.92% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	48	0.0100	0.05		Sheet Flow, Segment #1
					Woods: Light underbrush n= 0.400 P2= 3.62"
1.2	52	0.0100	0.70		Shallow Concentrated Flow, Segment #2
					Short Grass Pasture Kv= 7.0 fps
5.7	413	0.0300	1.21		Shallow Concentrated Flow, Segment #3
					Short Grass Pasture Kv= 7.0 fps
21.7	513	Total			

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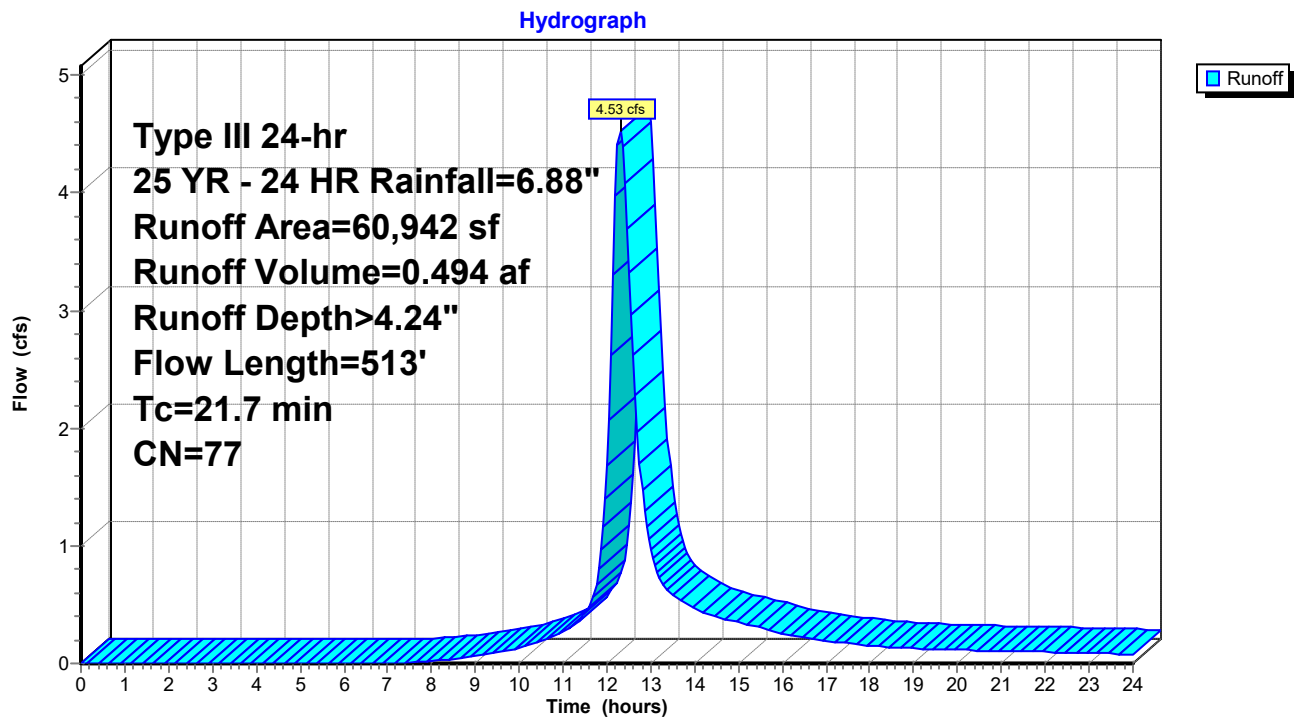
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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Subcatchment 12S: Subcatchment #12



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Subcatchment 13S: Subcatchment #13

Runoff = 6.34 cfs @ 12.22 hrs, Volume= 0.614 af, Depth> 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
2,947	98	Unconnected roofs, HSG A
28	98	Paved parking, HSG A
14,109	39	>75% Grass cover, Good, HSG A
22	30	Woods, Good, HSG A
8,470	98	Unconnected roofs, HSG C
19,004	98	Paved parking, HSG C
27,306	74	>75% Grass cover, Good, HSG C
383	98	Paved parking, HSG D
404	98	Unconnected roofs, HSG D
1,053	80	>75% Grass cover, Good, HSG D
73,726	78	Weighted Average
42,490		57.63% Pervious Area
31,236		42.37% Impervious Area
11,821		37.84% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	48	0.0050	0.09		Sheet Flow, Segment #1 Grass: Short n= 0.150 P2= 3.62"
0.3	20	0.0200	1.06		Sheet Flow, Segment #2 Smooth surfaces n= 0.011 P2= 3.62"
6.4	32	0.0050	0.08		Sheet Flow, Segment #3 Grass: Short n= 0.150 P2= 3.62"
0.5	44	0.0450	1.48		Shallow Concentrated Flow, Segment #2 Short Grass Pasture Kv= 7.0 fps
16.1	144	Total			

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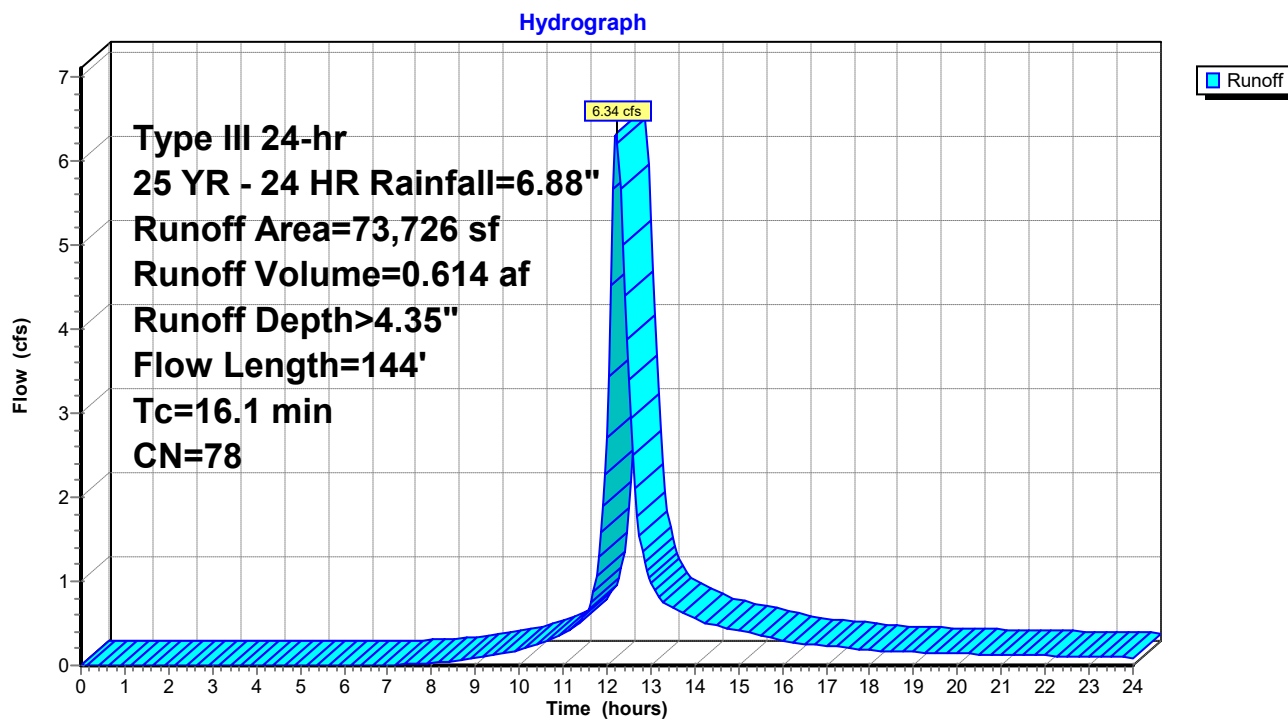
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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Subcatchment 13S: Subcatchment #13



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Subcatchment 14S: Subcatchment #14

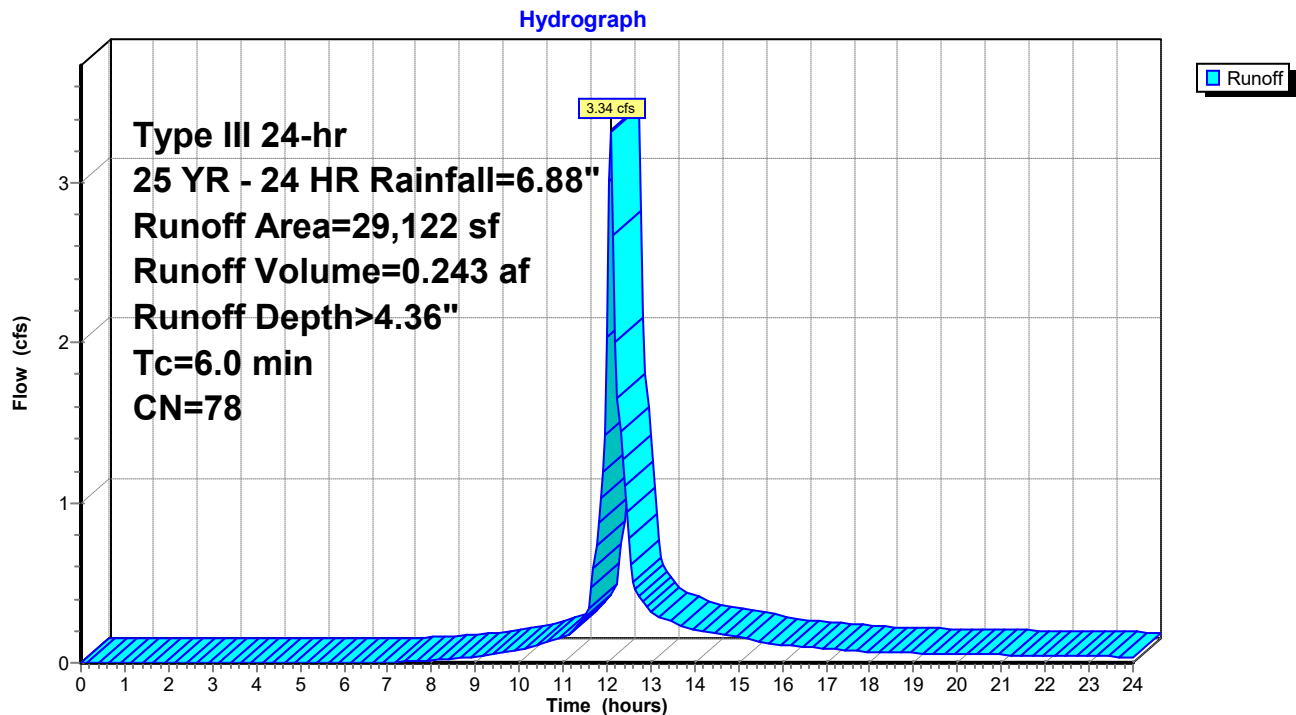
Runoff = 3.34 cfs @ 12.09 hrs, Volume= 0.243 af, Depth> 4.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
16,677	98	Paved parking, HSG A
9,882	39	>75% Grass cover, Good, HSG A
2,017	98	Paved parking, HSG C
546	74	>75% Grass cover, Good, HSG C
29,122	78	Weighted Average
10,428		35.81% Pervious Area
18,694		64.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment #1

Subcatchment 14S: Subcatchment #14



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Subcatchment 15S: Subcatchment #15

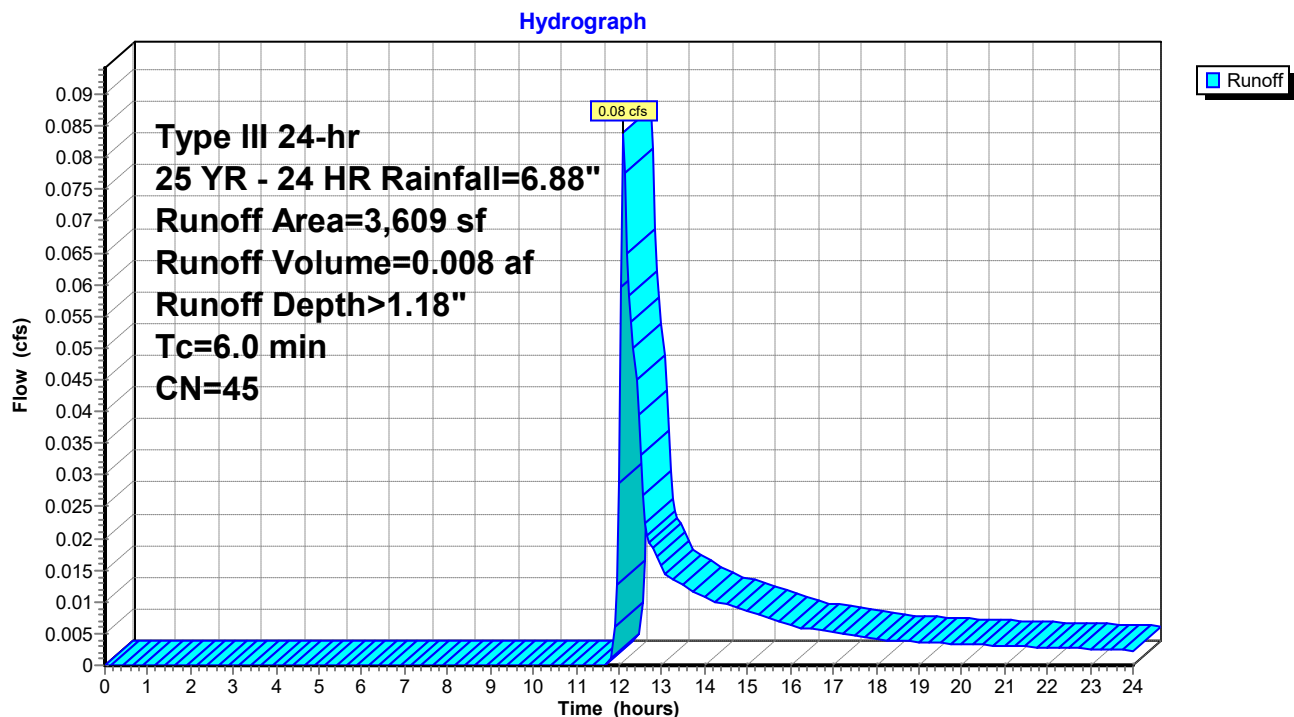
Runoff = 0.08 cfs @ 12.12 hrs, Volume= 0.008 af, Depth> 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
277	98	Paved parking, HSG A
3,214	39	>75% Grass cover, Good, HSG A
118	74	>75% Grass cover, Good, HSG C
3,609	45	Weighted Average
3,332		92.32% Pervious Area
277		7.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment #1

Subcatchment 15S: Subcatchment #15



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Subcatchment 18S: Mixed Use Building

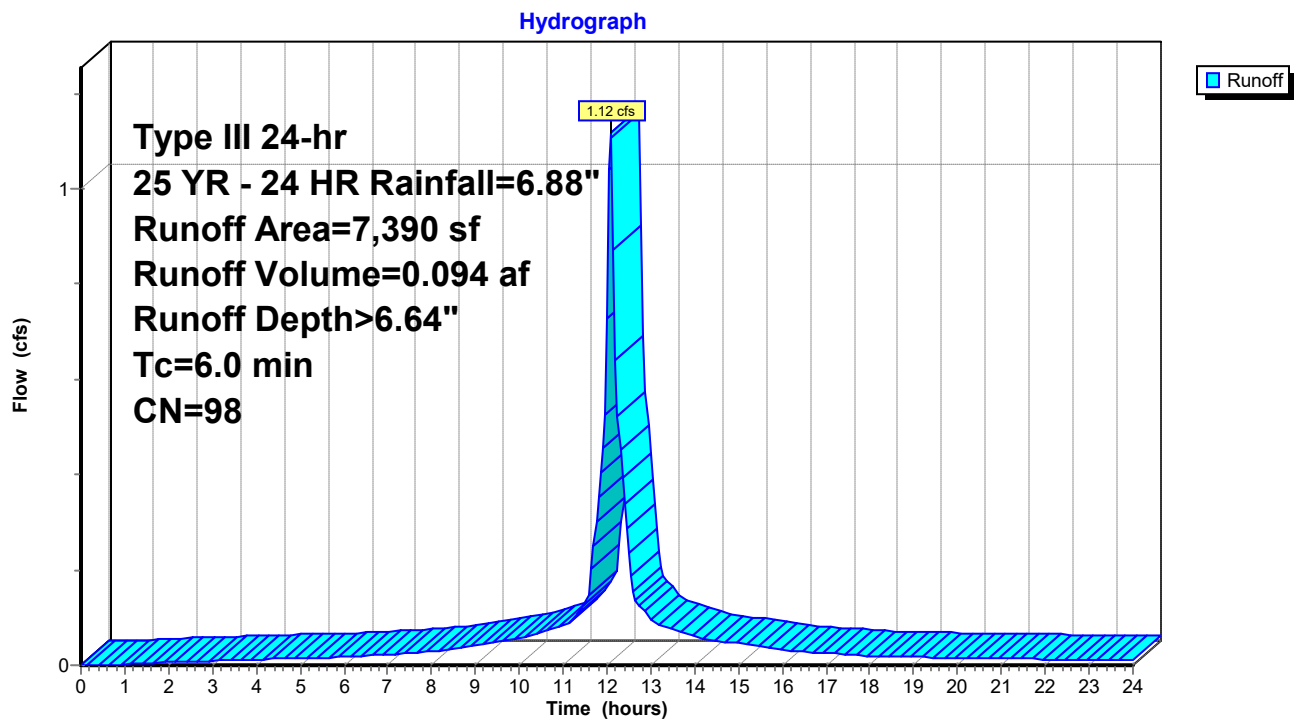
Runoff = 1.12 cfs @ 12.09 hrs, Volume= 0.094 af, Depth> 6.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
307	98	Roofs, HSG A
7,083	98	Roofs, HSG C
7,390	98	Weighted Average
7,390		100.00% Impervious Area

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

Subcatchment 18S: Mixed Use Building



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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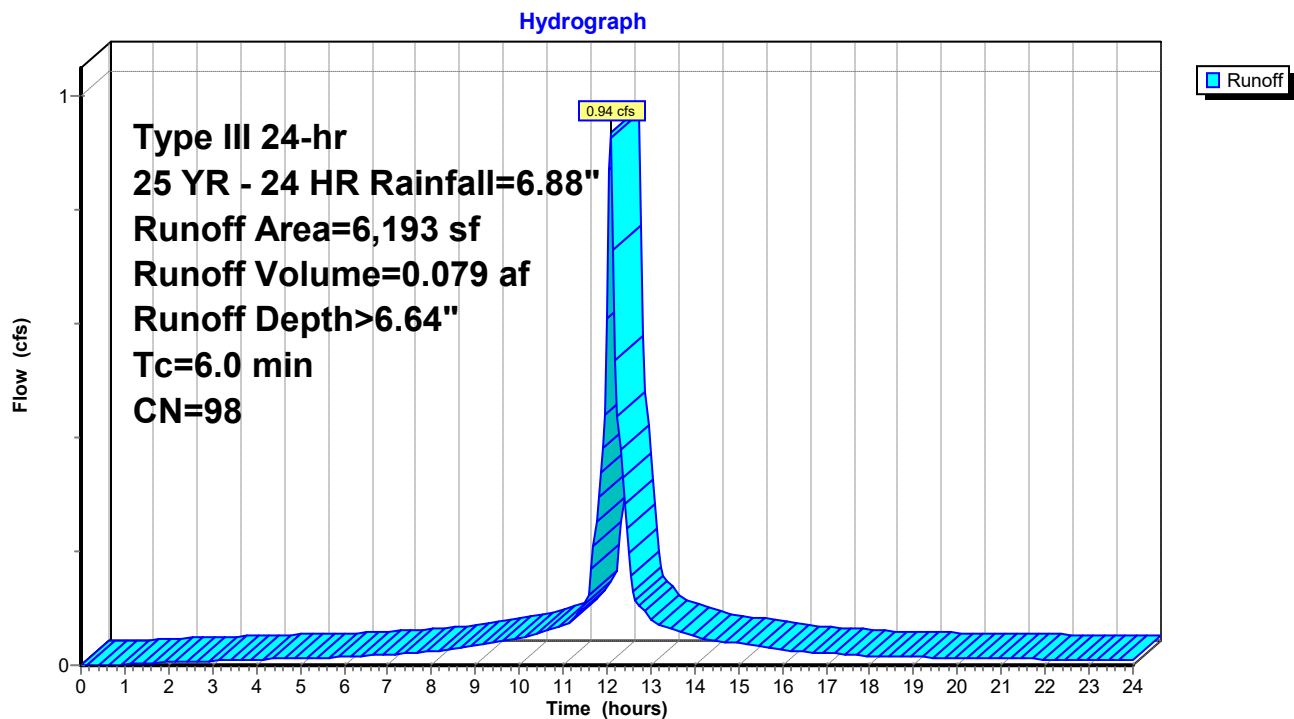
Summary for Subcatchment 19S: Mixed Use Building

Runoff = 0.94 cfs @ 12.09 hrs, Volume= 0.079 af, Depth> 6.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

Area (sf)	CN	Description
2,953	98	Roofs, HSG A
3,240	98	Roofs, HSG C
6,193	98	Weighted Average
6,193		100.00% Impervious Area

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

Subcatchment 19S: Mixed Use Building

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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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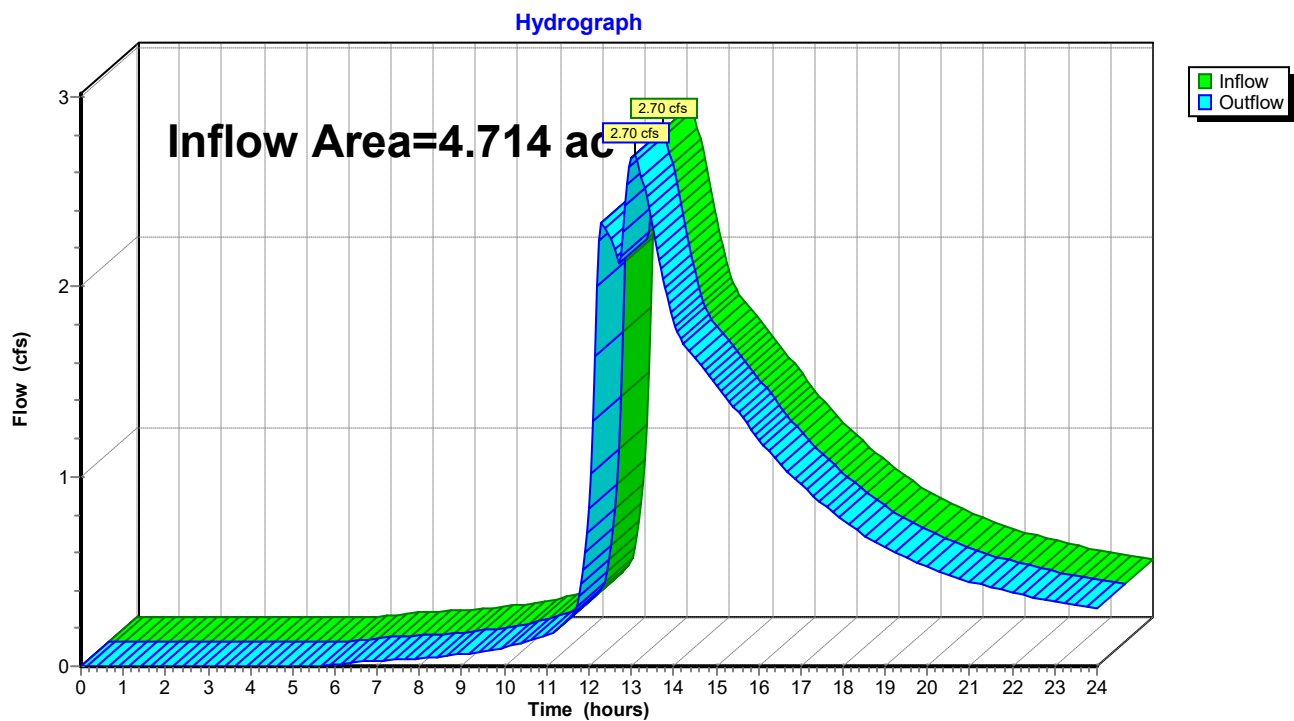
Summary for Reach 100R: Final Reach 100

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

Inflow Area = 4.714 ac, 42.04% Impervious, Inflow Depth > 2.70" for 25 YR - 24 HR event
Inflow = 2.70 cfs @ 13.07 hrs, Volume= 1.059 af
Outflow = 2.70 cfs @ 13.07 hrs, Volume= 1.059 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 100R: Final Reach 100



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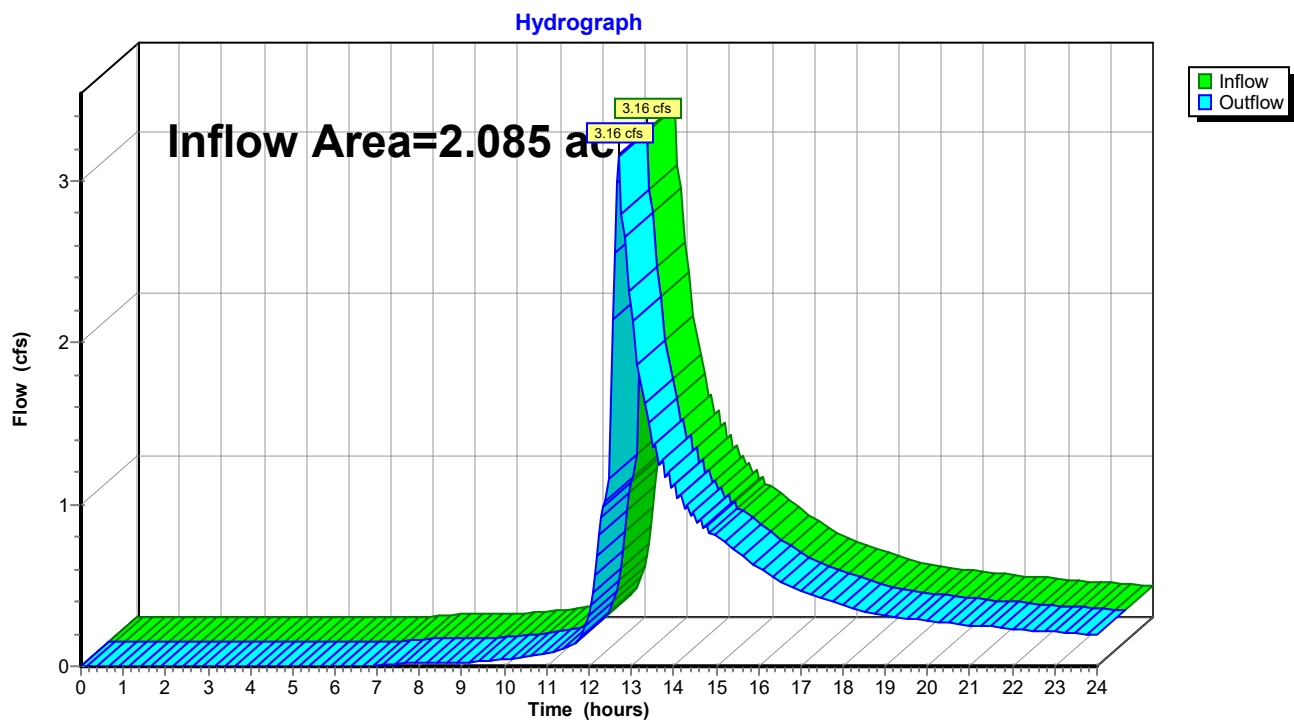
Summary for Reach 200R: Final Reach 200

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

Inflow Area = 2.085 ac, 34.40% Impervious, Inflow Depth > 3.62" for 25 YR - 24 HR event
Inflow = 3.16 cfs @ 12.69 hrs, Volume= 0.628 af
Outflow = 3.16 cfs @ 12.69 hrs, Volume= 0.628 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 200R: Final Reach 200



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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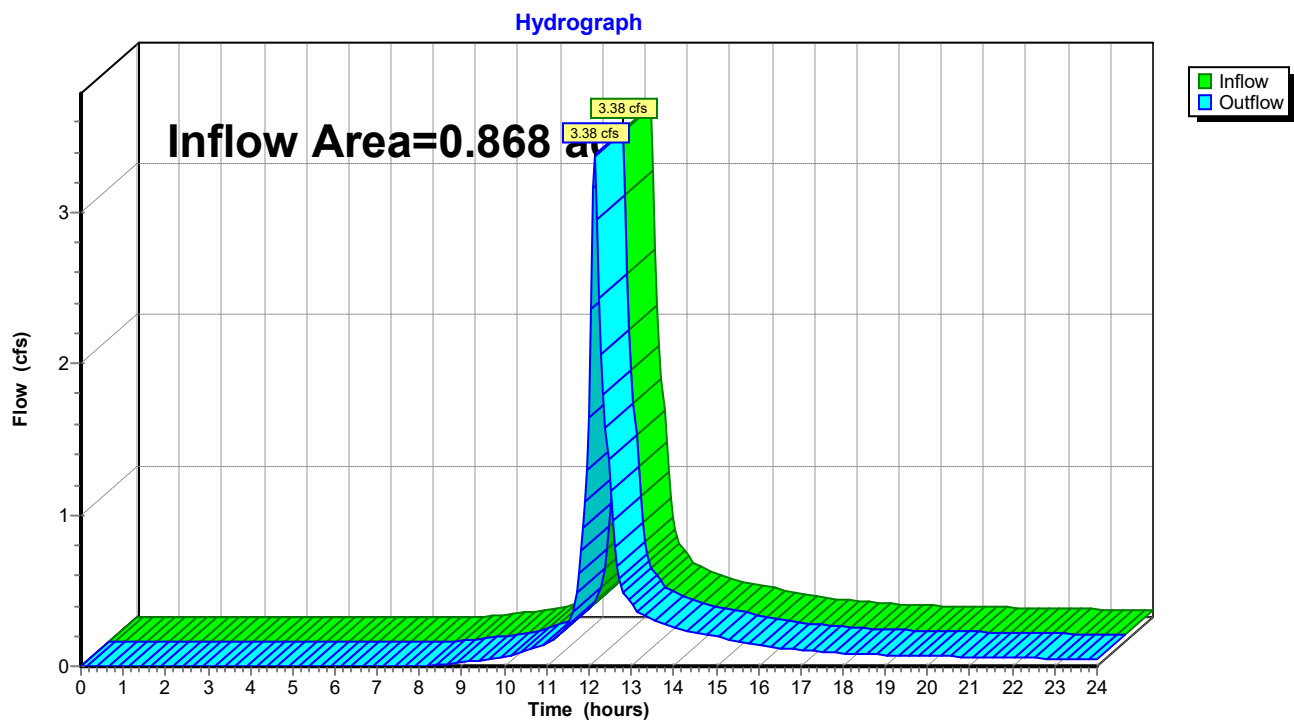
Summary for Reach 300R: Final Reach 300

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

Inflow Area = 0.868 ac, 0.36% Impervious, Inflow Depth > 3.83" for 25 YR - 24 HR event
Inflow = 3.38 cfs @ 12.14 hrs, Volume= 0.277 af
Outflow = 3.38 cfs @ 12.14 hrs, Volume= 0.277 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 300R: Final Reach 300



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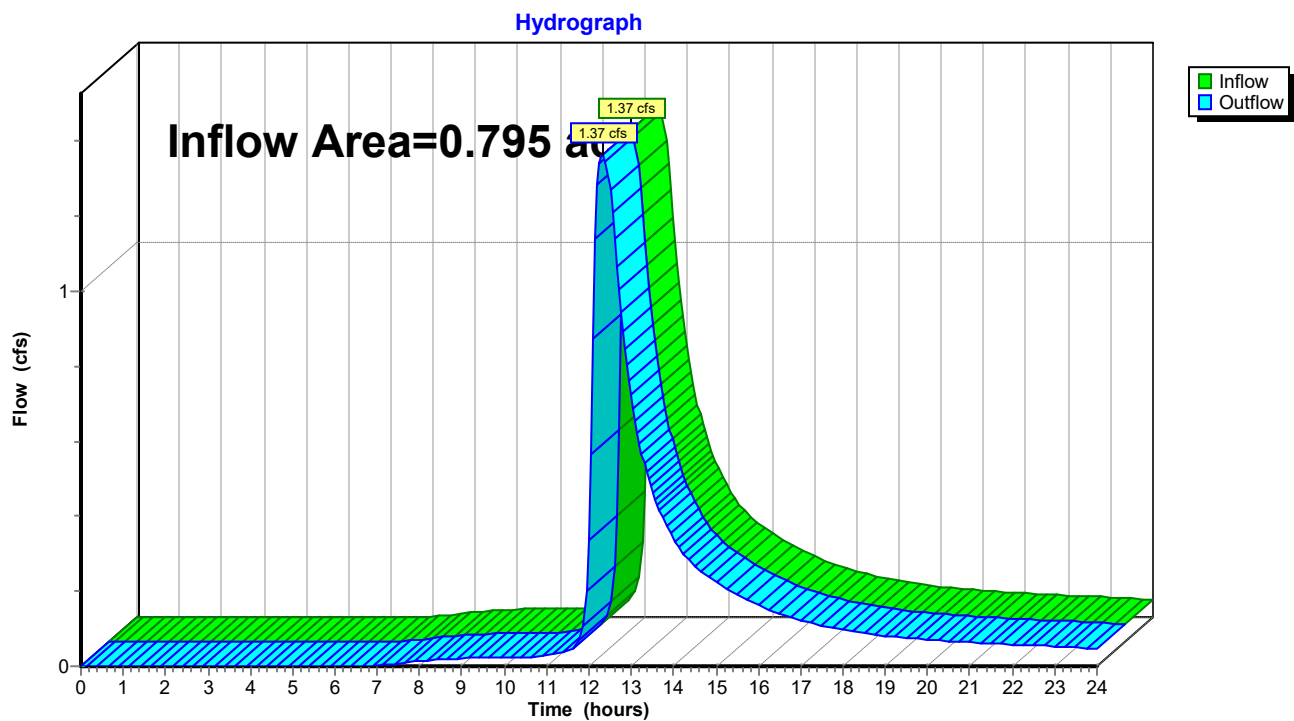
Summary for Reach 400R: Final Reach 400

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

Inflow Area = 0.795 ac, 59.55% Impervious, Inflow Depth > 3.48" for 25 YR - 24 HR event
Inflow = 1.37 cfs @ 12.34 hrs, Volume= 0.230 af
Outflow = 1.37 cfs @ 12.34 hrs, Volume= 0.230 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 400R: Final Reach 400



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Summary for Pond 4P: Pond 4

Inflow Area = 0.795 ac, 59.55% Impervious, Inflow Depth > 3.48" for 25 YR - 24 HR event
 Inflow = 1.37 cfs @ 12.32 hrs, Volume= 0.230 af
 Outflow = 1.37 cfs @ 12.34 hrs, Volume= 0.230 af, Atten= 0%, Lag= 1.0 min
 Primary = 1.37 cfs @ 12.34 hrs, Volume= 0.230 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 89.94' @ 12.34 hrs Surf.Area= 261 sf Storage= 60 cf

Plug-Flow detention time= 0.7 min calculated for 0.230 af (100% of inflow)
 Center-of-Mass det. time= 0.5 min (871.0 - 870.5)

Volume	Invert	Avail.Storage	Storage Description		
#1	89.38'	1,237 cf	Open Water Storage (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
89.38	10	14.0	0	0	10
90.00	306	70.6	77	77	392
91.00	559	95.9	426	503	737
92.00	924	126.3	734	1,237	1,286

Device	Routing	Invert	Outlet Devices
#1	Primary	89.38'	15.0" Round 15" CMP ? L= 46.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 89.38' / 88.00' S= 0.0300 ' / Cc= 0.900 n= 0.024, Flow Area= 1.23 sf

Primary OutFlow Max=1.36 cfs @ 12.34 hrs HW=89.94' TW=0.00' (Dynamic Tailwater)
 ↑ **1=15" CMP ?** (Inlet Controls 1.36 cfs @ 2.55 fps)

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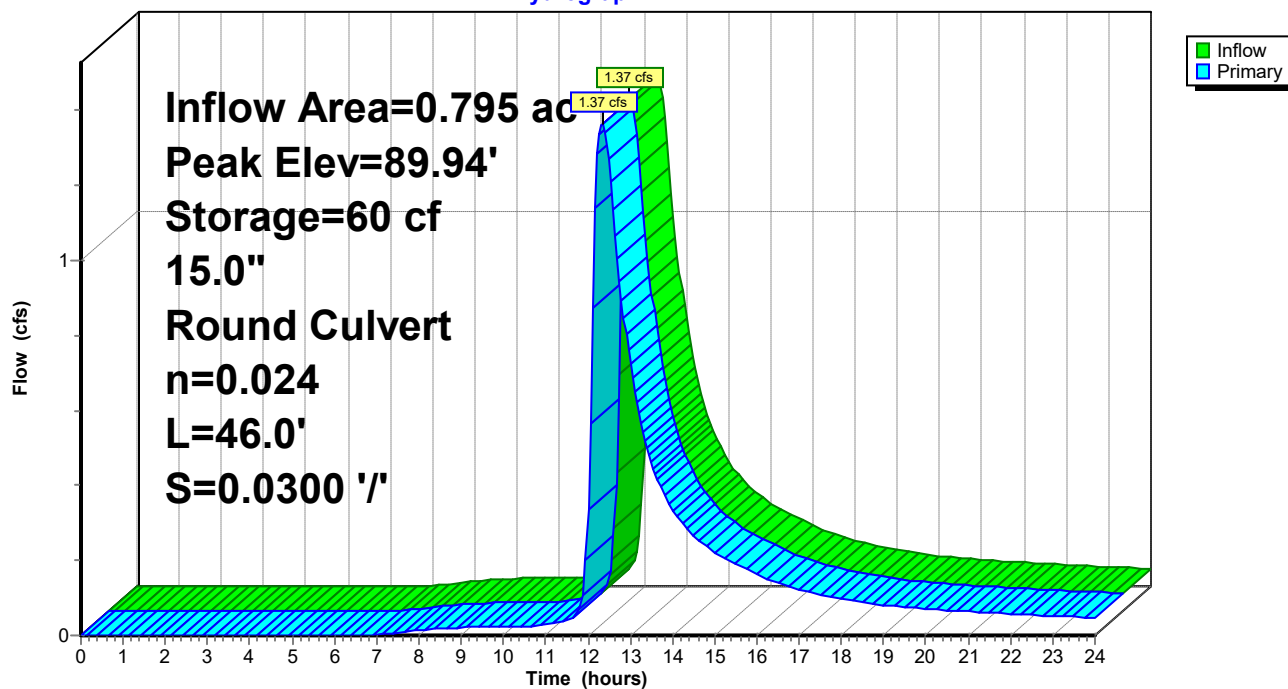
Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Pond 4P: Pond 4

Hydrograph



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Pond 101P: Gravel Wetland #101

Inflow Area = 4.219 ac, 43.01% Impervious, Inflow Depth > 3.58" for 25 YR - 24 HR event
 Inflow = 12.12 cfs @ 12.15 hrs, Volume= 1.260 af
 Outflow = 2.42 cfs @ 13.10 hrs, Volume= 0.875 af, Atten= 80%, Lag= 57.1 min
 Primary = 2.08 cfs @ 13.10 hrs, Volume= 0.853 af
 Secondary = 0.33 cfs @ 13.10 hrs, Volume= 0.021 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 93.54' @ 13.10 hrs Surf.Area= 28,544 sf Storage= 27,948 cf
 Flood Elev= 94.00' Surf.Area= 33,529 sf Storage= 42,068 cf

Plug-Flow detention time= 233.4 min calculated for 0.875 af (69% of inflow)
 Center-of-Mass det. time= 142.3 min (961.1 - 818.8)

Volume	Invert	Avail.Storage	Storage Description
#1	92.10'	27 cf	4.00'D x 2.15'H Vertical Cone/Cylinder
#2	92.25'	27,755 cf	Forebay (Irregular) Listed below (Recalc)
#3	92.25'	23,573 cf	Cell (Irregular) Listed below (Recalc)
		51,354 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
92.25	7,203	1,278.0	0	0	7,203
93.00	15,196	1,487.0	8,215	8,215	53,201
94.00	24,233	1,688.0	19,540	27,755	104,010

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
92.25	7,147	413.0	0	0	7,147
93.00	7,976	426.1	5,668	5,668	8,077
94.00	9,283	445.0	8,621	14,290	9,457
95.00	9,283	445.0	9,283	23,573	9,902

Device	Routing	Invert	Outlet Devices
#1	Primary	92.10'	12.0" Round 12" RCP L= 16.8' Ke= 0.500 Inlet / Outlet Invert= 92.10' / 92.00' S= 0.0060 ' / Cc= 0.900 n= 0.010 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	92.10'	2.0" Vert. 2" Orifice Goose Neck C= 0.600
#3	Device 1	93.00'	15.0" W x 6.0" H Vert. 6"X15" Slot C= 0.600
#4	Device 1	93.50'	48.0" Horiz. 4' Structure C= 0.600 Limited to weir flow at low heads
#5	Secondary	93.50'	15.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

20-066 Proposed Conditions Analysis

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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Primary OutFlow Max=2.08 cfs @ 13.10 hrs HW=93.54' TW=0.00' (Dynamic Tailwater)

1=12" RCP (Passes 2.08 cfs of 3.45 cfs potential flow)

2=2" Orifice Goose Neck (Orifice Controls 0.12 cfs @ 5.62 fps)

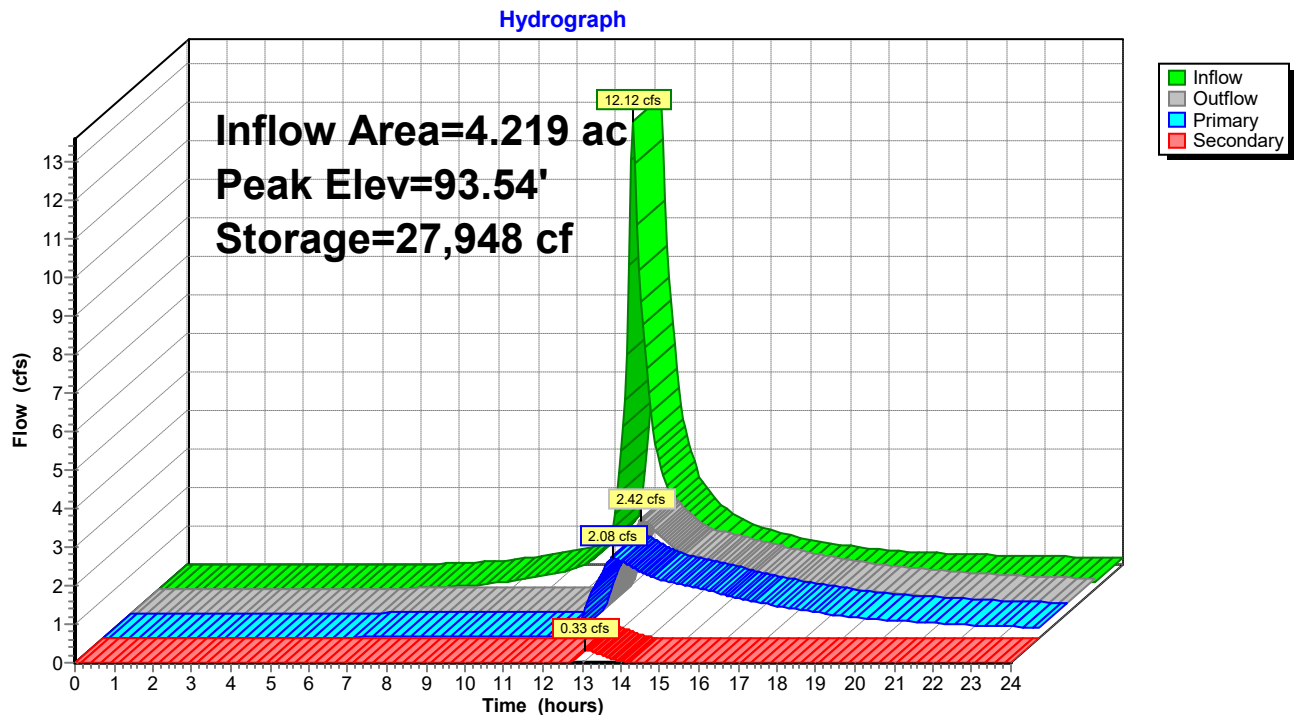
3=6"X15" Slot (Orifice Controls 1.57 cfs @ 2.52 fps)

4=4' Structure (Weir Controls 0.39 cfs @ 0.69 fps)

Secondary OutFlow Max=0.33 cfs @ 13.10 hrs HW=93.54' TW=0.00' (Dynamic Tailwater)

5=Broad-Crested Rectangular Weir (Weir Controls 0.33 cfs @ 0.50 fps)

Pond 101P: Gravel Wetland #101



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Summary for Pond 102AP: DMH #1

[80] Warning: Exceeded Pond 102P by 0.91' @ 23.95 hrs (3.18 cfs 2.083 af)

Inflow = 2.14 cfs @ 12.80 hrs, Volume= 0.233 af
Outflow = 1.97 cfs @ 12.80 hrs, Volume= 0.234 af, Atten= 8%, Lag= 0.1 min
Primary = 1.97 cfs @ 12.80 hrs, Volume= 0.234 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 94.66' @ 12.82 hrs Surf.Area= 13 sf Storage= 25 cf

Flood Elev= 97.50' Surf.Area= 13 sf Storage= 61 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

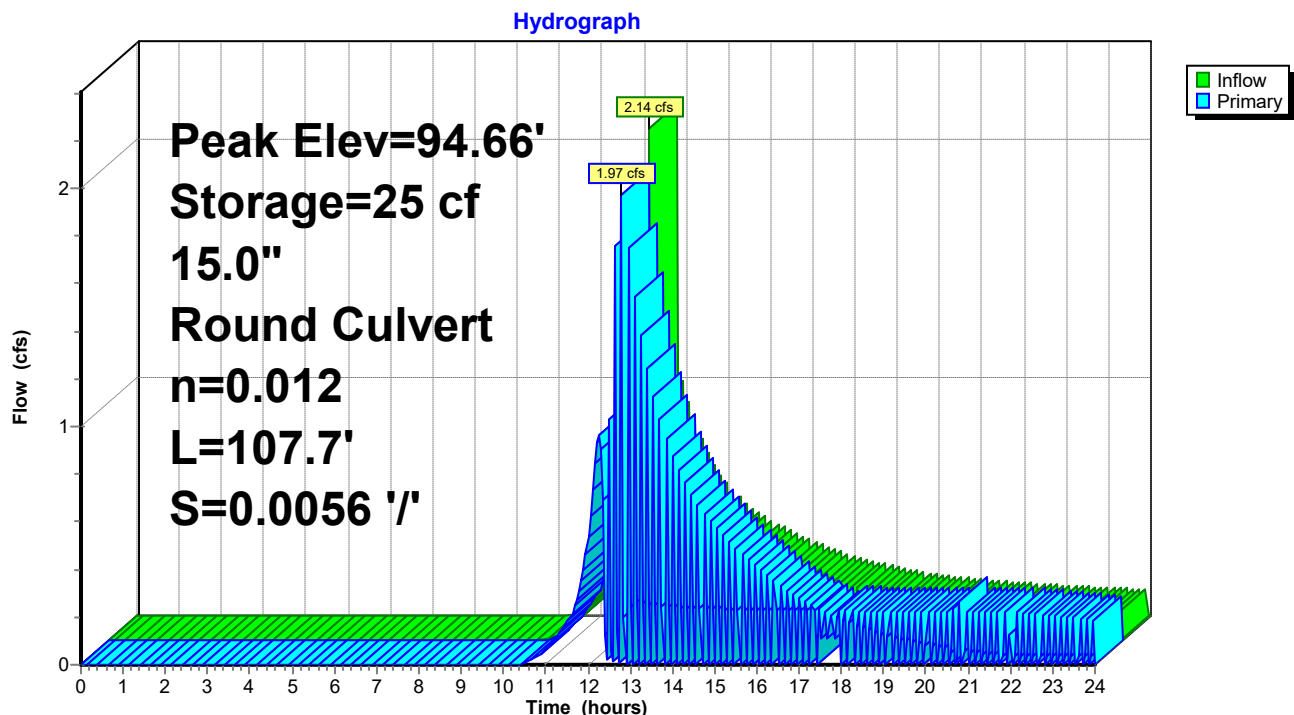
Center-of-Mass det. time= 0.8 min (916.6 - 915.7)

Volume	Invert	Avail.Storage	Storage Description
#1	92.68'	6,057 cf	4.00'D x 482.00'H 4' structure

Device	Routing	Invert	Outlet Devices
#1	Primary	92.85'	15.0" Round 15" HDPE N-12 L= 107.7' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.85' / 92.25' S= 0.0056 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.92 cfs @ 12.80 hrs HW=94.56' TW=94.39' (Dynamic Tailwater)
←**1=15" HDPE N-12** (Inlet Controls 1.92 cfs @ 1.57 fps)

Pond 102AP: DMH #1



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Pond 102P: Detention Pond #102

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=75)

[80] Warning: Exceeded Pond 105P by 1.62' @ 12.00 hrs (0.07 cfs 1.696 af)

Inflow Area = 1.794 ac, 43.06% Impervious, Inflow Depth > 3.94" for 25 YR - 24 HR event
 Inflow = 4.99 cfs @ 12.29 hrs, Volume= 0.588 af
 Outflow = 3.87 cfs @ 12.80 hrs, Volume= 0.524 af, Atten= 23%, Lag= 30.8 min
 Primary = 1.94 cfs @ 12.61 hrs, Volume= 0.291 af
 Secondary = 2.14 cfs @ 12.80 hrs, Volume= 0.233 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 94.04' @ 12.61 hrs Surf.Area= 10,935 sf Storage= 8,803 cf
 Flood Elev= 95.00' Surf.Area= 10,935 sf Storage= 19,327 cf

Plug-Flow detention time= 120.6 min calculated for 0.524 af (89% of inflow)
 Center-of-Mass det. time= 69.9 min (884.3 - 814.3)

Volume	Invert	Avail.Storage	Storage Description
#1	92.75'	19,327 cf	Open water storage (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
92.75	878	169.0	0	0	878
93.00	5,127	435.0	677	677	13,663
93.50	7,490	691.8	3,136	3,813	36,692
94.00	10,935	932.0	4,579	8,392	67,733
95.00	10,935	932.0	10,935	19,327	68,665

Device	Routing	Invert	Outlet Devices
#1	Primary	93.25'	15.0" Round 15" HDPE N-12 L= 57.6' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 93.25' / 92.25' S= 0.0174 ' /' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#2	Secondary	93.10'	15.0" Round 15" HDPE N-12 L= 29.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 93.10' / 92.95' S= 0.0051 ' /' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.93 cfs @ 12.61 hrs HW=94.04' TW=93.47' (Dynamic Tailwater)↑ **1=15" HDPE N-12** (Inlet Controls 1.93 cfs @ 2.38 fps)**Secondary OutFlow** Max=0.00 cfs @ 12.80 hrs HW=94.01' TW=94.57' (Dynamic Tailwater)↑ **2=15" HDPE N-12** (Controls 0.00 cfs)

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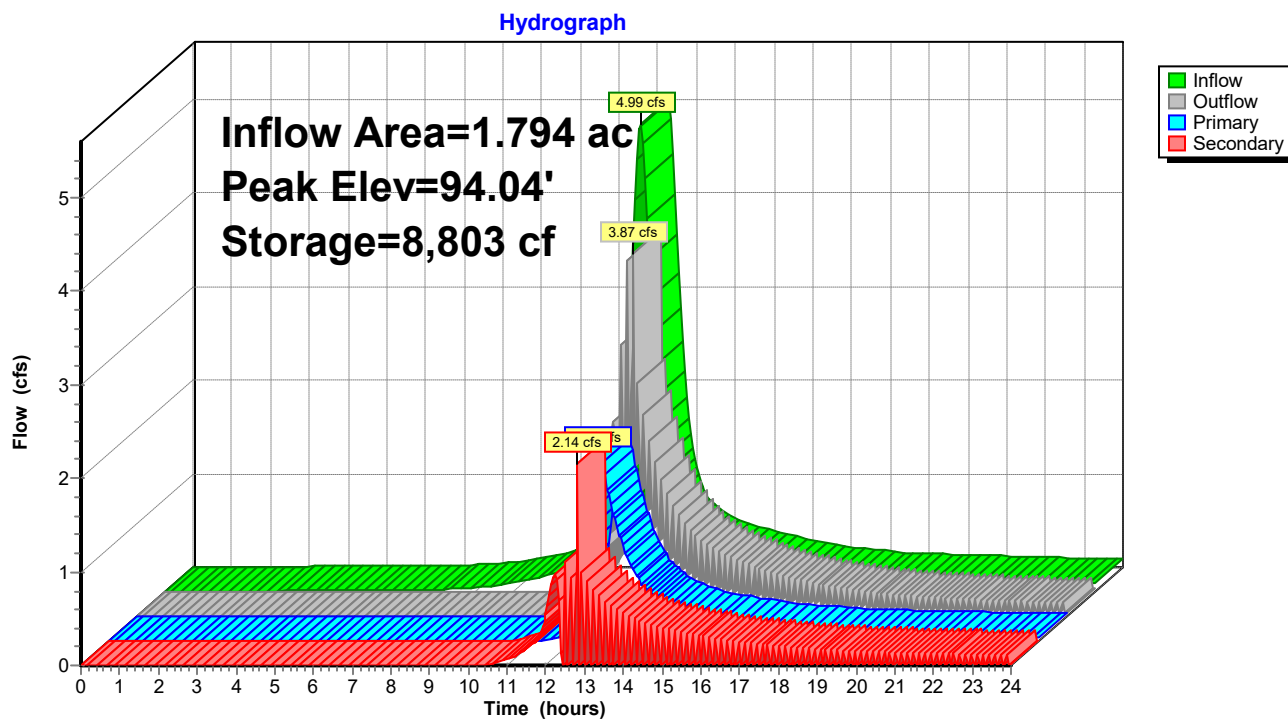
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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Pond 102P: Detention Pond #102



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Pond 103P: Gravel Wetland #103

[80] Warning: Exceeded Pond 102AP by 1.68' @ 13.05 hrs (4.40 cfs 1.389 af)

Inflow Area = 1.693 ac, 42.37% Impervious, Inflow Depth > 6.01" for 25 YR - 24 HR event
 Inflow = 7.29 cfs @ 12.22 hrs, Volume= 0.848 af
 Outflow = 2.51 cfs @ 12.70 hrs, Volume= 0.511 af, Atten= 66%, Lag= 28.5 min
 Primary = 2.51 cfs @ 12.70 hrs, Volume= 0.511 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 94.40' @ 12.70 hrs Surf.Area= 17,652 sf Storage= 15,924 cf
 Flood Elev= 95.00' Surf.Area= 18,484 sf Storage= 21,727 cf

Plug-Flow detention time= 214.4 min calculated for 0.511 af (60% of inflow)
 Center-of-Mass det. time= 96.7 min (944.1 - 847.4)

Volume	Invert	Avail.Storage	Storage Description
#1	92.10'	40 cf	4.00'D x 3.15'H Outlet Structure
#2	92.25'	4,839 cf	Forebay (Irregular) Listed below (Recalc)
#3	92.25'	7,445 cf	Cell 1 (Irregular) Listed below (Recalc)
#4	94.00'	9,406 cf	Open water storage (Irregular) Listed below (Recalc)
		21,730 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
92.25	2,155	362.0	0	0	2,155
93.00	2,634	375.2	1,793	1,793	2,977
94.00	3,477	401.0	3,046	4,839	4,617

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
92.25	3,700	319.0	0	0	3,700
93.00	4,134	336.0	2,936	2,936	4,620
94.00	4,895	364.0	4,509	7,445	6,218

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.00	8,730	447.0	0	0	8,730
95.00	10,099	466.0	9,406	9,406	10,184

Device	Routing	Invert	Outlet Devices
#1	Primary	92.10'	12.0" Round 12" HDPE N-12 L= 15.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.10' / 92.00' S= 0.0063 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	92.10'	1.5" Vert. 1.5" Orifice Goose Neck C= 0.600
#3	Device 1	94.25'	48.0" Horiz. 4' Structure C= 0.600 Limited to weir flow at low heads
#4	Secondary	94.50'	15.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50

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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66
2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=2.49 cfs @ 12.70 hrs HW=94.40' TW=0.00' (Dynamic Tailwater)

1=12" HDPE N-12 (Passes 2.49 cfs of 4.01 cfs potential flow)

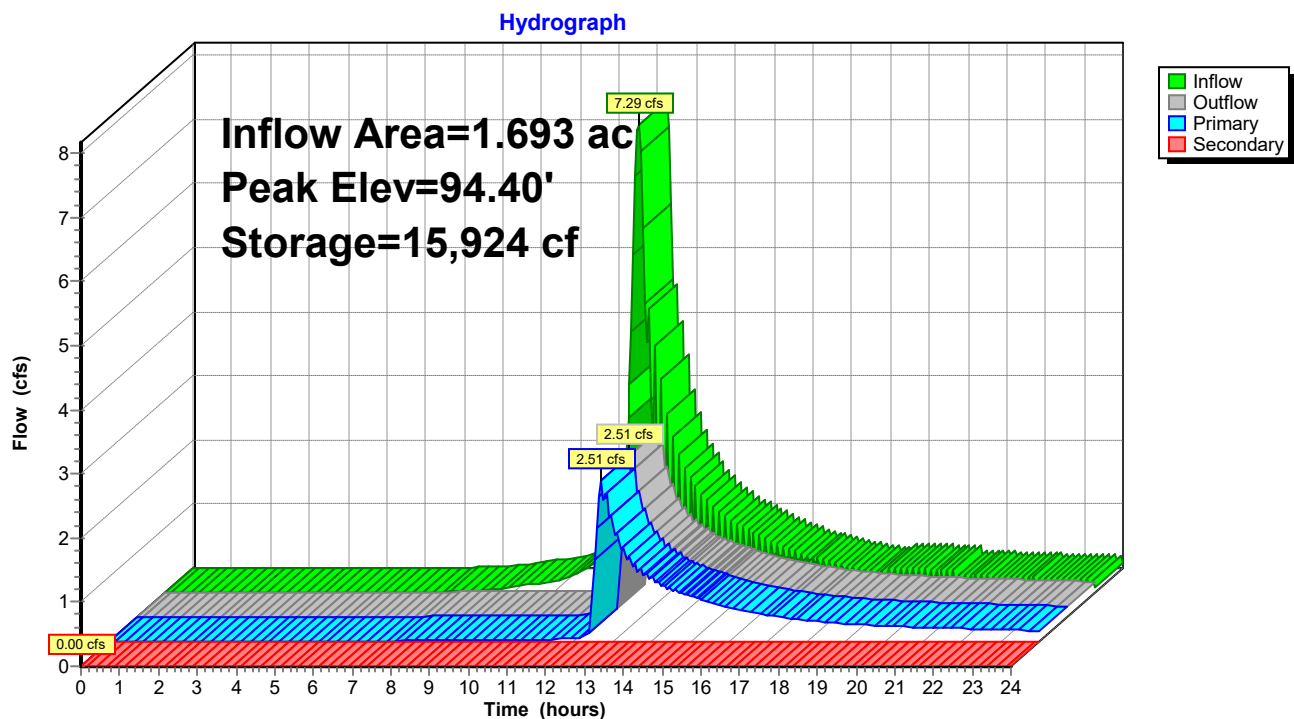
2=1.5" Orifice Goose Neck (Orifice Controls 0.09 cfs @ 7.20 fps)

3=4' Structure (Weir Controls 2.40 cfs @ 1.27 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=92.10' TW=0.00' (Dynamic Tailwater)

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

Pond 103P: Gravel Wetland #103



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Pond 104P: Gravel Wetland #104

Inflow Area = 0.669 ac, 64.19% Impervious, Inflow Depth > 4.36" for 25 YR - 24 HR event
 Inflow = 3.34 cfs @ 12.09 hrs, Volume= 0.243 af
 Outflow = 1.20 cfs @ 12.37 hrs, Volume= 0.205 af, Atten= 64%, Lag= 17.0 min
 Primary = 1.20 cfs @ 12.37 hrs, Volume= 0.205 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 92.27' @ 12.37 hrs Surf.Area= 6,812 sf Storage= 3,972 cf

Flood Elev= 93.00' Surf.Area= 9,519 sf Storage= 7,180 cf

Plug-Flow detention time= 124.1 min calculated for 0.205 af (84% of inflow)

Center-of-Mass det. time= 59.0 min (872.0 - 813.0)

Volume	Invert	Avail.Storage	Storage Description
#1	90.33'	43 cf	4.00'D x 3.42'H Outlet Structure
#2	91.00'	1,537 cf	Forebay (Irregular) Listed below (Recalc)
#3	91.00'	903 cf	Cell 1 (Irregular) Listed below (Recalc)
#4	91.00'	1,078 cf	Cell 2 (Irregular) Listed below (Recalc)
#5	92.00'	3,629 cf	Open water storage (Irregular) Listed below (Recalc)
		7,190 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
91.00	680	132.2	0	0	680
92.00	1,142	154.2	901	901	1,201
92.50	1,405	166.2	636	1,537	1,518

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
91.00	687	131.0	0	0	687
92.00	1,138	151.0	903	903	1,157

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
91.00	760	181.0	0	0	760
92.00	1,431	204.7	1,078	1,078	1,513

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
92.00	2,671	356.5	0	0	2,671
92.50	3,213	366.4	1,469	1,469	3,269
93.00	5,532	485.7	2,160	3,629	11,361

Device	Routing	Invert	Outlet Devices
#1	Primary	90.33'	12.0" Round 12" HDPE N-12 L= 12.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 90.33' / 90.00' S= 0.0258 ' / Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	90.33'	1.0" Vert. 1" Orifice Goose Neck C= 0.600
#3	Device 1	91.60'	8.0" W x 8.0" H Vert. 8" x 8" slot C= 0.600

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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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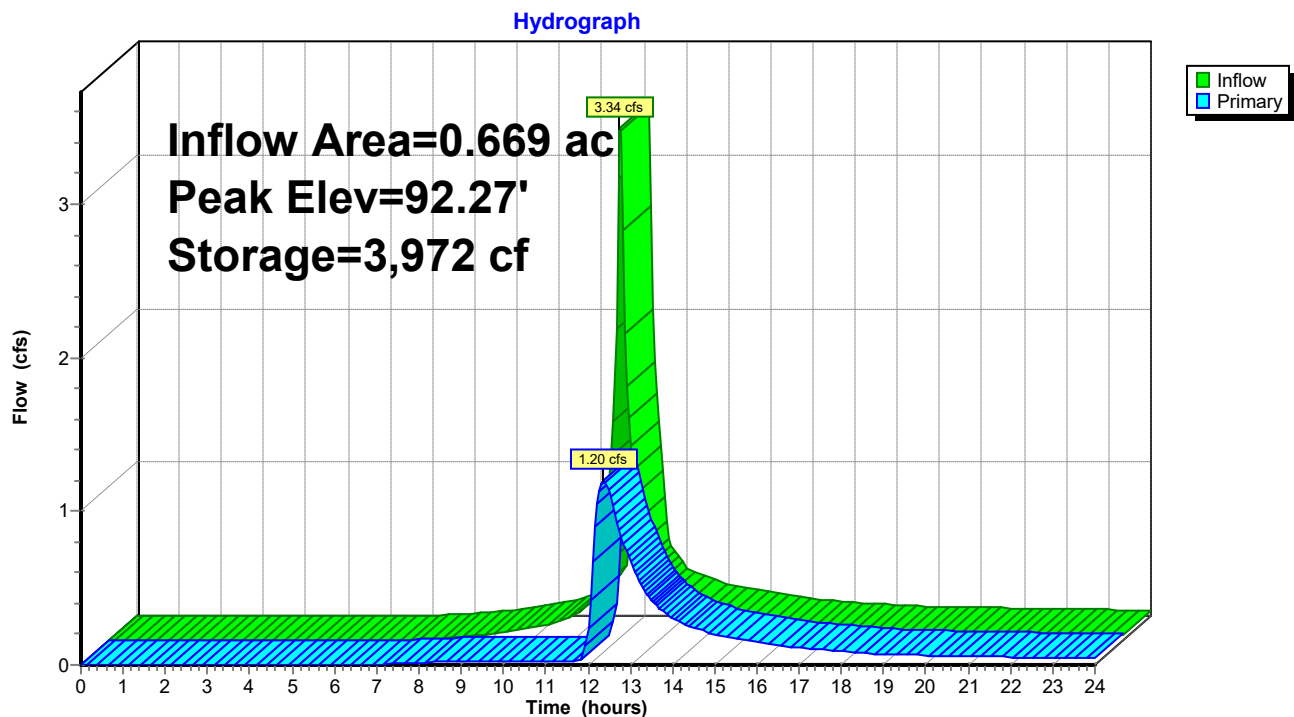
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#4 Device 1 92.75' 48.0" Horiz. 4' Structure C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.19 cfs @ 12.37 hrs HW=92.26' TW=89.94' (Dynamic Tailwater)

- 1=12" HDPE N-12 (Passes 1.19 cfs of 3.58 cfs potential flow)
- 2=1" Orifice Goose Neck (Orifice Controls 0.04 cfs @ 6.62 fps)
- 3=8" x 8" slot (Orifice Controls 1.16 cfs @ 2.62 fps)
- 4=4' Structure (Controls 0.00 cfs)

Pond 104P: Gravel Wetland #104



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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Summary for Pond 105P: Infiltration Pond #105

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=61)

Inflow Area = 0.225 ac, 66.01% Impervious, Inflow Depth > 4.63" for 25 YR - 24 HR event
 Inflow = 1.02 cfs @ 12.09 hrs, Volume= 0.087 af
 Outflow = 0.19 cfs @ 12.56 hrs, Volume= 0.087 af, Atten= 82%, Lag= 28.2 min
 Discarded = 0.19 cfs @ 12.56 hrs, Volume= 0.087 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 93.00' @ 12.55 hrs Surf.Area= 2,933 sf Storage= 1,148 cf
 Flood Elev= 94.00' Surf.Area= 3,301 sf Storage= 2,827 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 71.2 min (828.7 - 757.5)

Volume	Invert	Avail.Storage	Storage Description
#1	91.00'	2 cf	Stone (Irregular) Listed below (Recalc) 382 cf Overall x 0.4% Voids
#2	91.50'	1,146 cf	Bio-media (Irregular) Listed below (Recalc)
#3	93.00'	1,679 cf	Open water storage (Irregular) Listed below (Recalc)
		2,827 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
91.00	764	124.0	0	0	764
91.50	764	124.0	382	382	826

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
91.50	764	124.0	0	0	764
93.00	764	124.0	1,146	1,146	950

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
93.00	1,405	238.0	0	0	1,405
93.50	1,773	248.4	793	793	1,826
94.00	1,773	248.4	887	1,679	1,950

Device	Routing	Invert	Outlet Devices
#1	Discarded	91.00'	3.000 in/hr Exfiltration over Surface area
#2	Primary	93.50'	15.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

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Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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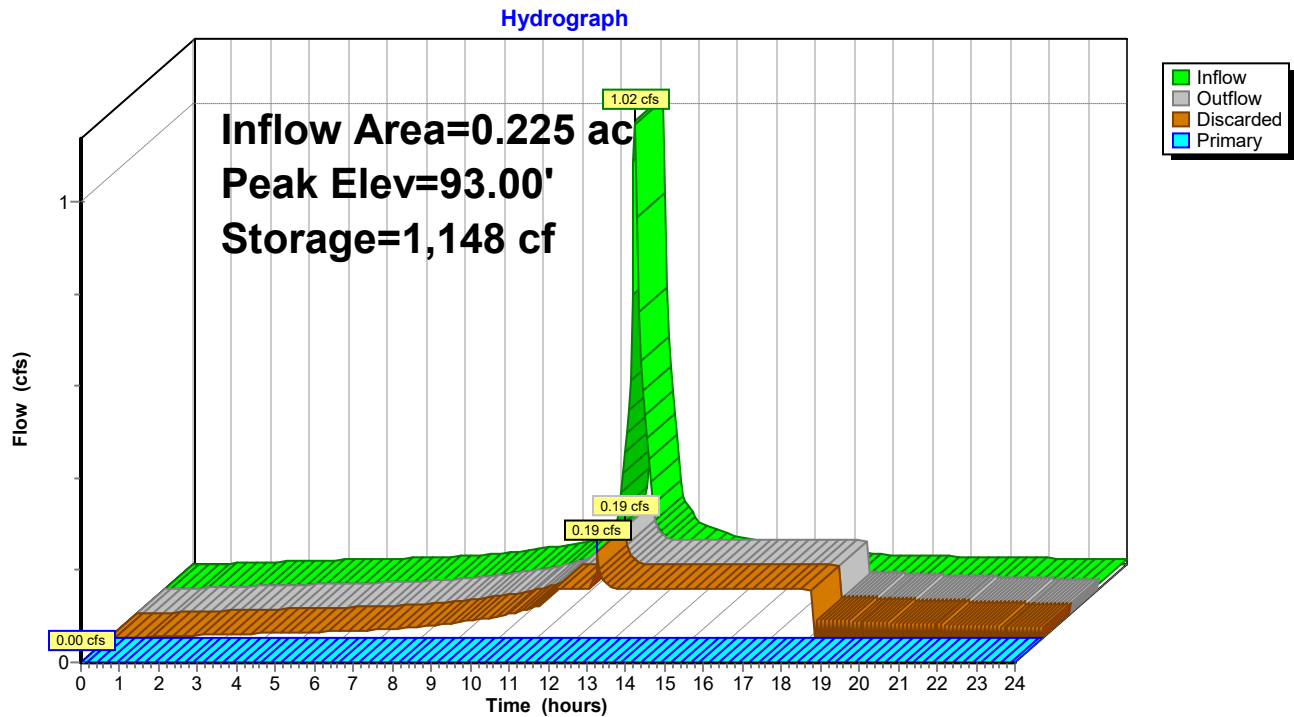
Discarded OutFlow Max=0.11 cfs @ 12.56 hrs HW=93.00' (Free Discharge)

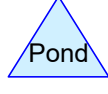
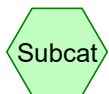
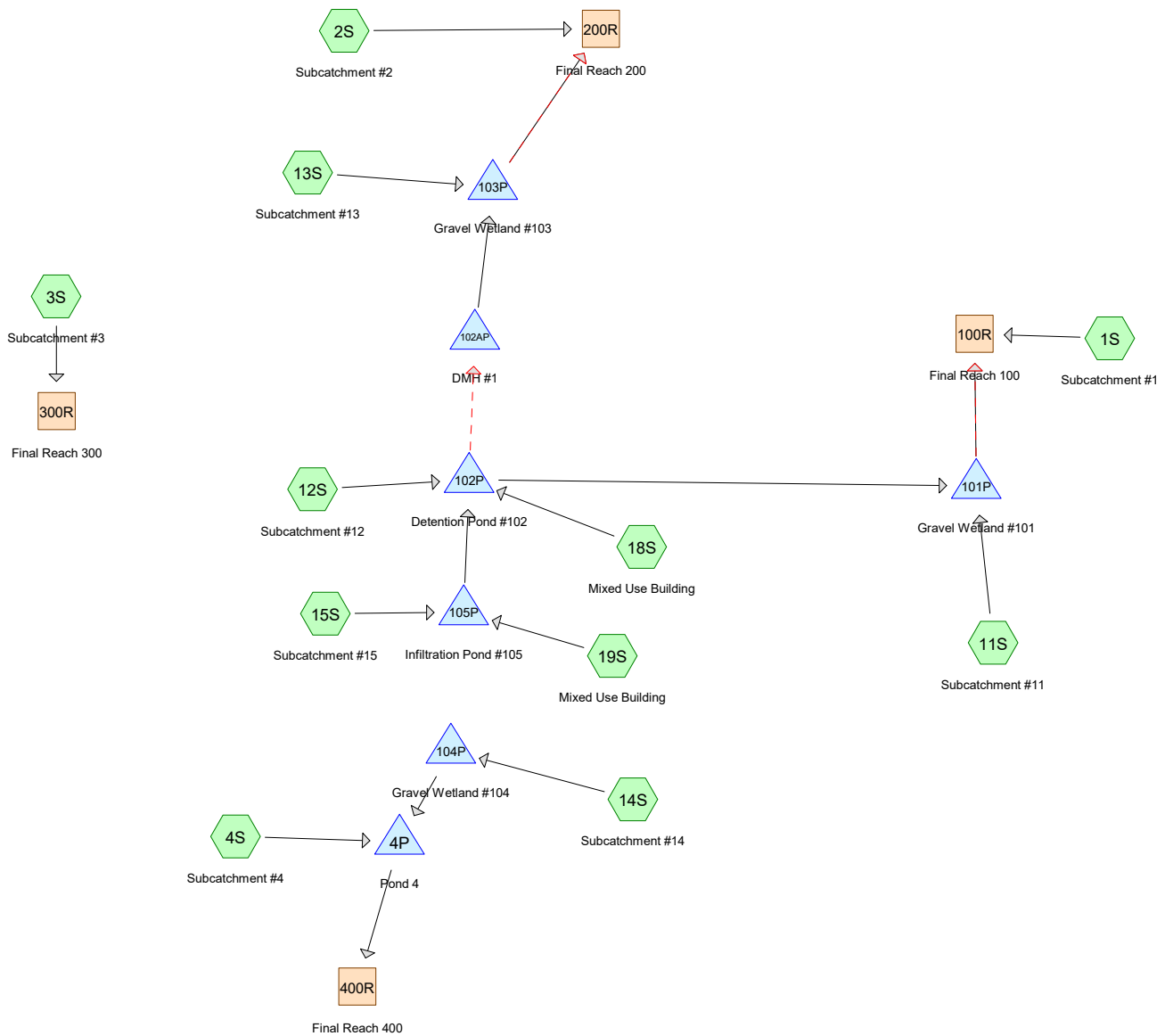
↑**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=91.00' TW=92.75' (Dynamic Tailwater)

↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 105P: Infiltration Pond #105





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Type III 24-hr 2 YR - 24 HR Rainfall=3.60"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 1S: Subcatchment #1	Runoff Area=21,574 sf 33.85% Impervious Runoff Depth>1.64" Flow Length=404' Tc=18.1 min CN=79 Runoff=0.66 cfs 0.068 af
Subcatchment 2S: Subcatchment #2	Runoff Area=17,079 sf 0.00% Impervious Runoff Depth>1.12" Flow Length=251' Tc=29.9 min CN=71 Runoff=0.27 cfs 0.037 af
Subcatchment 3S: Subcatchment #3	Runoff Area=37,818 sf 0.36% Impervious Runoff Depth>1.24" Flow Length=127' Tc=9.8 min CN=73 Runoff=1.06 cfs 0.090 af
Subcatchment 4S: Subcatchment #4	Runoff Area=5,487 sf 34.88% Impervious Runoff Depth>0.53" Flow Length=150' Tc=9.0 min CN=59 Runoff=0.05 cfs 0.006 af
Subcatchment 11S: Subcatchment #11	Runoff Area=105,633 sf 42.97% Impervious Runoff Depth>1.86" Flow Length=214' Tc=10.4 min CN=82 Runoff=4.53 cfs 0.376 af
Subcatchment 12S: Subcatchment #12	Runoff Area=60,942 sf 32.46% Impervious Runoff Depth>1.50" Flow Length=513' Tc=21.7 min CN=77 Runoff=1.57 cfs 0.175 af
Subcatchment 13S: Subcatchment #13	Runoff Area=73,726 sf 42.37% Impervious Runoff Depth>1.57" Flow Length=144' Tc=16.1 min CN=78 Runoff=2.25 cfs 0.221 af
Subcatchment 14S: Subcatchment #14	Runoff Area=29,122 sf 64.19% Impervious Runoff Depth>1.57" Tc=6.0 min CN=78 Runoff=1.20 cfs 0.088 af
Subcatchment 15S: Subcatchment #15	Runoff Area=3,609 sf 7.68% Impervious Runoff Depth>0.10" Tc=6.0 min CN=45 Runoff=0.00 cfs 0.001 af
Subcatchment 18S: Mixed Use Building	Runoff Area=7,390 sf 100.00% Impervious Runoff Depth>3.36" Tc=6.0 min CN=98 Runoff=0.58 cfs 0.048 af
Subcatchment 19S: Mixed Use Building	Runoff Area=6,193 sf 100.00% Impervious Runoff Depth>3.36" Tc=6.0 min CN=98 Runoff=0.49 cfs 0.040 af
Reach 100R: Final Reach 100	Inflow=0.73 cfs 0.178 af Outflow=0.73 cfs 0.178 af
Reach 200R: Final Reach 200	Inflow=0.32 cfs 0.111 af Outflow=0.32 cfs 0.111 af
Reach 300R: Final Reach 300	Inflow=1.06 cfs 0.090 af Outflow=1.06 cfs 0.090 af
Reach 400R: Final Reach 400	Inflow=0.11 cfs 0.060 af Outflow=0.11 cfs 0.060 af
Pond 4P: Pond 4	Peak Elev=89.54' Storage=4 cf Inflow=0.11 cfs 0.060 af 15.0" Round Culvert n=0.024 L=46.0' S=0.0300 ' Outflow=0.11 cfs 0.060 af

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Pond 101P: Gravel Wetland #101 Peak Elev=93.03' Storage=14,611 cf Inflow=4.53 cfs 0.438 af
Primary=0.12 cfs 0.110 af Secondary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.110 af

Pond 102AP: DMH #1 Peak Elev=93.84' Storage=15 cf Inflow=0.50 cfs 0.105 af
15.0" Round Culvert n=0.012 L=107.7' S=0.0056 '/ Outflow=0.50 cfs 0.105 af

Pond 102P: Detention Pond #102 Peak Elev=93.51' Storage=3,918 cf Inflow=1.81 cfs 0.222 af
Primary=0.26 cfs 0.062 af Secondary=0.50 cfs 0.105 af Outflow=0.75 cfs 0.167 af

Pond 103P: Gravel Wetland #103 Peak Elev=93.84' Storage=10,971 cf Inflow=2.41 cfs 0.326 af
Primary=0.08 cfs 0.074 af Secondary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.074 af

Pond 104P: Gravel Wetland #104 Peak Elev=91.71' Storage=1,886 cf Inflow=1.20 cfs 0.088 af
Outflow=0.10 cfs 0.054 af

Pond 105P: Infiltration Pond #105 Peak Elev=91.99' Storage=374 cf Inflow=0.49 cfs 0.041 af
Discarded=0.11 cfs 0.041 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.041 af

20-066 Proposed Conditions Analysis

Type III 24-hr 10 YR - 24 HR Rainfall=5.44"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 1S: Subcatchment #1	Runoff Area=21,574 sf 33.85% Impervious Runoff Depth>3.17" Flow Length=404' Tc=18.1 min CN=79 Runoff=1.29 cfs 0.131 af
Subcatchment 2S: Subcatchment #2	Runoff Area=17,079 sf 0.00% Impervious Runoff Depth>2.44" Flow Length=251' Tc=29.9 min CN=71 Runoff=0.63 cfs 0.080 af
Subcatchment 3S: Subcatchment #3	Runoff Area=37,818 sf 0.36% Impervious Runoff Depth>2.63" Flow Length=127' Tc=9.8 min CN=73 Runoff=2.31 cfs 0.190 af
Subcatchment 4S: Subcatchment #4	Runoff Area=5,487 sf 34.88% Impervious Runoff Depth>1.49" Flow Length=150' Tc=9.0 min CN=59 Runoff=0.18 cfs 0.016 af
Subcatchment 11S: Subcatchment #11	Runoff Area=105,633 sf 42.97% Impervious Runoff Depth>3.47" Flow Length=214' Tc=10.4 min CN=82 Runoff=8.41 cfs 0.701 af
Subcatchment 12S: Subcatchment #12	Runoff Area=60,942 sf 32.46% Impervious Runoff Depth>2.98" Flow Length=513' Tc=21.7 min CN=77 Runoff=3.19 cfs 0.348 af
Subcatchment 13S: Subcatchment #13	Runoff Area=73,726 sf 42.37% Impervious Runoff Depth>3.08" Flow Length=144' Tc=16.1 min CN=78 Runoff=4.50 cfs 0.434 af
Subcatchment 14S: Subcatchment #14	Runoff Area=29,122 sf 64.19% Impervious Runoff Depth>3.09" Tc=6.0 min CN=78 Runoff=2.37 cfs 0.172 af
Subcatchment 15S: Subcatchment #15	Runoff Area=3,609 sf 7.68% Impervious Runoff Depth>0.59" Tc=6.0 min CN=45 Runoff=0.03 cfs 0.004 af
Subcatchment 18S: Mixed Use Building	Runoff Area=7,390 sf 100.00% Impervious Runoff Depth>5.20" Tc=6.0 min CN=98 Runoff=0.88 cfs 0.074 af
Subcatchment 19S: Mixed Use Building	Runoff Area=6,193 sf 100.00% Impervious Runoff Depth>5.20" Tc=6.0 min CN=98 Runoff=0.74 cfs 0.062 af
Reach 100R: Final Reach 100	Inflow=1.39 cfs 0.652 af Outflow=1.39 cfs 0.652 af
Reach 200R: Final Reach 200	Inflow=0.78 cfs 0.350 af Outflow=0.78 cfs 0.350 af
Reach 300R: Final Reach 300	Inflow=2.31 cfs 0.190 af Outflow=2.31 cfs 0.190 af
Reach 400R: Final Reach 400	Inflow=0.73 cfs 0.151 af Outflow=0.73 cfs 0.151 af
Pond 4P: Pond 4	Peak Elev=89.78' Storage=27 cf Inflow=0.73 cfs 0.151 af 15.0" Round Culvert n=0.024 L=46.0' S=0.0300 ' Outflow=0.73 cfs 0.151 af

20-066 Proposed Conditions Analysis*Type III 24-hr 10 YR - 24 HR Rainfall=5.44"*

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Pond 101P: Gravel Wetland #101Peak Elev=93.34' Storage=22,429 cf Inflow=8.67 cfs 0.890 af
Primary=0.92 cfs 0.521 af Secondary=0.00 cfs 0.000 af Outflow=0.92 cfs 0.521 af**Pond 102AP: DMH #1**Peak Elev=94.32' Storage=21 cf Inflow=1.38 cfs 0.172 af
15.0" Round Culvert n=0.012 L=107.7' S=0.0056 ' /' Outflow=1.28 cfs 0.171 af**Pond 102P: Detention Pond #102**Peak Elev=93.82' Storage=6,586 cf Inflow=3.55 cfs 0.421 af
Primary=1.12 cfs 0.189 af Secondary=1.38 cfs 0.172 af Outflow=2.42 cfs 0.361 af**Pond 103P: Gravel Wetland #103**Peak Elev=94.31' Storage=15,083 cf Inflow=5.23 cfs 0.606 af
Primary=0.69 cfs 0.270 af Secondary=0.00 cfs 0.000 af Outflow=0.69 cfs 0.270 af**Pond 104P: Gravel Wetland #104**Peak Elev=92.03' Storage=3,035 cf Inflow=2.37 cfs 0.172 af
Outflow=0.65 cfs 0.135 af**Pond 105P: Infiltration Pond #105**Peak Elev=92.53' Storage=786 cf Inflow=0.76 cfs 0.066 af
Discarded=0.11 cfs 0.066 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.066 af

20-066 Proposed Conditions Analysis

Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 1S: Subcatchment #1	Runoff Area=21,574 sf 33.85% Impervious Runoff Depth>4.46" Flow Length=404' Tc=18.1 min CN=79 Runoff=1.81 cfs 0.184 af
Subcatchment 2S: Subcatchment #2	Runoff Area=17,079 sf 0.00% Impervious Runoff Depth>3.60" Flow Length=251' Tc=29.9 min CN=71 Runoff=0.94 cfs 0.118 af
Subcatchment 3S: Subcatchment #3	Runoff Area=37,818 sf 0.36% Impervious Runoff Depth>3.83" Flow Length=127' Tc=9.8 min CN=73 Runoff=3.38 cfs 0.277 af
Subcatchment 4S: Subcatchment #4	Runoff Area=5,487 sf 34.88% Impervious Runoff Depth>2.42" Flow Length=150' Tc=9.0 min CN=59 Runoff=0.30 cfs 0.025 af
Subcatchment 11S: Subcatchment #11	Runoff Area=105,633 sf 42.97% Impervious Runoff Depth>4.80" Flow Length=214' Tc=10.4 min CN=82 Runoff=11.51 cfs 0.969 af
Subcatchment 12S: Subcatchment #12	Runoff Area=60,942 sf 32.46% Impervious Runoff Depth>4.24" Flow Length=513' Tc=21.7 min CN=77 Runoff=4.53 cfs 0.494 af
Subcatchment 13S: Subcatchment #13	Runoff Area=73,726 sf 42.37% Impervious Runoff Depth>4.35" Flow Length=144' Tc=16.1 min CN=78 Runoff=6.34 cfs 0.614 af
Subcatchment 14S: Subcatchment #14	Runoff Area=29,122 sf 64.19% Impervious Runoff Depth>4.36" Tc=6.0 min CN=78 Runoff=3.34 cfs 0.243 af
Subcatchment 15S: Subcatchment #15	Runoff Area=3,609 sf 7.68% Impervious Runoff Depth>1.18" Tc=6.0 min CN=45 Runoff=0.08 cfs 0.008 af
Subcatchment 18S: Mixed Use Building	Runoff Area=7,390 sf 100.00% Impervious Runoff Depth>6.64" Tc=6.0 min CN=98 Runoff=1.12 cfs 0.094 af
Subcatchment 19S: Mixed Use Building	Runoff Area=6,193 sf 100.00% Impervious Runoff Depth>6.64" Tc=6.0 min CN=98 Runoff=0.94 cfs 0.079 af
Reach 100R: Final Reach 100	Inflow=2.70 cfs 1.059 af Outflow=2.70 cfs 1.059 af
Reach 200R: Final Reach 200	Inflow=3.16 cfs 0.628 af Outflow=3.16 cfs 0.628 af
Reach 300R: Final Reach 300	Inflow=3.38 cfs 0.277 af Outflow=3.38 cfs 0.277 af
Reach 400R: Final Reach 400	Inflow=1.37 cfs 0.230 af Outflow=1.37 cfs 0.230 af
Pond 4P: Pond 4	Peak Elev=89.94' Storage=60 cf Inflow=1.37 cfs 0.230 af 15.0" Round Culvert n=0.024 L=46.0' S=0.0300 ' Outflow=1.37 cfs 0.230 af

20-066 Proposed Conditions Analysis

Type III 24-hr 25 YR - 24 HR Rainfall=6.88"

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Pond 101P: Gravel Wetland #101 Peak Elev=93.54' Storage=27,948 cf Inflow=12.12 cfs 1.260 af
Primary=2.08 cfs 0.853 af Secondary=0.33 cfs 0.021 af Outflow=2.42 cfs 0.875 af

Pond 102AP: DMH #1 Peak Elev=94.66' Storage=25 cf Inflow=2.14 cfs 0.233 af
15.0" Round Culvert n=0.012 L=107.7' S=0.0056 '/ Outflow=1.97 cfs 0.234 af

Pond 102P: Detention Pond #102 Peak Elev=94.04' Storage=8,803 cf Inflow=4.99 cfs 0.588 af
Primary=1.94 cfs 0.291 af Secondary=2.14 cfs 0.233 af Outflow=3.87 cfs 0.524 af

Pond 103P: Gravel Wetland #103 Peak Elev=94.40' Storage=15,924 cf Inflow=7.29 cfs 0.848 af
Primary=2.51 cfs 0.511 af Secondary=0.00 cfs 0.000 af Outflow=2.51 cfs 0.511 af

Pond 104P: Gravel Wetland #104 Peak Elev=92.27' Storage=3,972 cf Inflow=3.34 cfs 0.243 af
Outflow=1.20 cfs 0.205 af

Pond 105P: Infiltration Pond #105 Peak Elev=93.00' Storage=1,148 cf Inflow=1.02 cfs 0.087 af
Discarded=0.19 cfs 0.087 af Primary=0.00 cfs 0.000 af Outflow=0.19 cfs 0.087 af

20-066 Proposed Conditions Analysis

Type III 24-hr 50 YR - 24 HR Rainfall=8.23"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 1S: Subcatchment #1	Runoff Area=21,574 sf 33.85% Impervious Runoff Depth>5.71" Flow Length=404' Tc=18.1 min CN=79 Runoff=2.30 cfs 0.235 af
Subcatchment 2S: Subcatchment #2	Runoff Area=17,079 sf 0.00% Impervious Runoff Depth>4.75" Flow Length=251' Tc=29.9 min CN=71 Runoff=1.24 cfs 0.155 af
Subcatchment 3S: Subcatchment #3	Runoff Area=37,818 sf 0.36% Impervious Runoff Depth>5.01" Flow Length=127' Tc=9.8 min CN=73 Runoff=4.42 cfs 0.362 af
Subcatchment 4S: Subcatchment #4	Runoff Area=5,487 sf 34.88% Impervious Runoff Depth>3.39" Flow Length=150' Tc=9.0 min CN=59 Runoff=0.44 cfs 0.036 af
Subcatchment 11S: Subcatchment #11	Runoff Area=105,633 sf 42.97% Impervious Runoff Depth>6.07" Flow Length=214' Tc=10.4 min CN=82 Runoff=14.43 cfs 1.226 af
Subcatchment 12S: Subcatchment #12	Runoff Area=60,942 sf 32.46% Impervious Runoff Depth>5.47" Flow Length=513' Tc=21.7 min CN=77 Runoff=5.81 cfs 0.637 af
Subcatchment 13S: Subcatchment #13	Runoff Area=73,726 sf 42.37% Impervious Runoff Depth>5.59" Flow Length=144' Tc=16.1 min CN=78 Runoff=8.10 cfs 0.788 af
Subcatchment 14S: Subcatchment #14	Runoff Area=29,122 sf 64.19% Impervious Runoff Depth>5.60" Tc=6.0 min CN=78 Runoff=4.25 cfs 0.312 af
Subcatchment 15S: Subcatchment #15	Runoff Area=3,609 sf 7.68% Impervious Runoff Depth>1.86" Tc=6.0 min CN=45 Runoff=0.15 cfs 0.013 af
Subcatchment 18S: Mixed Use Building	Runoff Area=7,390 sf 100.00% Impervious Runoff Depth>7.99" Tc=6.0 min CN=98 Runoff=1.34 cfs 0.113 af
Subcatchment 19S: Mixed Use Building	Runoff Area=6,193 sf 100.00% Impervious Runoff Depth>7.99" Tc=6.0 min CN=98 Runoff=1.12 cfs 0.095 af
Reach 100R: Final Reach 100	Inflow=6.62 cfs 1.459 af Outflow=6.62 cfs 1.459 af
Reach 200R: Final Reach 200	Inflow=5.83 cfs 0.895 af Outflow=5.83 cfs 0.895 af
Reach 300R: Final Reach 300	Inflow=4.42 cfs 0.362 af Outflow=4.42 cfs 0.362 af
Reach 400R: Final Reach 400	Inflow=1.87 cfs 0.309 af Outflow=1.87 cfs 0.309 af
Pond 4P: Pond 4	Peak Elev=90.05' Storage=93 cf Inflow=1.88 cfs 0.309 af 15.0" Round Culvert n=0.024 L=46.0' S=0.0300 ' Outflow=1.87 cfs 0.309 af

20-066 Proposed Conditions Analysis*Type III 24-hr 50 YR - 24 HR Rainfall=8.23"*

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Pond 101P: Gravel Wetland #101 Peak Elev=93.64' Storage=30,604 cf Inflow=15.40 cfs 1.621 af
Primary=3.73 cfs 1.098 af Secondary=1.79 cfs 0.125 af Outflow=5.52 cfs 1.223 af

Pond 102AP: DMH #1 Peak Elev=94.99' Storage=29 cf Inflow=2.87 cfs 0.288 af
15.0" Round Culvert n=0.012 L=107.7' S=0.0056 '/ Outflow=2.65 cfs 0.289 af

Pond 102P: Detention Pond #102 Peak Elev=94.20' Storage=10,603 cf Inflow=6.37 cfs 0.750 af
Primary=2.57 cfs 0.395 af Secondary=2.87 cfs 0.288 af Outflow=5.36 cfs 0.683 af

Pond 103P: Gravel Wetland #103 Peak Elev=94.56' Storage=17,411 cf Inflow=8.83 cfs 1.078 af
Primary=4.18 cfs 0.733 af Secondary=0.52 cfs 0.007 af Outflow=4.70 cfs 0.740 af

Pond 104P: Gravel Wetland #104 Peak Elev=92.48' Storage=4,908 cf Inflow=4.25 cfs 0.312 af
Outflow=1.59 cfs 0.273 af

Pond 105P: Infiltration Pond #105 Peak Elev=93.19' Storage=1,423 cf Inflow=1.27 cfs 0.107 af
Discarded=0.21 cfs 0.107 af Primary=0.00 cfs 0.000 af Outflow=0.21 cfs 0.107 af

20-066 Proposed Conditions Analysis

Type III 24-hr 100 YR - 24 HR Rainfall=9.84"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 1S: Subcatchment #1	Runoff Area=21,574 sf 33.85% Impervious Runoff Depth>7.22" Flow Length=404' Tc=18.1 min CN=79 Runoff=2.89 cfs 0.298 af
Subcatchment 2S: Subcatchment #2	Runoff Area=17,079 sf 0.00% Impervious Runoff Depth>6.18" Flow Length=251' Tc=29.9 min CN=71 Runoff=1.61 cfs 0.202 af
Subcatchment 3S: Subcatchment #3	Runoff Area=37,818 sf 0.36% Impervious Runoff Depth>6.46" Flow Length=127' Tc=9.8 min CN=73 Runoff=5.67 cfs 0.467 af
Subcatchment 4S: Subcatchment #4	Runoff Area=5,487 sf 34.88% Impervious Runoff Depth>4.63" Flow Length=150' Tc=9.0 min CN=59 Runoff=0.60 cfs 0.049 af
Subcatchment 11S: Subcatchment #11	Runoff Area=105,633 sf 42.97% Impervious Runoff Depth>7.61" Flow Length=214' Tc=10.4 min CN=82 Runoff=17.90 cfs 1.538 af
Subcatchment 12S: Subcatchment #12	Runoff Area=60,942 sf 32.46% Impervious Runoff Depth>6.96" Flow Length=513' Tc=21.7 min CN=77 Runoff=7.35 cfs 0.811 af
Subcatchment 13S: Subcatchment #13	Runoff Area=73,726 sf 42.37% Impervious Runoff Depth>7.10" Flow Length=144' Tc=16.1 min CN=78 Runoff=10.20 cfs 1.001 af
Subcatchment 14S: Subcatchment #14	Runoff Area=29,122 sf 64.19% Impervious Runoff Depth>7.11" Tc=6.0 min CN=78 Runoff=5.34 cfs 0.396 af
Subcatchment 15S: Subcatchment #15	Runoff Area=3,609 sf 7.68% Impervious Runoff Depth>2.78" Tc=6.0 min CN=45 Runoff=0.25 cfs 0.019 af
Subcatchment 18S: Mixed Use Building	Runoff Area=7,390 sf 100.00% Impervious Runoff Depth>9.59" Tc=6.0 min CN=98 Runoff=1.60 cfs 0.136 af
Subcatchment 19S: Mixed Use Building	Runoff Area=6,193 sf 100.00% Impervious Runoff Depth>9.59" Tc=6.0 min CN=98 Runoff=1.34 cfs 0.114 af
Reach 100R: Final Reach 100	Inflow=10.85 cfs 1.955 af Outflow=10.85 cfs 1.955 af
Reach 200R: Final Reach 200	Inflow=9.73 cfs 1.212 af Outflow=9.73 cfs 1.212 af
Reach 300R: Final Reach 300	Inflow=5.67 cfs 0.467 af Outflow=5.67 cfs 0.467 af
Reach 400R: Final Reach 400	Inflow=2.42 cfs 0.405 af Outflow=2.42 cfs 0.405 af
Pond 4P: Pond 4	Peak Elev=90.16' Storage=128 cf Inflow=2.41 cfs 0.405 af 15.0" Round Culvert n=0.024 L=46.0' S=0.0300 ' Outflow=2.42 cfs 0.405 af

20-066 Proposed Conditions Analysis*Type III 24-hr 100 YR - 24 HR Rainfall=9.84"*

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Pond 101P: Gravel Wetland #101 Peak Elev=93.77' Storage=34,503 cf Inflow=19.47 cfs 2.069 af
Primary=4.08 cfs 1.310 af Secondary=4.98 cfs 0.347 af Outflow=9.06 cfs 1.657 af

Pond 102AP: DMH #1 Peak Elev=95.34' Storage=33 cf Inflow=3.65 cfs 0.346 af
15.0" Round Culvert n=0.012 L=107.7' S=0.0056 '/ Outflow=3.32 cfs 0.348 af

Pond 102P: Detention Pond #102 Peak Elev=94.40' Storage=12,815 cf Inflow=8.02 cfs 0.947 af
Primary=3.42 cfs 0.531 af Secondary=3.65 cfs 0.346 af Outflow=7.00 cfs 0.877 af

Pond 103P: Gravel Wetland #103 Peak Elev=94.72' Storage=18,974 cf Inflow=11.49 cfs 1.348 af
Primary=4.35 cfs 0.907 af Secondary=3.77 cfs 0.103 af Outflow=8.12 cfs 1.010 af

Pond 104P: Gravel Wetland #104 Peak Elev=92.77' Storage=6,020 cf Inflow=5.34 cfs 0.396 af
Outflow=2.06 cfs 0.356 af

Pond 105P: Infiltration Pond #105 Peak Elev=93.47' Storage=1,880 cf Inflow=1.58 cfs 0.133 af
Discarded=0.23 cfs 0.133 af Primary=0.00 cfs 0.000 af Outflow=0.23 cfs 0.133 af

Extreme Precipitation Tables

Northeast Regional Climate Center

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

Smoothing	Yes
State	New Hampshire
Location	
Longitude	70.911 degrees West
Latitude	43.178 degrees North
Elevation	0 feet
Date/Time	Thu, 29 Oct 2020 14:25:29 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.40	0.50	0.65	0.81	1.03	1yr	0.70	0.98	1.20	1.54	1.99	2.60	2.85	1yr	2.30	2.74	3.14	3.87	4.44	1yr
2yr	0.32	0.49	0.61	0.81	1.01	1.28	2yr	0.87	1.17	1.50	1.91	2.44	3.13	3.48	2yr	2.77	3.35	3.84	4.57	5.21	2yr
5yr	0.37	0.57	0.72	0.96	1.23	1.58	5yr	1.06	1.44	1.85	2.38	3.06	3.96	4.46	5yr	3.50	4.29	4.90	5.78	6.54	5yr
10yr	0.40	0.63	0.80	1.09	1.41	1.84	10yr	1.22	1.69	2.17	2.82	3.65	4.73	5.38	10yr	4.19	5.17	5.90	6.90	7.77	10yr
25yr	0.46	0.73	0.94	1.29	1.72	2.26	25yr	1.48	2.09	2.69	3.51	4.59	5.98	6.90	25yr	5.30	6.64	7.54	8.73	9.76	25yr
50yr	0.51	0.82	1.06	1.48	1.99	2.65	50yr	1.72	2.45	3.17	4.17	5.47	7.16	8.33	50yr	6.33	8.01	9.08	10.43	11.61	50yr
100yr	0.58	0.93	1.20	1.70	2.31	3.11	100yr	1.99	2.88	3.73	4.94	6.51	8.56	10.07	100yr	7.57	9.68	10.94	12.47	13.81	100yr
200yr	0.64	1.04	1.35	1.94	2.69	3.65	200yr	2.32	3.39	4.41	5.87	7.77	10.24	12.17	200yr	9.06	11.70	13.18	14.91	16.44	200yr
500yr	0.75	1.24	1.61	2.34	3.28	4.51	500yr	2.83	4.20	5.47	7.34	9.79	12.98	15.64	500yr	11.49	15.04	16.87	18.91	20.72	500yr

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.24	0.37	0.45	0.60	0.74	0.90	1yr	0.64	0.88	0.91	1.25	1.55	2.04	2.48	1yr	1.81	2.38	2.92	3.35	4.05	1yr
2yr	0.31	0.49	0.60	0.81	1.00	1.18	2yr	0.86	1.16	1.36	1.83	2.36	3.04	3.38	2yr	2.69	3.25	3.73	4.45	5.06	2yr
5yr	0.35	0.54	0.67	0.91	1.16	1.40	5yr	1.00	1.37	1.61	2.15	2.78	3.70	4.11	5yr	3.27	3.96	4.58	5.40	6.10	5yr
10yr	0.38	0.59	0.73	1.02	1.32	1.60	10yr	1.14	1.57	1.82	2.45	3.14	4.26	4.78	10yr	3.77	4.59	5.31	6.24	7.01	10yr
25yr	0.44	0.67	0.83	1.18	1.55	1.91	25yr	1.34	1.87	2.11	2.85	3.67	5.04	5.79	25yr	4.46	5.57	6.48	7.56	8.43	25yr
50yr	0.48	0.73	0.91	1.31	1.77	2.19	50yr	1.53	2.14	2.36	3.21	4.12	5.78	6.69	50yr	5.11	6.44	7.53	8.74	9.68	50yr
100yr	0.54	0.81	1.02	1.47	2.02	2.51	100yr	1.74	2.46	2.64	3.59	4.61	6.61	7.73	100yr	5.85	7.43	8.76	10.09	11.08	100yr
200yr	0.60	0.90	1.14	1.65	2.30	2.88	200yr	1.99	2.81	2.93	4.02	5.16	7.57	8.93	200yr	6.70	8.58	10.19	11.67	12.72	200yr
500yr	0.70	1.04	1.34	1.94	2.77	3.47	500yr	2.39	3.39	3.40	4.67	6.01	9.01	10.78	500yr	7.97	10.37	12.44	14.15	15.20	500yr

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.71	0.87	1.08	1yr	0.75	1.05	1.23	1.74	2.21	2.83	3.05	1yr	2.50	2.93	3.37	4.17	4.76	1yr
2yr	0.33	0.51	0.62	0.84	1.04	1.24	2yr	0.90	1.22	1.48	1.95	2.50	3.25	3.59	2yr	2.87	3.45	3.96	4.72	5.39	2yr
5yr	0.39	0.60	0.75	1.03	1.31	1.58	5yr	1.13	1.54	1.85	2.49	3.19	4.22	4.80	5yr	3.73	4.61	5.23	6.17	6.94	5yr
10yr	0.46	0.70	0.87	1.21	1.57	1.92	10yr	1.35	1.87	2.23	3.04	3.84	5.19	5.98	10yr	4.59	5.75	6.55	7.58	8.46	10yr
25yr	0.55	0.84	1.05	1.49	1.96	2.47	25yr	1.69	2.41	2.87	3.95	4.92	6.93	8.02	25yr	6.13	7.71	8.73	9.96	11.02	25yr
50yr	0.64	0.97	1.21	1.74	2.34	2.98	50yr	2.02	2.91	3.48	4.80	5.97	8.55	10.03	50yr	7.57	9.64	10.87	12.25	13.47	50yr
100yr	0.74	1.12	1.40	2.03	2.78	3.59	100yr	2.40	3.51	4.21	5.87	7.24	10.55	12.55	100yr	9.34	12.07	13.52	15.08	16.47	100yr
200yr	0.86	1.29	1.63	2.37	3.30	4.35	200yr	2.85	4.26	5.12	7.18	8.78	13.06	15.72	200yr	11.56	15.11	16.83	18.54	20.18	200yr
500yr	1.05	1.56	2.00	2.91	4.13	5.59	500yr	3.57	5.46	6.61	9.39	11.34	17.35	21.17	500yr	15.36	20.36	22.49	24.42	26.41	500yr

RIP RAP CALCULATIONS

20-066 McCrone Place

Dover, NH

Berry Surveying & Engineering

335 Second Crown Point Road

Barrington, NH

22-Jan-20

Rip Rap equations were obtained from the *Stormwater Management and Erosion Control Handbook for Urban and Developing Areas in New Hampshire*. Rip Rap was sized for the 25 year storm event. (Some d50 sizes and T values have been modified)

TAILWATER < HALF THE Do

$La = (1.8 \times Q) / Do^{3/2} + (7 \times Do)$ Q = Peak Flow & Do is Pipe Diameter

$W = La + 3 \times Do$ or defined channel width

$d50 = (0.02 \times Q^{4/3}) / (Tw \times Do)$ Tw = Tailwater Depth

$T = \text{Largest Stone Size} \times 1.5$

Culvert or Catch Basin	Tailwater (Feet) Tw	Discharge (C.F.S.) Q	Diameter of Pipe Do	Length of Rip Rap La (feet)	Width of Rip Rap W (feet)	d50-Stone Rip Rap $d50(ft.)$	Actual Size	Thickness
---------------------------	-----------------------------	------------------------------	-----------------------------	-------------------------------------	-----------------------------------	------------------------------------	----------------	-----------

12" HDPE (Pond #101P)	0.20	1.55	1.00	9.8	12.8	0.18	0.50	1.20
15" HDPE (Pond #102P)	0.25	1.12	1.25	10.2	13.9	0.07	0.50	1.20
15" HDPE (Pond #102AP)	0.25	2.77	1.25	12.3	16.1	0.25	0.50	1.20
12" HDPE (Pond #103P)	0.20	2.98	1.00	12.4	15.4	0.43	0.50	1.20
12" HDPE (Pond #104)	0.20	1.20	1.00	9.2	12.2	0.13	0.50	1.20

Please note that the designer chose to use the 25 Year Event for the dimensional calculations.

Table 7-24 -- Recommended Rip Rap Gradation Ranges				
d50 Size =	0.5	Feet	6	Inches
% of Weight Smaller Than the Given d50 Size	Size of Stone (Inches)			
	From		To	
100%	9		12	
50%	6		9	
50%	6		9	
15%	2		3	



GRAVEL WETLAND DESIGN CRITERIA

(Env-Wq 1508.05)

Type/Node Name: **Gravel Wetland #101**

Enter the node name in the drainage analysis if applicable

4.22	ac	A = Area draining to the practice	
1.80	ac	A_I = Impervious area draining to the practice	
0.43	decimal	I = percent impervious area draining to the practice, in decimal form	
0.43	unitless	R_v = Runoff coefficient = $0.05 + (0.9 \times I)$	
1.83	ac-in	$WQV = 1'' \times R_v \times A$	
6,647	cf	WQV conversion (ac-in $\times$ 43,560 sf/ac $\times$ 1 ft/12")	
665	cf	10% $\times$ WQV (check calc for sediment forebay and micropool volume)	
2,991	cf	45% $\times$ WQV (check calc for gravel wetland treatment bay volume)	
27,755	cf	V_{SED} = sediment forebay volume	← $\geq 10\%WQV$
23,573	cf	V_{TB1} = volume of treatment bay 1 ¹	← $\geq 45\%WQV$
-	cf	V_{TB2} = volume of treatment bay 2 ¹	← $\geq 45\%WQV$
92.66	ft	E_{WQV} = elevation of WQV (attach stage-storage table)	
0.07	cfs	Q_{WQV} = discharge at the E_{WQV} (attach stage-discharge table)	← $< 2Q_{avg}$
52.75	hours	T_{ED} = drawdown time of extended detention = $2WQV/Q_{WQV}$	← $\geq 24\text{-hrs}$
3.00	:1	Pond side slopes	← $\geq 3:1$
89.83	ft	Elevation of SHWT	
92.10	ft	E_{pp} = Elevation of the permanent pool (elevation of lowest orifice) ²	← $\leq E_{SHWT} - 2 \text{ ft}$
30.00	ft	Length of the flow path between the inlet and outlet in each cell	← $\geq 15 \text{ ft}$
Angle Grate		What mechanism is proposed to prevent the outlet structure from clogging (applicable for orifices/weirs with a dimension of $\leq 6''$)?	
93.64	ft	Peak elevation of the 50-year storm event (E_{50})	
94.00	ft	Berm elevation of the pond	
YES		$E_{50} \leq$ the berm elevation?	← yes
Qualified professional that developed the planting plan: Name, Profession:			

1. Volume stored above the wetland soil and below the high flow by-pass.
2. 4" to 8" below the wetland soil. If lowest orifice is less than 2 feet below SHWT, and saturated hydraulic conductivity (K_{sat}) is greater than 0.015 in/hr, the system must be lined.

Designer's Notes:

Single cell gravel wetland with a 30' flow path between the inlet and outlet.

20-066 Proposed Conditions Analysis

Prepared by Berry Surveying & Engineering

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Type III 24-hr 50 YR - 24 HR Rainfall=8.23"

Printed 1/25/2021

Stage-Area-Storage for Pond 101P: Gravel Wetland #101

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
92.10	0	93.14	17,232	94.18	43,741
92.12	0	93.16	17,724	94.20	43,927
92.14	1	93.18	18,220	94.22	44,113
92.16	1	93.20	18,720	94.24	44,299
92.18	1	93.22	19,223	94.26	44,485
92.20	1	93.24	19,730	94.28	44,671
92.22	2	93.26	20,242	94.30	44,856
92.24	2	93.28	20,757	94.32	45,042
92.26	146	93.30	21,276	94.34	45,228
92.28	437	93.32	21,799	94.36	45,413
92.30	732	93.34	22,326	94.38	45,599
92.32	1,031	93.36	22,857	94.40	45,785
92.34	1,335	93.38	23,393	94.42	45,970
92.36	1,642	93.40	23,932	94.44	46,156
92.38	1,953	93.42	24,475	94.46	46,342
92.40	2,269	93.44	25,022	94.48	46,527
92.42	2,589	93.46	25,574	94.50	46,713
92.44	2,913	93.48	26,129	94.52	46,899
92.46	3,242	93.50	26,689	94.54	47,084
92.48	3,574	93.52	27,252	94.56	47,270
92.50	3,912	93.54	27,820	94.58	47,456
92.52	4,253	93.56	28,392	94.60	47,641
92.54	4,599	93.58	28,968	94.62	47,827
92.56	4,950	93.60	29,549	94.64	48,013
92.58	5,305	93.62	30,133	94.66	48,198
92.60	5,665	93.64	30,722	94.68	48,384
92.62	6,029	93.66	31,316	94.70	48,569
92.64	6,399	93.68	31,913	94.72	48,755
6647CF → 92.66	6,773	93.70	32,515	94.74	48,941
92.68	7,151	93.72	33,121	94.76	49,126
92.70	7,535	93.74	33,731	94.78	49,312
92.72	7,923	93.76	34,346	94.80	49,498
92.74	8,316	93.78	34,965	94.82	49,683
92.76	8,715	93.80	35,588	94.84	49,869
92.78	9,118	93.82	36,216	94.86	50,055
92.80	9,526	93.84	36,849	94.88	50,240
92.82	9,939	93.86	37,485	94.90	50,426
92.84	10,358	93.88	38,127	94.92	50,612
92.86	10,781	93.90	38,772	94.94	50,797
92.88	11,210	93.92	39,422	94.96	50,983
92.90	11,644	93.94	40,077	94.98	51,169
92.92	12,084	93.96	40,736	95.00	51,354
92.94	12,528	93.98	41,400		
92.96	12,978	94.00	42,068		
92.98	13,434	94.02	42,254		
93.00	13,895	94.04	42,440		
93.02	14,360	94.06	42,626		
93.04	14,830	94.08	42,812		
93.06	15,303	94.10	42,998		
93.08	15,779	94.12	43,184		
93.10	16,260	94.14	43,370		
93.12	16,744	94.16	43,556		

20-066 Proposed Conditions Analysis

Prepared by Berry Surveying & Engineering

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Type III 24-hr 50 YR - 24 HR Rainfall=8.23"

Printed 1/25/2021

Stage-Discharge for Pond 101P: Gravel Wetland #101

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)	Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
92.10	0.00	0.00	0.00	94.70	58.13	5.48	52.65
92.15	0.00	0.00	0.00	94.75	61.41	5.55	55.87
92.20	0.01	0.01	0.00	94.80	64.75	5.61	59.14
92.25	0.03	0.03	0.00	94.85	68.14	5.67	62.47
92.30	0.04	0.04	0.00	94.90	71.58	5.74	65.85
92.35	0.04	0.04	0.00	94.95	75.27	5.80	69.47
92.40	0.05	0.05	0.00	95.00	79.02	5.86	73.16
92.45	0.05	0.05	0.00				
92.50	0.06	0.06	0.00				
92.55	0.06	0.06	0.00				
92.60	0.07	0.07	0.00				
92.65	0.07	0.07	0.00				
92.70	0.08	0.08	0.00				
92.75	0.08	0.08	0.00				
92.80	0.08	0.08	0.00				
92.85	0.09	0.09	0.00				
92.90	0.09	0.09	0.00				
92.95	0.09	0.09	0.00				
93.00	0.09	0.09	0.00				
93.05	0.14	0.14	0.00				
93.10	0.23	0.23	0.00				
93.15	0.34	0.34	0.00				
93.20	0.46	0.46	0.00				
93.25	0.61	0.61	0.00				
93.30	0.77	0.77	0.00				
93.35	0.94	0.94	0.00				
93.40	1.13	1.13	0.00				
93.45	1.33	1.33	0.00				
93.50	1.54	1.54	0.00				
93.55	2.57	2.17	0.40				
93.60	4.29	3.16	1.13				
93.65	5.85	3.77	2.07				
93.70	7.11	3.92	3.19				
93.75	8.59	4.05	4.54				
93.80	10.21	4.14	6.06				
93.85	11.99	4.23	7.76				
93.90	13.95	4.31	9.64				
93.95	16.06	4.39	11.67				
94.00	18.34	4.47	13.87				
94.05	20.78	4.55	16.23				
94.10	23.38	4.63	18.75				
94.15	25.83	4.71	21.13				
94.20	28.37	4.78	23.59				
94.25	30.99	4.86	26.14				
94.30	33.70	4.93	28.76				
94.35	36.48	5.00	31.47				
94.40	39.33	5.07	34.26				
94.45	42.26	5.14	37.12				
94.50	45.26	5.21	40.05				
94.55	48.37	5.28	43.09				
94.60	51.55	5.35	46.21				
94.65	54.81	5.41	49.39				

42.66 →

GRAVEL WETLAND DESIGN CRITERIA (Env-Wq 1508.05)

Type/Node Name: Gravel Wetland #103

Enter the node name in the drainage analysis if applicable

1.70	ac	A = Area draining to the practice	
0.72	ac	A _I = Impervious area draining to the practice	
0.42	decimal	I = percent impervious area draining to the practice, in decimal form	
0.43	unitless	R _v = Runoff coefficient = 0.05 + (0.9 x I)	
0.73	ac-in	WQV = 1" x R _v x A	
2,651	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
265	cf	10% x WQV (check calc for sediment forebay and micropool volume)	
1,193	cf	45% x WQV (check calc for gravel wetland treatment bay volume)	
4,839	cf	V _{SED} = sediment forebay volume	← ≥ 10%WQV
7,445	cf	V _{TB1} = volume of treatment bay 1 ¹	← ≥ 45%WQV
	cf	V _{TB2} = volume of treatment bay 2 ¹	← ≥ 45%WQV
92.68	ft	E _{WQV} = elevation of WQV (attach stage-storage table)	
0.04	cfs	Q _{WQV} = discharge at the E _{WQV} (attach stage-discharge table)	← <2Q _{avg}
36.82	hours	T _{ED} = drawdown time of extended detention = 2WQV/Q _{WQV}	← ≥ 24-hrs
3.00	:1	Pond side slopes	← ≥3:1
93.75	ft	Elevation of SHWT	
92.10	ft	E _{pp} = Elevation of the permanent pool (elevation of lowest orifice) ²	← ≤ E _{SHWT} - 2 ft
30.00	ft	Length of the flow path between the inlet and outlet in each cell	← ≥ 15 ft
Angle Grate		What mechanism is proposed to prevent the outlet structure from clogging (applicable for orifices/weirs with a dimension of ≤6")?	
94.56	ft	Peak elevation of the 50-year storm event (E ₅₀)	
95.00	ft	Berm elevation of the pond	
YES		E ₅₀ ≤ the berm elevation?	← yes
Qualified professional that developed the planting plan:			
Name, Profession:			

1. Volume stored above the wetland soil and below the high flow by-pass.
2. 4" to 8" below the wetland soil. If lowest orifice is less than 2 feet below SHWT, and saturated hydraulic conductivity (Ksat) is greater than 0.015 in/hr, the system must be lined.

Designer's Notes:

Single cell gravel wetland with a 30' flow path.

20-066 Proposed Conditions Analysis

Prepared by Berry Surveying & Engineering

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Type III 24-hr 50 YR - 24 HR Rainfall=8.23"

Printed 1/25/2021

Stage-Area-Storage for Pond 103P: Gravel Wetland #103

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
92.10	0	94.70	18,757
92.15	1	94.75	19,243
92.20	1	94.80	19,733
92.25	2	94.85	20,226
92.30	297	94.90	20,723
92.35	595	94.95	21,223
92.40	895	95.00	21,727
92.45	1,199	95.05	21,727
92.50	1,506	95.10	21,728
92.55	1,815	95.15	21,729
92.60	2,128	95.20	21,729
92.65	2,444	95.25	21,730
92.70	2,763		
92.75	3,084		
92.80	3,409		
92.85	3,738		
92.90	4,069		
92.95	4,403		
93.00	4,740		
93.05	5,081		
93.10	5,426		
93.15	5,775		
93.20	6,127		
93.25	6,483		
93.30	6,844		
93.35	7,208		
93.40	7,576		
93.45	7,948		
93.50	8,324		
93.55	8,704		
93.60	9,088		
93.65	9,476		
93.70	9,868		
93.75	10,264		
93.80	10,665		
93.85	11,069		
93.90	11,478		
93.95	11,891		
94.00	12,308		
94.05	12,747		
94.10	13,189		
94.15	13,634		
94.20	14,083		
94.25	14,535		
94.30	14,990		
94.35	15,449		
94.40	15,912		
94.45	16,377		
94.50	16,846		
94.55	17,319		
94.60	17,794		
94.65	18,274		

92.68 →

20-066 Proposed Conditions Analysis

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Type III 24-hr 50 YR - 24 HR Rainfall=8.23"

Printed 1/25/2021

Stage-Discharge for Pond 103P: Gravel Wetland #103

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)	Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
92.10	0.00	0.00	0.00	94.70	7.52	4.33	3.19
92.15	0.00	0.00	0.00	94.75	8.92	4.38	4.54
92.20	0.01	0.01	0.00	94.80	10.49	4.43	6.06
92.25	0.02	0.02	0.00	94.85	12.24	4.48	7.76
92.30	0.02	0.02	0.00	94.90	14.17	4.53	9.64
92.35	0.03	0.03	0.00	94.95	16.25	4.58	11.67
92.40	0.03	0.03	0.00	95.00	18.49	4.63	13.87
92.45	0.03	0.03	0.00	95.05	20.90	4.67	16.23
92.50	0.03	0.03	0.00	95.10	23.47	4.72	18.75
92.55	0.04	0.04	0.00	95.15	25.89	4.77	21.13
92.60	0.04	0.04	0.00	95.20	28.40	4.81	23.59
92.65	0.04	0.04	0.00	95.25	31.00	4.86	26.14
92.70	0.04	0.04	0.00				
92.75	0.05	0.05	0.00				
92.80	0.05	0.05	0.00				
92.85	0.05	0.05	0.00				
92.90	0.05	0.05	0.00				
92.95	0.05	0.05	0.00				
93.00	0.05	0.05	0.00				
93.05	0.06	0.06	0.00				
93.10	0.06	0.06	0.00				
93.15	0.06	0.06	0.00				
93.20	0.06	0.06	0.00				
93.25	0.06	0.06	0.00				
93.30	0.06	0.06	0.00				
93.35	0.06	0.06	0.00				
93.40	0.07	0.07	0.00				
93.45	0.07	0.07	0.00				
93.50	0.07	0.07	0.00				
93.55	0.07	0.07	0.00				
93.60	0.07	0.07	0.00				
93.65	0.07	0.07	0.00				
93.70	0.07	0.07	0.00				
93.75	0.07	0.07	0.00				
93.80	0.08	0.08	0.00				
93.85	0.08	0.08	0.00				
93.90	0.08	0.08	0.00				
93.95	0.08	0.08	0.00				
94.00	0.08	0.08	0.00				
94.05	0.08	0.08	0.00				
94.10	0.08	0.08	0.00				
94.15	0.08	0.08	0.00				
94.20	0.08	0.08	0.00				
94.25	0.09	0.09	0.00				
94.30	0.55	0.55	0.00				
94.35	1.39	1.39	0.00				
94.40	2.48	2.48	0.00				
94.45	3.76	3.76	0.00				
94.50	4.12	4.12	0.00				
94.55	4.57	4.17	0.40				
94.60	5.35	4.22	1.13				
94.65	6.35	4.27	2.07				

92.68 →

GRAVEL WETLAND DESIGN CRITERIA (Env-Wq 1508.05)

Type/Node Name: Gravel Wetland #104

Enter the node name in the drainage analysis if applicable

0.67	ac	A = Area draining to the practice	
0.43	ac	A _I = Impervious area draining to the practice	
0.64	decimal	I = percent impervious area draining to the practice, in decimal form	
0.63	unitless	R _v = Runoff coefficient = 0.05 + (0.9 x I)	
0.42	ac-in	WQV = 1" x R _v x A	
1,526	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
153	cf	10% x WQV (check calc for sediment forebay and micropool volume)	
687	cf	45% x WQV (check calc for gravel wetland treatment bay volume)	
1,537	cf	V _{SED} = sediment forebay volume	← ≥ 10%WQV
903	cf	V _{TB1} = volume of treatment bay 1 ¹	← ≥ 45%WQV
1,078	cf	V _{TB2} = volume of treatment bay 2 ¹	← ≥ 45%WQV
91.59	ft	E _{WQV} = elevation of WQV (attach stage-storage table)	
0.03	cfs	Q _{WQV} = discharge at the E _{WQV} (attach stage-discharge table)	← <2Q _{avg}
28.26	hours	T _{ED} = drawdown time of extended detention = 2WQV/Q _{WQV}	← ≥ 24-hrs
3.00	:1	Pond side slopes	← ≥3:1
90.00	ft	Elevation of SHWT	
90.33	ft	E _{pp} = Elevation of the permanent pool (elevation of lowest orifice) ²	← ≤ E _{SHWT} - 2 ft
52&79	ft	Length of the flow path between the inlet and outlet in each cell	← ≥ 15 ft
Angle Grate		What mechanism is proposed to prevent the outlet structure from clogging (applicable for orifices/weirs with a dimension of ≤6")?	
92.48	ft	Peak elevation of the 50-year storm event (E ₅₀)	
93.00	ft	Berm elevation of the pond	
YES		E ₅₀ ≤ the berm elevation?	← yes
Qualified professional that developed the planting plan:			
Name, Profession:			

1. Volume stored above the wetland soil and below the high flow by-pass.
2. 4" to 8" below the wetland soil. If lowest orifice is less than 2 feet below SHWT, and saturated hydraulic conductivity (Ksat) is greater than 0.015 in/hr, the system must be lined.

Designer's Notes:

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper appears to be a standard notebook page.

20-066 Proposed Conditions Analysis

Prepared by Berry Surveying & Engineering

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Type III 24-hr 50 YR - 24 HR Rainfall=8.23"

Printed 1/25/2021

Stage-Area-Storage for Pond 104P: Gravel Wetland #104

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
90.33	0	92.93	6,805
90.38	1	92.98	7,070
90.43	1	93.03	7,181
90.48	2	93.08	7,181
90.53	3	93.13	7,182
90.58	3	93.18	7,183
90.63	4	93.23	7,183
90.68	4	93.28	7,184
90.73	5	93.33	7,184
90.78	6	93.38	7,185
90.83	6	93.43	7,186
90.88	7	93.48	7,186
90.93	8	93.53	7,187
90.98	8	93.58	7,188
91.03	73	93.63	7,188
91.08	184	93.68	7,189
91.13	298	93.73	7,190
91.18	416		
91.23	537		
91.28	663		
91.33	791		
91.38	924		
91.43	1,060		
91.48	1,201		
91.53	1,345		
91.58	1,493		
91.63	1,645		
91.68	1,802		
91.73	1,962		
91.78	2,127		
91.83	2,296		
91.88	2,469		
91.93	2,647		
91.98	2,829		
92.03	3,019		
92.08	3,214		
92.13	3,413		
92.18	3,617		
92.23	3,824		
92.28	4,035		
92.33	4,251		
92.38	4,470		
92.43	4,694		
92.48	4,922		
92.53	5,112		
92.58	5,285		
92.63	5,468		
92.68	5,662		
92.73	5,867		
92.78	6,083		
92.83	6,312		
92.88	6,552		

91.58 →

20-066 Proposed Conditions Analysis

Prepared by Berry Surveying & Engineering

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Type III 24-hr 50 YR - 24 HR Rainfall=8.23"

Printed 1/25/2021

Stage-Discharge for Pond 104P: Gravel Wetland #104

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
90.33	0.00	91.37	0.03	92.41	1.48	93.45	4.83
90.35	0.00	91.39	0.03	92.43	1.51	93.47	4.85
90.37	0.00	91.41	0.03	92.45	1.55	93.49	4.87
90.39	0.00	91.43	0.03	92.47	1.58	93.51	4.89
90.41	0.01	91.45	0.03	92.49	1.61	93.53	4.91
90.43	0.01	91.47	0.03	92.51	1.64	93.55	4.92
90.45	0.01	91.49	0.03	92.53	1.67	93.57	4.94
90.47	0.01	91.51	0.03	92.55	1.70	93.59	4.96
90.49	0.01	91.53	0.03	92.57	1.73	93.61	4.98
90.51	0.01	91.55	0.03	92.59	1.75	93.63	5.00
90.53	0.01	91.57	0.03	92.61	1.78	93.65	5.01
90.55	0.01	→ 91.59	0.03	92.63	1.81	93.67	5.03
90.57	0.01	91.61	0.03	92.65	1.83	93.69	5.05
90.59	0.01	91.63	0.04	92.67	1.86	93.71	5.07
90.61	0.01	91.65	0.05	92.69	1.89	93.73	5.08
90.63	0.01	91.67	0.07	92.71	1.91	93.75	5.10
90.65	0.01	91.69	0.09	92.73	1.94		
90.67	0.01	91.71	0.11	92.75	1.96		
90.69	0.01	91.73	0.13	92.77	2.10		
90.71	0.02	91.75	0.16	92.79	2.34		
90.73	0.02	91.77	0.18	92.81	2.64		
90.75	0.02	91.79	0.21	92.83	2.99		
90.77	0.02	91.81	0.24	92.85	3.38		
90.79	0.02	91.83	0.27	92.87	3.81		
90.81	0.02	91.85	0.30	92.89	4.28		
90.83	0.02	91.87	0.33	92.91	4.31		
90.85	0.02	91.89	0.37	92.93	4.33		
90.87	0.02	91.91	0.40	92.95	4.35		
90.89	0.02	91.93	0.44	92.97	4.37		
90.91	0.02	91.95	0.48	92.99	4.39		
90.93	0.02	91.97	0.51	93.01	4.41		
90.95	0.02	91.99	0.55	93.03	4.43		
90.97	0.02	92.01	0.60	93.05	4.45		
90.99	0.02	92.03	0.64	93.07	4.47		
91.01	0.02	92.05	0.68	93.09	4.49		
91.03	0.02	92.07	0.72	93.11	4.51		
91.05	0.02	92.09	0.77	93.13	4.53		
91.07	0.02	92.11	0.81	93.15	4.55		
91.09	0.02	92.13	0.86	93.17	4.57		
91.11	0.02	92.15	0.91	93.19	4.59		
91.13	0.02	92.17	0.96	93.21	4.61		
91.15	0.02	92.19	1.01	93.23	4.63		
91.17	0.02	92.21	1.06	93.25	4.64		
91.19	0.02	92.23	1.11	93.27	4.66		
91.21	0.02	92.25	1.16	93.29	4.68		
91.23	0.02	92.27	1.21	93.31	4.70		
91.25	0.02	92.29	1.26	93.33	4.72		
91.27	0.02	92.31	1.30	93.35	4.74		
91.29	0.03	92.33	1.34	93.37	4.76		
91.31	0.03	92.35	1.38	93.39	4.78		
91.33	0.03	92.37	1.41	93.41	4.80		
91.35	0.03	92.39	1.45	93.43	4.81		



INFILTRATION PRACTICE CRITERIA (Env-Wq 1508.06)

Type/Node Name: **Infiltration Pond #105**

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?	
0.23	ac	A = Area draining to the practice	
0.15	ac	A _I = Impervious area draining to the practice	
0.65	decimal	I = percent impervious area draining to the practice, in decimal form	
0.64	unitless	R _v = Runoff coefficient = 0.05 + (0.9 x I)	
0.15	ac-in	WQV = 1" x R _v x A	
532	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
133	cf	25% x WQV (check calc for sediment forebay volume)	
	Clean	Method of pretreatment? (not required for clean or roof runoff)	
NA	cf	V _{SED} = sediment forebay volume, if used for pretreatment	← ≥ 25%WQV
1,940	cf	V = volume ¹ (attach a stage-storage table)	← ≥ WQV
420	sf	A _{SA} = surface area of the bottom of the pond	
3.00	iph	K _{sat} _{DESIGN} = design infiltration rate ²	
5.1	hours	T _{DRAIN} = drain time = V / (A _{SA} * I _{DESIGN})	← ≤ 72-hrs
91.50	feet	E _{BTM} = elevation of the bottom of the basin	
90.00	feet	E _{SHWT} = elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
N/A	feet	E _{ROCK} = elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1.50	feet	D _{SHWT} = separation from SHWT	← ≥ * ³
#VALUE!	feet	D _{ROCK} = separation from bedrock	← ≥ * ³
-	ft	D _{amend} = Depth of amended soil, if applicable due high infiltration rate	← ≥ 24"
-	ft	D _T = depth of trench, if trench proposed	← 4 - 10 ft
No	Yes/No	If a trench or underground system is proposed, observation well provided ⁴	
NO		If a trench is proposed, material in trench	
NO		If a basin is proposed, basin floor material	
Yes	Yes/No	If a basin is proposed, the perimeter should be curvilinear, basin floor shall be flat.	
3.0	:1	If a basin is proposed, pond side slopes	← ≥ 3:1
92.53	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
93.19	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
94.00	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. K_{sat}_{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:



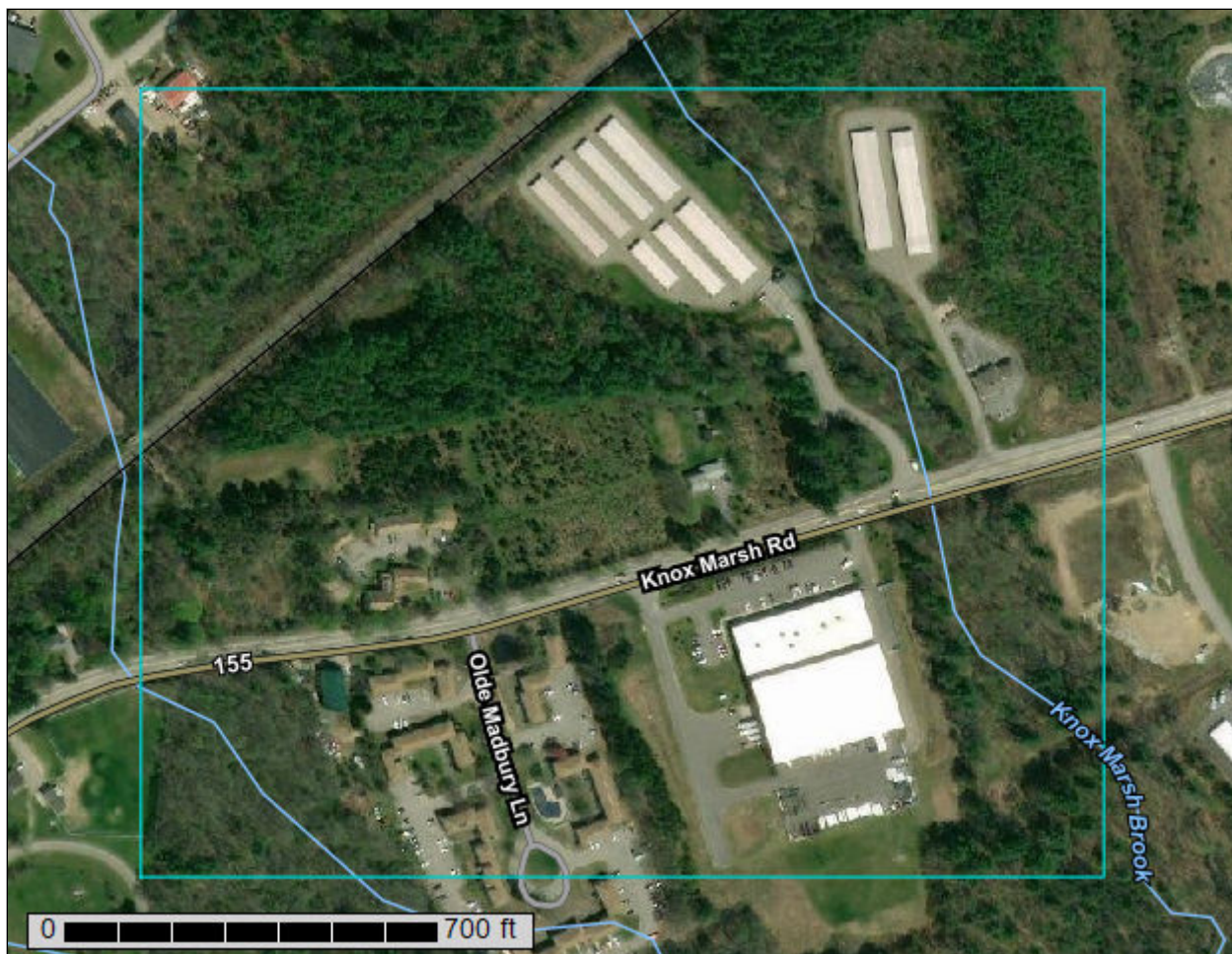
United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

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

Custom Soil Resource Report for **Strafford County, New Hampshire**



January 19, 2021

Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Custom Soil Resource Report Soil Map



Map Scale: 1:3,810 if printed on A landscape (11" x 8.5") sheet.

0 50 100 200 300 Meters

0 150 300 600 900 Feet

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

Custom Soil Resource Report

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: Strafford County, New Hampshire
Survey Area Data: Version 20, May 29, 2020

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

Date(s) aerial images were photographed: Dec 31, 2009—Sep 9, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Be	Biddeford silty clay loam	3.6	5.9%
BzA	Buxton silt loam, 0 to 3 percent slopes	9.4	15.3%
DeB	Deerfield loamy fine sand, 3 to 8 percent slopes	2.1	3.4%
MI	Mixed alluvial land, wet	0.0	0.0%
ScA	Scantic silt loam, 0 to 3 percent slopes	16.2	26.5%
SfC	Suffield silt loam, 8 to 15 percent slopes	2.0	3.2%
WdA	Windsor loamy sand, 0 to 3 percent slopes	20.0	32.6%
WfB	Windsor loamy fine sand, clay subsoil variant, 0 to 8 percent slopes	8.1	13.1%
Totals for Area of Interest		61.4	100.0%

Map Unit Descriptions

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

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a

given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

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

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

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

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

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

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

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

Strafford County, New Hampshire

Be—Biddeford silty clay loam

Map Unit Setting

National map unit symbol: 9d6m
Elevation: 0 to 200 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

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

Description of Biddeford

Setting

Landform: Marine terraces
Parent material: Glaciomarine

Typical profile

H1 - 0 to 7 inches: silty clay loam
H2 - 7 to 26 inches: silty clay
H3 - 26 to 41 inches: silty clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water capacity: Moderate (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Not named wet

Percent of map unit: 10 percent
Landform: Marine terraces
Hydric soil rating: Yes

Scantic

Percent of map unit: 5 percent
Landform: Marine terraces

Hydric soil rating: Yes

BzA—Buxton silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9d6n

Elevation: 0 to 280 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: All areas are prime farmland

Map Unit Composition

Buxton and similar soils: 85 percent

Minor components: 15 percent

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

Description of Buxton

Setting

Parent material: Glaciomarine

Typical profile

H1 - 0 to 10 inches: silt loam

H2 - 10 to 28 inches: silty clay loam

H3 - 28 to 43 inches: silty clay

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 12 to 24 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: C/D

Ecological site: F145XY006CT - Semi-Rich Moist Lake Plain

Hydric soil rating: No

Minor Components

Scantic

Percent of map unit: 10 percent

Landform: Marine terraces

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Hydric soil rating: Yes

Not named

Percent of map unit: 5 percent

Hydric soil rating: No

DeB—Deerfield loamy fine sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2xfg9

Elevation: 0 to 1,190 feet

Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 145 to 240 days

Farmland classification: Farmland of local importance

Map Unit Composition

Deerfield and similar soils: 85 percent

Minor components: 15 percent

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

Description of Deerfield

Setting

Landform: Kame terraces, outwash plains, outwash terraces, outwash deltas

Landform position (three-dimensional): Tread

Down-slope shape: Convex, linear, concave

Across-slope shape: Concave, linear, convex

Parent material: Sandy outwash derived from granite, gneiss, and/or quartzite

Typical profile

Ap - 0 to 9 inches: loamy fine sand

Bw - 9 to 25 inches: loamy fine sand

BC - 25 to 33 inches: fine sand

Cg - 33 to 60 inches: sand

Properties and qualities

Slope: 3 to 8 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 very high (1.42 to 99.90 in/hr)

Depth to water table: About 15 to 37 inches

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)

Sodium adsorption ratio, maximum: 11.0

Available water capacity: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: A

Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 7 percent

Landform: Outwash terraces, outwash deltas, kame terraces, outwash plains

Landform position (three-dimensional): Tread

Down-slope shape: Linear, convex, concave

Across-slope shape: Concave, linear, convex

Hydric soil rating: No

Wareham

Percent of map unit: 5 percent

Landform: Depressions, drainageways

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

Sudbury

Percent of map unit: 2 percent

Landform: Outwash deltas, kame terraces, outwash plains, outwash terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear, concave, convex

Across-slope shape: Concave, linear, convex

Hydric soil rating: No

Ninigret

Percent of map unit: 1 percent

Landform: Kame terraces, outwash terraces, outwash plains

Landform position (three-dimensional): Tread

Down-slope shape: Convex, linear

Across-slope shape: Convex, concave

Hydric soil rating: No

MI—Mixed alluvial land, wet

Map Unit Setting

National map unit symbol: 9d86

Elevation: 300 to 1,800 feet

Mean annual precipitation: 30 to 50 inches

Mean annual air temperature: 45 to 54 degrees F

Frost-free period: 105 to 180 days

Farmland classification: Not prime farmland

Map Unit Composition

Mixed alluvial land: 100 percent

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

Description of Mixed Alluvial Land

Setting

Landform: Flood plains

Typical profile

H1 - 0 to 5 inches: loam

H2 - 5 to 72 inches: very gravelly silt loam

Properties and qualities

Slope: 0 to 2 percent

Drainage class: Poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 20.00 in/hr)

Depth to water table: About 0 inches

Frequency of flooding: FrequentNone

Frequency of ponding: Occasional

Calcium carbonate, maximum content: 15 percent

Available water capacity: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 5w

Hydric soil rating: Yes

ScA—Scantic silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9d8s

Elevation: 0 to 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: Farmland of local importance

Map Unit Composition

Scantic and similar soils: 85 percent

Minor components: 15 percent

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

Description of Scantic

Setting

Landform: Marine terraces

Typical profile

H1 - 0 to 13 inches: silt loam

H2 - 13 to 23 inches: silty clay loam

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H3 - 23 to 40 inches: silty clay

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: C/D

Hydric soil rating: Yes

Minor Components

Not named wet

Percent of map unit: 5 percent

Landform: Marine terraces

Hydric soil rating: Yes

Biddeford

Percent of map unit: 5 percent

Landform: Marine terraces

Hydric soil rating: Yes

Swanton

Percent of map unit: 5 percent

Landform: Marine terraces

Hydric soil rating: Yes

SfC—Suffield silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9d8v

Elevation: 0 to 250 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: Farmland of statewide importance

Map Unit Composition

Suffield and similar soils: 85 percent

Minor components: 15 percent

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

Description of Suffield

Typical profile

H1 - 0 to 19 inches: silt loam
H2 - 19 to 28 inches: silt loam
H3 - 28 to 41 inches: silty clay

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F144AY017NH - Well Drained Lake Plain
Hydric soil rating: No

Minor Components

Not named

Percent of map unit: 9 percent
Hydric soil rating: No

Buxton

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

Rock outcrop

Percent of map unit: 1 percent
Hydric soil rating: No

WdA—Windsor loamy sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkg
Elevation: 0 to 990 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: Farmland of local importance

Map Unit Composition

Windsor, loamy sand, and similar soils: 85 percent

Minor components: 15 percent

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

Description of Windsor, Loamy Sand

Setting

Landform: Dunes, deltas, outwash terraces, outwash plains

Landform position (three-dimensional): Tread, riser

Down-slope shape: Convex, linear

Across-slope shape: Convex, linear

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

O - 0 to 1 inches: moderately decomposed plant material

A - 1 to 3 inches: loamy sand

Bw - 3 to 25 inches: loamy sand

C - 25 to 65 inches: sand

Properties and qualities

Slope: 0 to 3 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 capacity: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s

Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash

Hydric soil rating: No

Minor Components

Deerfield, loamy sand

Percent of map unit: 10 percent

Landform: Outwash plains, terraces, deltas

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Tread, tal

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Hinckley, loamy sand

Percent of map unit: 5 percent

Landform: Deltas, outwash plains, eskers, kames

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Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise

Down-slope shape: Convex

Across-slope shape: Convex, linear

Hydric soil rating: No

WfB—Windsor loamy fine sand, clay subsoil variant, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9d9b

Elevation: 0 to 280 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: All areas are prime farmland

Map Unit Composition

Windsor variant and similar soils: 85 percent

Minor components: 15 percent

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

Description of Windsor Variant

Typical profile

H1 - 0 to 26 inches: loamy fine sand

H2 - 26 to 30 inches: loamy sand

H3 - 30 to 42 inches: silt loam

Properties and qualities

Slope: 0 to 8 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 (0.20 to 0.60 in/hr)

Depth to water table: About 24 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3s

Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash

Hydric soil rating: No

Minor Components

Not named

Percent of map unit: 15 percent

Hydric soil rating: No

References

- American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
- American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
- Federal Register. July 13, 1994. Changes in hydric soils of the United States.
- Federal Register. September 18, 2002. Hydric soils of the United States.
- Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.
- National Research Council. 1995. Wetlands: Characteristics and boundaries.
- Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262
- Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577
- Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580
- Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.
- United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.
- United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374
- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelpdb1043084>

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United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

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2/18/20

**Christopher Berry
Berry Surveying and Engineering
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Job # 20-004

**Site Specific Soil Survey 2/17/20
239 Know Marsh Road Dover, NH**

Dear Chris,

This letter report presents the findings of a Site Specific Soil Survey conducted on the referenced property by John P. Hayes III, On February 7, 2020. The soil survey was conducted in accordance with the New Hampshire Supplement of the Site-Specific Soil Mapping Standard For New Hampshire and Vermont, Version 5.0, December 2017, Special Publication # 3, published by the Society of Soil Scientist of Northern New England.

The portion of the property that is subject of the soil survey is located on the northwest side of Knox Marsh road, and southeast of the railroad line, in Dover NH. The parcel is 9.36 acres in size. The plans used for these soil maps are a 50 scale plan, where 1 inch equals 50 feet, with two foot contours.

The purpose of the soil survey is to provide the client with soils information for urban and suburban or rural land planning. Soil characteristics on the property were evaluated through observation of numerous test holes and hand auger probes conducted throughout the property. Slope phases were determined with the use of the topography provided on the plan. The Site-specific Soil Map Units identified are taken from the New Hampshire State-Wide Numerical Soils Legend, Issue #10 January 2011, and are briefly described below. Official Series Descriptions (OSD) for each of these soil series are enclosed with this report. The soil map units comply with the Range In Characteristics described in the OSD. Dissimilar inclusions are noted above. Limits of the Site Specific mapping units are highlighted on the plan. Portions of the soil map with the map unit denominator P, are poorly drained soils.

MAP UNIT #	SOIL TAXANOMIC NAME	DESCRIPTION
BzA (State No. 232)	Buxton	The Buxton series consists of very deep, moderately well drained soils that formed in glaciolacustrine or glaciomarine deposits on coastal lowlands and river valleys. Permeability is moderate or moderately slow in the surface horizon, moderately slow or slow in the upper part of the subsoil, and slow or very slow in the lower part of the subsoil and in the substratum. The hydrologic soil group is C. Slope ranges from 0% to 3%.
BzB (State No. 232)	Buxton	The Buxton series consists of very deep, moderately well drained soils that formed in glaciolacustrine or glaciomarine deposits on coastal lowlands and river valleys. Permeability is moderate or moderately slow in the surface horizon, moderately slow or slow in the upper part of the subsoil, and slow or very slow in the lower part of the subsoil and in the substratum. The hydrologic soil group is C. Slope ranges from 3% to 8%.
BzC (State No. 232)	Buxton	The Buxton series consists of very deep, moderately well drained soils that formed in glaciolacustrine or glaciomarine deposits on coastal lowlands and river valleys. Permeability is moderate or moderately slow in the surface horizon, moderately slow or slow in the upper part of the subsoil, and slow or very slow in the lower part of the subsoil and in the substratum. The hydrologic soil group is C. Slope ranges from 8% to 15%.
ScA P (State No. 233)	Scantic	The Scantic series consists of very deep, poorly drained soils formed in glaciomarine or glaciolacustrine deposits on coastal lowlands and river valleys. Saturated hydraulic conductivity of the surface and subsurface horizons is moderately high or high and low or moderately slow in the subsoil and substratum. The hydrologic soil group is D. Slope ranges from 0% to 3%.
ScB P (State No. 233)	Scantic	The Scantic series consists of very deep, poorly drained soils formed in glaciomarine or glaciolacustrine deposits on coastal lowlands and river valleys. Saturated hydraulic conductivity of the surface and subsurface horizons is moderately high or high and low or moderately slow in the subsoil and substratum. The hydrologic soil group is D. Slope ranges from 3% to 8%.
WfA (State No. 327)	Windsor Variant (clay Subsoil)	The Windsor series consists of very deep, excessively drained soils formed in sandy outwash or eolian deposits, that have a clay subsoil. They are nearly level through very steep soils on glaciofluvial landforms. Saturated hydraulic conductivity is high or very high. The hydrologic soil group is A. Slope ranges from 0% to 3%.

MAP UNIT #	SOIL TAXANOMIC NAME	DESCRIPTION
WfB (State No. 327)	Windsor Variant (clay Subsoil)	The Windsor series consists of very deep, excessively drained soils formed in sandy outwash or eolian deposits, that have a clay subsoil. They are nearly level through very steep soils on glaciofluvial landforms. Saturated hydraulic conductivity is high or very high. The hydrologic soil group is A. Slope ranges from 3% to 8%.
WfC (State No. 327)	Windsor Variant (clay Subsoil)	The Windsor series consists of very deep, excessively drained soils formed in sandy outwash or eolian deposits, that have a clay subsoil. They are nearly level through very steep soils on glaciofluvial landforms. Saturated hydraulic conductivity is high or very high. The hydrologic soil group is A. Slope ranges from 8% to 15%.

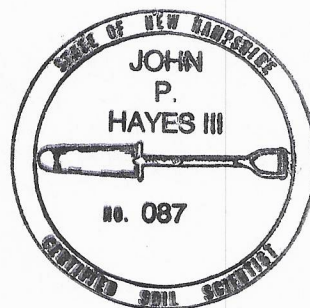
Slope Phases

<u>Alpha Slope Symbol</u>	<u>Range</u>
A	0 – 3%
B	3 – 8%
C	8 – 15%
D	15 – 25%
E	25 – 50%
F	> 50%

I trust that this Soil Survey and report meet your current planning needs. Please do not hesitate to contact me if you have any questions.

Sincerely:

John P. Hayes III



John P. Hayes III CSS, CWS

Established Series
Rev. MFF-SMF-DCP
03/2014

WINDSOR SERIES

The Windsor series consists of very deep, excessively drained soils formed in sandy outwash or eolian deposits. They are nearly level through very steep soils on glaciofluvial landforms. Slope ranges from 0 through 60 percent. Saturated hydraulic conductivity is high or very high. Mean annual temperature is about 10 degrees C and mean annual precipitation is about 1092 mm.

TAXONOMIC CLASS: Mixed, mesic Typic Udipsamments

TYPICAL PEDON: Windsor loamy sand - forested, 3 percent slope, at an elevation of about 24 meters. (Colors are for moist soil.)

Oe--0 to 3 cm; black (10YR 2/1) moderately decomposed forest plant material; many very fine and fine roots; very strongly acid; abrupt smooth boundary. (0 to 8 cm thick.)

A--3 to 8 cm; very dark grayish brown (10YR 3/2) loamy sand; weak medium granular structure; very friable; many very fine and fine roots; strongly acid; abrupt wavy boundary. (3 to 25 cm thick.)

Bw1--8 to 23 cm; strong brown (7.5YR 5/6) loamy sand; very weak fine granular structure; very friable; many fine and medium roots; strongly acid; gradual wavy boundary.

Bw2--23 to 53 cm; yellowish brown (10YR 5/6) loamy sand; very weak fine granular structure; very friable; common fine and medium roots; strongly acid; gradual wavy boundary.

Bw3--53 to 64 cm; light yellowish brown (10YR 6/4) sand; single grain; loose; few coarse roots; strongly acid; clear wavy boundary. (Combined thickness of the Bw horizons is 23 to 86 cm.)

C--64 to 165 cm; pale brown (10YR 6/3) and light brownish gray (10YR 6/2) sand; single grain; loose; few coarse roots; strongly acid.

TYPE LOCATION: Hartford County, Connecticut; town of South Windsor, 1100 feet northwest along Chapel Road from the intersection of Chapel Road and Ellington Road and 100 feet due south of Chapel Road. USGS Manchester, CT topographic quadrangle, Latitude 41 degrees, 48 minutes, 35 seconds N., Longitude 72 degrees, 36 minutes, 22 seconds W., NAD 1983

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 25 to 92 cm. Rock fragments, dominantly fine gravel, range from 0 through 10 percent by volume in the solum and from 0 to 15 percent in the substratum. Thin strata of gravel or thin subhorizons of coarse sand or loamy coarse sand are present in some pedons. Unless limed, reaction in the solum commonly is extremely acid to moderately acid, but the range includes slightly acid. Unless limed, reaction in the substratum commonly is very strongly acid to slightly acid, but the range includes neutral.

O horizons are present in some pedons.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. Many pedons have an Ap horizon up to 12 inches thick with value of 3 or 4 and chroma of 2 to 4. The A or Ap horizon is loamy fine sand, loamy sand, fine sand, or sand. It has weak or moderate granular structure and is very friable, friable, or loose.

Some pedons have a thin E horizon with hue 7.5YR or 10YR, value of 4 to 6, and chroma of 1 or 2.

The upper part of the Bw horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 4 to 8. The lower part of Bw horizon has hue of 7.5YR to 5Y, value of 4 to 7, and chroma of 3 to 6. The Bw horizon is loamy sand or loamy fine sand in the upper part and loamy fine sand, loamy sand, fine sand, or sand in the lower part. The Bw horizon has weak granular or weak subangular blocky structure, or it is massive or single grain. Consistence is very friable or loose.

Some pedons have a BC horizon similar to the lower part of the Bw horizon.

The C horizon has hue of 5YR to 5Y, value of 4 to 7, and chroma of 1 to 6. It is fine sand, sand, coarse sand, loamy fine sand, or loamy sand. The horizon is massive or single grain and consistence is very friable or loose.

COMPETING SERIES: These are the Acquango, Aldo, Bigapple, Biltmore, Boplain, Breeze, Caesar, Chute, Dabney, Hodge, Oakville, Osolo, Pahuk, Penwood, Perks, Pinegrove, Plainfield, Poquonock, Ronda, Samoa, Sardak, Sarpy, Scotah, Spessard, Suncook, Tyner, and Wapanucket series. Acquango, Aldo, Biltmore, Boplain, Chute, Dabney, Hodge, Osolo, Pahuk, Perks, Ronda, Samoa, Sardak, Spessard, and Tyner soils are from outside of LRRs L, R, and S. Acquango soils are very slightly to moderately saline within the soil profile. Aldo soils have a water table and saturation within the series control section for as much as one month per year in 6 out of 10 years. Bigapple soils formed in human transported soil material from dredging activities. Biltmore and Spessard soils are well drained. Breeze soils formed in human transported sandy soil materials intermingled with construction debris. Caesar soils contain more coarse sand. Chute, Hodge, and Sarpy soils contain free carbonates and do not have a B horizon. Dabney soils do not have a B horizon and receive more than 152 cm of precipitation annually. Oakville soils typically average 50 percent or more fine sand in the subsoil. Osolo soils have a solum thicker than 1.5 m. Penwood soils have hue of 5YR or redder in the B horizon. Pahuk, Perks, Samoa, and Suncook soils do not have a B horizon. Plainfield soils are less moist in all parts of the control section for the 120 days following the summer solstice. Poquonock soils have a densic contact with in 1 m. Ronda soils formed in alluvium from residuum sources. Sardak soils formed in alluvium and are calcareous. Tyner soils have a thicker solum. Wapanucket soils are underlain by glaciolacustrine deposits with in the series control section.

GEOGRAPHIC SETTING: Windsor soils are nearly level through very steep soils typically on glaciofluvial landforms but include late-Wisconsin-aged dunes. The steeper slopes are typically on terrace escarpments. Slope ranges from 0 to 60 percent. The soils formed in outwash or eolian deposits of poorly graded sands and loamy sands derived mainly from crystalline rocks. Mean annual temperature ranges from 7 to 12 degrees C, and the mean annual precipitation typically ranges from 965 to 1270 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 growing season ranges from 120 to 190 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Deerfield, Hinckley, Merrimac, Quonset, Suncook, Agawam, Hadley, Haven, Occum, Pootatuck, Scarboro, Sudbury, Walpole, Wareham, and Winooski soils on nearby landscapes. The moderately well drained Deerfield and Sudbury, the somewhat poorly drained and poorly drained Walpole and Wareham, and the very poorly drained Scarboro soils are common drainage associates. Agawam and Haven soils are coarse-loamy over sandy or sandy-skeletal or coarse-loamy terrace associates, respectively. Hadley, Occum, Pootatuck, and Winooski soils are on nearby flood plains.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Excessively drained. Surface runoff is negligible to medium. Saturated hydraulic conductivity is high or very high.

USE AND VEGETATION: Most areas are forested or in low growing brushy vegetation. Some areas are used

for silage corn, hay, and pasture. Small areas, mostly irrigated, are used for shade tobacco, vegetables and nursery stock. Some areas are in community development. Common trees are white, black, and northern red oak, eastern white pine, pitch pine, gray birch, poplar, red maple, and sugar maple.

DISTRIBUTION AND EXTENT: Late Wisconsin glaciofluvial or eolian landforms in Connecticut, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont; MLRAs 101, 142, 144A, and 145. The series is of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Connecticut Valley Area, 1899.

REMARKS: The use of the Windsor series in Maine, and in MLRAs 141, 144B, and 143 is relict to before temperature classes in soil taxonomy. These have been removed from the SC file.

Diagnostic horizons and features recognized in this pedon include:

1. Ochric epipedon - the zone from 0 to 8 cm (Oe and A horizons).
2. Particle-size class - averages sandy in the control section from 25 to 100 cm.
3. No cambic horizon and development of color - the zone from 8 to 64 cm demonstrates development of color with no illuvial accumulation of material (Bw horizons).

ADDITIONAL DATA: Reference samples from pedons 54MA023005, 63VT011001, 63VT011002, 64NH017003, 64NH017004, 70CT003003, 70MA011003, 70VT017002, 73MA005003, 73MA005004, 91MA023006, 95NH013001, 96NH013004, 98NY045002, 98NY085002, S07VT011004.

National Cooperative Soil Survey
U.S.A.

Established Series
Rev. KJL-GBJ-WDH
06/2016

SCANTIC SERIES

The Scantic series consists of very deep, poorly drained soils formed in glaciomarine or glaciolacustrine deposits on coastal lowlands and river valleys. Slope ranges from 0 to 8 percent. Saturated hydraulic conductivity of the surface and subsurface horizons is moderately high or high and low or moderately slow in the subsoil and substratum. Mean annual temperature is about 7 degrees C, and mean annual precipitation is about 1168 mm inches at the type location.

TAXONOMIC CLASS: Fine, illitic, nonacid, frigid Typic Epiaquepts

TYPICAL PEDON: Scantic silt loam, on a 1 percent slope in an idle field. (Colors are for moist soil unless otherwise noted.)

Ap1--0 to 10 cm; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine granular structure; very friable; many very fine, fine, medium and coarse roots; moderately acid; abrupt smooth boundary.

Ap2--10 to 23 cm; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; moderate very fine granular structure; very friable; common very fine, fine, medium and coarse roots; common medium distinct olive gray (5Y 5/2) irregularly shaped iron depletions throughout; moderately acid; abrupt wavy boundary. (Combined thickness of the Ap horizons is 13 to 23 cm.)

Eg--23 to 28 cm; olive gray (5Y 5/2) silt loam; weak medium platy structure parting to weak very fine subangular blocky; friable; common very fine, fine, medium and coarse roots; common medium prominent light olive brown (2.5Y 5/6) masses of iron accumulation in the matrix and along root channels; moderately acid; abrupt smooth boundary. (0 to 20 cm thick)

Bg1--28 to 41 cm; olive gray (5Y 5/2) silty clay loam; moderate thin platy structure; firm; common very fine, fine, and medium and few coarse roots; common medium prominent yellowish brown (10YR 5/6) masses of iron accumulation in the matrix and along pores; many coarse prominent olive brown (2.5Y 4/4) masses of iron accumulation in the matrix and along pores; common medium faint gray (5Y 6/1) irregularly shaped iron depletions in the matrix; light olive gray (5Y 6/2) silt coatings on walls of earthworm channels and on 50 percent of faces of peds; few medium dark gray (5Y 4/1) oxide coats on faces of peds; slightly acid; clear wavy boundary.

Bg2--41 to 56 cm; olive gray (5Y 5/2) silty clay; weak medium platy structure parting to moderate very fine subangular blocky; firm; few very fine and fine roots; few pores; common medium faint gray (5Y 6/1) irregularly shaped iron depletions in the matrix; common medium prominent light olive brown (2.5Y 5/4) masses of iron accumulation in the matrix and along pores; light olive gray (5Y 6/2) silt coatings on walls of earthworm channels and on 50 percent of faces of peds; few fine prominent dark reddish brown (5YR 2/2) oxide coats on faces of peds; slightly acid; gradual wavy boundary.

Bg3--56 to 74 cm; olive gray (5Y 4/2) silty clay; moderate very fine and fine subangular blocky structure; firm; few pores; common medium prominent light olive brown (2.5Y 5/6) masses of iron accumulation in the matrix

and along pores; common medium faint olive gray (5Y 5/2) irregularly shaped iron depletions in the matrix; gray (5Y 6/1) silt coatings on 50 percent of faces of peds and pores; common medium prominent dark reddish brown (5YR 2/2) oxide coats on 10 percent of faces of peds; slightly acid; clear wavy boundary. (Combined thickness of the Bg horizon is 23 to 89 cm.)

Cg--74 to 1165 cm; olive gray (5Y 4/2) clay; weak thick platy structure; firm; few medium prominent light olive brown (2.5Y 5/6) masses of iron accumulation in the matrix; few fine faint gray (5Y 5/1) irregularly shaped iron depletions in the matrix; gray (5Y 6/1) silt coatings on 50 percent of faces of peds; many medium prominent dark reddish brown (5YR 2/2) oxide coats on 30 percent of faces of peds; slightly acid.

TYPE LOCATION: Washington County, Maine; Town of Whitneyville; 0.25 mile south of railroad track on U.S. Route 1A, and 200 feet northwest of the road; USGS Whitneyville topographic quadrangle; lat. 44 degrees 42 minutes 34 seconds N. and long. 67 degrees 31 minutes 29 seconds W., NAD 27.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 63 to 127 cm. Depth to bedrock is more than 152 cm. The soil is commonly free of rock fragments but a few pedons contain up to 3 percent gravel. Stones cover from 0 to 3 percent of the surface. Reaction ranges from very strongly acid to slightly acid in the surface and subsurface horizons, unless limed, and from strongly acid to neutral in the upper part of the subsoil. The reaction in the lower part of the subsoil and in the substratum is moderately acid to neutral.

In undisturbed areas some pedons have an O horizon that ranges from 3 to 18 cm thick that is neutral or has a hue of 5YR to 10YR, value of 2 to 3 and a chroma of 0 to 2. It is muck or mucky peat.

The Ap horizon has hue of 10YR to 5Y, value of 3 to 5 and chroma of 1 or 2. It has weak or moderate, very fine to coarse granular structure. Undisturbed areas have an A horizon 5 to 13 cm thick, that has hue of 10YR, value of 3 and chroma of 1 or 2. It is silt loam, silty clay loam, or loam. Consistence is very friable or friable.

The Eg horizon, has hue of 2.5Y or 5Y, value of 4 or 5 and chroma of 1 or 2 and few or common redoximorphic features. It has weak or moderate, thin to thick platy, fine or medium granular or very fine subangular blocky structure. It is silt loam, silty clay loam, or loam. Consistence is very friable or friable.

The Bg horizon has hue of 2.5Y or 5Y, value of 4 to 6 and chroma of 1 or 2 and has faint to prominent redoximorphic features. It is silt loam, silty clay loam, or silty clay. It has subangular blocky or platy structure but some pedons have primary structure that is prismatic. Consistence is friable or firm.

The BCg horizon, where present, has hue of 2.5Y or 5Y, or 5BG value of 4 to 6 and chroma of 1 or 2 with faint to prominent redoximorphic features. It is silty clay loam, silty clay, or clay. It has platy or angular blocky structure but some pedons have primary structure that is prismatic. Consistence is friable to very firm.

The Cg horizon is neutral or has hue of 2.5Y, 5Y or 10Y, value of 4 to 6 and chroma of 0 to 2 and redoximorphic features are less abundant than in the B horizon or are lacking. It is silty clay loam, silty clay, or clay. Platy or prismatic structure is dominant but some pedons are massive. Consistence is firm or very firm. Patchy or discontinuous oxide coatings are common in the B and C horizons in pedons from marine deposits and are less common or lacking in those from lacustrine deposits.

COMPETING SERIES: There are currently no other series in the same family. The Lamoine, Swanton, and Swanville series are similar soils in related families. Lamoine soils have dominant chroma of 3 or more between the A or Ap horizon and 76 cm below the mineral soil surface. Swanton soils have a coarse-loamy over clayey particle-size class. Swanville soils have less clay in the particle-size control section.

GEOGRAPHIC SETTING: Scantic soils are on coastal lowlands and river valleys. Slope ranges from 0 to 8 percent. The soils formed in medium, moderately fine and fine textured glaciomarine or glaciolacustrine deposits. The climate is humid and cool temperate. Mean annual temperature ranges from about 6 to almost 8 degrees C, and mean annual precipitation ranges from 863 to 1219 mm. The frost-free season ranges from 90 to

160 days. Elevation ranges from about 2 to 275 m above mean sea level.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Biddeford, Buxton, Elmwood, Lamoine, Melrose, Swanton, and Whately soils. The Biddeford, Buxton and Lamoine soils are members of a drainage sequence with Scantic soils on the same landscape, Buxton and Lamoine soils are in higher positions and Biddeford soils are in depressions. The Elmwood, Melrose, Swanton and Whately soils all have a coarse-loamy over clayey particle-size class. Elmwood and Melrose soils are in higher positions on the landscape. Swanton soils are in similar positions and Whately soils are in depressions.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Poorly drained. Surface runoff is slow. Saturated hydraulic conductivity of the surface and subsurface horizons is moderately high or high and low or moderately slow in the subsoil and substratum.

USE AND VEGETATION: Mostly idle or woodland, some areas are used for growing hay and pasture. Common tree species include red maple, elm, gray birch, white ash, balsam fir, red and white spruce, tamarack, and some eastern white pine.

DISTRIBUTION AND EXTENT: MLRAs 142, 143, and 144B in Maine, Massachusetts, New Hampshire, New York, and Vermont. The series is of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts

SERIES ESTABLISHED: Penobscot County, Maine, 1947.

REMARKS: Previous revisions reflect a change in classification from Typic Haplaquepts to conform with Keys To Soil Taxonomy, sixth edition, 1994. Historic correlations of Scantic may have occurred in presumed or isolated frigid areas in MLRAs 144A and 145.

Diagnostic horizons and features recognized in this pedon are:

1. Ochric epipedon - the zone from 0 to 28 cm (Ap and Eg horizons).
2. Cambic horizon - the zone from 28 to 89 cm (Bg horizon).
3. Nonacid - the pH is 5.0 or more in 0.01M calcium chloride in at least some part of the control section (25 to 100 cm).
4. Aquic conditions - redoximorphic features at 10 cm.
5. Episaturation - a perched water table.

ADDITIONAL DATA: Source of data used in establishing taxonomic class and range in characteristics is Maine Agricultural Experiment Station, Technical Bulletin 94, September 1979.

Soil interpretation record numbers for the Scantic series are: Scantic, ME0044; Scantic, stony, ME0062.

Established Series

Rev. GBJ-PAH-WDH-NRB

12/2015

BUXTON SERIES

The Buxton series consists of very deep, moderately well drained soils that formed in glaciolacustrine or glaciomarine deposits on coastal lowlands and river valleys. Slope ranges from 3 to 50 percent. Permeability is moderate or moderately slow in the surface horizon, moderately slow or slow in the upper part of the subsoil, and slow or very slow in the lower part of the subsoil and in the substratum. Mean annual temperature is about 7 degrees C, and mean annual precipitation is about 1118 mm at the type location.

TAXONOMIC CLASS: Fine, illitic, frigid Aquic Dystric Eutrudepts

TYPICAL PEDON: Buxton silt loam, on a 13 percent slope in an abandoned hayfield. (Colors are for moist soil unless otherwise noted.)

Ap--0 to 20 cm; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; strong medium granular structure; friable; many very fine and common fine and medium roots; moderately acid; abrupt smooth boundary. (13 to 25 cm thick)

Bw1--20 to 41 cm; dark yellowish brown (10YR 4/4) silt loam; moderate very fine and fine granular structure; friable; common very fine and few fine and medium roots; slightly acid; abrupt wavy boundary.

Bw2--41 to 53 cm; light olive brown (2.5Y 5/4) silty clay loam; moderate thin and medium platy structure parting to weak very fine angular blocky; firm; common very fine roots; common medium prominent olive gray (5Y 5/2) iron depletions, and common medium prominent brown (7.5YR 4/4) masses of iron accumulation; slightly acid; clear wavy boundary. (Combined thickness of the B horizon is 20 to 66 cm.)

BC--53 to 89 cm; olive (5Y 5/3) silty clay; weak very coarse prismatic structure parting to weak fine and medium angular blocky; firm; few very fine roots; light brownish gray (2.5Y 6/2) faces of prisms and a few faint silt films on faces of peds within prisms; common prominent dark reddish brown (5YR 2/2) oxide coatings on faces of peds within prisms; common medium faint olive gray (5Y 5/2) iron depletions, and common medium prominent brown (7.5YR 4/4) masses of iron accumulation; slightly acid; gradual wavy boundary. (13 to 51 cm thick)

C--89 to 165 cm; olive gray (5Y 4/2) silty clay; weak very coarse prismatic structure parting to weak fine and medium angular blocky; very firm; olive gray (5Y 5/2) faces of prisms; many prominent dark reddish brown (5YR 2/2) oxide coatings on faces of peds within prisms; common medium prominent yellowish brown (10YR 5/6) masses of iron accumulation that increase in size and abundance with depth; slightly acid.

TYPE LOCATION: Hancock County, Maine; Town of Hancock; 1 mile west of junction of U.S. Route 1 and Maine Route 182, 200 feet north of U.S. Route 1 in an abandoned hayfield; USGS Hancock topographic quadrangle; lat. 44 degrees 32 minutes 19 seconds N. and long. 68 degrees 20 minutes 22 seconds W., NAD 27.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 46 to 140 cm. Depth to bedrock is more than 152 cm. Rock fragment content throughout the soil is less than 5 percent by volume. Stones cover from 0 to 3 percent of the surface. Iron depletions occur within 61 cm of the mineral soil surface. Reaction

ranges from very strongly acid to slightly acid in the surface horizon, unless limed, from strongly acid to neutral in the subsoil, and from moderately acid to neutral in the substratum.

The Ap horizon has hue of 7.5YR to 2.5Y, with value and chroma of 2 to 5. Some undisturbed areas have an A horizon 3 to 15 cm thick, that has hue of 7.5YR to 2.5Y, with value and chroma of 2 to 5. They are silt loam or silty clay loam. They have weak to strong, very fine to medium granular structure. Consistence is very friable or friable.

The B horizon has hue of 7.5YR to 5Y, value of 3 to 6 and chroma of 2 to 8, with chroma of 2 being inherited. It is silt loam, silty clay loam, or silty clay. It has weak or moderate, very fine to medium granular, very fine to coarse blocky or thin to thick platy structure. Consistence is friable or firm.

The BC horizon has hue of 2.5Y or 5Y, value of 4 to 6 and chroma of 2 to 4. It is silt loam, silty clay loam, or silty clay. It has blocky or platy structure or has primary structure that is prismatic. Consistence is firm or very firm.

The C horizon has hue of 2.5Y or 5Y, value of 4 to 6 and chroma of 2 to 6. It is silty clay loam, silty clay, or clay. It has blocky, platy or prismatic structure, all of which are considered inherited, or the horizon is massive. Consistence is firm or very firm. Common or many black to dark reddish brown patchy oxide coatings are on faces of peds. Some pedons have films on faces of peds that appear to be silt.

COMPETING SERIES: There are currently no other series in the same family. Similar soils in related families are the Boothbay and Elmwood series. Boothbay soils have a fine-silty particle-size class. Elmwood soils have a coarse-loamy over clayey particle-size class.

GEOGRAPHIC SETTING: Buxton soils are on coastal lowlands and river valleys. Slope ranges from 3 to 50 percent. The soils formed in medium, moderately fine, and fine textured glaciolacustrine or glaciomarine deposits. The climate is humid and cool temperate. Mean annual precipitation ranges from 860 to 1220 mm, and mean annual temperature ranges from 6 to 8 degrees C. The frost-free season ranges from 90 to 160 days. Elevation ranges from 2 to 274 meters above mean sea level.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Biddeford, Elmwood, Lamoine, Melrose, Scantic, Swanton and Whately soils. The very poorly drained Biddeford soils are in depressions on the landscape. The somewhat poorly drained Lamoine soils and poorly drained Scantic soils are in lower positions on the landscape. The Elmwood, Melrose, Swanton, and Whately soils all have a coarse-loamy over clayey particle-size class. Elmwood soils are in similar positions on the landscape; Melrose soils are in higher positions; Swanton soils are in lower positions and Whately soils are in depressions.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Moderately well drained. Surface runoff is medium or rapid depending on slope. Saturated Hydraulic Conductivity is moderately high in the surface horizon and the upper part of the subsoil, and low to moderately low in the lower part of the subsoil and in the substratum.

USE AND VEGETATION: Cleared areas are used mainly for hay, forage crops, or pasture. Some areas are used for silage corn or vegetables. The remaining areas are forested. Common tree species include eastern white pine, balsam fir, paper birch, white spruce, eastern hemlock, and northern red oak.

DISTRIBUTION AND EXTENT: Maine, Massachusetts, New Hampshire, New York, and Vermont. The series is of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts

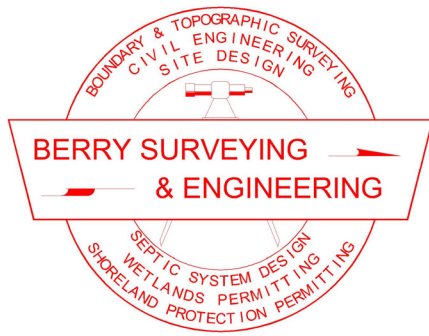
SERIES ESTABLISHED: York County, Maine, 1941.

- REMARKS:** 1. Some pedons have been described with a bisequum profile.
2. Diagnostic horizons and features recognized in this pedon are:
- a. Ochric epipedon - the zone from 0 to 20 cm (Ap horizon).
 - b. Cambic horizon - the zone from 20 to 53 cm (Bw1 and Bw2 horizons).
 - c. Aquic feature - Iron depletions within 61 cm of the mineral soil surface.
 - d. Dystric feature - no carbonates within a depth of 102 cm.

ADDITIONAL DATA: Source of data used in establishing taxonomic class and range in characteristics is Maine Agricultural Experiment Station, Technical Bulletin 29, February 1968.

Soil interpretation Record Numbers for the Buxton series are: Buxton, ME0043; Buxton, stony, ME0084.

National Cooperative Soil Survey
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Inspection and Maintenance Manual

Stormwater System Management

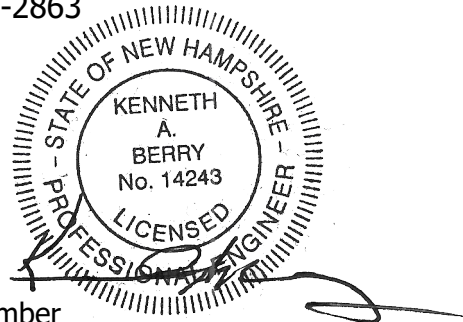
Proposed Mixed Use Site Plan McCrone Place and Concolor Drive Tax Map H, Lot 37A

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File Number
DB2020-066

January 21, 2021

Inspection and Maintenance Manual

Stormwater System Management

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NHDOT Design and Maintenance of Subsurface Gravel Wetlands, 2/2015	43 Pages

Introduction

The Best Management Practices (BMP) described in this manual are specified in more detail within the plan set giving design details and specifications. The New Hampshire Stormwater Manual, Volume 2, Post-Construction Best Management Practices Selection & Design (December 2008, NHDES & US EPA) is included by reference to this manual. Additional details, construction specifications, and example drawings are provided within this reference. (<http://des.nh.gov/organization/divisions/water/stormwater/>)

The BMP's are covered below in the general order in which the storm water flows. Each BMP has a description and maintenance consideration listed. A Check List table is provided after the narrative to summarize the maintenance responsibilities and schedule. A Log Form is also provided for the owners use.

For details regarding the design of the Storm Water System see also Drainage Analysis & Sediment and Erosion, January 21, 2021, as revised. See also plan set completed for **Equine Properties, LLC**, originally dated **January 21, 2021**, as revised.

Equine Properties, LLC, development company with Turner Porter, Managing Member as the operator, is responsible for the Operation, Inspection, and Maintenance of the Stormwater Management System. A significant step in this responsibility is the Inspection and Maintenance of each component of the system. Ongoing, semi-annual, and annual inspection and maintenance requirement are documented below and must be followed diligently. Failure of any component of the system can result in surface water run-off ponding and/or freezing in the roadway and parking lots, leaving the developed site untreated, and/or causing violations to issued permits. The owner / developer must maintain, and have available, plans of the Stormwater System in order properly inspect and maintain the system. (Reduced copies attached.) The responsible party will conduct the inspections, complete the required maintenance, and will maintain the Inspection & Maintenance Check Lists and Logs, and will provide copies with the Annual Report to the City of Dover, Community Services, DPW / Engineering Department and provided a copy to NHDES AoT by December 15th of each year. Equine Properties, LLC will initiate the Home Owners Association and act as the initial majority owner. When the HOA converts to be managed by elected home owners copies of the Inspection & Maintenance Manual complete with attachments and plans must be transferred to the incoming management / ownership team.

The owner of Tax Map H, Lot 37A, Equine Properties, LLC, are proposing a Mixed Use Site Development consisting of 12 detached residential units, two twenty-six unit mixed use buildings. This includes 998 linear feet of roadway, parking areas, three subsurface gravel wetlands, an infiltration pond, and detention areas.

The following practices and drainage features will all require periodic inspections and maintenance based on this manual and drainage layout:

Conveyance Swales

Culvert Pipes, Flared End Sections, and Headwalls.

Sediment Forebay to SGW #101, #103, and #104.

Subsurface Gravel Wetland #101 with inlets, clean-outs, outlet structure, and a spillway.

Subsurface Gravel Wetland #103 with inlets, clean-outs, outlet structure, and a spillway.

Subsurface Gravel Wetland #104 with inlets, clean-outs and outlet structure.

Infiltration Pond #105 with spillway.

Detention Pond #102 with an outlet structure.

Rip Rap Level Spreaders

Note: In addition to the inspection and maintenance requirements contained in this narrative, attached in the appendix is a NHDOT document entitled Design and Maintenance of Subsurface Gravel Wetlands, dated February 2015, which is a part of the inspection and maintenance requirements for the operation of a Subsurface Gravel Wetland.

Conveyance Swales

Description: "Swales are stabilized channels designed to convey runoff at non-erosive velocities." (NHDES SWM) They will be trapezoidal or parabolic in section view. A conveyance swale is intended to move surface water runoff from one point to another where as a treatment swale will slow the velocity to a point where sediment will settle out of the stormwater flow. A treatment swale will be constructed to a width of between four and eight feet and have a minimum length of 100 feet. The flow characteristics will also meet design criteria. See SWM Volume 2, 4.3 Treatment Practices, 5. Treatment Swales, page 123.

Project Intent: The swales are individually designed in the drainage analysis and specified on the design plans. The designed swales must have greater than 85% vegetated growth prior to receiving runoff. The bottom of a treatment swale must be above the seasonal high water table.

Maintenance Considerations: Grassed swales will be inspected twice annually, removing accumulated sediment and gross solids. Grass will be mowed periodically but to a depth of not less than 4 inches. Any damage to the vegetation will be repaired and woody vegetation and invasive vegetation will be removed.

Culvert Pipes, Flared End Sections / Headwalls

Description: Culvert pipes are placed to route surface water runoff from catch basins to drain manholes, and drain manholes to a discharge point conveying the runoff in such a manner that erosion does not take place. Culvert pipes are often terminated with flared end sections or headwalls.

Maintenance Considerations: The entrance and exit of the culvert pipe should be cleaned of any trash and sediment build-up. The culvert should be clear to let runoff pass through the culvert unobstructed. Flared end sections and headwalls should be inspected for erosion and destabilization, with repairs made as required.

Sediment Forebay

Description: A sediment forebay is designed to reduce the velocity of incoming surface water runoff allowing sediment to fall out of suspension initially pre-treating the runoff before it is sent to a treatment structure. This earthen basin will have vegetated side-

slopes and a check dam to further reduce and pretreat the runoff. At the point of incoming runoff, the basin will be protected by rip rap outlet protection construction and the outgoing edge will be protected with rip rap. The check dam will be constructed from one side of the basin to the other and cause runoff to either go through or over. The volume of the forebay is generally 10% the volume of the Water Quality Volume (WQV) for gravel wetlands, and 25% for rain gardens. A dewatering drain is designed into the two-foot berm of the forebay. Construction specifications are included in the plan set and New Hampshire Stormwater Manual, Volume 2, 4-4 Pretreatment Practices 1, Sediment Forebays.

Maintenance Considerations: The basin and slopes will be periodically mowed, at least twice per year ensuring that woody material does not get an opportunity to grow. Sediment accumulated in the basin will be removed and properly disposed of when it reaches half the height of the check dam. Erosion or other damage to the basin will be repaired and revegetated. (See Outlet Protection) Inspect and clean the dewatering drain to ensure runoff is not trapped for more than 72 hours in the forebay.

Infiltration Basins & Detention Ponds

Description: Infiltration Basins are constructed ponds that are intended to detain surface water runoff and during the detention to infiltrate runoff into the ground. Detention Ponds are also constructed ponds with the purpose of detaining runoff but not necessarily for infiltration purposes. During construction it is important that the ground surface not be exposed to traffic or construction equipment to preserve the infiltration capabilities of the existing soil. Construction specifications are included in the plan set and New Hampshire Stormwater Manual, Volume 2, 4-3 Treatment Practices, 3B, In-ground Infiltration Basin and Section 4-6, Conveyance Practices, 2. Detention Basins.

Maintenance Considerations:

Infiltration Basins and Detention Ponds should be inspected at least twice annually and following any rainfall event exceeding 0.25 inches in a twenty-four hour period. Maintenance rehabilitation will be conducted as warranted by each inspection. Trash and debris will be removed at each inspection.

On an annual basis the infiltration capabilities need to be confirmed by evaluation the drawdown time. If the infiltration system does not drain within 72-hours following a rainfall event, a qualified professional will assess the condition of the basin to determine

measures required to restore the infiltration function. This is normally the direct result of sediment accumulation which will be removed to restore the filter media ratio.

Also on an annual basis the vegetation should be inspected to ensure healthy condition. Invasive species need to be removed along with dead or diseased vegetation.

Subsurface Gravel Wetland

Description: A Gravel Wetland (NHDES SWM 4-3 Treatment Practice 2D) or Subsurface Gravel Wetland consists of a forebay and multiple flow-through treatment cells. During smaller rain events, the surface water runoff is intended to pass from the forebay, into the gravel media through perforated pipes and structures where it passes through an anaerobic environment where the Water Quality Volume will have 24-72 hours of contact time. The forebay is required to contain 10% of the WQV and each of the two cell must contain 45% of the WQV. During larger storm events, the system works as a detention pond. The design of a Subsurface Gravel Wetland will be constructed in accordance with the most current version of the Design Specifications provided by the UNH Stormwater Center and SWM Volume 2, Section 4-3 Treatment Practices, 2d Gravel Wetlands.

Maintenance Considerations: The outlet configuration of the anaerobic subsurface gravel consists of a small discharge orifice that is located in a threaded cap. This goose-neck feature is designed to be disassembled to allow cleaning. This outlet orifice is located within a concrete outlet structure that also contains a control stack used to control and detain runoff in the system. Although this is designed to be "clean water" after the filtering process, the outlet structure in general is going to require periodic maintenance to ensure that it is discharging runoff properly. If the Subsurface Gravel Wetland retains runoff on the surface for more than 72 hours the performance is not correct and maintenance is required.

Debris will need to be removed from the inlet and outlet structures as well as any buildup of sediment. The surface of the ponded area is intended to have wetland plants which may require periodic replanting, depending on the sediment loading. Sediment buildup in the forebay must be removed to maintain the minimum required volume. See also 9 and 10 of the attached UNHSC Subsurface Gravel Wetland Design Specifications 2009, and / or UNHSC Subsurface Gravel Wetland Design Specifications 2016 with Maintenance Guidelines and Checklist. See also Design and Maintenance of Subsurface Gravel Wetlands, dated February 2015, attached. Specifically Attachment B,

Regular Inspection and Maintenance Guidance for Gravel Wetland Stormwater Management Device and Checklist for Inspection of Gravel Wetland.

Rip Rap Outlet Protection, Level Spreaders, & Emergency Spillways

Description: Outlet Protection consists of a riprap apron or preformed scour hole that is designed to provide velocity reduction of the surface water run-off that is leaving a culvert. The design is dependent on the culvert size, soil conditions, velocity, and quantity of the run-off. There are to be no bend or curves at the intersection of the conduit and apron. Level spreaders are intended to provide a level lip where surface water runoff is allowed to continue downhill closer to sheet flow. The level lip is to be constructed as level as possible for the entire length. Emergency Spillways are rip rap reinforced outlets near the top of the berm that allow runoff to leave a practice during periods of very high flow. Ref.: NHDES SWM Volume 2, Section 4-6 Conveyance Practices, 6. Outlet Protection and 1. Detention Ponds, Note 3, Page 158.

Maintenance Considerations: The riprap outlet protection will be inspected annually for damage, which must be corrected immediately. Any sediment buildup will be removed and disposed of correctly. Sediment and subsequent vegetation will build up in the Level Spreader. This material will be cleaned out along with any gross solids and disposed of properly. (See invasive species below) Any rip rap that has been displaced from the original construction will be repaired, especially recreating the level lip.

Stabilization for Long Term Cover

Vegetated Stabilization – Original Planting

All areas that are disturbed during construction will be stabilized with vegetated material within 14 calendar days (City of Dover) of breaking ground and within 3 calendar days of establishing finish grade. (See Chapter 149-17) Construction will be managed in such a manner that erosion is prevented and that no abutter's property will be subjected to any siltation, unless otherwise permitted. All areas to be planted with grass for long-term cover will follow the specification and on Sheet E-102 using seeding mixture C, as follows:

Mixture	Pounds	Pounds per
	per Acre	1,000 Sq. Ft.
Tall Fescue	24	0.55
Creeping Red Fescue	24	0.55
Total	48	1.10

Conservation Mix

Mixture	Pounds per Acre	Pounds per 1,000 Sq. Ft.
Tall Fescue	15	0.35
Creeping Red Fescue	15	0.35
Annual Ryegrass	5	0.12
Perennial Ryegrass	5	0.12
Kentucky Bluegrass	15	0.35
White Clover	7	0.16
Total	62	1.45

Conservation Mix will be used to stabilize all 2:1 slopes and all land area disturbed within the wetland buffer. As the site is to be stabilized with erosion control mix as a mulch, the vegetation should be established with a high percentage of white clover for growth to be established.

Detention Pond mix

The grass that is planted within a detention pond will meet the provisions of Administrative Code Env-Wq 1508.17 (D) (7). "All areas of the detention basin, including the basin floors, side slopes, berms, impoundment structures, or other earth structures shall have vegetation suitable for the soil type, the moisture content, the amount of sun exposure, and the level of inundation to which it is exposed;" Planting specification will meet the requirements as outlined by Ernst Conservation Seeds Detention Pond Mix ERNMX-126; or approved equal.

Maintenance Considerations: Permanent seeded areas for long-term cover will be inspected on a periodic basis looking for signs of growth loss or erosion. Any areas found to be damaged will be repaired and replanted to reestablish the growth. The grass should be mowed at least twice per year and any dead material removed. Any woody growth that becomes established will need to be cut and removed.

Long-term maintenance of the land cover is critical and must be maintained at least 85% grass / vegetation coverage, must be inspected for concentrated flow, rills, and channels; and must be repaired as necessary to prevent erosion.

CONTROL OF INVASIVE PLANTS

During maintenance activities, check for the presence of invasive plants and remove in a safe manner as described on the following pages. They should be controlled as described on the following pages.

Invasive plants are introduced, alien, or non-native plants, which have been moved by people from their native habitat to a new area. Some exotic plants are imported for human use such as landscaping, erosion control, or food crops. They also can arrive as "hitchhikers" among shipments of other plants, seeds, packing materials, or fresh produce. Some exotic plants become invasive and cause harm by:

- becoming weedy and overgrown;
- killing established shade trees;
- obstructing pipes and drainage systems;
- forming dense beds in water;
- lowering water levels in lakes, streams, and wetlands;
- destroying natural communities;
- promoting erosion on stream banks and hillsides; and
- resisting control except by hazardous chemical.

Annual Report

Description: The owner is responsible to keep an **I & M Activity Log** that documents inspection, maintenance and repairs to the storm water management system, and a **Deicing Log** to track the amount and type of deicing material applied to the site. The original owner is responsible to ensure that any subsequent owner (s) have copies of the Inspection & Maintenance Manual, Stormwater System Management, copies of past logs and check lists. This includes any owner association that might become involved with the property. The Annual Report will be prepared and submitted to the City of Dover Community Services Engineering Department / DPW with copies of both logs and check lists no later than December 15th of each year and provided to NHDES on that same date. Upon an ownership change, the Annual Report will include the Transfer of Ownership Responsibility Forms duplicated from the form found below.

The plan that accompanies this manual includes one sheet, "Drainage Operation, Inspection, & Maintenance Plan". The owners and municipality will also maintain a complete set of the approved original design plans.

Respectfully,
BERRY SURVEYING & ENGINEERING

James F. Hayden
Project Engineer / Manager

A handwritten signature in black ink, appearing to read 'K. Berry', with a stylized flourish at the end.

Kenneth A. Berry, PE, LLS
CPSWQ, CPESC, CESSWI
Principal, VP – Technical Operations

STORMWATER SYSTEM: INSPECTION AND MAINTENANCE MANUAL

Inspection & Maintenance Manual Checklist

Proposed Mixed Use Site Plan McCrone Place and Concolor Drive

Equine Properties, LLC
149 Epping Road Suite 2A
Exeter, NH 03833

☒	Date	BMP / System	Minimum Inspection Frequency	Minimum Inspection Requirements	Maintenance / Cleanout Threshold
		Pavement Sweeping	Three Times Per Year	N/A	N/A
		Litter/Trash Removal	Routinely	Inspect dumpsters, outdoor waste receptacles area, and yard areas.	Parcel will be free of litter/trash.
		Deicing Agents	N/A	N/A	Use salt as the primary agent for roadway safety during winter.
		Invasive Species	Two times per year.	Inspect for Invasive Species	Remove and dispose invasive species.
		Closed Drainage System:			
		Drainage Pipes & Inlet Sumps	2 times per year	Check for sediment accumulation & clogging.	Less than 2" sediment depth

☒	Date	BMP / System	Minimum Inspection Frequency	Minimum Inspection Requirements	Maintenance / Cleanout Threshold
		Subsurface Gravel Wetlands, Detention Ponds & Infiltration Ponds	2 times per year	Check for sediment and debris accumulation buildup.	Remove sediment & debris when required. Remove Invasive Species
		Subsurface Gravel Wetland & bio-swale and system clean-outs.	Annually	72-Hour drawdown time evaluation and vegetation evaluation. Underdrain flushing.	Remove dead & diseased vegetation along with all debris, take corrective measures of filtration media if required. Flush underdrain clean-outs with a hose.
		Infiltration Ponds	Annually	72-Hour drawdown time evaluation and vegetation evaluation. Underdrain flushing.	Remove dead & diseased vegetation along with all debris, take corrective measures of filtration media if required. Flush underdrain clean-outs with a hose.
		Riprap Outlet Protection	Annually	Check for sediment buildup and structure damage.	Remove excess sediment and repair damage.
		Winter Maintenance	Ongoing	Remove snow as directed.	Ongoing

		Post Winter Maintenance	Annually	Remove excess sand, gross solids, and repair vegetation and plantings	Parcel will be free of excess sand, litter/trash. Vegetation per approved plans.
		Annual Report	1 time per year	Submit Annual Report to Dover Engineering Dept. / DPW and kept on file by the owner.	Report to be submitted on or before December 15th each year. Copies submitted to NHDES by that date.

See also Design and Maintenance of Subsurface Gravel Wetlands, dated February 2015, attached. Specifically Attachment B, Regular Inspection and Maintenance Guidance for Gravel Wetland Stormwater Management Device and Checklist for Inspection of Gravel Wetland.

The following practices and drainage features will all require periodic inspections and maintenance based on this manual and drainage layout:

Conveyance Swales

Culvert Pipes, Flared End Sections, and Headwalls.

Sediment Forebay to SGW #101, #103, and #104.

Subsurface Gravel Wetland #101 with inlets, clean-outs, outlet structure, and a spillway.

Subsurface Gravel Wetland #103 with inlets, clean-outs, outlet structure, and a spillway.

Subsurface Gravel Wetland #104 with inlets, clean-outs and outlet structure.

Infiltration Pond #105 with spillway.

Detention Pond #102 with two outlet culverts.

Rip Rap Level Spreaders

Equine Properties, LLC
149 Epping Road Suite 2A
Exeter, NH 03833

[illegible]

[illegible]

STORMWATER SYSTEM OPERATION & MAINTENANCE PLAN CERTIFICATION

Owner	Responsibility
Name: Equine Properties, LLC Turner Porter, Managing Member Address: 149 Epping Road, Suite 2A Exeter, NH 03833 Telephone: (603) 944-7530 (Mobile) E-mail Address: faireday@aol.com	The owner is responsible for the conduct of all construction activities, and ultimate compliance with all the provisions of the Stormwater System Operation & Maintenance Plan and the implementation of the Inspection and Maintenance Manual.

OWNER CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed: _____ Date: _____

Printed Name:

Representing:

Control of Invasive Plants

**New Hampshire
Department of Agriculture,
Markets & Food
Douglas Cygan
603-271-3488
doug.cygan@agr.nh.gov**

This guide lists garden plants and weeds which are already causing significant changes to natural areas in the Mid-Atlantic. **Measures for controlling each species are indicated by number, e.g., (3), in the text with a full explanation at the end of this article.** Click on the word [Control](#): to jump to that section. Then click your "back" button to return to the text. Following each section suggested alternative plants are given. These alternatives are native plants, well adapted and needing little care, attractive to birds and butterflies, and an important part of the food web for our indigenous species.

INVASIVE TREES

NORWAY MAPLE (*Acer platanoides*) has large leaves similar to sugar maple. To easily confirm that the plant is Norway maple, break off a leaf and if it's truly Norway maple it will exude milky white sap. Fall foliage is yellow. (Exception: cultivars such as 'Crimson King,' which have red leaves in spring or summer, may have red autumn leaves.) The leaves turn color late, usually in late October after native trees have dropped their foliage. This tree suppresses growth of grass, garden plants, and forest understory beneath it, at least as far as the drip-line. Its wind-borne seeds can germinate and grow in deep shade. The presence of young Norway maples in our woodlands is increasing.

[Control](#): (1); (7), (8), (9), or (10); (11) in mid-October to early November, before the leaves turn color.

TREE OF HEAVEN (*Ailanthus altissima*), is incredibly tough and can grow in the poorest conditions. It produces huge quantities of wind-borne seeds, grows rapidly, and secretes a toxin that kills other plants. Its long compound leaves, with 11-25 lance-shaped leaflets, smell like peanut butter or burnt coffee when crushed. Once established, this tree cannot be removed by mechanical means alone.

[Control](#): (1) - seedlings only. Herbicide - use Garlon 3a (9) with no more than a 1" gap between cuts, or (10); plus (11) on re-growth. Or paint bottom 12" of bark with Garlon 4 Ultra (in February or March to protect surrounding plants). USE MAXIMUM STRENGTH SPECIFIED ON LABEL for all herbicide applications on Ailanthus. Glyphosate is not effective against Ailanthus.

INVASIVE SHRUBS

AUTUMN OLIVE (*Eleagnus umbellata*): Formerly recommended for erosion control and wildlife value, these have proved highly invasive and diminish the overall quality of wildlife habitat.

[Control](#): (1) - up to 4" diameter trunks; (7) or (10) or bury stump. Do not mow.

MULTIFLORA ROSE (*Rosa multiflora*), formerly recommended for erosion control, hedges, and wildlife habitat, becomes a huge shrub that chokes out all other vegetation and is too dense for many species of birds to nest in, though a few favor it. In shade, it grows up trees like a vine. It is covered with white flowers in June. (Our native roses have fewer flowers, mostly pink.) Distinguish multiflora by its size, and by the presence of very hard, curved thorns, and a fringed edge to the leaf stalk.

[Control](#): (1) - pull seedlings, dig out larger plants at least 6" from the crown and 6" down; (4) on extensive infestations; (10) or (11). It may remain green in winter, so herbicide may *applied when other plants are dormant. For foliar application, mix Rodeo with extra sticker-spreader, or use Roundup Sure Shot Foam on small plants.*

BUSH HONEYSUCKLES (*Lonicera spp.*), including Belle, Amur, Morrow's, and Tatarian honeysuckle. (In our region, assume that any honeysuckle is exotic unless it is a scarlet-flowered vine). Bush honeysuckles create denser shade than native shrubs, reducing plant diversity and eliminating nest sites for many forest interior species.

Control: (2) on ornamentals; (1); on shady sites only, brush cut in early spring and again in early fall (3); (4) during the growing season; (7); or (10) late in the growing season.

BLUNT-LEAVED PRIVET (*Ligustrum obtusifolium*). Control: (1); (7) or (10); or trim off all flowers. Do not cut back or mow.

BURNING BUSH, WINGED EUONYMUS (*Euonymus alatus*), identified by wide, corky wings on the branches.

Control: (1); (7) or (10); or trim off all flowers.

JAPANESE BARBERRY (*Berberis thunbergii*), and all cultivars and varieties.

Control: (1); (7) or (10); or trim off all flowers.

INVASIVE WOODY VINES

All of these vines shade out the shrubs and young trees of the forest understory, eventually killing them, and changing the open structure of the forest into a dense tangle. DO NOT PLANT NEXT TO OPEN SPACE.

JAPANESE HONEYSUCKLE (*Lonicera japonica*), including Hall's honeysuckle, has gold-and-white flowers with a heavenly scent and sweet nectar in June. This is probably the familiar honeysuckle of your childhood. It is a rampant grower that spirals around trees, often strangling them.

Control: (1); (3); (10); (11) in fall or early spring when native vegetation is dormant. Plan to re-treat repeatedly.

ORIENTAL BITTERSWEET (*Celastrus orbiculatus*) has almost completely displaced American bittersweet (*C. scandens*). The Asian plant has its flowers and bright orange seed capsules in clusters all along the stem, while the native species bears them only at the branch tips.

Control: (1); keep ornamental plants cut back, remove all fruits as soon as they open, and bag or burn fruits; to eradicate use Garlon 3a (10).

JAPANESE KNOTWEED, MEXICAN BAMBOO (*Polygonum cuspidatum*) can grow in shade. The stems have knotty joints, reminiscent of bamboo. It grows 6-10' tall and has large pointed oval or triangular leaves.

Control: Cut at least 3 times each growing season and/or treat with Rodeo (10) or (11). In gardens, heavy mulch or dense shade may kill it.

INVASIVE HERBACEOUS PLANTS

GARLIC MUSTARD (*Alliaria petiolata*, *A. officinalis*), a white-flowered biennial with rough, scalloped leaves (kidney-, heart- or arrow-shaped), recognizable by the smell of garlic and taste of mustard when its leaves are crushed. (The odor fades by fall.)

Control: Pull before it flowers in spring (1), removing crown and roots. Tamp down soil afterwards. Once it has flowered, cut (2), being careful not to scatter seed, then bag and burn or send to the landfill. (11) may be appropriate in some settings.

JAPANESE STILT GRASS (*Microstegium vimineum*) can be identified by its lime-green color and a line of silvery hairs down the middle of the 2-3" long blade. It tolerates sun or dense shade and quickly invades areas left bare or disturbed by tilling or flooding. An annual grass, it builds up a large seed bank in the soil.

Control: Easily pulled in early to mid-summer (1) - be sure to pull before it goes to seed. If seeds have formed, bag and burn or send to landfill. Mowing weekly or when it has just begun to flower may prevent it from setting seed (3). Use glyphosate (11) or herbicidal soap (less effective) on large infestations. Follow up with (5) in spring.

MILE-A-MINUTE VINE, DEVIL'S TAIL TEARTHUMB (*Polygonum perfoliatum*), a rapidly growing annual vine with triangular leaves, barbed stems, and turquoise berries in August which are spread by birds. It quickly covers and shades out herbaceous plants.

Control: same as for stilt grass.

SPOTTED KNAPWEED (*Centaurea maculosa*), a biennial with thistle-like flowers.

Control: Do NOT pull (1) unless the plant is young and the ground is very soft - the tap root will break off and produce several new plants. Wear sturdy gloves. (2); (6); (10) or (11).

CONTROL MEASURES

- (1) PULL seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs.
- (2) DEADHEAD to prevent spread of seeds of invasive plants. Cut off seeds or fruits before they ripen. Bag, and burn or send to a landfill.
- (3) MOW or CUTTING at least 4 times a season to deplete plants' store of nutrients and carbohydrates, reduce seed formation, and kill or minimize spread of plants. If necessary, repeat each year.
- (4) CONTROLLED BURNING during the spring, repeated over several years, allows native vegetation to compete more effectively with the invasive species. This requires a permit. Spot treatment with glyphosate in late fall can be used to make this method more effective.
- (5) Use a CORN-BASED PRE-EMERGENCE HERBICIDE on annual weeds. This product is also an organic fertilizer, i.e., it can stimulate growth of existing plants, including weeds, so it is appropriate for lawns and gardens but may not be appropriate in woodlands.
- (6) In lawns, SPOT TREAT with BROAD-LEAF WEEDKILLER. Good lawn-care practices (test soil; use lime and fertilizer only when soil test shows a need; mow high and frequently; leave clippings on lawn) reduce weed infestations.
- (7) CUT DOWN the tree. Grind out the stump, or clip off re-growth.
- (8) GIRDLE tree: cut through the bark and growing layer (cambium) all around the trunk, about 6" above the ground. Girdling is most effective in spring when the sap is rising, and from middle to late summer when the tree is sending down food to the roots. Clip off sucker sprouts.
- (9) FRILL: Using a machete, hatchet or similar device, hack scars (several holes in larger trees) downward into the cambium layer, and squirt in glyphosate (or triclopyr if recommended in text above). Follow label directions for Injection and Frill Applications. This is most effective from middle to late summer. Clip off any sucker sprouts or treat with glyphosate.
- (10) CUT STEM / CUT STUMP WITH GLYPHOSATE (or triclopyr if specified above). Follow label directions for Cut Stump Application. Clip off sucker sprouts or paint with glyphosate. See Note on Herbicides.
- (11) FOLIAR SPRAY WITH GLYPHOSATE herbicide (see Note on Herbicides). Use a backpack or garden sprayer or mist blower, following label directions. Avoid overspray and/or dripping onto non-target plants, because glyphosate kills most plants except moss. If it rolls off waxy or grass-like foliage, use additional sticker-spreader. Deciduous trees, shrubs, and perennials move nutrients down to the roots in late summer. Glyphosate is particularly effective at this time and when plants have just gone out of flowering. Several invasive species retain their foliage after native plants have lost theirs, and resume growth earlier in spring than most natives. This allows you to treat them without harming the natives. However, the plant must be actively growing for the herbicide to work. Retreatments may be necessary the following year if suckering occurs or the plant hasn't been entirely killed.

NOTE ON HERBICIDES: It is highly recommended that small populations try to be controlled using non-chemical methods wherever feasible. However, for large infestations, and for a few plants specified above, herbicide use is essential. Apply herbicides carefully to avoid non-target plants, glyphosate is the least environmentally damaging herbicide in most cases. Add food coloring for visibility, and a soap-based sticker such as Cide-Kick. Glyphosate is ineffective on some

plants; for these, triclopyr (Garlon) may be indicated. When using herbicides, read the entire label and observe all precautions listed, including proper disposal. If in doubt, call your local Cooperative Extension Service.

Pavement Temp. (°F) and Trend (↑ ↓)	Weather Condition	Maintenance Actions	Application Rate (lbs/per 1000 sq.ft.)			
			Salt Prewetted/Pretreated with salt brine	Salt Prewetted/Pretreated with other blends	Dry salt	Winter sand
>30 ↑	Snow	Plow, treat intersections only				Not recommended
	Frz. Rain	Apply chemical				Not recommended
30 ↓	Snow	Plow and apply chemical				Not recommended
	Frz. Rain	Apply chemical				Not recommended
25 - 30 ↑	Snow	Plow and apply chemical				Not recommended
	Frz. Rain	Apply chemical				Not recommended
25 - 30 ↓	Snow	Plow and apply chemical				Not recommended
	Frz. Rain	Apply chemical				3.25
20 - 25 ↑	Snow or frz. Rain	Plow and Apply chemical				3.25 for frz. Rain
20 - 25 ↓	Snow	Plow and apply chemical				Not recommended
	Frz. Rain	Apply chemical				3.25
15 - 20 ↑	Snow	Plow and apply chemical				Not recommended
	Frz. Rain	Apply chemical				3.25
15 - 20 ↓	Snow or Frz. Rain	Plow and apply chemical				3.25 for frz. Rain
0 to 15 ↑↓	Snow	Plow, treat with blends, sand hazardous areas	Not recommended		Not recommended	5.0 and spot-treat as needed
< 0	Snow	Plow, treat with blends, sand hazardous areas	Not recommended		Not recommended	5.0 and spot-treat as needed

Table 19. Application Rates for Deicing

These rates & table format are based on road application guidelines (Mn Snow & Ice Control Field Handbook, Manual 2005-1). Develop your own application rates by adjusting your current rates incrementally downward toward these guidelines. Where temperature categories overlap, select the rate most applicable to your situation.



Design and Maintenance of Subsurface Gravel Wetlands

February 4, 2015

The University of New Hampshire Stormwater Center conducted a design and maintenance review of subsurface gravel wetland systems for the New Hampshire Department of Transportation. The UNHSC utilized various NHDOT site and construction plans, construction photo documentation, cost and material specification sheets, and the NHDOT subsurface gravel wetland (SGW) design specification dated December 20, 2013. The UNHSC also conducted inspections of subsurface gravel wetland systems that were designed and installed by the NHDOT or its contractors in order to determine maintenance needs. The UNHSC prepared this report as a resource for SGW designers and installers to assist in the design, cost and material specification, and maintenance requirements to ensure a properly functioning SGW system.

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1.0 Introduction

The UNHSC appreciates the opportunity to provide Design and Maintenance Review services for the New Hampshire Department of Transportation. We have completed our review and site visits of NHDOT SGW installations and offer the following summary.

Information Reviewed:

- Various Site Plans prepared by NHDOT and various assisting engineering firms
- Construction Management photos provided by NHDOT
- Costs and material specifications compiled by NHDOT
- NHDOT Subsurface Gravel Wetland Design, dated December 20, 2013

2.0 Background

The subsurface gravel wetland (SGW) stormwater management system has been around for almost 20 years. It approximates the look and function of a natural wetland, effectively removing sediments and other pollutants commonly found in runoff while enhancing the visual appeal of the landscape by adding buffers or greenscape to urban areas. The SGW specification used by NHDOT represents the original specification developed by the University of New Hampshire Stormwater Center (UNHSC) and documented in the UNHSC SGW Design Specifications published in June of 2009. These specifications reflect findings from five years of study of the SGW originally designed and evaluated at UNHSC. The SGW is a horizontal-flow filtration system and should not be confused with stormwater wetlands that function more like ponds. Instead, the SGW includes a dense root mat in a wetland soil that forms a cover over crushed stone. The subsurface crushed stone is the primary flow path for stormwater and is an anaerobic microbe-rich environment for improving water quality. Like other filtration systems, it demonstrates a tremendous capacity to reduce runoff peak flows and improve water quality.

3.0 Implementation

Subsurface gravel wetlands can be used in many regions, with the exception of those that are too arid to support a wetland system. SGW systems have demonstrated exceptional stormwater quality treatment, in particular for nutrients, for a range of land uses including linear transportation environments. It should be noted that as implementation has progressed and coupled with an additional five years of research at the UNHSC, additional findings and design modifications have arisen. The initial design of the UNHSC SGW was to handle runoff from a commuter parking area, best represented by a high density commercial use. In such applications SGW systems are space intensive; however for linear transportation environments some flexibility is expected. Recommendations and comments provided herein reflect additional learning and research findings gathered since the original publication of the UNHSC 2009 SGW specification.

- 1.) The purpose of the NHDOT underdrain systems is to intercept and provide drainage for seasonal high ground water levels where deemed to be within 0.5' of the wetland soil surface elevation. The rationale is not well defined and requires justification. For systems that are installed within proximity to seasonal high groundwater (SHGW) it is unclear how the benefits of the flushing basins justify overall costs (average cost savings: \$1,069 per system). The SGW low flow orifice not only controls the stormwater flow through the system, by this hydraulic control will also ultimately control SHGW elevation in the vicinity of the SGW in the same manner. An SGW may have a portion of the system built below the SHGW. The original SGW at the UNHSC site in Durham, NH is a case in point. A caution is noted in that groundwater flows should not be significant compared to the stormwater flows. Significant groundwater inflows could prevent the formation of the anaerobic zone in the crushed stone.
- 2.) Overall system sizing for NHDOT systems appears to be based on the UNHSC 2009 SGW drainage design guidance with respect to overall length to width (L:W) ratio. In some locations L:W ratio dominates design orientation. UNHSC researchers recommend that this design criterion not be considered the most critical design element. The critical design element with respect to configuration is to size the system to treat the desired design rainfall depth from the contributing drainage area (1" Water Quality Volume). Linear systems are fine (higher L:W), provided the minimum WQV: Internal Storage Reservoir (ISR) capacity ratio is 4:1 or 25% (WQV:ISR) and the minimum flow path in the crushed stone in each cell is 15 feet.
- 3.) Most inspected forebays appear to function as wet basins rather than the more desirable dry basin. Dry forebays promote aerobic transformations of nitrogen which is an important first step prior to the anaerobic zone. It is recommended that if forebays cannot be economically installed to operate dry then concrete inlet structures such as off-line deep sump catch basins be used for pre-treatment as opposed to a forebay structure. A deep sump catch basin or other precast inlet structure may also be easier to maintain. A very important function of any SGW forebay is that it be aerobic in order to convert most forms of nitrogen to nitrate or nitrite.
- 4.) Most forebay outlets lack low flow conveyance which causes them to function as wet basins as opposed to dry basins. It is important that regardless of the configuration of the pretreatment structure that the SGW system forebay contain an outlet with an invert at the same level as the wetland surface to eliminate ponding behind the forebay berm such that obligate wetland plant colonization (cattails) and the potential for anaerobic conditions do not occur. Other options are to design the forebays to convey low flows that draw the fore bay water level down between storm events.
- 5.) Hydraulic inlets (leaching chambers) appear to be oversized. There are many hydraulic inlet design configurations that may be able to replace existing designs with better function and maintenance capacity and diminished costs. NHDOT SGW systems observed in this study, small and large, seem to use similar hydraulic inlet configurations

with the same number of structures regardless of watershed area size or design treatment volume. UNHSC research indicates the hydraulic inlet configuration can be flexible provided it has a greater hydraulic capacity/efficiency than the primary outlet orifice control. Recent experience in UNHSC designs have used slotted hydraulic inlet pipes as a backup inlet with a primary inlet composed of woven geotextile laid on the subsurface pea stone and covered in 6"-8" diameter stone around the outfall of the inlet pipe (see figures 1 and 2). This configuration protects the stone filter in the subsurface of the wetland system while also providing a more accessible and maintainable surface hydraulic inlet feature that will inevitably be easier and less costly to construct.

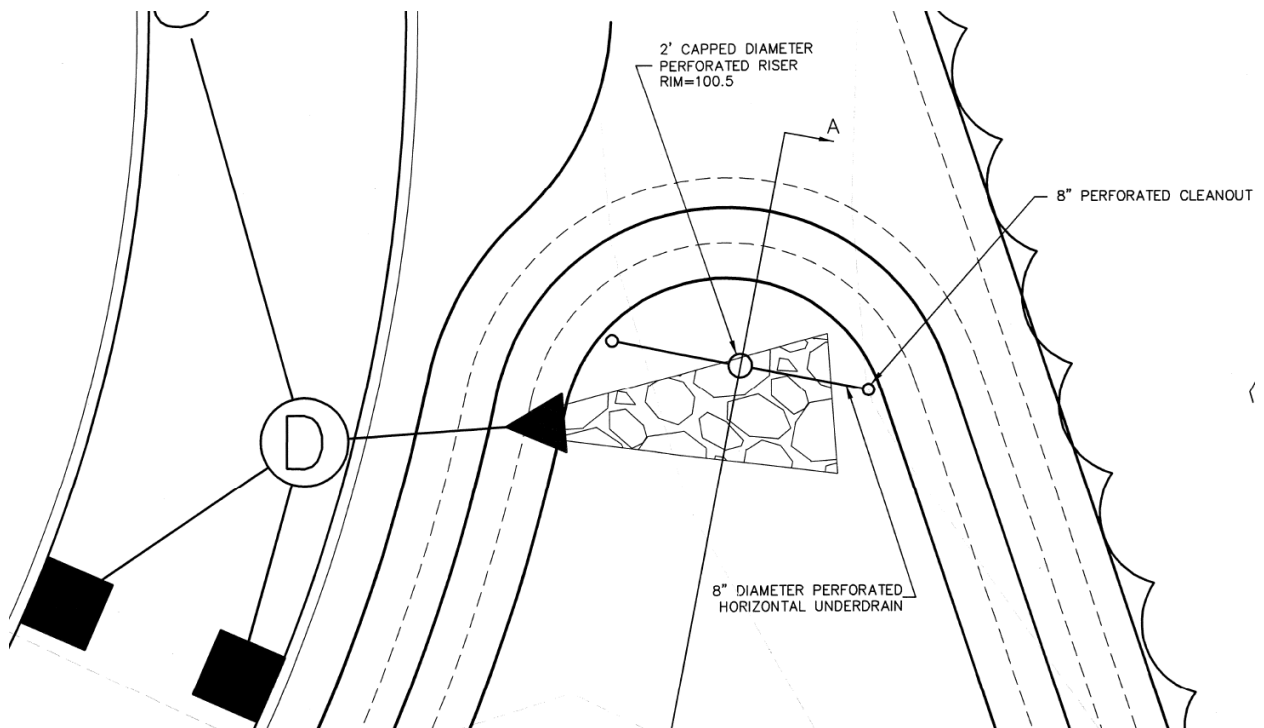


Figure 1: Typical plan view of multi-inlet configuration of a SGW system

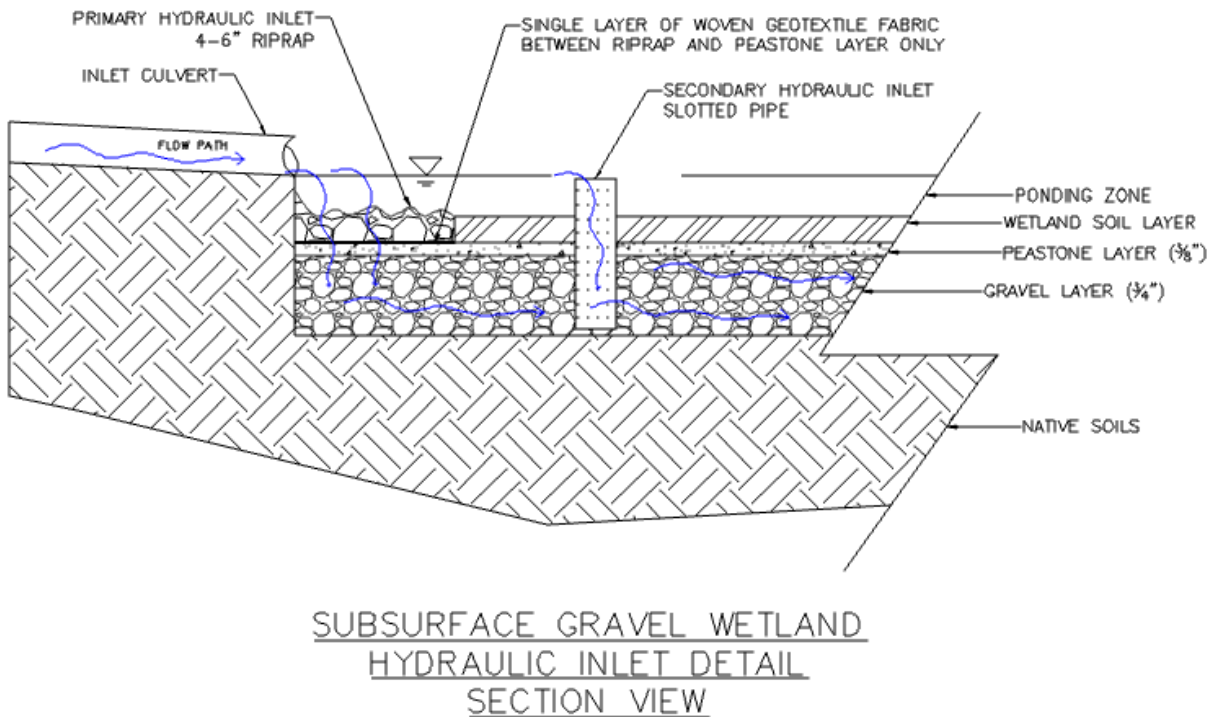


Figure 2: Typical profile view of multi-inlet configuration of a SGW system.

- 6.) Cleanout structures (leaching chambers) need not be as large since their primary function is for emergency access to the subsurface header pipe that directs flow either to the second wetland chamber or the outlet structure. Cleanout structures can be capped or be installed at the wetland surface grade with a manhole cover to ensure that the cleanouts are accessible, water tight, and does not short circuit system hydraulics.
- 7.) Some of the outlet control structures have slotted inlets (4" high by 12" wide) to allow for drainage of high flows. These slots need to be protected by covering them with 6-8" stone or some type of trash screen. This will prevent trash, leaves, or other debris from clogging the outlet orifice.

4.0 Costs

For this project NHDOT produced itemized costs associated with the bid prices for the materials and installation of thirteen SGW systems. In meetings with NHDOT personnel several items were determined to be irrelevant to this project and were thus eliminated from the spreadsheet. These items are itemized in the list below:

- 206.1 (Common Structure Excavation) and 206.2 (Rock Structure Excavation) were determined to be unique and not standard items and eliminated

- 209.1 (Granular Backfill) was determined to reflect typical stabilization for bedding material and were eliminated
- 593.331 (Geotextile, Stabilization, Class 3, Non-woven) was determined to be no longer used, and was replaced with Item 585.7 (Stone Fill, Class G) and thus eliminated
- 593.411 (Geotextile, Permeability Control, Class 1, Non-woven), 593.421 (Geotextile, Permeability Control, Class 2, Non-woven), 593.431 (Geotextile, Permeability Control, Class 3, Non-woven) were determined to be erosion control items and were eliminated
- 603.83206 (6" Plastic Pipe, Smooth Interior), 605.906 (6" Pipe Underdrain, Contractors' Option) were determined to be irrelevant to the SGW construction costs and were thus eliminated.

To compare costs, all original capital construction costs were converted to 2014 dollars using consumer price index inflation rates (USDOL, 2014). Average SGW materials and installation costs from the range of assessed projects (see attachment A for the raw costs) was \$32,462 per impervious acre treated (\$0.75/sf) with a maximum cost of \$68,893 per impervious acre treated (\$1.47/sf) and a minimum cost of \$12,210 per impervious acre treated (\$0.28/sf). As a comparison, for the SGW studied at the UNH field facility, costs were calculated at \$28,079 per impervious acre treated (\$0.64/sf). Cost details are illustrated in Table 1.

Table 1: Comparison of unit costs from all reviewed NHDOT SGW materials cost data and reference information documented by UNHSC. Note all costs are in 2014 dollars

Total Price Statistics	Contributing Impervious Area (A)	Construction Cost per Impervious Area (\$/A)	Construction Cost per Impervious Area (\$/sf)	UNHSC Costs (\$/A)	UNHSC Costs (\$/sf)
Minimum	1.90	\$ 12,210	\$ 0.28	-	-
Average	4.56	\$ 32,462	\$ 0.75	\$28,079	\$ 0.64
Maximum	8.40	\$ 63,893	\$ 1.47	-	-

Results of the cost assessment indicate room for potential savings with respect to design. In light of the detailed recommendations outlined in the Implementation section of this report, cost adjustments and justifications include:

Eliminate items 605.79 and 605.82251-24 (perimeter dewatering controls) for use if SHGW is within 0.5' of SGW surface. There is no data or clear rationale for any threat from SHGW in SGW systems. SHGW levels are often intermittent and would ultimately be controlled by the outlet orifice which is typically 0.5 to 0.67' below SGW surface. Therefore this item is redundant and further justification is necessary to validate the additional expense. Cost savings is estimated at 3.3% or \$1,069 per system.

Reduce the number of item numbers 604.921 and 604.922 (alt: 604.193, 604.393, and 604.912) leaching chambers. Hydraulic inlet controls could be reduced if not eliminated in the future as linear routing through the system is adapted in future designs. Other hydraulic inlet controls such as suggested in the Implementation section of this report may be less expensive and offer

greater maintainability. There is no clear rationale for these structures at the end of each wetland cell as their only function is to provide access to the perforated header pipe in the subsurface as a potential clean out. At the end of the wetland cell these can simply be solid risers capped at the wetland surface. At the upstream end of each wetland cell, hydraulic inlets should be reduced to two if not eliminated and replaced with alternative inlet structures. Hydraulic inlet capacity need only exceed that of the outlet orifice. Cost savings is estimated at 10% or \$3,201 per system.

Items 647.1 (Humus) and 647.29 (Wetland Humus) incurred high variability with respect to cost and in some systems had some of the largest percent costs (>12%) than any additional line items. There is no specification for the wetland humus in the NHDOT SGW design guidelines dated December 20, 2013 and the wetland soil specification in the UNHSC 2009 guidance is weak without sufficient detail to allow for accurate and cost effective bidding. Subsequent to this report UNHSC has worked to develop a particle size distribution for use in specifying wetland humus in future SGW systems. The proposed PSD for wetland humus is provided in Table 2 and reflects a poorly drained soil with a d50 of 0.15 mm and is a clay or silt loam in the soil textural triangle. We feel that this will allow for more cost effective bidding of appropriate soil types with the potential to even employ appropriate onsite excavated materials into select humus mixes thereby further reducing costs. We believe with these additional specifications it is not unrealistic to assume a future price of \$15/CY, which represents the 25% quartile cost of the original line item. Cost savings is estimated at 0.5% or \$164 per system.

Table 2: Particle size distribution and testing tolerances for wetland humus for the subsurface gravel wetland system

US Standard Sieve Size in/mm	Percent Passing	Percent Passing Testing Tolerances
0.5/12.5	100	± 10.0
#10/2.00	90 - 75	± 5.0
#100/0.15	40-50	± 5.0
#200/0.75	25-50	± 5.0

Relative cost savings are summarized in table 3.

Table 3: Comparison of unit costs from all reviewed SGW materials cost data with projected cost savings from recommended itemized design modifications. Note all costs are amortized to reflect 2014 dollars.

Total Price Statistics	Contributing Impervious Area (A)	Construction Cost per Impervious Area (\$/A)	Construction Cost per Impervious Area (\$/sf)	UNHSC Costs (\$/A)	UNHSC Costs (\$/sf)
Minimum	1.90	\$ 7,895	\$ 0.18	-	-
Average	4.56	\$ 27,320	\$ 0.63	\$28,079	\$0.64
Maximum	8.40	\$ 53,780	\$ 1.23	-	-

5.0 Maintenance

Inspection and maintenance is a critical component of the long term function and effectiveness of any stormwater control measure. Overall the UNHSC inspections of the facilities proved that the SGW systems were largely functioning properly and were well designed and constructed. The UNHSC has produced operation and maintenance guidelines as well as an inspection checklist which have been provided in attachment A of this report. Inspection is critical to assess as built functionality in addition to identifying unique maintenance tasks that may be less general in nature and more site specific. Overall the inspections conducted and provided as an attachment to this report (attachment B) indicates that routine biannual inspection (annual as a minimum) should be initiated at these facilities as a standard of practice. Post construction inspections are critical just after newly constructed SGW system is placed online. While some long-term maintenance items are due to system aging and processing of polluted runoff, some operation issues are a result of construction and installation practices not fully aligned with design specifications. These items are often quickly identifiable. In our assessment of eight NHDOT SGW systems two main issues were identified associated with installation or construction. First numerous pre-treatment forebays in observed systems held ponding water. This impacts the overall chemical function and processing of dissolved inorganic nitrogen species as these ponded forebay areas often turn into anaerobic areas of obligate wetland plants. Second on one particular system (NHDOT # 14633F BMP 19) three to five inches of standing water was observed within the entire system. The final water elevation was being controlled by an outlet pipe invert that was installed above the overall wetland soil elevation. This has resulted in sparse vegetation and likely was not part of the original design.

Beyond construction and installation issues the primary maintenance need identified through these inspections is simple maintenance of the established wetland vegetation. Numerous facilities are in need of this type of maintenance which involves cutting the existing plants down to the base and removing it from the system to prevent breakdown and rerelease of nitrogen.

Attachment A: Raw Item Costs

SUBSURFACE GRAVEL WETLANDS (13933C/ DB 920)			
Item	Quantity	Bid Price	Total
<i>Item 203.1 - Common Excavation (CY)</i>	16,603	\$4.75	\$78,864.25
<i>Item 203.6 - Embankment-in-Place (CY)</i>	245	\$8.95	\$2,192.75
<i>Item 203. 52 - Impervious Material (CY)</i>	500	\$14.00	\$7,000.00
<i>Item 585.3- Stone Fill, Class C (CY)</i>	83	\$18.00	\$1,494.00
<i>Item 585.5 - Stone Fill, Class E (CY)</i>	900	\$18.00	\$16,200.00
<i>Item 585.7 - Stone Fill, Class G (CY)</i>	120	\$24.00	\$2,880.00
<i>Item 593.411 - Geotextile, Perm. Control, Cl. 1, Non-woven (SY)</i>	215	\$2.10	\$451.50
<i>Item 603.83212 - 12" Plastic Pipe (Smooth Interior) (LF)</i>	283	\$33.00	\$9,339.00
<i>Item 604.91X - Outlet Control Structure (U)</i>	2	\$5,800.00	\$11,600.00
<i>Item 604.193 - Special Catch Basin (3' Dia) (U)</i>	8	\$3,300.00	\$26,400.00
<i>Item 604.393 - Specia Drain Manhole 3'x 3' (U)</i>	3	\$2,600.00	\$7,800.00
<i>Item 605.508 - 8" Perf. Corr. Poly. Pipe Underdrain (LF)</i>	592	\$22.00	\$13,024.00
<i>Item 605.79 - Underdrain Flushing Basins (EA)</i>	10	\$660.00	\$6,600.00
<i>Item 605.906 - 6" Pipe Underdrain (Contractor's Option)</i>	506	\$16.00	\$8,096.00
<i>Item 646.3 - Turf Establishment w/ Mulch & Tackifiers (A)</i>	0.48	\$1,650.00	\$792.00
<i>Item 647.1 - Humus (CY)</i>	1,900	\$15.00	\$28,500.00
<i>Item 647.29 - Wetland Humus (CY)</i>	330	\$15.00	\$4,950.00
<i>Item 670.01 - Sediment Sump Measuring Post (EA)</i>	1	\$225.00	\$225.00
Total			\$226,408.50

SUBSURFACE GRAVEL WETLANDS (13455A/ GW)			
Item	Quantity	Bid Price	Total
<i>Item 203.1 - Common Excavation (CY)</i>	5,776	\$9.75	\$56,316.00
<i>Item 203.2 - Rock Excavation (CY)</i>	2,241	\$29.00	\$64,989.00
<i>Item 203.6 - Embankment-in-Place (CY)</i>	317	\$6.25	\$1,981.25
<i>Item 203.53 - Low Permeability Fill (CY)</i>	255	\$8.80	\$2,244.00
<i>Item 520.1 - Concrete Class A (CY)</i>	6	\$375.00	\$2,250.00
<i>Item 585.3- Stone Fill, Class C (CY)</i>	131	\$34.50	\$4,519.50
<i>Item 585.5 - Stone Fill, Class E (CY)</i>	370	\$31.00	\$11,470.00
<i>Item 585.7 - Stone Fill, Class G (CY)</i>	62	\$34.25	\$2,123.50
<i>Item 593.421 - Geotextile, Perm. Control, Cl. 2, Non-woven (SY)</i>	502	\$2.00	\$1,004.00
<i>Item 603.80012 - 12" Plastic Pipe (LF)</i>	31	\$40.00	\$1,240.00
<i>Item 604.91X - Outlet Control Structure (U)</i>	1	\$4,850.00	\$4,850.00
<i>Item 604.921 - Leaching Chamber, Type 1 (U)</i>	6	\$1,700.00	\$10,200.00
<i>Item 604.922 - Leaching Chamber, Type 2 (U)</i>	5	\$1,850.00	\$9,250.00
<i>Item 605.506 - 6" Perf. Corr. Poly. Pipe Underdrain (LF)</i>	204	\$19.50	\$3,978.00
<i>Item 647.1 - Humus (CY)</i>	244	\$14.00	\$3,416.00
<i>Item 647.29 - Wetland Humus (CY)</i>	123	\$16.00	\$1,968.00
<i>Item 670.01 - Sediment Sump Measuring Post (EA)</i>	1	\$250.00	\$250.00
Total			\$182,049.25

SUBSURFACE GRAVEL WETLANDS (10620L/ GW)			
Item	Quantity	Bid Price	Total
<i>Item 203.52 - Impervious Material (CY)</i>	1,919	\$18.05	\$34,637.95
<i>Item 585.2 - Stone Fill, Class B (CY)</i>	56	\$19.15	\$1,072.40
<i>Item 585.3- Stone Fill, Class C (CY)</i>	278	\$40.25	\$11,189.50
<i>Item 585.5 - Stone Fill, Class E (CY)</i>	46	\$45.90	\$2,111.40
<i>Item 593.431 - Geotextile, Perm. Control, Cl. 3, Non-woven (SY)</i>	200	\$6.00	\$1,200.00
<i>Item 603.83212 - 12" Plastic Pipe (Smooth Interior) (LF)</i>	50	\$32.15	\$1,607.50
<i>Item 604.91X - Outlet Control Structure (U)</i>	1	\$2,045.00	\$2,045.00
<i>Item 604.921 - Leaching Chamber, Type 1 (U)</i>	4	\$3,080.00	\$12,320.00
<i>Item 604.922 - Leaching Chamber, Type 2 (U)</i>	4	\$2,950.00	\$11,800.00
<i>Item 605.512 - 12" Perf. Corr. Poly. Pipe Underdrain (LF)</i>	187	\$15.75	\$2,945.25
<i>Item 647.29 - Wetland Humus (CY)</i>	93	\$35.00	\$3,255.00
Total			\$84,184.00

There was no earthwork specifically attributable to the gravel wetland. It is essentially constructed on top of the existing ground between the Rte. 16 NB slope work and the Exit 15 on ramp slope work.

SUBSURFACE GRAVEL WETLANDS (10418G/ GW)			
Item	Quantity	Bid Price	Total
<i>Item 203.1 - Common Excavation (CY)</i>	5,978	\$8.00	\$47,824.00
<i>Item 203.6 - Embankment-in-Place (CY)</i>	8	\$5.00	\$40.00
<i>Item 203. 52 - Impervious Material (CY)</i>	1,415	\$18.00	\$25,470.00
<i>Item 206.1 - Common Structure Excavation (CY)</i>	1,225	\$16.00	\$19,600.00
<i>Item 585.3- Stone Fill, Class C (CY)</i>	21	\$30.00	\$630.00
<i>Item 585.5 - Stone Fill, Class E (CY)</i>	1,141	\$30.00	\$34,230.00
<i>Item 593.331 - Geotextile, Stabilization, Cl. 3, Non-woven (SY)</i>	1,711	\$3.00	\$5,133.00
<i>Item 603.83206 - 6" Plastic Pipe (Smooth Interior) (LF)</i>	55	\$24.00	\$1,320.00
<i>Item 604.91X - Outlet Control Structure (U)</i>	1	\$2,400.00	\$2,400.00
<i>Item 604.921 - Leaching Chamber, Type 1 (U)</i>	4	\$3,000.00	\$12,000.00
<i>Item 604.922 - Leaching Chamber, Type 2 (U)</i>	2	\$3,000.00	\$6,000.00
<i>Item 605.906 - 6" Pipe Underdrain (Contractors Option) (LF)</i>	602	\$16.00	\$9,632.00
<i>Item 605.79 - Underdrain Flushing Basins (EA)</i>	8	\$600.00	\$4,800.00
<i>Item 647.29 - Wetland Humus (CY)</i>	380	\$25.00	\$9,500.00
Total			\$178,579.00

SUBSURFACE GRAVEL WETLANDS (11238L/ BMP 1590)			
Item	Quantity	Bid Price	Total
<i>Item 203.1 - Common Excavation (CY)</i>	3,933	\$4.00	\$15,732.00
<i>Item 203.6 - Embankment-in-Place (CY)</i>	184	\$2.00	\$368.00
<i>Item 203.52 - Impervious Material (CY)</i>	1,530	\$15.00	\$22,950.00
<i>Item 206.2- Rock Structure Excavation (CY)</i>	27	\$30.00	\$810.00
<i>Item 520.1 - Concrete Class A (CY)</i>	5	\$500.00	\$2,700.00
<i>Item 585.3- Stone Fill, Class C (CY)</i>	90	\$30.00	\$2,700.00
<i>Item 585.5 - Stone Fill, Class E (CY)</i>	182	\$28.00	\$5,096.00
<i>Item 585.7 - Stone Fill, Class G (CY)</i>	30	\$40.00	\$1,200.00
<i>Item 593.411 - Geotextile, Perm. Control, Cl. 1, Non-woven (SY)</i>	192	\$2.25	\$432.00
<i>Item 603.83212 - 12" Plastic Pipe (Smooth Interior) (LF)</i>	20	\$32.00	\$640.00
<i>Item 604.91X - Outlet Control Structure (U)</i>	1	\$3,000.00	\$3,000.00
<i>Item 604.921 - Leaching Chamber, Type 1 (U)</i>	6	\$1,250.00	\$7,500.00
<i>Item 604.922 - Leaching Chamber, Type 2 (U)</i>	5	\$1,250.00	\$6,250.00
<i>Item 605.512 - 12" Perf. Corr. Poly. Pipe Underdrain (LF)</i>	125	\$25.00	\$3,125.00
<i>Item 646.31 - Turf Establishment w/ Mulch & Tackifiers (SY)</i>	1,482	\$0.35	\$518.70
<i>Item 647.1 - Humus (CY)</i>	78	\$20.00	\$1,560.00
<i>Item 647.29 - Wetland Humus (CY)</i>	103	\$35.00	\$3,605.00
<i>Item 670.01 - Sediment Sump Measuring Post (EA)</i>	1	\$500.00	\$500.00
Total			\$78,686.70

SUBSURFACE GRAVEL WETLANDS (11238L/ BMP 922)			
Item	Quantity	Bid Price	Total
<i>Item 203.1 - Common Excavation (CY)</i>	3,822	\$4.00	\$15,288.00
<i>Item 203.6 - Embankment-in-Place (CY)</i>	467	\$2.00	\$934.00
<i>Item 206.1 - Common Structure Excavation (CY)</i>	5	\$30.00	\$150.00
<i>Item 520.1 - Concrete Class A (CY)</i>	4	\$500.00	\$2,000.00
<i>Item 585.3- Stone Fill, Class C (CY)</i>	22	\$30.00	\$660.00
<i>Item 585.5 - Stone Fill, Class E (CY)</i>	420	\$28.00	\$11,760.00
<i>Item 585.7 - Stone Fill, Class G (CY)</i>	69	\$40.00	\$2,760.00
<i>Item 593.411 - Geotextile, Perm. Control, Cl. 1, Non-woven (SY)</i>	96	\$2.25	\$216.00
<i>Item 603.83212 - 12" Plastic Pipe (Smooth Interior) (LF)</i>	41	\$32.00	\$1,312.00
<i>Item 604.91X - Outlet Control Structure (U)</i>	1	\$3,000.00	\$3,000.00
<i>Item 604.921 - Leaching Chamber, Type 1 (U)</i>	6	\$1,250.00	\$7,500.00
<i>Item 604.922 - Leaching Chamber, Type 2 (U)</i>	6	\$1,250.00	\$7,500.00
<i>Item 605.512 - 12" Perf. Corr. Poly. Pipe Underdrain (LF)</i>	306	\$25.00	\$7,650.00
<i>Item 605.79 - Underdrain Flushing Basins (EA)</i>	2	\$500.00	\$1,000.00
<i>Item 605.82251 - 24" Agg. Und. Type 2 w/ 6" Perf. Corr. PE Pipe (LF)</i>	565	\$25.00	\$14,125.00
<i>Item 646.31 - Turf Establishment w/ Mulch & Tackifiers (SY)</i>	3,262	\$0.35	\$1,141.70
<i>Item 647.1 - Humus (CY)</i>	89	\$20.00	\$1,780.00
<i>Item 647.29 - Wetland Humus (CY)</i>	304	\$35.00	\$10,640.00
<i>Item 670.01 - Sediment Sump Measuring Post (EA)</i>	1	\$500.00	\$500.00
Total			\$89,916.70

SUBSURFACE GRAVEL WETLANDS (14633F/ BMP 19)			
Item	Quantity	Bid Price	Total
<i>Item 203.1 - Common Excavation (CY)</i>	2,396	\$4.00	\$9,584.00
<i>Item 203.6 - Embankment-in-Place (CY)</i>	468	\$3.15	\$1,474.20
<i>Item 203.52 - Impervious Material (CY)</i>	582	\$15.00	\$8,730.00
<i>Item 520.1 - Concrete Class A (CY)</i>	10	\$180.00	\$1,800.00
<i>Item 585.3- Stone Fill, Class C (CY)</i>	108	\$26.00	\$2,808.00
<i>Item 585.5 - Stone Fill, Class E (CY)</i>	267	\$25.00	\$6,675.00
<i>Item 585.7 - Stone Fill, Class G (CY)</i>	44	\$35.00	\$1,540.00
<i>Item 593.431 - Geotextile, Perm. Control, Cl. 3, Non-woven (SY)</i>	281	\$3.00	\$843.00
<i>Item 603.83212 - 12" Plastic Pipe (Smooth Interior) (LF)</i>	50	\$21.00	\$1,050.00
<i>Item 604.91X - Outlet Control Structure (U)</i>	1	\$4,000.00	\$4,000.00
<i>Item 604.921 - Leaching Chamber, Type 1 (U)</i>	6	\$980.00	\$5,880.00
<i>Item 604.922 - Leaching Chamber, Type 2 (U)</i>	5	\$960.00	\$4,800.00
<i>Item 605.506 - 6" Perf. Corr. Poly. Pipe Underdrain (LF)</i>	192	\$15.00	\$2,880.00
<i>Item 605.79 - Underdrain Flushing Basins (EA)</i>	2	\$300.00	\$600.00
<i>Item 605.82251 - 24" Agg. Und. Type 2 w/ 6" Perf. Corr. PE Pipe (LF)</i>	429	\$20.00	\$8,580.00
<i>Item 647.1 - Humus (CY)</i>	233	\$20.00	\$4,660.00
<i>Item 647.29 - Wetland Humus (CY)</i>	292	\$12.50	\$3,650.00
<i>Item 670.01 - Sediment Sump Measuring Post (EA)</i>	1	\$110.00	\$110.00
Total			\$69,664.20

SUBSURFACE GRAVEL WETLANDS (14633E/ BMP 17)			
Item	Quantity	Bid Price	Total
<i>Item 203.1 - Common Excavation (CY)</i>	7,638	\$3.75	\$28,642.50
<i>Item 203.2 - Rock Excavation (CY)</i>	1,923	\$10.75	\$20,672.25
<i>Item 203.6 - Embankment-in-Place (CY)</i>	4,211	\$4.90	\$20,633.90
<i>Item 203.52 - Impervious Material (CY)</i>	1,746	\$12.00	\$20,952.00
<i>Item 520.1 - Concrete Class A (CY)</i>	23	\$525.00	\$12,075.00
<i>Item 585.3- Stone Fill, Class C (CY)</i>	194	\$25.00	\$4,850.00
<i>Item 585.5 - Stone Fill, Class E (CY)</i>	317	\$30.00	\$9,510.00
<i>Item 585.7 - Stone Fill, Class G (CY)</i>	52	\$40.00	\$2,080.00
<i>Item 593.431 - Geotextile, Perm. Control, Cl. 3, Non-woven (SY)</i>	580	\$2.00	\$1,160.00
<i>Item 603.83212 - 12" Plastic Pipe (Smooth Interior) (LF)</i>	38	\$24.00	\$912.00
<i>Item 604.91X - Outlet Control Structure (U)</i>	1	\$2,900.00	\$2,900.00
<i>Item 604.921 - Leaching Chamber, Type 1 (U)</i>	6	\$1,115.00	\$6,690.00
<i>Item 604.922 - Leaching Chamber, Type 2 (U)</i>	5	\$1,070.00	\$5,350.00
<i>Item 605.506 - 6" Perf. Corr. Poly. Pipe Underdrain (LF)</i>	369	\$10.50	\$3,874.50
<i>Item 605.79 - Underdrain Flushing Basins (EA)</i>	6	\$240.00	\$1,440.00
<i>Item 605.82251 - 24" Agg. Und. Type 2 w/ 6" Perf. Corr. PE Pipe (LF)</i>	718	\$21.00	\$15,078.00
<i>Item 647.29 - Wetland Humus (CY)</i>	289	\$20.00	\$5,780.00
<i>Item 670.01 - Sediment Sump Measuring Post (EA)</i>	1	\$500.00	\$500.00
Total			\$163,100.15

SUBSURFACE GRAVEL WETLANDS (14633F/ BMP 16)			
Item	Quantity	Bid Price	Total
<i>Item 203.1 - Common Excavation (CY)</i>	3,498	\$4.00	\$13,992.00
<i>Item 203.2 - Rock Excavation (CY)</i>	3,532	\$9.00	\$31,788.00
<i>Item 203.6 - Embankment-in-Place (CY)</i>	25	\$3.15	\$78.75
<i>Item 203.52 - Impervious Material (CY)</i>	3,435	\$15.00	\$51,525.00
<i>Item 206.2- Rock Structure Excavation (CY)</i>	39	\$17.00	\$663.00
<i>Item 209.1 - Granular Backfill (CY)</i>	7	\$28.00	\$196.00
<i>Item 520.1 - Concrete Class A (CY)</i>	7	\$180.00	\$1,260.00
<i>Item 585.2 - Stone Fill, Class B (CY)</i>	202	\$20.00	\$4,040.00
<i>Item 585.3- Stone Fill, Class C (CY)</i>	106	\$26.00	\$2,756.00
<i>Item 585.5 - Stone Fill, Class E (CY)</i>	667	\$25.00	\$16,675.00
<i>Item 585.7 - Stone Fill, Class G (CY)</i>	111	\$35.00	\$3,885.00
<i>Item 593.411 - Geotextile, Perm. Control, Cl. 1, Non-woven (SY)</i>	222	\$3.00	\$666.00
<i>Item 593.431 - Geotextile, Perm. Control, Cl. 3, Non-woven (SY)</i>	273	\$3.00	\$819.00
<i>Item 603.83212 - 12" Plastic Pipe (Smooth Interior) (LF)</i>	72	\$21.00	\$1,512.00
<i>Item 604.91X - Outlet Control Structure (U)</i>	2	\$4,000.00	\$8,000.00
<i>Item 604.921 - Leaching Chamber, Type 1 (U)</i>	6	\$980.00	\$5,880.00
<i>Item 604.922 - Leaching Chamber, Type 2 (U)</i>	5	\$960.00	\$4,800.00
<i>Item 605.506 - 6" Perf. Corr. Poly. Pipe Underdrain (LF)</i>	360	\$15.00	\$5,400.00
<i>Item 605.79 - Underdrain Flushing Basins (EA)</i>	6	\$300.00	\$1,800.00
<i>Item 605.82251 - 24" Agg. Und. Type 2 w/ 6" Perf. Corr. PE Pipe (LF)</i>	1,016	\$20.00	\$20,320.00
<i>Item 647.1 - Humus (CY)</i>	434	\$20.00	\$8,680.00
<i>Item 647.29 - Wetland Humus (CY)</i>	314	\$12.50	\$3,925.00
<i>Item 670.01 - Sediment Sump Measuring Post (EA)</i>	1	\$110.00	\$110.00
Total			\$188,770.75

SUBSURFACE GRAVEL WETLANDS (14633E/ BMP 14)			
Item	Quantity	Bid Price	Total
<i>Item 203.1 - Common Excavation (CY)</i>	4,570	\$3.75	\$17,137.50
<i>Item 203.2 - Rock Excavation (CY)</i>	572	\$10.75	\$6,149.00
<i>Item 203.6 - Embankment-in-Place (CY)</i>	23	\$4.90	\$112.70
<i>Item 203.52 - Impervious Material (CY)</i>	1,049	\$12.00	\$12,588.00
<i>Item 520.1 - Concrete Class A (CY)</i>	16	\$525.00	\$8,400.00
<i>Item 585.3- Stone Fill, Class C (CY)</i>	183	\$25.00	\$4,575.00
<i>Item 585.5 - Stone Fill, Class E (CY)</i>	210	\$30.00	\$6,300.00
<i>Item 585.7 - Stone Fill, Class G (CY)</i>	35	\$40.00	\$1,400.00
<i>Item 593.431 - Geotextile, Perm. Control, Cl. 3, Non-woven (SY)</i>	550	\$2.00	\$1,100.00
<i>Item 603.83212 - 12" Plastic Pipe (Smooth Interior) (LF)</i>	34	\$24.00	\$816.00
<i>Item 604.91X - Outlet Control Structure (U)</i>	1	\$2,900.00	\$2,900.00
<i>Item 604.921 - Leaching Chamber, Type 1 (U)</i>	6	\$1,115.00	\$6,690.00
<i>Item 604.922 - Leaching Chamber, Type 2 (U)</i>	5	\$1,070.00	\$5,350.00
<i>Item 605.506 - 6" Perf. Corr. Poly. Pipe Underdrain (LF)</i>	296	\$10.50	\$3,108.00
<i>Item 605.79 - Underdrain Flushing Basins (EA)</i>	2	\$240.00	\$480.00
<i>Item 605.82251 - 24" Agg. Und. Type 2 w/ 6" Perf. Corr. PE Pipe (LF)</i>	256	\$21.00	\$5,376.00
<i>Item 647.29 - Wetland Humus (CY)</i>	106	\$20.00	\$2,120.00
<i>Item 670.01 - Sediment Sump Measuring Post (EA)</i>	1	\$500.00	\$500.00
Total			\$85,102.20

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SUBSURFACE GRAVEL WETLANDS (14633F/ BMP 13)			
Item	Quantity	Bid Price	Total
<i>Item 203.1 - Common Excavation (CY)</i>	8,865	\$4.00	\$35,460.00
<i>Item 203.2 - Rock Excavation (CY)</i>	1,679	\$9.00	\$15,111.00
<i>Item 203.6 - Embankment-in-Place (CY)</i>	568	\$3.15	\$1,789.20
<i>Item 203.52 - Impervious Material (CY)</i>	4,102	\$15.00	\$61,530.00
<i>Item 206.2- Rock Structure Excavation (CY)</i>	64	\$17.00	\$1,088.00
<i>Item 209.1 - Granular Backfill (CY)</i>	9	\$28.00	\$252.00
<i>Item 520.1 - Concrete Class A (CY)</i>	8	\$180.00	\$1,440.00
<i>Item 585.3- Stone Fill, Class C (CY)</i>	159	\$26.00	\$4,134.00
<i>Item 585.5 - Stone Fill, Class E (CY)</i>	922	\$25.00	\$23,050.00
<i>Item 585.7 - Stone Fill, Class G (CY)</i>	165	\$35.00	\$5,775.00
<i>Item 593.431 - Geotextile, Perm. Control, Cl. 3, Non-woven (SY)</i>	447	\$3.00	\$1,341.00
<i>Item 603.83212 - 12" Plastic Pipe (Smooth Interior) (LF)</i>	72	\$21.00	\$1,512.00
<i>Item 604.91X - Outlet Control Structure (U)</i>	2	\$4,000.00	\$8,000.00
<i>Item 604.921 - Leaching Chamber, Type 1 (U)</i>	6	\$980.00	\$5,880.00
<i>Item 604.922 - Leaching Chamber, Type 2 (U)</i>	5	\$960.00	\$4,800.00
<i>Item 605.506 - 6" Perf. Corr. Poly. Pipe Underdrain (LF)</i>	384	\$15.00	\$5,760.00
<i>Item 605.79 - Underdrain Flushing Basins (EA)</i>	5	\$300.00	\$1,500.00
<i>Item 605.82251 - 24" Agg. Und. Type 2 w/ 6" Perf. Corr. PE Pipe (LF)</i>	994	\$20.00	\$19,880.00
<i>Item 647.1 - Humus (CY)</i>	640	\$20.00	\$12,800.00
<i>Item 647.29 - Wetland Humus (CY)</i>	467	\$12.50	\$5,837.50
<i>Item 670.01 - Sediment Sump Measuring Post (EA)</i>	1	\$110.00	\$110.00
Total			\$217,049.70

SUBSURFACE GRAVEL WETLANDS (13742B/ GW #2)			
Item	Quantity	Bid Price	Total
<i>Item 203.1 - Common Excavation (CY)</i>	2,172	\$5.00	\$10,860.00
<i>Item 203.6 - Embankment-in-Place (CY)</i>	51	\$5.00	\$255.00
<i>Item 203.52 - Impervious Material (CY)</i>	462	\$14.00	\$6,468.00
<i>Item 585.3- Stone Fill, Class C (CY)</i>	93	\$27.00	\$2,511.00
<i>Item 585.5 - Stone Fill, Class E (CY)</i>	82	\$34.00	\$2,788.00
<i>Item 585.7 - Stone Fill, Class G (CY)</i>	14	\$51.00	\$714.00
<i>Item 593.421 - Geotextile, Perm. Control, Cl. 2, Non-woven (SY)</i>	314	\$2.50	\$785.00
<i>Item 603.80012 - 12" Plastic Pipe (LF)</i>	36	\$27.00	\$972.00
<i>Item 604.91X - Outlet Control Structure (U)</i>	1	\$4,000.00	\$4,000.00
<i>Item 604.921 - Leaching Chamber Type 1 (U)</i>	6	\$1,350.00	\$8,100.00
<i>Item 604.912 - Leaching Chamber Type 2 (U)</i>	5	\$1,350.00	\$6,750.00
<i>Item 605.506 - 6" Perf. Corr. Poly. Pipe Underdrain (LF)</i>	109	\$15.50	\$1,689.50
<i>Item 646.3 - Turf Establishment w/ Mulch & Tackifiers (A)</i>	0.50	\$1,775.00	\$887.50
<i>Item 647.29 - Wetland Humus (CY)</i>	256	\$19.00	\$4,864.00
<i>Item 670.01 - Sediment Sump Measuring Post (EA)</i>	1	\$170.00	\$170.00
Total			\$51,814.00

SUBSURFACE GRAVEL WETLANDS (13742B/ GW #1)			
Item	Quantity	Bid Price	Total
<i>Item 203.1 - Common Excavation (CY)</i>	1,150	\$5.00	\$5,750.00
<i>Item 203.6 - Embankment-in-Place (CY)</i>	831	\$5.00	\$4,155.00
<i>Item 203.52 - Impervious Material (CY)</i>	924	\$14.00	\$12,936.00
<i>Item 585.3 - Stone Fill, Class C (CY)</i>	98	\$27.00	\$2,646.00
<i>Item 585.5 - Stone Fill, Class E (CY)</i>	178	\$34.00	\$6,052.00
<i>Item 585.7 - Stone Fill, Class G (CY)</i>	30	\$51.00	\$1,530.00
<i>Item 593.421 - Geotextile, Perm. Control, Cl. 2, Non-woven (SY)</i>	333	\$2.50	\$832.50
<i>Item 603.80012 - 12" Plastic Pipe (LF)</i>	28	\$27.00	\$756.00
<i>Item 604.91X - Outlet Control Structure (U)</i>	1	\$4,000.00	\$4,000.00
<i>Item 604.921 - Leaching Chamber Type 1 (U)</i>	6	\$1,350.00	\$8,100.00
<i>Item 604.912 - Leaching Chamber Type 2 (U)</i>	5	\$1,350.00	\$6,750.00
<i>Item 605.506 - 6" Perf. Corr. Poly. Pipe Underdrain (LF)</i>	188	\$15.50	\$2,914.00
<i>Item 646.3 - Turf Establishment w/ Mulch & Tackifiers (A)</i>	0.40	\$1,775.00	\$710.00
<i>Item 647.1 - Humus (CY)</i>	330	\$18.00	\$5,940.00
<i>Item 647.29 - Wetland Humus (CY)</i>	60	\$19.00	\$1,140.00
<i>Item 670.01 - Sediment Sump Measuring Post (EA)</i>	1	\$170.00	\$170.00
Total			\$64,381.50

Attachment B: Subsurface Gravel Wetland Inspection and Maintenance Guidance

Regular Inspection and Maintenance Guidance for Gravel Wetland Stormwater Management Device

Regular inspection and maintenance is critical to the effective operation of Gravel Wetland systems. It is the responsibility of the owner to maintain the Gravel Wetland in accordance with the minimum design standards. This page provides guidance on maintenance activities that are typically required for these systems, along with the suggested frequency for each activity. Individual systems may have more, or less, frequent maintenance needs, depending on a variety of factors including the occurrence of large storm events, overly wet or dry (I.E., drought), regional hydrologic conditions, and any changes or redevelopment in the upstream land use.

ACTIVITIES

Visual inspections are routine for system maintenance. This includes looking for standing water, accumulated leaves, holes in the soil media, signs of plant distress, and debris and sediment accumulation in the system. Vegetation coverage is integral to the performance of the system and vegetation care is important to system productivity and health. A gravel wetland is a subsurface horizontal filtration system and does not rely upon the surface soils for treatment. As such, surface infiltration rates are expected to be low and not a criterion for cleaning. Rather, stormwater access to subsurface treatment is by way of inlet standpipes. It is important to ensure these inlets are performing properly.

1ST YEAR POST-CONSTRUCTION ACTIVITY	FREQUENCY
1. Check that plants have adequate water, are well established and healthy. Remedy: Water plants as necessary, remove or treat diseased vegetation as necessary and re-vegetate poorly established plants as necessary	After every major storm in the first few months, then biannually.
2. Check for erosion in the system and short circuiting (holes) in the surface wetland soils. Remedy: Soil piping, erosion, and holes should be filled, lightly compacted, and reseeded.	
POST-CONSTRUCTION ACTIVITY	FREQUENCY
3. Check inlets outlets and stand pipes for leaves and debris. Remedy: Rake in and around the system to clear it of debris. Also, clear the inlet, outlets and standpipes if obstructed.	Quarterly initially, biannually, frequency adjusted as needed after 3 inspections
4. Check for animal burrows and short circuiting in the system. Remedy: Soil erosion from short circuiting or animal boroughs should be repaired when they occur. The holes should be filled and lightly compacted	
5. Check that the depth of accumulated sediment in the sedimentation chamber is less than 12 inches or 10 percent of the pretreatment volume. Remedy: The sedimentation chamber, forebay, and treatment cells outlet devices should be cleaned when drawdown times exceed 36 hours. Remove material with rakes where possible rather than heavy construction equipment to avoid compaction of the gravel wetland surface. Heavy equipment could be used if the system is designed with dimensions that allow equipment to be located outside the gravel wetland, while a backhoe shovel reaches inside the gravel wetland to remove sediment. Removed sediments should be dewatered (if necessary) and disposed of in an acceptable manner.	
6. Inspect inlets and outlets to ensure good condition and no evidence of deterioration. Check to see if high-flow bypass is functioning. Remedy: Repair or replace any damaged structural parts, inlets and outlets.	Annually
7. Check for robust vegetation coverage throughout the system. Remedy: If at least 50 % vegetation coverage is not established after 2 years, reinforcement planting should be performed.	
8. Cut and remove vegetation from the Gravel Wetland System and forebay in order to maintain nitrogen removal performance. Remedy: The vegetation should be cut and removed from the system to prevent nitrogen from cycling back into the system.	Once every 3 years

CHECKLIST FOR INSPECTION OF GRAVEL WETLAND

Location:

Inspector:

Date:

Time:

Site Conditions:

Date Since Last Rain Event:

Inspection Items	Satisfactory (S) or Unsatisfactory (U)	Comments/Corrective Action
1st Year Post-Construction Monitoring (After every major storm for the first three months)		
Plants are stable, roots not exposed	S U	
Vegetation is established and thriving	S U	
No evidence of holes in the wetland soil causing short-circuiting	S U	
No evidence of erosion at inlet and outlet structures	S U	
Post-Construction Routine Monitoring (at least every 6 months thereafter as per USEPA Good House-Keeping Requirements. Inspection frequency can be reduced to annual following 2 years of monitoring indicating the rate of sediment accumulation is less than cleaning criteria listed below.)		
1. Standing Water		
Gravel wetland surface is free of standing water or other evidence of clogging, such as discolored or accumulated sediments	S U	
2. Short Circuiting & Erosion		
No evidence of animal burrows or other holes	S U	
No evidence of erosion	S U	
3. Drought Conditions (As needed)		
Water plants as needed	S U	
Dead or dying plants	S U	
4. Sedimentation Chamber or Forebay Inlet Inspection		
No evidence of sediment accumulation, trash, and debris.	S U	
Good condition, no need for repair	S U	
5. Vegetation Coverage		
50 % coverage established throughout system by first year	S U	
Robust coverage by year 2 or later	S U	
6. Inlet and Outlet Controls		
Flow is unobstructed in openings (grates, orifices, etc)	S U	
Structures are operational with no evidence of deterioration	S U	
7. Vegetation removal (once every 3 years)		
Prune dead, diseased, or decaying plants	S U	
Corrective Action Needed		Due Date
1.		
2.		
3.		

Attachment C: Results of Subsurface Gravel Wetland Inspections

Regular Inspection and Maintenance Guidance for Gravel Wetland Stormwater Management Device

Regular inspection and maintenance is critical to the effective operation of Gravel Wetland systems. It is the responsibility of the owner to maintain the Gravel Wetland in accordance with the minimum design standards. This page provides guidance on maintenance activities that are typically required for these systems, along with the suggested frequency for each activity. Individual systems may have more, or less, frequent maintenance needs, depending on a variety of factors including the occurrence of large storm events, overly wet or dry (I.E., drought), regional hydrologic conditions, and any changes or redevelopment in the upstream land use.

ACTIVITIES

Visual inspections are routine for system maintenance. This includes looking for standing water, accumulated leaves, holes in the soil media, signs of plant distress, and debris and sediment accumulation in the system. Vegetation coverage is integral to the performance of the system and vegetation care is important to system productivity and health. A gravel wetland is a subsurface horizontal filtration system and does not rely upon the surface soils for treatment. As such, surface infiltration rates are expected to be low and not a criterion for cleaning. Rather, stormwater access to subsurface treatment is by way of inlet standpipes. It is important to ensure these inlets are performing properly.

1ST YEAR POST-CONSTRUCTION ACTIVITY	FREQUENCY
1. Check that plants have adequate water, are well established and healthy. Remedy: Water plants as necessary, remove or treat diseased vegetation as necessary and re-vegetate poorly established plants as necessary	After every major storm in the first few months, then biannually.
2. Check for erosion in the system and short circuiting (holes) in the surface wetland soils. Remedy: Soil piping, erosion, and holes should be filled, lightly compacted, and reseeded.	
POST-CONSTRUCTION ACTIVITY	FREQUENCY
3. Check inlets outlets and stand pipes for leaves and debris. Remedy: Rake in and around the system to clear it of debris. Also, clear the inlet, outlets and standpipes if obstructed.	Quarterly initially, biannually, frequency adjusted as needed after 3 inspections
4. Check for animal burrows and short circuiting in the system. Remedy: Soil erosion from short circuiting or animal boroughs should be repaired when they occur. The holes should be filled and lightly compacted	
5. Check that the depth of accumulated sediment in the sedimentation chamber is less than 12 inches or 10 percent of the pretreatment volume. Remedy: The sedimentation chamber, forebay, and treatment cells outlet devices should be cleaned when drawdown times exceed 36 hours. Remove material with rakes where possible rather than heavy construction equipment to avoid compaction of the gravel wetland surface. Heavy equipment could be used if the system is designed with dimensions that allow equipment to be located outside the gravel wetland, while a backhoe shovel reaches inside the gravel wetland to remove sediment. Removed sediments should be dewatered (if necessary) and disposed of in an acceptable manner.	
6. Inspect inlets and outlets to ensure good condition and no evidence of deterioration. Check to see if high-flow bypass is functioning. Remedy: Repair or replace any damaged structural parts, inlets and outlets.	Annually
7. Check for robust vegetation coverage throughout the system. Remedy: If at least 50 % vegetation coverage is not established after 2 years, reinforcement planting should be performed.	
8. Cut and remove vegetation from the Gravel Wetland System and forebay in order to maintain nitrogen removal performance. Remedy: The vegetation should be cut and removed from the system to prevent nitrogen from cycling back into the system.	Once every 3 years

CHECKLIST FOR INSPECTION OF GRAVEL WETLAND

Location: I93 NB & SB Exit 5 Area DOT#: 14633F BMP 19

Inspector: Tim Puls

Date: 7/18/14

Time: 1:00PM

Site Conditions: Poor

Date of Last Rain Event: 7/16/14

Inspection Items	Satisfactory (S) or Unsatisfactory (U)	Comments/Corrective Action
1st Year Post-Construction Monitoring (After every major storm for the first three months)		
Plants are stable, roots not exposed	(S) U	Constructed 2013-2014
Vegetation is established and thriving	(S) U	
No evidence of holes in the wetland soil causing short-circuiting	(S) U	
No evidence of erosion at inlet and outlet structures	(S) U	
Post-Construction Routine Monitoring (at least every 6 months thereafter as per USEPA Good House-Keeping Requirements. Inspection frequency can be reduced to annual following 2 years of monitoring indicating the rate of sediment accumulation is less than cleaning criteria listed below.)		
1. Standing Water		
Gravel wetland surface is free of standing water or other evidence of clogging, such as discolored or accumulated sediments	S (U)	Standing water in fore bay & both cells, approx. 3-5"
2. Short Circuiting & Erosion		
No evidence of animal burrows or other holes	(S) U	
No evidence of erosion	(S) U	
3. Drought Conditions (As needed)		Too much water. Plants are thin in areas where water has been pooling.
Water plants as needed	S (U)	
Dead or dying plants	S (U)	
4. Sedimentation Chamber or Forebay Inlet Inspection		
No evidence of sediment accumulation, trash, and debris.	(S) U	
Good condition, no need for repair	(S) U	
5. Vegetation Coverage		
50 % coverage established throughout system by first year	(S) U	NA
Robust coverage by year 2 or later	S U	
6. Inlet and Outlet Controls:		
Flow is unobstructed in openings (grates, orifices, etc)	(S) U	
Structures are operational with no evidence of deterioration	(S) U	
7. Vegetation removal (once every 3 years)		
Prune dead, diseased, or decaying plants	S U	NA
Corrective Action Needed		Due Date
1. Outlet pipe invert is above the wetland soil elevation which keeps the system flooded. Could bring the soil up another 6-8".		ASAP
COMMENT: Area of system is smaller than other BMPs but has the same number of structures.		

Regular Inspection and Maintenance Guidance for Gravel Wetland Stormwater Management Device

Regular inspection and maintenance is critical to the effective operation of Gravel Wetland systems. It is the responsibility of the owner to maintain the Gravel Wetland in accordance with the minimum design standards. This page provides guidance on maintenance activities that are typically required for these systems, along with the suggested frequency for each activity. Individual systems may have more, or less, frequent maintenance needs, depending on a variety of factors including the occurrence of large storm events, overly wet or dry (I.E., drought), regional hydrologic conditions, and any changes or redevelopment in the upstream land use.

ACTIVITIES

Visual inspections are routine for system maintenance. This includes looking for standing water, accumulated leaves, holes in the soil media, signs of plant distress, and debris and sediment accumulation in the system. Vegetation coverage is integral to the performance of the system and vegetation care is important to system productivity and health. A gravel wetland is a subsurface horizontal filtration system and does not rely upon the surface soils for treatment. As such, surface infiltration rates are expected to be low and not a criterion for cleaning. Rather, stormwater access to subsurface treatment is by way of inlet standpipes. It is important to ensure these inlets are performing properly.

1ST YEAR POST-CONSTRUCTION ACTIVITY	FREQUENCY
1. Check that plants have adequate water, are well established and healthy. Remedy: Water plants as necessary, remove or treat diseased vegetation as necessary and re-vegetate poorly established plants as necessary	After every major storm in the first few months, then biannually.
2. Check for erosion in the system and short circuiting (holes) in the surface wetland soils. Remedy: Soil piping, erosion, and holes should be filled, lightly compacted, and reseeded.	
POST-CONSTRUCTION ACTIVITY	FREQUENCY
3. Check inlets outlets and stand pipes for leaves and debris. Remedy: Rake in and around the system to clear it of debris. Also, clear the inlet, outlets and standpipes if obstructed.	Quarterly initially, biannually, frequency adjusted as needed after 3 inspections
4. Check for animal burrows and short circuiting in the system. Remedy: Soil erosion from short circuiting or animal boroughs should be repaired when they occur. The holes should be filled and lightly compacted	
5. Check that the depth of accumulated sediment in the sedimentation chamber is less than 12 inches or 10 percent of the pretreatment volume. Remedy: The sedimentation chamber, forebay, and treatment cells outlet devices should be cleaned when drawdown times exceed 36 hours. Remove material with rakes where possible rather than heavy construction equipment to avoid compaction of the gravel wetland surface. Heavy equipment could be used if the system is designed with dimensions that allow equipment to be located outside the gravel wetland, while a backhoe shovel reaches inside the gravel wetland to remove sediment. Removed sediments should be dewatered (if necessary) and disposed of in an acceptable manner.	
6. Inspect inlets and outlets to ensure good condition and no evidence of deterioration. Check to see if high-flow bypass is functioning. Remedy: Repair or replace any damaged structural parts, inlets and outlets.	Annually
7. Check for robust vegetation coverage throughout the system. Remedy: If at least 50 % vegetation coverage is not established after 2 years, reinforcement planting should be performed.	
8. Cut and remove vegetation from the Gravel Wetland System and forebay in order to maintain nitrogen removal performance. Remedy: The vegetation should be cut and removed from the system to prevent nitrogen from cycling back into the system.	Once every 3 years

CHECKLIST FOR INSPECTION OF GRAVEL WETLAND

Location: I93 NB, East side DOT#: 14633F BMP 18

Inspector: Tim Puls

Date: 7/18/14

Time: 1:45PM

Site Conditions: Fair, Draining

Date of Last Rain Event: 7/16/14

Inspection Items	Satisfactory (S) or Unsatisfactory (U)	Comments/Corrective Action
1st Year Post-Construction Monitoring (After every major storm for the first three months)		
Plants are stable, roots not exposed	(S) U	Constructed 2013-2014
Vegetation is established and thriving	(S) U	
No evidence of holes in the wetland soil causing short-circuiting	(S) U	
No evidence of erosion at inlet and outlet structures	(S) U	
Post-Construction Routine Monitoring (at least every 6 months thereafter as per USEPA Good House-Keeping Requirements. Inspection frequency can be reduced to annual following 2 years of monitoring indicating the rate of sediment accumulation is less than cleaning criteria listed below.)		
1. Standing Water		
Gravel wetland surface is free of standing water or other evidence of clogging, such as discolored or accumulated sediments	S (U)	Standing water in fore bay & both cells, approx. 3-5"
2. Short Circuiting & Erosion		
No evidence of animal burrows or other holes	(S) U	
No evidence of erosion	(S) U	
3. Drought Conditions (As needed)		Too much water. Plants are thin in areas where water has been pooling.
Water plants as needed	S (U)	
Dead or dying plants	S (U)	
4. Sedimentation Chamber or Forebay Inlet Inspection		
No evidence of sediment accumulation, trash, and debris.	(S) U	
Good condition, no need for repair	(S) U	
5. Vegetation Coverage		
50 % coverage established throughout system by first year	S (U)	NA
Robust coverage by year 2 or later	S U	
6. Inlet and Outlet Controls:		
Flow is unobstructed in openings (grates, orifices, etc)	S (U)	A piece of trash was blocking outlet orifice. Blockage cleared and system began to drain.
Structures are operational with no evidence of deterioration	(S) U	
7. Vegetation removal (once every 3 years)		
Prune dead, diseased, or decaying plants	S U	NA
Corrective Action Needed		Due Date
1. Outlet control structure has slotted inlets (4" x 12") that are unprotected. Bring rip rap up over the inlet slots to keep trash out of structure.		ASAP
COMMENT: Area of system is smaller than other BMPs but has the same number of structures.		

Regular Inspection and Maintenance Guidance for Gravel Wetland Stormwater Management Device

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ACTIVITIES

Visual inspections are routine for system maintenance. This includes looking for standing water, accumulated leaves, holes in the soil media, signs of plant distress, and debris and sediment accumulation in the system. Vegetation coverage is integral to the performance of the system and vegetation care is important to system productivity and health. A gravel wetland is a subsurface horizontal filtration system and does not rely upon the surface soils for treatment. As such, surface infiltration rates are expected to be low and not a criterion for cleaning. Rather, stormwater access to subsurface treatment is by way of inlet standpipes. It is important to ensure these inlets are performing properly.

1ST YEAR POST-CONSTRUCTION ACTIVITY	FREQUENCY
1. Check that plants have adequate water, are well established and healthy. Remedy: Water plants as necessary, remove or treat diseased vegetation as necessary and re-vegetate poorly established plants as necessary	After every major storm in the first few months, then biannually.
2. Check for erosion in the system and short circuiting (holes) in the surface wetland soils. Remedy: Soil piping, erosion, and holes should be filled, lightly compacted, and reseeded.	
POST-CONSTRUCTION ACTIVITY	FREQUENCY
3. Check inlets outlets and stand pipes for leaves and debris. Remedy: Rake in and around the system to clear it of debris. Also, clear the inlet, outlets and standpipes if obstructed.	Quarterly initially, biannually, frequency adjusted as needed after 3 inspections
4. Check for animal burrows and short circuiting in the system. Remedy: Soil erosion from short circuiting or animal boroughs should be repaired when they occur. The holes should be filled and lightly compacted	
5. Check that the depth of accumulated sediment in the sedimentation chamber is less than 12 inches or 10 percent of the pretreatment volume. Remedy: The sedimentation chamber, forebay, and treatment cells outlet devices should be cleaned when drawdown times exceed 36 hours. Remove material with rakes where possible rather than heavy construction equipment to avoid compaction of the gravel wetland surface. Heavy equipment could be used if the system is designed with dimensions that allow equipment to be located outside the gravel wetland, while a backhoe shovel reaches inside the gravel wetland to remove sediment. Removed sediments should be dewatered (if necessary) and disposed of in an acceptable manner.	
6. Inspect inlets and outlets to ensure good condition and no evidence of deterioration. Check to see if high-flow bypass is functioning. Remedy: Repair or replace any damaged structural parts, inlets and outlets.	Annually
7. Check for robust vegetation coverage throughout the system. Remedy: If at least 50 % vegetation coverage is not established after 2 years, reinforcement planting should be performed.	
8. Cut and remove vegetation from the Gravel Wetland System and forebay in order to maintain nitrogen removal performance. Remedy: The vegetation should be cut and removed from the system to prevent nitrogen from cycling back into the system.	Once every 3 years

CHECKLIST FOR INSPECTION OF GRAVEL WETLAND

Location: I93 Exit 5 NB Off Ramp Area DOT#: 14633F

Inspector: Tim Puls

Date: 7/18/14

Time: 12:30AM

Site Conditions: Very Good

Date of Last Rain Event: 7/16/14

Two systems – BMP 13, BMP 16

Inspection Items	Satisfactory (S) or Unsatisfactory (U)	Comments/Corrective Action
1st Year Post-Construction Monitoring (After every major storm for the first three months)		
Plants are stable, roots not exposed	(S) U	New systems – BMP 13 approx. 1.5 years old and BMP 16 is approx. 6 months. GC is Severino Construction
Vegetation is established and thriving	(S) U	
No evidence of holes in the wetland soil causing short-circuiting	(S) U	
No evidence of erosion at inlet and outlet structures	(S) U	
Post-Construction Routine Monitoring (at least every 6 months thereafter as per USEPA Good House-Keeping Requirements. Inspection frequency can be reduced to annual following 2 years of monitoring indicating the rate of sediment accumulation is less than cleaning criteria listed below.)		
1. Standing Water		
Gravel wetland surface is free of standing water or other evidence of clogging, such as discolored or accumulated sediments	(S) U	None
2. Short Circuiting & Erosion		
No evidence of animal burrows or other holes	(S) U	
No evidence of erosion	(S) U	
3. Drought Conditions (As needed)		
Water plants as needed	(S) U	
Dead or dying plants	(S) U	
4. Sedimentation Chamber or Forebay Inlet Inspection		
No evidence of sediment accumulation, trash, and debris.	(S) U	
Good condition, no need for repair	(S) U	
5. Vegetation Coverage		
50 % coverage established throughout system by first year	(S) U	
Robust coverage by year 2 or later	(S) U	
6. Inlet and Outlet Controls:		
Flow is unobstructed in openings (grates, orifices, etc)	(S) U	
Structures are operational with no evidence of deterioration	(S) U	
7. Vegetation removal (once every 3 years)		
Prune dead, diseased, or decaying plants	(S) U	
Corrective Action Needed		Due Date
COMMENT: Both BMPs drain to a central 48" line. Could reduce number of hydraulic inlets and cleanout structures.		

Regular Inspection and Maintenance Guidance for Gravel Wetland Stormwater Management Device

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ACTIVITIES

Visual inspections are routine for system maintenance. This includes looking for standing water, accumulated leaves, holes in the soil media, signs of plant distress, and debris and sediment accumulation in the system. Vegetation coverage is integral to the performance of the system and vegetation care is important to system productivity and health. A gravel wetland is a subsurface horizontal filtration system and does not rely upon the surface soils for treatment. As such, surface infiltration rates are expected to be low and not a criterion for cleaning. Rather, stormwater access to subsurface treatment is by way of inlet standpipes. It is important to ensure these inlets are performing properly.

1ST YEAR POST-CONSTRUCTION ACTIVITY	FREQUENCY
1. Check that plants have adequate water, are well established and healthy. Remedy: Water plants as necessary, remove or treat diseased vegetation as necessary and re-vegetate poorly established plants as necessary	After every major storm in the first few months, then biannually.
2. Check for erosion in the system and short circuiting (holes) in the surface wetland soils. Remedy: Soil piping, erosion, and holes should be filled, lightly compacted, and reseeded.	
POST-CONSTRUCTION ACTIVITY	FREQUENCY
3. Check inlets outlets and stand pipes for leaves and debris. Remedy: Rake in and around the system to clear it of debris. Also, clear the inlet, outlets and standpipes if obstructed.	Quarterly initially, biannually, frequency adjusted as needed after 3 inspections
4. Check for animal burrows and short circuiting in the system. Remedy: Soil erosion from short circuiting or animal boroughs should be repaired when they occur. The holes should be filled and lightly compacted	
5. Check that the depth of accumulated sediment in the sedimentation chamber is less than 12 inches or 10 percent of the pretreatment volume. Remedy: The sedimentation chamber, forebay, and treatment cells outlet devices should be cleaned when drawdown times exceed 36 hours. Remove material with rakes where possible rather than heavy construction equipment to avoid compaction of the gravel wetland surface. Heavy equipment could be used if the system is designed with dimensions that allow equipment to be located outside the gravel wetland, while a backhoe shovel reaches inside the gravel wetland to remove sediment. Removed sediments should be dewatered (if necessary) and disposed of in an acceptable manner.	
6. Inspect inlets and outlets to ensure good condition and no evidence of deterioration. Check to see if high-flow bypass is functioning. Remedy: Repair or replace any damaged structural parts, inlets and outlets.	Annually
7. Check for robust vegetation coverage throughout the system. Remedy: If at least 50 % vegetation coverage is not established after 2 years, reinforcement planting should be performed.	
8. Cut and remove vegetation from the Gravel Wetland System and forebay in order to maintain nitrogen removal performance. Remedy: The vegetation should be cut and removed from the system to prevent nitrogen from cycling back into the system.	Once every 3 years

CHECKLIST FOR INSPECTION OF GRAVEL WETLAND

Location: I93 Exit 5 NB On Ramp DOT#: 14633E BMP 17

Inspector: Tim Puls

Date: 7/18/14

Time: 1:30PM

Site Conditions: Good

Date of Last Rain Event: 7/16/14

Inspection Items	Satisfactory (S) or Unsatisfactory (U)	Comments/Corrective Action
1st Year Post-Construction Monitoring (After every major storm for the first three months)		
Plants are stable, roots not exposed	S U	NA System constructed in 2008-2009
Vegetation is established and thriving	S U	
No evidence of holes in the wetland soil causing short-circuiting	S U	
No evidence of erosion at inlet and outlet structures	S U	
Post-Construction Routine Monitoring (at least every 6 months thereafter as per USEPA Good House-Keeping Requirements. Inspection frequency can be reduced to annual following 2 years of monitoring indicating the rate of sediment accumulation is less than cleaning criteria listed below.)		
1. Standing Water		
Gravel wetland surface is free of standing water or other evidence of clogging, such as discolored or accumulated sediments	S U	Fore bay has pooled water. Full of cattails.
2. Short Circuiting & Erosion		
No evidence of animal burrows or other holes	S U	
No evidence of erosion	S U	
3. Drought Conditions (As needed)		
Water plants as needed	S U	
Dead or dying plants	S U	
4. Sedimentation Chamber or Forebay Inlet Inspection		
No evidence of sediment accumulation, trash, and debris.	S U	
Good condition, no need for repair	S U	
5. Vegetation Coverage		
50 % coverage established throughout system by first year	S U	
Robust coverage by year 2 or later	S U	
6. Inlet and Outlet Controls:		
Flow is unobstructed in openings (grates, orifices, etc)	S U	
Structures are operational with no evidence of deterioration	S U	
7. Vegetation removal (once every 3 years)		No maintenance has been done to date.
Prune dead, diseased, or decaying plants	S U	
Corrective Action Needed		Due Date
1. Cut vegetation down to base and remove from system.		ASAP
COMMENT: Area of system is larger than other BMPs but has the same number of structures. 6 hydraulic inlets, 5 leach basins, 1 outlet		

Regular Inspection and Maintenance Guidance for Gravel Wetland Stormwater Management Device

Regular inspection and maintenance is critical to the effective operation of Gravel Wetland systems. It is the responsibility of the owner to maintain the Gravel Wetland in accordance with the minimum design standards. This page provides guidance on maintenance activities that are typically required for these systems, along with the suggested frequency for each activity. Individual systems may have more, or less, frequent maintenance needs, depending on a variety of factors including the occurrence of large storm events, overly wet or dry (I.E., drought), regional hydrologic conditions, and any changes or redevelopment in the upstream land use.

ACTIVITIES

Visual inspections are routine for system maintenance. This includes looking for standing water, accumulated leaves, holes in the soil media, signs of plant distress, and debris and sediment accumulation in the system. Vegetation coverage is integral to the performance of the system and vegetation care is important to system productivity and health. A gravel wetland is a subsurface horizontal filtration system and does not rely upon the surface soils for treatment. As such, surface infiltration rates are expected to be low and not a criterion for cleaning. Rather, stormwater access to subsurface treatment is by way of inlet standpipes. It is important to ensure these inlets are performing properly.

1ST YEAR POST-CONSTRUCTION ACTIVITY	FREQUENCY
1. Check that plants have adequate water, are well established and healthy. Remedy: Water plants as necessary, remove or treat diseased vegetation as necessary and re-vegetate poorly established plants as necessary	After every major storm in the first few months, then biannually.
2. Check for erosion in the system and short circuiting (holes) in the surface wetland soils. Remedy: Soil piping, erosion, and holes should be filled, lightly compacted, and reseeded.	
POST-CONSTRUCTION ACTIVITY	FREQUENCY
3. Check inlets outlets and stand pipes for leaves and debris. Remedy: Rake in and around the system to clear it of debris. Also, clear the inlet, outlets and standpipes if obstructed.	Quarterly initially, biannually, frequency adjusted as needed after 3 inspections
4. Check for animal burrows and short circuiting in the system. Remedy: Soil erosion from short circuiting or animal boroughs should be repaired when they occur. The holes should be filled and lightly compacted	
5. Check that the depth of accumulated sediment in the sedimentation chamber is less than 12 inches or 10 percent of the pretreatment volume. Remedy: The sedimentation chamber, forebay, and treatment cells outlet devices should be cleaned when drawdown times exceed 36 hours. Remove material with rakes where possible rather than heavy construction equipment to avoid compaction of the gravel wetland surface. Heavy equipment could be used if the system is designed with dimensions that allow equipment to be located outside the gravel wetland, while a backhoe shovel reaches inside the gravel wetland to remove sediment. Removed sediments should be dewatered (if necessary) and disposed of in an acceptable manner.	
6. Inspect inlets and outlets to ensure good condition and no evidence of deterioration. Check to see if high-flow bypass is functioning. Remedy: Repair or replace any damaged structural parts, inlets and outlets.	Annually
7. Check for robust vegetation coverage throughout the system. Remedy: If at least 50 % vegetation coverage is not established after 2 years, reinforcement planting should be performed.	
8. Cut and remove vegetation from the Gravel Wetland System and forebay in order to maintain nitrogen removal performance. Remedy: The vegetation should be cut and removed from the system to prevent nitrogen from cycling back into the system.	Once every 3 years

CHECKLIST FOR INSPECTION OF GRAVEL WETLAND

Location: I93 Exit 5 SB On Ramp DOT#: 14633E BMP 14

Inspector: Tim Puls

Date: 7/18/14

Time: 1:20PM

Site Conditions: Good

Date of Last Rain Event: 7/16/14

Inspection Items	Satisfactory (S) or Unsatisfactory (U)	Comments/Corrective Action
1st Year Post-Construction Monitoring (After every major storm for the first three months)		
Plants are stable, roots not exposed	S U	NA System constructed in 2008-2009
Vegetation is established and thriving	S U	
No evidence of holes in the wetland soil causing short-circuiting	S U	
No evidence of erosion at inlet and outlet structures	S U	
Post-Construction Routine Monitoring (at least every 6 months thereafter as per USEPA Good House-Keeping Requirements. Inspection frequency can be reduced to annual following 2 years of monitoring indicating the rate of sediment accumulation is less than cleaning criteria listed below.)		
1. Standing Water		
Gravel wetland surface is free of standing water or other evidence of clogging, such as discolored or accumulated sediments	(S) U	Fore bay is dry
2. Short Circuiting & Erosion		
No evidence of animal burrows or other holes	(S) U	
No evidence of erosion	(S) U	
3. Drought Conditions (As needed)		
Water plants as needed	(S) U	
Dead or dying plants	(S) U	
4. Sedimentation Chamber or Forebay Inlet Inspection		
No evidence of sediment accumulation, trash, and debris.	(S) U	
Good condition, no need for repair	(S) U	
5. Vegetation Coverage		
50 % coverage established throughout system by first year	(S) U	
Robust coverage by year 2 or later	(S) U	
6. Inlet and Outlet Controls:		
Flow is unobstructed in openings (grates, orifices, etc)	(S) U	
Structures are operational with no evidence of deterioration	(S) U	
7. Vegetation removal (once every 3 years)		No maintenance has been done to date.
Prune dead, diseased, or decaying plants	S (U)	
Corrective Action Needed		Due Date
1. Cut vegetation down to base and remove from system.		ASAP
COMMENT: Area of system is smaller than other BMPs but has the same number of structures. 6 hydraulic inlets, 5 leach basins, 1 outlet		

Regular Inspection and Maintenance Guidance for Gravel Wetland Stormwater Management Device

Regular inspection and maintenance is critical to the effective operation of Gravel Wetland systems. It is the responsibility of the owner to maintain the Gravel Wetland in accordance with the minimum design standards. This page provides guidance on maintenance activities that are typically required for these systems, along with the suggested frequency for each activity. Individual systems may have more, or less, frequent maintenance needs, depending on a variety of factors including the occurrence of large storm events, overly wet or dry (I.E., drought), regional hydrologic conditions, and any changes or redevelopment in the upstream land use.

ACTIVITIES

Visual inspections are routine for system maintenance. This includes looking for standing water, accumulated leaves, holes in the soil media, signs of plant distress, and debris and sediment accumulation in the system. Vegetation coverage is integral to the performance of the system and vegetation care is important to system productivity and health. A gravel wetland is a subsurface horizontal filtration system and does not rely upon the surface soils for treatment. As such, surface infiltration rates are expected to be low and not a criterion for cleaning. Rather, stormwater access to subsurface treatment is by way of inlet standpipes. It is important to ensure these inlets are performing properly.

1ST YEAR POST-CONSTRUCTION ACTIVITY	FREQUENCY
1. Check that plants have adequate water, are well established and healthy. Remedy: Water plants as necessary, remove or treat diseased vegetation as necessary and re-vegetate poorly established plants as necessary	After every major storm in the first few months, then biannually.
2. Check for erosion in the system and short circuiting (holes) in the surface wetland soils. Remedy: Soil piping, erosion, and holes should be filled, lightly compacted, and reseeded.	
POST-CONSTRUCTION ACTIVITY	FREQUENCY
3. Check inlets outlets and stand pipes for leaves and debris. Remedy: Rake in and around the system to clear it of debris. Also, clear the inlet, outlets and standpipes if obstructed.	Quarterly initially, biannually, frequency adjusted as needed after 3 inspections
4. Check for animal burrows and short circuiting in the system. Remedy: Soil erosion from short circuiting or animal boroughs should be repaired when they occur. The holes should be filled and lightly compacted	
5. Check that the depth of accumulated sediment in the sedimentation chamber is less than 12 inches or 10 percent of the pretreatment volume. Remedy: The sedimentation chamber, forebay, and treatment cells outlet devices should be cleaned when drawdown times exceed 36 hours. Remove material with rakes where possible rather than heavy construction equipment to avoid compaction of the gravel wetland surface. Heavy equipment could be used if the system is designed with dimensions that allow equipment to be located outside the gravel wetland, while a backhoe shovel reaches inside the gravel wetland to remove sediment. Removed sediments should be dewatered (if necessary) and disposed of in an acceptable manner.	
6. Inspect inlets and outlets to ensure good condition and no evidence of deterioration. Check to see if high-flow bypass is functioning. Remedy: Repair or replace any damaged structural parts, inlets and outlets.	Annually
7. Check for robust vegetation coverage throughout the system. Remedy: If at least 50 % vegetation coverage is not established after 2 years, reinforcement planting should be performed.	
8. Cut and remove vegetation from the Gravel Wetland System and forebay in order to maintain nitrogen removal performance. Remedy: The vegetation should be cut and removed from the system to prevent nitrogen from cycling back into the system.	Once every 3 years

CHECKLIST FOR INSPECTION OF GRAVEL WETLAND

Location: I93 Exit 1 NB Off Ramp DOT#: 13933C

Inspector: Tim Puls

Date: 7/18/14

Time: 11:00AM

Site Conditions: Very Good

Date of Last Rain Event: 7/16/14

Inspection Items	Satisfactory (S) or Unsatisfactory (U)	Comments/Corrective Action
1st Year Post-Construction Monitoring (After every major storm for the first three months)		
Plants are stable, roots not exposed	S U	NA – This system was constructed in 2007
Vegetation is established and thriving	S U	
No evidence of holes in the wetland soil causing short-circuiting	S U	
No evidence of erosion at inlet and outlet structures	S U	
Post-Construction Routine Monitoring (at least every 6 months thereafter as per USEPA Good House-Keeping Requirements. Inspection frequency can be reduced to annual following 2 years of monitoring indicating the rate of sediment accumulation is less than cleaning criteria listed below.)		
1. Standing Water		
Gravel wetland surface is free of standing water or other evidence of clogging, such as discolored or accumulated sediments	S U	None
2. Short Circuiting & Erosion		
No evidence of animal burrows or other holes	S U	
No evidence of erosion	S U	
3. Drought Conditions (As needed)		
Water plants as needed	S U	
Dead or dying plants	S U	
4. Sedimentation Chamber or Forebay Inlet Inspection		Some trash has accumulated
No evidence of sediment accumulation, trash, and debris.	S U	
Good condition, no need for repair	S U	
5. Vegetation Coverage		Plants are in good condition.
50 % coverage established throughout system by first year	S U	Treatment cells are densely vegetated.
Robust coverage by year 2 or later	S U	
6. Inlet and Outlet Controls:		Concrete outlet structure 8' x 10'
Flow is unobstructed in openings (grates, orifices, etc)	S U	
Structures are operational with no evidence of deterioration	S U	
7. Vegetation removal (once every 3 years)		No maintenance has been done to date.
Prune dead, diseased, or decaying plants	S U	
Corrective Action Needed		Due Date
1. Maintain vegetation = cut down to base of plant and remove vegetation from system		
COMMENT: This is an extremely large system. RRoseen advised them to replace "E Stone" with 3/8" pea stone during construction.		

Regular Inspection and Maintenance Guidance for Gravel Wetland Stormwater Management Device

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ACTIVITIES

Visual inspections are routine for system maintenance. This includes looking for standing water, accumulated leaves, holes in the soil media, signs of plant distress, and debris and sediment accumulation in the system. Vegetation coverage is integral to the performance of the system and vegetation care is important to system productivity and health. A gravel wetland is a subsurface horizontal filtration system and does not rely upon the surface soils for treatment. As such, surface infiltration rates are expected to be low and not a criterion for cleaning. Rather, stormwater access to subsurface treatment is by way of inlet standpipes. It is important to ensure these inlets are performing properly.

1ST YEAR POST-CONSTRUCTION ACTIVITY	FREQUENCY
1. Check that plants have adequate water, are well established and healthy. Remedy: Water plants as necessary, remove or treat diseased vegetation as necessary and re-vegetate poorly established plants as necessary	After every major storm in the first few months, then biannually.
2. Check for erosion in the system and short circuiting (holes) in the surface wetland soils. Remedy: Soil piping, erosion, and holes should be filled, lightly compacted, and reseeded.	
POST-CONSTRUCTION ACTIVITY	FREQUENCY
3. Check inlets outlets and stand pipes for leaves and debris. Remedy: Rake in and around the system to clear it of debris. Also, clear the inlet, outlets and standpipes if obstructed.	Quarterly initially, biannually, frequency adjusted as needed after 3 inspections
4. Check for animal burrows and short circuiting in the system. Remedy: Soil erosion from short circuiting or animal boroughs should be repaired when they occur. The holes should be filled and lightly compacted	
5. Check that the depth of accumulated sediment in the sedimentation chamber is less than 12 inches or 10 percent of the pretreatment volume. Remedy: The sedimentation chamber, forebay, and treatment cells outlet devices should be cleaned when drawdown times exceed 36 hours. Remove material with rakes where possible rather than heavy construction equipment to avoid compaction of the gravel wetland surface. Heavy equipment could be used if the system is designed with dimensions that allow equipment to be located outside the gravel wetland, while a backhoe shovel reaches inside the gravel wetland to remove sediment. Removed sediments should be dewatered (if necessary) and disposed of in an acceptable manner.	
6. Inspect inlets and outlets to ensure good condition and no evidence of deterioration. Check to see if high-flow bypass is functioning. Remedy: Repair or replace any damaged structural parts, inlets and outlets.	Annually
7. Check for robust vegetation coverage throughout the system. Remedy: If at least 50 % vegetation coverage is not established after 2 years, reinforcement planting should be performed.	
8. Cut and remove vegetation from the Gravel Wetland System and forebay in order to maintain nitrogen removal performance. Remedy: The vegetation should be cut and removed from the system to prevent nitrogen from cycling back into the system.	Once every 3 years

CHECKLIST FOR INSPECTION OF GRAVEL WETLAND

Location: Rt. 16 NB Exit 5

Date: 6/20/14

Time: 10:00AM

Inspector: Jamie Houle, Tim Puls

Site Conditions: Good

Date of Last Rain Event: 6/13/14 (0.75")

Inspection Items	Satisfactory (S) or Unsatisfactory (U)	Comments/Corrective Action
1st Year Post-Construction Monitoring (After every major storm for the first three months)		
Plants are stable, roots not exposed	S U	NA System constructed in 2010-2011
Vegetation is established and thriving	S U	
No evidence of holes in the wetland soil causing short-circuiting	S U	
No evidence of erosion at inlet and outlet structures	S U	
Post-Construction Routine Monitoring (at least every 6 months thereafter as per USEPA Good House-Keeping Requirements. Inspection frequency can be reduced to annual following 2 years of monitoring indicating the rate of sediment accumulation is less than cleaning criteria listed below.)		
1. Standing Water		
Gravel wetland surface is free of standing water or other evidence of clogging, such as discolored or accumulated sediments	S U	Fore bay has pooled water. Some cattails.
2. Short Circuiting & Erosion		
No evidence of animal burrows or other holes	S U	
No evidence of erosion	S U	
3. Drought Conditions (As needed)		
Water plants as needed	S U	
Dead or dying plants	S U	
4. Sedimentation Chamber or Forebay Inlet Inspection		Wet fore bay w/ evidence of anaerobic conditions, i.e. standing water, cattails, and algae.
No evidence of sediment accumulation, trash, and debris.	S U	
Good condition, no need for repair	S U	
5. Vegetation Coverage		
50 % coverage established throughout system by first year	S U	
Robust coverage by year 2 or later	S U	
6. Inlet and Outlet Controls:		Inlet is obstructed due to high elevation of fore bay control. Need low flow outlet from fore bay.
Flow is unobstructed in openings (grates, orifices, etc)	S U	
Structures are operational with no evidence of deterioration	S U	
7. Vegetation removal (once every 3 years)		
Prune dead, diseased, or decaying plants	S U	
Corrective Action Needed		Due Date
1. Fore bay needs to be drained. 2.2ft of standing water.		ASAP
COMMENT:		

Regular Inspection and Maintenance Guidance for Gravel Wetland Stormwater Management Device

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ACTIVITIES

Visual inspections are routine for system maintenance. This includes looking for standing water, accumulated leaves, holes in the soil media, signs of plant distress, and debris and sediment accumulation in the system. Vegetation coverage is integral to the performance of the system and vegetation care is important to system productivity and health. A gravel wetland is a subsurface horizontal filtration system and does not rely upon the surface soils for treatment. As such, surface infiltration rates are expected to be low and not a criterion for cleaning. Rather, stormwater access to subsurface treatment is by way of inlet standpipes. It is important to ensure these inlets are performing properly.

1ST YEAR POST-CONSTRUCTION ACTIVITY	FREQUENCY
1. Check that plants have adequate water, are well established and healthy. Remedy: Water plants as necessary, remove or treat diseased vegetation as necessary and re-vegetate poorly established plants as necessary	After every major storm in the first few months, then biannually.
2. Check for erosion in the system and short circuiting (holes) in the surface wetland soils. Remedy: Soil piping, erosion, and holes should be filled, lightly compacted, and reseeded.	
POST-CONSTRUCTION ACTIVITY	FREQUENCY
3. Check inlets outlets and stand pipes for leaves and debris. Remedy: Rake in and around the system to clear it of debris. Also, clear the inlet, outlets and standpipes if obstructed.	Quarterly initially, biannually, frequency adjusted as needed after 3 inspections
4. Check for animal burrows and short circuiting in the system. Remedy: Soil erosion from short circuiting or animal boroughs should be repaired when they occur. The holes should be filled and lightly compacted	
5. Check that the depth of accumulated sediment in the sedimentation chamber is less than 12 inches or 10 percent of the pretreatment volume. Remedy: The sedimentation chamber, forebay, and treatment cells outlet devices should be cleaned when drawdown times exceed 36 hours. Remove material with rakes where possible rather than heavy construction equipment to avoid compaction of the gravel wetland surface. Heavy equipment could be used if the system is designed with dimensions that allow equipment to be located outside the gravel wetland, while a backhoe shovel reaches inside the gravel wetland to remove sediment. Removed sediments should be dewatered (if necessary) and disposed of in an acceptable manner.	
6. Inspect inlets and outlets to ensure good condition and no evidence of deterioration. Check to see if high-flow bypass is functioning. Remedy: Repair or replace any damaged structural parts, inlets and outlets.	Annually
7. Check for robust vegetation coverage throughout the system. Remedy: If at least 50 % vegetation coverage is not established after 2 years, reinforcement planting should be performed.	
8. Cut and remove vegetation from the Gravel Wetland System and forebay in order to maintain nitrogen removal performance. Remedy: The vegetation should be cut and removed from the system to prevent nitrogen from cycling back into the system.	Once every 3 years

CHECKLIST FOR INSPECTION OF GRAVEL WETLAND

Location: I93 Exit 2 Park & Ride. DOT#: 10418G

Inspector: Tim Puls

Date: 7/18/14

Time: 10:30AM

Site Conditions: Very Good

Date of Last Rain Event: 7/16/14

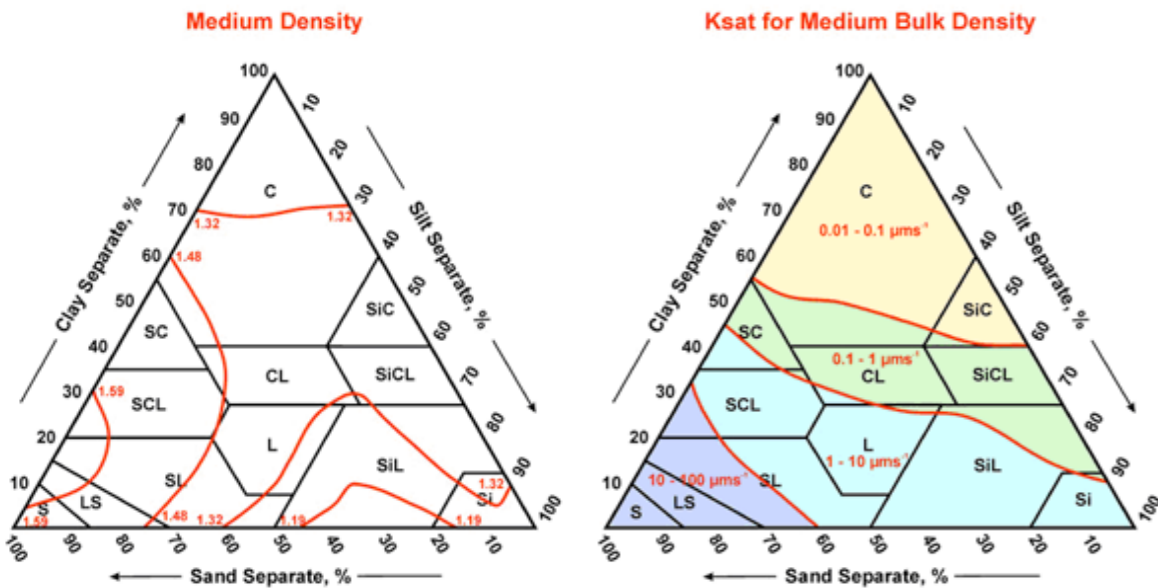
Inspection Items	Satisfactory (S) or Unsatisfactory (U)	Comments/Corrective Action
1st Year Post-Construction Monitoring (After every major storm for the first three months)		
Plants are stable, roots not exposed	S U	NA – This system was constructed in 2007
Vegetation is established and thriving	S U	
No evidence of holes in the wetland soil causing short-circuiting	S U	
No evidence of erosion at inlet and outlet structures	S U	
Post-Construction Routine Monitoring (at least every 6 months thereafter as per USEPA Good House-Keeping Requirements. Inspection frequency can be reduced to annual following 2 years of monitoring indicating the rate of sediment accumulation is less than cleaning criteria listed below.)		
1. Standing Water		
Gravel wetland surface is free of standing water or other evidence of clogging, such as discolored or accumulated sediments	(S) U	Plunge pools around the 3 inlet locations
2. Short Circuiting & Erosion		
No evidence of animal burrows or other holes	(S) U	
No evidence of erosion	(S) U	
3. Drought Conditions (As needed)		
Water plants as needed	(S) U	
Dead or dying plants	(S) U	
4. Sedimentation Chamber or Forebay Inlet Inspection		Some trash has accumulated
No evidence of sediment accumulation, trash, and debris.	(S) U	
Good condition, no need for repair	(S) U	
5. Vegetation Coverage		Plants are in good condition. Forebay is >95% cattails. Treatment cells are densely vegetated.
50 % coverage established throughout system by first year	(S) U	
Robust coverage by year 2 or later	(S) U	
6. Inlet and Outlet Controls		
Flow is unobstructed in openings (grates, orifices, etc)	(S) U	
Structures are operational with no evidence of deterioration	(S) U	
7. Vegetation removal (once every 3 years)		No maintenance has been done to date.
Prune dead, diseased, or decaying plants	S (U)	
Corrective Action Needed		Due Date
1. Maintain vegetation = cut down to base of plant and remove vegetation from system		
COMMENT: Perimeter ground water drainage is a 6" PUD in 2'x3' stone trench. Flow is directed to inlets.		

K_{sat} VALUES

FOR

NEW HAMPSHIRE SOILS

(Including Hydrologic and DES Soil Lot Sizing Groups)



From: Guide for Estimating K_{sat} from Soil Properties (Exhibit 618-9). (<http://soils.usda.gov/technical/handbook/contents/part618ex.html>)

Sponsored by the Society of Soil Scientists of Northern New England
SSSNNE Special Publication No. 5
September, 2009

K_{sat} VALUES FOR NEW HAMPSHIRE SOILS

ABOUT THE SOCIETY OF SOIL SCIENTISTS OF NORTHERN NEW ENGLAND

The Society of Soil Scientists of Northern New England (SSSNNE) is a non-profit professional organization of soil scientists, both in the private and public sectors, which is dedicated to the advancement of soil science. The Society fosters the profession of soil classification, mapping and interpretation, and encourages the dissemination of information concerning soil science. With the intent of contributing to the general human welfare, the Society seeks to educate the public on the wise use of soils and the associated natural resources.

INTRODUCTION

The publication “K_{sat} Values for New Hampshire Soils” is designed to assist soil scientists, engineers, and other professionals by assembling tables of existing data for all soil series currently on the state soil legend with regard to K_{sat} values and hydrologic groupings (Hyd.Grp.). The need for this information has become more important since the adoption by the New Hampshire Department of Environmental Services of the revised Alteration of Terrain rules for stormwater management. Additional information has been provided for each soil series with regard to landform, temperature regime (Temp.), soil textures, NHDES Soil Lot Size Groupings (Group), whether the soil is a Spodosol (Spodosol?) and other information which will be valuable to a variety of soil information users.

The data for each soil series has been sorted 3 ways for ease of searching:

Table A-Sorted by Numerical Legend

Table B-Sorted by Soil Series Name

Table C-Sorted by NHDES Soil Group for Establishing Lot Size

The report represents cumulative efforts by private soil scientists and NHDES staff with assistance from the USDA Natural Resource Conservation Service.

Comments or inquiries on the information in this publication may be directed to the Board of Directors at the following address:

**Society of Soil Scientists
of Northern New England
PO Box 76
Durham, NH 03824**

SATURATED HYDRAULIC CONDUCTIVITY (K_{SAT})

K_{sat} refers to the ease with which pores in a saturated soil transmit water. The estimates presented here are expressed in terms of inches per hour (NRCS official data presents K_{sat} in both micrometers per second and inches per hour). K_{sat} values are based on soil characteristics observed in the field, particularly structure, consistence, porosity, and texture. (USDA NRCS, Web Soil Survey)

Saturated flow occurs when the soil water pressure is positive; that is, when the soil matric potential is zero (saturated wet condition). In most soils this situation takes place when about 95 percent of the total pore space is filled with water. The remaining 5 percent is filled with entrapped air. Saturated hydraulic conductivity cannot be used to describe water movement under unsaturated conditions. (Soil Survey Manual, 1993)

It is commonly known that soil features (and thus data) for a certain soil series name may be slightly different from one county soil survey to the next and the range in characteristics (via the Typical Pedon) may be slightly different. For example – a Marlow soil (series) in Carroll County may have a higher sand content in its B horizon as opposed to a Marlow soil (series) in Coos County; resulting in a slightly different K_{sat} range for the B horizon.

The K_{sat} data for this publication was obtained from the USDA-NRCS Soil Data Mart using the Typical Pedon from the county that best reflected the soil and/or had the most acres of that soil. This data is presented in B and C horizons only as it is assumed that the topsoil (A or A_p horizon) will be removed in typical construction practices.

References:

Web Soil Survey. *Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at <http://websoilsurvey.nrcs.usda.gov/>.*

Soil Data Mart. <http://soildatamart.nrcs.usda.gov/>.

Soil Survey Manual. *Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.*

HYDROLOGIC SOIL GROUPS

Hydrologic group is a group of soils having the same runoff potential under similar storm and cover conditions.

Hydrologic groups are used in equations that estimate runoff from rainfall. These estimates are needed for solving hydrologic problems that arise in planning stormwater management, watershed protection, and flood-prevention projects and for planning or designing structures for the use, control, and disposal of water.

Classifications assigned to soils were based on the use of rainfall-runoff data from small watersheds and infiltrometer plots. From these data, relationships between soil properties and hydrologic groups were established. Assignment of soils to hydrologic groups is based on the relationship between soil properties and hydrologic groups. Wetness characteristics, permeability after prolonged wetting, and depth to very slowly permeable layers are properties that assist in estimating hydrologic groups. Minimum annual steady ponded infiltration rate for a bare ground surface determines the hydrologic soil groups.

Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonally high water table, intake rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. (The influence of ground cover is treated independently, not in hydrologic soil groups.).

The soils in the United States are placed into four groups, A, B, C, and D, and three dual classes, *A/D*, *B/D*, and *C/D*. In the definitions of the classes, infiltration rate is the rate at which water enters the soil at the surface and is controlled by the surface conditions. Transmission rate is the rate at which water moves in the soil and is controlled by soil properties. Definitions of the classes are as follows:

Group A- Saturated hydraulic conductivity is very high or in the upper half of high and internal free water occurrence is very deep. Soils in this group have low runoff potential when thoroughly wet. Water is transmitted freely through the soil. Group A soils typically have less than 10 percent clay and more than 90 percent sand or gravel and have gravel or sand textures. Some soils having loamy sand, sandy loam, loam or silt loam textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments. The limits on the diagnostic physical characteristics of group A are as follows. The saturated hydraulic conductivity of all soil layers exceeds 40.0 micrometers per second (5.67 inches per hour). The depth to any water impermeable layer is greater than 50 centimeters [20 inches]. The depth to the water table is greater than 60 centimeters [24 inches]. Soils that are deeper than 100 centimeters [40 inches] to a water impermeable layer are in group A if the saturated hydraulic conductivity of all soil layers within 100 centimeters [40 inches] of the surface exceeds 10 micrometers per second (1.42 inches per hour).

Group B- Saturated hydraulic conductivity is in the lower half of high or in the upper half of moderately high and free water occurrence is deep or very deep. Soils in this group have moderately low runoff potential when thoroughly wet. Water transmission through the soil is unimpeded. Group B soils typically have between 10 percent and 20 percent clay and 50 percent to 90 percent sand and have loamy sand or sandy loam textures. Some soils having loam, silt loam, silt, or sandy clay loam textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments. The limits on the diagnostic physical characteristics of group B are as follows. The saturated hydraulic conductivity in the least transmissive layer between the surface and 50 centimeters [20 inches] ranges from 10.0 micrometers per second (1.42 inches per hour) to 40.0 micrometers per second (5.67 inches per hour). The depth to any water impermeable layer is greater than 50 centimeters [20 inches]. The depth to the water table is greater than 60 centimeters [24 inches]. Soils that are deeper than 100 centimeters [40 inches] to a water impermeable layer or water table are in group B if the saturated hydraulic conductivity of all soil layers within 100 centimeters [40 inches] of the surface exceeds 4.0 micrometers per second (0.57 inches per hour) but is less than 10.0 micrometers per second (1.42 inches per hour).

Group C- Saturated hydraulic conductivity is in the lower half of moderately high or in the upper half of moderately low and internal free water occurrence is deeper than shallow. Soils in this group have moderately high runoff potential when thoroughly wet. Water transmission through the soil is somewhat restricted. Group C soils typically have between 20 percent and 40 percent clay and less than 50 percent sand and have loam, silt loam, sandy clay loam, clay loam, and silty clay loam textures. Some soils having clay, silty clay, or sandy clay textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments. The limits on the diagnostic physical characteristics of group C are as follows. The saturated hydraulic conductivity in the least transmissive layer between the surface and 50 centimeters [20 inches] is between 1.0 micrometers per second (0.14 inches per hour) and 10.0 micrometers per second (1.42 inches per hour). The depth to any water impermeable layer is greater than 50 centimeters [20 inches]. The depth to the water table is greater than 60 centimeters [24 inches]. Soils that are deeper than 100 centimeters [40 inches] to a restriction or water table are in group C if the saturated hydraulic conductivity of all soil layers within 100 centimeters [40 inches] of the surface exceeds 0.40 micrometers per second (0.06 inches per hour) but is less than 4.0 micrometers per second (0.57 inches per hour).

Group D- Saturated hydraulic conductivity is below the upper half of moderately low, and/or internal free water occurrence is shallow or very shallow and transitory through permanent. Soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is restricted or very restricted. Group D soils typically have greater than 40 percent clay, less than 50 percent sand, and have clayey textures. In some areas, they also have high shrink-swell potential. All soils with a depth to a water impermeable layer less than 50 centimeters [20 inches] and all soils with a water table within 60 centimeters [24 inches] of the surface are in this group, although some may have a dual classification, as described in the next section, if they can be adequately drained. The limits on the physical diagnostic characteristics of group D are as follows. For soils with a water impermeable layer at a depth between 50 centimeters and 100 centimeters [20 and 40 inches], the saturated hydraulic conductivity in the least transmissive soil layer is less than or equal to 1.0 micrometers per second (0.14 inches per hour). For soils that are deeper than 100 centimeters [40 inches] to a restriction or water table, the saturated hydraulic

conductivity of all soil layers within 100 centimeters [40 inches] of the surface is less than or equal to 0.40 micrometers per second (0.06 inches per hour).

Dual hydrologic soil groups-Certain wet soils are placed in group D based solely on the presence of a water table within 60 centimeters [24 inches] of the surface even though the saturated hydraulic conductivity may be favorable for water transmission. If these soils can be adequately drained, then they are assigned to dual hydrologic soil groups (*A/D*, *B/D*, and *C/D*) based on their saturated hydraulic conductivity and the water table depth when drained. The first letter applies to the drained condition and the second to the undrained condition. For the purpose of hydrologic soil group, adequately drained means that the seasonal high water table is kept at least 60 centimeters [24 inches] below the surface in a soil where it would be higher in a natural state.

References:

National Engineering Handbook, Natural Resource Conservation Service, U.S. Department of Agriculture.

Soil Data Mart. <http://soildatamart.nrcs.usda.gov/>.

Soil Survey Manual. *Soil Survey Division Staff. 1993. Soil survey manual. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 18.*

TABLE A

NUMERICAL LEGEND

Soil Series	legend number	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Group	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Occum	1	0.6	2.0	6.00	20.0	B	2	Flood Plain (Bottom Land)	mesic	loamy	no	loamy over loamy sand
Suncook	2	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	mesic	sandy	no	occasionally flooded
Lim	3	0.6	2.0	6.00	20.0	C	5	Flood Plain (Bottom Land)	mesic	loamy	no	
Pootatuck	4	0.6	6.0	6.00	20.0	B	3	Flood Plain (Bottom Land)	mesic	loamy	no	single grain in C
Rippowam	5	0.6	6.0	6.00	20.0	C	5	Flood Plain (Bottom Land)	mesic	loamy	no	
Saco	6	0.6	2.0	6.00	20.0	D	6	Flood Plain (Bottom Land)	mesic	silty	no	strata
Hadley	8	0.6	2.0	0.60	6.0	B	2	Flood Plain (Bottom Land)	mesic	silty	no	strata of fine sand
Winooski	9	0.6	6.0	0.60	6.0	B		Flood Plain (Bottom Land)	mesic	silty over loamy	no	
Merrimac	10	2.0	20.0	6.00	20.0	A	1	Outwash and Stream Terraces	mesic	gravelly sand	no	loamy cap
Gloucester	11	6.0	20.0	6.00	20.0	A	1	Sandy Till	mesic	sandy-skeletal	no	loamy cap
Hinckley	12	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	sandy-skeletal	no	
Sheepscot	14	6.0	20.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	gravelly coarse sand
Searsport	15	6.0	20.0	6.00	20.0	D	6	Outwash and Stream Terraces	frigid	sandy	no	organic over sand
Saugatuck	16	0.06	0.2	6.00	20.0	C	5	Outwash and Stream Terraces	mesic	sandy	yes	ortstein
Colton, gravelly	21	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	gravelly surface
Colton	22	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	
Masardis	23	6.0	20.0	6.00	20.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	slate, loamy cap
Agawam	24	6.0	20.0	20.00	100.0	B	2	Outwash and Stream Terraces	mesic	loamy over sandy	no	loamy over sand/gravel
Windsor	26	6.0	20.0	6.00	20.0	A	1	Outwash and Stream Terraces	mesic	sandy	no	
Groveton	27	0.6	2.0	0.60	6.0	B	2	Outwash and Stream Terraces	frigid	loamy	yes	loamy over sandy
Madawaska	28	0.6	2.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	loamy over sandy	yes	sandy or sandy-skeletal
Woodbridge	29	0.6	2.0	0.00	0.6	C	3	Firm, platy, loamy till	mesic	loamy	no	sandy loam in Cd
Unadilla	30	0.6	2.0	2.00	20.0	B	2	Terraces and glacial lake plains	mesic	silty	no	silty over gravelly
Hartland	31	0.6	2.0	0.20	2.0	B	2	Terraces and glacial lake plains	mesic	silty	no	very fine sandy loam
Boxford	32	0.1	0.2	0.00	0.2	C	3	Silt and Clay Deposits	mesic	fine	no	silty clay loam
Scitico	33	0.0	0.2	0.00	0.2	C	5	Silt and Clay Deposits	mesic	fine	no	
Wareham	34	6.0	20.0	6.00	20.0	C	5	Outwash and Stream Terraces	mesic	sandy	no	
Champlain	35	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	gravelly sand	no	
Adams	36	6.0	20.0	20.00	99.0	A	1	Outwash and Stream Terraces	frigid	sandy	yes	
Melrose	37	2.0	6.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	frigid	loamy over clayey	no	silty clay loam in C
Eldridge	38	6.0	20.0	0.06	0.6	C	3	Sandy/loamy over silt/clay	mesic	sandy over loamy	no	
Millis	39					C	3	Firm, platy, sandy till	frigid	loamy	yes	loamy sand in Cd
Canton	42	2.0	6.0	6.00	20.0	B	2	Loose till, sandy textures	mesic	loamy over sandy	no	loamy over loamy sand
Montauk	44	0.6	6.0	0.06	0.6	C	3	Firm, platy, sandy till	mesic	loamy	no	loamy sand in Cd
Henniker	46	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	no	loamy sand in Cd
Madawaska, aquatic	48	0.6	2.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	loamy over sandy	yes	sandy or sandy-skeletal
Whitman	49	0.0	0.2	0.00	0.2	D	6	Firm, platy, loamy till	mesic	loamy	no	mucky loam
Hermon	55	2.0	20.0	6.00	20.0	A	1	Sandy Till	frigid	sandy-skeletal	yes	loamy cap
Becket	56	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	yes	gravelly sandy loam in Cd
Waumbeck	58	2.0	20.0	6.00	20.0	B	3	Loose till, sandy textures	frigid	sandy-skeletal	yes	very cobbly loamy sand
Charlton	62	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	mesic	loamy	no	fine sandy loam
Paxton	66	0.6	2.0	0.00	0.2	C	3	Firm, platy, loamy till	mesic	loamy	no	
Sutton	68	0.6	6.0	0.60	6.0	B	3	Loose till, loamy textures	mesic	loamy	no	
Berkshire	72	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	frigid	loamy	yes	fine sandy loam
Marlow	76	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	fine sandy loam in Cd
Peru	78	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	
Thorndike	84	0.6	2.0	0.60	2.0	C/D	4	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	less than 20 in. deep
Hollis	86	0.6	6.0	0.60	6.0	C/D	4	Loose till, bedrock	mesic	loamy	no	less than 20 in. deep
Winnecook	88	0.6	2.0	0.60	2.0	C	4	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	20 to 40 in. deep
Chatfield	89	0.6	6.0	0.60	6.0	B	4	Loose till, bedrock	mesic	loamy	no	20 to 40 in. deep
Hogback	91	2.0	6.0	2.00	6.0	C	4	Loose till, bedrock	frigid	loamy	yes	less than 20 in. deep
Lyman	92	2.0	6.0	2.00	6.0	A/D	4	Loose till, bedrock	frigid	loamy	yes	less than 20 in. deep
Woodstock	93	2.0	6.0	2.00	6.0	C/D	4	Loose till, bedrock	frigid	loamy	no	less than 20 in. deep
Rawsonville	98	0.6	6.0	0.60	6.0	C	4	Loose till, bedrock	frigid	loamy	yes	20 to 40 in. deep
Tunbridge	99	0.6	6.0	0.60	6.0	C	4	Loose till, bedrock	frigid	loamy	yes	20 to 40 in. deep

Soil Series	legend number	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Group	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Ondawa	101	0.6	6.0	6.00	20.0	B	2	Flood Plain (Bottom Land)	frigid	loamy	no	loamy over loamy sand
Sunday	102	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	frigid	sandy	no	occasionally flooded
Winooski	103	0.6	6.0	0.60	6.0	B	3	Flood Plain (Bottom Land)	mesic	silty	no	very fine sandy loam
Podunk	104	0.6	6.0	6.00	20.0	B	3	Flood Plain (Bottom Land)	frigid	loamy	no	loamy to coarse sand in C
Rumney	105	0.6	6.0	6.00	20.0	C	5	Flood Plain (Bottom Land)	frigid	loamy	no	
Hadley	108	0.6	2.0	0.60	6.0	B	2	Flood Plain (Bottom Land)	mesic	silty	no	strata of fine sand, occ flooded
Limerick	109	0.6	2.0	0.60	2.0	C	5	Flood Plain (Bottom Land)	mesic	silty	no	
Scarboro	115	6.0	20.0	6.00	20.0	D	6	Outwash and Stream Terraces	mesic	sandy	no	organic over sand, non stony
Finch	116					C	3	Outwash and Stream Terraces	frigid	sandy	yes	cemented (ortstein)
Sudbury	118	2.0	6.0	2.00	20.0	B	3	Outwash and Stream Terraces	mesic	sandy	no	loam over gravelly sand
Telos	123	0.6	2.0	0.02	0.2	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	channery silt loam in Cd
Chesuncook	126	0.6	2.0	0.02	0.2	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	channery silt loam in Cd
Allagash	127	0.6	2.0	6.00	20.0	B	2	Outwash and Stream Terraces	frigid	loamy over sandy	yes	loamy over sandy
Elliottsville	128	0.6	2.0	0.60	2.0	B	4	Friable till, silty, schist & phyllite	frigid	loamy	yes	20 to 40 in. deep
Hitchcock	130	0.6	2.0	0.06	0.6	B	3	Terraces and glacial lake plains	mesic	silty	no	silt loam to silt in C
Burnham	131	0.2	6.0	0.02	0.2	D	6	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	organic over silt
Dartmouth	132	0.6	2.0	0.06	0.6	B	3	Terraces and glacial lake plains	mesic	silty	no	thin strata silty clay loam
Monson	133	0.6	2.0	0.60	2.0	D	4	Friable till, silty, schist & phyllite	frigid	loamy	yes	less than 20 in. deep
Maybid	134	0.0	0.2	0.00	0.2	D	6	Silt and Clay Deposits	mesic	fine	no	silt over clay
Shapleigh	136					C/D	4	Sandy Till	mesic	sandy	yes	less than 20 in. deep
Monadnock	142	0.6	2.0	2.00	6.0	B	2	Loose till, sandy textures	frigid	loamy over sandy, sandy-skeletal	yes	gravely loamy sand in C
Acton	146	2.0	20.0	2.00	20.0	B	3	Loose till, sandy textures	mesic	sandy-skeletal	no	cobbly loamy sand
Vassalboro	150					D	6	Organic Materials - Freshwater	frigid	peat	no	deep organic
Success	154	2.0	6.0	6.00	20.0	A	1	Sandy Till	frigid	sandy-skeletal	yes	cemented
Canterbury	166	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	no	loam in Cd
Sunapee	168	0.6	2.0	0.60	6.0	B	3	Loose till, loamy textures	frigid	loamy	yes	
Waskish	195					D	6	Organic Materials - Freshwater	frigid	peat	no	deep organic
Ondawa	201	0.6	6.0	6.00	20.0	B	2	Flood Plain (Bottom Land)	frigid	loamy	no	occ flood, loamy over l. sand
Sunday	202	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	frigid	sandy	no	frequently flooded
Fryeburg	208	0.6	2.0	2.00	6.0	B	2	Flood Plain (Bottom Land)	frigid	silty	no	very fine sandy loam
Charles	209	0.6	100.0	0.60	100.0	C	5	Flood Plain (Bottom Land)	frigid	silty	no	
Warwick	210	2.0	6.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	loamy-skeletal	no	loamy over slate gravel
Naumburg	214	6.0	20.0	6.00	20.0	C	5	Outwash and Stream Terraces	frigid	sandy	yes	
Boscawen	220	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	no	loamy cap
Bemis	224	0.6	0.2	0.00	0.2	C	5	Firm, platy, loamy till	crylic	loamy	no	
Bice	226	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	frigid	loamy	no	sandy loam
Lanesboro	228	0.6	2.0	0.06	0.2	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	channery silt loam in Cd
Poocham	230	0.6	2.0	0.20	2.0	B	3	Terraces and glacial lake plains	mesic	silty	no	silt loam in C
Buxton	232	0.1	0.6	0.00	0.2	C	3	Silt and Clay Deposits	frigid	fine	no	silty clay
Scantic	233	0.0	0.2	0.00	0.2	D	5	Silt and Clay Deposits	frigid	fine	no	
Biddeford	234	0.0	0.2	0.00	0.2	D	6	Silt and Clay Deposits	frigid	fine	no	organic over clay
Buckland	237	0.6	2.0	0.06	0.2	C	3	Firm, platy, loamy till	frigid	loamy	no	loam in Cd
Elmridge	238	2.0	6.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	mesic	loamy over clayey	no	
Brayton	240	0.6	2.0	0.06	0.6	C	5	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	
Lyme	246	0.6	6.0	0.60	6.0	C	5	Loose till, sandy textures	frigid	loamy	no	
Millsite	251	0.6	6.0	0.60	6.0	C	4	Loose till, bedrock	frigid	loamy	no	20 to 40 in. deep
Macomber	252	0.6	2.0	0.60	2.0	C	4	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	20 to 40 in. deep
Lombard	259	0.6	6.0	2.00	20.0	C/D	2	Weathered bedrock, phyllite	frigid	loamy	no	very channery
Sunapee var	269	0.6	2.0	0.60	6.0	B	3	Loose till, loamy textures	frigid	loamy	yes	frigid dystrodept
Chatfield Var.	289	0.6	6.0	0.60	6.0	B	3	Loose till, bedrock	mesic	loamy	no	mwd to swpd
Greenwood	295					A/D	6	Organic Materials - Freshwater	frigid	hemic	no	deep organic
Catden	296					A/D	6	Organic Materials - Freshwater	mesic	sapric	no	deep organic
Lovewell	307	0.6	2.0	0.60	2.0	B	3	Flood Plain (Bottom Land)	frigid	silty	no	very fine sandy loam
Quonset	310	2.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	sandy-skeletal	no	shale
Deerfield	313	6.0	20.0	20.00	100.0	B	3	Outwash and Stream Terraces	mesic	sandy	no	single grain in C

Soil Series	legend number	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Group	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Pipestone	314					B	5	Outwash and Stream Terraces	mesic	sandy	yes	
Mashpee	315	6.0	20.0	6.00	20.0	B	5	Outwash and Stream Terraces	mesic	sandy	yes	
Bernardston	330	0.6	2.0	0.06	0.2	C	3	Firm, platy, silty till, schist & phyllite	mesic	loamy	no	channery silt loam in Cd
Roundabout	333	0.2	2.0	0.06	0.6	C	5	Terraces and glacial lake plains	frigid	silty	no	silt loam in the C
Pittstown	334	0.6	2.0	0.06	0.2	C	3	Firm, platy, silty till, schist & phyllite	mesic	loamy	no	channery silt loam in Cd
Elmwood	338	2.0	6.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	frigid	loamy over clayey	no	
Stissing	340	0.6	2.0	0.06	0.2	C	5	Firm, platy, silty till, schist & phyllite	mesic	loamy	no	
Cardigan	357	0.6	2.0	0.60	2.0	B	4	Friable till, silty, schist & phyllite	mesic	loamy	no	20 to 40 in. deep
Kearsarge	359	0.6	2.0	0.60	2.0	B	4	Friable till, silty, schist & phyllite	mesic	loamy	no	less than 20 in. deep
Dutchess	366	0.6	2.0	0.60	2.0	B	2	Friable till, silty, schist & phyllite	mesic	loamy	no	very channery
Dixfield	378	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	fine sandy loam in Cd
Timakwa	393			6.00	100.0	D	6	Organic Materials - Freshwater	mesic	sandy or sandy-skeletal	no	organic over sand
Chocorua	395			6.00	20.0	D	6	Organic Materials - Freshwater	frigid	sandy or sandy-skeletal	no	organic over sand
Ipswich	397					D	6	Tidal Flat	mesic	hemic/sapric	no	deep organic
Suncook	402	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	mesic	sandy	no	frequent flooding
Metallak	404	6.0	100.0	6.00	100.0	B	3	Flood Plain (Bottom Land)	frigid	loamy over sandy	no	sandy or sandy-skeletal
Medomak	406	0.6	2.0	0.60	2.0	D	6	Flood Plain (Bottom Land)	frigid	silty	no	organic over silt
Haven	410	0.6	2.0	20.00	100.0	B	2	Outwash and Stream Terraces	mesic	loamy over sandy	no	loamy over sand/gravel
Duane	413	6.0	20.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	cemented (ortstein)
Moosilauke	414	6.0	20.0	6.00	20.0	C	5	Loose till, sandy textures	frigid	sandy	no	
Grange	433	0.6	2.0	0.60	2.0	C	5	Outwash and Stream Terraces	frigid	co. loamy over sandy (skeletal)	no	
Swanton	438	2.0	6.0	0.00	0.2	C	5	Sandy/loamy over silt/clay	frigid	co. loamy over clayey	no	
Shaker	439	2.0	6.0	0.00	0.2	C	5	Sandy/loamy over silt/clay	mesic	co. loamy over clayey	no	
Chichester	442	0.6	2.0	2.00	6.0	B		Loose till, sandy textures	frigid	loamy over sandy	no	loamy over loamy sand
Newfields	444	0.6	2.0	0.60	2.0	B	3	Loose till, sandy textures	mesic	loamy over sandy	no	sandy or sandy-skeletal
Scituate	448	0.6	2.0	0.06	0.2	C	3	Firm, platy, sandy till	mesic	loamy	no	loamy sand in Cd
Metacomet	458	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	no	loamy sand in Cd
Pennichuck	460	0.6	2.0	0.60	2.0	B	4	Friable till, silty, schist & phyllite	mesic	loamy-skeletal	no	20 to 40 in. deep
Gilmanton	478	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	no	fine sandy loam in Cd
Ossipee	495			0.20	2.0	D	6	Organic Materials - Freshwater	frigid	loamy	no	organic over loam
Natchaug	496			0.20	2.0	D	6	Organic Materials - Freshwater	mesic	loamy	no	organic over loam
Pawcatuck	497			20.00	100.0	D	6	Tidal Flat	mesic	sandy or sandy-skeletal	no	organic over sand
Abenaki	501	0.6	2.0	6.00	99.0	B	2	Outwash and Stream Terraces	frigid	loamy over sandy-skeletal	no	loamy over gravelly
Cohas	505	0.6	2.0	0.60	100.0	C	5	Flood Plain (Bottom Land)	frigid	co. loamy over sandy (skeletal)	no	
Hoosic	510	2.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	sandy-skeletal	no	slate, loamy cap
Ninigret	513	0.6	6.0	6.00	20.0	B	3	Outwash and Stream Terraces	mesic	loamy over sandy	no	sandy or sandy-skeletal
Leicester	514	0.6	6.0	0.60	20.0	C	5	Loose till, loamy textures	mesic	loamy	no	
Au Gres	516					B	5	Outwash and Stream Terraces	frigid	sandy	yes	single grain, loose
Machias	520	2.0	6.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	sandy or sandy-skeletal	yes	strata sand/gravel in C
Stetson	523	0.6	6.0	6.00	20.0	B	2	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	loamy over gravelly
Caesar	526	20.0	100.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	coarse sand	no	
Scio	531	0.6	2.0	0.60	2.0	B	3	Terraces and glacial lake plains	mesic	silty	no	gravelly sand in 2C
Belgrade	532	0.6	2.0	0.06	2.0	B	3	Terraces and glacial lake plains	mesic	silty	no	strata of fine sand
Raynham	533	0.2	2.0	0.06	0.2	C	5	Terraces and glacial lake plains	mesic	silty	no	
Binghamville	534	0.2	2.0	0.06	0.2	D	5	Terraces and glacial lake plains	mesic	silty	no	
Suffield	536	0.6	2.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	mesic	silty over clayey	no	deep to clay C
Squamscott	538	6.0	20.0	0.06	0.6	C	5	Sandy/loamy over silt/clay	mesic	sandy over loamy	yes	
Raypol	540	0.6	2.0	6.00	100.0	D	5	Outwash and Stream Terraces	mesic	co. loamy over sandy (skeletal)	no	
Walpole	546	2.0	6.0	6.00	20.0	C	5	Outwash and Stream Terraces	mesic	sandy	no	
Peacham	549	0.6	2.0	0.00	0.2	D	6	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	organic over loam
Skerry	558	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	yes	loamy sand in Cd
Plaisted	563	0.6	2.0	0.06	0.6	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	channery silt loam in Cd
Howland	566	0.6	2.0	0.06	0.2	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	silt loam, platy in Cd
Monarda	569	0.2	2.0	0.02	0.2	D	5	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	
Bangor	572	0.6	2.0	0.60	2.0	B	2	Friable till, silty, schist & phyllite	frigid	loamy	yes	silt loam

Soil Series	legend number	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Group	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Dixmont	578	0.6	2.0	0.60	2.0	C	3	Friable till, silty, schist & phyllite	frigid	loamy	yes	silt loam, platy in C
Cabot	589	0.6	2.0	0.06	0.2	D	5	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	
Westbrook	597			0.00	2.0	D	6	Tidal Flat	mesic	loamy	no	organic over loam
Mundal	610	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	gravely sandy loam in Cd
Croghan	613	20.0	100.0	20.00	100.0	B	3	Outwash and Stream Terraces	frigid	sandy	yes	single grain in C
Kinsman	614	6.0	20.0	6.00	20.0	C	5	Outwash and Stream Terraces	frigid	sandy	yes	
Salmon	630	0.6	2.0	0.60	2.0	B	2	Terraces and glacial lake plains	frigid	silty	yes	very fine sandy loam
Nicholville	632	0.6	2.0	0.60	2.0	C	3	Terraces and glacial lake plains	frigid	silty	yes	very fine sandy loam
Pemi	633	0.6	2.0	0.06	0.6	C	5	Terraces and glacial lake plains	frigid	silty	no	
Pillsbury	646	0.6	2.0	0.06	0.2	C	5	Firm, platy, loamy till	frigid	silty	no	
Ridgebury	656	0.6	6.0	0.00	0.2	C	5	Firm, platy, loamy till	mesic	loamy	no	
Canaan	663	2.0	20.0	2.00	20.0	C	4	Weathered Bedrock Till	frigid	loamy-skeletal	yes	less than 20 in. deep
Redstone	665	2.0	6.0	6.00	20.0	A	1	Weathered Bedrock Till	frigid	fragmental	yes	loamy cap
Sisk	667	0.6	2.0	0.00	0.6	C	3	Firm, platy, loamy till	cryic	loamy	yes	sandy loam in Cd
Surplus	669	0.6	2.0	0.00	0.6	C	3	Firm, platy, loamy till	cryic	loamy	yes	mwd, sandy loam in Cd
Glebe	671	2.0	6.0	2.00	6.0	C	4	Loose till, bedrock	cryic	loamy	yes	20 to 40 in. deep
Saddleback	673	0.6	2.0	0.60	2.0	C/D	4	Loose till, bedrock	cryic	loamy	yes	less than 20 in. deep
Ricker	674	2.0	6.0	2.00	6.0	A	4	Organic over bedrock (up to 4" of mineral)	cryic	fibric to hemic	no	well drained, less than 20 in. deep
Houghtonville	795	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	frigid	loamy	yes	cobbly fine sandy loam
Matunuck	797			20.00	100.0	D	6	Tidal Flat	mesic	sandy	no	organic over sand
Meadowsedge	894					D	6	Organic Materials - Freshwater	frigid	peat	no	deep organic
Bucksport	895					D	6	Organic Materials - Freshwater	frigid	sapric	no	deep organic
Colonel	927	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	loam in Cd
Pondicherry	992			6.00	20.0	D	6	Organic Materials - Freshwater	frigid	sandy or sandy-skeletal	no	organic over sand
Wonsqueak	995			0.20	2.0	D	6	Organic Materials - Freshwater	frigid	loamy	no	organic over loam
Glover	NA	0.6	2.0	0.60	2	D	4	Friable till, silty, schist & phyllite	frigid	loamy	no	less than 20 in. deep



no longer recognized
organic materials

TABLE B

SOIL SERIES

Soil Series	legend number	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Group	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Abenaki	501	0.6	2.0	6.00	99.0	B	2	Outwash and Stream Terraces	frigid	loamy over sandy-skeletal	no	loamy over gravelly
Acton	146	2.0	20.0	2.00	20.0	B	3	Loose till, sandy textures	mesic	sandy-skeletal	no	cobbly loamy sand
Adams	36	6.0	20.0	20.00	99.0	A	1	Outwash and Stream Terraces	frigid	sandy	yes	
Agawam	24	6.0	20.0	20.00	100.0	B	2	Outwash and Stream Terraces	mesic	loamy over sandy	no	loamy over sand/gravel
Allagash	127	0.6	2.0	6.00	20.0	B	2	Outwash and Stream Terraces	frigid	loamy over sandy	yes	loamy over sandy
Au Gres	516					B	5	Outwash and Stream Terraces	frigid	sandy	yes	single grain, loose
Bangor	572	0.6	2.0	0.60	2.0	B	2	Friable till, silty, schist & phyllite	frigid	loamy	yes	silt loam
Becket	56	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	yes	gravelly sandy loam in Cd
Belgrade	532	0.6	2.0	0.06	2.0	B	3	Terraces and glacial lake plains	mesic	silty	no	strata of fine sand
Bemis	224	0.6	0.2	0.00	0.2	C	5	Firm, platy, loamy till	cryic	loamy	no	
Berkshire	72	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	frigid	loamy	yes	fine sandy loam
Bernardston	330	0.6	2.0	0.06	0.2	C	3	Firm, platy, silty till, schist & phyllite	mesic	loamy	no	channery silt loam in Cd
Bice	226	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	frigid	loamy	no	sandy loam
Biddeford	234	0.0	0.2	0.00	0.2	D	6	Silt and Clay Deposits	frigid	fine	no	organic over clay
Binghamville	534	0.2	2.0	0.06	0.2	D	5	Terraces and glacial lake plains	mesic	silty	no	
Boscawen	220	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	no	loamy cap
Boxford	32	0.1	0.2	0.00	0.2	C	3	Silt and Clay Deposits	mesic	fine	no	silty clay loam
Brayton	240	0.6	2.0	0.06	0.6	C	5	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	
Buckland	237	0.6	2.0	0.06	0.2	C	3	Firm, platy, loamy till	frigid	loamy	no	loam in Cd
Bucksport	895					D	6	Organic Materials - Freshwater	frigid	sapric	no	deep organic
Burnham	131	0.2	6.0	0.02	0.2	D	6	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	organic over silt
Buxton	232	0.1	0.6	0.00	0.2	C	3	Silt and Clay Deposits	frigid	fine	no	silty clay
Cabot	589	0.6	2.0	0.06	0.2	D	5	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	
Caesar	526	20.0	100.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	coarse sand	no	
Canaan	663	2.0	20.0	2.00	20.0	C	4	Weathered Bedrock Till	frigid	loamy-skeletal	yes	less than 20 in. deep
Canterbury	166	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	no	loam in Cd
Canton	42	2.0	6.0	6.00	20.0	B	2	Loose till, sandy textures	mesic	loamy over sandy	no	loamy over loamy sand
Cardigan	357	0.6	2.0	0.60	2.0	B	4	Friable till, silty, schist & phyllite	mesic	loamy	no	20 to 40 in. deep
Catden	296					A/D	6	Organic Materials - Freshwater	mesic	sapric	no	deep organic
Champlain	35	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	gravelly sand	no	
Charles	209	0.6	100.0	0.60	100.0	C	5	Flood Plain (Bottom Land)	frigid	silty	no	
Charlton	62	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	mesic	loamy	no	fine sandy loam
Chatfield	89	0.6	6.0	0.60	6.0	B	4	Loose till, bedrock	mesic	loamy	no	20 to 40 in. deep
Chatfield Var.	289	0.6	6.0	0.60	6.0	B	3	Loose till, bedrock	mesic	loamy	no	mwd to swpd
Chesuncook	126	0.6	2.0	0.02	0.2	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	channery silt loam in Cd
Chichester	442	0.6	2.0	2.00	6.0	B		Loose till, sandy textures	frigid	loamy over sandy	no	loamy over loamy sand
Chocorua	395			6.00	20.0	D	6	Organic Materials - Freshwater	frigid	sandy or sandy-skeletal	no	organic over sand
Cohas	505	0.6	2.0	0.60	100.0	C	5	Flood Plain (Bottom Land)	frigid	co. loamy over sandy (skeletal)	no	
Colonel	927	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	loam in Cd
Colton	22	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	
Colton, gravelly	21	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	gravelly surface
Croghan	613	20.0	100.0	20.00	100.0	B	3	Outwash and Stream Terraces	frigid	sandy	yes	single grain in C
Dartmouth	132	0.6	2.0	0.06	0.6	B	3	Terraces and glacial lake plains	mesic	silty	no	thin strata silty clay loam
Deerfield	313	6.0	20.0	20.00	100.0	B	3	Outwash and Stream Terraces	mesic	sandy	no	single grain in C
Dixfield	378	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	fine sandy loam in Cd
Dixmont	578	0.6	2.0	0.60	2.0	C	3	Friable till, silty, schist & phyllite	frigid	loamy	yes	silt loam, platy in C
Duane	413	6.0	20.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	cemented (ortstein)
Dutchess	366	0.6	2.0	0.60	2.0	B	2	Friable till, silty, schist & phyllite	mesic	loamy	no	very channery
Eldridge	38	6.0	20.0	0.06	0.6	C	3	Sandy/loamy over silt/clay	mesic	sandy over loamy	no	
Elliottsville	128	0.6	2.0	0.60	2.0	B	4	Friable till, silty, schist & phyllite	frigid	loamy	yes	20 to 40 in. deep
Elmridge	238	2.0	6.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	mesic	loamy over clayey	no	
Elmwood	338	2.0	6.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	frigid	loamy over clayey	no	
Finch	116					C	3	Outwash and Stream Terraces	frigid	sandy	yes	cemented (ortstein)

Soil Series	legend number	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Group	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Fryeburg	208	0.6	2.0	2.00	6.0	B	2	Flood Plain (Bottom Land)	frigid	silty	no	very fine sandy loam
Gilmanton	478	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	no	fine sandy loam in Cd
Glebe	671	2.0	6.0	2.00	6.0	C	4	Loose till, bedrock	cryic	loamy	yes	20 to 40 in. deep
Gloucester	11	6.0	20.0	6.00	20.0	A	1	Sandy Till	mesic	sandy-skeletal	no	loamy cap
Glover	NA	0.6	2.0	0.60	2	D	4	Friable till, silty, schist & phyllite	frigid	loamy	no	less than 20 in. deep
Grange	433	0.6	2.0	0.60	2.0	C	5	Outwash and Stream Terraces	frigid	co. loamy over sandy (skeletal)	no	
Greenwood	295					A/D	6	Organic Materials - Freshwater	frigid	hemic	no	deep organic
Groveton	27	0.6	2.0	0.60	6.0	B	2	Outwash and Stream Terraces	frigid	loamy	yes	loamy over sandy
Hadley	8	0.6	2.0	0.60	6.0	B	2	Flood Plain (Bottom Land)	mesic	silty	no	strata of fine sand
Hadley	108	0.6	2.0	0.60	6.0	B	2	Flood Plain (Bottom Land)	mesic	silty	no	strata of fine sand, occ flooded
Hartland	31	0.6	2.0	0.20	2.0	B	2	Terraces and glacial lake plains	mesic	silty	no	very fine sandy loam
Haven	410	0.6	2.0	20.00	100.0	B	2	Outwash and Stream Terraces	mesic	loamy over sandy	no	loamy over sand/gravel
Henniker	46	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	no	loamy sand in Cd
Hermon	55	2.0	20.0	6.00	20.0	A	1	Sandy Till	frigid	sandy-skeletal	yes	loamy cap
Hinckley	12	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	sandy-skeletal	no	
Hitchcock	130	0.6	2.0	0.06	0.6	B	3	Terraces and glacial lake plains	mesic	silty	no	silt loam to silt in C
Hogback	91	2.0	6.0	2.00	6.0	C	4	Loose till, bedrock	frigid	loamy	yes	less than 20 in. deep
Hollis	86	0.6	6.0	0.60	6.0	C/D	4	Loose till, bedrock	mesic	loamy	no	less than 20 in. deep
Hoosic	510	2.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	sandy-skeletal	no	slate, loamy cap
Houghtonville	795	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	frigid	loamy	yes	cobbly fine sandy loam
Howland	566	0.6	2.0	0.06	0.2	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	silt loam, platy in Cd
Ipswich	397					D	6	Tidal Flat	mesic	hemic/sapric	no	deep organic
Kearsarge	359	0.6	2.0	0.60	2.0	B	4	Friable till, silty, schist & phyllite	mesic	loamy	no	less than 20 in. deep
Kinsman	614	6.0	20.0	6.00	20.0	C	5	Outwash and Stream Terraces	frigid	sandy	yes	
Lanesboro	228	0.6	2.0	0.06	0.2	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	channery silt loam in Cd
Leicester	514	0.6	6.0	0.60	20.0	C	5	Loose till, loamy textures	mesic	loamy	no	
Lim	3	0.6	2.0	6.00	20.0	C	5	Flood Plain (Bottom Land)	mesic	loamy	no	
Limerick	109	0.6	2.0	0.60	2.0	C	5	Flood Plain (Bottom Land)	mesic	silty	no	
Lombard	259	0.6	6.0	2.00	20.0	C/D	2	Weathered bedrock, phyllite	frigid	loamy	no	very channery
Lovewell	307	0.6	2.0	0.60	2.0	B	3	Flood Plain (Bottom Land)	frigid	silty	no	very fine sandy loam
Lyman	92	2.0	6.0	2.00	6.0	A/D	4	Loose till, bedrock	frigid	loamy	yes	less than 20 in. deep
Lyme	246	0.6	6.0	0.60	6.0	C	5	Loose till, sandy textures	frigid	loamy	no	
Machias	520	2.0	6.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	sandy or sandy-skeletal	yes	strata sand/gravel in C
Macomber	252	0.6	2.0	0.60	2.0	C	4	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	20 to 40 in. deep
Madawaska	28	0.6	2.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	loamy over sandy	yes	sandy or sandy-skeletal
Madawaska, aquifer	48	0.6	2.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	loamy over sandy	yes	sandy or sandy-skeletal
Marlow	76	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	fine sandy loam in Cd
Masardis	23	6.0	20.0	6.00	20.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	slate, loamy cap
Mashpee	315	6.0	20.0	6.00	20.0	B	5	Outwash and Stream Terraces	mesic	sandy	yes	
Matunuck	797			20.00	100.0	D	6	Tidal Flat	mesic	sandy	no	organic over sand
Maybid	134	0.0	0.2	0.00	0.2	D	6	Silt and Clay Deposits	mesic	fine	no	silt over clay
Meadowsedge	894					D	6	Organic Materials - Freshwater	frigid	peat	no	deep organic
Medomak	406	0.6	2.0	0.60	2.0	D	6	Flood Plain (Bottom Land)	frigid	silty	no	organic over silt
Melrose	37	2.0	6.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	frigid	loamy over clayey	no	silty clay loam in C
Merrimac	10	2.0	20.0	6.00	20.0	A	1	Outwash and Stream Terraces	mesic	gravelly sand	no	loamy cap
Metacomet	458	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	no	loamy sand in Cd
Metallak	404	6.0	100.0	6.00	100.0	B	3	Flood Plain (Bottom Land)	frigid	loamy over sandy	no	sandy or sandy-skeletal
Millis	39					C	3	Firm, platy, sandy till	frigid	loamy	yes	loamy sand in Cd
Millsite	251	0.6	6.0	0.60	6.0	C	4	Loose till, bedrock	frigid	loamy	no	20 to 40 in. deep
Monadnock	142	0.6	2.0	2.00	6.0	B	2	Loose till, sandy textures	frigid	loamy over sandy, sandy-skeletal	yes	gravelly loamy sand in C
Monarda	569	0.2	2.0	0.02	0.2	D	5	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	
Monson	133	0.6	2.0	0.60	2.0	D	4	Friable till, silty, schist & phyllite	frigid	loamy	yes	less than 20 in. deep
Montauk	44	0.6	6.0	0.06	0.6	C	3	Firm, platy, sandy till	mesic	loamy	no	loamy sand in Cd
Moosilauke	414	6.0	20.0	6.00	20.0	C	5	Loose till, sandy textures	frigid	sandy	no	

Soil Series	legend number	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Group	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Mundal	610	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	gravely sandy loam in Cd
Natchaug	496			0.20	2.0	D	6	Organic Materials - Freshwater	mesic	loamy	no	organic over loam
Naumburg	214	6.0	20.0	6.00	20.0	C	5	Outwash and Stream Terraces	frigid	sandy	yes	
Newfields	444	0.6	2.0	0.60	2.0	B	3	Loose till, sandy textures	mesic	loamy over sandy	no	sandy or sandy-skeletal
Nicholville	632	0.6	2.0	0.60	2.0	C	3	Terraces and glacial lake plains	frigid	silty	yes	very fine sandy loam
Ninigret	513	0.6	6.0	6.00	20.0	B	3	Outwash and Stream Terraces	mesic	loamy over sandy	no	sandy or sandy-skeletal
Occum	1	0.6	2.0	6.00	20.0	B	2	Flood Plain (Bottom Land)	mesic	loamy	no	loamy over loamy sand
Ondawa	101	0.6	6.0	6.00	20.0	B	2	Flood Plain (Bottom Land)	frigid	loamy	no	loamy over loamy sand
Ondawa	201	0.6	6.0	6.00	20.0	B	2	Flood Plain (Bottom Land)	frigid	loamy	no	occ flood, loamy over l. sand
Ossipee	495			0.20	2.0	D	6	Organic Materials - Freshwater	frigid	loamy	no	organic over loam
Pawcatuck	497			20.00	100.0	D	6	Tidal Flat	mesic	sandy or sandy-skeletal	no	organic over sand
Paxton	66	0.6	2.0	0.00	0.2	C	3	Firm, platy, loamy till	mesic	loamy	no	
Peacham	549	0.6	2.0	0.00	0.2	D	6	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	organic over loam
Pemi	633	0.6	2.0	0.06	0.6	C	5	Terraces and glacial lake plains	frigid	silty	no	
Pennichuck	460	0.6	2.0	0.60	2.0	B	4	Friable till, silty, schist & phyllite	mesic	loamy-skeletal	no	20 to 40 in. deep
Peru	78	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	
Pillsbury	646	0.6	2.0	0.06	0.2	C	5	Firm, platy, loamy till	frigid	silty	no	
Pipestone	314					B	5	Outwash and Stream Terraces	mesic	sandy	yes	
Pittstown	334	0.6	2.0	0.06	0.2	C	3	Firm, platy, silty till, schist & phyllite	mesic	loamy	no	channery silt loam in Cd
Plaisted	563	0.6	2.0	0.06	0.6	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	channery silt loam in Cd
Podunk	104	0.6	6.0	6.00	20.0	B	3	Flood Plain (Bottom Land)	frigid	loamy	no	loamy to coarse sand in C
Pondicherry	992			6.00	20.0	D	6	Organic Materials - Freshwater	frigid	sandy or sandy-skeletal	no	organic over sand
Poocham	230	0.6	2.0	0.20	2.0	B	3	Terraces and glacial lake plains	mesic	silty	no	silt loam in C
Pootatuck	4	0.6	6.0	6.00	20.0	B	3	Flood Plain (Bottom Land)	mesic	loamy	no	single grain in C
Quonset	310	2.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	sandy-skeletal	no	shale
Rawsonville	98	0.6	6.0	0.60	6.0	C	4	Loose till, bedrock	frigid	loamy	yes	20 to 40 in. deep
Raynham	533	0.2	2.0	0.06	0.2	C	5	Terraces and glacial lake plains	mesic	silty	no	
Raypol	540	0.6	2.0	6.00	100.0	D	5	Outwash and Stream Terraces	mesic	co. loamy over sandy (skeletal)	no	
Redstone	665	2.0	6.0	6.00	20.0	A	1	Weathered Bedrock Till	frigid	fragmental	yes	loamy cap
Ricker	674	2.0	6.0	2.00	6.0	A	4	Organic over bedrock (up to 4" of mineral)	cryic	fibric to hemic	no	well drained, less than 20 in. deep
Ridgebury	656	0.6	6.0	0.00	0.2	C	5	Firm, platy, loamy till	mesic	loamy	no	
Rippowam	5	0.6	6.0	6.00	20.0	C	5	Flood Plain (Bottom Land)	mesic	loamy	no	
Roundabout	333	0.2	2.0	0.06	0.6	C	5	Terraces and glacial lake plains	frigid	silty	no	silt loam in the C
Rumney	105	0.6	6.0	6.00	20.0	C	5	Flood Plain (Bottom Land)	frigid	loamy	no	
Saco	6	0.6	2.0	6.00	20.0	D	6	Flood Plain (Bottom Land)	mesic	silty	no	strata
Saddleback	673	0.6	2.0	0.60	2.0	C/D	4	Loose till, bedrock	cryic	loamy	yes	less than 20 in. deep
Salmon	630	0.6	2.0	0.60	2.0	B	2	Terraces and glacial lake plains	frigid	silty	yes	very fine sandy loam
Saugatuck	16	0.06	0.2	6.00	20.0	C	5	Outwash and Stream Terraces	mesic	sandy	yes	ortstein
Scantic	233	0.0	0.2	0.00	0.2	D	5	Silt and Clay Deposits	frigid	fine	no	
Scarboro	115	6.0	20.0	6.00	20.0	D	6	Outwash and Stream Terraces	mesic	sandy	no	organic over sand, non stony
Scio	531	0.6	2.0	0.60	2.0	B	3	Terraces and glacial lake plains	mesic	silty	no	gravely sand in 2C
Scitico	33	0.0	0.2	0.00	0.2	C	5	Silt and Clay Deposits	mesic	fine	no	
Scituate	448	0.6	2.0	0.06	0.2	C	3	Firm, platy, sandy till	mesic	loamy	no	loamy sand in Cd
Searsport	15	6.0	20.0	6.00	20.0	D	6	Outwash and Stream Terraces	frigid	sandy	no	organic over sand
Shaker	439	2.0	6.0	0.00	0.2	C	5	Sandy/loamy over silt/clay	mesic	co. loamy over clayey	no	
Shapleigh	136					C/D	4	Sandy Till	mesic	sandy	yes	less than 20 in. deep
Sheepscot	14	6.0	20.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	gravely coarse sand
Sisk	667	0.6	2.0	0.00	0.6	C	3	Firm, platy, loamy till	cryic	loamy	yes	sandy loam in Cd
Skerry	558	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	yes	loamy sand in Cd
Squamscott	538	6.0	20.0	0.06	0.6	C	5	Sandy/loamy over silt/clay	mesic	sandy over loamy	yes	
Stetson	523	0.6	6.0	6.00	20.0	B	2	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	loamy over gravelly
Stissing	340	0.6	2.0	0.06	0.2	C	5	Firm, platy, silty till, schist & phyllite	mesic	loamy	no	
Success	154	2.0	6.0	6.00	20.0	A	1	Sandy Till	frigid	sandy-skeletal	yes	cemented
Sudbury	118	2.0	6.0	2.00	20.0	B	3	Outwash and Stream Terraces	mesic	sandy	no	loam over gravelly sand

Soil Series	legend number	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Group	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Suffield	536	0.6	2.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	mesic	silty over clayey	no	deep to clay C
Sunapee	168	0.6	2.0	0.60	6.0	B	3	Loose till, loamy textures	frigid	loamy	yes	
Sunapee var	269	0.6	2.0	0.60	6.0	B	3	Loose till, loamy textures	frigid	loamy	yes	frigid dystrodept
Suncook	2	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	mesic	sandy	no	occasionally flooded
Suncook	402	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	mesic	sandy	no	frequent flooding
Sunday	102	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	frigid	sandy	no	occasionally flooded
Sunday	202	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	frigid	sandy	no	frequently flooded
Surplus	669	0.6	2.0	0.00	0.6	C	3	Firm, platy, loamy till	cryic	loamy	yes	mwd, sandy loam in Cd
Sutton	68	0.6	6.0	0.60	6.0	B	3	Loose till, loamy textures	mesic	loamy	no	
Swanton	438	2.0	6.0	0.00	0.2	C	5	Sandy/loamy over silt/clay	frigid	co. loamy over clayey	no	
Telos	123	0.6	2.0	0.02	0.2	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	channery silt loam in Cd
Thorndike	84	0.6	2.0	0.60	2.0	C/D	4	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	less than 20 in. deep
Timakwa	393			6.00	100.0	D	6	Organic Materials - Freshwater	mesic	sandy or sandy-skeletal	no	organic over sand
Tunbridge	99	0.6	6.0	0.60	6.0	C	4	Loose till, bedrock	frigid	loamy	yes	20 to 40 in. deep
Unadilla	30	0.6	2.0	2.00	20.0	B	2	Terraces and glacial lake plains	mesic	silty	no	silty over gravelly
Vassalboro	150					D	6	Organic Materials - Freshwater	frigid	peat	no	deep organic
Walpole	546	2.0	6.0	6.00	20.0	C	5	Outwash and Stream Terraces	mesic	sandy	no	
Wareham	34	6.0	20.0	6.00	20.0	C	5	Outwash and Stream Terraces	mesic	sandy	no	
Warwick	210	2.0	6.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	loamy-skeletal	no	loamy over slate gravel
Waskish	195					D	6	Organic Materials - Freshwater	frigid	peat	no	deep organic
Waumbeck	58	2.0	20.0	6.00	20.0	B	3	Loose till, sandy textures	frigid	sandy-skeletal	yes	very cobbly loamy sand
Westbrook	597			0.00	2.0	D	6	Tidal Flat	mesic	loamy	no	organic over loam
Whitman	49	0.0	0.2	0.00	0.2	D	6	Firm, platy, loamy till	mesic	loamy	no	mucky loam
Windsor	26	6.0	20.0	6.00	20.0	A	1	Outwash and Stream Terraces	mesic	sandy	no	
Winnecook	88	0.6	2.0	0.60	2.0	C	4	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	20 to 40 in. deep
Winooski	9	0.6	6.0	0.60	6.0	B		Flood Plain (Bottom Land)	mesic	silty over loamy	no	
Winooski	103	0.6	6.0	0.60	6.0	B	3	Flood Plain (Bottom Land)	mesic	silty	no	very fine sandy loam
Wonsqueak	995			0.20	2.0	D	6	Organic Materials - Freshwater	frigid	loamy	no	organic over loam
Woodbridge	29	0.6	2.0	0.00	0.6	C	3	Firm, platy, loamy till	mesic	loamy	no	sandy loam in Cd
Woodstock	93	2.0	6.0	2.00	6.0	C/D	4	Loose till, bedrock	frigid	loamy	no	less than 20 in. deep

 no longer recognized
 organic materials

TABLE C

NHDES SOIL GROUPINGS

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
Adams	36	1	6.0	20.0	20.00	99.0	A	Outwash and Stream Terraces	frigid	sandy	yes	
Boscawen	220	1	6.0	20.0	20.00	100.0	A	Outwash and Stream Terraces	frigid	sandy-skeletal	no	loamy cap
Caesar	526	1	20.0	100.0	20.00	100.0	A	Outwash and Stream Terraces	mesic	coarse sand	no	
Champlain	35	1	6.0	20.0	20.00	100.0	A	Outwash and Stream Terraces	frigid	gravelly sand	no	
Colton	22	1	6.0	20.0	20.00	100.0	A	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	
Colton, gravelly	21	1	6.0	20.0	20.00	100.0	A	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	gravelly surface
Gloucester	11	1	6.0	20.0	6.00	20.0	A	Sandy Till	mesic	sandy-skeletal	no	loamy cap
Hermon	55	1	2.0	20.0	6.00	20.0	A	Sandy Till	frigid	sandy-skeletal	yes	loamy cap
Hinckley	12	1	6.0	20.0	20.00	100.0	A	Outwash and Stream Terraces	mesic	sandy-skeletal	no	
Hoosic	510	1	2.0	20.0	20.00	100.0	A	Outwash and Stream Terraces	mesic	sandy-skeletal	no	slate, loamy cap
Masardis	23	1	6.0	20.0	6.00	20.0	A	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	slate, loamy cap
Merrimac	10	1	2.0	20.0	6.00	20.0	A	Outwash and Stream Terraces	mesic	gravelly sand	no	loamy cap
Quonset	310	1	2.0	20.0	20.00	100.0	A	Outwash and Stream Terraces	mesic	sandy-skeletal	no	shale
Redstone	665	1	2.0	6.0	6.00	20.0	A	Weathered Bedrock Till	frigid	fragmental	yes	loamy cap
Success	154	1	2.0	6.0	6.00	20.0	A	Sandy Till	frigid	sandy-skeletal	yes	cemented
Suncook	2	1	6.0	20.0	6.00	20.0	A	Flood Plain (Bottomland)	mesic	sandy	no	occasionally flooded
Suncook	402	1	6.0	20.0	6.00	20.0	A	Flood Plain (Bottomland)	mesic	sandy	no	frequent flooding
Sunday	102	1	6.0	20.0	6.00	20.0	A	Flood Plain (Bottomland)	frigid	sandy	no	occasionally flooded
Sunday	202	1	6.0	20.0	6.00	20.0	A	Flood Plain (Bottomland)	frigid	sandy	no	frequently flooded
Warwick	210	1	2.0	6.0	20.00	100.0	A	Outwash and Stream Terraces	mesic	loamy-skeletal	no	loamy over slate gravel
Windsor	26	1	6.0	20.0	6.00	20.0	A	Outwash and Stream Terraces	mesic	sandy	no	
Abenaki	501	2	0.6	2.0	6.00	99.0	B	Outwash and Stream Terraces	frigid	loamy over sandy-skeletal	no	loamy over gravelly
Agawam	24	2	6.0	20.0	20.00	100.0	B	Outwash and Stream Terraces	mesic	loamy over sandy	no	loamy over sand/gravel
Allagash	127	2	0.6	2.0	6.00	20.0	B	Outwash and Stream Terraces	frigid	loamy over sandy	yes	loamy over sandy
Bangor	572	2	0.6	2.0	0.60	2.0	B	Friable till, silty, schist & phyllite	frigid	loamy	yes	silt loam
Berkshire	72	2	0.6	6.0	0.60	6.0	B	Loose till, loamy textures	frigid	loamy	yes	fine sandy loam
Bice	226	2	0.6	6.0	0.60	6.0	B	Loose till, loamy textures	frigid	loamy	no	sandy loam
Canton	42	2	2.0	6.0	6.00	20.0	B	Loose till, sandy textures	mesic	loamy over sandy	no	loamy over loamy sand
Charlton	62	2	0.6	6.0	0.60	6.0	B	Loose till, loamy textures	mesic	loamy	no	fine sandy loam
Dutchess	366	2	0.6	2.0	0.60	2.0	B	Friable till, silty, schist & phyllite	mesic	loamy	no	very channery
Fryeburg	208	2	0.6	2.0	2.00	6.0	B	Flood Plain (Bottom Land)	frigid	silty	no	very fine sandy loam
Groveton	27	2	0.6	2.0	0.60	6.0	B	Outwash and Stream Terraces	frigid	loamy	yes	loamy over sandy
Hadley	8	2	0.6	2.0	0.60	6.0	B	Flood Plain (Bottom Land)	mesic	silty	no	strata of fine sand
Hadley	108	2	0.6	2.0	0.60	6.0	B	Flood Plain (Bottom Land)	mesic	silty	no	strata of fine sand, occ flooded
Hartland	31	2	0.6	2.0	0.20	2.0	B	Terraces and glacial lake plains	mesic	silty	no	very fine sandy loam
Haven	410	2	0.6	2.0	20.00	100.0	B	Outwash and Stream Terraces	mesic	loamy over sandy	no	loamy over sand/gravel
Houghtonville	795	2	0.6	6.0	0.60	6.0	B	Loose till, loamy textures	frigid	loamy	yes	cobbly fine sandy loam
Lombard	259	2	0.6	6.0	2.00	20.0	C/D	Weathered bedrock, phyllite	frigid	loamy	no	very channery
Monadnock	142	2	0.6	2.0	2.00	6.0	B	Loose till, sandy textures	frigid	loamy over sandy, sandy-skeletal	yes	gravelly loamy sand in C
Occum	1	2	0.6	2.0	6.00	20.0	B	Flood Plain (Bottom Land)	mesic	loamy	no	loamy over loamy sand
Ondawa	101	2	0.6	6.0	6.00	20.0	B	Flood Plain (Bottom Land)	frigid	loamy	no	loamy over loamy sand
Ondawa	201	2	0.6	6.0	6.00	20.0	B	Flood Plain (Bottom Land)	frigid	loamy	no	occ flood, loamy over l. sand
Salmon	630	2	0.6	2.0	0.60	2.0	B	Terraces and glacial lake plains	frigid	silty	yes	very fine sandy loam
Stetson	523	2	0.6	6.0	6.00	20.0	B	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	loamy over gravelly
Unadilla	30	2	0.6	2.0	2.00	20.0	B	Terraces and glacial lake plains	mesic	silty	no	silty over gravelly
Chichester	442	2	0.6	2.0	2.00	6.0	B	Loose till, sandy textures	frigid	loamy over sandy	no	loamy over loamy sand
Acton	146	3	2.0	20.0	2.00	20.0	B	Loose till, sandy textures	mesic	sandy-skeletal	no	cobbly loamy sand
Becket	56	3	0.6	2.0	0.06	0.6	C	Firm, platy, sandy till	frigid	loamy	yes	gravelly sandy loam in Cd
Belgrade	532	3	0.6	2.0	0.06	2.0	B	Terraces and glacial lake plains	mesic	silty	no	strata of fine sand
Bernardston	330	3	0.6	2.0	0.06	0.2	C	Firm, platy, silty till, schist & phyllite	mesic	loamy	no	channery silt loam in Cd
Boxford	32	3	0.1	0.2	0.00	0.2	C	Silt and Clay Deposits	mesic	fine	no	silty clay loam

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 swp
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
Madawaska, aquifer	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
Mundak	610	3	0.6	2.0	0.06	0.6	C	Firm, platy, loamy till	frigid	loamy	yes	gravely 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	gravely 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	gravely 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 gravely 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 dystroch
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

Sorted by DES Soil Group for Establishing Lot Size
K_{sat} B and C horizons
SSSNNE pub no. 5

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
Waumbeck	58	3	2.0	20.0	6.00	20.0	B	Loose till, sandy textures	frigid	sandy-skeletal	yes	very cobbly loamy sand
Winooski	103	3	0.6	6.0	0.60	6.0	B	Flood Plain (Bottom Land)	mesic	silty	no	very fine sandy loam
Woodbridge	29	3	0.6	2.0	0.00	0.6	C	Firm, platy, loamy till	mesic	loamy	no	sandy loam in Cd
Winooski	9	3	0.6	6.0	0.60	6.0	B	Flood Plain (Bottom Land)	mesic	silty over loamy	no	
Canaan	663	4	2.0	20.0	2.00	20.0	C	Weathered Bedrock Till	frigid	loamy-skeletal	yes	less than 20 in. deep
Cardigan	357	4	0.6	2.0	0.60	2.0	B	Friable till, silty, schist & phyllite	mesic	loamy	no	20 to 40 in. deep
Chatfield	89	4	0.6	6.0	0.60	6.0	B	Loose till, bedrock	mesic	loamy	no	20 to 40 in. deep
Elliottsville	128	4	0.6	2.0	0.60	2.0	B	Friable till, silty, schist & phyllite	frigid	loamy	yes	20 to 40 in. deep
Glebe	671	4	2.0	6.0	2.00	6.0	C	Loose till, bedrock	cryic	loamy	yes	20 to 40 in. deep
Glover	NA	4	0.6	2.0	0.60	2	D	Friable till, silty, schist & phyllite	frigid	loamy	no	less than 20 in. deep
Hogback	91	4	2.0	6.0	2.00	6.0	C	Loose till, bedrock	frigid	loamy	yes	less than 20 in. deep
Hollis	86	4	0.6	6.0	0.60	6.0	C/D	Loose till, bedrock	mesic	loamy	no	less than 20 in. deep
Kearsarge	359	4	0.6	2.0	0.60	2.0	B	Friable till, silty, schist & phyllite	mesic	loamy	no	less than 20 in. deep
Lyman	92	4	2.0	6.0	2.00	6.0	A/D	Loose till, bedrock	frigid	loamy	yes	less than 20 in. deep
Macomber	252	4	0.6	2.0	0.60	2.0	C	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	20 to 40 in. deep
Millsite	251	4	0.6	6.0	0.60	6.0	C	Loose till, bedrock	frigid	loamy	no	20 to 40 in. deep
Monson	133	4	0.6	2.0	0.60	2.0	D	Friable till, silty, schist & phyllite	frigid	loamy	yes	less than 20 in. deep
Pennichuck	460	4	0.6	2.0	0.60	2.0	B	Friable till, silty, schist & phyllite	mesic	loamy-skeletal	no	20 to 40 in. deep
Rawsonville	98	4	0.6	6.0	0.60	6.0	C	Loose till, bedrock	frigid	loamy	yes	20 to 40 in. deep
Ricker	674	4	2.0	6.0	2.00	6.0	A	Organic over bedrock (up to 4" of miner)	cryic	fibric to hemic	no	well drained, less than 20 in. deep
Saddleback	673	4	0.6	2.0	0.60	2.0	C/D	Loose till, bedrock	cryic	loamy	yes	
Shapleigh	136	4					C/D	Sandy Till	mesic	sandy	yes	less than 20 in. deep
Thorndike	84	4	0.6	2.0	0.60	2.0	C/D	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	less than 20 in. deep
Tunbridge	99	4	0.6	6.0	0.60	6.0	C	Loose till, bedrock	frigid	loamy	yes	20 to 40 in. deep
Winnecook	88	4	0.6	2.0	0.60	2.0	C	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	20 to 40 in. deep
Woodstock	93	4	2.0	6.0	2.00	6.0	C/D	Loose till, bedrock	frigid	loamy	no	less than 20 in. deep
Au Gres	516	5					B	Outwash and Stream Terraces	frigid	sandy	yes	single grain, loose
Bemis	224	5	0.6	0.2	0.00	0.2	C	Firm, platy, loamy till	cryic	loamy	no	
Binghamville	534	5	0.2	2.0	0.06	0.2	D	Terraces and glacial lake plains	mesic	silty	no	
Brayton	240	5	0.6	2.0	0.06	0.6	C	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	
Cabot	589	5	0.6	2.0	0.06	0.2	D	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	
Charles	209	5	0.6	100.0	0.60	100.0	C	Flood Plain (Bottom Land)	frigid	silty	no	
Cohas	505	5	0.6	2.0	0.60	100.0	C	Flood Plain (Bottom Land)	frigid	co. loamy over sandy (skeletal)	no	
Grange	433	5	0.6	2.0	0.60	2.0	C	Outwash and Stream Terraces	frigid	co. loamy over sandy (skeletal)	no	
Kinsman	614	5	6.0	20.0	6.00	20.0	C	Outwash and Stream Terraces	frigid	sandy	yes	
Leicester	514	5	0.6	6.0	0.60	20.0	C	Loose till, loamy textures	mesic	loamy	no	
Lim	3	5	0.6	2.0	6.00	20.0	C	Flood Plain (Bottom Land)	mesic	loamy	no	
Limerick	109	5	0.6	2.0	0.60	2.0	C	Flood Plain (Bottom Land)	mesic	silty	no	
Lyme	246	5	0.6	6.0	0.60	6.0	C	Loose till, sandy textures	frigid	loamy	no	
Mashpee	315	5	6.0	20.0	6.00	20.0	B	Outwash and Stream Terraces	mesic	sandy	yes	
Monarda	569	5	0.2	2.0	0.02	0.2	D	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	
Moosilauke	414	5	6.0	20.0	6.00	20.0	C	Loose till, sandy textures	frigid	sandy	no	
Naumburg	214	5	6.0	20.0	6.00	20.0	C	Outwash and Stream Terraces	frigid	sandy	yes	
Pemi	633	5	0.6	2.0	0.06	0.6	C	Terraces and glacial lake plains	frigid	silty	no	
Pillsbury	646	5	0.6	2.0	0.06	0.2	C	Firm, platy, loamy till	frigid	silty	no	
Pipestone	314	5					B	Outwash and Stream Terraces	mesic	sandy	yes	
Raynham	533	5	0.2	2.0	0.06	0.2	C	Terraces and glacial lake plains	mesic	silty	no	
Raypol	540	5	0.6	2.0	6.00	100.0	D	Outwash and Stream Terraces	mesic	co. loamy over sandy (skeletal)	no	
Ridgebury	656	5	0.6	6.0	0.00	0.2	C	Firm, platy, loamy till	mesic	loamy	no	
Rippowam	5	5	0.6	6.0	6.00	20.0	C	Flood Plain (Bottom Land)	mesic	loamy	no	
Roundabout	333	5	0.2	2.0	0.06	0.6	C	Terraces and glacial lake plains	frigid	silty	no	silt loam in the C
Rumney	105	5	0.6	6.0	6.00	20.0	C	Flood Plain (Bottom Land)	frigid	loamy	no	

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
Saugatuck	16	5	0.06	0.2	6.00	20.0	C	Outwash and Stream Terraces	mesic	sandy	yes	ortstein
Scantic	233	5	0.0	0.2	0.00	0.2	D	Silt and Clay Deposits	frigid	fine	no	
Scitico	33	5	0.0	0.2	0.00	0.2	C	Silt and Clay Deposits	mesic	fine	no	
Shaker	439	5	2.0	6.0	0.00	0.2	C	Sandy/loamy over silt/clay	mesic	co. loamy over clayey	no	
Squamscott	538	5	6.0	20.0	0.06	0.6	C	Sandy/loamy over silt/clay	mesic	sandy over loamy	yes	
Stissing	340	5	0.6	2.0	0.06	0.2	C	Firm, platy, silty till, schist & phyllite	mesic	loamy	no	
Swanton	438	5	2.0	6.0	0.00	0.2	C	Sandy/loamy over silt/clay	frigid	co. loamy over clayey	no	
Walpole	546	5	2.0	6.0	6.00	20.0	C	Outwash and Stream Terraces	mesic	sandy	no	
Wareham	34	5	6.0	20.0	6.00	20.0	C	Outwash and Stream Terraces	mesic	sandy	no	
Biddeford	234	6	0.0	0.2	0.00	0.2	D	Silt and Clay Deposits	frigid	fine	no	organic over clay
Bucksport	895	6					D	Organic Materials - Freshwater	frigid	sapric	no	deep organic
Burnham	131	6	0.2	6.0	0.02	0.2	D	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	organic over silt
Catden	296	6					A/D	Organic Materials - Freshwater	mesic	sapric	no	deep organic
Chocorua	395	6			6.00	20.0	D	Organic Materials - Freshwater	frigid	sandy or sandy-skeletal	no	organic over sand
Greenwood	295	6					A/D	Organic Materials - Freshwater	frigid	hemic	no	deep organic
Ipswich	397	6					D	Tidal Flat	mesic	hemic/sapric	no	deep organic
Matunuck	797	6			20.00	100.0	D	Tidal Flat	mesic	sandy	no	organic over sand
Maybid	134	6	0.0	0.2	0.00	0.2	D	Silt and Clay Deposits	mesic	fine	no	silt over clay
Meadowsedge	894	6					D	Organic Materials - Freshwater	frigid	peat	no	deep organic
Medomak	406	6	0.6	2.0	0.60	2.0	D	Flood Plain (Bottom Land)	frigid	silty	no	organic over silt
Natchaug	496	6			0.20	2.0	D	Organic Materials - Freshwater	mesic	loamy	no	organic over loam
Ossipee	495	6			0.20	2.0	D	Organic Materials - Freshwater	frigid	loamy	no	organic over loam
Pawcatuck	497	6			20.00	100.0	D	Tidal Flat	mesic	sandy or sandy-skeletal	no	organic over sand
Peacham	549	6	0.6	2.0	0.00	0.2	D	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	organic over loam
Pondicherry	992	6			6.00	20.0	D	Organic Materials - Freshwater	frigid	sandy or sandy-skeletal	no	organic over sand
Saco	6	6	0.6	2.0	6.00	20.0	D	Flood Plain (Bottom Land)	mesic	silty	no	strata
Scarboro	115	6	6.0	20.0	6.00	20.0	D	Outwash and Stream Terraces	mesic	sandy	no	organic over sand, non stony
Searsport	15	6	6.0	20.0	6.00	20.0	D	Outwash and Stream Terraces	frigid	sandy	no	organic over sand
Timakwa	393	6			6.00	100.0	D	Organic Materials - Freshwater	mesic	sandy or sandy-skeletal	no	organic over sand
Vassalboro	150	6					D	Organic Materials - Freshwater	frigid	peat	no	deep organic
Waskish	195	6					D	Organic Materials - Freshwater	frigid	peat	no	deep organic
Westbrook	597	6			0.00	2.0	D	Tidal Flat	mesic	loamy	no	organic over loam
Whitman	49	6	0.0	0.2	0.00	0.2	D	Firm, platy, loamy till	mesic	loamy	no	mucky loam
Wonsqueak	995	6			0.20	2.0	D	Organic Materials - Freshwater	frigid	loamy	no	organic over loam

no longer recognized organic materials denotes break between Soil Group

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Each Watershed Report Card covers a single 12 digit Hydrologic Unit Code (HUC12), on average a 34 square mile area. Each Watershed Report Card has three components;

1. REPORT CARD - A one page card that summarizes the overall use support for Aquatic Life Integrity, Primary Contact (i.e. Swimming), and Secondary Contact (i.e. Boating) Designated Uses on every Assessment Unit ID (AUID) within the HUC12.
2. HUC 12 MAP - A map of the watershed with abbreviated labels for each AUID within the HUC12.
3. ASSESSMENT DETAILS - Anywhere from one to forty pages with the detailed assessment information for each and every AUID in the Report Card and Map.

How are the Surface Water Quality Assessment determinations made?

All readily available data with reliable Quality Assurance/Quality Control is used in the biennial surface water quality assessments. For a full understanding of how the Surface Water Quality Standards (Env-Wq 1700) are translated into surface water quality assessments we urge the reader to review the 2018 Consolidated Assessment and Listing Methodology (CALM) at

<https://www.des.nh.gov/organization/divisions/water/wmb/swqa/2018/documents/r-wd-19-04.pdf>.

Where can I find more advanced mapping resources?

GIS files are available by assessment cycle at <ftp://pubftp.nh.gov/DES/wmb/WaterQuality/SWQA/2018/GIS>

I'd like to see the more raw water quality data?

The web mapping tool allows you to download the data used in the assessment of the primary contact and aquatic life designated uses by clicking on the "Data Access Waterbody Data (Aquatic Life and Swimming Uses)" link for any assessment unit. (<https://www.des.nh.gov/organization/divisions/water/wmb/swqa/assessment-viewers.htm>)

How are assessments coded in the report card?

Assessment outcomes are displayed on a color scale as well as an alpha numeric scale that provides additional distinctions for the designated use and parameter level assessments as outlined in the table below.

		Severe	Poor	Likely Bad	No Data	Likely Good	Marginal	Good
		Not Supporting, Severe	Not Supporting, Marginal	Insufficient Information – Potentially Not Supporting	No Data	Insufficient Information – Potentially Full Supporting	Full Support, Marginal	Full Support, Good
CATEGORY	Description							
Category 2	Meets standards						2-M or 2-OBS	2-G
Category 3	Insufficient Information			3-PNS	3-ND	3-PAS		
Category 4	Does not Meet Standards;							
4A	TMDL* Completed	4A-P	4A-M or 4A-T					
4B	Other enforceable measure will correct the issue.	4B-P	4B-M or 4B-T					
4C	Non-pollutant (i.e. exotic weeds)	4C-P	4C-M					
Category 5	TMDL^ Needed	5-P	5-M or 5-T					

* TMDL stands for Total Maximum Daily Load studies (<http://des.nh.gov/organization/divisions/water/wmb/tmdl/index.htm>)

WATERSHED 305(b) ASSESSMENT SUMMARY REPORT:

HUC 12 010600030903

HUC 12 NAME BELLAMY RIVER

(Locator map on next page only applies to this HUC12)

Assessment Cycle 2018

Good	Full Support Good
Marginal	Full Support Marginal
Likely Good	Insufficient Information – Potentially Full Support
No Data	No Data
Likely Bad	Insufficient Information – Potentially Not Support
Poor	Not Support Marginal
Severe	Not Support Severe



ASSESSMENT UNIT ID	MAP LABEL	ASSESSMENT UNIT NAME	AQUATIC LIFE	SWIMMING	BOATING	FISH CONSUMP.
NHEST600030903-01-01	E*01-01	BELLAMY RIVER NORTH	5-P	3-G	3-G	3-M
NHEST600030903-01-03	E*01-03	BELLAMY RIVER SOUTH CLEMENT POINT	5-P	3-G	3-G	3-M
NHEST600030903-01-04	E*01-04	BELLAMY RIVER SOUTH	5-P	3-G	3-G	3-M
NHIMP600030903-01	I*01	BELLAMY RIVER	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-02	I*02	BELLAMY RIVER - SAWYERS MILL DAM POND	5-M	3-M	3-ND	4A-M
NHIMP600030903-03	I*03	CANNEY BROOK - WILDLIFE POND	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-04	I*04	BELLAMY RIVER IV DAM	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-05	I*05	KNOX MARSH BROOK	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-06	I*06	UNNAMED BROOK - THORNWOOD COMMONS POND	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-07	I*07	UNNAMED BROOK - BELLAMY RIVER WILDLIFE POND	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-08	I*08	UNNAMED BROOK - FARM POND	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-09	I*09	UNNAMED BROOK - WEBSTER BROOK DAM	3-ND	3-ND	3-ND	4A-M
NHIMP600030903-10	I*10	UNNAMED BROOK - FARM POND	3-ND	3-ND	3-ND	4A-M
NHLAK600030903-01	L*01	BARBADOES POND	3-ND	3-ND	3-ND	4A-M
NHLAK600030903-02	L*02	BELLAMY RESERVOIR	5-M	3-ND	3-ND	4A-M
NHLAK600030903-03	L*03	SWAINS LAKE	5-P	3-PNS	3-ND	4A-M
NHLAK600030903-04	L*04	WINKLEY POND	5-P	3-ND	3-ND	4A-M
NHLAK600030903-05	L*05	BRANCH MALLEGO BROOK POND	3-ND	3-ND	3-ND	4A-M
NHLAK600030903-06	L*06	FARM POND	3-ND	3-ND	3-ND	4A-M
NHLAK600030903-07	L*07	UNNAMED POND	3-ND	3-ND	3-ND	4A-M
NHRIV600030903-01	R*01	MADLA BROOK	5-P	3-ND	3-ND	4A-M
NHRIV600030903-02	R*02	MALLEGO BROOK	5-P	3-ND	3-ND	4A-M
NHRIV600030903-03	R*03	CALEF BROOK	3-ND	3-PAS	3-PAS	4A-M
NHRIV600030903-05	R*05	UNNAMED BROOK - TO SWAINS LAKE	3-ND	3-ND	3-ND	4A-M
NHRIV600030903-06	R*06	BELLAMY RIVER - UNNAMED BROOK	5-M	3-ND	3-ND	4A-M
NHRIV600030903-07	R*07	BELLAMY RIVER	5-P	4A-P	4A-P	4A-M
NHRIV600030903-08	R*08	BELLAMY RIVER - KELLY BROOK - KNOX MARSH BROOK	5-P	4A-P	3-PNS	4A-M
NHRIV600030903-09	R*09	BELLAMY RIVER - UNNAMED BROOK	5-M	4A-P	3-ND	4A-M

WATERSHED 305(b) ASSESSMENT SUMMARY REPORT:

HUC 12 010600030903

HUC 12 NAME BELLAMY RIVER

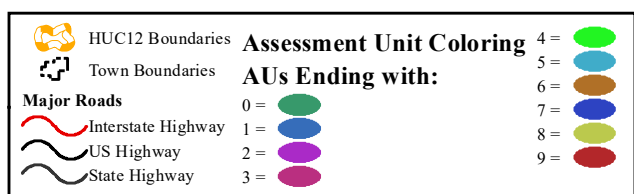
(Locator map on next page only applies to this HUC12)

Assessment Cycle 2018

Good	Full Support Good
Marginal	Full Support Marginal
Likely Good	Insufficient Information – Potentially Full Support
No Data	No Data
Likely Bad	Insufficient Information – Potentially Not Support
Poor	Not Support Marginal
Severe	Not Support Severe



ASSESSMENT UNIT ID	MAP LABEL	ASSESSMENT UNIT NAME	AQUATIC LIFE	SWIMMING	BOATING	FISH CONSUMP.
NHRIV600030903-10	R*10	CANNEY BROOK	3-ND	3-ND	3-ND	4A-B
NHRIV600030903-11	R*11	VARNEY BROOK - CANNEY BROOK	3-ND	4A-P	4A-B	4A-B
NHRIV600030903-12	R*12	UNNAMED BROOK - TO BELLAMY RIVER ROYALLS COVE	3-ND	3-ND	3-ND	4A-B
NHRIV600030903-13	R*13	GARRISON BROOK	3-ND	4A-P	3-ND	4A-B
NHRIV600030903-14	R*14	KNOX MARSH BROOK	3-ND	3-ND	3-ND	4A-B
NHRIV600030903-16	R*16	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-B
NHRIV600030903-17	R*17	VARNEY BROOK	3-ND	3-ND	3-ND	4A-B
NHRIV600030903-18	R*18	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-B
NHRIV600030903-19	R*19	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-B
NHRIV600030903-20	R*20	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-B
NHRIV600030903-21	R*21	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-B
NHRIV600030903-22	R*22	UNNAMED BROOK	3-ND	3-ND	3-ND	4A-B

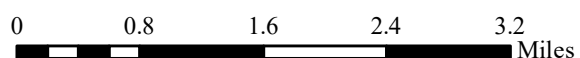


Abbrev. Label HUC 12

L*03 010 700060201

AUID = NH LAK700060201-03

Assessment Unit IDs are derived from the HUC12 they reside within. The labels have been shortened on this map for presentation purposes.
Example: the Label "L*03" in HUC12 = 010700060201 represents AUID = "NHLAK700060201-03"
In rare cases where an AUID extends beyond the boundary of a single HUC12, additional portions of the end of the HUC 12 number have also been replaced.



Scale:1:78,820

Assessment Unit ID NHRIV600030903-08

Size 9.4540 MILES

Assessment Unit Name BELLAMY RIVER - KELLY BROOK - KNOX MARSH

Beach N

2018, 305(b)/303(d) -
All Reviewed Parameters by
Assessment Unit

Primary Town MADBURY

Assessment Unit Category*~ 5-P

Designated Use Description	*Desig. Use Category	Parameter Name	Parameter Threatened (Y/N)	Last Sample	Last Exceed	Parameter Category*	TMDL Priority
Aquatic Life Integrity	5-P	ALKALINITY, CARBONATE AS CaCO3	N	1990	1990	3-ND	
		AMMONIA (TOTAL)	N	1997	N/A	3-ND	
		ARSENIC	N	1990	N/A	3-ND	
		Aluminum	N	2017	2017	5-M	LOW
		Benthic-Macroinvertebrate Bioassessments (Streams)	N	2000	2000	5-P	LOW
		CADMIUM	N	1990	N/A	3-ND	
		CHLORIDE	N	2018	N/A	3-PAS	
		COPPER	N	2016	2016	3-PNS	
		DISSOLVED OXYGEN SATURATION	N	2018	2007	3-PAS	
		Fishes Bioassessments (Streams)	N			3-PAS	
		Habitat Assessment (Streams)	N	2000	2000	4C-P	
		IRON	N	1997	N/A	3-ND	
		LEAD	N	2000	2000	3-ND	
		NICKEL	N	1990	N/A	3-ND	
		OXYGEN, DISSOLVED	N	2018	2016	2-M	
		PHOSPHORUS (TOTAL)	N	2017	NLV	3-PAS	
		SELENIUM	N	1990	N/A	3-ND	
		TURBIDITY	N	2017	2008	3-PAS	
		ZINC	N	2016	1998	3-PAS	
		pH	N	2018	2017	5-M	LOW
Fish Consumption	4A-M	ARSENIC	N	1990	1990	3-ND	
		COPPER	N	2016	N/A	3-PNS	
		MANGANESE	N	1990	N/A	3-ND	
		Mercury	N			4A-M	
		NICKEL	N	1990	N/A	3-ND	
		SELENIUM	N	1990	N/A	3-ND	
		ZINC	N	2016	N/A	3-PNS	
Potential Drinking Water Supply	2-G	ARSENIC	N	1990	1990	3-ND	
		COPPER	N	2016	N/A	3-PAS	

Severe Not Supporting, Severe	Poor Not Supporting, Marginal	Likely Bad Insufficient Information – Potentially Full Supporting	No Data No Data	Likely Good Insufficient Information – Potentially Full Supporting	Marginal Full Support, Marginal	Good Full Support, Good
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*DES Categories; 2-G = Supports Parameter well above criteria, 2-M = Supports Parameter marginally above criteria, 2-OBS = Exceeds WQ criteria but natural therefore not a WQ exceedence, 3-ND = Insufficient Information/No data, 3-PAS= Insufficient Information/Potentially Attaining Standard, 3-PNS= Insufficient Information/Potentially Not Attaining Standard, (4A=Impaired/TMDL Completed, 4B=Impaired/Other Measure will rectify Impairment, 4C=Impaired/Non-Pollutant, 5=Impaired/TMDL needed) M=Marginal Impairment, P=Severe Impairment, T=Threatened (<http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm>)

Assessment Unit ID NHRIV600030903-08
 Assessment Unit Name BELLAMY RIVER - KELLY BROOK - KNOX MARSH
 Primary Town MADBURY

Size 9.4540 MILES

Beach N

Assessment Unit Category*~ 5-P

**2018, 305(b)/303(d) -
 All Reviewed Parameters by
 Assessment Unit**

Designated Use Description	*Desig. Use Category	Parameter Name	Parameter Threatened (Y/N)	Last Sample	Last Exceed	Parameter Category*	TMDL Priority
Potential Drinking Water Supply	2-G	ESCHERICHIA COLI	N	2017	2017	3-PNS	
		FECAL COLIFORM	N	1990	1990	3-ND	
		FLUORIDE	N	1997	N/A	3-ND	
		IRON	N	1997	1997	3-ND	
		MANGANESE	N	1990	N/A	3-ND	
		NICKEL	N	1990	N/A	3-ND	
		SELENIUM	N	1990	N/A	3-ND	
		SULFATES	N	2016	N/A	3-PAS	
		ZINC	N	2016	N/A	3-PAS	
Primary Contact Recreation	4A-P	CHLOROPHYLL-A	N	1990	N/A	3-ND	
		Escherichia coli	N	2017	2017	4A-P	
Secondary Contact Recreation	3-PNS	ESCHERICHIA COLI	N	2017	2016	3-PNS	
Wildlife	3-ND						

Severe Not Supporting, Severe	Poor Not Supporting, Marginal	Likely Bad Insufficient Information – Potentially Full Supporting	No Data No Data	Likely Good Insufficient Information – Potentially Full Supporting	Marginal Full Support, Marginal	Good Full Support, Good
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*DES Categories; 2-G = Supports Parameter well above criteria, 2-M = Supports Parameter marginally above criteria, 2-OBS = Exceeds WQ criteria but natural therefore not a WQ exceedence, 3-ND = Insufficient Information/No data, 3-PAS= Insufficient Information/Potentially Attaining Standard, 3-PNS= Insufficient Information/Potentially Not Attaining Standard, (4A=Impaired/TMDL Completed, 4B=Impaired/Other Measure will rectify Impairment, 4C=Impaired/Non-Pollutant, 5=Impaired/TMDL needed) M=Marginal Impairment, P=Severe Impairment, T=Threatened (<http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm>)

List of ORW and Impaired (4A and 5) Waters for CGP NOIs 5/10/12							
(Outstanding Resource Waters and Impairments on the 2010 305(b)/303(d) that need, or have a completed, TMDL. File last update May 10, 2012.)							
Assessment Unit ID	Assessment Unit Name	Impairment Name	Pollutant allocated in TMDL (if different than "Impairment Name")	CGP eNOI Equivalent (to Impairment Name)	TMDL Approval Date	TMDL Name	Outstanding Resource Water (ORW) (AUIDs not shown are non ORWs) (See http://www2.des.state.nh.us/gis/onestop/ if your AUID says "Review OneStop GIS ORW Layer")
NHRIV600030902-16	WENDYS BROOK	pH		PH/ACIDITY/CAUSTIC CONDITIONS			Non-ORW
NHRIV600030903-01	MADLA BROOK	pH		PH/ACIDITY/CAUSTIC CONDITIONS			Non-ORW
NHRIV600030903-02	MALLEGO BROOK	pH		PH/ACIDITY/CAUSTIC CONDITIONS			Non-ORW
NHRIV600030903-06	BELLAMY RIVER - UNNAMED BROOK	Oxygen, Dissolved		ORGANIC ENRICHMENT/OXYGEN DEPLETION			Non-ORW
NHRIV600030903-06	BELLAMY RIVER - UNNAMED BROOK	pH		PH/ACIDITY/CAUSTIC CONDITIONS			Non-ORW
NHRIV600030903-07	BELLAMY RIVER	Dissolved oxygen saturation		ORGANIC ENRICHMENT/OXYGEN DEPLETION			Non-ORW
NHRIV600030903-07	BELLAMY RIVER	Escherichia coli		PATHOGENS	21-Sep-10	NEW HAMPSHIRE STATEWIDE BACTERIA	Non-ORW
NHRIV600030903-07	BELLAMY RIVER	Oxygen, Dissolved		ORGANIC ENRICHMENT/OXYGEN DEPLETION			Non-ORW
NHRIV600030903-07	BELLAMY RIVER	pH		PH/ACIDITY/CAUSTIC CONDITIONS			Non-ORW
NHRIV600030903-08	BELLAMY RIVER - KELLY BROOK - KNOX MARSH BROOK	Aluminum		METALS (OTHER THAN MERCURY)			Non-ORW
NHRIV600030903-08	BELLAMY RIVER - KELLY BROOK - KNOX MARSH BROOK	Benthic-Macroinvertebrate Bioassessments (Streams)		CAUSE UNKNOWN - IMPAIRED BIOTA			Non-ORW
NHRIV600030903-08	BELLAMY RIVER - KELLY BROOK - KNOX MARSH BROOK	Escherichia coli		PATHOGENS	21-Sep-10	NEW HAMPSHIRE STATEWIDE BACTERIA	Non-ORW
NHRIV600030903-08	BELLAMY RIVER - KELLY BROOK - KNOX MARSH BROOK	pH		PH/ACIDITY/CAUSTIC CONDITIONS			Non-ORW
NHRIV600030903-09	BELLAMY RIVER - UNNAMED BROOK	Escherichia coli		PATHOGENS	21-Sep-10	NEW HAMPSHIRE STATEWIDE BACTERIA	Non-ORW
NHRIV600030903-09	BELLAMY RIVER - UNNAMED BROOK	pH		PH/ACIDITY/CAUSTIC CONDITIONS			Non-ORW
NHRIV600030903-11	VARNEY BROOK - CANNEY BROOK	Escherichia coli		PATHOGENS	21-Sep-10	NEW HAMPSHIRE STATEWIDE BACTERIA	Non-ORW



Cycle	Assessment Unit ID (AUID)	Assessment Unit Name	Town(s) Primary Town is Listed First	Water Size	Size Unit	Designated Use Description	Parameter Name	NHDES Category	Threatened	TMDL Priority
2018	NHRIV600030903-07	BELLAMY RIVER	BARRINGTON, LEE, MADBURY	11.507	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-P	N	LOW
2018	NHRIV600030903-07	BELLAMY RIVER	BARRINGTON, LEE, MADBURY	11.507	MILES	Aquatic Life Integrity	pH	5-P	N	LOW
2018	NHRIV600030903-08	BELLAMY RIVER - KELLY BROOK - KNOX	MADBURY, DOVER	9.454	MILES	Aquatic Life Integrity	Aluminum	5-M	N	LOW
2018	NHRIV600030903-08	BELLAMY RIVER - KELLY BROOK - KNOX	MADBURY, DOVER	9.454	MILES	Aquatic Life Integrity	Benthic-Macroinvertebrate Bioassessments	5-P	N	LOW
2018	NHRIV600030903-08	BELLAMY RIVER - KELLY BROOK - KNOX	MADBURY, DOVER	9.454	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600030903-09	BELLAMY RIVER - UNNAMED BROOK	DOVER	0.756	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600030904-06	PICKERING BROOK	PORTSMOUTH, GREENLAND	6.432	MILES	Aquatic Life Integrity	Chloride	5-M	N	LOW
2018	NHRIV600030904-06	PICKERING BROOK	PORTSMOUTH, GREENLAND	6.432	MILES	Aquatic Life Integrity	Copper	5-P	N	LOW
2018	NHRIV600030904-06	PICKERING BROOK	PORTSMOUTH, GREENLAND	6.432	MILES	Aquatic Life Integrity	Iron	5-P	N	LOW
2018	NHRIV600030904-06	PICKERING BROOK	PORTSMOUTH, GREENLAND	6.432	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-P	N	LOW
2018	NHRIV600030904-06	PICKERING BROOK	PORTSMOUTH, GREENLAND	6.432	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600030904-09	KNIGHT BRANCH	NEWINGTON	0.565	MILES	Aquatic Life Integrity	Aluminum	5-M	N	LOW
2018	NHRIV600030904-11	MCINTYRE BROOK - PEASE AIR FORCE	NEWINGTON	0.621	MILES	Aquatic Life Integrity	Manganese	5-M	N	LOW
2018	NHRIV600030904-12	PEVERLY BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.131	MILES	Aquatic Life Integrity	Arsenic	5-M	N	LOW
2018	NHRIV600030904-12	PEVERLY BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.131	MILES	Aquatic Life Integrity	Cadmium	5-M	N	LOW
2018	NHRIV600030904-12	PEVERLY BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.131	MILES	Aquatic Life Integrity	Manganese	5-M	N	LOW
2018	NHRIV600030904-12	PEVERLY BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.131	MILES	Aquatic Life Integrity	Zinc	5-M	N	LOW
2018	NHRIV600031001-01	PICKERING BROOK - FLAGSTONE BROOK	NEWINGTON	2.720	MILES	Aquatic Life Integrity	Aluminum	5-M	N	LOW
2018	NHRIV600031001-01	PICKERING BROOK - FLAGSTONE BROOK	NEWINGTON	2.720	MILES	Aquatic Life Integrity	Iron	5-M	N	LOW
2018	NHRIV600031001-03	SAGAMORE CREEK	PORTSMOUTH	0.975	MILES	Aquatic Life Integrity	Chloride	5-M	N	LOW
2018	NHRIV600031001-03	SAGAMORE CREEK	PORTSMOUTH	0.975	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600031001-04	LOWER HODGSON BROOK	PORTSMOUTH	0.951	MILES	Aquatic Life Integrity	Benthic-Macroinvertebrate Bioassessments	5-P		LOW
2018	NHRIV600031001-04	LOWER HODGSON BROOK	PORTSMOUTH	0.951	MILES	Aquatic Life Integrity	Chloride	5-P	N	LOW
2018	NHRIV600031001-04	LOWER HODGSON BROOK	PORTSMOUTH	0.951	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-P	N	LOW
2018	NHRIV600031001-04	LOWER HODGSON BROOK	PORTSMOUTH	0.951	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600031001-05	UPPER HODGSON BROOK	PORTSMOUTH	1.572	MILES	Aquatic Life Integrity	Benthic-Macroinvertebrate Bioassessments	5-P	N	LOW
2018	NHRIV600031001-05	UPPER HODGSON BROOK	PORTSMOUTH	1.572	MILES	Aquatic Life Integrity	Chloride	5-M	N	LOW
2018	NHRIV600031001-05	UPPER HODGSON BROOK	PORTSMOUTH	1.572	MILES	Aquatic Life Integrity	Manganese	5-M	N	LOW
2018	NHRIV600031001-05	UPPER HODGSON BROOK	PORTSMOUTH	1.572	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-M	N	LOW
2018	NHRIV600031001-05	UPPER HODGSON BROOK	PORTSMOUTH	1.572	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Aluminum	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Arsenic	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Chromium (total)	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Copper	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Iron	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Lead	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Manganese	5-M	N	LOW
2018	NHRIV600031001-06	GRAFTON DITCH	PORTSMOUTH	1.305	MILES	Aquatic Life Integrity	Zinc	5-M	N	LOW
2018	NHRIV600031001-07	PAULS BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.515	MILES	Aquatic Life Integrity	Benthic-Macroinvertebrate Bioassessments	5-M	N	LOW
2018	NHRIV600031001-07	PAULS BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.515	MILES	Aquatic Life Integrity	Chloride	5-P	N	LOW
2018	NHRIV600031001-07	PAULS BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.515	MILES	Aquatic Life Integrity	DDD	5-M	N	LOW
2018	NHRIV600031001-07	PAULS BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.515	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-P	N	LOW
2018	NHRIV600031001-08	RAILWAY BROOK - PEASE AIR FORCE BASE	NEWINGTON	0.638	MILES	Aquatic Life Integrity	Iron	5-M	N	LOW
2018	NHRIV600031001-09	BORTHWICK AVE TRIBUTARY	PORTSMOUTH	1.340	MILES	Aquatic Life Integrity	Chloride	5-M	N	LOW
2018	NHRIV600031001-09	BORTHWICK AVE TRIBUTARY	PORTSMOUTH	1.340	MILES	Aquatic Life Integrity	Iron	5-M	N	LOW
2018	NHRIV600031001-09	BORTHWICK AVE TRIBUTARY	PORTSMOUTH	1.340	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-P	N	LOW
2018	NHRIV600031001-09	BORTHWICK AVE TRIBUTARY	PORTSMOUTH	1.340	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600031001-10	NEWFILEDS DITCH	PORTSMOUTH	1.315	MILES	Aquatic Life Integrity	Chloride	5-M	N	LOW
2018	NHRIV600031001-10	NEWFILEDS DITCH	PORTSMOUTH	1.315	MILES	Aquatic Life Integrity	pH	5-M	N	LOW
2018	NHRIV600031002-01	BERRYS BROOK	PORTSMOUTH, GREENLAND, RYE	9.372	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-P	N	LOW
2018	NHRIV600031002-01	BERRYS BROOK	PORTSMOUTH, GREENLAND, RYE	9.372	MILES	Aquatic Life Integrity	pH	5-M	N	LOW

SWPPP Cut Sheet:

Filtrex[®] Inlet Protection *Sediment & Perimeter Control Technology*

PURPOSE & DESCRIPTION

Filtrex[®] Inlet protection is a three-dimensional tubular sediment control and storm water runoff filtration device typically used for storm drain **inlet protection** of sediment and soluble pollutants (such as phosphorus and petroleum hydrocarbons) on and around construction activities.

APPLICATION

Drain inlets are located in areas that receive runoff from surrounding lands, often exposed and disturbed soils, and are located at a low point, or in a sump. Inlet protection used around drain inlets (or *Drain Inlet protection*) should completely enclose the circumference of the drain and where possible should not be placed on a grade or slope. Inlet protection used around drain inlets should never be the only form of site sediment control and should be accompanied by erosion control/slope stabilization practices, such as Slope protection or rolled erosion control blankets (RECB). Inlet protection should never be placed where they divert runoff flow from the drain inlet, or on top of the inlet, which can cause flooding. Under high runoff and sediment loading conditions placement of 1-2 in (25-50 mm) diameter rock (AASHTO #2) may be placed around the outer circumference of the Inlet protection up to ½ the height of the Inlet protection. This will slow runoff velocity as it contacts the Inlet protection and will reduce sediment build-up and clogging of the Inlet protection.

Curb inlets are generally located on paved surfaces and are designed to rapidly drain storm runoff from roadways to prevent flooding that poses a hazard to vehicular traffic. Inlet protection devices should be placed in a manner which intercepts runoff prior to entering the inlet, but does not block or divert runoff from the inlet. To prevent diversion of runoff, Inlet protection used around curbs (or *Curb*

Inlet protection) should be used in low points, or sumps, and minor slopes or grades. Inlet protection should never be placed in or on the curb inlet drain, or placed in a manner than obstructs vehicular traffic. Inlet protection height should be at least 1 in (25 mm) lower than top of curb inlet to allow for overflow into the drain and not over the curb. Maximum sediment removal efficiency occurs when minor ponding exists behind Inlet protection but should never lead to flooding.

Curb sediment containment systems are used to reduce the sediment and pollutant load flowing to a curb inlet. They are generally placed on paved surfaces perpendicular to runoff flow and should be lower than the height of the curb. Curb sediment containment systems should never cause flooding or placed where they are a hazard to vehicular traffic. Inlet protection used for curb sediment containment (or *Curb Sediment Containment Inlet protection*) can be placed on a grade but should never be placed directly upslope from curb inlet where it may inadvertently divert runoff from entering curb inlet.

INSTALLATION

1. Inlet protection used for inlet protection to reduce sediment and soluble pollutants entering storm drains shall meet Filtrex[®] FilterSoxx[™] Material Specifications and use Certified Filtrex[®] FilterMedia[™].
2. Contractor is required to be a Filtrex[®] Certified[™] Installer as determined by Filtrex[®] International, LLC (440-926-2607 or visit web site at [Filtrex.com](http://www.filtrex.com)). Certification shall be considered current if appropriate identification is shown during time of bid or at time of application (current list of installers can be found at www.filtrex.com). Look for the Filtrex[®] Certified[™] Installer Seal.



3. Filtrex® Inlet protection shall be placed at locations indicated on plans as directed by the Engineer. Inlet protection should be installed in a pattern that allows complete protection of the inlet area.
4. Installation of curb Inlet protection will ensure a minimal overlap of at least 1 ft (300mm) on either side of the opening being protected. The Inlet protection will be anchored to the soil behind the curb using staples, stakes or other devices capable of holding the Inlet protection in place.
5. Standard Inlet protection for curb inlet protection and curb sediment containment will use 8 in (200mm) diameter Inlet protection, and drain inlets on soil will use 12 in (300mm) or 18 in (450mm) diameter Inlet protection. In severe flow situations, larger Inlet protection may be specified by the Engineer. During curb installation, Inlet protection shall be compacted to be slightly shorter than curb height.
6. If Inlet protection becomes clogged with debris and sediment, they shall be maintained so as to assure proper drainage and water flow into the storm drain. In severe storm events, overflow of the Inlet protection may be acceptable in order to keep the area from flooding.
7. Curb and drain Inlet protection shall be positioned so as to provide a permeable physical barrier to the drain itself, allowing sediment to collect on the outside of the Inlet protection.
8. For drains and inlets that have only curb cuts, without street grates, a spacer is required in order to keep the Inlet protection away from the drain opening. This spacer should be a hog wire screen bent to overlap the grate opening and keep the sock from falling into the opening. Use at least one spacer for every 4 ft (1.2m) of curb drain opening. The wire grid also prevents other floatable waste from passing over the Inlet protection.
9. Stakes shall be installed through the middle of the drain Inlet protection on 5 ft (1.5m) centers, using 2 in (50mm) x 2 in (50mm) x 3 ft (1m) wood stakes.
10. Staking depth for sand and silt loam soils shall be 12 in (300mm), and 8 in (200mm) for clay soils.

INSPECTION AND MAINTENANCE

Routine inspection should be conducted within 24 hrs of a runoff event or as designated by the regulating authority. Inlet protection should be regularly inspected to make sure they maintain their

shape and are producing adequate hydraulic flow-through. If ponding becomes excessive, additional Inlet protection may be required or sediment removal may be necessary. Inlet protection shall be inspected until contributing drainage area has been permanently stabilized and construction activity has ceased

1. The Contractor shall maintain the Inlet protection in a functional condition at all times and it shall be routinely inspected.
2. If the Inlet protection has been damaged, it shall be repaired, or replaced if beyond repair.
3. The Contractor shall remove sediment at the base of the upslope side of the Inlet protection when accumulation has reached 1/2 of the effective height of the Inlet protection, or as directed by the Engineer. Alternatively, for drain Inlet protection a new Soxx™ may be placed on top of the original increasing the sediment storage capacity without soil disturbance.
4. Inlet protection shall be maintained until disturbed area above or around the device has been permanently stabilized and construction activity has ceased.
5. Regular maintenance includes lifting the Inlet protection and cleaning around and under them as sediment collects.
6. The FilterMedia™ will be removed from paved areas or dispersed on site soil or behind curb once disturbed area has been permanently stabilized, construction activity has ceased, or as determined by the Engineer.

Table 2.4 Spacing for Curb Sediment Containment Systems.

Grade (%)	Spacing (ft)	Spacing (mm)
0.5	100	30
1.0	50	15
2.0	25	8
3.0	16	5
4.0	13	4
5.0	10	3

Source: Fifield, 2001.



Figure 2.1. Engineering Design Drawing for Curb and Drain Inlet Protection

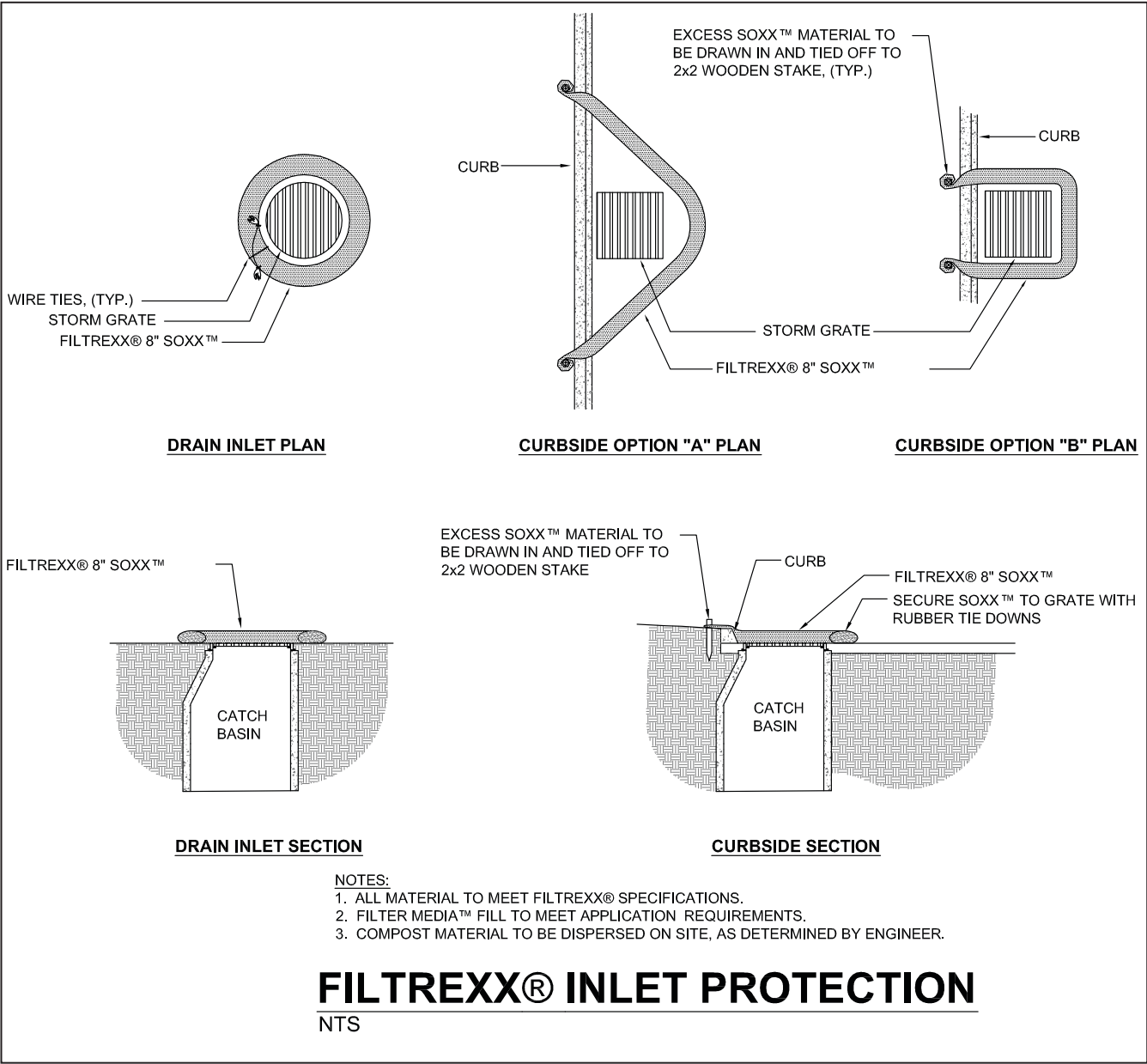
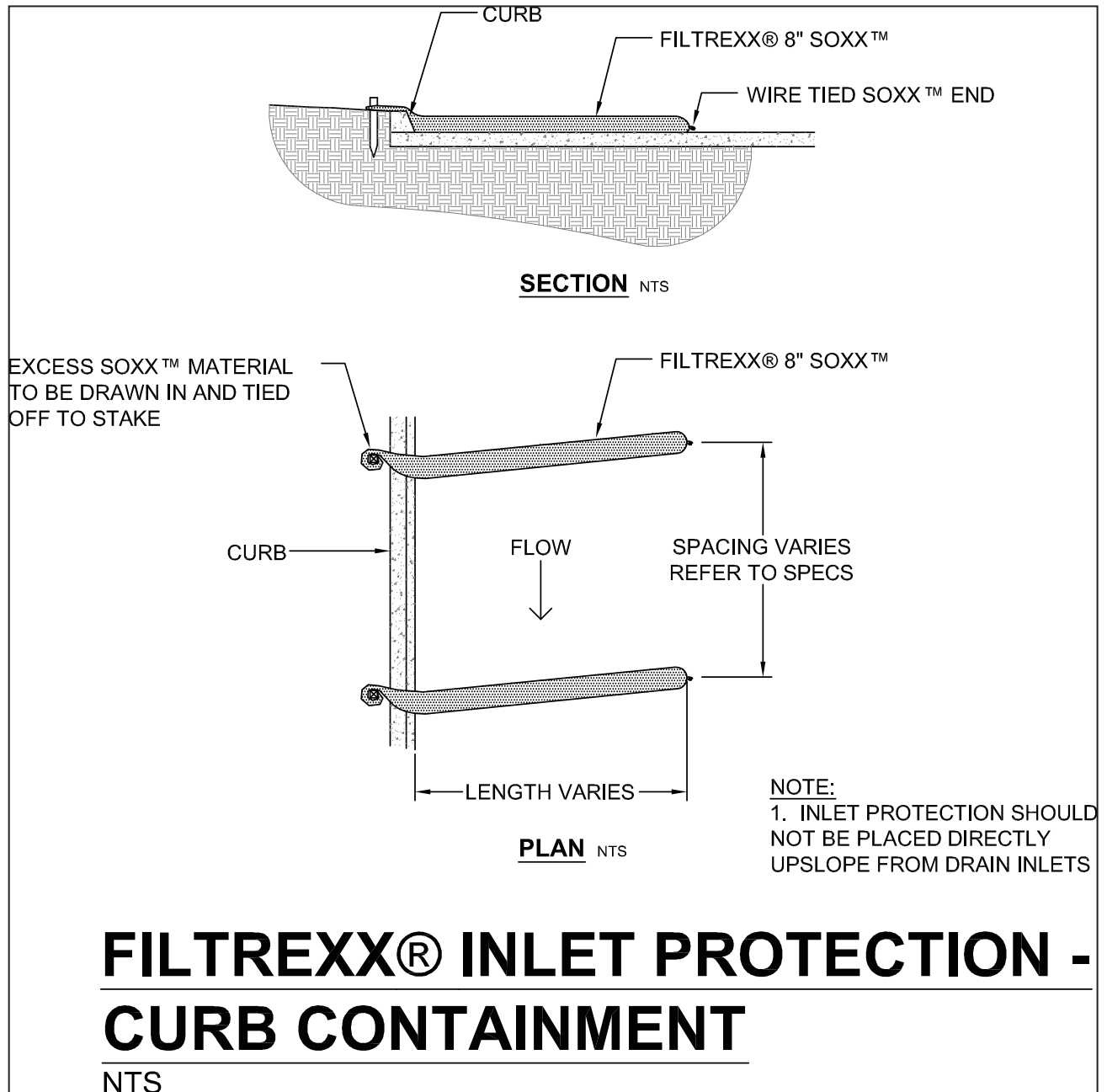


Figure 2.2. Engineering Design Drawing for Curb Sediment Containment Inlet Protection



SWPPP Cut Sheet:

Filtrex[®] Sediment Control

Sediment & Perimeter Control Technology

PURPOSE & DESCRIPTION

Filtrex[®] Sediment control is a three-dimensional tubular sediment control and storm water runoff filtration device typically used for **perimeter control** of sediment and other soluble pollutants (such as phosphorus and petroleum hydrocarbons), on and around construction activities.

APPLICATION

Filtrex[®] Sediment control is to be installed down slope of any disturbed area requiring erosion and sediment control and filtration of soluble pollutants from runoff. Sediment control is effective when installed perpendicular to sheet or low concentrated flow. Acceptable applications include:

- Site perimeters
- Above and below disturbed areas subject to sheet runoff, interrill and rill erosion
- Above and below exposed and erodable slopes
- Around area drains or inlets located in a 'sump'
- On compacted soils where trenching of silt fence is difficult or impossible
- Around sensitive trees where trenching of silt fence is not beneficial for tree survival or may unnecessarily disturb established vegetation.
- On frozen ground where trenching of silt fence is impossible.
- On paved surfaces where trenching of silt fence is impossible.

INSTALLATION

1. Sediment control used for perimeter control of sediment and soluble pollutants in storm runoff shall meet Filtrex[®] Soxx[™] Material Specifications and use Certified Filtrex[®] FilterMedia[™].
2. Contractor is required to be Filtrex[®] Certified[™], or use pre-filled Filtrex[®] Sediment control

products manufactured by a Filtrex[®] Certified Manufacturer[™] as determined by Filtrex[®] International, LLC (440-926-2607 or visit www.filtrex.com). Certification shall be considered current if appropriate identification is shown during time of bid or at time of application. Look for the Filtrex[®] Certified[™] Seal.

3. Sediment control will be placed at locations indicated on plans as directed by the Engineer.
4. Sediment control should be installed parallel to the base of the slope or other disturbed area. In extreme conditions (i.e., 2:1 slopes), a second Sediment control shall be constructed at the top of the slope.
5. Effective Soxx[™] height in the field should be as follows: 8" Diameter Sediment control = 6.5" high, 12" Diameter Sediment control = 9.5" high, 18" Diameter SiltSoxx[™] = 14.5" high, 24" Diameter Sediment control = 19" high.
6. Stakes shall be installed through the middle of the Sediment control on 10 ft (3m) centers, using 2 in (50mm) by 2 in (50mm) by 3 ft (1m) hard wood stakes. In the event staking is not possible, i.e., when Sediment control is used on pavement, heavy concrete blocks shall be used behind the Sediment control to help stabilize during rainfall/runoff events.
7. Staking depth for sand and silt loam soils shall be 12 in (300mm), and 8 in (200mm) for clay soils.
8. Loose compost may be backfilled along the upslope side of the Sediment control, filling the seam between the soil surface and the device, improving filtration and sediment retention.
9. If the Sediment control is to be left as a permanent filter or part of the natural landscape, it may be seeded at time of installation for



establishment of permanent vegetation. The Engineer will specify seed requirements.

10. Filtrex[®] Sediment control is not to be used in perennial, ephemeral, or intermittent streams.

See design drawing schematic for correct Filtrex[®] Sediment control installation (Figure 1.1).

INSPECTION AND MAINTENANCE

Routine inspection should be conducted within 24 hrs of a runoff event or as designated by the regulating authority. Sediment control should be regularly inspected to make sure they maintain their shape and are producing adequate hydraulic flow-through. If ponding becomes excessive, additional Sediment control may be required to reduce effective slope length or sediment removal may be necessary. Sediment control shall be inspected until area above has been permanently stabilized and construction activity has ceased

1. The Contractor shall maintain the Sediment control in a functional condition at all times and it shall be routinely inspected.
2. If the Sediment control has been damaged, it shall be repaired, or replaced if beyond repair.

3. The Contractor shall remove sediment at the base of the upslope side of the Sediment control when accumulation has reached 1/2 of the effective height of the Sediment control, or as directed by the Engineer. Alternatively, a new Sediment control can be placed on top of and slightly behind the original one creating more sediment storage capacity without soil disturbance.
4. Sediment control shall be maintained until disturbed area above the device has been permanently stabilized and construction activity has ceased.
5. The FilterMedia[™] will be dispersed on site once disturbed area has been permanently stabilized, construction activity has ceased, or as determined by the Engineer.
6. For long-term sediment and pollution control applications, Sediment control can be seeded at the time of installation to create a vegetative filtering system for prolonged and increased filtration of sediment and soluble pollutants (contained vegetative filter strip). The appropriate seed mix shall be determined by the Engineer.

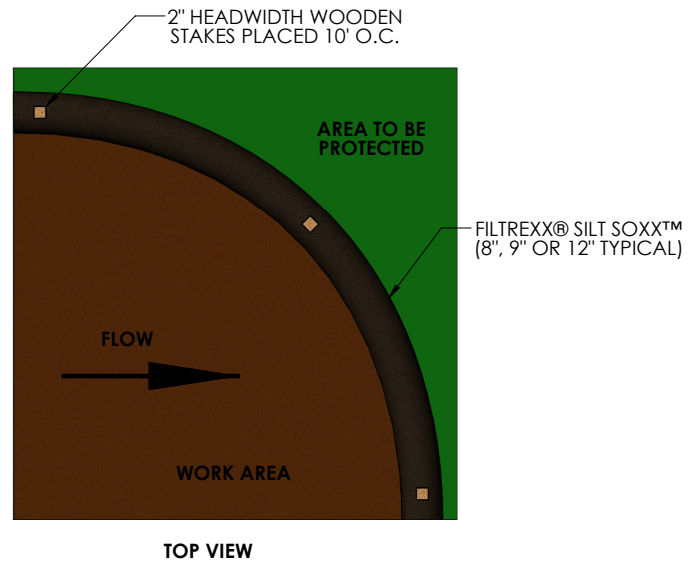
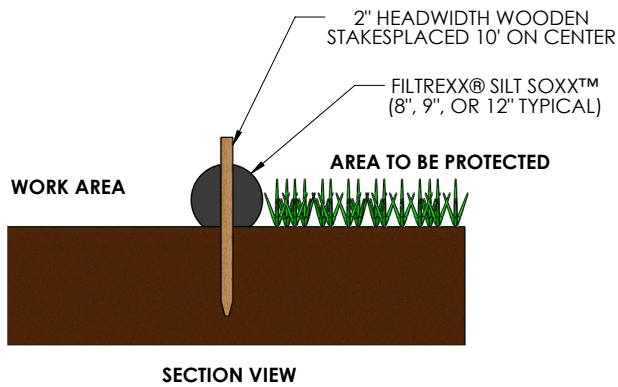
Slope Percent	Maximum Slope Length Above Sediment Control in Feet (meters)*				
	8 in (200 mm) Sediment control	12 in (300 mm) Sediment control	18 in (450 mm) Sediment control	24 in (600mm) Sediment control	32 in (800mm) Sediment control
	6.5 in (160 mm)**	9.5 in (240 mm) **	14.5 in (360 mm) **	19 in (480 mm) **	26 in (650 mm) **
2 (or less)	600 (180)	750 (225)	1000 (300)	1300 (400)	1650 (500)
5	400 (120)	500 (150)	550 (165)	650 (200)	750 (225)
10	200 (60)	250 (75)	300 (90)	400 (120)	500 (150)
15	140 (40)	170 (50)	200 (60)	325 (100)	450 (140)
20	100 (30)	125 (38)	140 (42)	260 (80)	400 (120)
25	80 (24)	100 (30)	110 (33)	200 (60)	275 (85)
30	60 (18)	75 (23)	90 (27)	130 (40)	200 (60)
35	60 (18)	75 (23)	80 (24)	115 (35)	150 (45)
40	60 (18)	75 (23)	80 (24)	100 (30)	125 (38)
45	40 (12)	50 (15)	60 (18)	80 (24)	100 (30)
50	40 (12)	50 (15)	55 (17)	65 (20)	75 (23)

* Based on a failure point of 36 in (0.9 m) super silt fence (wire reinforced) at 1000 ft (303 m) of slope, watershed width equivalent to receiving length of sediment control device, 1 in/ 24 hr (25 mm/24 hr) rain event.

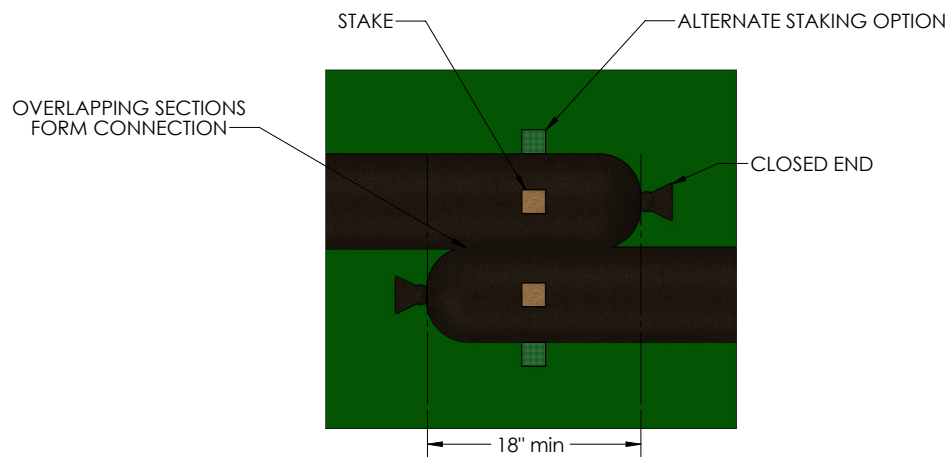
** Effective height of Sediment control after installation and with constant head from runoff as determined by Ohio State University.



FILTREXX® SILT SOXX™



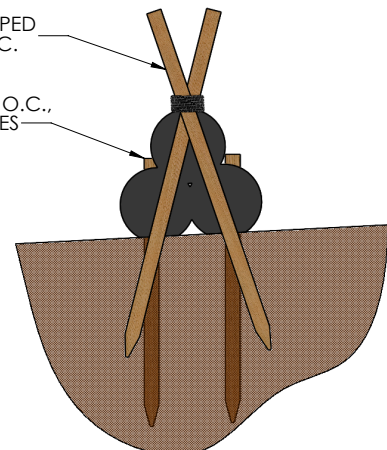
COMPOST SOCK CONNECTION/ATTACHMENT DETAIL



FILTREXX® PYRAMID STAKING DETAIL

(2) 2"x2"x48+" HARDWOOD STAKES, WRAPPED TOGETHER WITH 16 GAUGE WIRE, 10' O.C.

2"x2"x36" HARDWOOD STAKE, 10' O.C., STARTING 5' FROM ANGLED STAKES



NOTES:
1. ALL MATERIAL TO MEET FILTREXX® SPECIFICATIONS.
2. SILT SOXX™ FILL TO MEET APPLICATION REQUIREMENTS.
3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.

