civil &
environmental
engineering

UNDERWOOD engineers

2542.12

March 27, 2024

Ms. Samatha Collins, Chair
City of Portsmouth Conservation Commission
1 Junkins Avenue
Portsmouth, NH 03801

Re: ***Conditional Use Permit Application Submittal***
Maplewood Avenue Drainage Improvements – North Mill Pond Outfall
Portsmouth, NH

Dear Ms. Collins:

On behalf of the City of Portsmouth, we are applying for a Conditional Use Permit (Wetland Impacts) for proposed improvements to one of the existing outfall on North Mill Pond (behind the cemetaries). This work is required as part of the City's ongoing efforts to continue sewer separation in the Fleet Street Area of downtown and capacity upgrades are required at the outfall to accomodate additional storm drain flows resulting from the separation work.

We have completed the City's permitting submittal process on the website and enclosed for the Commission's consideration and use is one (1) hard copy of documents submitted electronically as required.

The intent is to be included on the April 10th meeting agenda to present the project and application to the Commission so that recommendation can be obtained for planning board approval during their May meeting.

Please feel free to contact me if any additional information is required in advance of the meeting.

Very truly yours,

UNDERWOOD ENGINEERS, INC.

Daniel J Rochette, P.E (NH)
Project Manager

Encl.
cc: Dave Desfosses, City of Portsmouth (via e-mail)

ph 603.436.6192
fx 603.431.4733
25 Vaughan Mall
Portsmouth, NH 03801
underwoodengineers.com

NHDES Wetlands Permit Application

Table of Contents

STANDARD DREDGE AND FILL WETLANDS PERMIT APPLICATION

Water Division / Land Resources Management

[Check the Status of your Application]

RSA/Rule: RSA 482-A/Env-Wt 100-900

APPLICANT'S NAME: **TOWN NAME:**

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

A person may request a waiver of the requirements in Rules Env-Wt 100-900 to accommodate situations where strict adherence to the requirements would not be in the best interest of the public or the environment but is still in compliance with RSA 482-A. A person may also request a waiver of the standards for existing dwellings over water pursuant to RSA 482-A:26, III(b). For more information, please consult the Waiver Request Form.

SECTION 1 - REQUIRED PLANNING FOR ALL PROJECTS (Env-Wt 306.05; RSA 482-A:3, I(d)(2)) Please use the Wetland Permit Planning Tool (WPPT), the Natural Heritage Bureau (NHB) DataCheck Tool, the Aquatic Restoration Mapper, or other sources to assist in identifying key features such as: Priority Resource Areas (PRAs), protected species or habitats, coastal areas, designated rivers, or designated prime wetlands.	
Has the required planning been completed?	(●) Yes ( ) No
Does the property contain a PRA? If yes, provide the following information:	(●) Yes ( ) No
• Does the project qualify for an Impact Classification Adjustment (e.g. NH Fish and Game Department (NHFG) and NHB agreement for a classification downgrade) or a Project-Type Exception (e.g. Maintenance or Statutory Permit-by-Notification (SPN) project)? See Env-Wt 407.02 and Env-Wt 407.04.	( ) Yes (●) No
• Protected species or habitat? ○ If yes, species or habitat name(s): ○ NHB Project ID #: NHB24-0476	( ) Yes (●) No
• Bog?	( ) Yes (●) No
• Floodplain wetland contiguous to a tier 3 or higher watercourse?	( ) Yes (●) No
• Designated prime wetland or duly-established 100-foot buffer?	(●) Yes ( ) No
• Sand dune, tidal wetland, tidal water, or undeveloped tidal buffer zone?	(●) Yes ( ) No
Is the property within a Designated River corridor? If yes, provide the following information: • Name of Local River Management Advisory Committee (LAC): • A copy of the application was sent to the LAC on Month: Day: Year:	( ) Yes (●) No

For dredging projects, is the subject property contaminated? • If yes, list contaminant:	○ Yes ◉ No
Is there potential to impact impaired waters, class A waters, or outstanding resource waters?	○ Yes ◉ No
For stream crossing projects, provide watershed size (see WPPT or Stream Stats):	

SECTION 2 - PROJECT DESCRIPTION (Env-Wt 311.04(i))

Provide a description of the project and the purpose of the project, the need for the proposed impacts to jurisdictional areas, an outline of the scope of work to be performed, and whether impacts are temporary or permanent.

The City of Portsmouth has been mandated by an EPA administrative order (AO) to mitigate combined sewer overflows. The separation of the Fleet Street drainage area is the next targeted project on the AO and will require increasing the capacity of the downstream drainage system and outfall to North Mill Pond. Presently, there is a 48" diameter pipe at the outfall and an additional 48" pipe is required to increase the outfall's capacity to handle the new design flow of 140 cfs. The drainage improvements will include stormwater treatment where hydraulically feasible to decrease the amount of nutrient pollutants discharged into North Mill Pond. The impact area related to the outfall improvements within tidal wetlands is approximately 500 SF for the installation of the new headwall, grading improvements, and restoration/stabilization efforts. As seen in the included photos, the existing 48" concrete pipe and associated headwall are exposed and protruding into the pond. Proposed work will relocate the headwall into the embankment so that it blends better with surrounding contours. The existing outfall location is within a tidal area with previous improvements and stabilization.

As mitigation for the impacts relating to the outfall the City is proposing to construct a marsh with a stabilized sill directly adjacent to the outfall location. The total area of marsh proposed is approximately 2,950 SF. Approximately 650 SF of tidal buffer area is also proposed. The proposed mitigation will also help stabilize a shoreline embankment undercut by over time and threatening to negatively impact the historic North and Union Cemeteries abutting the pond. Grading improvements will also eliminate a surface run-off swale that currently drains a paved area into the pond/mud flats which have scoured over time. The run-off from the paved area will be treated and re-directed into the proposed drainage system improvements proposed as part of the overall project. There is evidence of previous marsh existing adjacent to the mitigation area as documented in the photos

SECTION 3 - PROJECT LOCATION

Separate wetland permit applications must be submitted for each municipality within which wetland impacts occur.

ADDRESS:	90 Maplewood Avenue
TOWN/CITY:	Portsmouth
TAX MAP/BLOCK/LOT/UNIT:	Map 125 Lot 19
US GEOLOGICAL SURVEY (USGS) TOPO MAP WATERBODY NAME: ☐ N/A	North Mill Pond
(Optional) LATITUDE/LONGITUDE in decimal degrees (to five decimal places):	43.07811 North -70.76417 West

SECTION 4 - APPLICANT (DESIRED PERMIT HOLDER) INFORMATION (Env-Wt 311.04(a)) If the applicant is a trust or a company, then complete with the trust or company information.		
NAME: David Desfosses, City of Portsmouth		
MAILING ADDRESS: 680 Peverly Hill Road		
TOWN/CITY: Portsmouth	STATE: NH	ZIP CODE: 03801
EMAIL ADDRESS: djdesfosses@cityofportsmouth.com		
FAX: 603-427-1539	PHONE: 603-427-1530	
ELECTRONIC COMMUNICATION: By initialing here, I hereby authorize NHDES to communicate all matters relative to this application electronically.		

SECTION 5 - AUTHORIZED AGENT INFORMATION (Env-Wt 311.04(c)) ☐ N/A		
LAST NAME, FIRST NAME, M.I.: Rochette, Daniel J.		
COMPANY NAME: Underwood Engineers, Inc.		
MAILING ADDRESS: 25 Vaughan Mall		
TOWN/CITY: Portsmouth	STATE: NH	ZIP CODE: 03801
EMAIL ADDRESS: drochette@underwoodengineers.com		
FAX: 603-431-4733	PHONE: 603-436-6192	
ELECTRONIC COMMUNICATION: By initialing here, I hereby authorize NHDES to communicate all matters relative to this application electronically.		

SECTION 6 - PROPERTY OWNER INFORMATION (IF DIFFERENT THAN APPLICANT) (Env-Wt 311.04(b)) If the owner is a trust or a company, then complete with the trust or company information. ☐ Same as applicant		
NAME: 90 Maplewood Avenue		
MAILING ADDRESS: 27 Austin Street		
TOWN/CITY: Portsmouth	STATE: NH	ZIP CODE: 03801
EMAIL ADDRESS: smahoney@concast.net		
FAX:	PHONE: 603-502-9025	
ELECTRONIC COMMUNICATION: By initialing here, I hereby authorize NHDES to communicate all matters relative to this application electronically.		

SECTION 7 - RESOURCE-SPECIFIC CRITERIA ESTABLISHED IN Env-Wt 400, Env-Wt 500, Env-Wt 600, Env-Wt 700, OR Env-Wt 900 HAVE BEEN MET (Env-Wt 313.01(a)(3))

Describe how the resource-specific criteria have been met for each chapter listed above (please attach information about stream crossings, coastal resources, prime wetlands, or non-tidal wetlands and surface waters):

Per Env-Wt 600 and Env-Wt 900, this project is not classified as a stream crossing.

To satisfy Env-Wt 514, the shoreline stabilization shall be designed to be the least intrusive practicable method in accordance with Ch 8 of the A/M BMPs, conform to the natural alignment of the bank/shoreline, not adversly affect the stream course or physical stream forms, minimize impacts to shoreline resource functions as described in Env-Wt 514.10, and follow other construction guidelines described in Env-Wt 500. To satisfy Env-Wt 516 Inflow and Outflow Structures, the discharge location will be stabilized to mitigate scouring or endangering vegetation, finfish, crustacea, shellfish, or wildlife. The structure will be set in the embankment and will not endanger navigation, recreation, or commerce. The project will satisfy the requirements of Env-Wt 521 Utility Projects; Projects in Public Right-Of-Way, by being submitted as a single project even though it crosses multiple properties. It is being designed to the greatest extent practicable, within right of way areas or adjacent to utilities which already exist on private properties, and construction will be undertaken in the least environmentally impactful manner.

To satisfy Env-Wt 600, a CFA report and VA will be prepared in accordance with 603.04 and 603.05. A project design narrative will be prepared in accordance to Env-Wt 603.06. In accordance with ENV-Wt 700, the prime wetlands boundaries have been delinated by a certified wetlands scientist and accurately marked/recorded.

SECTION 8 - AVOIDANCE AND MINIMIZATION

Impacts within wetland jurisdiction must be avoided to the maximum extent practicable (Env-Wt 313.03(a)).* Any project with unavoidable jurisdictional impacts must then be minimized as described in the Wetlands Best Management Practice Techniques For Avoidance and Minimization and the Wetlands Permitting: Avoidance, Minimization and Mitigation fact sheet. For minor or major projects, a functional assessment of all wetlands on the project site is required (Env-Wt 311.03(b)(10)).*

Please refer to the application checklist to ensure you have attached all documents related to avoidance and minimization, as well as functional assessment (where applicable). Use the Avoidance and Minimization Checklist, the Avoidance and Minimization Narrative, or your own avoidance and minimization narrative.

**See Env-Wt 311.03(b)(6) and Env-Wt 311.03(b)(10) for shoreline structure exemptions.*

SECTION 9 - MITIGATION REQUIREMENT (Env-Wt 311.02)

If unavoidable jurisdictional impacts require mitigation, a mitigation pre-application meeting must occur at least 30 days but not more than 90 days prior to submitting this Standard Dredge and Fill Permit Application.

Mitigation Pre-Application Meeting Date: Month: Day: Year: April 2, 2024

(☐ N/A - Mitigation is not required)

SECTION 10 - THE PROJECT MEETS COMPENSATORY MITIGATION REQUIREMENTS (Env-Wt 313.01(a)(1)c)

Confirm that you have submitted a compensatory mitigation proposal that meets the requirements of Env-Wt 800 for all permanent unavoidable impacts that will remain after avoidance and minimization techniques have been exercised to the maximum extent practicable: ☐ I confirm submittal.

(☐ N/A – Compensatory mitigation is not required)

SECTION 11 - IMPACT AREA (Env-Wt 311.04(g))

For each jurisdictional area that will be/has been impacted, provide square feet (SF) and, if applicable, linear feet (LF) of impact, and note whether the impact is after-the-fact (ATF; i.e., work was started or completed without a permit).

For intermittent and ephemeral streams, the linear footage of impact is measured along the thread of the channel. *Please note, installation of a stream crossing in an ephemeral stream may be undertaken without a permit per Rule Env-Wt 309.02(d), however other dredge or fill impacts should be included below.*

For perennial streams/rivers, the linear footage of impact is calculated by summing the lengths of disturbances to the channel and banks.

Permanent (PERM.) impacts are impacts that will remain after the project is complete (e.g., changes in grade or surface materials).

Temporary (TEMP.) impacts are impacts not intended to remain (and will be restored to pre-construction conditions) after the project is completed.

JURISDICTIONAL AREA		PERM. SF	PERM. LF	PERM. ATF	TEMP. SF	TEMP. LF	TEMP. ATF
Wetlands	Forested Wetland			☐			☐
	Scrub-shrub Wetland			☐			☐
	Emergent Wetland			☐			☐
	Wet Meadow			☐			☐
	Vernal Pool			☐			☐
	Designated Prime Wetland			☐			☐
	Duly-established 100-foot Prime Wetland Buffer			☐			☐
Surface	Intermittent / Ephemeral Stream			☐			☐
	Perennial Stream or River			☐			☐
	Lake / Pond			☐			☐
	Docking - Lake / Pond			☐			☐
	Docking - River			☐			☐
Banks	Bank - Intermittent Stream			☐			☐
	Bank - Perennial Stream / River			☐			☐
	Bank / Shoreline - Lake / Pond			☐			☐
Tidal	Tidal Waters	3,870		☐			☐
	Tidal Marsh			☐			☐
	Sand Dune			☐			☐
	Undeveloped Tidal Buffer Zone (TBZ)			☐			☐
	Previously-developed TBZ	470		☐	120		☐
	Docking - Tidal Water			☐			☐
TOTAL		4,340			120		

SECTION 12 - APPLICATION FEE (RSA 482-A:3, I)

☐ **MINIMUM IMPACT FEE**: Flat fee of $400.

☐ **NON-ENFORCEMENT RELATED, PUBLICLY-FUNDED AND SUPERVISED RESTORATION PROJECTS, REGARDLESS OF IMPACT CLASSIFICATION:** Flat fee of $400 (refer to RSA 482-A:3, 1(c) for restrictions).

☐ **MINOR OR MAJOR IMPACT FEE:** Calculate using the table below:

Permanent and temporary (non-docking): 4,460	SF	× $0.40 =	$ 1,784
Seasonal docking structure:	SF	× $2.00 =	$
Permanent docking structure:	SF	× $4.00 =	$
Projects proposing shoreline structures (including docks) add $400 =			$ 400
		Total =	$ 2,184
The application fee for minor or major impact is the above calculated total or $400, whichever is greater =			$ 2,184

SECTION 13 - PROJECT CLASSIFICATION (Env-Wt 306.05) Indicate the project classification.		
☐ Minimum Impact Project	☐ Minor Project	☒ Major Project

SECTION 14 - REQUIRED CERTIFICATIONS (Env-Wt 311.11)	
Initial each box below to certify:	
Initials:	To the best of the signer's knowledge and belief, all required notifications have been provided.
Initials:	The information submitted on or with the application is true, complete, and not misleading to the best of the signer's knowledge and belief.
Initials:	The signer understands that: • The submission of false, incomplete, or misleading information constitutes grounds for NHDES to: 1. Deny the application. 2. Revoke any approval that is granted based on the information. 3. If the signer is a certified wetland scientist, licensed surveyor, or professional engineer licensed to practice in New Hampshire, refer the matter to the joint board of licensure and certification established by RSA 310-A:1.
Initials:	If the applicant is not the owner of the property, each property owner signature shall constitute certification by the signer that he or she is aware of the application being filed and does not object to the filing.

SECTION 15 - REQUIRED SIGNATURES (Env-Wt 311.04(d); Env-Wt 311.11)		
SIGNATURE (OWNER):	PRINT NAME LEGIBLY:	DATE:
SIGNATURE (APPLICANT, IF DIFFERENT FROM OWNER):	PRINT NAME LEGIBLY:	DATE:
SIGNATURE (AGENT, IF APPLICABLE):	PRINT NAME LEGIBLY:	DATE:

SECTION 16 - TOWN / CITY CLERK SIGNATURE (Env-Wt 311.04(f))	
As required by RSA 482-A:3, I(a)(1), I hereby certify that the applicant has filed four application forms, four detailed plans, and four USGS location maps with the town/city indicated below.	
TOWN/CITY CLERK SIGNATURE:	PRINT NAME LEGIBLY:
TOWN/CITY:	DATE:

US Army Corps of Engineers®
New England District

New Hampshire General Permits (GPs)
Appendix B - Corps Secondary Impacts Checklist
(for inland wetland/waterway fill projects in New Hampshire)

1. Attach any explanations to this checklist. Lack of information could delay a Corps permit determination.
2. All references to "work" include all work associated with the project construction and operation. Work includes filling, clearing, flooding, draining, excavation, dozing, stumping, etc.
3. See GC 5, regarding single and complete projects.
4. Contact the Corps at (978) 318-8832 with any questions.

1. Impaired Waters	Yes	No
1.1 Will any work occur within 1 mile upstream in the watershed of an impaired water? See http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm to determine if there is an impaired water in the vicinity of your work area.*	X	
2. Wetlands	Yes	No
2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?	X	
2.2 Are there proposed impacts to SAS, special wetlands. Applicants may obtain information from the NH Department of Resources and Economic Development Natural Heritage Bureau (NHB) DataCheck Tool for information about resources located on the property at https://www2.des.state.nh.us/nhb_datacheck/. The book Natural Community Systems of New Hampshire also contains specific information about the natural communities found in NH.		X
2.3 If wetland crossings are proposed, are they adequately designed to maintain hydrology, sediment transport & wildlife passage?	NA	
2.4 Would the project remove part or all of a riparian buffer? (Riparian buffers are lands adjacent to streams where vegetation is strongly influenced by the presence of water. They are often thin lines of vegetation containing native grasses, flowers, shrubs and/or trees that line the stream banks. They are also called vegetated buffer zones.)		X
2.5 The overall project site is more than 40 acres?		X
2.6 What is the area of the previously filled wetlands?	225 SF	
2.7 What is the area of the proposed fill in wetlands?	3,600 SF	
2.8 What is the % of previously and proposed fill in wetlands to the overall project site?	0.8% Previously 12.6% Proposed	
3. Wildlife	Yes	No
3.1 Has the NHB & USFWS determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project? (All projects require an NHB ID number & a USFWS IPAC determination.) NHB DataCheck Tool: https://www2.des.state.nh.us/nhb_datacheck/ USFWS IPAC website: https://ecos.fws.gov/ipac/location/index		X

3.2 Would work occur in any area identified as either "Highest Ranked Habitat in N.H." or "Highest Ranked Habitat in Ecological Region"? (These areas are colored magenta and green, respectively, on NH Fish and Game's map, "2010 Highest Ranked Wildlife Habitat by Ecological Condition.") Map information can be found at: • PDF: https://wildlife.state.nh.us/wildlife/wap-high-rank.html. • Data Mapper: www.granit.unh.edu. • GIS: www.granit.unh.edu/data/downloadfreedata/category/databycategory.html.		X
3.3 Would the project impact more than 20 acres of an undeveloped land block (upland, wetland/waterway) on the entire project site and/or on an adjoining property(s)?		X
3.4 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?		X
3.5 Are stream crossings designed in accordance with the GC 21?	NA	
4. Flooding/Floodplain Values	Yes	No
4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?	X	
4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?	NA	
5. Historic/Archaeological Resources		
For a minimum, minor or major impact project - a copy of the Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) with your DES file number shall be sent to the NH Division of Historical Resources as required on Page 11 GC 8(d) of the GP document**	X	

*Although this checklist utilizes state information, its submittal to the Corps is a Federal requirement.
** If your project is not within Federal jurisdiction, coordination with NH DHR is not required under Federal law.

IPaC **U.S. Fish & Wildlife Service**

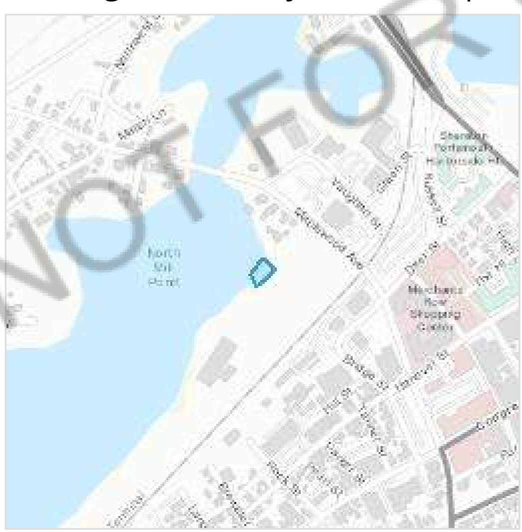
IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Rockingham County, New Hampshire



Local office

New England Ecological Services Field Office

(603) 223-2541
(603) 223-0104

70 Commercial Street, Suite 300

70 Commercial Street, Suite 300
Concord, NH 03301-5094

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat Myotis septentrionalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Oct 15 to Aug 31
Black-billed Cuckoo Coccyzus erythropthalmus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Blue-winged Warbler Vermivora pinus This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 1 to Jun 30
Bobolink Dolichonyx oryzivorus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Chimney Swift Chaetura pelagica This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25

Lesser Yellowlegs Tringa flavipes — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

Prairie Warbler Dendroica discolor — Breeds May 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Purple Sandpiper Calidris maritima — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Red-headed Woodpecker Melanerpes erythrocephalus — Breeds May 10 to Sep 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Rusty Blackbird Euphagus carolinus — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Short-billed Dowitcher Limnodromus griseus — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9480

Willet Tringa semipalmata — Breeds Apr 20 to Aug 5

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Wood Thrush Hylocichla mustelina — Breeds May 10 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

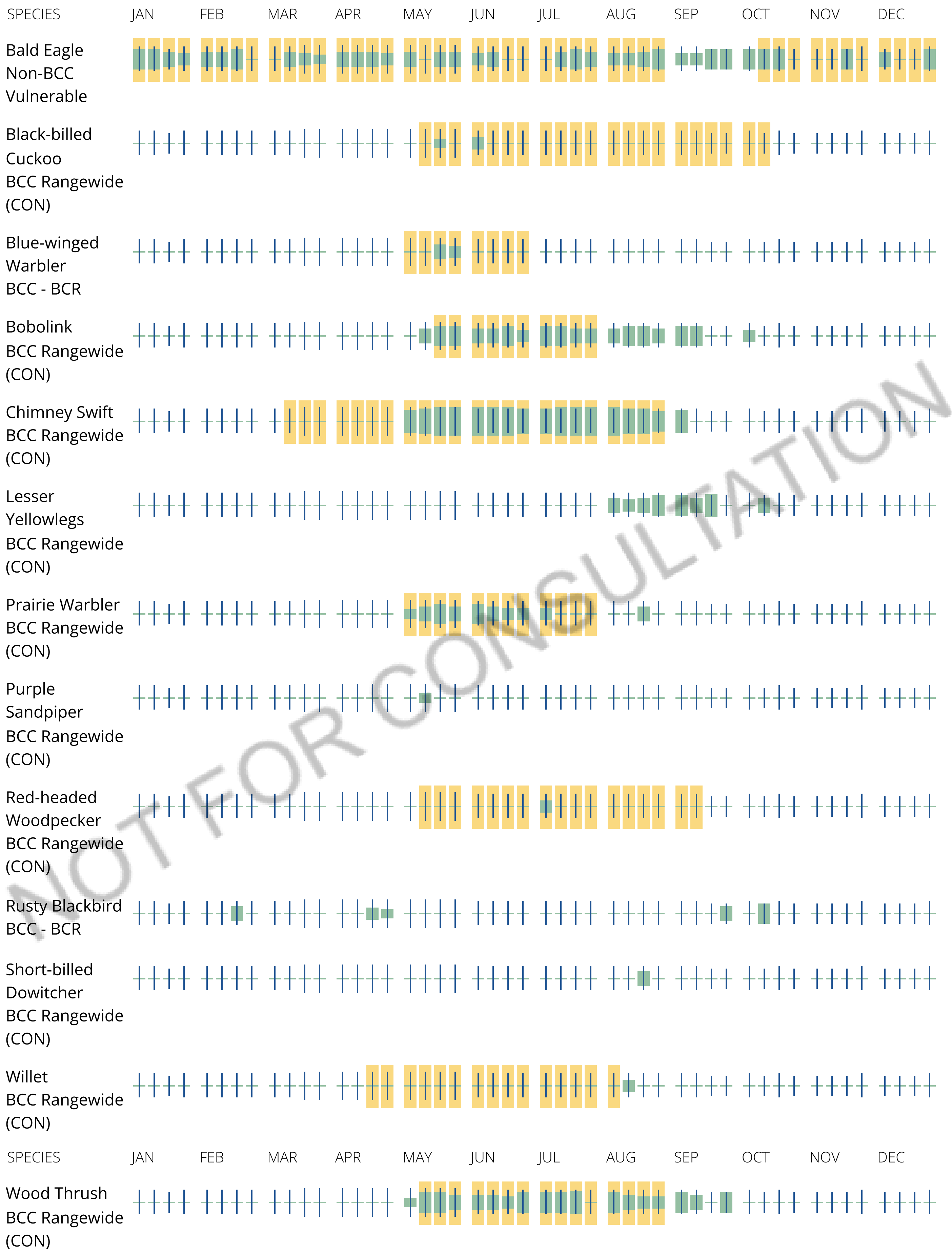
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort – no data


SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Bald Eagle
Non-BCC
Vulnerable
Black-billed
Cuckoo
BCC Rangewide
(CON)
Blue-winged
Warbler
BCC - BCR
Bobolink
BCC Rangewide
(CON)
Chimney Swift
BCC Rangewide
(CON)
Lesser
Yellowlegs
BCC Rangewide
(CON)
Prairie Warbler
BCC Rangewide
(CON)
Purple
Sandpiper
BCC Rangewide
(CON)
Red-headed
Woodpecker
BCC Rangewide
(CON)
Rusty Blackbird
BCC - BCR
Short-billed
Dowitcher
BCC Rangewide
(CON)
Willet
BCC Rangewide
(CON)
SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Wood Thrush
BCC Rangewide
(CON)
NOT FOR CONSULTATION

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Wetland information is not available at this time

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

RECEIVED FEB 0 9 2023 2542.12

Please mail the completed form and required material to:

New Hampshire Division of Historical Resources
State Historic Preservation Office
Attention: Review & Compliance
19 Pillsbury Street, Concord, NH 03301-3570

DHR Use Only	
R&C #	14678
Log In Date	2/9/23
Response Date	2/16/23
Sent Date	2/21/23

Request for Project Review by the New Hampshire Division of Historical Resources

☒ This is a new submittal
☐ This is additional information relating to DHR Review & Compliance (R&C) #:

GENERAL PROJECT INFORMATION

Project Title Maplewood Avenue Outfall Improvements

Project Location 90 Maplewood Avenue

City/Town Portsmouth   Tax Map 125   Lot # 19

RECEIVED FEB 27 2023 UNDERWOOD ENGI... PORTSMOUTH, NH

NH State Plane - Feet Geographic Coordinates: Easting 1225377 Northing 211984
(See RPR Instructions and R&C FAQs for guidance.)

Lead Federal Agency and Contact *(if applicable)*
(Agency providing funds, licenses, or permits)
Permit Type and Permit or Job Reference #

State Agency and Contact *(if applicable)* New Hampshire Department of Environmental Services

Permit Type and Permit or Job Reference # Dredge and Fill

APPLICANT INFORMATION

Applicant Name City of Portsmouth

Mailing Address 680 Peverly Hill Road   Phone Number 603.427.1530

City Portsmouth   State NH   Zip 03801   Email NA

CONTACT PERSON TO RECEIVE RESPONSE

Name/Company Zach Cronin

Mailing Address 680 Peverly Hill Road   Phone Number 603.610.7304

City Portsmouth   State NH   Zip 03801   Email NA

This form is updated periodically. Please download the current form at www.nh.gov/nhdhr/review. *Please refer to the Request for Project Review Instructions for direction on completing this form.* Submit one copy of this project review form for each project for which review is requested. Please include a self-addressed stamped envelope. Project submissions will not be accepted via facsimile or e-mail. This form is required. Review request form must be complete for review to begin. Incomplete forms will be sent back to the applicant without comment. Please be aware that this form may only initiate consultation. For some projects, additional information will be needed to complete the Section 106 review. All items and supporting documentation submitted with a review request, including photographs and publications, will be retained by the DHR as part of its review records. Items to be kept confidential should be clearly identified. For questions regarding the DHR review process and the DHR's role in it, please visit our website at: www.nh.gov/nhdhr/review or contact the R&C Specialist at marika.s.labash@dncr.nh.gov or 603.271.3558.

PROJECTS C. NOT BE PROCESSED WITHOUT T. INFORMATION

Project Boundaries and Description

☒ Attach the Project Mapping ***using EMMIT or relevant portion of a 7.5' USGS Map.*** *(See RPR Instructions and R&C FAQs for guidance.)*

☒ Attach a detailed narrative description of the proposed project.

☒ Attach a site plan. The site plan should include the project boundaries and areas of proposed excavation.

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EMMIT or in-house records search conducted on 10/6/2022.

Architecture

Are there any buildings, structures (bridges, walls, culverts, etc.) objects, districts or landscapes within the project area? ☒ Yes ☐ No

If no, skip to Archaeology section. If yes, submit all of the following information:

Approximate age(s): 50 years

☒ Photographs of ***each*** resource or streetscape located within the project area, with captions, along with a mapped photo key. (Digital photographs are accepted. All photographs must be clear, crisp and focused.)

☐ If the project involves rehabilitation, demolition, additions, or alterations to existing buildings or structures, provide additional photographs showing detailed project work locations. (i.e. Detail photo of windows if window replacement is proposed.)

Archaeology

Does the proposed undertaking involve ground-disturbing activity? ☒ Yes ☐ No

If yes, submit all of the following information:

☒ Description of current and previous land use and disturbances.

☒ Available information concerning known or suspected archaeological resources within the project area (such as cellar holes, wells, foundations, dams, etc.)

Please note that for many projects an architectural and/or archaeological survey or other additional information may be needed to complete the Section 106 process.

DHR Comment/Finding Recommendation *This Space for Division of Historical Resources Use Only*

☐ Insufficient information to initiate review. ☐ Additional information is needed in order to complete review.

☐ No Potential to cause Effects ☑ No Historic Properties Affected ☐ No Adverse Effect ☐ Adverse Effect

Comments: ARCHAEOLOGICAL MONITORING REQUIRED DURING TRENCHING ADJACENT TO OLD NORTH CEMETERY AND THROUGH INTERSECTION OF MAPLEWOOD AVE. + DEER ST. DUE TO PRESENCE OF PREVIOUSLY IDENTIFIED SITES. MONITORING ARCHAEOLOGIST TO HAVE EXPERIENCE IN RECOGNIZING 18TH-CENTURY BURIALS.

If plans change or resources are discovered in the course of this project, you must contact the Division of Historical Resources as required by federal law and regulation.

Authorized Signature: Nadine Miller, DSHPO Date: 2/16/23

civil &
environmental
engineering

UNDERWOOD
engineers

2542.12

February 7, 2023

Ms. Marika Labash, Review and Compliance
NH Division of Historical Resources
19 Pillsbury Street
Concord, NH 03301-3570

Re: **RPR Submittal for Review**
Maplewood Avenue Drainage Interceptor
Portsmouth, New Hampshire

Dear Ms. Labash:

On behalf of the City of Portsmouth, we are hereby submitting a RPR package for review for the above referenced project.

The proposed project is subject to Standard Dredge and Fill Wetlands Permit Application (Major Impacts) and is being funded by NHDES SRF loan program both of which require the Section 106 Historic/Archaeoligical Resource review

The following information regarding this project area is enclosed:

- RPR form
- Narrative
- EMMIT Mapping with Limits of Work shown
- Summary of EMMIT Database Search Results for resources adjacent to within in the vicinity of the project area
- Relevant plan set sheets
- Photo Key
- Photos

Please call me at (603) 436-6192 if you have any questions or need any additional information.

Very truly yours,

UNDERWOOD ENGINEERS, INC.

Daniel J. Rochette, P.E.
Senior Project Engineer

Encl

cc: Zach Cronin, E.I.T. – Assistant City Engineer, City of Portsmouth (via e-mail)
Dave Desfosses – Project Manager, City of Portsmouth (via e-mail)

ph 603.436.6192
fx 603.431.4733
25 Vaughan Mall
Portsmouth, NH 03801
underwoodengineers.com

Please mail the completed form and required material to:

New Hampshire Division of Historical Resources
State Historic Preservation Office
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19 Pillsbury Street, Concord, NH 03301-3570

DHR Use Only	
R&C #	________
Log In Date	___ / ___ / ___
Response Date	___ / ___ / ___
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PROJECTS CANNOT BE PROCESSED WITHOUT THIS INFORMATION

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  EMMIT or in-house records search conducted on 10/6/2022.

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Are there any buildings, structures (bridges, walls, culverts, etc.) objects, districts or landscapes within the project area? ☒ Yes ☐ No
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- ☒ Description of current and previous land use and disturbances.
- ☒ Available information concerning known or suspected archaeological resources within the project area (such as cellar holes, wells, foundations, dams, etc.)

Please note that for many projects an architectural and/or archaeological survey or other additional information may be needed to complete the Section 106 process.

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☐ No Potential to cause Effects ☐ No Historic Properties Affected ☐ No Adverse Effect ☐ Adverse Effect

Comments: ____________________

If plans change or resources are discovered in the course of this project, you must contact the Division of Historical Resources as required by federal law and regulation.

Authorized Signature: ____________________ Date: ____________

Narrative Statement
Maplewood Avenue Drainage Interceptor
Portsmouth, New Hampshire

Background and Purpose

The City of Portsmouth has been mandated by an EPA Administrative Order to mitigate combined sewer overflows (CSO's) around the City. The next project identified on the City's priority list is to complete sewer separation in the Fleet Street drainage area. Separation of stormwater from the sewer system will increase flows within the existing system. Hydraulic calculations show that once separation of the Fleet Street area is complete existing downstream drainage systems will be overwhelmed and capacities need to be increased.

Project Description

Currently, a new drainage interceptor along Maplewood Avenue ultimately discharging next to the existing outfall at North Mill Pond is being proposed to provide the additional capacity desired to accommodate additional stormwater flows resulting from the separation work Approximately 1,200 LF of 42" and 48" diameter RCP pipe is proposed along with a stormwater treatment unit.

New drainage piping also crosses below existing railroad tracks which will require trenchless installation methods so that existing tracks are not disturbed. The method of installation anticipated for the railroad crossing will be jack and bore to place a steel sleeve beneath the tracks for the drainage pipe to be inserted to.

Typical installations methods for the balance of the work will be open excavation with a trench width expected be vary between 6' and 8' wide dependent on pipe size and depth. Normal installations methods also include back filling excavations at the end of each work day.

Architectural and Archaeological Resources

In general, the impact areas will be contained to the area immediately surrounding the proposed work. Installation of new drainage piping will be linear in nature. Proposed alignments fall within existing roadways (Maplewood Avenue) or in locations previously disturbed by urban development (railroad access area).

Buildings abutting the road and sidewalks adjacent to the project area are all newer construction and have either been built within the last 20 years.

It is noted that work is proposed adjacent to the existing Old North Cemetery which is a known historic area. Existing conditions limited potential alignments for the proposed pipe. However, it is aligned so that the center of the pipe is approximately 19 feet (or more) from the existing fence line to the cemetery.

Where outfall improvements are proposed within jurisdictional wetland areas, impacts are generally limited to areas that have already been disturbed either by previous drainage system installations in the 1970's. Any excavation work completed beyond to existing outfall to place a stone apron and construct a permitted stabilized discharge will be limited to a depth of 2'.

Visual effects due to construction of the sewer line will be temporary in nature, as the infrastructure will be below ground and the area will be restored to existing conditions.

File Review

A file review was conducted using the EMMIT Database Search Tool on January 18, 2023.

The following files were found for an area where the project is being constructed:

- Eastern Railroad Linear Eastern District
  - **Impacts** – Proposed piping is being installed along the paved driveway to railroad access area. Impacts will consist of linear trench excavation as described above up to 8' in width and up to 13' depth. Upon completion the driveway will be paved and restored in kind.

The following files were found near the project area, but not within it:

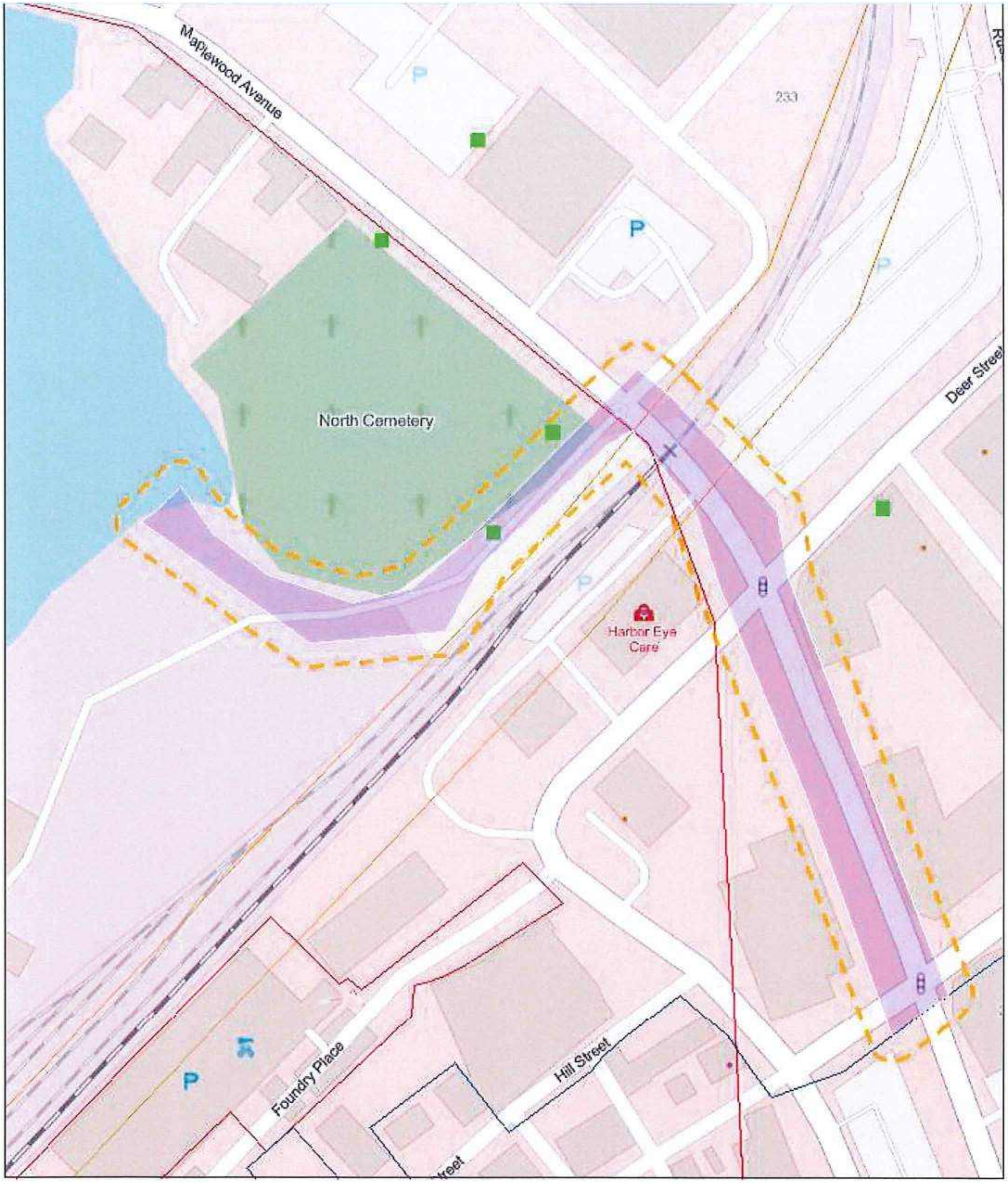
- Old North Cemetery (POR149)
- Portsmouth Downtown historic District (POR0174
- Col. George Boyd Tomb (POR1024)

Previous Land Uses

No other previous uses are known.

Other Known Or Suspected Archaeological Resources Within The Project Area

No known or suspected archaeological resources within the project area.



January 18, 2023

1:2,257

0 0.0175 0.035 0.07 mi

0 0.03 0.06 0.12 km

- Individual Properties < 10 acres
- Towns
- National Register Districts
- Historic Districts
- Project Areas
- Counties

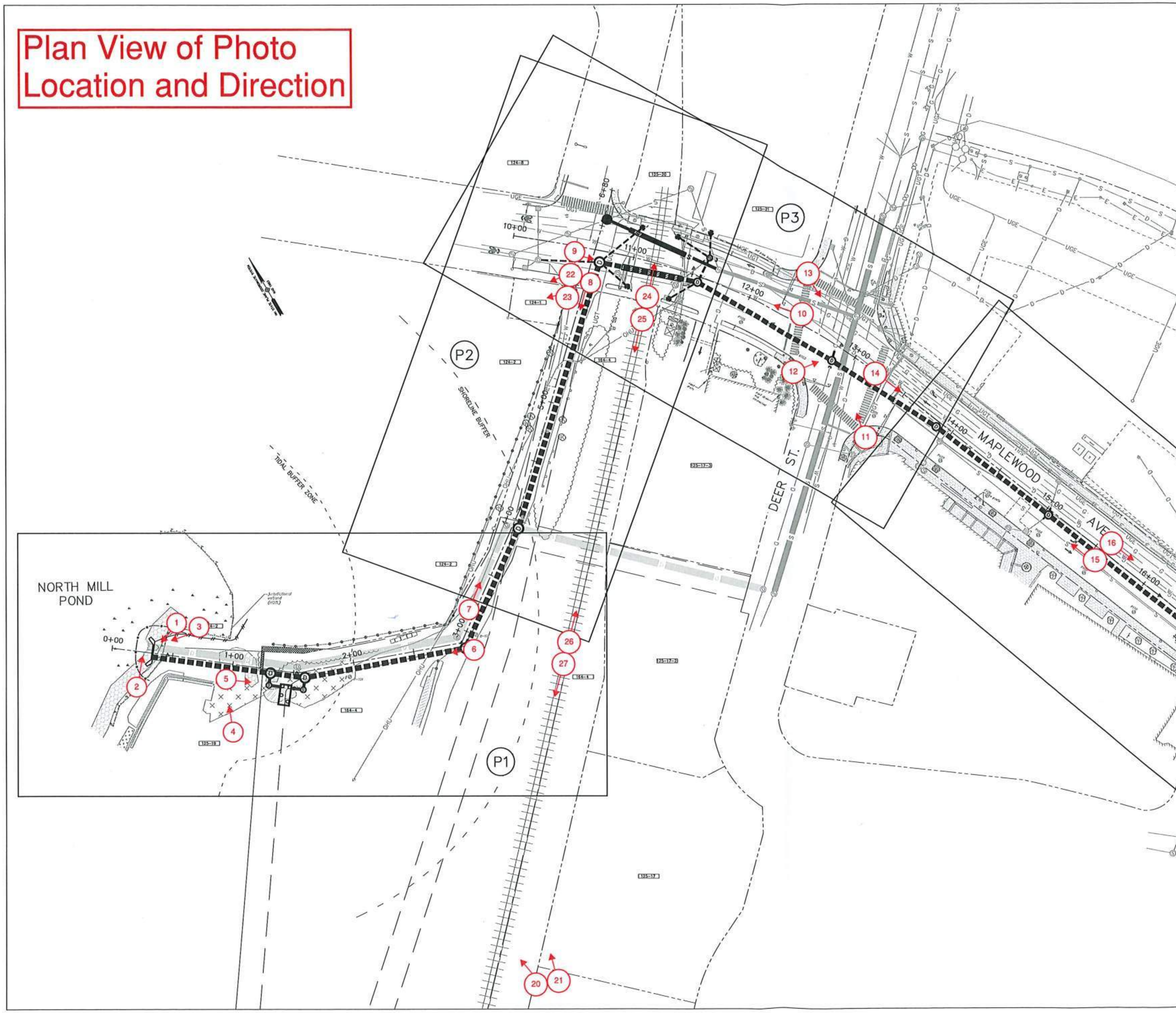
Maplewood Avenue Drainage Intercept
Portsmouth, New Hampshire

EMMIT Database Search Results

January 18, 2023

	Inventory #	Property Name	Address	Town	SR Listing Date	NR Listing Date	DOE Date Reviewed	Eligibilities	HABS Year	HAER Year	NH Property Doc Year	Doc Id
12027	POR-SMLP	Sarah Mildred Long Project		Portsmouth				Not reviewed for eligibility				
9346	POR0149	Old North Cemetery	Maplewood Avenue	Portsmouth		3/8/1978						
9371	POR0174	Portsmouth Downtown Historic District	multiple locations	Portsmouth		6/19/2017						
9410	POR1024	Col. George Boyd Tomb	Old North Cemetery	Portsmouth								HABS-0204
12153	ZMT-ERLD	RR Eastern Railroad Linear District/ B&M Eastern Division		zMulti-town				Eligible National Register district				

Plan View of Photo Location and Direction



PLAN INDEX

MAPLEWOOD AVE – DRAINAGE INTERCEPT

CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

FOR REVIEW
JAN. 2023
NOT FOR CONSTRUCTION

Drawn/Chk. RMG
Designed PDM
Checked –
Approved –
Date 1/5/2022
Book No. –
Project No. 2542
Dwg. ID 2542_pidx_M
Scale –

NO.	REVISIONS	APP'D

ISSUE FOR
BIDDING Date – By –
CONSTRUCTION Date – By –
RECORD DRAWING Date – By –

DWG NO G2

Photo 1 – Existing outfall headwall, exposed 48" RCP pipe, and tidal embankment looking west at high tide. Taken 9/28/22

Photo 2 – Existing outfall headwall, exposed 48" RCP pipe, and tidal embankment looking east at high tide. Taken 9/28/22

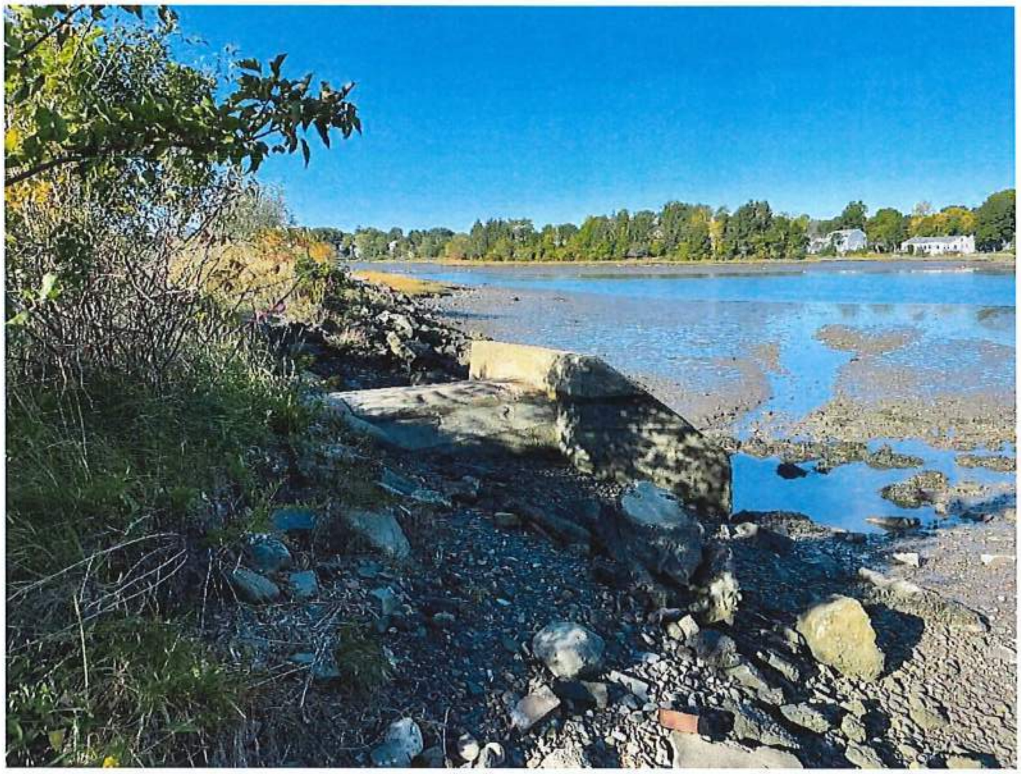


Photo 3 – Existing outfall headwall, exposed 48" RCP pipe, and tidal embankment looking west at low tide. Taken 9/29/22

Photo 4 – Edge of 90 Maplewood Ave LLC lot looking north with existing pipe located parallel to concrete block wall flowing west to outfall. Taken 1/19/23

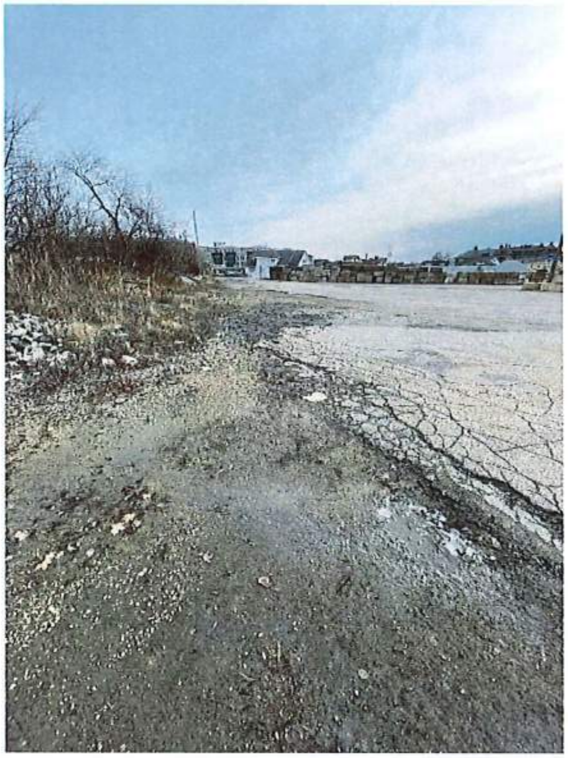


Photo 5 – Edge of concrete block wall at 90 Maplewood Ave LLC lot (right) looking northeast over existing pipe. Taken 1/19/23

Photo 6 – Road between railroad (left) and Old North Cemetery (right) looking west into 90 Maplewood Ave LLC lot. Taken 1/19/23

Photo 7 – Road between railroad (right) and Old North Cemetery (left) looking northeast toward Maplewood Ave. Taken 1/19/23

Photo 8 – Maplewood Ave at Vaughan Street looking southeast down the road between the railroad (left) and Old North Cemetery (right). Taken 1/19/23

Photo 9 – Corner of Maplewood Ave at Vaughan Street and Old North Cemetery (right) looking southeast at Maplewood Ave. Taken 1/19/23

Photo 10 – Maplewood Ave at Deer Street intersection looking northwest at Maplewood Ave. Taken 1/19/23

Photo 11 – Maplewood Ave and Deer Street intersection looking north. Taken 1/19/23

Photo 12 – Maplewood Ave and Deer Street intersection looking east. Taken 1/19/23

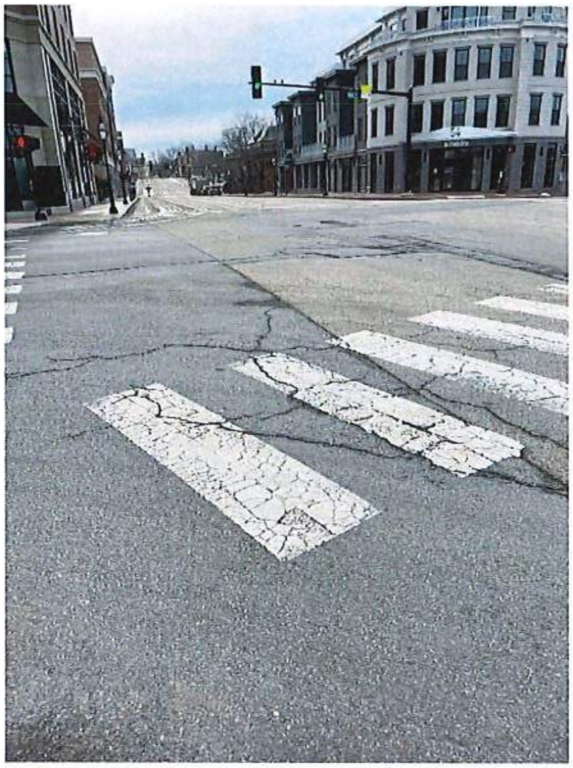


Photo 13 – Maplewood Ave and Deer Street intersection looking south. Taken 1/19/23

Photo 14 – Maplewood Ave at Deer Street intersection looking Southeast at Maplewood Ave. Taken 1/19/23

Photo 15 – Maplewood Ave between Hanover Street and Deer Street looking northwest. Taken 1/19/23

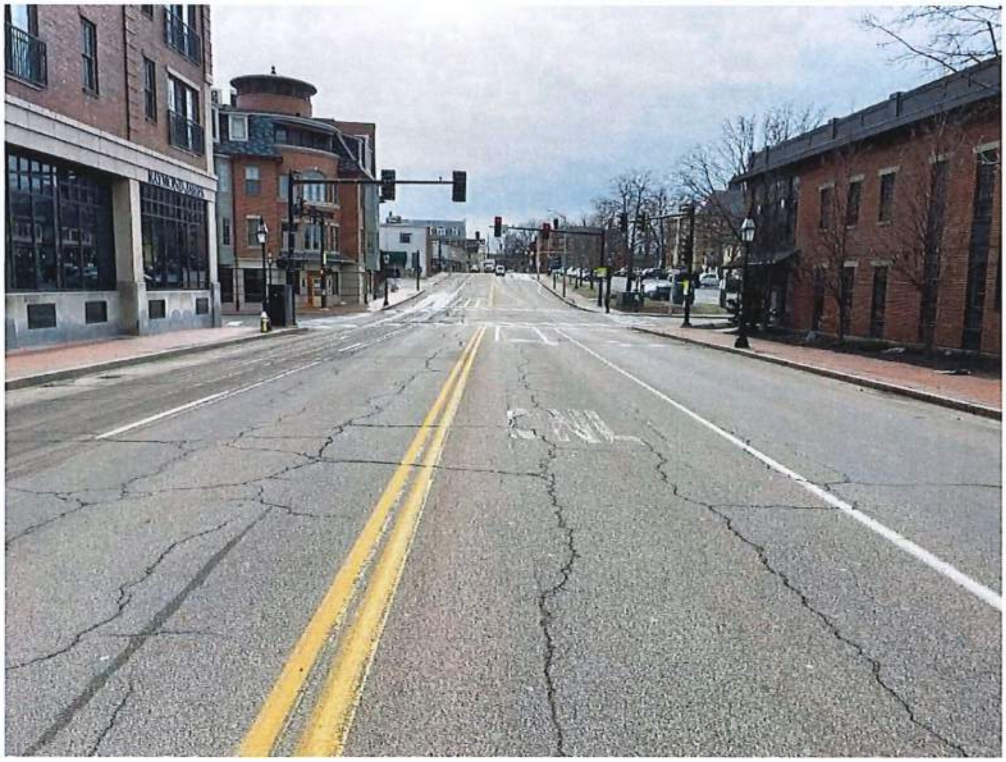


Photo 16 – Maplewood Ave between Hanover Street and Deer Street looking southeast. Taken 1/19/23

Project Area Photos
Maplewood Avenue Outfall Improvements
Portsmouth, NH

Photo 17 – Maplewood Ave at Hanover Street intersection looking northwest at Maplewood Ave. Taken 1/19/23

Photo 18 – Maplewood Ave and Hanover Street intersection looking east. Taken 1/19/23

Photo 19 – Maplewood Ave and Hanover Street intersection looking south. Taken 1/19/23

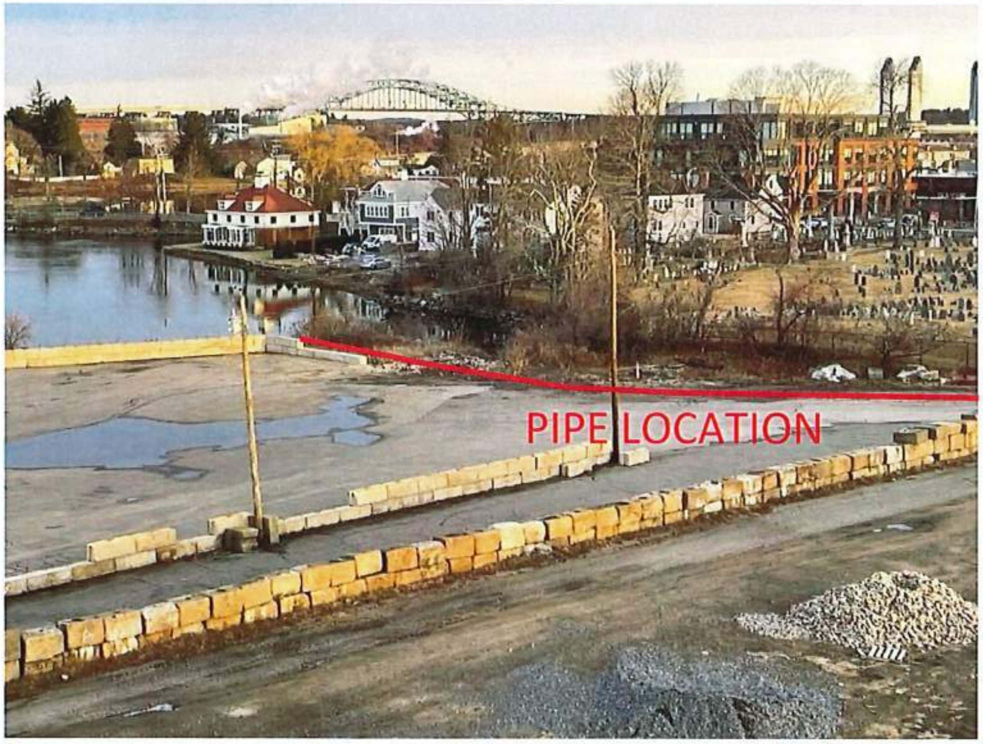


Photo 20 – Looking northwest at outfall and 90 Maplewood Ave LLC lot area (left). Picture taken from Foundry Parking Garage. Taken 1/19/23

Project Area Photos
Maplewood Avenue Outfall Improvements
Portsmouth, NH

Photo 21 – Looking north at 90 Maplewood Ave LLC lot and road between railroad (right) and Old North Cemetery (left). Picture taken from Foundry Parking Garage. Taken 1/19/23

Photo 22 – Old North Cemetery looking west from Maplewood Ave. Taken 1/19/23

Photo 23 – Sign at Old North Cemetery. Taken 1/19/23

Photo 24 – Railroad tracks looking northeast from Maplewood Ave. Taken 1/19/23

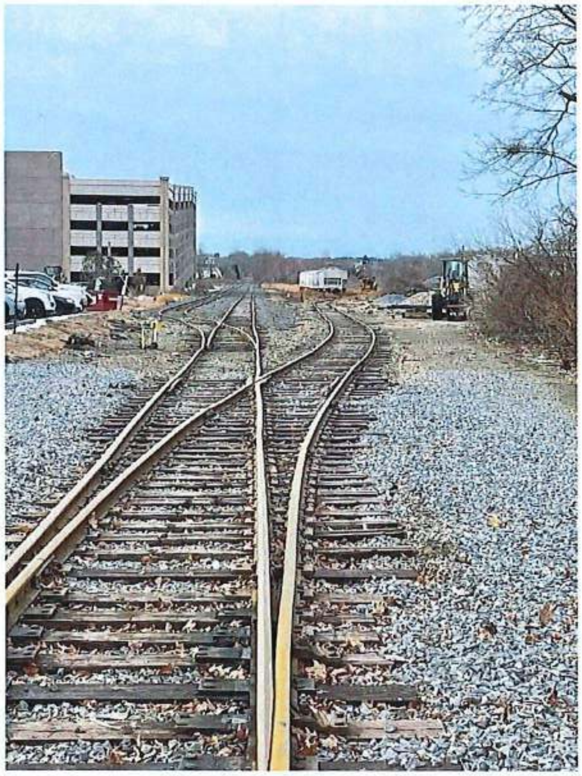


Photo 25 – Railroad tracks looking southwest from Maplewood Ave. Taken 1/19/23

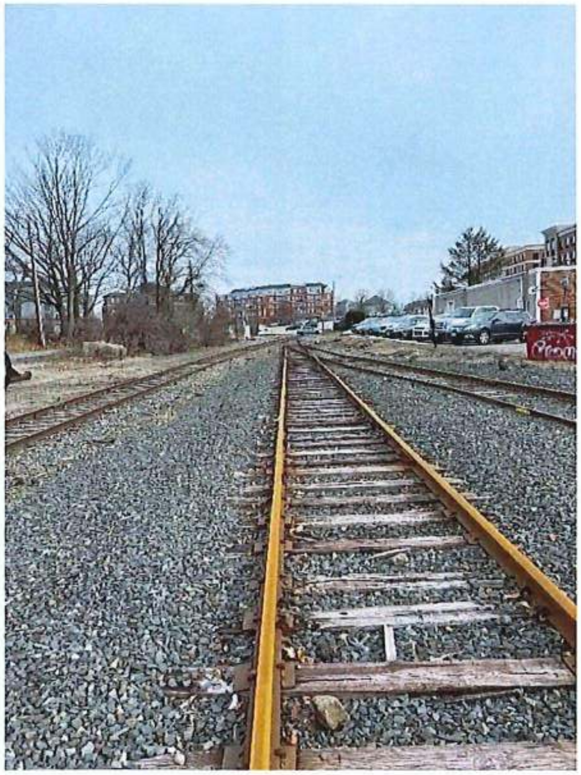


Photo 26 – Railroad tracks looking northwest. Taken 1/19/23

Photo 27 – Railroad tracks looking southwest. Taken 1/19/23

City of Portsmouth, New Hampshire

PERMIT APPLICATION DRAWINGS

MAPLEWOOD AVENUE - DRAINAGE INTERCEPT

LOCATION PLAN

PREPARED BY
UNDERWOOD ENGINEERS, INC.
PORTSMOUTH, NEW HAMPSHIRE
JANUARY, 2023

FOR REVIEW
JANUARY, 2023
NOT FOR CONSTRUCTION

VICINITY MAP

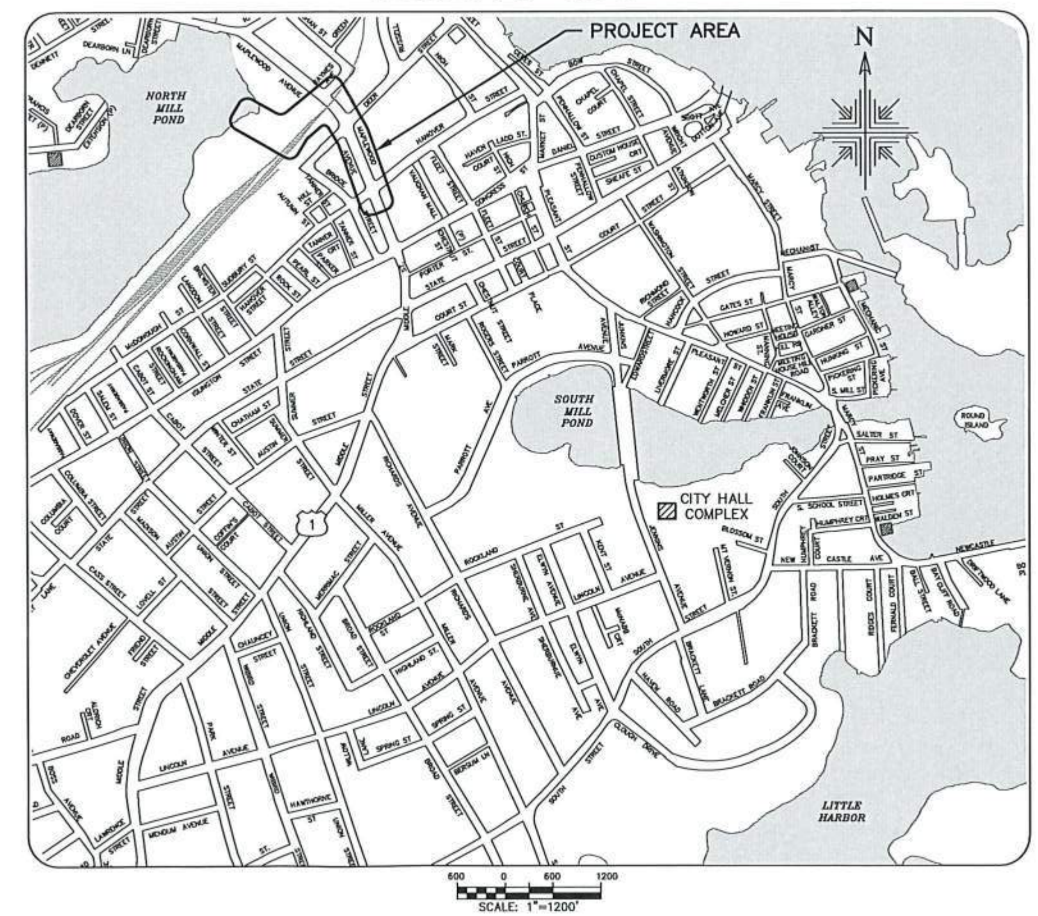


TABLE OF CONTENTS

UE #2542

UNDERWOOD engineers

LEGEND:

EXISTING	PROPOSED	
		STRUCTURES/BUILDINGS
		APPROXIMATE PROPERTY LINE
		PAVED ROAD/DRIVE
VGC		VERTICAL FACED GRANITE CURB
RWBL		MODULAR BLOCK RETAINING WALL
RWB		MORTARED BRICK RETAINING WALL
RWC		CONCRETE RETAINING WALL
RWG		GRANITE RETAINING WALL
		GRANITE POST
		PARK METER KIOSK
		PARKING METER
		BOLLARD
		SIGN
		HANDICAP SPACE
		LIGHT POLE
		UTILITY POLE WITH ARM & LIGHT
		UTILITY POLE
PSNH		PUBLIC SERVICE CO. OF NH
		ELECTRICAL MANHOLE
		ELECTRICAL CONDUIT
		ELECTRICAL METER/BOX
		GAS METER
		GAS SHUT OFF
		GAS VALVE
		WATER GATE VALVE
		WATER SHUT OFF VALVE
		HYDRANT
		FIRE CONNECTION
		TEE CONNECTION
		FITTINGS (11.25°, 22.5°, 45°)
		REDUCER
		THRUST BLOCK
		COUPLING
		CATCH BASIN (NEW)
		CATCH BASIN (REMOVE & REPLACE)
		DRAIN MANHOLE
		ROOF DOWNSPOUT
		SEWER MANHOLE
		SEWER CLEANOUT
		TELEPHONE MANHOLE
		TELEPHONE BOX
		CABLE MANHOLE
		FIRE ALARM
		DECIDUOUS TREE
		CONIFEROUS SHRUB
		DECIDUOUS SHRUB
OHW		OVERHEAD UTILITIES
W	W	WATER LINE
S	S	SEWER LINE
D		DRAIN LINE
G		GAS LINE
UGE		UNDERGROUND ELECTRIC
UGT		UNDERGROUND COMMUNICATIONS
		CEMENT CONCRETE
		BRICK PAVERS
LA		LANDSCAPED AREA
LAM		MULCHED AREA

LEGEND (cont.):

EXISTING	PROPOSED	
		GRASS COVER
25.4	25.4	SPOT GRADE
27.78		ELEVATION TO MATCH/NOT EXCEED
28	28	2' CONTOUR ELEVATION
30	30	10' CONTOUR ELEVATION
		SIGN – SEE SIGNAGE TABLE
117-45		TAX SHEET – LOT NUMBER
		ROCK
		POLE
		SEWER LATERALS APPROXIMATE LOCATION
		SEWER LATERALS ASSUMED DIRECTION OF EXIT
		WATER LATERALS APPROXIMATE LOCATION
		DRAIN LATERALS APPROXIMATE LOCATION
		RAILROAD SIGNAL
		RAILROAD TRACKS
B-101		BORING
R		SUBSURFACE REFUSAL
N/R		SUBSURFACE NO REFUSAL
		SUBSURFACE GROUNDWATER
		SILT BOOM
		SILT FENCE

ABBREVIATIONS

AC/ACP	ASPHALT CONCRETE PIPE
CB	CATCH BASIN
CI/CIP	CAST IRON PIPE
CL 52	CLASS 52 PIPE
CMP	CORRUGATED METAL PIPE
DI	DUCTILE IRON PIPE
DMH	DRAIN MANHOLE
GIS	CITY OF PORTSMOUTH GIS SYSTEM
HDPE	HIGH DENSITY POLYETHYLENE PIPE
I	INVERT ELEVATION
PE	POLYETHYLENE PIPE
PVC	POLYVINYL CHLORIDE PIPE
R	RIM ELEVATION
RCP	REINFORCED CONCRETE PIPE
RCRD	ROCKINGHAM COUNTY REGISTRY OF DEEDS
RCSC	ROCKINGHAM COUNTY SUPERIOR COURT
S	SLOPE (PIPE)
SMH	SEWER MANHOLE
UP	UTILITY POLE

SEWER TABLE

SMH# 5
RIM EL= 15.03
TOP OF TANK= 11.4±
(GREASE SEPERATOR)

SMH# 6
RIM EL= 15.02
TOP OF TANK= 11.4±
(GREASE SEPERATOR)

SMH# 1494
RIM EL= 10.62
CL FLOW= –1.16
(48" BRICK TUNNEL)

SMH# 1497
RIM EL= 11.04
(1) INV IN 10"____= 3.51
(2) INV IN 15"____= 2.98
(3) INV IN 8"____= 2.95
(4) INV OUT 15"VCP= 2.91

SMH# 1489
RIM EL= 9.39
(1) INV IN 12"____= 2.04

SMH# 1499
RIM EL= 15.61
(1) INV IN 48" BRICK= –1.84
(2) INV IN ____= –0.99
(3) INV OUT 48" BRICK= –1.94
(48" BRICK TUNNEL)

SMH# 1500
NOT FIELD OBSERVED
(STRUCTURE & LINE ABANDONED
PER PORTSMOUTH DPW)

SMH# 1501
RIM EL= 13.38
(1) INV IN 21"?____= –0.57
(2) INV OUT 24"____= –0.67

SMH# 1503
RIM EL= 15.13
(1) INV IN ____= 0.53
(2) INV OUT ____= ?

SMH# 1519
RIM EL= 13.30
(NO INVERT DATA)

SMH# 1570
RIM EL= 17.30
(1) INV IN 48" BRICK=
(48" BRICK TUNNEL)

SMH# 2746
RIM EL= 14.67
(1) INV IN ____= 5.4±
(2) INV IN ____= 5.3±
(3) INV OUT ____= 5.3±
(STRUCTURE INACTIVE)
(NO FLOW OBSERVED)

DRAIN TABLE

CB# 1352
RIM EL= 12.85
(1) INV IN 12"HDPE= 9.60
(2) INV OUT 12"HDPE= 9.50

CB# 3743
RIM EL= 12.83
(1) INV OUT 12"RCP= 9.58

CB# 3750
RIM EL= 10.91
(1) INV OUT 12"RCP= 7.39

CB# 3761
RIM EL= 10.52
(1) INV OUT 12"RCP= 7.03

CB# 3771
RIM EL= 15.14
(1) 6"PVC (PLUGGED)
(2) INV IN 6"PVC= 12.85
(3) INV OUT 12"RCP= 12.52

CB# 3772
RIM EL= 16.01
(1) INV OUT 12"RCP= 12.08

CB# 3773
RIM EL= 13.64
(1) INVERT INACCESSIBLE

CB# 3774
RIM EL= 13.25
(1) INV OUT 12"RCP= 8.60

CB# 3775
RIM EL= 12.97
(1) INV OUT 12"RCP= 9.87

CB# 3776
RIM EL= 12.93
(1) INV OUT 12"RCP= 8.25

CB# 3777
RIM EL= 12.94
(1) INV OUT 12"RCP= 8.64

CB# 3778
RIM EL= 14.59
(1) INV OUT 12"RCP= 11.09

CB# 3779
RIM EL= 14.51
(1) INV OUT 12"RCP= 11.20

CB# 25172
RIM EL= 15.28
(1) INV OUT 18"HDPE= 10.98

DMH# 6
RIM EL= 13.65
(1) INV IN 18"RCP= 4.25
(2) INV IN 12"HDPE= 5.40
(3) INV OUT 18"RCP= 4.33

DMH# 7
RIM EL= 14.29
(1) INV IN 6"PVC= 6.48
TOP OF CONCRETE WEIR= 9.96
(2) INV OUT 12"HDPE= 6.30

DMH# 8
RIM EL= 13.58
(1) INV IN 6"PVC= 9.83
TOP OF CONCRETE WEIR= 11.30
(2) INV OUT 12"HDPE= 9.68

DMH# 4979 (4'X6' VAULT)
RIM EL= 10.44
CL FLOW 48"RCP= *1.03
*RECORD GIS VALUE

DMH# 4980
RIM EL= 10.58
(1) INV IN 18"RCP= 3.03
(2) NO INVERT DATA
(3) INV OUT ____= 1.46

DMH# 4984
RIM EL= 9.40
(1) INV IN 36"RCP= 4.15

DMH# 5205
RIM EL= 15.81
(1) INV IN 12"RCP= 4.91
(2) INV IN 12"RCP= 12.26
(3) INV IN 18"HDPE= 8.71
(4) INV IN 12"RCP= 11.71
(5) INV OUT 18"RCP= 4.81

DMH# 5206
RIM EL= 13.32
(1) INV IN 12"RCP= 8.47
(2) INV IN 12"RCP= 9.29
(3) INV IN 12"RCP= 5.42
(4) INV OUT 12"RCP= 5.40

DMH# 5207
RIM EL= 13.01
(1) INV IN 12"RCP= 9.62
(2) INV IN 12"RCP= 5.56
(3) INV OUT 12"RCP= 5.56

DMH# 5208
RIM EL= 13.00
(1) INV IN 12"RCP= 7.95
(2) INV IN 12"RCP= 5.78
(3) INV IN 12"RCP= 7.90
(4) INV OUT 12"RCP= 5.77

DMH# 5209
RIM EL= 14.67
(1) INV IN 12"RCP= 10.39
(2) INV IN 12"RCP= 10.54
(3) INV OUT 12"RCP= 7.75

DMH# 5404
RIM EL= 13.35
(1) INV IN 12"RCP= 9.45
(2) INV IN 12"RCP= 9.28
(3) INV OUT 12"RCP= 7.12

DMH# 5438 (4'X6' VAULT)
RIM EL= 12.79
CL FLOW 48"RCP= 1.24

DMH# 5439 (4'X6' VAULT)
RIM EL= 7.21
CL FLOW 48"RCP= 0.76

DMH# 5677
RIM EL= 11.07
(1) INV IN 12"RCP= 6.97
(2) INV IN 10"RCP= 6.47
(3) INV IN 12"RCP= 6.98
(4) INV OUT 12"RCP= 6.37

DMH# 5678
RIM EL= 11.32
(1) INV IN 12"RCP= 6.07
(2) FLOW LINE 36"RCP= 4.60
(3) INV IN 12"RCP= 7.48
(4) INV IN 12"RCP= 6.45
(5) INV IN 12"RCP= 7.88

ISSUE FOR
BIDDING Date – By –
CONSTRUCTION Date – By –
RECORD DRAWING Date – By –

NO.	REVISIONS	APP'D

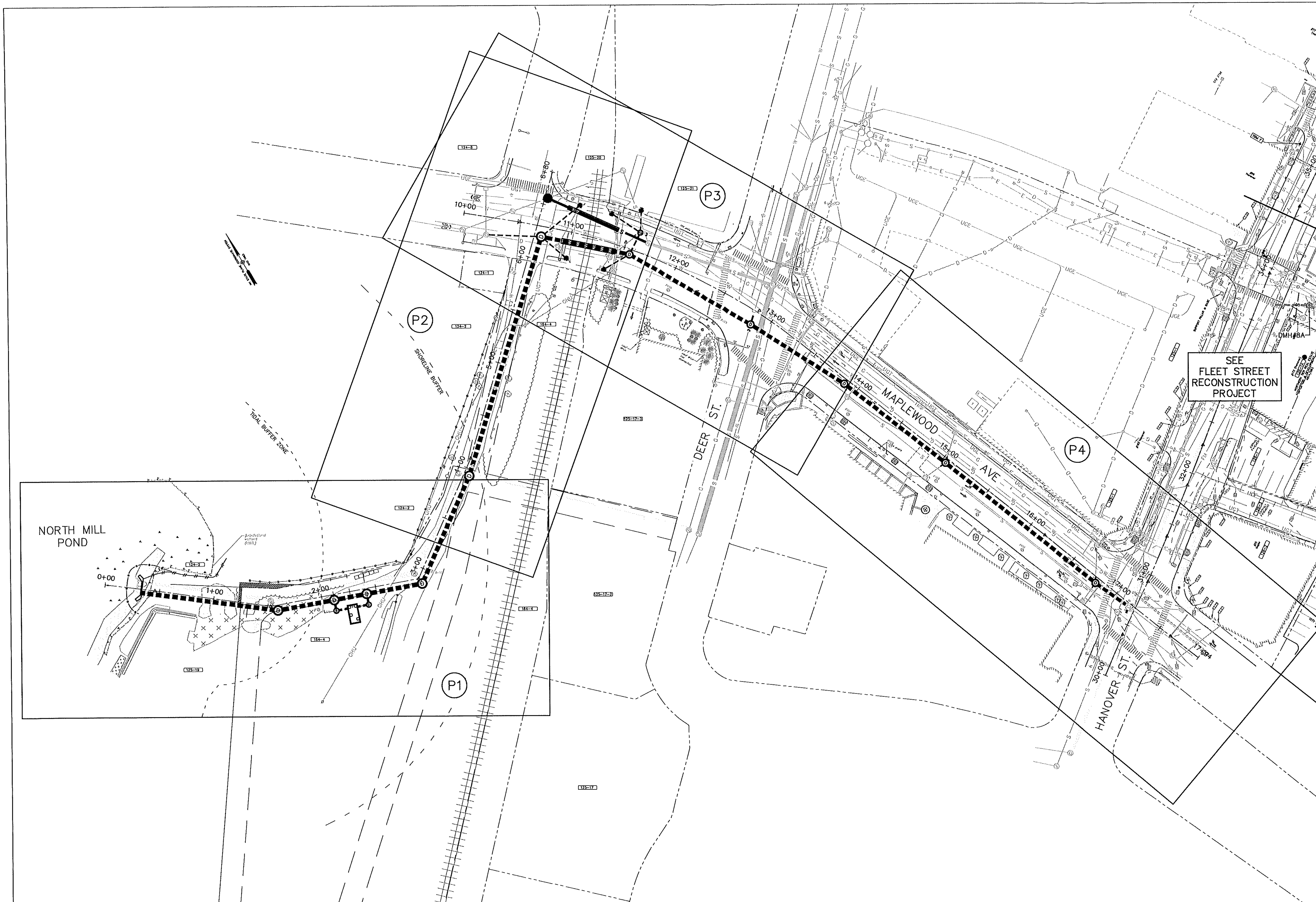
Drawn/Chk RMG
Designed PDM
Checked –
Approved –
Date 1/5/2022
Book No. –
Project No. 2542
Dwg. ID 2542_general_M
Scale

FOR REVIEW
JAN. 2023
NOT FOR CONSTRUCTION

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

LEGEND & ABBREVIATIONS, EXISTING STRUCTURE TABLES
MAPLEWOOD AVE – DRAINAGE INTERCEPT
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO G1



ISSUE FOR

BIDDING	Date –	By –
CONSTRUCTION	Date –	By –
RECORD DRAWING	Date –	By –

NO.	REVISIONS	APP'D

Drawn/Chk. RMG
Designed PDM
Checked –
Approved –
Date 1/26/2022
Book No. –
Project No. 2542
Dwg. ID 2542_prbase_bl
Scale

FOR REVIEW
JAN. 2023
NOT FOR CONSTRUCTION

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

PLAN INDEX

MAPLEWOOD AVE – DRAINAGE INTERCEPT

CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO G2

GENERAL NOTES:

1. THE LINE WORK REPRESENTING THE EXISTING UNOERGROUNO STRUCTURES AND PIPES IS BASEO ON A FIELO SURVEY, TIE SHEETS, ANO OTHER INFORMATION AVAILABLE, INCLUDEO IN THE PROJECT MANUAL APPENDIX. THE ENGINEER/SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGRDUNO UTILITIES SHOWN ON THE PLANS OR THE PROJECT MANUAL APPENDIX CDMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE ENGINEER/SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGRDUND UTILITIES SHDWN ARE IN THE EXACT LOCATION INOICATEO. IN ADDITION, CONTRACTOR SHALL ANTICIPATE THAT EVERY BUILDING OR UNIT WITHIN THE PROJECT AREA HAS A LEAST DNE GAS, SEWER ANO WATER SERVICE EXTENOING FRDM THE MAIN IN THE STREET TD THE BUILDING. THEREFORE THE CONTRACTOR SHOULO CDNSIDER CONFLICTS, HAND EXCAVATION ANO POSSIBLE DELAYS IN CDNSTRUCTION, WHEN PREPARING THEIR BID.

2. THE CONTRACTOR IS RESPONSIBLE FOR THE LOCATION, PROTECTION AND REPAIR (IF DAMAGED) OF ALL EXISTING UTILITY MAINS AND SERVICES. THE LOCATIONS DF KNOWN SEWER, WATER AND GAS, MAINS, SHDWN ON THESE DRAWINGS ARE APPROXIMATE. HOWEVER, WATER ANO SEWER SERVICE LATERALS ARE NOT SHOWN AND THE CDNTRACTDR IS TO ANTICIPATE THEIR EXISTENCE. TIE SHEETS FOR THE KNOWN UTILITIES (INCLUDING GAS AND WATER) ARE PROVIDED IN THE APPENOIX OF THE PROJECT MANUAL. VIOEO LOGS AND SANITARY SURVEYS FOR SEWER LATERALS ARE AVAILABLE FROM THE ENGINEER UPON REQUEST. NOTIFY DIG-SAFE PRIOR TO CDMMENCING CONSTRUCTION (1-8BB-344-7233). CONTRACTOR SHALL GIVE ADEQUATE NOTICE TO THE ENGINEER DF CDNFLICTS OF PROPOSEO WORK WITH MARKED UTILITIES PRIOR TO CONSTRUCTING THE PRDPOSEO WORK.

3. ALL CONFLICTS WITH GAS LINES SHALL BE COORDINATED WITH UNITIL, SUBSIDIARY.

4. THE CONTRACTOR SHALL MAINTAIN SINGLE LANE TRAFFIC AND ACCESS TO BUSINESSES ANO PROPERTIES AT ALL TIMES DURING WORKING HOURS. TRAFFIC CONTROL WARNING DEVICES SHALL BE IN ACCORDANCE WITH MUTCD (LATEST EDITION) REQUIREMENTS AND SECTION 0157D OF THE PROJECT MANUAL.

5. ALL STREET OPENINGS SHALL BE BACKFILLEO AT THE ENO OF EACH DAYS OPERATIONS TO ENSURE SAFE VEHICULAR AND PEOESTRIAN TRAFFIC. THE CONTRACTOR SHALL MAINTAIN SAFE PASSAGE FOR 2-LANES DF TRAFFIC AT THE END OF EACH WDRK DAY. DUST CONTROL OPERATIONS ARE TO BE CONTINUOUS THROUGHOUT CDNSTRUCTION AND IS INCIOENTAL TO THE WORK.

6. THE USE OF PLATES TO COVER OPEN EXCAVATIONS IN LIEU OF BACKFILLING WILL NDT BE PERMITTED UNLESS PRIOR APPROVAL HAS BEEN GRANTED BY THE OWNER.

7. A NPOES PERMIT FOR CONSTRUCTION ACTIVITIES IS REQUIRED FOR THIS PROJECT. THE CONTRACTOR IS REQUIRED TO PREPARE A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) ANO TO SUBMIT A NOTICE OF INTENT (NOI) TO THE EPA TD FULFILL PROJECT REQUIREMENTS. THE SWPPP MUST BE PREPARED IN ACCORDANCE WITH THE EPA'S REQUIREMENTS. NO WORK IS TO PRDCEED UNTIL THE SWPPP AND THE NOI IS SUBMITTED AND ACCEPTED BY THE OWNER. A COPY OF THE NOI, SWPPP REQUIREMENTS, AND EXAMPLE SWPPP ARE INCLUOEO IN THE PROJECT MANUAL APPENDIX.

B. THIS SET OF PLANS HAS BEEN CREATED TO BE USED IN CONJUNCTION WITH A TECHNICAL SPECIFICATION ENTITLED "PROJECT MANUAL, MAPLEWOOO AVENUE – DRAINAGE INTERCEPT, PDRTSMOUTH, NH".

9. THE CONTRACTOR SHALL BE RESPDNSIBLE FOR THE REMOVAL AND OISPOSAL OF ALL SURPLUS EARTHEN MATERIALS, LEDGE, CURB, PIPE, AND SEWER OR DRAIN STRUCTURES EXCAVATEO OURING CONSTRUCTION, UNLESS MATERIALS ARE CLAIMEO BY THE OWNER OR OTHERWISE INOICATED IN THE PROJECT MANUAL OR THE DRAWINGS.

1D. THE CONTRACTOR SHALL BE RESPDNSIBLE FOR ALL PROPERTY RESTORATION BOTH PUBLIC AND PRIVATE. UTILITIES DAMAGED AS A RESULT OF THE CDNTRACTORS DPERATIONS SHALL BE REPAIRED BY THE CDNTRACTOR AT NO ADDITIONAL COST TO THE OWNER.

11. PAVING REPAIRS SHALL MAINTAIN EXISTING LINE ANO GRAOE UNLESS OTHERWISE INDICATED OR DIRECTED.

12. OVERHEAO WIRES AND WIRE DROPS TO BUILOINGS ARE NOT SHOWN IN ENTIRETY. THE CONTRACTOR SHALL ANTICIPATE THEIR EXISTENCE IN ALL OPERATIONS.

13. THE CDNTRACTOR SHALL BE RESPDNSIBLE FOR MAINTENANCE OF ROADWAY SIGNS. ANY SIGN DAMAGED DURING THE CDMPLETION OF WORK SHALL BE REPLACEO AT NO ADDITIONAL COST TO THE OWNER.

14. AREAS OUTSIDE THE LIMITS DF PRDPOSED WORK DISTURBED BY THE CDNTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR DRIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.

15. CONTRACTOR SHALL NOT USE ANY ADJACENT ORIVEWAYS OR PARKING LOTS WITHOUT WRITTEN PERMISSION FDR PROPERTY OWNER. OAMAGE RESULTING FRDM CDNSTRUCTION LOADS OUTSIDE PRDPDSED LIMITS OF WORK SHALL BE REPAIREO BY THE CONTRACTOR AT NO ADDITIONAL COST TO OWNER.

16. EXISTING PROPERTY LINE MONUMENTATION DISTURBED DURING CDNSTRUCTION SHALL BE SET OR RESET BY A LICENSED LAND SURVEYOR (LLS), SUBSIOIARY.

REFERENCE PLANS:

1. PORTWALK SITE PLAN, PREPARED BY APPLEOORE ENGINEERS INC., DATE/LAST REVISED 3/5/201D.
2. 195 HANOVER STREET AS BUILT, PREPARED BY S.U.R., OATE/LAST REVISED 7/21/2015.
3. PORTWALK AS BUILT, PREPARED BY MSC, DATE/LAST REVISEO 9/15/2015.

SURVEY NOTES:

1. THIS PLAN IS BASED ON A FIELO SURVEY BY JAMES VERRA AND ASSOCIATES, INC. 12/2019-6/2D22. DN SITE CONTROL ESTABLISHED USING SURVEY GRADE GPS UNITS.
HORIZONTAL DATUM: NAD 19B3 (1986 AOJUSTMENT)
PRIMARY BM: NHDDT 379-D15D (PORTSMOUTH TRAFFIC CIRCLE)
VERTICAL OATUM: NAVD 19BB
PRIMARY BM: CITY CONTROL POINT "ALBA"

2. CONTRACTOR TO VERIFY SITE BENCHMARKS BY LEVELING BETWEEN 2 BENCHMARKS PRIOR TO THE SETTING OR ESTABLISHMENT OF ANY GRADES/ELEVATIONS. DISCREPANCIES ARE TO BE REPORTED TO JAMES VERRA ANO ASSOC., INC.

3. THE LOCATION DF ALL UNOERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE ANO ARE BASED UPON THE FIELD LDCATION OF ALL VISIBLE STRUCTURES (IE CATCH BASINS, MANHOLES, WATER GATES ETC.) AND INFORMATION COMPILED FROM PLANS PRDVIDED BY UTILITY COMPANIES AND GDVERNMENTAL AGENCIES. ALL CONTRACTDRS SHOULD NOTIFY, IN WRITING, SAID AGENCIES PRIOR TO ANY EXCAVATIDN WORK AND CALL DIG-SAFE @ 1-BBB-OIG-SAFE.

NOTE: VERY LITTLE UNDERGROUND UTILITY MARKING WAS COMPLETEO PRIOR TO CONDUCTING THE FIELD SURVEY.

SANITARY SEWER NOTES:

1. ALL NEW SEWER SERVICE LATERALS SHALL BE 6" OIAMETER, UNLESS OIRECTED OTHERWISE. PRIOR TO CONSTRUCTION OF NEW SEWER MAINS IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY EXACT SEWER SERVICE LOCATIONS, SIZES, AND ELEVATIDNS, BY VIOEO INSPECTION WITH TRANSMITTER AND LOCATOR, PAY ITEM 1.1B. SEWER LATERALS SHALL BE INSTALLED TO THE PROPERTY LINE (UNLESS SHOWN DTHERWISE ON THE DRAWINGS). ANY SERVICE WORK EXTENOING PAST THE PRDPERTY LINE SHALL BE APPROVED BY THE PROPERTY OWNER, THE CITY, AND THE ENGINEER PRIOR TO CDNSTRUCTION. MIN. SLOPE OF SERVICE PIPE = SHALL BE D.D2 FT/FT.

2. WORK ON PRIVATE PROPERTY SHALL BE COORDINATED WITH THE CITY AND THE PROPERTY OWNER.

3. SEWER CDNSTRUCTION SHALL PRDCEEO FROM THE LOWEST POINT UPWARO UNLESS OTHERWISE APPRDVEO BY THE ENGINEER.

4. SMH RIMS SHALL BE SET 1/B" TO 1/4" BELOW GRADE WHEN IN PAVEMENT OR GRAVEL ROADS (I.E., PLDWED AREAS). RIMS SHALL BE SET AT GRAOE IN NON-PLOWED AREAS UNLESS DTHERWISE INDICATED.

5. ALL EXISTING SEWER STRUCTURES (PIPE ANO MANHOLES) TO BE ABANDONEO SHALL BE PREPAREO AS FOLLOWS:

MANHOLES – SHALL BE REMOVED TO A MINIMUM OEPTH OF 4' BELOW GRADE. THE BASE OF STRUCTURES SHALL BE FILLED WITH FLOWEILL OR GRAVEL, COMPACTED IN B" LIFTS, SUBSIOIARY, UNLESS OTHERWISE PAIO FOR.
PIPE – ALL PIPE TO BE ABANOONEO IN PLACE AND SHALL BE CUT & PLUGGED AT BOTH ENDS, SUBSIDIARY. PIPES EXCEEDING 12-INCH DIAMETER, TO BE ABANDONED, WILL BE FILLEO WITH FLOWABLE FILL (WHERE OIRECTEO BY ENGINEER) ANO PAIO FOR UNOER ITEM 1.11.

6. IN ORDER OF PREFERENCE SEWER SERVICE CLEANOUTS SHALL BE PLACED:
1) BEHIND CDNCRETE SIDEWALKS.
2) IN BRICK STRIP.
3) IN CDNCRETE SIDEWALKS.

7. ALL SEWER PIPE SHALL BE SDR 35 PVC UNLESS SHOWN OTHERWISE ON THE DRAWINGS.

DRAINAGE SYSTEM NOTES

1. IN GENERAL, NEW CB'S WILL BE SET AT THE LOCATIONS SHOWN. EXISTING CB STRUCTURES ARE TO BE REMOVED. (SUBSIDIARY). ALL FRAMES ANO GRATES SHALL BE OELIVERED TO THE PORTSMOUTH DPW (SUBSIOIARY). ALL NEW CATCH BASIN RIMS SHALL BE SET 1/2" BELOW FINISH GRAOE ELEVATION. REMOVAL OF CB'S OUTSIDE NORMAL EXCAVATION LIMITS WILL BE PAIO AS ITEM 202.5.

2. MANHOLE AND CATCH BASIN BASES, RISERS, CONE SECTIONS, AND SLAB TOPS SHALL BE DESIGNED SUCH THAT THERE EXISTS A MINIMUM 6" PERIPHERY OF MONOLITHIC SOLID WALL SEPARATION BETWEEN OPENINGS (CORINGS ANO SECTIONS).

3. ALL CATCH BASINS, DRAIN MANHOLES, & ORAIN LINES SHALL BE CLEANED PRIDR TO ACCEPTANCE.

4. ALL REQUIRED STORM DRAIN SERVICES MAY NOT BE SHOWN ON THE PLANS, AND SHALL BE PRDVIDED WHERE DIRECTED BY THE ENGINEER.

5. OMH RIMS SHALL BE SET 1/B" TO 1/4" BELOW GRAOE WHEN IN PAVEMENT OR GRAVEL ROADS (I.E., PLOWED AREAS). RIMS SHALL BE SET AT GRAOE IN NON-PLOWED AREAS UNLESS OTHERWISE INOICATED.

6. LOCATIONS OF NEW ORAIN SERVICES ARE BASEO ON EXISTING ROOF LEAOERS OBSERVED. ACTUAL LOCATION AND CDNFIGURATION MAY CHANGE BASED ON FINAL REVIEW WITH PRDPERTY OWNER DURING CDNSTRUCTION.

WATER DISTRIBUTION SYSTEM NOTES:

1. THE CONTRACTOR SHALL MAINTAIN AND PROTECT THE EXISTING WATER SYSTEM AT ALL TIMES. LOCATE ANO IDENTIFY ALL EXISTING MAINS ANO SERVICE LDCATIDNS IN AOVANCE.

2. WATER BOXES, OR OTHER CASTINGS, DISTURBED OR RELOCATED BY CDNSTRUCTION ACTIVITIES SHALL BE ADJUSTED TO EXISTING LINE AND GRADE, UNLESS SHOWN OTHERWISE ON THESE PLANS OR AS DIRECTED BY THE ENGINEER (SUBSIDIARY).

CONSTRUCTION SEQUENCE:

PERFDRM WDRK IN ACCOROANCE WITH APPROVED SCHEDULE, GENERALLY ACCEPTED INDUSTRY OROER OF OPERATIONS UNLESS OTHERWISE APPROVED IN WRITING BY THE ENGINEER.

1. PRIOR TD THE START DF CONSTRUCTION PROVIOE A WRITTEN NARRATIVE OF THE CONSTRUCTION METHOOS TO BE USEO ANO INCLUOE A PRELIMINARY SCHEDULE DF KEY MILESTONES, INCLUOING COOROINATION OF UTILITY PIPE INSTALLATIONS ANO COORDINATION WITH GAS COMPANY, ANO OTHER UTILITIES AS APPLICABLE.

2. REFER TO SECTION D1O1D (SUMMARY OF WDRK) AND SECTION POW (PRDSECUTION OF WORK) FOR AODITIONAL SCHEOULE ANO PROJECT REQUIREMENTS.

3. INSTITUTE EXPLORATORY EXCAVATION PROGRAM WITH ENGINEER TO IDENTIFY POTENTIAL CONFLICTS AT UTILITY CROSSINGS. EXPLORATORY EXCAVATION COMPLETED WITHOUT PRIOR APPROVAL FROM THE ENGINEER WILL BE AT NO ADDITIONAL COST TO THE OWNER.

4. INSTALL ANO MAINTAIN TEMPORARY ANO PERMANENT EROSION CONTROL DEVICES THROUGHOUT THE CONSTRUCTION PERIOD (INCLUOING WINTER SHUT DOWN PERIODS AS REQUIRED) AS SHOWN IN THE APPROVEO SWPPP, DN THE DRAWINGS, DR AS APPROVED BY THE ENGINEER.

5. PRE-DRAIN AND/OR OEWATER EXCAVATIONS BEFORE INSTALLING PIPE. INSTALL PIPE DN STABLE BEDDING (IN DRY CONOITIONS) TO THE ELEVATIONS SHOWN ON DRAWINGS.

6. DISPOSE DF SURPLUS ANO UNSUITABLE MATERIALS AS THE WORK PROGRESSES. STOCKPILE DF MATERIALS WILL ONLY BE PERMITTED IN AREAS APPROVEO BY THE CITY DF PDRTSMOUTH, DPW.

7. INSTALL CRUSHED GRAVEL OR RECLAIMED BASE AS SHOWN ON DRAWINGS, IN TRENCH AT ENO OF EACH DAY. VISUAL INSPECTION, ALIGNMENT TESTS AND DEFLECTION TESTS OF PIPES SHALL BE COMPLETEO NO LESS THAN THIRTY (3D) DAYS FOLLOWING INSTALLATION. CONSTRUCT PAVEMENT REPAIRS AS SOON AS PRACTICAL, FOLLOWING UTILITY INSTALLATIONS AND TESTING.

B. IMMEDIATELY STABILIZE OISTURBED AREAS AFTER PIPE INSTALLATION ANO REESTABLISH TEMPORARY EROSION CONTROL DEVICES MOVED DURING CONSTRUCTIDN.

9. FINISH GRAOING, LOAM AND SEED DISTURBEO AREAS ANO BACK UP PAVEMENT WITH GRAVEL IMMEDIATELY FOLLOWING PAVEMENT REPAIRS.

1D. REMOVE ALL TEMPORARY EROSION CONTROL DEVICES AS SOON AS VEGETATIDN IS ESTABLISHED ANO AREAS ARE STABILIZEO.

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RECORD DRAWING	–	–

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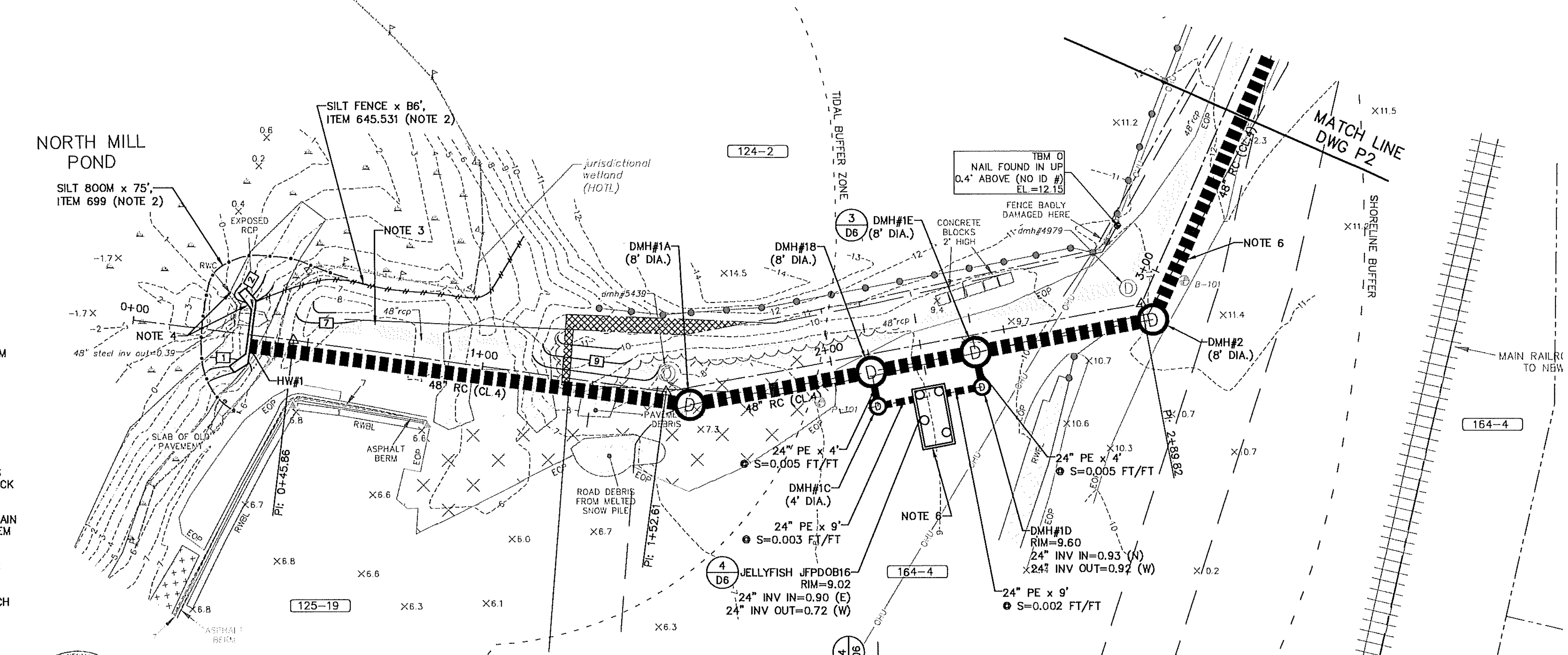
FOR REVIEW
JAN. 2023
NOT FOR CONSTRUCTION

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

UTILITY PLAN NOTES
MAPLEWOOD AVE – DRAINAGE INTERCEPT
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO G3



NORTH MILL POND AREA PLAN VIEW

SCALE: 1 INCH = 20 FT.

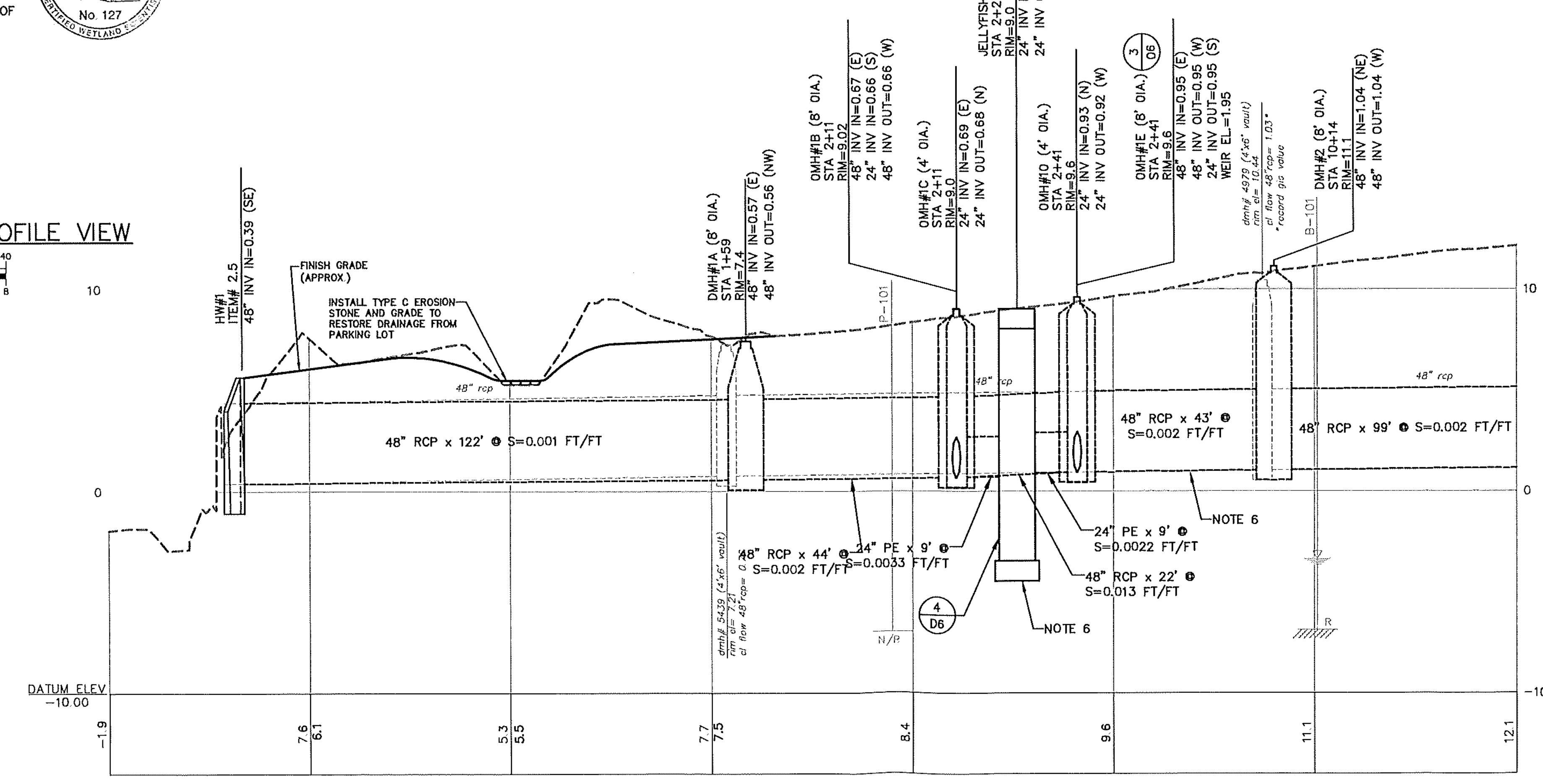
DRAINAGE OUTFALL NOTES:

1. CONSTRUCT DRAINAGE OUTFALL AND HEADWALL IN ACCORDANCE WITH PERMIT CONDITIONS, DRAWINGS AND SPECIFICATIONS.
2. INSTALL SILT BOOM AND SET ANCHORS TO KEEP SILT BOOM IN PLACE DURING TIDAL FLUCTUATIONS, ITEM 699. INSTALL SILT FENCE, ITEM 645.531. MAINTAIN EROSION CONTROLS THROUGH CONSTRUCTION, PREVENT DEGRADATION OF DOWNSTREAM PROPERTIES AND TIDAL WETLANDS.
3. MAINTAIN FLOW IN THE EXISTING 48" DRAIN PIPE THROUGHOUT CONSTRUCTION, SUBSIDIARY.
4. REMOVE EXISTING HEADWALL AND INSTALL PRE-CAST HEADWALL DURING LOW WATER AND LOW FLOW CONDITIONS OR INSTALL SHEETING AND PUMP SYSTEM TO CONTROL BACK WATER, PAY AS ITEM 2.5.
5. INSTALL TIDE VALVES AND PREVENT BACK WATER INTO DRAIN PIPES DURING CONSTRUCTION OF DRAIN PIPES, PAY AS ITEM 2.6.
6. MAINTAIN GROUND WATER ELEVATION BELOW PIPE INVERTS AND BOTTOM OF JELLYFISH UNIT SO INSTALLATION IS COMPLETED IN THE DRY. GROUND WATER MAY VARY SEE B-101, APPENDIX A FOR OBSERVED GROUND WATER, MARCH 2022. GROUND WATER DISCHARGE SHALL BE FILTERED THROUGH A CONTROLLED SYSTEM IN ACCORDANCE WITH CONTRACTORS SWPPP, PAY AS ITEM 2.2.
7. THOMAS SOKOLOSKI, CERTIFIED WETLAND SCIENTIST #127, OF TES ENVIRONMENTAL CONSULTANTS, L.L.C. OF BOW, NH, PERFORMED THE WETLAND IDENTIFICATION AND DELINEATION ON JUNE 28, 2022 ACCORDING TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL AND THE REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: NORTHCENTRAL AND NORTHEAST REGION, VERSION 2.0, JANUARY 2012, US ARMY CORPS OF ENGINEERS.

STATE OF NEW HAMPSHIRE — THOMAS E. SOKOLOSKI — No. 127 — CERTIFIED WETLAND SCIENTIST

NORTH MILL POND AREA PROFILE VIEW

HORIZ: 1 INCH = 20 FT.
VERT: 1 INCH = 4 FT.



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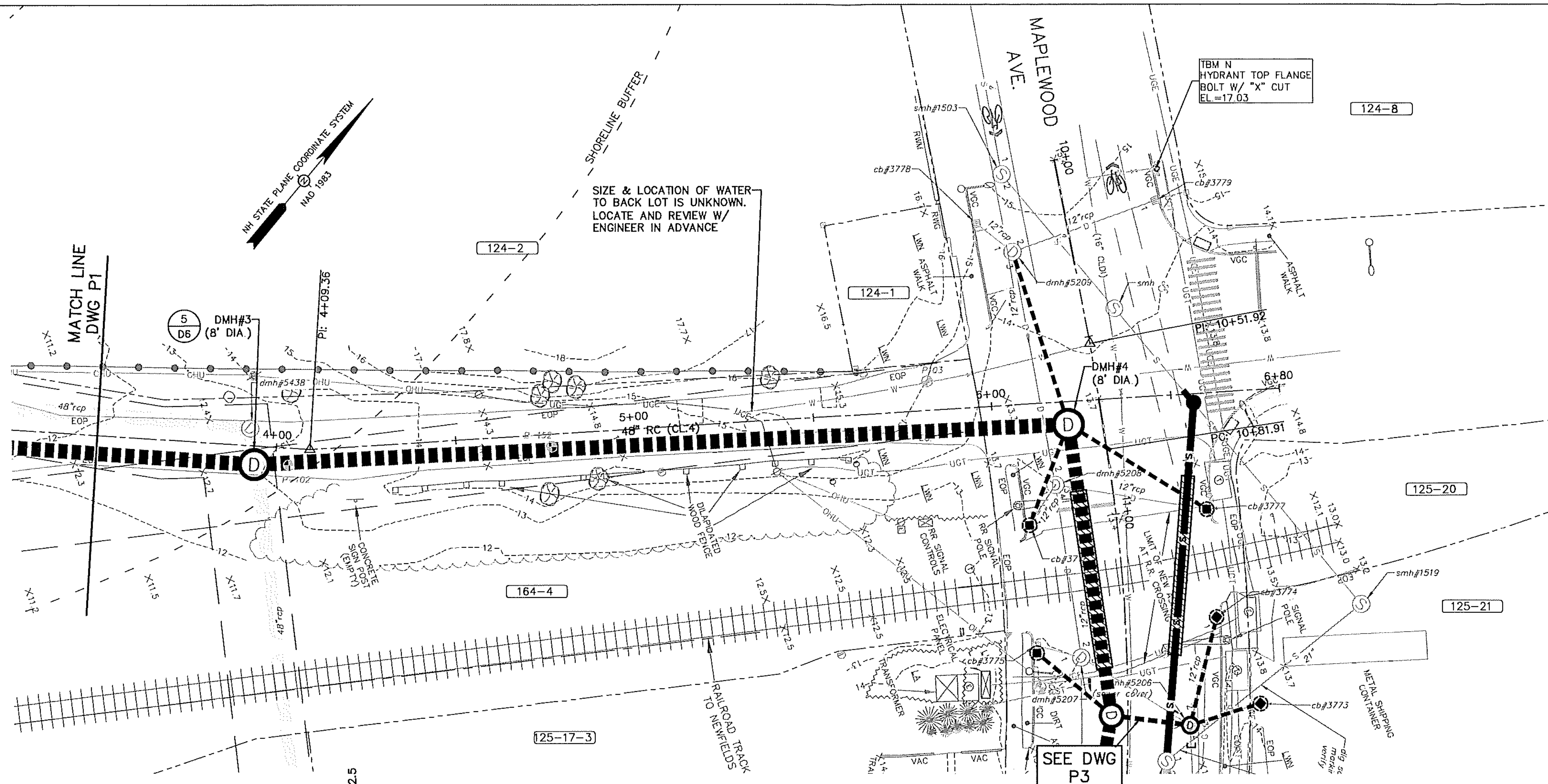
UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

NORTH MILL POND DRAINAGE OUTFALL PIPE PLAN AND PROFILES

MAPLEWOOD AVE – DRAINAGE INTERCEPT

CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO P1 | SHEET 5 OF 14

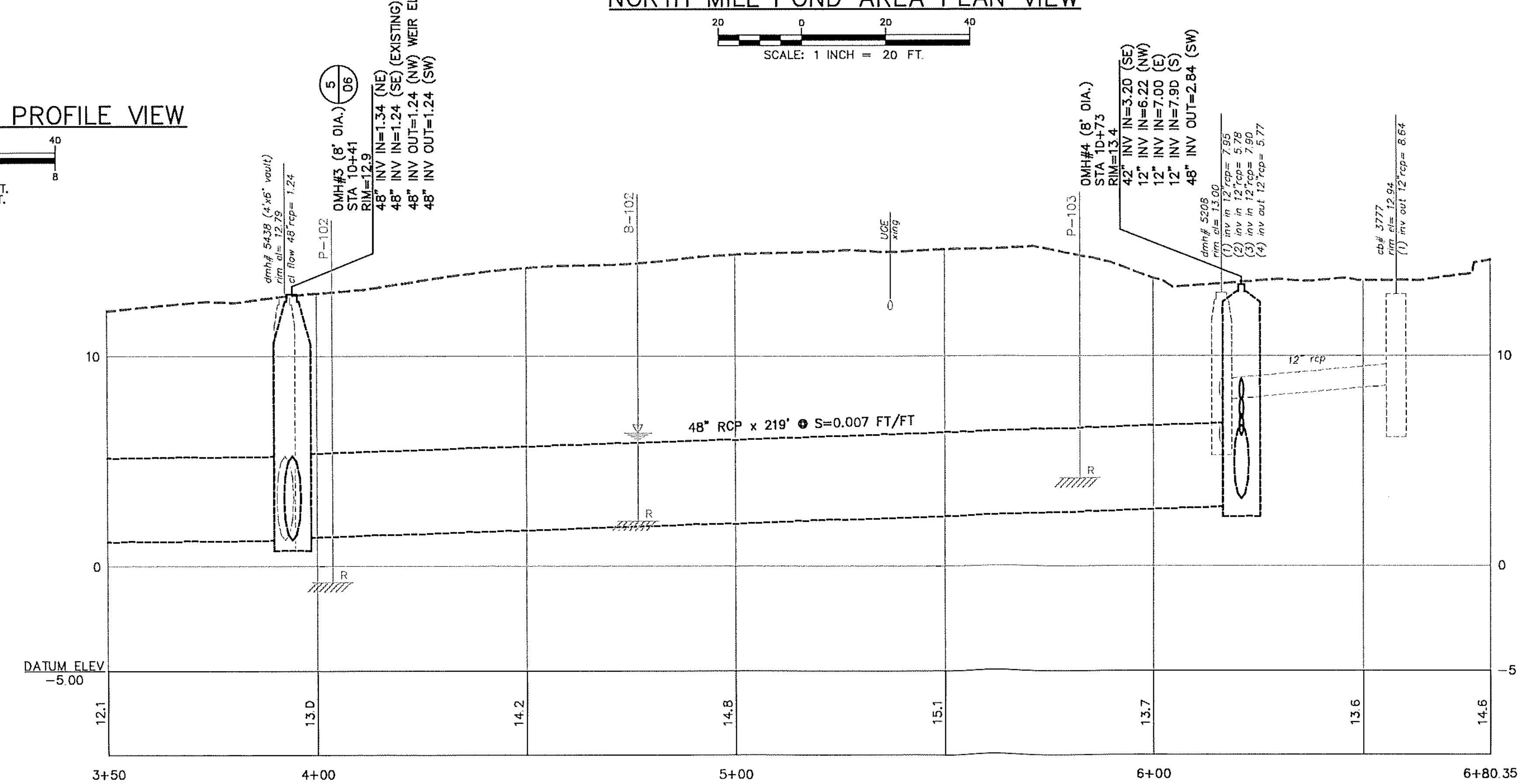


NORTH MILL POND AREA PLAN VIEW

SCALE: 1 INCH = 20 FT.

NORTH MILL POIND AREA PROFILE VIEW

HORIZ: 1 INCH = 20 FT.
VERT: 1 INCH = 4 FT.



NORTH MILL POND AREA
PIPE PLAN AND PROFILES

MAPLEWOOD AVE – DRAINAGE INTERCEPT

CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

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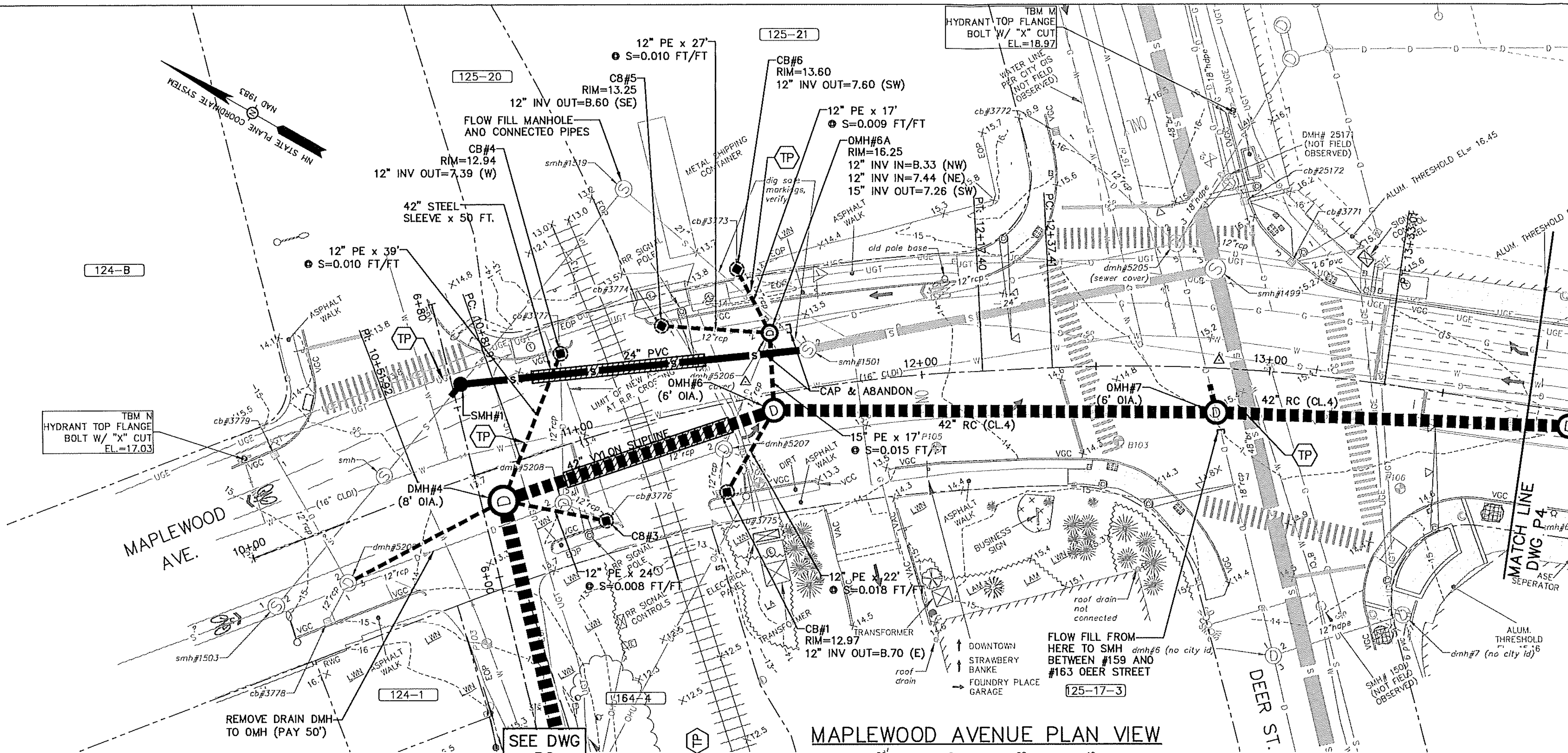
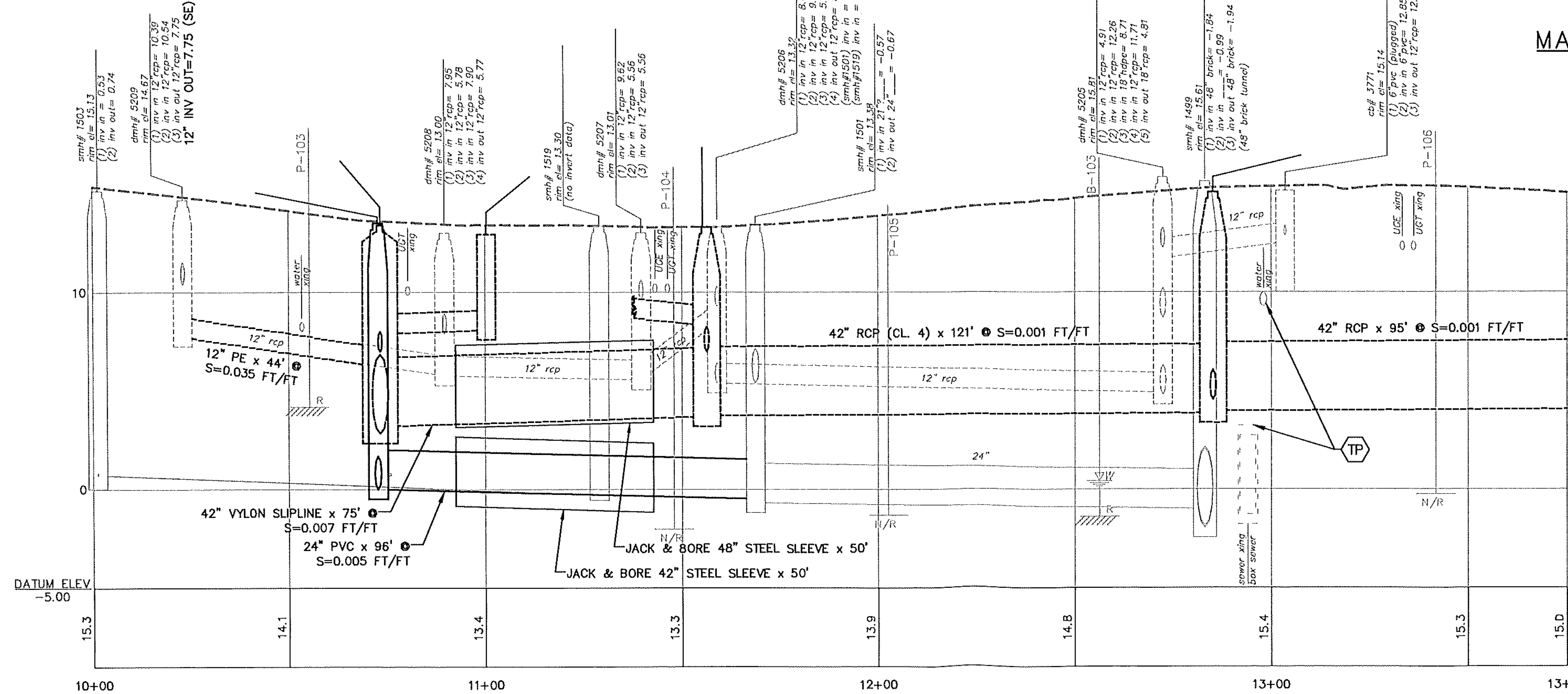


MAPLEWOOD AVENUE PLAN VIEW

SCALE: 1 INCH = 20 FT.

MAPLEWOOD AVENUE PROFILE VIEW

HORIZ: 1 INCH = 20 FT.
VERT: 1 INCH = 4 FT.



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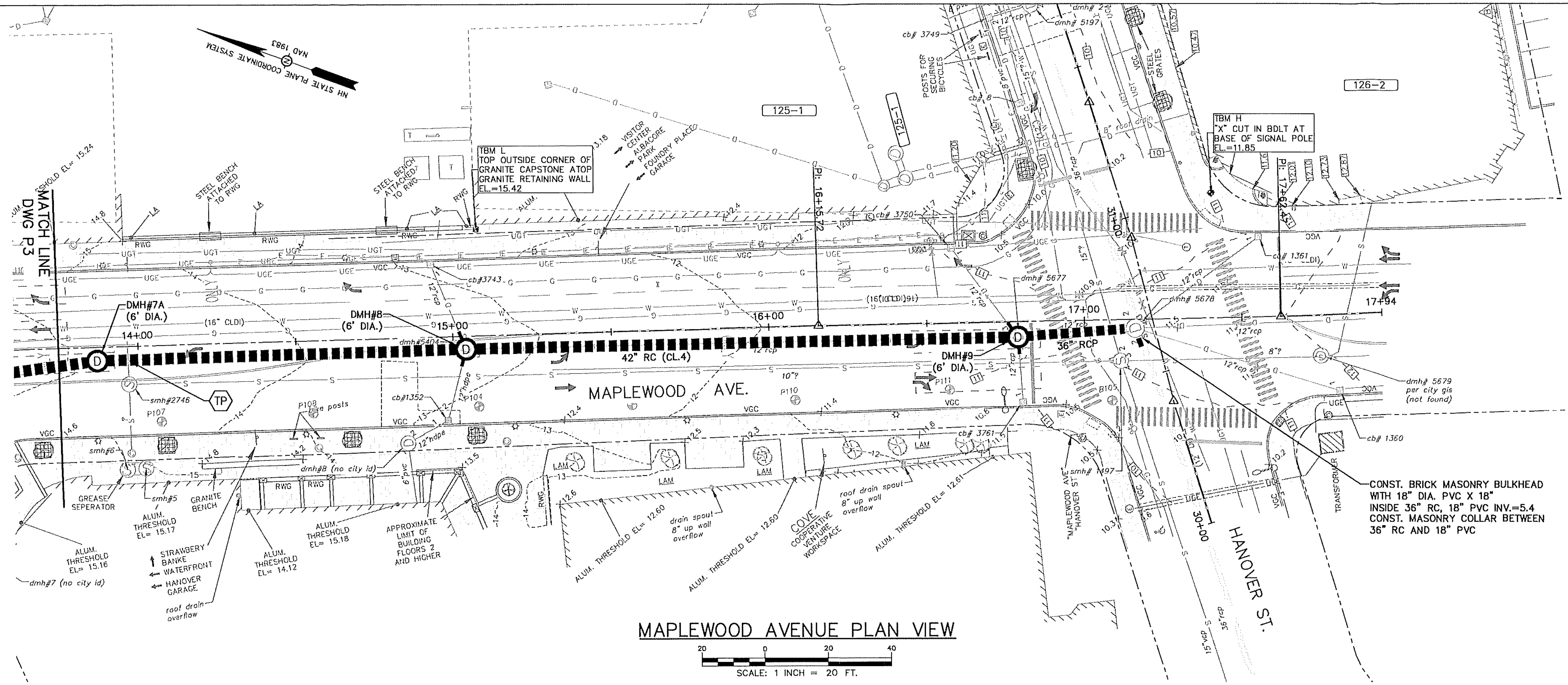
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

MAPLEWOOD AVENUE PIPE PLAN AND PROFILES

MAPLEWOOD AVE – DRAINAGE INTERCEPT

CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO P3

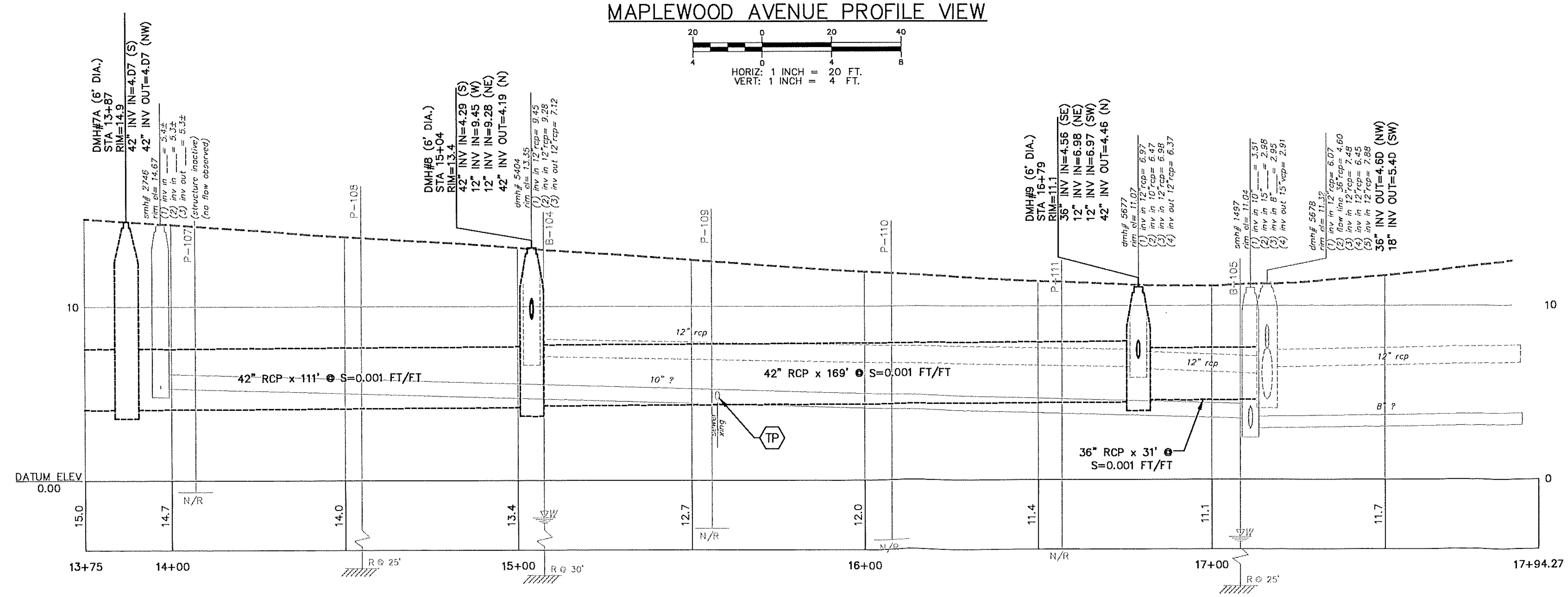


MAPLEWOOD AVENUE PLAN VIEW

SCALE: 1 INCH = 20 FT.

MAPLEWOOD AVENUE PROFILE VIEW

HORIZ: 1 INCH = 20 FT.
VERT: 1 INCH = 4 FT.



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25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

MAPLEWOOD AVENUE PIPE PLAN AND PROFILES

MAPLEWOOD AVE – DRAINAGE INTERCEPT

CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO P4

STANDARD MANHOLE NOTES:

1. GENERAL: SEWER MANHOLES, INCLUDING ALL COMPONENT PARTS, SHALL BE ASSEMBLED OF PRECAST SECTIONS, WITH STEEL REINFORCEMENT. IN ANY APPROVED MANHOLE, THE COMPLETE STRUCTURE SHALL BE OF SUCH MATERIAL AND QUALITY AS TO WITHSTAND LOADS OF 8 TONS (H20 LOADING) WITHOUT FAILURE, AND TO PREVENT LEAKAGE IN EXCESS OF ONE GALLON PER DAY PER VERTICAL FOOT OF MANHOLE, CONTINUOUSLY FOR THE LIFE OF THE STRUCTURE. A PERIOD GENERALLY IN EXCESS OF 25 YEARS IS TO BE UNDERSTOOD IN BOTH CASES.

2. BARRELS AND CONE SECTIONS: SHALL BE PRECAST REINFORCED CONCRETE.

3. PRECAST CONCRETE: BARREL SECTIONS, CONES, AND BASES SHALL CONFORM TO ASTM C478.

4. LEAKAGE TEST: SHALL BE PERFORMED IN ACCORDANCE WITH THE SPECIFICATIONS. INVERT AND SHELF TO BE PRIOR TO BACKFILL PLACED AFTER TESTING.

5. INVERTS AND SHELVES: MANHOLES SHALL HAVE A BRICK PAVED SHELF AND INVERT, CONSTRUCTED TO CONFORM TO THE SIZE OF PIPE AND FLOW. CARE SHALL BE TAKEN TO INSURE THAT THE BRICK INVERT IS A SMOOTH CONTINUATION OF THE SEWER INVERT. INVERT BRICKS SHALL BE LAID ON EDGE. AT CHANGES IN DIRECTION, THE INVERTS SHALL BE LAID OUT IN CURVES OF THE LONGEST POSSIBLE TANGENT TO THE CENTER LINE OF THE SEWER PIPES. SHELVES SHALL BE CONSTRUCTED TO AN ELEVATION OF 1" ABOVE THE HIGHEST PIPE CROWN AND SLOPE TO DRAIN TOWARD THE FLOWING THROUGH CHANNEL. UNDERLAYMENT OF INVERT AND SHELF SHALL CONSIST OF BRICK MASONRY.

6. FRAMES AND COVERS: MANHOLE FRAMES AND COVERS SHALL BE CITY OF PORTSMOUTH STANDARD AND SHALL BE PICKED UP BY THE CONTRACTOR AT PORTSMOUTH DPW.

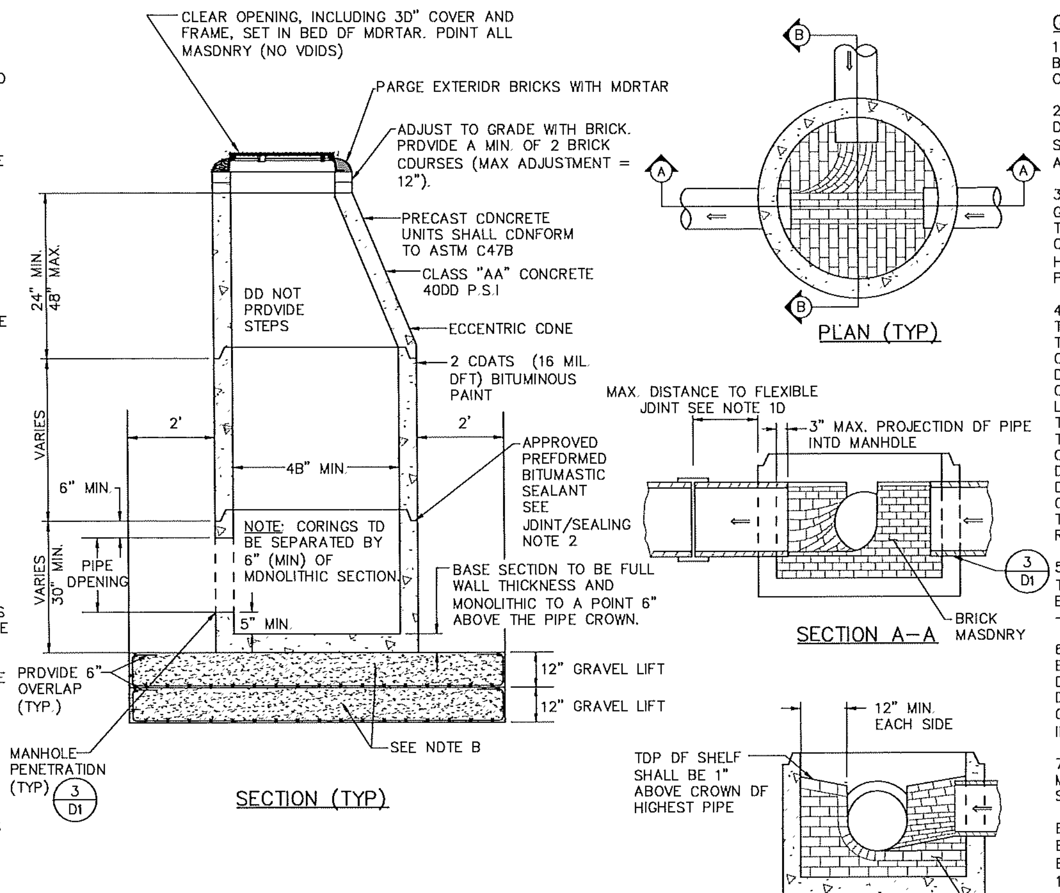
7. BEDDING: SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATTER AND MEETING ASTM C33. STONE SIZE NO. 67.
   - 100% PASSING 1 INCH SCREEN
   - 90-100% PASSING 3/4 INCH SCREEN
   - 20-55% PASSING 3/8 INCH SCREEN
   - 0-10% PASSING #4 SIEVE
   - 0-5% PASSING #8 SIEVE

8. WHERE THE MATERIAL BELOW MANHOLE STRUCTURE IS SOFT OR YIELDING, AND WHERE DIRECTED BY THE ENGINEER, INSTALL DOUBLE LAYER OF GEOGRID (TENSAR TX160 OR EQUAL). PAY AS ITEM 1.8B (LFx2).

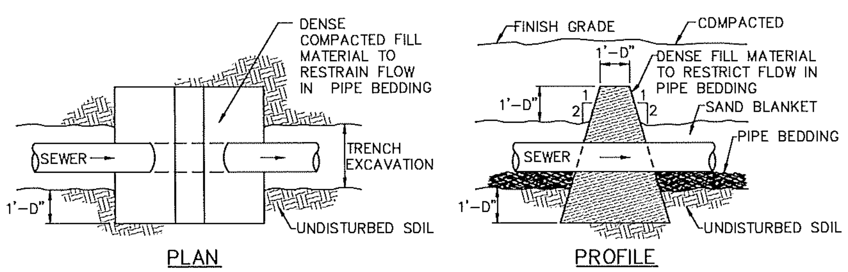
9. SHALLOW MANHOLE: IN LIEU OF A CONE SECTION, WHEN MANHOLE IS LESS THAN 6 FEET, A REINFORCED CONCRETE SLAB COVER HAVING AN ECCENTRIC ENTRANCE AND CAPABLE OF SUPPORTING H-20 LOADS MAY BE USED.

10. FLEXIBLE JOINT: A FLEXIBLE JOINT SHALL BE PROVIDED WITHIN THE FOLLOWING DISTANCES:
    - RCP AND CI PIPE – ALL SIZES – 48"
    - AC AND VC PIPE – UP THROUGH 12" DIA. – 18"
    - AC AND VC PIPE – LARGER THAN 12" DIA. – 36"
    - DI PIPE – NONE REQUIRED
    - PVC – UP THROUGH 15" DIA. – NONE REQUIRED
    - PVC – LARGER THAN 15" DIA. – 48"/60"
    - ABS (ASTM D2680) – ALL SIZES – SAME AS VC ABOVE.

11. SPECIFICATIONS: ADDITIONAL CONSTRUCTION SPECIFICATIONS ARE INCLUDED IN THE CONTRACT DOCUMENTS. THESE STANDARD MANHOLE DRAWINGS ARE NOT COMPLETE WITHOUT THESE SPECIFICATIONS.



1 SEWER MANHOLE
D1 NOT TO SCALE



NOTES:
1. TRENCH DRAINS TO BE AT LOCATIONS SHOWN ON THE PLAN OR AS DIRECTED TO CONTROL BACK WATER IN STONE BEDDING, SUBSIDIARY.

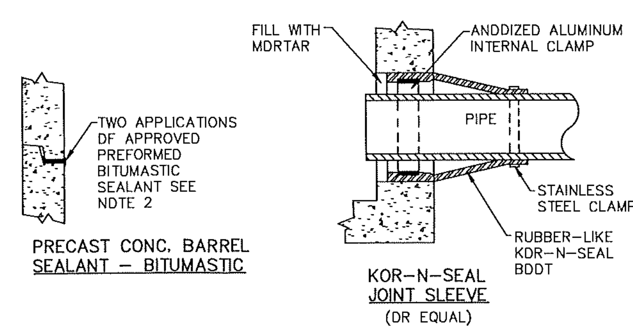
4 TRENCH DAM
D1 NOT TO SCALE

JOINTING AND SEALING NOTES

1. PIPE TO MANHOLE JOINTS SHALL BE ONLY AS APPROVED BY THE ENGINEER AND IN GENERAL, WILL DEPEND UPON AN ELASTOMERIC SEALANT FOR WATERTIGHTNESS.

2. FOR BITUMASTIC TYPE JOINTS THE AMOUNT OF SEALANT SHALL BE SUFFICIENT TO FILL AT LEAST 75% OF THE JOINT CAVITY. APPROVED BITUMASTIC SEALANTS: RAM-NEK E Z KENT SEAL NO.2

3. ALL GASKETS, SEALANTS, MORTAR, ETC., SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS WRITTEN INSTRUCTIONS.



3 MANHOLE PENETRATIONS
D1 NOT TO SCALE

GRAVITY SEWER TRENCH NOTES:

1. ORDERED EXCAVATION OF UNSUITABLE MATERIAL BELOW GRADE: BACKFILL AS STATED IN THE TECHNICAL SPECIFICATIONS OR AS SHOWN ON THE DRAWINGS.

2. BEDDING: SEE NOTE 7 OF STANDARD MANHOLE NOTES. WHERE ORDERED BY THE ENGINEER TO STABILIZE THE TRENCH BASE, GRADED SCREENED GRAVEL OR CRUSHED STONE 1/2 INCH TO 1-1/2 INCH AND/OR THE USE OF GEOGRID FABRIC (ITEM 1.8B) MAY BE REQUIRED.

3. SAND BLANKET: CLEAN SAND FREE FROM ORGANIC MATTER, SO GRADED THAT 90-100% PASSES A 1/2 INCH SIEVE AND NOT MORE THAN 15% WILL PASS A #200 SIEVE. BLANKET MAY BE OMITTED FOR CAST-IRON, DUCTILE IRON, AND REINFORCED CONCRETE PIPE PROVIDED HOWEVER, THAT NO STONE LARGER THAN 2" IS IN CONTACT WITH THE PIPE.

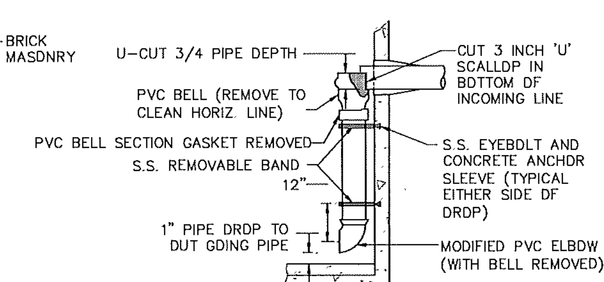
4. SUITABLE MATERIAL: IN ROADS, ROAD SHOULDERS, WALKWAYS AND TRAVELED WAYS, SUITABLE MATERIAL FOR TRENCH BACKFILL SHALL BE THE NATURAL MATERIAL EXCAVATED DURING THE COURSE OF CONSTRUCTION, BUT SHALL EXCLUDE DEBRIS; PIECES OF PAVEMENT; ORGANIC MATTER; TOP SOIL; ALL WET OR SOFT MUCK, PEAT, OR SOFT CLAY; ALL EXCAVATED LEDGE MATERIAL; ALL ROCKS OVER 6 INCHES IN LARGEST DIMENSION; AND ANY MATERIAL WHICH, AS DETERMINED BY THE ENGINEER, WILL NOT PROVIDE SUFFICIENT SUPPORT OR MAINTAIN THE COMPLETED CONSTRUCTION IN A STABLE CONDITION. IN CROSS-COUNTRY CONSTRUCTION, SUITABLE MATERIAL SHALL BE AS DESCRIBED ABOVE, EXCEPT THAT THE ENGINEER MAY PERMIT THE USE OF TOP SOIL, LOAM, MUCK, OR PEAT, IF HE IS SATISFIED THAT THE COMPLETED CONSTRUCTION WILL BE ENTIRELY STABLE AND PROVIDED THAT EASY ACCESS TO THE SEWER, FOR MAINTENANCE AND POSSIBLY RECONSTRUCTION, WILL BE PRESERVED.

5. BASE COURSE AND PAVEMENT SHALL MEET THE REQUIREMENTS OF THE NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION'S LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES – DIVISIONS 300 AND 400 RESPECTIVELY.

6. W = MAXIMUM ALLOWABLE TRENCH PAYMENT WIDTH FOR ROCK EXCAVATION, FOR ORDERED EXCAVATION BELOW GRADE AND HANDLING OF EXCAVATED CONTAMINATED SOILS. FOR PIPES 15 INCHES NOMINAL DIAMETER OR LESS, W SHALL BE NO MORE THAN 36 INCHES. FOR PIPES GREATER THAN 15 INCHES IN NOMINAL DIAMETER, W SHALL BE 24 INCHES PLUS PIPE OUTSIDE DIAMETER (O.D.)

7. FOR CROSS COUNTRY CONSTRUCTION, BACKFILL OR FILL SHALL BE MOUNDED TO A HEIGHT OF 6 INCHES ABOVE THE ORIGINAL GROUND SURFACE.

8. WHERE TRENCH BOTTOM IS SOFT OR YIELDING, AND WHERE DIRECTED BY THE ENGINEER, INSTALL SINGLE LAYER OF GEOGRID (TX160 OR EQUAL) ACROSS THE ENTIRE WIDTH OF TRENCH BOTTOM. PAY AS ITEM 1.8A (L.F.).

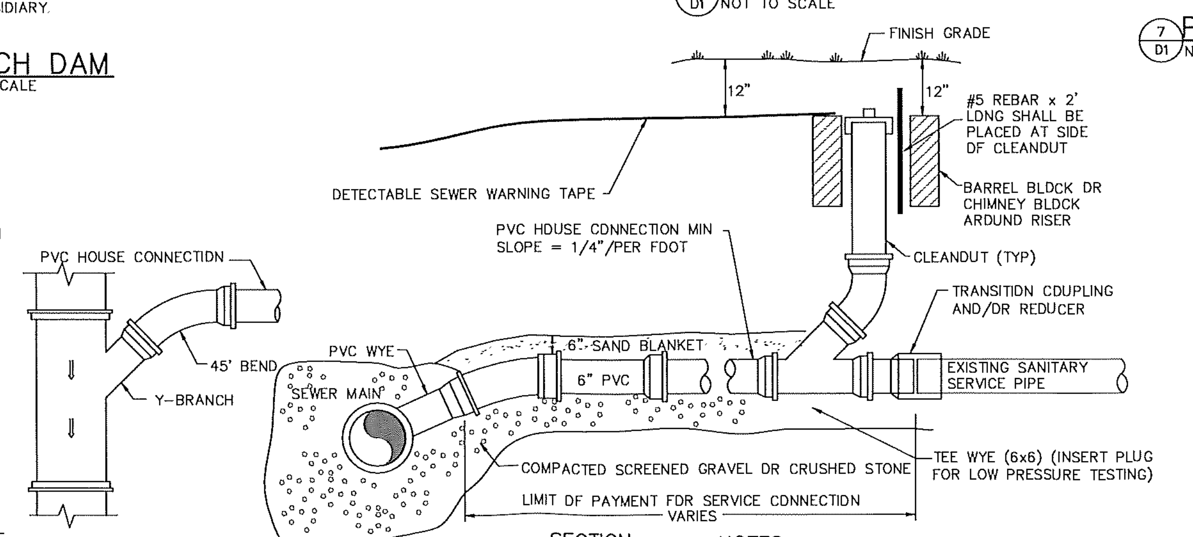


SIZE GUIDE:
- 1-8" OR 10" DROP: 4'-0" DIA. M.H.
- 2-8" OR 10" DROP: 5'-0" DIA. M.H.
- 1-12" DROP: 5'-0" DIA. M.H.
- 1-15" DROP: 5'-0" DIA. M.H.

5 DROP MANHOLE
D1 NOT TO SCALE

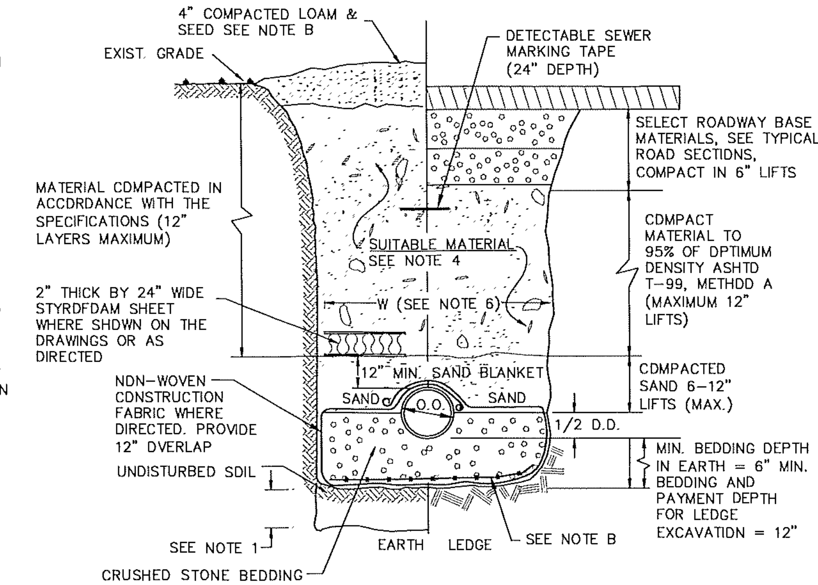
SERVICE CONNECTION NOTES:

1. SEE DETAILS FOR SERVICE CONNECTION REQUIREMENTS.
2. SERVICE CONNECTION SHALL BE INSTALLED BELOW WATER MAIN WHERE POSSIBLE.
3. CLEANOUTS SHALL BE INSTALLED AT EACH SERVICE CONNECTION.
4. REBAR SHALL BE PLACED AT SIDE OF CLEANOUT.
5. CLEANOUT SHALL BE USED TO PLUG AND TEST ALL NEW LATERALS WITH MINIMAL INTERRUPTION TO OPERATION OF HOMEOWNER SANITARY SYSTEM.
6. CLEANOUT RISER PIPE AND FITTINGS SHALL BE INCIDENTAL AND SHALL NOT BE CONSIDERED FOR PAYMENT.

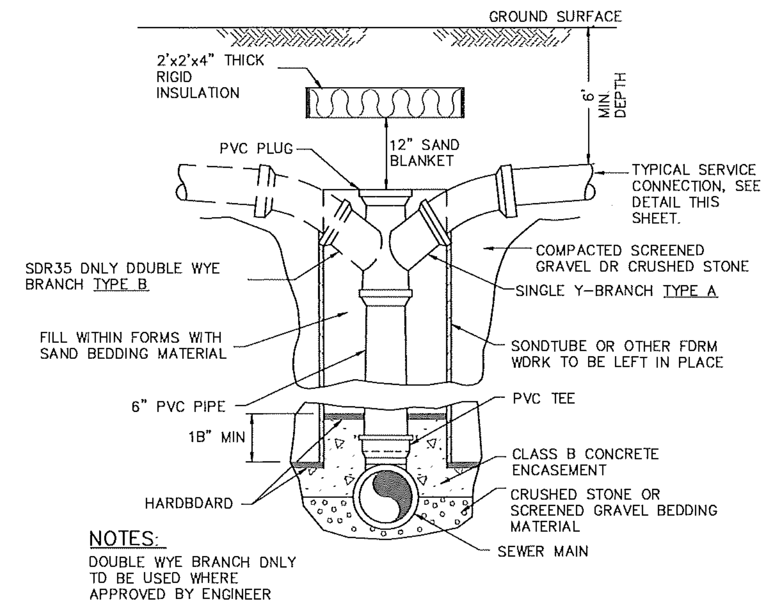


6 SERVICE CONNECTION
D1 NOT TO SCALE

NOTES:
1. MAINTAIN 18" SEPARATION BETWEEN NEW SEWER SERVICE AND NEW OR EXISTING WATER MAIN (WATER SHALL BE OVER SEWER).



2 TRENCH – GRAVITY SEWER
D1 NOT TO SCALE



NOTES:
DOUBLE WYE BRANCH ONLY TO BE USED WHERE APPROVED BY ENGINEER

7 PVC SEWER SERVICE CHIMNEY WITH WYE
D1 NOT TO SCALE

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25 Vaughan Mall, Portsmouth, N.H. 03801
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SEWER DETAILS
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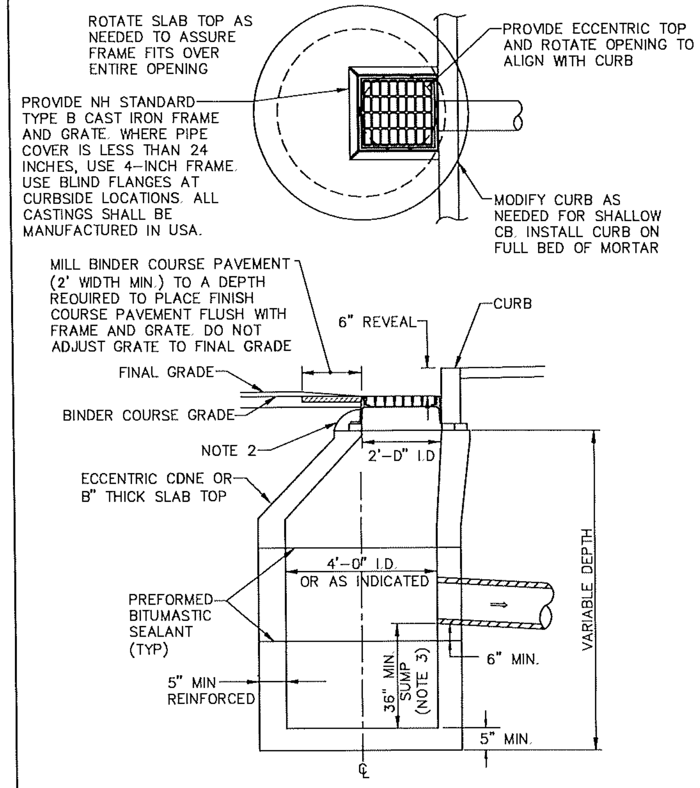
PORTSMOUTH, NEW HAMPSHIRE

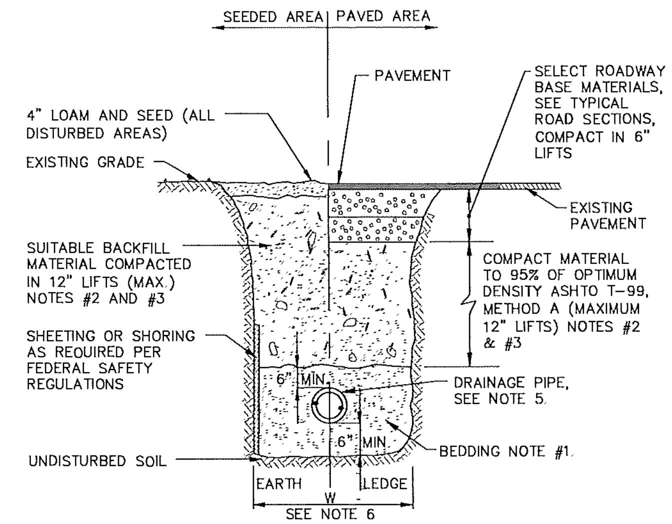
DWG NO D1
SHEET 9 OF 14



(1/D2) CATCH BASIN DETAIL
NOT TO SCALE

CATCH BASIN NOTES:

1. ENTIRE STRUCTURE SHALL BE CAPABLE OF WITHSTANDING AN H – 20 LOAD DETAILS OF REINFORCEMENT TO BE FURNISHED BY MANUFACTURER.
2. ADJUST FRAME AND GRATE TO BINDER COURSE ELEVATION, WITH BRICK SET IN A FULL BED OF MORTAR. POINT ALL MASONRY (NO VOIDS) AND PARGE EXTERIOR BRICK WITH MORTAR.
3. WHERE SUMP IS OMITTED PROVIDE MASONRY INVERT PER DETAIL (4/D2)



(3/D2) TRENCH DETAIL – STORM DRAIN
NOT TO SCALE

TRENCH NOTES – STORM DRAIN

1. BEDDING: BEDDING FOR PIPES SHALL CONSIST OF PREPARING THE BOTTOM OF THE TRENCH TO SUPPORT THE ENTIRE LENGTH OF THE PIPE AT A UNIFORM SLOPE AND ALIGNMENT. CRUSHED GRAVEL (NHDOT ITEM 304.3) OR CRUSHED STONE SHALL BE USED TO BED THE PIPE TO THE ELEVATION SHOWN ON THE DRAWINGS.

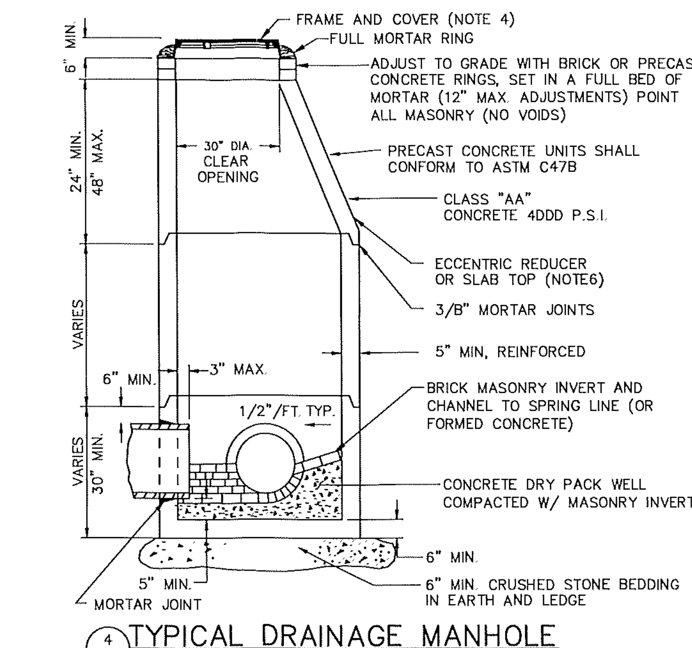
2. COMPACTION: ALL BACKFILL SHALL BE COMPACTED AT OR NEAR OPTIMUM MOISTURE CONTENT BY PNEUMATIC TAMPERS, VIBRATORY COMPACTORS OR OTHER APPROVED MEANS. BACKFILL BENEATH PAVED SURFACES SHALL BE COMPACTED TO NOT LESS THAN 95 PERCENT OF AASHTO T99, METHOD C.

3. SUITABLE MATERIAL: IN ROADS, ROAD SHOULDERS, WALKWAYS AND TRAVELED WAYS, SUITABLE MATERIAL FOR TRENCH BACKFILL SHALL BE THE NATURAL MATERIAL EXCAVATED DURING THE COURSE OF CONSTRUCTION, BUT SHALL EXCLUDE DEBRIS, PIECES OF PAVEMENT; ORGANIC MATTER; TOP SOIL; ALL WET OR SOFT MUCK, PEAT, OR CLAY; ALL EXCAVATED LEDGE MATERIAL; ROCKS OVER 6 INCHES IN LARGEST DIMENSION; FROZEN EARTH AND ANY MATERIAL WHICH, AS DETERMINED BY THE ENGINEER, WILL NOT PROVIDE SUFFICIENT SUPPORT OR MAINTAIN THE COMPLETED CONSTRUCTION IN A STABLE CONDITION. IN SEEDED AREAS, SUITABLE MATERIAL SHALL BE AS DESCRIBED ABOVE, EXCEPT THAT THE ENGINEER MAY PERMIT THE USE OF TOP SOIL, LOAM, ROCKS UNDER 12", FROZEN EARTH OR CLAY, IF HE/SHE IS SATISFIED THAT THE COMPLETED CONSTRUCTION WILL BE ENTIRELY STABLE AND PROVIDED THAT EASY ACCESS TO THE PIPE WILL BE PRESERVED.

4. BASE COURSE AND PAVEMENT: SHALL MEET THE REQUIREMENTS OF THE NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION'S LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES – DIVISIONS 300 AND 400 RESPECTIVELY.

5. DRAINAGE PIPE: PIPE MATERIALS SHALL BE EITHER PVC SDR 35 OR POLYETHYLENE (PE).

6. W=MAXIMUM ALLOWABLE TRENCH WIDTH: FOR ROCK EXCAVATION, FOR ORDERED EXCAVATION BELOW GRADE AND HANDLING OF EXCAVATED CONTAMINATED SOILS. FOR PIPES 15 INCHES NOMINAL DIAMETER OR LESS, W SHALL BE NO MORE THAN 36 INCHES. FOR PIPES GREATER THAN 15 INCHES IN NOMINAL DIAMETER, W SHALL BE 24 INCHES PLUS PIPE OUTSIDE DIAMETER (O.D.)



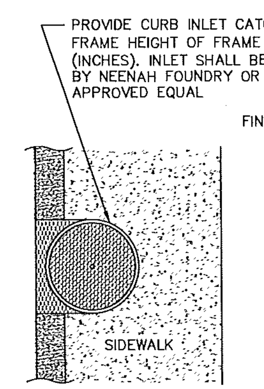
(4/D2) TYPICAL DRAINAGE MANHOLE
NOT TO SCALE

DRAIN MANHOLE NOTES:

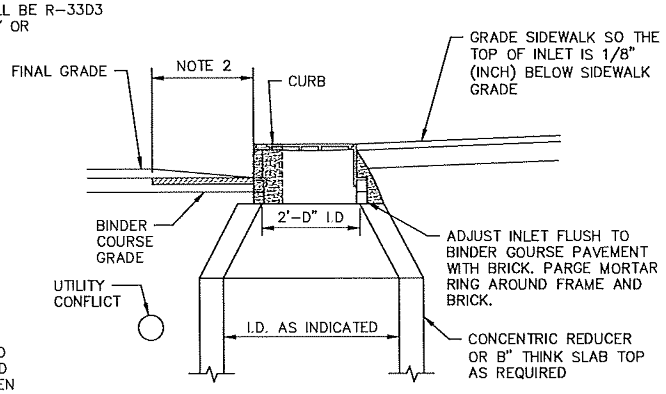
1. BARRELS AND CONE SECTIONS SHALL BE PRECAST REINFORCED CONCRETE.
2. PRECAST CONCRETE BARREL SECTIONS, CONES, AND BASES SHALL CONFORM TO ASTM C478.
3. INVERTS AND SHELVES: MANHOLES SHALL HAVE A BRICK PAVED SHELF AND INVERT (OR FORMED CONCRETE), CONSTRUCTED TO CONFORM TO THE SIZE OF PIPE AND FLOW. CARE SHALL BE TAKEN TO INSURE THAT THE BRICK INVERT IS A SMOOTH CONTINUATION OF THE INVERT. INVERT BRICKS SHALL BE LAID ON EDGE. AT CHANGES IN DIRECTION, THE INVERTS SHALL BE LAID OUT IN CURVES OF THE LONGEST POSSIBLE TANGENT TO THE CENTER LINE OF THE PIPES. SHELVES SHALL BE CONSTRUCTED TO AN ELEVATION OF 1/2 THE PIPE DIA. AND SLOPE TO DRAIN TOWARD THE FLOWING THROUGH CHANNEL.
4. FRAMES AND COVERS: MANHOLE FRAMES AND COVERS SHALL BE HINGED, ERGO XL BY EAST JORDON IRON WORKS, AND PROVIDE A 30-INCH (MIN.) CLEAR OPENING. THE WORD "DRAIN", IN 3-INCH LETTERS SHALL BE PLAINLY CAST INTO THE CENTER OF EACH COVER.
5. BEDDING: SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATTER AND MEETING ASTM C33. STONE SIZE NO. 67.

   100% PASSING 1 INCH SCREEN
   90–100% PASSING 3/4 INCH SCREEN
   20– 55% PASSING 3/8 INCH SCREEN
   0–10% PASSING #4 SIEVE
   0– 5% PASSING #8 SIEVE

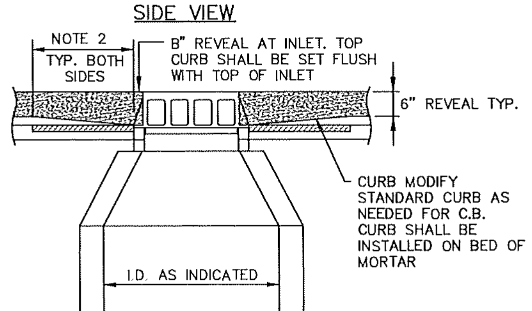
   WHERE ORDERED BY THE ENGINEER TO STABILIZE THE BASE, SCREENED GRAVEL OR CRUSHED STONE 1-1/2 INCH TO 1/2 INCH OR USE OF GEOGRID FABRIC (ITEM 1.88) MAY BE REQUIRED.
6. SLAB TOP COVERS: MAY BE APPROVED IN LIEU OF A CONE SECTION, WHEN MANHOLE IS LESS THAN 5 FEET AND FOR LARGE DIAMETER MANHOLES. SLAB TOP COVERS SHALL BE REINFORCED CONCRETE HAVING AN ECCENTRIC ENTRANCE AND CAPABLE OF SUPPORTING H-20 LOADS.



TOP VIEW



SIDE VIEW



FRONT VIEW

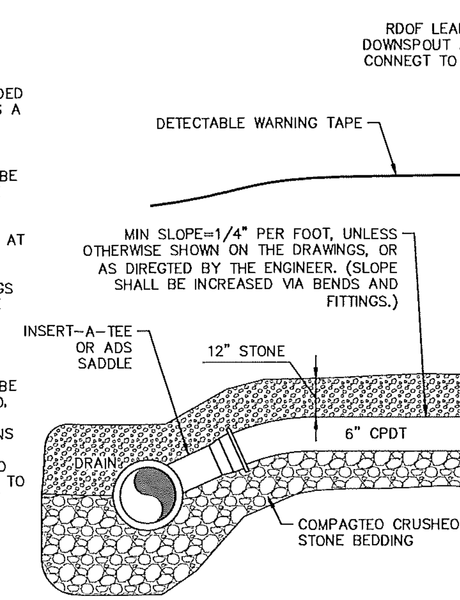
NOTES:

1. ENTIRE STRUCTURE SHALL BE CAPABLE OF WITHSTANDING AN H-20 LOAD DETAILS OF REINFORCEMENT TO BE FURNISHED BY MANUFACTURER.
2. MILL BINDER COURSE PAVEMENT IN FRONT AND TO EACH SIDE OF INLET (2 WIDTH MIN.) TO A DEPTH REQUIRED TO PLACE FINISH COURSE PAVEMENT SO THAT CURB INLET AND CURBING (AT THE INLET) HAS AN 8" REVEAL.
3. DETAIL TO BE USED WHERE NECESSARY TO AVOID UTILITY CONFLICTS OR WHERE DIRECTED.

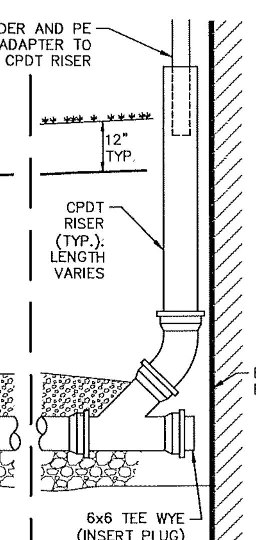
(5/D2) INLET CATCH BASIN FRAME DETAIL
NOT TO SCALE

NOTES:

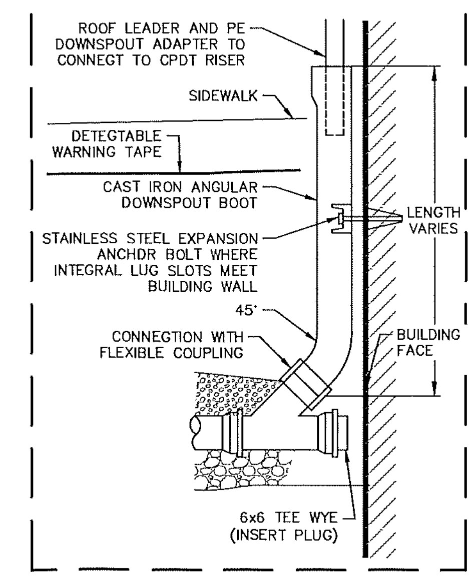
1. SERVICE LATERALS WILL BE PROVIDED AT EACH DOWNSPOUT AS WELL AS A SEPARATE CLEANOUT FOR EACH PROPERTY TO FACILITATE PRIVATE SUMP PUMP /DRAIN SERVICE CONNECTIONS. CLEANOUTS SHALL BE INSTALLED AT THE PROPERTY LINE FOR EACH SERVICE LATERAL.
2. REBAR OR 2X4 SHALL BE PLACED AT SIDE OF CLEANOUT.
3. CLEANOUT RISER PIPE AND FITTINGS ARE INCIDENTAL AND WILL NOT BE CONSIDERED FOR PAYMENT.
4. SERVICES SHALL BE ORIENTED @ 10:30 OR 1:30 (TYP). UNDER NO CIRCUMSTANCES SHALL SERVICES BE LOCATED BETWEEN 3:00 AND 9:00.
5. LOCATE ROOF LEADER CONNECTIONS AT EXISTING DOWNSPOUTS. AT ADJACENT BUILDING CORNERS, TWO DOWNSPOUTS MAY BE CONNECTED TO ONE LATERAL USING APPROPRIATE WYE (AND OTHER) FITTING(S).



(6/D2) DRAIN LATERAL & ROOF LEADER CONNECTION
NOT TO SCALE



RISER FOR ROOF LEADER BEHIND SIDEWALK



DOWNSPOUT BOOT FOR ROOF LEADER AT BACK OF SIDEWALK OR PARKING LOT

ISSUE FOR: BIDDING Date – By – ; CONSTRUCTION Date – By – ; RECORD DRAWING Date – By –

NO.	REVISIONS	APP'D

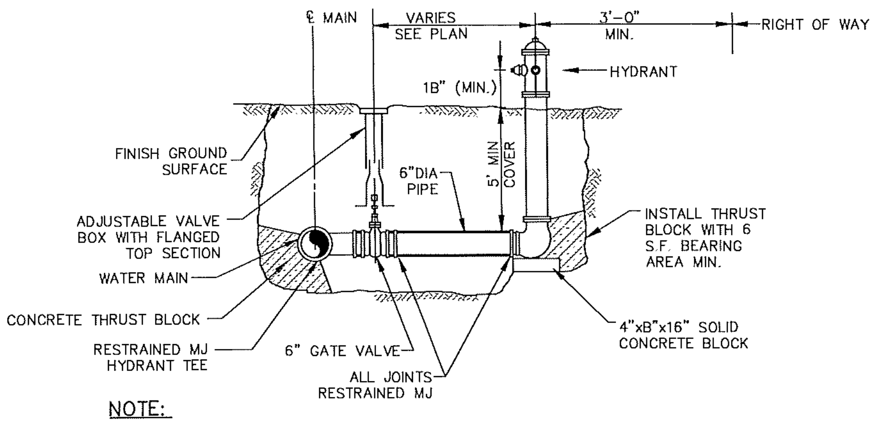
Drawn/Chk. RMG
Designed PDM
Checked –
Approved –
Date 1/26/2022
Book No. –
Project No. 2542
Dwg. ID –
Scale –

FOR REVIEW
JAN. 2023
NOT FOR CONSTRUCTION

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

DRAINAGE DETAILS
MAPLEWOOD AVE – DRAINAGE INTERCEPT
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO D2
SHEET 10 OF 14

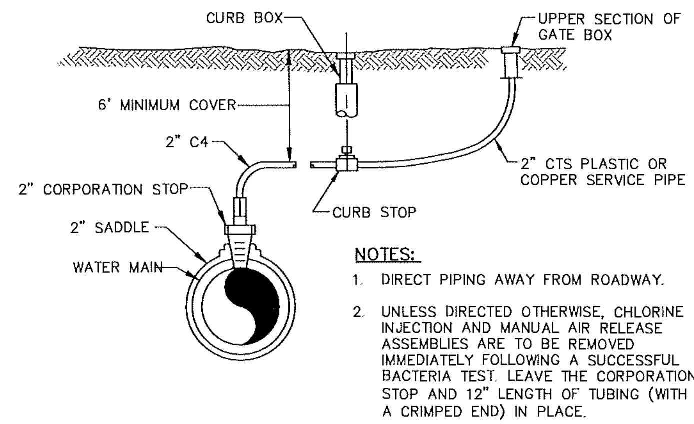


NOTE:

1. HYDRANTS SHALL BE DELIVERED FROM FACTORY W/O DRAIN HOLES.
2. HYDRANT ASSEMBLY INCLUDES MJ HYDRANT TEE.
3. HYDRANT SHALL BE KENNEDY K-81A GUARDIAN, PER CITY OF PORTSMOUTH STANDARDS.
4. LOCATE HYDRANTS A MINIMUM OF 18" BEHIND CURBING UNLESS OTHERWISE DIRECTED. REVIEW HYDRANT LOCATIONS WITH PROJECT REPRESENTATIVE PRIOR TO WATER MAIN INSTALLATIONS.

1/D3 TYPICAL HYDRANT ASSEMBLY SECTION

NOT TO SCALE

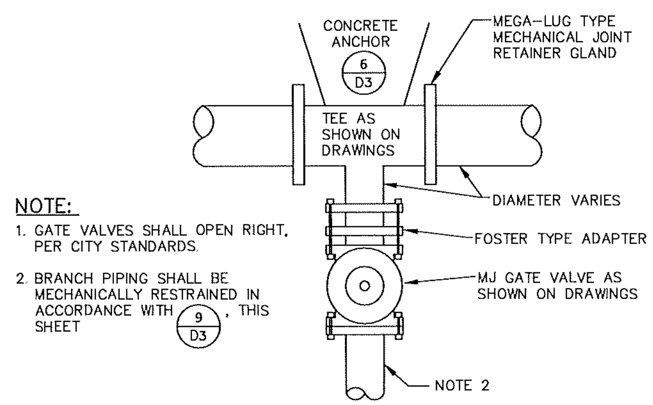


NOTES:

1. DIRECT PIPING AWAY FROM ROADWAY.
2. UNLESS DIRECTED OTHERWISE, CHLORINE INJECTION AND MANUAL AIR RELEASE ASSEMBLIES ARE TO BE REMOVED IMMEDIATELY FOLLOWING A SUCCESSFUL BACTERIA TEST. LEAVE THE CORPORATION STOP AND 12" LENGTH OF TUBING (WITH A CRIMPED END) IN PLACE.

2/D3 TEMPORARY BLOW-OFF TAP ASSEMBLY

NOT TO SCALE

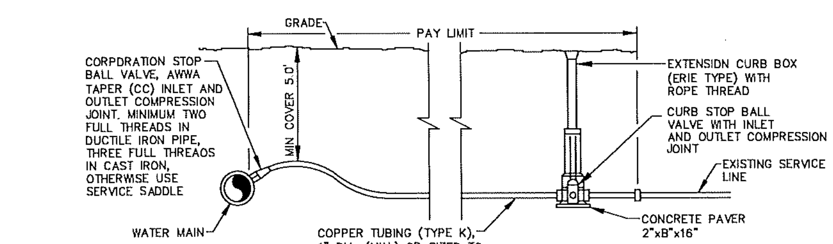


NOTE:

1. GATE VALVES SHALL OPEN RIGHT, PER CITY STANDARDS.
2. BRANCH PIPING SHALL BE MECHANICALLY RESTRAINED IN ACCORDANCE WITH 9/D3, THIS SHEET

5/D3 TEE & GATE VALVE ASSEMBLY DETAIL (TYP.)

NOT TO SCALE

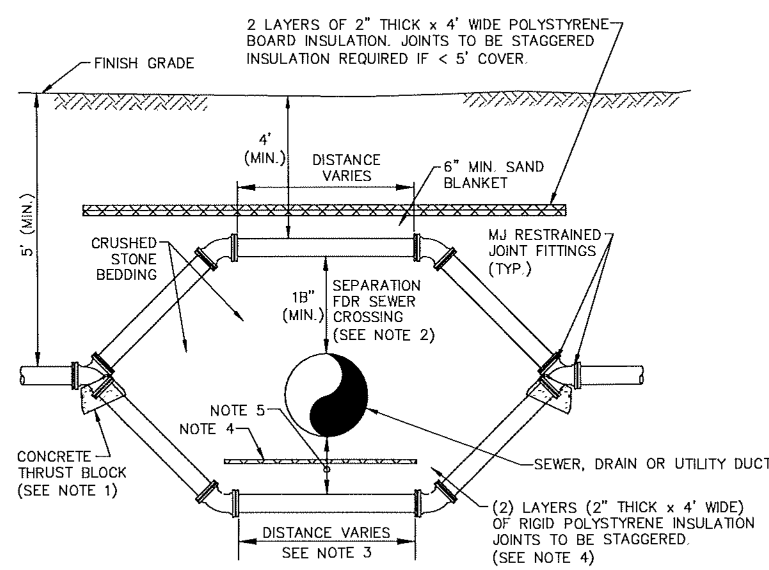


NOTES:

1. PROVIDE NEW LINE USING CONTINUOUS LENGTHS OF COPPER. NO COUPLING ALLOWED IN ROADWAY WITHOUT APPROVAL OF ENGINEER.
2. TAPS TO BE MADE AT APPROX. 2:00 AND 10:00.
3. PROVIDE FOR SERVICE LINE CONTRACTION AND EXPANSION BY INSTALLING "S" IN SERVICE LINE NEAR MAIN.
4. IF SERVICE IS INSTALLED WITH LESS THAN 5' COVER, INSULATE OVER LINE.
5. REMOVE EXISTING CURB STOP (SALVAGE AS IDENTIFIED IN SECT. 01611).
6. CONNECT CURB STOP TO EXISTING SERVICE LINE AT PROPERTY LINE OR AT LOCATION APPROVED BY THE ENGINEER (NO COUPLING WITHOUT APPROVAL OF ENGINEER) AFTER PRESSURE TESTING AND DISINFECTION.
7. SHUT OFF EXISTING CORPORATION AND REMOVE OR ABANDON EXISTING SERVICE LINE.
8. CURB BOX SHALL BE SET IN THE GRASS AREA BETWEEN CURB AND SIDEWALK UNLESS DIRECTED OTHERWISE.
9. 2" SERVICE CONNECTIONS SHALL USE A STAINLESS STEEL SERVICE SADDLE.
10. MAINTAIN 18" SEPARATION BETWEEN THE NEW WATER SERVICE AND THE NEW OR EXISTING SEWER MAIN (WATER SHALL BE OVER SEWER).

4/D3 TYPICAL SERVICE CONNECTION

NOT TO SCALE



NOTE:

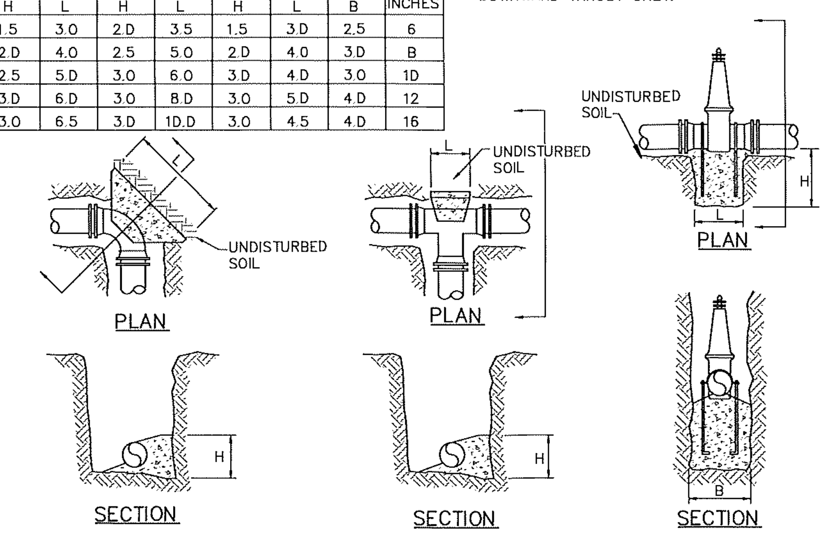
1. INSTALL (4) FOUR 45° MJ BENDS WITH RESTRAINED JOINT FITTINGS.
2. VERTICAL SEPARATION DEPTH BETWEEN WATER AND SEWER SHALL BE AT LEAST 18", WITH WATER ABOVE SEWER, PER NHDES ENV-Wq 704.12. VERTICAL SEPARATION OF LESS THAN 18" ALLOWED ONLY WITH WAIVER FROM NHDES. IF CONSTRUCTION OF WATER MAIN UNDER SEWER MAIN IS UNAVOIDABLE, SEWER MAIN SHALL BE CONSTRUCTED OF C900 PVC PIPE FROM MANHOLE TO MANHOLE.
3. CENTER CROSSING PIPE BETWEEN BELLS. SEWER PIPE JOINT SHALL BE A MINIMUM OF OF 6 FT. HORIZONTALLY FROM THE WATER MAIN.
4. PROVIDE INSULATION IF DRAIN CROSSES OVER WATER MAIN.
5. PROVIDE 8" TO 12" SEPARATION FOR DRAIN OR OTHER UTILITY CROSSINGS.

7/D3 WATER MAIN CONFLICT – CROSSING DETAIL

NOT TO SCALE

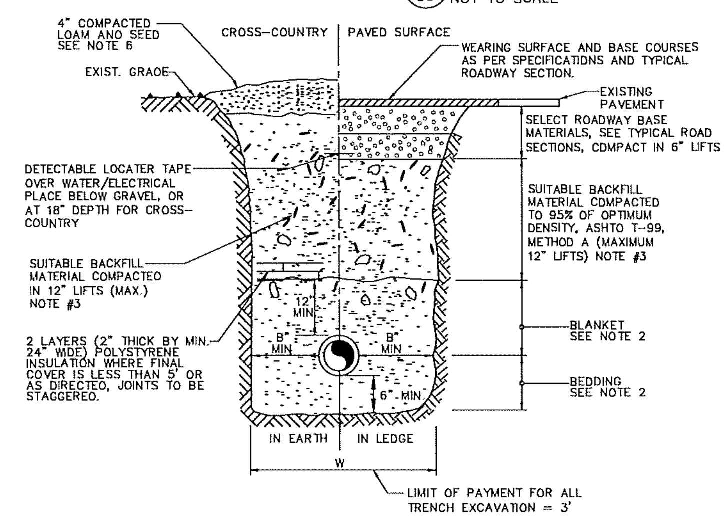
MINIMUM CONCRETE ANCHOR DIMENSIONS								
BENDS, TEES AND LINE VALVES AT 25D PSI								
PIPE SIZE INCHES	TEE OR PLUG FT.		ALL BENDS FT.		ALL LINE VALVES FT.			PIPE SIZE INCHES
	H	L	H	L	H	L	B	
6	1.5	3.0	2.D	3.5	1.5	3.D	2.5	6
B	2.D	4.0	2.5	5.0	2.D	4.0	3.D	B
10	2.5	5.D	3.0	6.0	3.D	4.D	3.0	1D
12	3.D	6.D	3.0	8.D	3.0	5.D	4.D	12
16	3.0	6.5	3.D	1D.D	3.0	4.5	4.D	16

BASIS: SOIL BEARING CAPACITY OF 2000 PSF AND 5 FEET COVER IN GRANULAR SOIL. HEIGHT OF BLOCK MUST BE LESS THAN 1/2 DEPTH OF TRENCH. 6 MIL THICK POLYETHYLENE SHALL BE PLACED AROUND FITTINGS PRIOR TO CONCRETE PLACEMENT. USE FOR HORIZONTAL OR DOWNWARD THRUST ONLY.



6/D3 CONCRETE ANCHORS

NOT TO SCALE



8/D3 TYPICAL TRENCH DETAIL

NOT TO SCALE

STANDARD TRENCH NOTES

1. ORDEREO EXCAVATION OF UNSUITABLE MATERIAL BELOW GRADE: BACKFILL AS STATED IN THE TECHNICAL SPECIFICATIONS OR AS SHOWN ON THE DRAWINGS.

2. BEDDING AND BLANKET: CLEAN SAND FREE FROM ORGANIC MATTER (SECTION D222B). BLANKET MAY BE OMITTEO FOR DUCTILE IRON AND REINFDRCED CONCRETE PIPE, PROVIDED HOWEVER, THAT NO STONE LARGER THAN 2" IS IN CONTACT WITH THE PIPE.

3. BACKFILL MATERIAL: IN ROADS, ROAD SHOULDERS, WALKWAYS AND TRAVELEO WAYS, SUITABLE MATERIAL FOR TRENCH BACKFILL SHALL BE THE NATURAL MATERIAL EXCAVATED DURING THE CDURSE OF CONSTRUCTION, BUT SHALL EXCLUDE DEBRIS; PIECES DF PAVEMENT; ORGANIC MATTER; TOP SOIL; ALL WET OR SOFT MUCK, PEAT, OR CLAY; ALL EXCAVATED LEDGE MATERIAL; ALL ROCKS OVER 6 INCHES IN LARGEST DIMENSION; AND ANY MATERIAL WHICH, AS DETERMINED BY THE ENGINEER, WILL NOT PROVIDE SUFFICIENT SUPPORT OR MAINTAIN THE COMPLETED CDNSTRUCTION IN A STABLE CONDITION.

IN CROSS-COUNTRY CONSTRUCTION, SUITABLE MATERIAL SHALL BE AS DESCRIBED ABOVE, EXCEPT THAT THE ENGINEER MAY PERMIT THE USE OF TOP SOIL, LOAM, MUCK, OR PEAT, IF ENGINEER IS SATISFIED THAT THE CDMPLETED CONSTRUCTION WILL BE ENTIRELY STABLE AND PROVIDED THAT EASY ACCESS TO THE PIPE LINE, FOR MAINTENANCE AND POSSIBLY RECONSTRUCTION, WILL BE PRESERVEO.

4. MINIMUM COVER: NOT LESS THAN 5.5 FEET, 7 MAX, EXCEPT TO AVOID SUBSURFACE STRUCTURES.

6. FOR CROSS COUNTRY CONSTRUCTION, BACKFILL OR FILL SHALL BE MDUNDEO TO A HEIGHT OF 6 INCHES ABDVE THE DRIGINAL GROUND SURFACE.

7. DRIVEWAYS: CRUSHED GRAVEL IN DRIVEWAYS SHALL MATCH EXISTING WITH A MINIMUM OF 6". EXISTING GRAVEL SHALL BE REMOVEO AND REPLACED ANO SHALL NOT BE MEASURED FOR PAYMENT.

HORIZONTAL BENDS:

Nominal Pipe Diameter	8end Angle			
	90°	45°	22.5°	11.25°
4"	6'	3'	2'	1'
6"	9'	4'	2'	2'
8"	11'	5'	3'	2'
1D"	13'	6'	3'	2'
12"	16'	7'	3'	2'
16"	20'	9'	4'	2'

TEES:

Nominal Pipe	Nominal Branch Diameter (Note 5)			
	8"	10"	12"	16"
8"	6'	-	-	-
10"	8'	11'	-	-
12"	1'	7'	16'	-
16"	1'	1'	9'	25'

REDUCERS:

Nom. Diameter of Large Pipe	Nominal Diameter of Small Pipe (Note 4)				
	4"	6"	8"	10"	12"
8"	17'	10'	-	-	-
10"	23'	17'	10'	-	-
12"	29'	24'	18'	10'	-
16"	39'	36'	31'	28'	18'

DEAD ENDS:

Nom. Pipe Diameter	Restarined Length (ft)
4"	13'
6"	18'
8"	23'
10"	28'
12"	33'
16"	43'

NOTES:

1. ALL FITTINGS SHALL HAVE MECHANICAL RETAINING GLANDS AT ALL ENDS AND A MINIMUM OF ONE JOINT SHALL BE RESTRAINED BEYOND EACH SIDE OF FITTING.
2. PIPE EXTENDING FROM ALL FITTINGS SHALL BE MECHANICALLY RESTRAINED TO THE MINIMUM LENGTHS SHOWN.
3. ALL MINIMUM LENGTHS SHOWN ABOVE WERE CALCULATED USING THE EBAA IRON RESTRAINT LENGTH CALCULATOR VERSION 6.3 USING THE FOLLOWING ASSUMPTIONS: DUCTILE IRON PIPE, TYPE 4 TRENCH, 5 FOOT DEPTH OF BURY, A TEST PRESSURE OF 150 PSI AND SOILS CONSISTING OF WELL GRADED SANDS AND GRAVELLY SANDS WITH LITTLE OR NO FINES.
4. ENGINEER RESERVES THE RIGHT TO MODIFY RESTRAINT LENGTHS REQUIRED BASED ON VARYING TRENCH CONDITIONS, DEPTH OF BURY OR PIPE MATERIALS.
5. FOR REDUCERS, RESTRAIN LENGTH SHOWN IS FOR THE LARGER PIPE.
6. MECHANICALLY RESTRAIN ONE JOINT ON EITHER SIDE OF THE NOMINAL PIPE OF TEE AT A MINIMUM DISTANCE OF 5'.

9/D3 MECHANICAL JOINT RESTRAINT

NOT TO SCALE

ISSUE FOR	Date	By
BIDOING	-	-
CONSTRUCTION	-	-
RECORO DRAWING	-	-

NO.	REVISIONS	APP'O
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Orawn/Chk. RMG
Designed PDM
Checked -
Approved -
Oate 1/26/2022
Book No. -
Project No. 2542
Dwg. ID
Scale

FOR REVIEW
JAN. 2023
NOT FOR CONSTRUCTION

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

WATER DETAILS

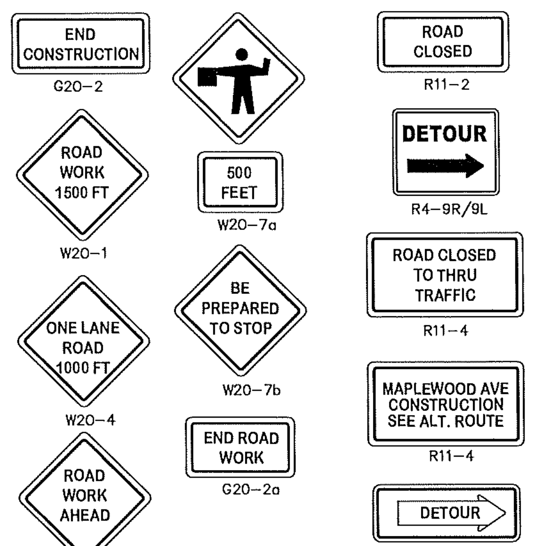
MAPLEWOOD AVE – DRAINAGE INTERCEPT

CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

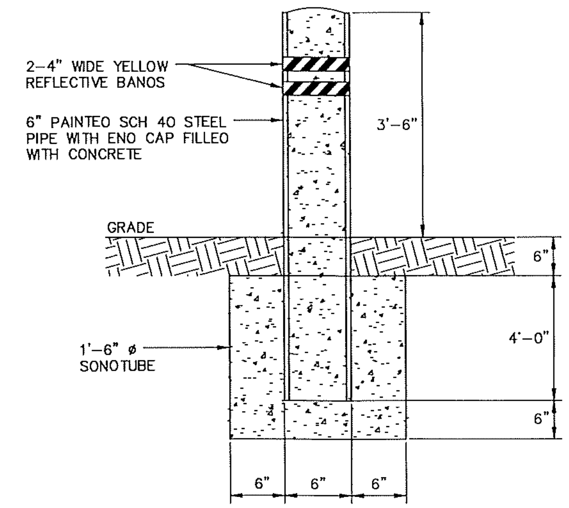
DWG NO D3

TRAFFIC CONTROL NOTES:

1. TYPICAL SIGN DETAILS ARE BASEO ON THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCO) ANO IS NOT INTENDEO AS AN ALL-INCLUSIVE LIST. ALL SIGNAGE ANO OTHER TRAFFIC CONTROL OEVICES SHALL CONFORM TO THE MUTCO (LATEST EDITION) ANO NHOOT REQUIREMENTS.
2. CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING THE TRAFFIC CONTROL PLAN AS SHOWN. ANY MOOIFICATIONS MUST BE SUBMITTEO IN WRITING FOR APPROVAL BY THE ENGINEER, CITY OF PORTSMOUTH ANO THE NHOOT. SEE PROJECT MANUAL FOR AOOITIONAL REQUIREMENTS.
3. CONTRACTOR SHALL ERECT ALL OAILY USE SIGNS IN THE MORNING PRIOR TO WORK BEGINNING ANO REMOVE ALL OAILY USE SIGNS AT THE END OF EACH OAY.
4. OAILY SIGNS SHALL INCLUOE SIGNAGE NECESSARY TO ENSURE THE SAFETY OF THE PUBLIC (I.E. ROAO CLOSEO, FLAGGER AHEAO, ONE LANE TRAFFIC, ETC).
5. DETOUR SIGNS ARE TO BE USEO WITH PHASE I CONSTRUCTION (CULVERT INSTALLATION) ONLY. REFER TO PROSECUTION OF WORK ON SHEET G-1)
6. ALL SIGNS SHALL BE ERECTEO ANO PLACEO IN ACCOROANCE WITH MUTCO (LATEST EOITION).

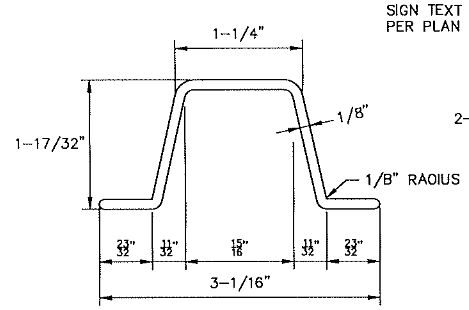


(1/D4) TRAFFIC CONTROL SIGNS
NOT TO SCALE

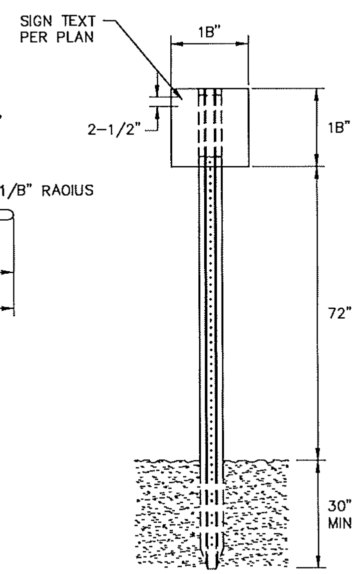


(3/D4) STEEL BOLLARD DETAIL
NOT TO SCALE

LENGTH (P2-10): 10'-0"
WEIGHT PER LINEAR FOOT: 2.00 LBS
HOLES: 3/B" DIA., 1" C-C FULL LENGTH
STEEL: SHALL CONFORM TO ASTM A-499 (AISI C1060)
FINISH: SHALL BE PAINTEO WITH TWO COATS OF AN APPROVEO MEO. GREEN, BAKEO PAINT OR AIR ORIED, PAINT OF WEATHER-RESISTANT QUALITY, ALL FABRICATION SHALL BE COMPLETEO BEFORE PAINTING.



POST SECTION



P2-10 POST

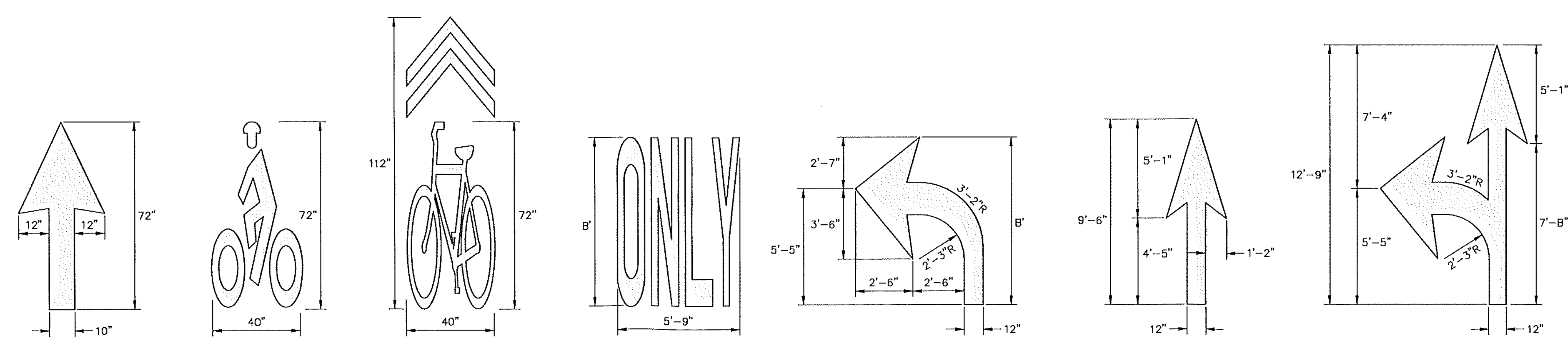
NOTES:

1. POSTS SHALL BE P2-10 AS REQUIREO.
2. POSTS SHALL BE PLUMB; ANY POST BENT OR OTHERWISE OAMAGEO SHALL BE REMOVEO ANO PROPERLY PLACEO.
3. POSTS MAY BE SET OR ORIVEN. WHEN POSTS ARE SET, HOLES SHALL BE OUG TO THE PROPER DEPTH; AFTER INSERTING POSTS, THE HOLES SHALL BE BACKFILLEO WITH SUITABLE MATERIAL IN LAYERS NOT TO EXCEEO 6" OEEP ANO THOROUGHLY COMPACTEO, CARE BEING TAKEN TO PRESERVE THE ALIGNMENT OF THE POST. WHEN POSTS ARE ORIVEN, A SUITABLE ORIVING CAP SHALL BE USED ANO AFTER DRIVING THE TOP OF THE POST; BATTERING HEAOS WILL NOT BE ACCEPTEO. POST SHALL NOT BE ORIVEN WITH THE SIGN ATTACHED TO THE POST.

(2/D4) SIGN DETAIL
NOT TO SCALE

GENERAL NOTES:

1. ALL WOROS ANO SYMBOLS SHALL BE RETROREFLECTIVE WHITE ANO SHALL CONFORM TO THE LATEST VERSION OF THE MUTCO.
2. MULTI-WORD MESSAGES SHALL REAO "UP"; THAT IS, THE FIRST WORO SHALL BE NEAREST THE APPROACHING ORIVER.
3. THE WORD "ONLY" SHALL NOT BE USED WITH THROUGH OR COMBINATION ARROWS, ANO SHALL NOT BE USEO AOJACENT TO A BROKEN LANE LINE. A WORO/SYMBOL SHALL PRECEOEO THE WORO "ONLY".
4. PREFORMED WOROS AND SYMBOLS SHALL BE PRE-CUT BY THE MANUFACTURER.
5. WRONG-WAY ARROWS SHALL NOT BE SUBSTITUTED FOR THROUGH ARROWS.
6. ALL STOP BARS, WOROS, SYMBOLS ANO ARROWS SHALL BE THERMOPLASTIC.



BICYCLE LANE DIRECTIONAL ARROW
PAY QUANTITY = 6.0 FT²

BICYCLE LANE SYMBOL
PAY QUANTITY = B.1 FT²

BICYCLE LANE SYMBOL
PAY QUANTITY = 12.B FT²

ONLY
PAY QUANTITY = 22.3 FT²

TURN ARROW
(RIGHT TURN OPPOSITE IN KIND)
PAY QUANTITY = 17.0 FT²

THROUGH (STRAIGHT ARROW)
PAY QUANTITY = 12.5 FT²

COMBINATION ARROW
PAY QUANTITY = 2B.B FT²

ITEM 632.32

(4/D4) PAVEMENT MARKING – WORD AND SYMBOLS
NOT TO SCALE

ISSUE FOR
BIDDING Date – By –
CONSTRUCTION Date – By –
RECORD DRAWING Date – By –

NO.	REVISIONS	APP'D

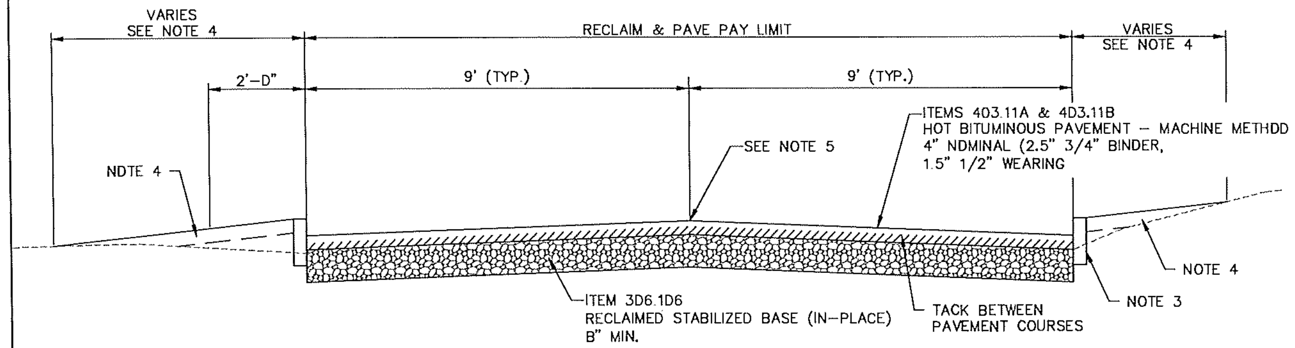
Drawn/Chk. RMG
Designed PDM
Checked –
Approved –
Date 1/25/2022
Book No. –
Project No. 2542
Dwg. ID 2542_details_M
Scale

FOR REVIEW
JAN. 2023
NOT FOR CONSTRUCTION

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

TRAFFIC CONTROL SIGNS & PAVEMENT MARKINGS
MAPLEWOOD AVE – DRAINAGE INTERCEPT
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO 04
SHEET 12 OF 14



ROAD RE-CONSTRUCTION NOTES:

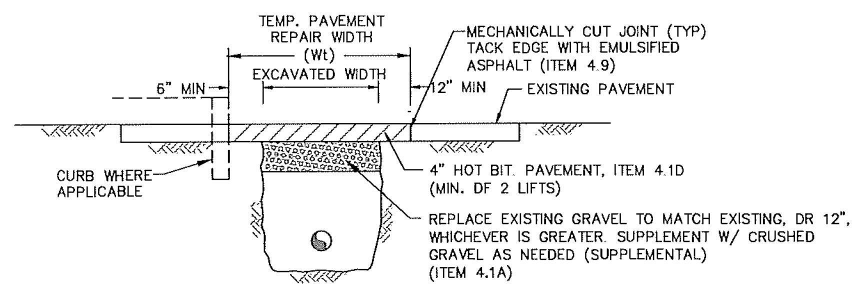
1. SAWCUT DRIVEWAYS AND CONSTRUCT DRIVEWAY APRON FOLLOWING CONSTRUCTION OF PAVEMENT BINDER COURSE (SEE DRIVEWAY APRON DETAILS, THIS DRAWING).
2. GRADE RECLAIM (UNIFORMLY) TO MINIMIZE IMPACTS TO DRIVEWAYS AND SIDE SLOPES. REVIEW GRADING WITH ENGINEER IN ADVANCE OF RECLAIM. RECLAIM AT 10" DEPTH, REMOVE AND DISPOSE OF SURPLUS RECLAIM WHERE DIRECTED TO MINIMIZE GRADING IMPACTS, SUBSIDIARY. TYPICAL CROSS SLOPE = 3% UNLESS DIRECTED OTHERWISE.T, SUBSIDIARY.
3. INSTALL GRANITE CURB (WHERE DIRECTED), ITEM 609.01. SEE DETAIL 6/D5.
4. LOAM, SEED & MULCH ROADSIDE SLOPES, PAY AS ITEM 912.
5. ALL SEAMS AND JOINTS SHALL BE RAKED AND LUTED PRIOR TO COMPACTION AND ROLLING.

1/D5 TYPICAL ROADWAY SECTION – RAILROAD EASEMENT AREA
NOT TO SCALE

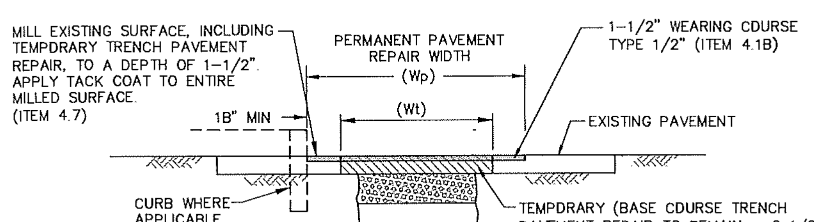
MINIMUM TRENCH PAVEMENT WIDTHS

PIPE I.D.	Wt (INCHES)	Wp (INCHES)
1-21 INCHES	84	108
24-30 INCHES	96	120
> 30 INCHES	108	132

NOTE:
THE DIMENSIONS SHOWN SHALL BE CONSIDERED MAXIMUM PAVEMENT PAYMENT WIDTHS FOR 0-10' DEEP CONSTRUCTION. Wt AND Wp SHALL BE INCREASED BY 4'-0" FOR TRENCHES 10' TO 15' AND BY 8'-0" FOR TRENCHES 15' TO 20' IN DEPTH.

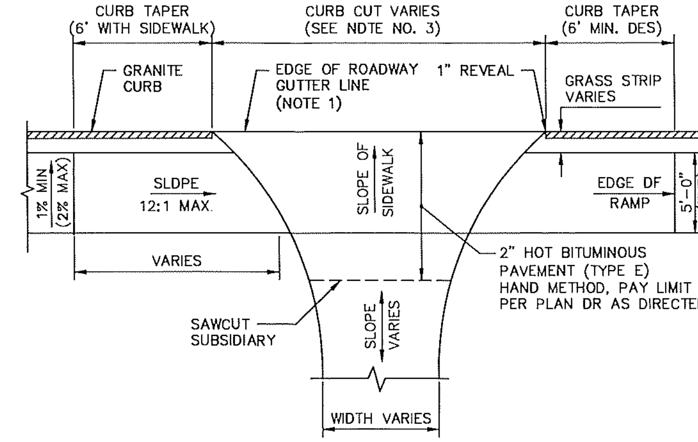


2/D-5 TEMPORARY TRENCH PAVEMENT REPAIR
NOT TO SCALE



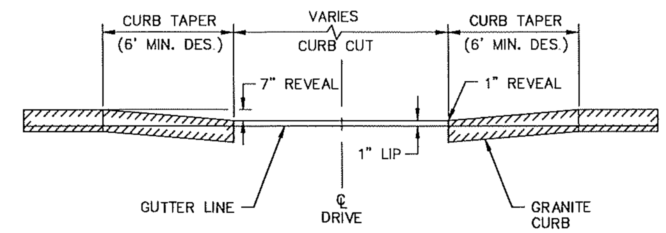
NOTES:
1. ALL PAVEMENT REMOVAL SHALL BE PRECEDED BY MACHINE CUTTING.
2. ALL TEMPORARY, DAMAGED OR DEFECTIVE PAVEMENT SHALL BE REMOVED PRIOR TO PLACEMENT OF PERMANENT TRENCH REPAIRS.
3. SEE TABLE IN "TEMPORARY TRENCH PAVEMENT REPAIRS" FOR MINIMUM TRENCH WIDTHS.

3/D-5 PERMANENT TRENCH PAVEMENT REPAIR
NOT TO SCALE



PLAN VIEW WITH SIDEWALK RAMP

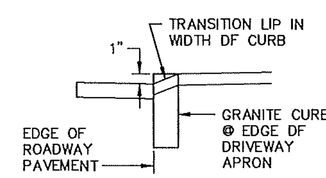
NOTES:
1. ALL PAVEMENT MATCHES AT DRIVEWAY SHALL BE SAWCUT AND KEYED FOR SMOOTH TRANSITION (SUBSIDIARY)



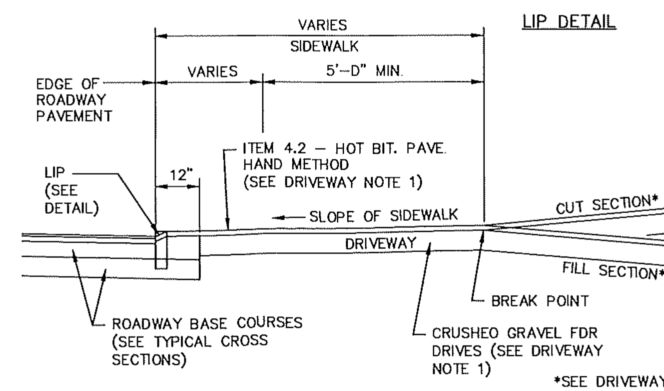
PROFILE

DRIVEWAY NOTES:
1. PAVEMENT & GRAVEL DEPTHS FOR RESIDENTIAL DRIVES SHALL BE 8" CRUSHED GRAVEL WITH 2" H.B.P. (HAND METHOD) SINGLE COURSE.
2. CURBING CAN BE FLARED TO FIT DRIVE RADII IF APPROPRIATE OR ENDED AS DETAILED ABOVE.
3. DRIVEWAY CURB CUTS SHALL MATCH EXISTING APRON WIDTHS UNLESS OTHERWISE DIRECTED.
4. FOR UNPAVED DRIVES, THE PAVED APRON NORMALLY ENDS AT THE RADIUS TANGENT POINT OR BACK OF SIDEWALK, WHICHEVER IS GREATER.

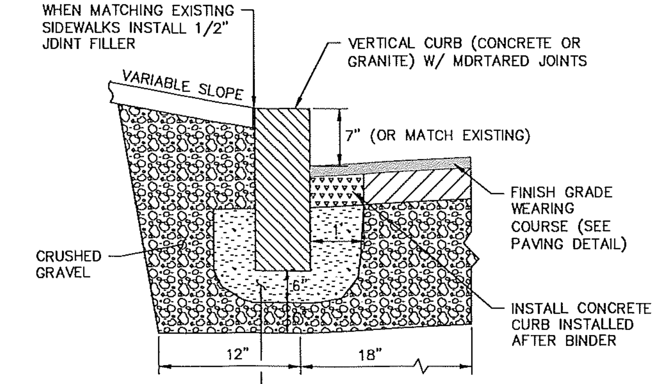
4/D5 DRIVEWAY APRON/CURB CUT (FINAL GRADING PLAN)
NOT TO SCALE



LIP DETAIL

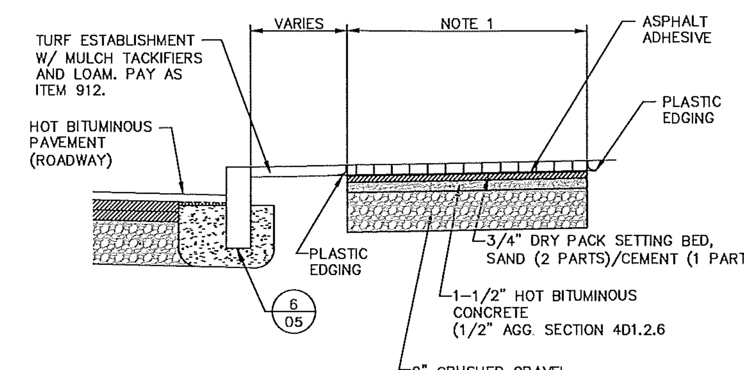


5/D5 TYPICAL URBAN CURBED DRIVE IN CUT/FILL SECTION
NOT TO SCALE



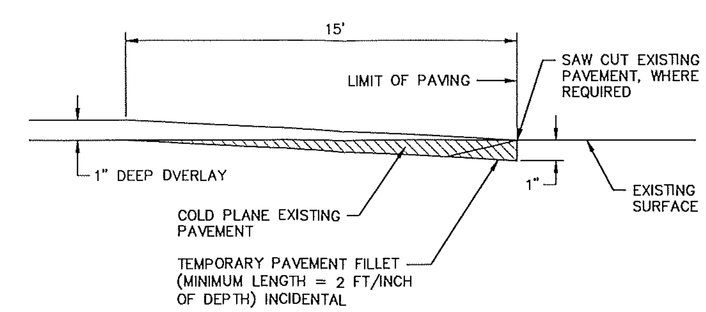
NOTES:
1. DAMAGED OR IMPACTED CURB (WHETHER GRANITE OR CONCRETE) IS TO BE REPLACED AT THE CONTRACTORS OWN EXPENSIVE, UNLESS OTHERWISE NOTED ON PLAN.
2. CLASS AA CONCRETE FILL SHALL BE PLACED IN VOIDS IN FRONT, BEHIND, AND BELOW CURBING PRIOR TO INSTALLATION OF GRAVEL BACKING AND FINISH GRADE WEARING COURSE PAVEMENT.

6/D5 VERTICAL CURB (NEW OR RESET) (GRANITE OR CONCRETE)
NOT TO SCALE



NOTES:
1. RE-CONSTRUCT CURB AND SIDEWALKS IMPACTED FROM CONSTRUCTION OR WHERE DIRECTED. CURB AND SIDEWALKS DAMAGED OUTSIDE TRENCH LIMITS (THREE-FEET FROM OUTSIDE OF PIPE) SHALL BE RESTORED AT CONTRACTOR'S COST AND WILL NOT BE MEASURED FOR PAYMENT.

7/D5 BRICK SIDEWALK DETAIL (NEW OR RECONSTRUCT)
NOT TO SCALE



NOTES:
THE LENGTH OF THE TAPER MAY BE ADJUSTED AS ORDERED TO PROVIDE FOR VARYING FIELD CONDITIONS OR CHANGES IN SINGLE COURSE DEPTH.

8/D5 OVERLAY PAVEMENT MATCH
NOT TO SCALE

ISSUE FOR			
BIDDING	Date -	By -	
CONSTRUCTION	Date -	By -	
RECORD DRAWING	Date -	By -	
NO.	REVISIONS	APP'D	

Drawn/Chk. RMG
Designed PDM
Checked -
Approved -
Date 1/26/2022
Book No. -
Project No. 2542
Dwg. ID 2542_details_d
Scale -

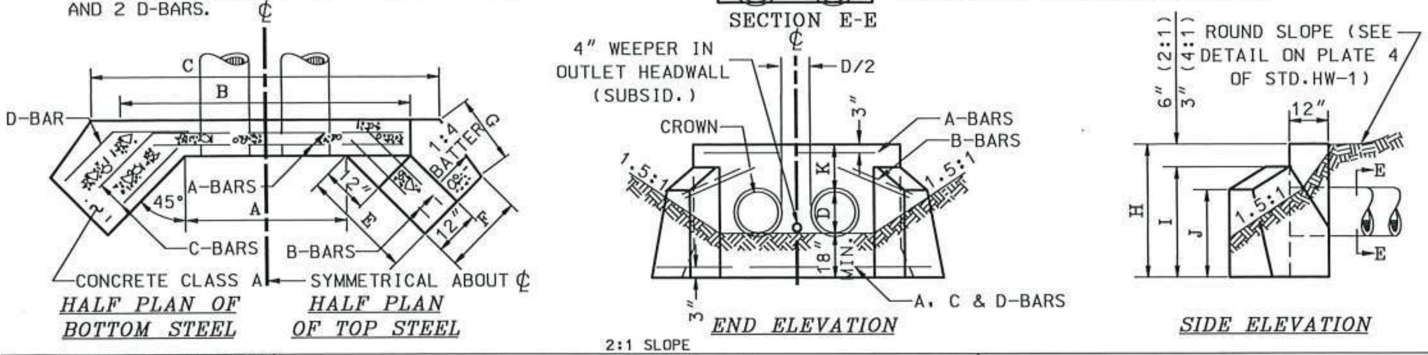
FOR REVIEW
JAN. 2023
NOT FOR CONSTRUCTION

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

ROADWAY AND SIDEWALK DETAILS
MAPLEWOOD AVE – DRAINAGE INTERCEPT
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO D5

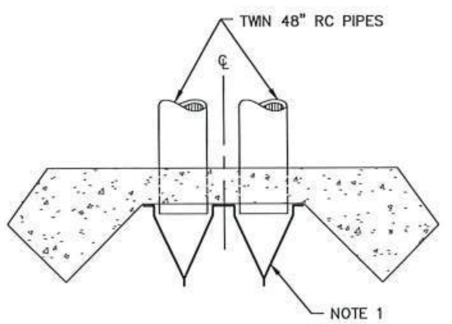
NOTE:
ALL LIKE BARS IN EACH HEADWALL ARE THE SAME SIZE. EACH STD. HEADER HAS 4 A, B & C-BARS, AND 2 D-BARS.



2:1 SLOPE

DIA. D INCHES	QUANTITIES PER HEADER: CONC. CU. YD.	STEEL LB.	EXC. FOR 1' DEPTH CU. YD.	DIMENSIONS: A	B	C	E	F	G	H	I	J	K	D/2	REINFORCING STEEL: SIZE	LENGTH: A BARS	B BARS	C BARS	D BARS	D-BARS: a	b
24	2.44	46	1.96	6'-0"	8'-10"	10'-0"	3'-0"	1'-11"	2'-3"	5'-0"	4'-6"	3'-10"	1'-6"	1'-0"	#4	8'-6"	3'-2"	3'-0"	4'-8"	2'-5"	2'-3"
30	3.18	53	2.28	7-5	10-3	11-9	3-7	2-0	2-9	5-6	5-0	4-1	1-6	1-3	#4	9-11	3-9	3-7	5-3	2-6	2-9
36	3.99	61	2.69	8-10	11-8	13-7	4-2	2-1	3-3	6-0	5-6	4-4	1-6	1-6	#4	11-4	4-3	4-1	5-10	2-8	3-2
42	5.43	161	3.22	10-3	13-1	15-6	5-1	2-2	4-0	6-9	6-3	4-10	1-9	1-9	#6	12-9	5-3	4-11	7-10	3-10	4-0
48	6.53	180	3.64	11-8	14-6	17-3	5-9	2-3	4-6	7-3	6-9	5-1	1-9	2-0	#6	14-2	5-11	5-7	8-5	3-10	4-7
54	7.76	197	4.00	13-1	15-11	19-1	6-4	2-4	5-0	7-9	7-3	5-4	1-9	2-3	#6	15-7	6-7	6-1	9-2	4-1	5-1
60	9.10	214	4.45	14-6	17-4	20-10	6-11	2-5	5-6	8-3	7-9	5-8	1-9	2-6	#6	17-0	7-1	6-8	9-9	4-1	5-8
66	10.56	232	4.84	15-11	18-9	22-5	7-6	2-6	6-0	8-9	8-3	5-11	1-9	2-9	#6	18-5	7-8	7-3	10-5	4-2	6-3
72	12.28	249	5.25	17'-4"	20'-2"	24'-2"	8'-2"	2'-7"	6'-6"	9'-3"	8'-9"	6'-3"	1'-9"	3'-0"	#6	19'-10"	8'-3"	7'-10"	11'-0"	4'-3"	6'-9'
4:1 SLOPE																					
24	3.05	53	2.29	6'-0"	8'-10"	10'-0"	3'-11"	2'-1"	3'-2"	5'-0"	4'-9"	4'-3"	1'-6"	1'-0"	#4	8'-6"	4'-3"	4'-0"	5'-6"	2'-6"	3'-0'
30	3.92	61	2.70	7-5	10-3	11-9	4-8	2-2	3-9	5-6	5-3	4-7	1-6	1-3	#4	9-11	5-0	4-8	6-3	2-8	3-7
36	5.09	70	3.15	8-10	11-8	13-7	5-5	2-3	4-5	6-0	5-9	5-0	1-6	1-6	#4	11-4	5-9	5-4	7-1	2-10	4-3
42	6.97	185	3.78	10-3	13-1	15-6	6-7	2-5	5-4	6-9	6-6	5-6	1-9	1-9	#6	12-9	6-11	6-5	9-3	4-0	5-3
48	8.44	204	4.24	11-8	14-6	17-3	7-4	2-6	6-0	7-3	7-0	5-11	1-9	2-0	#6	14-2	7-8	7-1	10-1	4-2	5-11
54	10.13	225	4.74	13-1	15-11	19-1	8-2	2-7	6-9	7-9	7-6	6-3	1-9	2-3	#6	15-7	8-6	7-10	10-11	4-3	6-8
60	11.90	245	5.23	14-6	17-4	20-10	8-11	2-8	7-4	8-3	8-0	6-7	1-9	2-6	#6	17-0	9-3	8-8	11-9	4-4	7-5
66	13.87	266	5.75	15-11	18-9	22-5	9-8	2-9	8-0	8-9	8-6	7-0	1-9	2-9	#6	18-5	10-0	9-5	12-8	4-7	8-1
72	16.13	283	6.29	17'-4"	20'-2"	24'-2"	10'-6"	2'-10"	8'-8"	9'-3"	9'-0"	7'-4"	1'-9"	3'-0"	#6	19'-10"	10'-10"	9'-9"	13'-5"	4'-8"	8'-9'

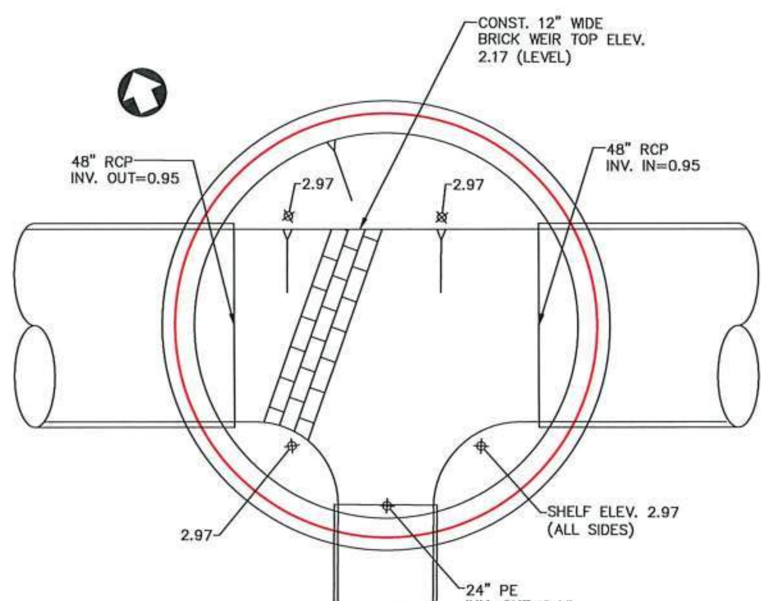
(1/D6) CONCRETE HEADWALLS WITH 45° WINGS FOR TWIN R.C. PIPE (48" DIA. W/4:1 SLOPE)
NOT TO SCALE



NOTES:

1. TIDE VALVES SHALL BE TIDE FLEX TF-1 OR APPROVED EQUAL. ATTACH DIRECTLY TO HEADWALL USING THIMBLE PLATE IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS. PROVIDE THIMBLE PLATE INSTALLATION DETAILS OR RECOMMENDED ALTERNATIVE. THE TIDE VALVES WILL BE MOUNTED TO THE HEADWALL

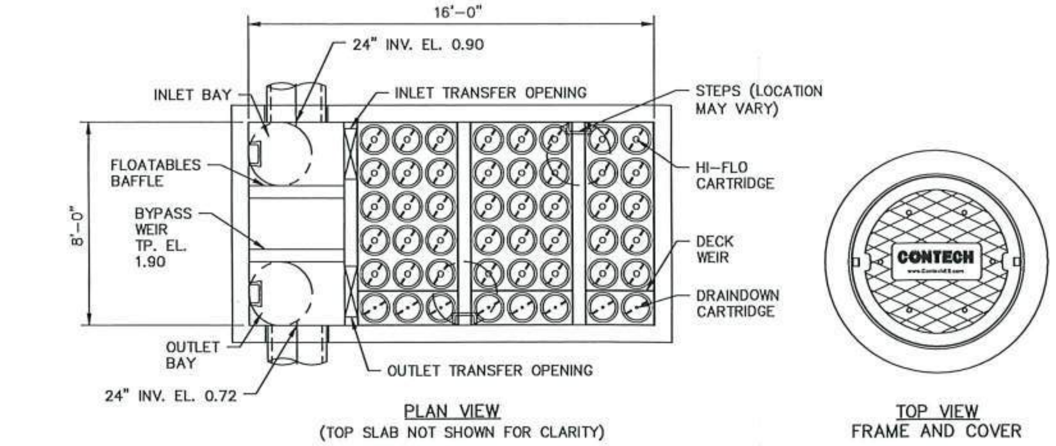
(2/D6) TIDE VALVE DETAIL
NOT TO SCALE

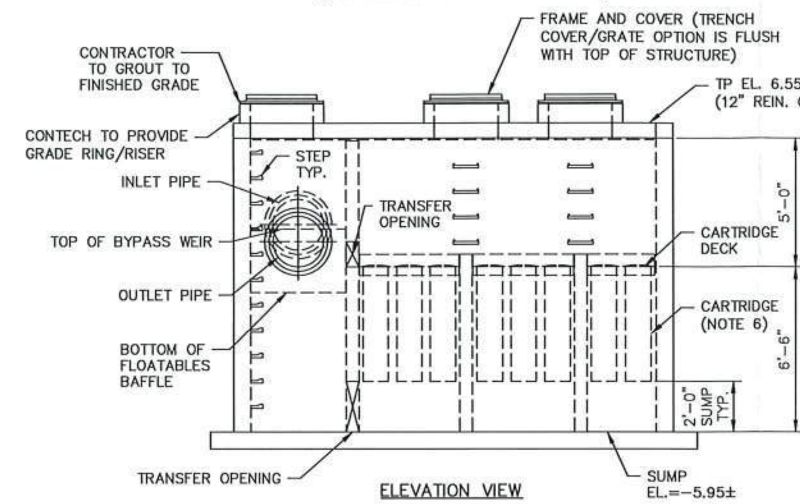


NOTES:

1. CONSTRUCT DMH IN ACCORDANCE WITH NOTES, DETAILS SPECIFICATIONS AND DETAILED SHOP DRAWINGS. PROVIDED BY MANUFACTURER.
2. FORM BRICK CHANNEL TO SPRING LINE AND CONSTRUCT SHELF TO ELEVATIONS PROVIDED.
3. CONST. BRICK WEIR OR REMOVABLE PLATE WEIR TO ELEVATION PROVIDED.

(3/D6) DMH#1E – BYPASS STRUCTURE
NOT TO SCALE (ITEM _____)

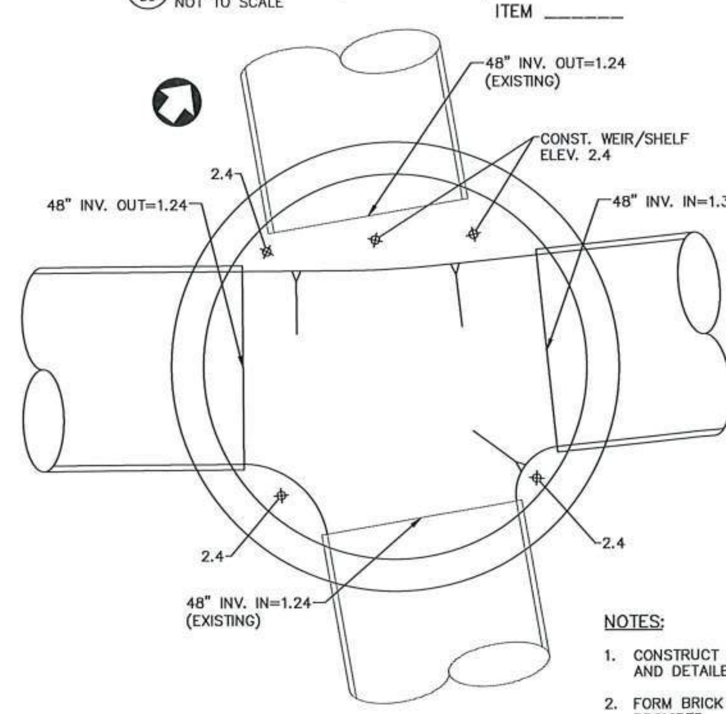




GENERAL NOTES:

1. STORMWATER TREATMENT STRUCTURE SHALL BE PROVIDED BY CONTECH OR APPROVED EQUIVALENT.
2. ENTIRE STRUCTURE SHALL MEET OR EXCEED HS-20 RATING (HEAVY LOADING).
3. PROVIDE ANTI-FLOTATION COLLARS (ALL SIDES), TO EXTEND 12" BEYOND WALLS.
4. SET STRUCTURE LEVEL. SEAL ALL JOINTS WITH APPROVED SEALANT OR NON-SHRINK GROUT.
5. INSTALL FLEXIBLE BOOT AT INLET AND OUTLET.
6. CARTRIDGE LENGTH SHALL BE 54", INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

(4/D6) JELLYFISH (JFPD0816) DETAILS
NOT TO SCALE ITEM _______



NOTES:

1. CONSTRUCT DMH IN ACCORDANCE WITH NOTES, DETAILS SPECIFICATIONS AND DETAILED SHOP DRAWINGS. PROVIDED BY MANUFACTURER.
2. FORM BRICK CHANNEL AND CONSTRUCT SHELF TO ELEVATIONS PROVIDED.
3. CONST. BRICK WEIR OR REMOVABLE PLATE WEIR TO ELEVATION PROVIDED.

(5/D6) DMH#3 – BYPASS STRUCTURE
NOT TO SCALE (ITEM _____)

NO.	REVISIONS	APP'D
△		
△		
△		
△		
△		
△		

ISSUE FOR: BIDDING Date – By – ; CONSTRUCTION Date – By – ; RECORD DRAWING Date – By –

Drawn/Chk. RMG
Designed PDM
Checked –
Approved –
Date 1/26/2022
Book No. –
Project No. 2542
Dwg. ID 2542_details_w
Scale –

FOR REVIEW
JAN. 2023
NOT FOR CONSTRUCTION

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

DRAINAGE OUTFALL DETAILS
MAPLEWOOD AVE – DRAINAGE INTERCEPT
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO D6

Maplewood Avenue Outfall Improvements
Portsmouth, New Hampshire

Abutter List

September 28, 2022

Tax Map/Lot No.: 124/2
(Maplewood Avenue)
City of Portsmouth
PO Box 628
Portsmouth, NH 03802

Tax Map/Lot No.: 125/19
(90 Maplewood Avenue)
90 Maplewood Avenue LLC
27 Austin Street
Portsmouth, NH 03801

March 2023

City of Portsmouth
PO Box 628
Portsmouth, NH 03802

Tax Map/Lot No.: 124/2

Re: ***Abutter Notification of Standard Dredge and Fill Wetlands Permit Application***
Maplewood Avenue Outfall Improvements
Portsmouth, New Hampshire

Dear Property Owner:

On behalf of the City of Portsmouth, please accept this letter as notification that a Standard Dredge and Fill Wetlands Permit Application is being submitted to the N.H. Department of Environmental Services (DES) Wetlands Bureau for proposed improvements to the outfall at 90 Maplewood Avenue. Under state law RSA 482-A:3 I (d)(1), we are required to notify you about this wetland application, because the City's proposed work abuts your property.

Once the permit is filed, the permit application, including plans of the proposed work will be available for viewing during business hours at the City of Portsmouth's Offices or by scheduling a file review at the NHDES Wetlands Bureau offices by calling (603) 271-2919 or online through the NHDES Public Records Center at the following address:
https://nhdes.govqa.us/WEBAPP/_rs/(S(wd23zfh31mcst04r1jgivddp))/SupportHome.aspx

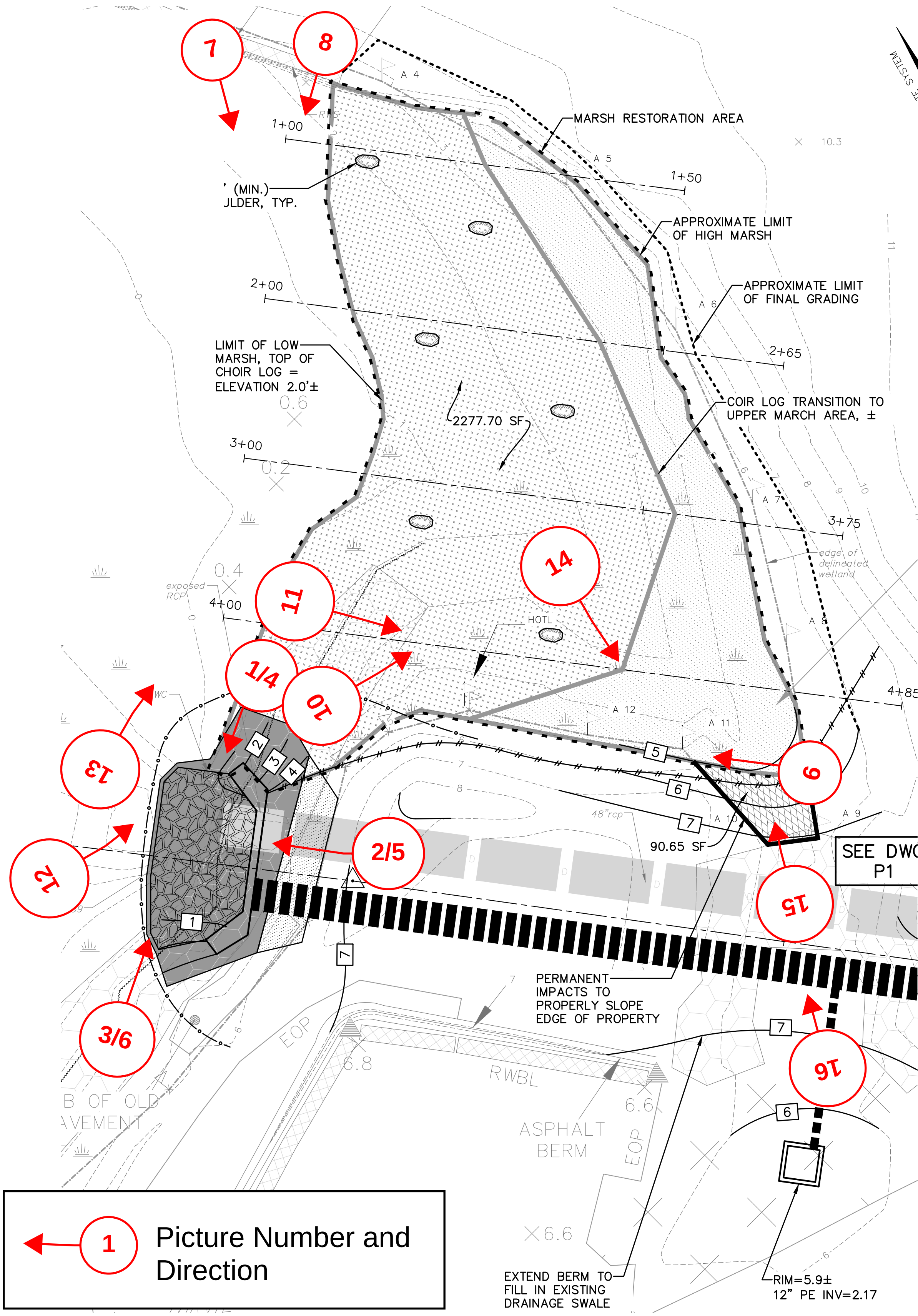
Please feel free to contact this office if you have any questions concerning this work.

Very truly yours,

UNDERWOOD ENGINEERS, INC.

Daniel J. Rochette, P.E.
Project Manager

Wetlands Impacts area
North Mill Pond
Subject Property
90 Maplewood Avenue, LLC
27 Austin Street
Portsmouth, NH 03801
Abutter
City of Portsmouth
PO Box 628
Portsmouth, NH 03802
FOUNDRY PL
MAPLEWOOD AVE
VAUGHAN ST
GREEN ST
RUSSELL ST
DEER ST
HILL ST
AUTUMN ST
BRIDGE ST
HANOVER ST
TANNER CT
TANNER ST
PARKER ST
PEARL ST
ROCK ST
ISLINGTON ST
PORTWALK PL
VAUGHAN MALL
FLEET ST
HIGH ST
Partial Legend
See the cover sheet for the complete legend.
7-5A Lot or lot-unit number
2.56 ac Parcel area in acres (ac) or square feet (sf)
25 Address number
233-137 Parcel number from a neighboring map
68' Parcel line dimension
SIMS AVE Street name
Parcel/Parcel boundary
Parcel/ROW boundary
Water boundary
Structure (1994 data)
Parcel covered by this map
Parcel from a neighboring map (see other map for current status)
0 50 100 200 Feet
0 20 40 Meters
This map is for assessment purposes only. It is not intended for legal description or conveyance. Parcels are mapped as of April 1. Building footprints are 2006 data and may not represent current structures. Streets appearing on this map may be paper (unbuilt) streets. Lot numbers take precedence over address numbers. Address numbers shown on this map may not represent posted or legal addresses.
Nearby Tax Maps
143 209 122 140 123 120 124 139 125 119 138 118 126 137 117 106 127 116 107 128
Map Location
Portsmouth, New Hampshire
2021
Tax Map 125



1 Picture Number and Direction

Not To Scale

DATE		Photo index	FIG.
3-6-24	UNDERWOOD engineers	Outfall Improvements and Marsh Restoration	3.1
PROJECT 2542	25 Vaughan Mall, Portsmouth, N.H. 03801 Tel. 603-436-6192 Fax. 603-431-4733	Portsmouth, New Hampshire	

Project Area Photos
Maplewood Avenue Outfall Improvements
Portsmouth, NH

Photo 1 – Existing outfall headwall, exposed 48" RCP pipe, and tidal embankment looking west at approximate high tide. Taken 9/28/22

Photo 2 – Existing outfall headwall and exposed 48" RCP pipe looking northwest at approximate high tide. Taken 9/28/22

Photo 3 – Existing outfall headwall, exposed 48" RCP pipe, and tidal embankment looking east at approximate high tide. Taken 9/28/22

Photo 4 – Existing outfall headwall, exposed 48" RCP pipe, and tidal embankment looking west at approximate low tide. Taken 9/29/22

Photo 5 – Existing outfall headwall and exposed 48” RCP pipe looking northwest at approximate low tide. Taken 9/29/22

Photo 6 – Existing outfall headwall, exposed 48” RCP pipe, and tidal embankment looking east at approximate low tide. Taken 9/29/22

Photo 7 – Mitigation area, looking south at approximate low tide. Taken 3/20/24

Photo 8 – Mitigation area, looking southeast at approximate low tide. Note existing large rocks to be stockpiled for use on stabilized slope and ice breakers. Taken 3/20/24

Photo 9 – Small existing marsh area in mitigation area looking northwest at approximate low tide. Note proposed grading will work to include within the proposed high marsh area. Taken 3/20/24

Photo 10 – Mitigation area looking east at approximate low tide. Note undercut embankment below cemetery. Marsh restoration will provide revetement. Trees and vegetation on embankment to remain, tree canopy to be trimmed up approximately 20’ from ground surface. Taken 3/20/24

Photo 11 – Small existing marsh area in mitigation area looking northwest at approximate low tide. Note proposed grading will work to include within the proposed high marsh area. Taken 3/20/24

Photo 12 – Existing outfall headwall with mitigation area in background looking east at approximate low tide. Taken 3/20/24

Photo 13 – Approximate location of proposed stabilized marsh sill, looking northeast at approximate low tide. Taken 3/20/24

Photo 14 – Eroded channel in mitigation area at outlet of drainage swale (to be eliminated), looking south at approximate low tide. Taken 3/20/24

Photo 15 – Existing drainage swale outlet (to be eliminated) and erosion in mitigation area looking north at approximate low tide. Taken 3/20/24

Photo 16 – Existing drainage swale (to be eliminated) looking north at approximate low tide. Taken 3/20/24

USGS
science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
OnDemand Topo

7.5-MINUTE TOPO 1 QUADRANGLE
Custom Extent
7.5-MINUTE TOPO

-70.8291° 43.1385° -70.7041° 43.1385°
43.0136° -70.8291° -70.7041° 43.136°

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 19T
Data is provided by The National Map (TNM), is the best available at the time of map generation, and includes data content from supporting themes of Elevation, Hydrography, Geographic Names, Boundaries, Transportation, Structures, Land Cover, and Orthoimagery. Refer to associated Federal Geographic Data Committee (FGDC) Metadata for additional source data information.

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands. Temporal changes may have occurred since these data were collected and some data may no longer represent actual surface conditions.

Learn About The National Map: https://nationalmap.gov

MN GN
14°35´ 259 MILS
1°12´ 21 MILS
UTM GRID AND 2021 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
CH
Grid Zone Designation 19T

SCALE 1:24 000
KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988
CONTOUR SMOOTHNESS = Medium

NEW HAMPSHIRE
QUADRANGLE LOCATION

Dover East	York Harbor
Portsmouth	Kittery

ADJOINING QUADRANGLES

ROAD CLASSIFICATION
Expressway — Local Connector
Secondary Hwy — Local Road
Ramp — 4WD
Interstate Route — US Route — State Route

7.5-MINUTE TOPO 1, NH
2022

Maplewood Avenue Outfall Improvements and Marsh Restoration
Portsmouth, New Hampshire

Work Sequence Narrative

Note: The sequence of work provided below is a typical sequence for the work proposed. Bidding documents will require the contractor to provide a detailed sequence of work based on their preferred method of installation.

Pipe Installation

Temporary and permanent erosion control devices will be installed at the project site prior to the start of construction in accordance to the Contractor's Approved SWPPP. Silt booms will also be installed in accordance with the project plans in the vicinity of the work. It is anticipated that the contractor will complete all installations during low tide and low flow conditions and permanent flow diversions and engineered dewatering systems will not be required. Any trench dewatering that occurs during installation will be discharged to appropriate silt bags or haybale detention ponds.

The trench for the new proposed 48" reinforced concrete pipe will be excavated through the embankment at North Mill Pond in parallel to the existing 48" reinforced concrete pipe. Following the removal of the existing outfall headwall, a new headwall for the existing and proposed 48" pipes will be constructed in the embankment at low tide. The proposed 48" pipe will be installed in the finished trench and dewatering and daily gravel installation measures will be performed as stated on the project plans.

Site restoration efforts after the completion of the pipe installation will include filling excavations and stabilizing the embankment and other disturbed areas within the jurisdictional wetlands. The temporary and permanent erosion control measures will be removed from the site once vegetation is established and all disturbed areas are fully stabilized.

Marsh Restoration

Contractor will ensure the silt boom is installed across the entire marsh restoration area. Sequence his work to complete all grading and fill operation during low tide conditions. Planting shall be scheduled to occur immediately following the completion grading to begin establishing vegetation as soon as possible. Tree limb trimming as described on the drawings shall occur anytime prior to the planting of marsh vegetation

Following planting of vegetation, the marsh area shall be routinely monitored for erosion and vegetation establishment. Weather conditions will also be monitored so that vegetation is to be watered as required during times of drought. Monitoring will also be in place to ensure that geese and other waterfowl are not negatively impacting the newly planted areas. If waterfowl impacts are observed than measured shall be put in place to deter waterfowl until vegetation is established. Long term observation and maintenance will be conducted by a certified wetlands scientist as required by NHDES to ensure long term success of the mitigated area.

UTILITY EASEMENT DEED

KNOW ALL MEN BY THESE PRESENTS, that 90 Maplewood Avenue LLC with a mailing address of 27 Austin Street, Portsmouth, New Hampshire 03801, County of Rockingham, State of New Hampshire, (herein "Grantor")

FOR CONSIDERATION PAID in the amount of One Dollar ($1.00), receipt of which is hereby acknowledged, grant to the **CITY OF PORTSMOUTH**, its employees, agents, or assigns acting on behalf of the City of Portsmouth, New Hampshire, a municipal body politic, having a mailing address of 1 Junkins Ave, Portsmouth, New Hampshire, 03801, County of Portsmouth, State of New Hampshire (herein referred to as the "Grantee").

WITH QUITCLAIM COVENANTS, the following easement rights with respect to the Grantor's property situated at #90 Maplewood Ave, Portsmouth, Rockingham County, New Hampshire (the "Premises"), Assessor's Map 125, Lot 19. Said easements are further bounded and described as follows:

1. Temporary Easement: Conveying to the Grantee the temporary right and privilege to enter onto the land of the Grantor, for the initial purpose of construction of the drainage pipelines in the area shown on the Easement Plan. The Temporary Easement will expire one year following acceptance of the drainage construction by the City of Portsmouth.

2. Permanent Easement: The Permanent Easement shall be to the limits as they are described on the Easement Plan.

3. Purpose and Rights: It is further agreed that within the described Easements, the Grantor convey to the Grantee the perpetual, permanent, uninterrupted, and unobstructed exclusive easement and right of way in, under, across and over the Easement area for the purpose of installing, operating, maintaining, inspecting, removing, repairing, and replacing: the drain line with their associated pipes, catch basins, manholes, and appurtenances; along the length of the drain line. The Grantee shall have the right to remove pavement, trees, bushes, undergrowth, and other obstructions interfering with the activities authorized herein and to take such other actions as may be reasonably necessary, useful, or convenient for the enjoyment of the easement rights herein granted.

4. Grantee's Responsibility to Restore: Disturbed areas within the Temporary and Permanent Easement areas shall be backfilled and restored along the length of the drain. Pavement will be replaced in kind and other areas disturbed will be loamed and seeded, restored to existing condition, or as otherwise shown on the Easement Plan. Any fences removed will be reset.

5. Grantor's Retained Rights: Grantor retains the right to freely use and enjoy its interest in the Permanent Easement Area insofar as the exercise thereof does not endanger or interfere with the purpose of this instrument. Grantor shall not, however, erect any structure within the Permanent Easement area or substantially change the grade or slope, or otherwise restrict access to the drain operated by the Grantee, without prior written consent of the Grantee.

6. Easement to Run with Land: All rights and privileges, obligations and liabilities created by this instrument shall inure to the benefit of, and be binding upon, the heirs, devises,

administrators, executor, successors and assignees of the Grantee and of the Grantor, the parties hereto and all subsequent owners of the Premises and shall run with the land.

7. Recording of Easement: It is the intention of the grantor and grantee that the easement will be permanently defined with metes and bounds including monumentation following construction of the drainage. The Permanent Easement plan will then be recorded at the Rockingham County Registry of Deeds, at the Grantee's expense.

MEANING AND INTENDING to convey an easement over a portion of the premises conveyed to the within Grantor by deed of 90 Maplewood Avenue LLC dated March 15, 2019, and recorded in Book 5986 Page 661 of the Rockingham County Registry of Deeds.

DATED this _______ day of ____________, 2024.

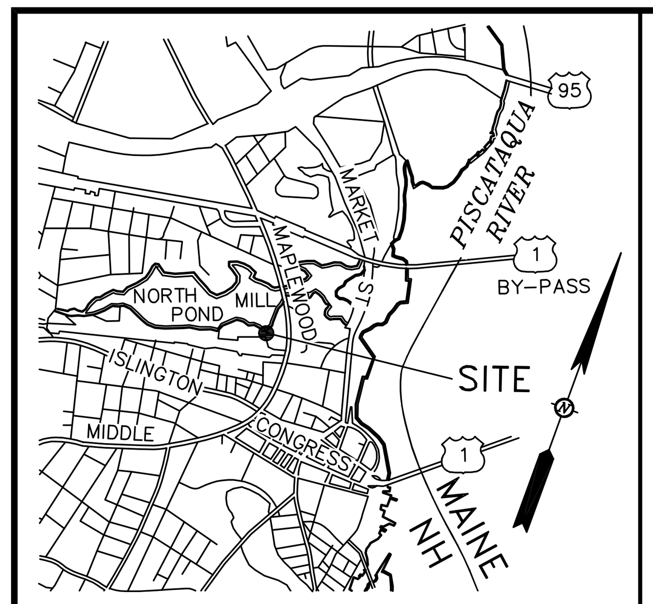
By: ________________________________
Grantor: 90 Maplewood Avenue LLC

STATE OF NEW HAMPSHIRE
COUNTY OF ROCKINGHAM

The foregoing instrument was acknowledged before me this _____ day of ____________, 2024 by ________________________ (Grantor)

____
Justice of the Peace/Notary Public
Printed Name:

My Commission Expires:



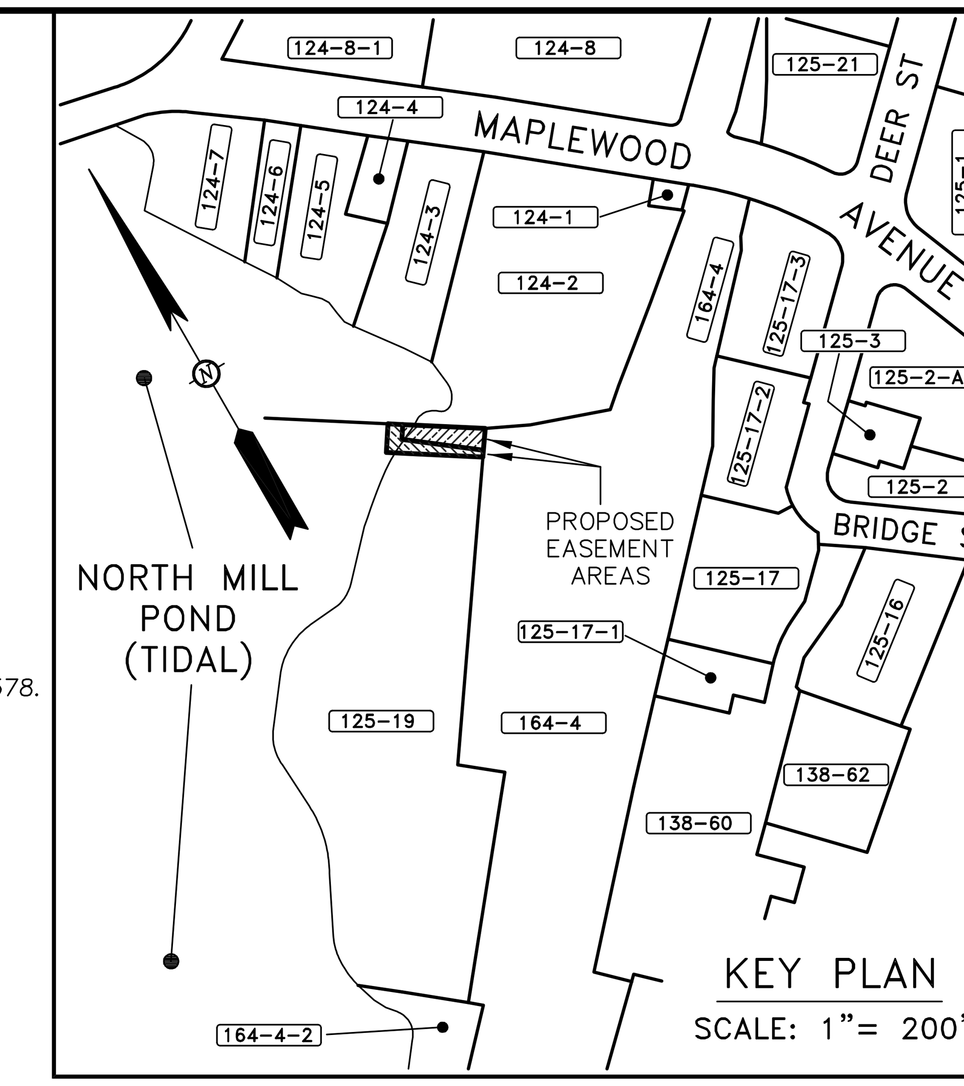
NOTES:

1. OWNER OF RECORD.................. **90 MAPLEWOOD AVENUE, LLC**
   ADDRESS.................................. **27 AUSTIN ST, PORTSMOUTH, NH 03801**
   DEED REFERENCE...................... **5986/661**
   TAX SHEET / LOT.................... **125-19**
2. THIS PLAN IS BASED ON A FIELD SURVEY BY JAMES VERRA AND ASSOCIATES, INC. 12/2019-6/2022. ON SITE CONTROL ESTABLISHED USING SURVEY GRADE GPS UNITS.
   HORIZONTAL DATUM: NAD 1983 (1986 ADJUSTMENT)
   PRIMARY BM: NHDOT 379-0150 (PORTSMOUTH TRAFFIC CIRCLE)
   VERTICAL DATUM: NAVD 1988
   PRIMARY BM: CITY CONTROL POINT "ALBA"
   UNITS: US SURVEY FOOT
3. THE LOCATION OF ALL UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE AND ARE BASED UPON THE FIELD LOCATION OF ALL VISIBLE STRUCTURES (IE CATCH BASINS, MANHOLES, WATER GATES ETC.) AND INFORMATION COMPILED FROM PLANS PROVIDED BY UTILITY COMPANIES AND GOVERNMENTAL AGENCIES. ALL CONTRACTORS SHOULD NOTIFY, IN WRITING, SAID AGENCIES PRIOR TO ANY EXCAVATION WORK AND CALL DIG-SAFE @ 1-888-DIG-SAFE.

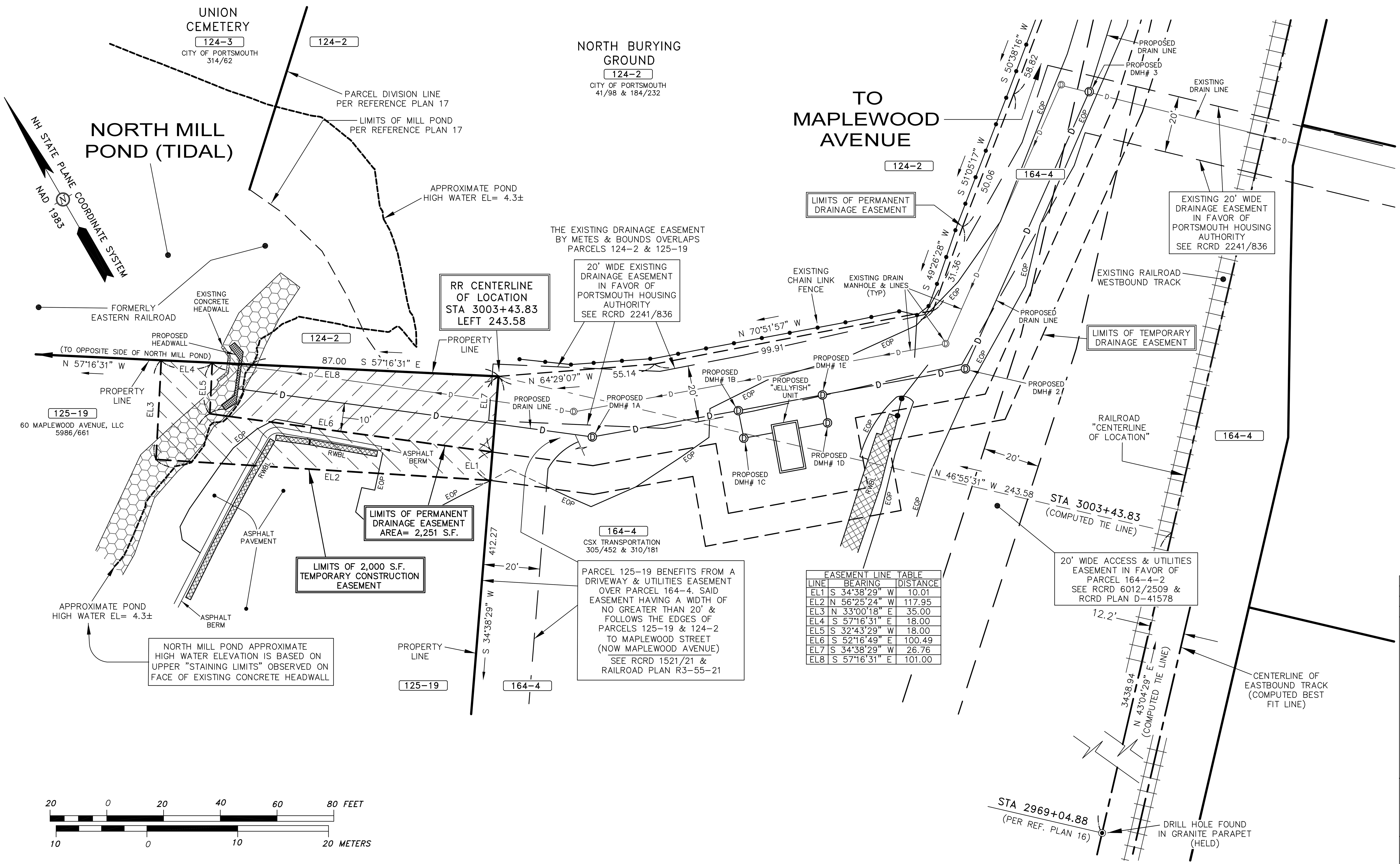
   NOTE: VERY LITTLE UNDERGROUND UTILITY MARKING WAS COMPLETED PRIOR TO THE FIELD SURVEY.
4. THE RELATIVE ERROR OF CLOSURE WAS LESS THAN 1 FOOT IN 15,000 FEET.

REFERENCE PLANS:

1. VAUGHAN STREET PROJECT, PROJECT NO. R-10, PLAN OF PERIMETER SURVEY, FOR PORTSMOUTH HOUSING AUTHORITY, PORTSMOUTH, N.H., SCALE: 1"= 40', REVISED TO 7/10/1969, BY JOHN W. DURGIN, CIVIL ENGINEER, NOT RECORDED.
2. DISPOSITION MAP, VAUGHAN STREET URBAN RENEWAL PROJECT, N.H. R-10, PORTSMOUTH, N.H., BY ANDERSON-NICHOLS & CO., INC., REVISED TO 11/5/1970, RCRD PLAN D-2408.
3. DISPOSITION MAP, PARCEL 4, VAUGHAN STREET URBAN RENEWAL PROJECT, N.H. R-10, PORTSMOUTH, N.H., BY ANDERSON-NICHOLS & CO., INC., REVISED TO 8/11/1972, RCRD PLAN C-3525.
4. DISPOSITION MAP, PARCEL 4, VAUGHAN STREET URBAN RENEWAL PROJECT, N.H. R-10, PORTSMOUTH, N.H., BY ANDERSON-NICHOLS & CO., INC., DATED 10/1973, RCRD PLAN C-4116.
5. REVISED DISPOSITION MAP, PARCEL 2C, VAUGHAN STREET URBAN RENEWAL PROJECT, N.H. R-10, PORTSMOUTH, N.H., BY ANDERSON-NICHOLS & CO., INC., DATED 7/1974, RCRD PLAN C-4701.
6. SKETCH, RAILROAD PROPERTY LINES - WEST OF DEPOT, PORTSMOUTH, N.H., SCALE: 1"= 30', DATED 4/1938, VAL. SEC. 3, MAP 55 (M222-48), NOT RECORDED.
7. LAND IN PORTSMOUTH, N.H., BOSTON AND MAINE RAILROAD TO CITY CONCRETE CO., INC., SCALE: 1"= 80', RR PLAN: R3-55-21, DATED 1/1955, NOT RECORDED.
8. LAND IN PORTSMOUTH, N.H., BOSTON AND MAINE RAILROAD TO RAYLEEN REALTY COMPANY, RR PLAN: R3-55A-2, DATED 7/1960, RCRD PLAN 03276.
9. LAND IN PORTSMOUTH, N.H., BOSTON AND MAINE RAILROAD TO ALL STATE REALTY CORPORATION, RR PLAN: R3-54-6, DATED 2/1961, RCRD PLAN 00160.
10. LAND IN PORTSMOUTH, N.H., BOSTON AND MAINE RAILROAD TO RAYLEEN REALTY COMPANY, RR PLAN: R3-55-27, DATED 4/1961, RCRD PLAN 03226.
11. BOUNDARY LINE AGREEMENT PLAN & CORRECTIVE PLAN OF LAND FOR THE GAGE COMPANY, DEER STREET ASSOCIATES AND B&M CORPORATION, PORTSMOUTH, N.H., DATED 9/1996, RCRD PLAN D-25007.
12. LOT LINE RELOCATION PLAN, LAND IN PORTSMOUTH, N.H., BOSTON AND MAINE CORPORATION TO DEER STREET ASSOCIATES, BRIDGE, DEER & HILL STREETS, REVISED TO 5/5/2015, RCRD PLAN D-38906.
13. CONSOLIDATION & SUBDIVISION PLAN, DEER STREET ASSOCIATES, BRIDGE, DEER & HILL STREETS, PORTSMOUTH, N.H., REVISED TO 5/18/2016, RCRD PLAN D-39699.
14. LOT LINE RELOCATION PLAN, BOSTON AND MAINE CORPORATION & IRON HORSE PROPERTIES, LLC, PROPERTY LOCATED BETWEEN BARTLETT STREET & MAPLEWOOD AVENUE, PORTSMOUTH, N.H., REVISED TO 5/30/2019, RCRD PLAN D-41570.
15. PROPOSED EASEMENT PLAN, BOSTON & MAINE CORPORATION TO BENEFIT IRON HORSE PROPERTIES, LLC, PROPERTY LOCATED BETWEEN BARTLETT STREET & MAPLEWOOD AVENUE, PORTSMOUTH, N.H., REVISED TO 6/27/2019, RCRD PLAN D-41578.
16. STATION MAP-LANDS, BOSTON AND MAINE RAILROAD, V3NH/SL55, REVISED TO 8/2004.
17. PLAN OF THE NORTH BURYING GROUND, IN THE TOWN OF PORTSMOUTH, DATED 1850, NOT RECORDED, ON FILE AT THE PORTSMOUTH DEPARTMENT OF PUBLIC WORKS.



KEY PLAN
SCALE: 1"= 200'



EASEMENT LINE TABLE		
LINE	BEARING	DISTANCE
EL1	S 34°38'29" W	10.01
EL2	N 56°25'24" W	117.95
EL3	N 33°00'18" E	35.00
EL4	S 57°16'31" E	18.00
EL5	S 32°43'29" W	18.00
EL6	S 52°16'49" E	100.49
EL7	S 34°38'29" W	26.76
EL8	S 57°16'31" E	101.00

LEGEND:

- 110-5 .... TAX SHEET – LOT NUMBER
- RCRD .... ROCKINGHAM COUNTY REGISTRY OF DEEDS
- .... CHAIN LINK FENCE
- RWBL...................... MODULAR BLOCK RETAINING WALL
- .... LIGHT POLE
- .... UTILITY POLE W/TRANSFORMER
- .... UTILITY POLE
- .... CATCH BASIN
- .... DRAIN MANHOLE
- .... DECIDUOUS TREE
- —D— .... DRAIN LINE
- .... CEMENT CONCRETE
- .... RETAINING WALL
- .... RIP RAP

STATE OF NEW HAMPSHIRE — JAMES VERRA — No. 625 — LICENSED LAND SURVEYOR — SIGNATURE

PURSUANT TO RSA 676:18,III AND RSA 672:14

I CERTIFY THAT THIS SURVEY PLAT IS NOT A SUBDIVISION PURSUANT TO THIS TITLE AND THAT THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW WAYS ARE SHOWN.

James Verra — 12/26/2023
JAMES VERRA — DATE

REV. NO.	DATE	DESCRIPTION	APPR'D
3	12/26/2023	REVISE PER PROJECT SURVEYOR COMMENTS	JV
2	12/21/2023	MODIFY BOUNDARY LINE LANGUAGE	JV
1	8/8/2023	MODIFY TEMPORARY CONSTRUCTION EASEMENT PER ENGINEER	JV

EASEMENT PLAN
off MAPLEWOOD AVENUE
PORTSMOUTH, NEW HAMPSHIRE
NORTH MILL POND DRAINAGE OUTFALL
over land of 90 MAPLEWOOD AVENUE, LLC
ASSESSOR'S PARCEL 125-19
for UNDERWOOD ENGINEERS, INC.

JAMES VERRA and ASSOCIATES, INC.
101 SHATTUCK WAY
SUITE 8
NEWINGTON, N.H. 03801-7876
603-436-3557

JV — PROJECT MGR
JCS — DRAWN BY

DATE:	3/16/2023
JOB NO:	23824-2
SCALE:	1" = 20'
DWG NAME:	23824-ESMT
PLAN NO:	23824-ESMT
SHEET:	1 OF 1

To: Dan Rochette, Underwood Engineers
25 Vaughan Mall
Portsmouth, NH 03801
drochette@underwoodengineers.com

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

cc: NHFG Review

Date: 02/20/2024 (valid until 02/20/2025)
Re: DataCheck Review by NH Natural Heritage Bureau and NH Fish & Game
Permits: NHDES - Wetland Standard Dredge & Fill - Major

NHB ID: NHB24-0476

Town: Portsmouth
Location: Maplewood Avenue

Project Description: Upgrade and existing drainage outfall at North Mill pond to increase capacity and complete a marsh restoration adjacent to the outfall area

Next Steps for Applicant:

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

NHB Comments: No comments at this time.

NHFG Comments: Please refer to NHFG consultation requirements below.

NHB Consultation

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

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

NH Fish and Game Department Consultation

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

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

If the NHB DataCheck response letter does not include a threatened or endangered wildlife species but includes other wildlife species (e.g., Species of Special Concern), consultation under Fis 1004 is not required; however, some species are protected under other state laws or rules, so coordination with NH Fish & Game is highly recommended or may be required for certain permits. While some permitting processes are exempt from required consultation under Fis 1004 (e.g., *statutory permit by notification, permit by rule, permit by notification, routine roadway registration, docking structure registration, or conditional authorization by rule*), coordination with NH Fish & Game may still be required under the rules governing those specific permitting processes, and it is recommended you contact the applicable permitting agency. For projects not requiring consultation under Fis 1004, but where additional coordination with NH Fish and Game is requested, please email NHFGreview@wildlife.nh.gov, and include the NHB DataCheck results letter number and "review request" in the email subject line.
Contact NH Fish & Game at (603) 271-0467 with questions.

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

Vertebrate species	State[1]	Federal	Notes
American Eel (*Anguilla rostrata*)*	SC	--	Contact the NH Fish & Game Dept (see above).

[1]Codes: "E" = Endangered, "T" = Threatened, "SC" = Special Concern, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list.
An asterisk (*) indicates that the most recent report for that occurrence was 20 or more years ago.

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

Disclaimer: NHB's database can only tell you of known occurrences that have been reported to NHFG/NHB. Known occurrences are based on information gathered by qualified biologists or members of the public, reported to our offices, and verified by NHB/NHFG.
However, many areas have never been surveyed, or have only been surveyed for certain species.
NHB recommends surveys to determine what species/natural communities are present onsite.

NHB24-0476


American Eel*
Portsmouth
Legend
Animal
Site bounds
towns
0
0.1
0.2
0.4
0.6
0.8
1
Miles

NHB24-0476 EOCODE: AFCEA01010*004*NH

New Hampshire Natural Heritage Bureau - Animal Record

American Eel (*Anguilla rostrata*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	Special Concern	State:	Rare or uncommon

Description at this Location

Conservation Rank: Not ranked
Comments on Rank: --

Detailed Description: 2000: Area 13217: Not enumerated.
General Area: --
General Comments: --
Management Comments: --

Location

Survey Site Name: Portsmouth Harbor
Managed By:

County: Rockingham
Town(s): Portsmouth
Size: 1.9 acres Elevation:

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

Directions: 2000: Hodgson Brook

Dates documented

First reported: 2000 Last reported: 2000

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

Daniel Rochette

From:	FGC: NHFG review <NHFGreview@wildlife.nh.gov>
Sent:	Thursday, March 21, 2024 11:34 AM
To:	Daniel Rochette; FGC: NHFG review
Cc:	Jacob Stoddard; Sullivan, Kevin
Subject:	RE: NHB24-0476 Review need for Consultation

Hi Dan,

Thank you for reaching out. I appreciate your patience while we navigate staffing shortages. You are correct, if the NHB datacheck results letter does not include records of Threatened and/or Endangered species, then consultation with NHFG does is not required to follow Fis rules. However, as you also correctly noted, NHFG consultation is still required for many state permits, including wetlands permit applications. This can make things a bit confusing!

In general, our review of a proposed project follows the same process whether or not a project is required by Fis rules. Depending on the species, some of the recommendations provided by NHFG may be required or strongly recommended in order to avoid impacts to species that may be protected by NH or federal laws (such as migratory birds which have state and federal protection).

You could proceed in two ways. You could provide us with the wetlands pre-application package as a submittal, and we could follow up with you if we have any questions or require additional information. Or, you could submit what you have available currently and request a non-Fis consultation review and provide similar details laid out in Fis 1004. Whatever you decide, you should submit materials via email to NHFGreview@wildlife.nh.gov with the subject line **NHB24-0476 Maplewood Ave, Portsmouth - Env. Review Request**.

We have already assigned you a program review manager for this project. His name is Kevin Sullivan, and his email is kevin.m.sullivan@wildlife.nh.gov if you have specific questions and would like to reach out to him.

I hope this helps clarify things, and please let us know if you have further questions.

Thank you,

Hayley Bibaud
Environmental Review Planner
NH Fish & Game Department
11 Hazen Drive
Concord NH 03301
Phone: (603) 271 - 0467
Email: hayley.a.bibaud@wildlife.nh.gov

New Hampshire Fish and Game requirements for environmental review consultation can be found at: https://gencourt.state.nh.us/rules/state_agencies/fis1000.html. ALL requests for consultation and submittals should be sent via email to NHFGreview@wildlife.nh.gov or can be sent hardcopy by mail. The NHB datacheck results letter number needs to be included in the email subject line to read as **"NHBxx-xxxx_Project Name_FIS 1004 Consultation Submittal".**

The requirements for consultation (Fis 1004) shall not apply to the following: statutory permit by notification, permit by rule, permit by notification, routine roadway registration, docking structure registration, or conditional authorization by rule. Review requests for these projects or other project types should be submitted to NHFGreview@wildlife.nh.gov or can be sent hardcopy by mail – email or mail subject line for these review requests should read **"NHBxx-xxxx_Project Name_ Env. Review Request".**

Please provide shapefiles/KMZ/KMLs of the project site (and relevant features if applicable) with your submittal. Review statements provided in the NHB Datacheck Results letter for additional guidance.

Did you know? New Hampshire Fish and Game protects, conserves, and manages more than 500 species of wildlife and thousands of invertebrates. Learn more at www.wildnh.com/nongame

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From: Daniel Rochette <drochette@underwoodengineers.com>
Sent: Wednesday, February 21, 2024 11:04 AM
To: FGC: NHFG review <NHFGreview@wildlife.nh.gov>
Cc: Jacob Stoddard <jstoddard@underwoodengineers.com>
Subject: NHB24-0476 Review need for Consultation

EXTERNAL: Do not open attachments or click on links unless you recognize and trust the sender.

Good afternoon,

We received the attached NHB24-0476 record review yesterday with a record of an American Eel reported in the vicinity of our project. The project involves upgrading an existing an existing outfall on North Mill Pond in Portsmouth, NH and marsh restoration adjacent to the outfall location as mitigation. As we are working in tidal waters and the wetlands permit will be categorized as a major impact project. I wanted to reach out to ensure we are following the proper procedures with NHF&G as the eel is listed as a 'special concern' species and per the guidance provided, a consultation with NHF&G is not required but coordination is recommended depending on the type of project.

We are currently in the process of scheduling or pre application mitigation meeting with the wetlands bureau and I believe NHF&G is typically a part of that meeting.

Please let me know how to proceed from here or what additional information you may need. I believe we have had other projects in our office with "special concern" results where a formal consultation was not required but some guidance and considerations were provided by NHF&G to be included as part of the construction documents after discussing the project.

Thank You

-Dan

UNDERWOOD engineers

Client service and teamwork for over 40 years!

Daniel J. Rochette, P.E. (NH)
Senior Project Engineer & Technical Leader
Underwood Engineers
Phone: (603) 436-6192
http://www.underwoodengineers.com

AVOIDANCE AND MINIMIZATION WRITTEN NARRATIVE

Water Division/Land Resources Management Wetlands Bureau

Check the Status of your Application

RSA/ Rule: RSA 482-A/ Env-Wt 311.04(j); Env-Wt 311.07; Env-Wt 313.01(a)(1)b; Env-Wt 313.01(c)

APPLICANT'S NAME: **City of Portsmouth** **TOWN NAME:** **Portsmouth, NH**

An applicant for a standard permit shall submit with the permit application a written narrative that explains how all impacts to functions and values of all jurisdictional areas have been avoided and minimized to the maximum extent practicable. This attachment can be used to guide the narrative (attach additional pages if needed). Alternatively, the applicant may attach a completed Avoidance and Minimization Checklist (NHDES-W-06-050) to the permit application.

SECTION 1 - WATER ACCESS STRUCTURES (Env-Wt 311.07(b)(1)) Is the primary purpose of the proposed project to construct a water access structure?
No
SECTION 2 - BUILDABLE LOT (Env-Wt 311.07(b)(1)) Does the proposed project require access through wetlands to reach a buildable lot or portion thereof?
No
SECTION 3 - AVAILABLE PROPERTY (Env-Wt 311.07(b)(2))* For any project that proposes permanent impacts of more than one acre, or that proposes permanent impacts to a PRA, or both, are any other properties reasonably available to the applicant, whether already owned or controlled by the applicant or not, that could be used to achieve the project's purpose without altering the functions and values of any jurisdictional area, in particular wetlands, streams, and PRAs? **Except as provided in any project-specific criteria and except for NH Department of Transportation projects that qualify for a categorical exclusion under the National Environmental Policy Act.*
The location selected for outfall improvements is the location of an existing outfall. Using other areas along North Mill pond would require impacts to a new area of shoreline. The area adjacent to the outfall is also previously developed as a paved lot and an old warehouse building. The Embankment stabilization along the cemetery could not occur by making improvements towards the shore as there are burial sites located in close proximity to the top of slope. Therefor any necessary grading or slope stabilization efforts would need to be completed on the seaward side of the embankment. The proposed marsh restoration will serve two functions; 1. provide compensatory mitigation for impacts associated to the outfall, and 2. to provide revetement for the undercut embankment adjacent to the cemetery.

SECTION 4 - ALTERNATIVES (Env-Wt 311.07(b)(3))

Could alternative designs or techniques, such as different layouts, different construction sequencing, or alternative technologies be used to avoid impacts to jurisdictional areas or their functions and values as described in the Wetlands Best Management Practice Techniques For Avoidance and Minimization?

No alternate location was considered for the outfall improvements as adding a parallel pipe to the existing outfall was the simpliest way to increase capacity. The existing location already had select land rights/easements in place for existing infrastructure. Upgrading the existing pipe to provide a single pipe with additional capacity was not an option due to physical constraints with depths and conflicts around other underground utilities. An alternate outfall location for a second pipe while maintaining the existing outfall location would have added an additional outfall location to the pond which would result in additional impacts to natural resources. Also any potential alternate locations to outlet the second pipe would have resulted in longer length of pipe to reach negatively impacting pipe hydraulics as the outlet would have been further below high tide lines than it currently is.

The marsh restoration location was selected as it is directly adjacent to the outfall work. Three separate alternatives were reviewed with NHDES Wetlands bureau and the proposed alternative (marsh with stone armored sill) was selected as the preferred. Other alternatives included reducing the marsh size to reduce the sill height and using timber reimforcement to create tiers with stabilized mudflats and marsh within the same footprint. The alternative selected better meets intent of maximising the marsh restoration.

The work will also include some grading adjacent to the proposed marsh to eliminate surface runoff from the paved parking lot adjacent to to the project area and redirect runoff to a stormwater treatment unit prior to being discharged from the upgraded outfall. The upgraded outfall will also include its own stormwater tretment unit to help maintain water quality in receiving water bodies.

SECTION 5 - CONFORMANCE WITH Env-Wt 311.10(c) (Env-Wt 311.07(b)(4))**

How does the project conform to Env-Wt 311.10(c)?

***Except for projects solely limited to construction or modification of non-tidal shoreline structures only need to complete relevant sections of Attachment A*.

Compensatory mitigation is proposed in the form of the marsh restorations shown on the plan. Approximately 3,600 SF of marsh restoration is proposed to provide compensation for approximately 550 SF of permanent impacts resulting from the outfall work.

Information Required under Env-Wt 903.05(f), Env-Wt 904.07(d), and Env-Wt 603.05

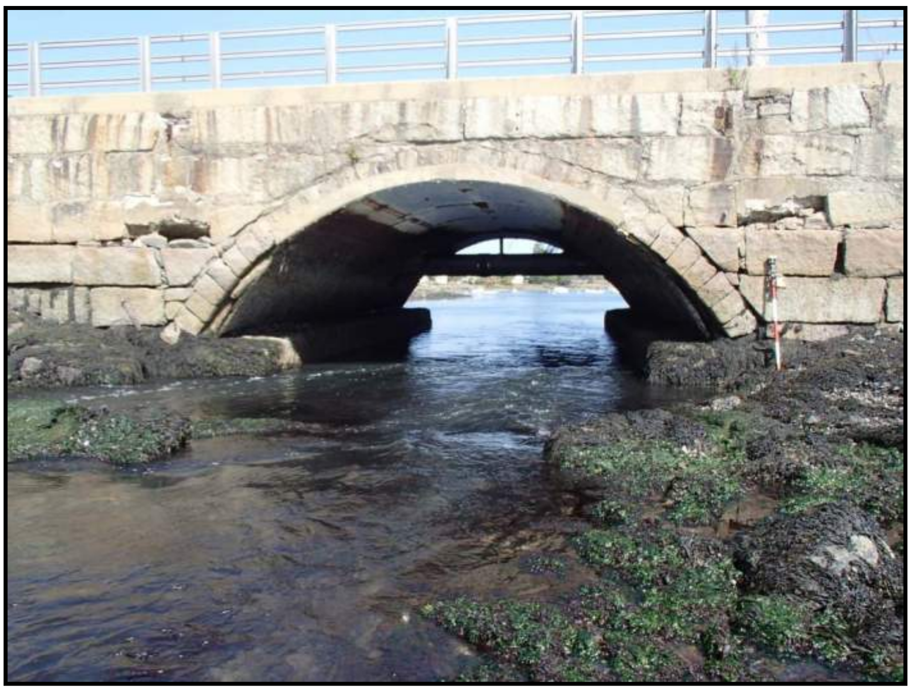
for

Maplewood Avenue over North Mill Pond Bridge Rehabilitation Project

and

North Mill Pond Drainage Outfall Project

Portsmouth, New Hampshire



Prepared For:
Hoyle, Tanner & Associates, Inc.
Pease International Tradeport
100 International Drive, Suite 360
Portsmouth, NH 03801

Prepared by:
Headwaters Consulting, LLC
P.O. Box 744
Littleton, NH 03561

August 23, 2023

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APPENDICES

A. Introduction

This report describes the hydrologic and hydraulic analyses completed to support a NHDES Wetlands Permit application for the Maplewood Avenue over North Mill Pond Bridge Rehabilitation Project and the North Mill Pond Drainage Outfall Project in Portsmouth, NH. More specifically, this report includes the information required under sections Env-Wt 903.05(f), Env-Wt 904.07(d), and Env-Wt 603.05 of the NHDES administrative rules.

B. Env-Wt 903.05(f)

Env-Wt 903.05(f) requires "a narrative explanation of the effect of the crossing on the tidal hydrograph, and the corresponding effect on the upstream and downstream tidal resource." Since the drainage outfall project does not include a tidal waterway crossing, only the effects of the bridge rehabilitation project on tidal conditions have been evaluated.

Two-dimensional (2D) unsteady flow models which simulate existing (i.e., pre-project) conditions and proposed (i.e., post-project) conditions with the geopolymer liner applied and portions of the existing above-grade concrete footings removed have been developed to evaluate the effect of the proposed bridge rehabilitation work on the tidal hydrograph and North Mill Pond. The models were created using the U.S. Army Corps of Engineers HEC-RAS program (version 6.3). To understand the effects of the proposed bridge rehabilitation work across a range of tidal conditions, pre- and post-project models were developed using two different tide stage hydrographs – one simulating a tide stage crest equal to mean higher-high water (MHHW) and one simulating a tide stage trough equal to mean lower-low water (MLLW). Comparisons between the pre- and post-project models were used to identify changes to maximum and minimum water levels and timing of the high and low tides caused by the rehabilitation work. The following sections describe the development of these models and the analysis results.

B.1. Hydraulic Model Geometry – All Models

The hydraulic models cover an area from a point on Hodgson Brook (a.k.a. Hodgdon Brook) about 1,200 feet southwest (upstream) from Bartlett Street to a point in North Mill Pond approximately 500 feet north of Maplewood Avenue. Model geometry was developed from a combination of field survey data and publicly-available LiDAR data (Coastal New Hampshire - 2014 data set). With the exception of the area in the vicinity of the bridge, the same geometry was used in all of the models.

The LiDAR data does not include below-water ground elevations (i.e., bathymetry), geometry of the corrugated metal arch bridge at Maplewood Avenue, or geometry of the box culvert at Bartlett Street; therefore, this information was field surveyed. Bathymetry of North Mill Pond within the study area was surveyed by Doucet Survey, LLC in late 2019 and early 2020. The Doucet survey also included topography along about 800 feet of Maplewood Avenue, portions of the shoreline north and south of the road, and other above-water areas in the project vicinity. However, it did not include detailed geometry of the existing bridge, bathymetry at the bridge inlet or outlet, geometry of the box culvert at Bartlett Street, or channel bottom elevations at the box culvert inlet or outlet; therefore, this information was field surveyed by Headwaters Consulting, LLC in September 2020. All field survey data was collected relative to NH State Plane coordinates and NAVD88 elevations, which are the same coordinate system and elevation datum the LiDAR data is referenced to (though the LiDAR data was converted from metric to U.S. customary units). This allowed the field survey data to be merged with the LiDAR data to produce a comprehensive digital elevation model (DEM) of the study area. Figure 1 shows the hydraulic study area DEM with the Doucet field survey area outlined in red and the Headwaters field survey areas outlined in blue. Terrain information in all other areas was generated from LiDAR data.

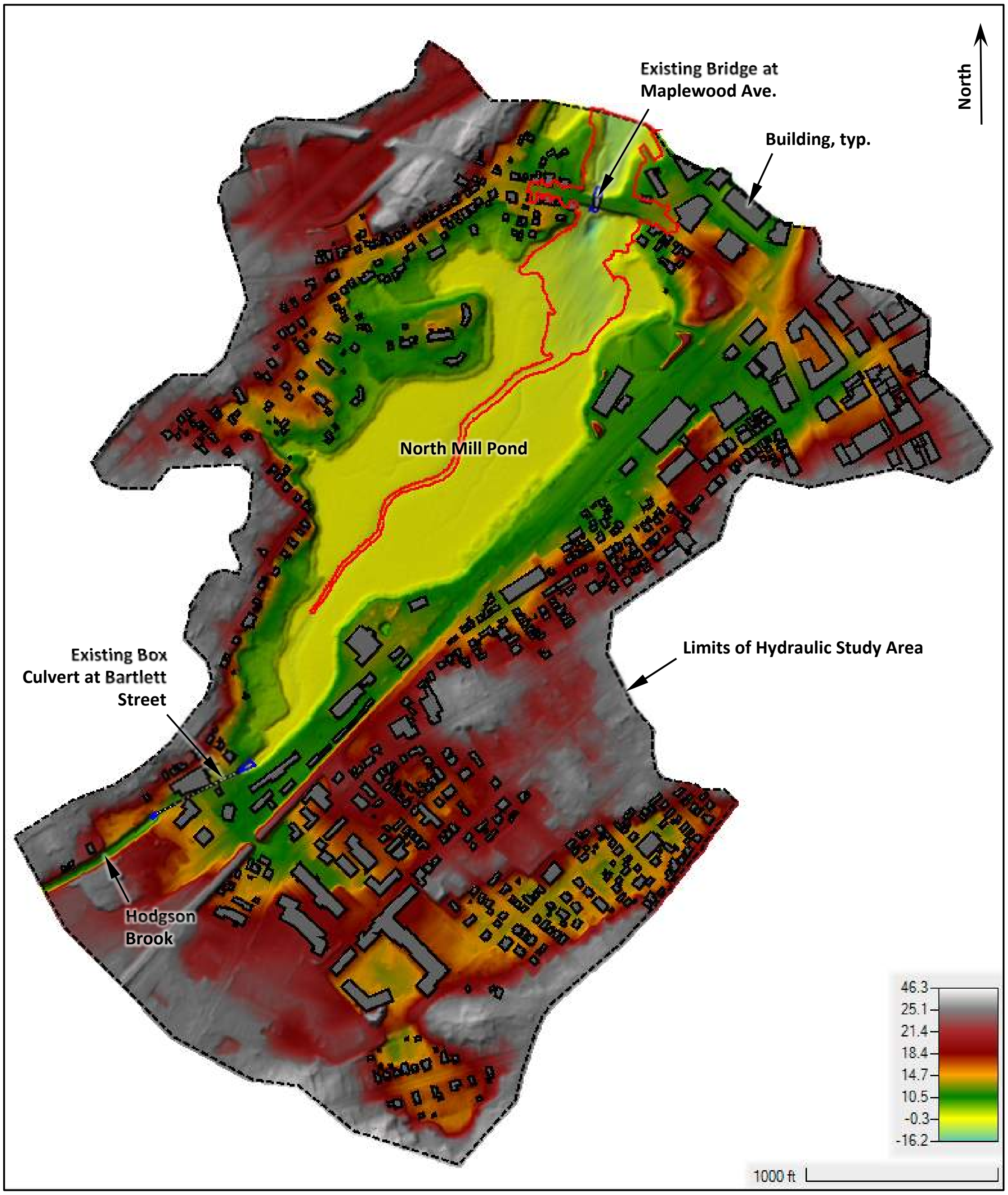

Figure 1 – Existing conditions digital elevation model (DEM) of the hydraulic study area showing areas field surveyed by Doucet Survey, LLC outlined in red and areas field surveyed by Headwaters Consulting, LLC outlined in blue

As shown in Figure 1, there are many buildings within the hydraulic study area. The building footprints were provided by the City of Portsmouth in GIS format and were uniformly assigned an elevation value of 30 feet in the DEM so that they would be recognized as flow obstructions in the model.

A 2D computational mesh with a 25-foot x 25-foot cell size was overlaid on the DEM. Breaklines were defined along the tops of embankments and other elevated features which obstruct the flow (e.g., Maplewood Avenue) to prevent the model from calculating flow over them before they are actually overtopped. Figure 2 shows the computational mesh layout in the vicinity of Maplewood Avenue for the pre-project hydraulic models.

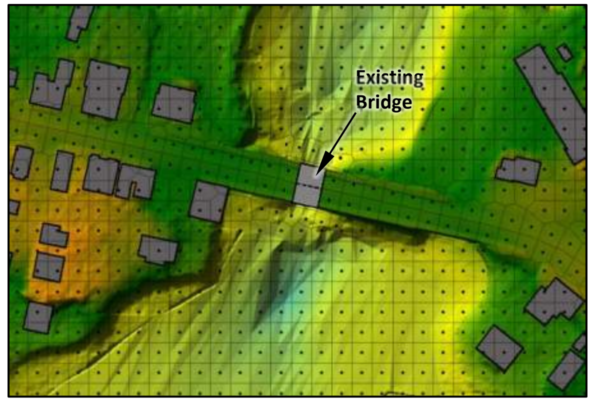

Figure 2 – Computational mesh in the vicinity of Maplewood Avenue used in the pre-project hydraulic models

B.2. <u>Pre-Project Bridge Geometry</u>

Figure 3 shows a photo of the existing bridge inlet and Figures 4 and 5 show cross-sections at the existing bridge inlet and outlet. [Note that although there is bi-directional flow through the bridge, for the purposes of this study the bridge inlet is on the south side of Maplewood Avenue and the bridge outlet is on the north side of the road.] Geometries of the metal arch, concrete footings, and channel bottom are based on field survey data collected by Headwaters Consulting, LLC collected in September 2020. The roadway embankment geometries were determined from the Doucet Survey, LLC survey information.

A 24-inch diameter sanitary sewer main passes through the bridge opening about 15 feet south of the bridge outlet (see Figures 3 and 6). The size, location, and elevation of the sewer main were estimated from a 2009 plan by Haight Engineering, PLLC[1] and superimposed on the existing bridge outlet section (Figure 5).

[1] Existing Profile Plan, Maplewood Ave Culvert Replacement & North Mill Pond Restoration, Portsmouth, NH, prepared by Haight Engineering, PLLC, Sheet C-4, date: 12-30-2009

Figure 3 – View north at the existing bridge inlet (09-23-20)

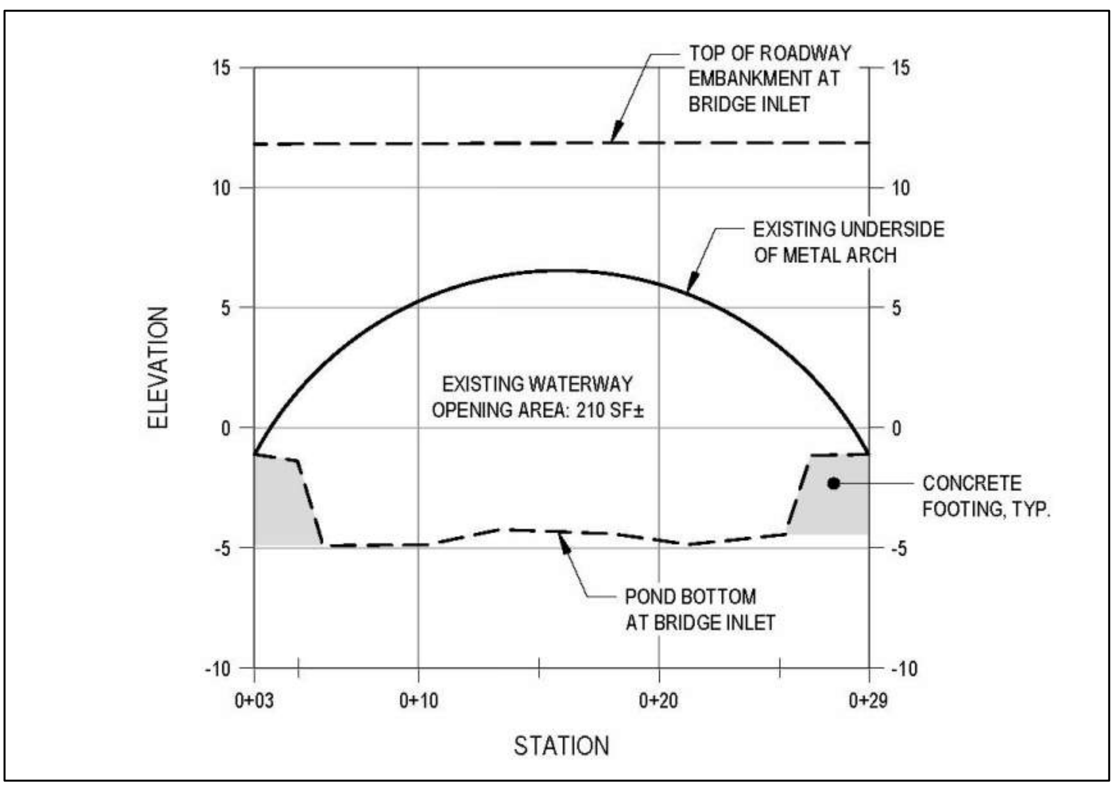

Figure 4 – Existing bridge inlet cross-section

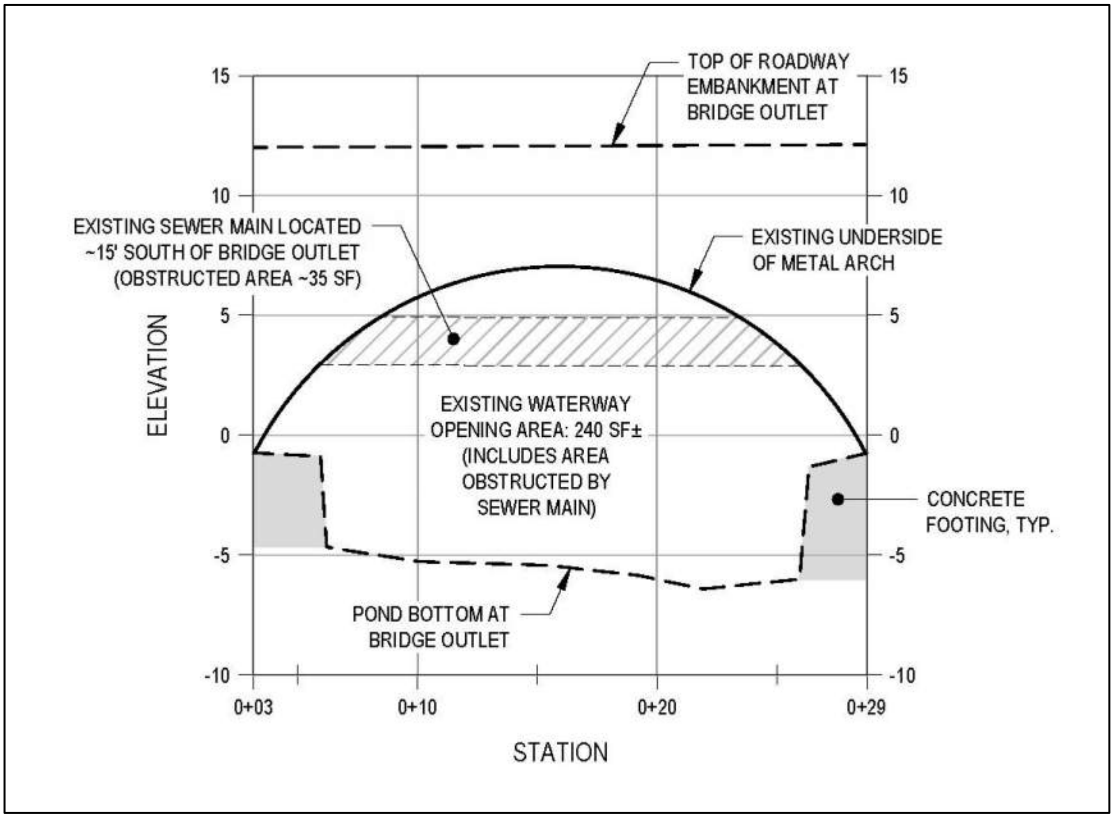

Figure 5 – Existing bridge outlet cross-section

Since the HEC-RAS bridge hydraulics routine computes flow through the bridge only at the inlet and outlet, the true effect of the sewer main cannot be modelled directly. Therefore, in an attempt to estimate its impact, the waterway opening at the bridge outlet was reduced by an area equal to the area obstructed by the sewer main, which is shown to be approximately 35 square feet on the 2009 Haight Engineering plan. Figure 7 shows the bridge outlet section as coded in the pre-project models to account for the sewer main. The waterway opening area at the bridge outlet is approximately 240 square feet when the sewer main obstruction is disregarded. The modeled waterway opening area at the bridge outlet is about 205 square feet.

Figure 6 – View north within the existing bridge opening showing the sewer main (09-23-20)

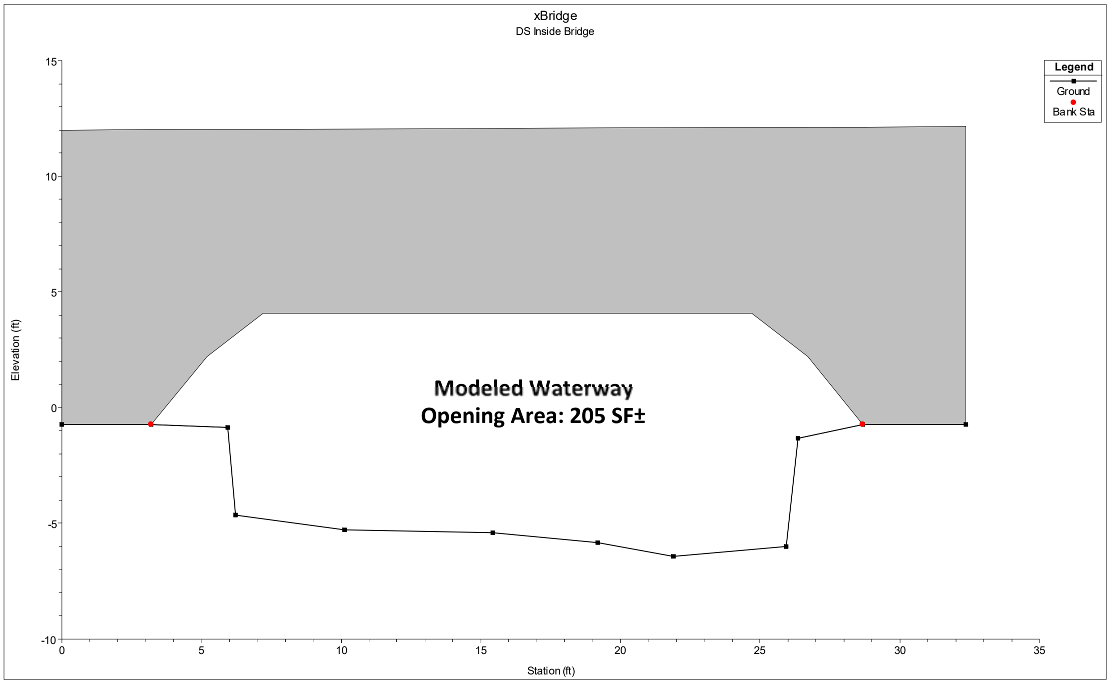

Figure 7 – Existing bridge outlet cross-section as modeled to account for sewer main obstruction

B.3. Post-Project Bridge Geometry

Figure 8 shows a cross-section of the bridge inlet as modeled with the geopolymer liner applied and portions of the concrete footings removed. The existing waterway opening area at the inlet is approximately 210 square feet (see Figure 4). The geopolymer liner would occupy approximately 11 square feet and the concrete footing removal would add about 11 square feet, resulting in no change to the overall waterway opening area at the inlet.

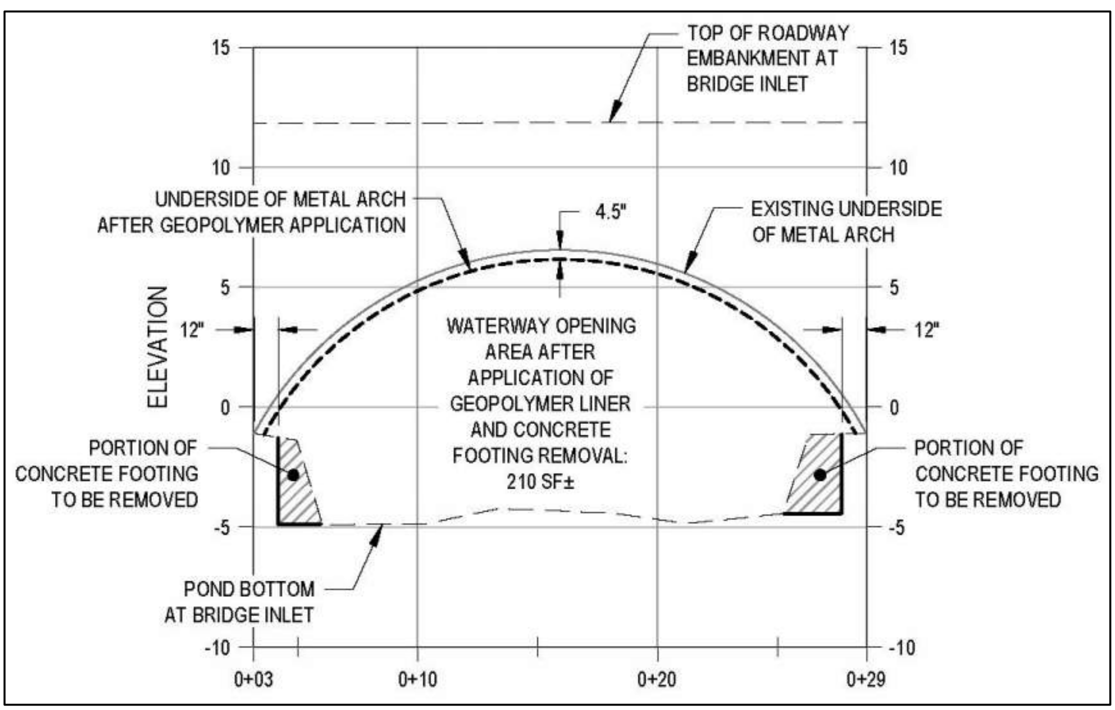

Figure 8 – Post-project bridge inlet cross-section

The waterway opening at the bridge outlet was reduced by an area equal to the sum of the areas obstructed by the geopolymer liner and sanitary sewer main (45 sf) less the area added by removing portions of the concrete footings (15 sf). Figure 9 shows the bridge outlet section defined in the hydraulic models to account for these obstructions and additions which increase the modeled waterway opening area at the bridge outlet from 205 square feet (see Figure 7) to about 210 square feet.

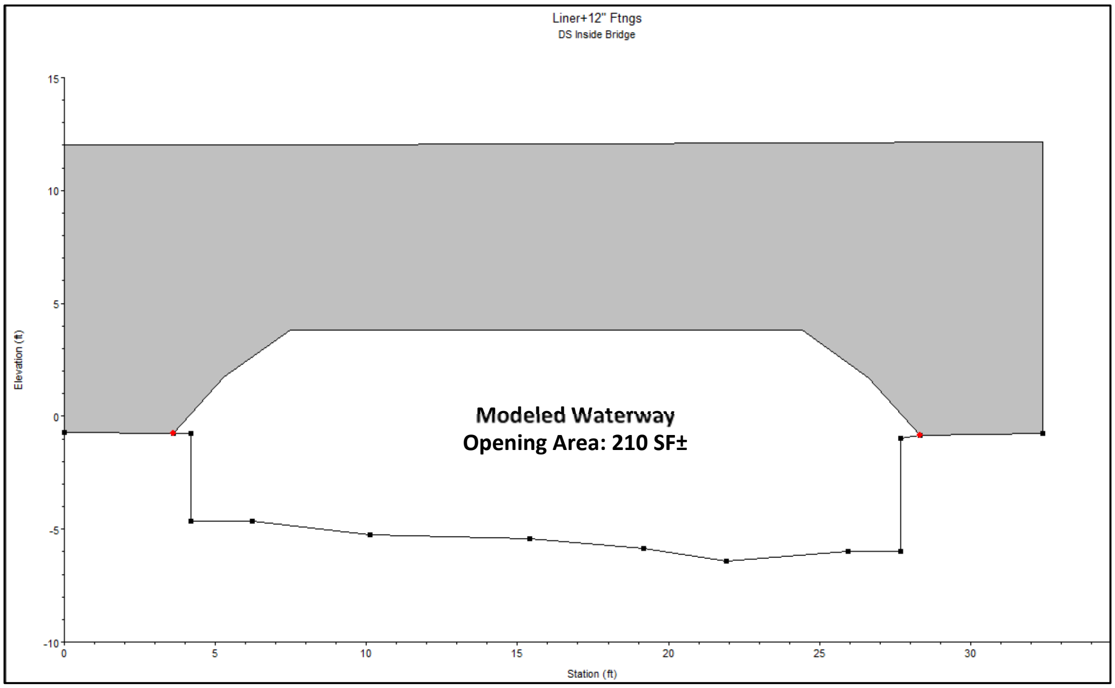

Figure 9 – Post-project bridge outlet cross-section as modeled to account for the areas obstructed by the geopolymer liner and sewer main and the area added by removing portions of the concrete footings

Details for the geopolymer liner at the interface of the metal arch and concrete footings are still being developed and as a result there may be some minor differences between the final proposed waterway opening geometries and those shown in Figures 8 and 9; however, if these result in a diminution of the modeled opening areas, additional concrete footing removal will be incorporated into the details such that the final proposed waterway opening geometries will have the same cross-sectional areas as the modeled waterway openings and the results of these analyses will still be valid.

B.4. Roughness

2017 aerial photography and the "Impervious Surfaces in the Coastal Watershed of NH and Maine, High Resolution – 2015" and "Land Use 2015 - Southeastern New Hampshire" GIS layers downloaded from NHGRANIT were used to map land cover in the hydraulic study area via the creation of GIS land cover polygons. Manning's n surface roughness coefficients were then assigned to each land cover type for use in the hydraulic modeling. Figure 10 shows the land cover mapping and Table 1 lists the roughness coefficients assigned to the land cover classifications. A full-size copy of the land cover map is included in Appendix 1.

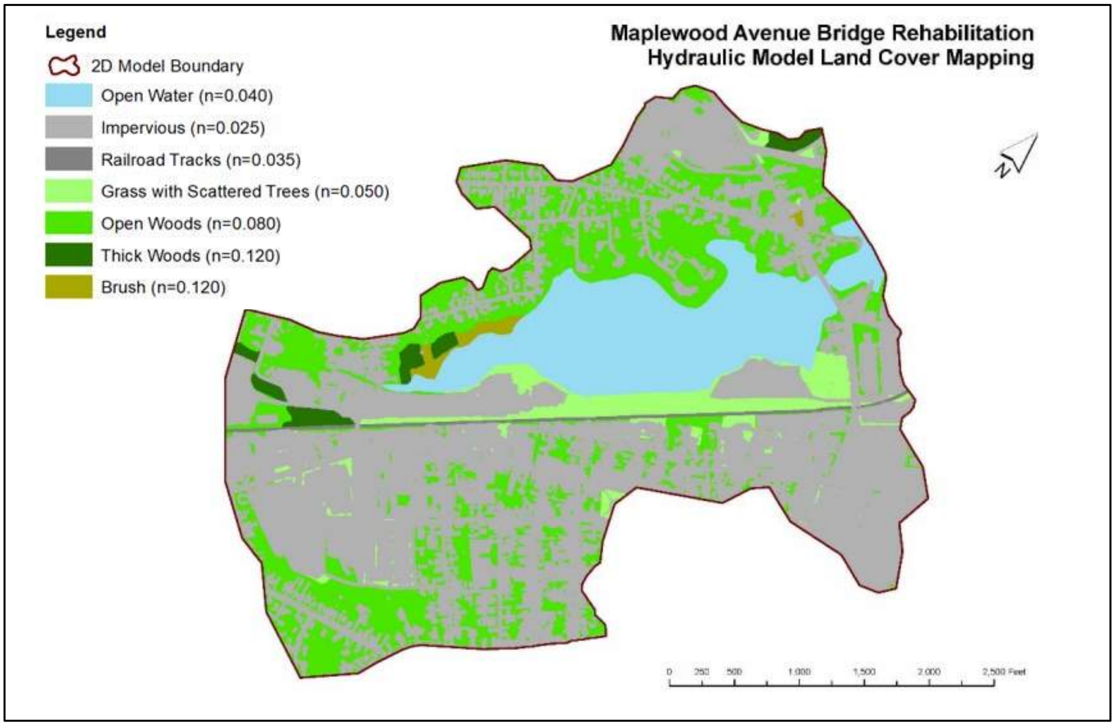

Figure 10 – Land cover mapping

Table 1 – Manning's n roughness coefficients

Land Cover Classification	Manning's n Roughness Coefficient
Open Water	0.040
Impervious Surface	0.025
Railroad Tracks	0.035
Grass with Scattered Trees	0.050
Open Woods	0.080
Thick Woods	0.120
Brush	0.120

Figure 11 shows the hydraulic study area (i.e., 2D model boundary) overlaid on the 2017 aerial photography.

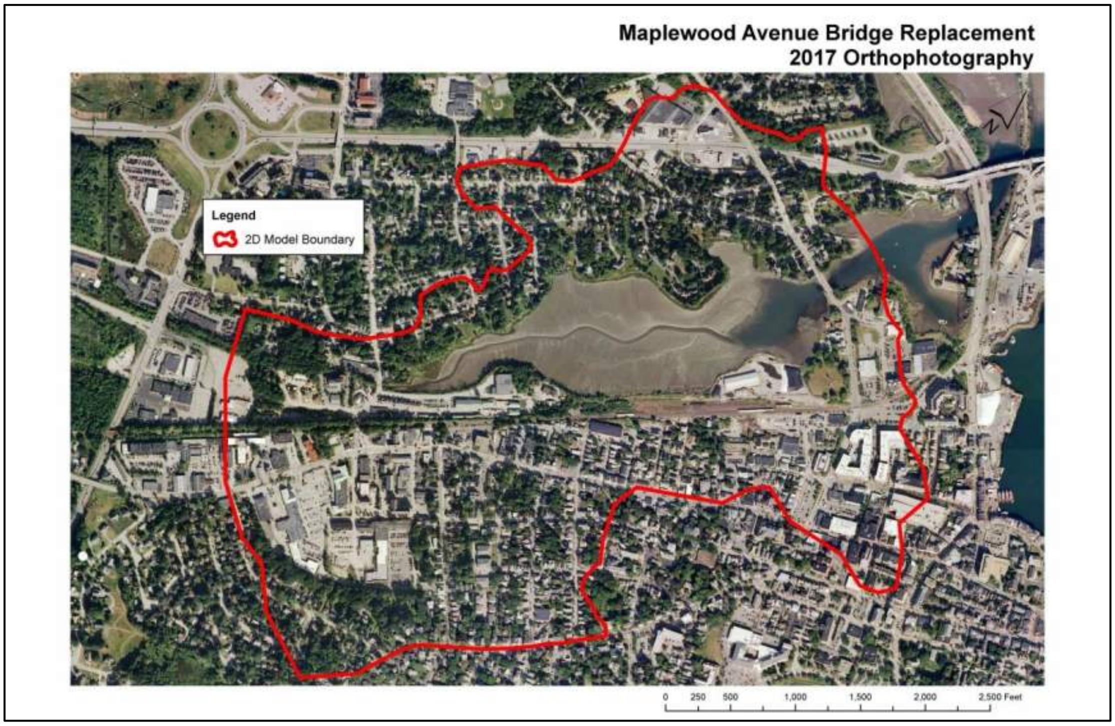

Figure 11 – Hydraulic study area boundary overlaid on 2017 aerial photography

B.5. Boundary Conditions

External boundary conditions were defined at the upstream (south) and downstream (north) limits of the hydraulic study area in each model. These include flow hydrographs at the upstream end of the study area, which represent freshwater inflow to North Mill Pond, and stage hydrographs at the downstream end of the study area to simulate tide fluctuations.

Since Env-Wt 903.05(f) only requires an assessment of project's impact on the tidal hydrograph, the freshwater inflow hydrograph only reflects base flow conditions for Hodgson Brook, which are estimated to be a constant discharge of 2 cfs, which is the approximate flow that is equaled or exceeded 60% of the time predicted by the flow duration regression equations in the web-based USGS StreamStats program[2] (see Appendix 1).

Data from the NOAA Seavey Island tide station (#8419870) were used to develop stage hydrographs for the downstream boundary. The tide station is located at the Portsmouth Naval Shipyard about 1.2 miles due east of the bridge and has operated intermittently between 1926 and present with a cumulative record of approximately 58 years.

Doucet Survey, LLC completed a tidal study In May and June 2022 to relate tide stages on the north side of Maplewood Avenue (i.e., the ocean side) to tide stages measured at the Seavey Island tide station. This involved surveying high and low water elevations at the bridge on three separate occasions, comparing these to the high and low water elevations measured at the tide station, and using the data to calculate tide datums on the north side of the bridge.

[2] Flynn, R.H. and Tasker, G.D.,2002, Development of Regression Equations to Estimate Flow Durations and Low-Flow-Frequency Statistics in New Hampshire Streams: U.S. Geological Survey Scientific Investigations Report 02-4298, 66 p. (http://pubs.water.usgs.gov/wrir02-4298)

Table 2 summarizes the calculated tidal datums. A summary table from the Doucet tidal study is also included in Appendix 1.

Table 2 – Tide Datums from Doucet Survey Tidal Study

Datum	Description	Maplewood Ave. Bridge (North Side)	Seavey Island Tide Station (#8419870)
HAT	Highest Astronomical Tide	5.6 ft	5.87 ft
MHHW	Mean Higher-High Water	4.0 ft	4.18 ft
MHW	Mean High Water	3.6 ft	3.76 ft
MTL	Mean Tide Level	-0.3 ft	-0.32 ft
MLW	Mean Low Water	-4.2 ft	-4.39 ft
MLLW	Mean Lower-Low Water	-4.5 ft	-4.71 ft
NAVD88	North American Vertical Datum of 1988	0.0 ft	0.00 ft

Tide stage hydrographs used for the downstream boundaries were estimated using water levels measured at the Seavey Island station during tide cycles with crests and troughs equal to MHHW and MLLW, respectively. These occurred most recently at 4:24 AM on July 16, 2021 (higher-high water 4.18 ft) and 6:48 PM on October 26, 2022 (lower-low water -4.71 ft).

Six-minute water level data for 24-hour periods centered on the MHHW and MLLW measurements at the tide station were downloaded from the NOAA website. Per the Doucet tidal study, MHHW on the north side of the bridge is approximately 4.3% lower than MHHW at the tide station and MLLW on the north side of the bridge is approximately 4.5% higher than MLLW at the tide station. The water levels measured at the tide station were lowered and raised by these percentages to generate tide stage hydrogaphs simulating MHHW and MLLW on the north side of the bridge which were used as the downstream boundaries in the models. Figures 12 and 13 show the tide stage hydrographs simulating MHHW and MLLW at the downstream model boundary.

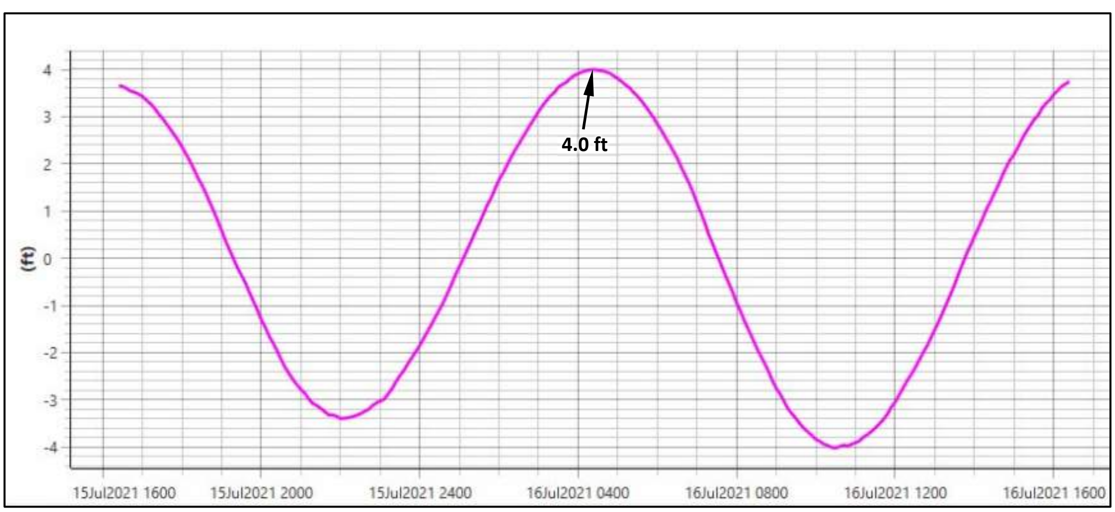

Figure 12 – Tide stage hydrograph simulating MHHW at the downstream model boundary

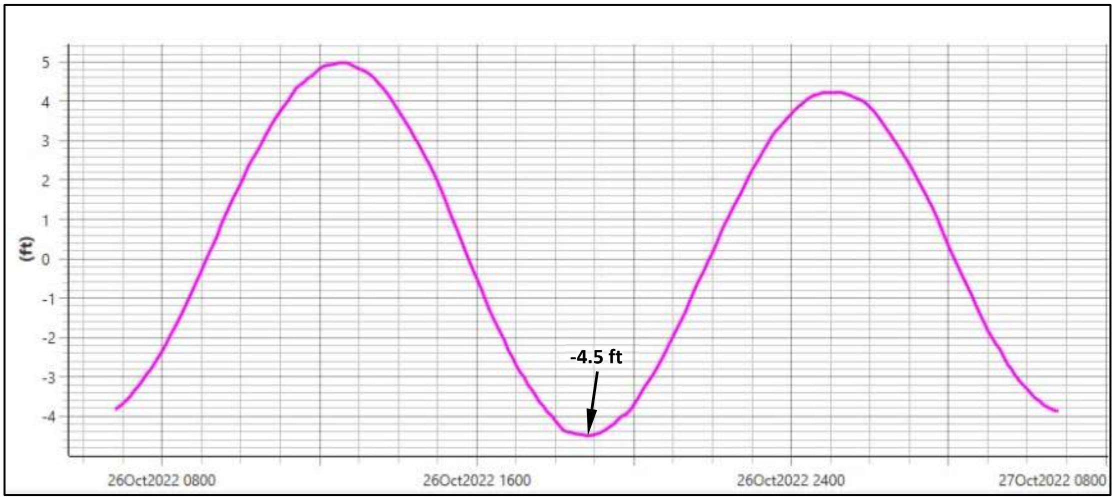

Figure 13 – Tide stage hydrograph simulating MLLW at the downstream model boundary

B.6. Additional Modeling Parameters

All models were run with the full momentum SWE-ELM equation set (i.e., Shallow Water Equations, Eulerian-Lagrangian Method) which is appropriate for tidally-influenced conditions as it is capable of modeling the propagation of dynamic tide cycle waves.

The HEC-RAS program was allowed to adjust the computational time step as needed to produce stable model runs with Courant numbers of about one or less to ensure that flow was not propagating through more than one cell at each time step.

Bridge hydraulics were calculated with the energy-based standard step method for low flow conditions (i.e., open channel flow where the water surface is below the highest point of the bridge low chord) and pressure flow (orifice equations) for high flow conditions when the bridge is submerged. The energy-based method was selected as the low flow computational method because there are no piers and this method accounts for friction losses, changes in geometry through the bridge, and losses due to flow transitions and turbulence. Contraction and expansion coefficients of 0.3 and 0.5, respectively, were used in the energy head loss equation. The pressure flow method was used as the high flow computational method because the bridge deck and roadway are significant flow obstructions which create backwater and result in the bridge opening acting like a pressurized orifice when it is submerged.

B.7. Analysis Results – MHHW

Both the pre- and post-project MHHW models indicate that the peak stage in North Mill Pond south of the bridge is only slightly lower (<0.01 ft) than on the north side of the bridge. Figure 14 shows the inundation area at the MHHW tide stage crest and the centroid of the portion of North Mill Pond south of Maplewood Avenue, which has been selected as a representative location for comparing the pre- and post-project MHHW tidal hydrographs.

Figure 15 shows the pre- and post-project MHHW tide stage hydrographs calculated at the centroid. The analysis shows little change to the tide crest and more substantial changes to the tide trough, which is discussed in Section B.8. Figure 16 shows a zoomed in view of the pre- and post-project stage hydrographs at the tide crest so that the minor changes at the upper end of the tide range projected to result from the bridge rehabilitation project can be seen. As compared to pre-project conditions, the analysis shows no change to the MHHW high water level or duration of the tide crest and that the time to reach the peak stage would be delayed by 1 minute.

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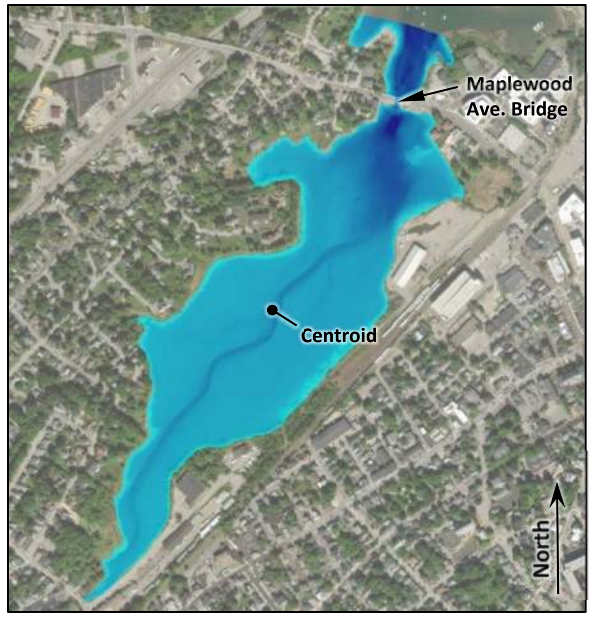


Figure 14 – Inundation area at the MHHW tide stage crest and centroid of the portion of North Mill Pond south of Maplewood Avenue

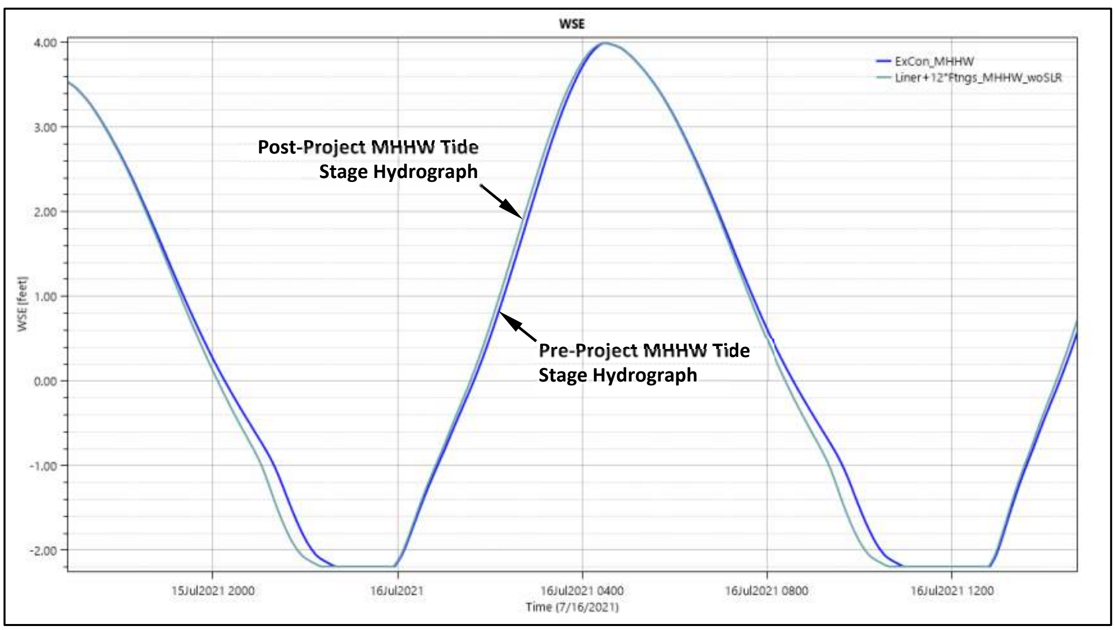


Figure 15 – Pre- and post-project MHHW tide stage hydrographs calculated at the centroid of the portion of North Mill Pond south of Maplewood Avenue

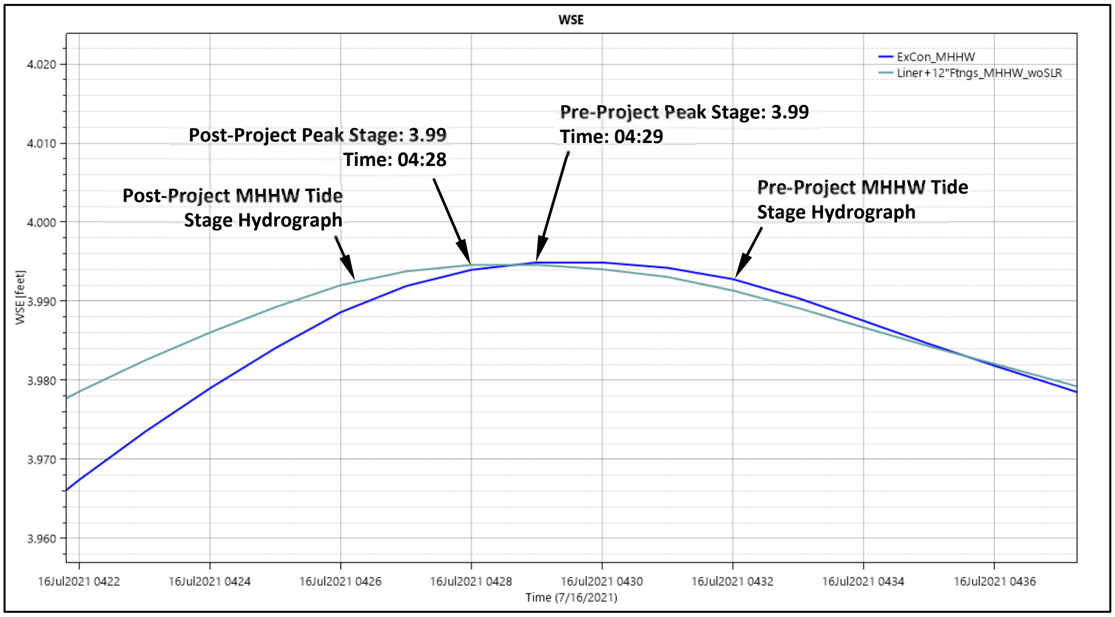


Figure 16 – Crest of the pre- and post-project MHHW tide stage hydrographs calculated at the centroid of the portion of North Mill Pond south of Maplewood Avenue for MHHW

B.8. Analysis Results – MLLW

The pre- and post-project MLLW models indicate that: (1) the project would lower the low water level in the portion of North Mill Pond south of the bridge by 0.10 feet and (2) the lowest stages in North Mill Pond south of the bridge for pre- and post-project conditions are about 1.2 and 1.1 feet higher, respectively, than the lowest water level on the north side of the bridge. Figure 17 shows the pre- and post-project inundation areas at the MLLW tide stage trough in the vicinity of Maplewood Avenue. Blue shading represents the post-project inundation area at MLLW and yellow shading along the periphery of the blue shading indicates the additional areas inundated at MLLW under pre-project conditions. The pre-project MLLW inundation area of the main waterbody south of Maplewood Avenue (i.e., not including isolated areas of ponded water remaining after the tide recedes) is approximately 264,300 square feet (6.067 acres) and the post-project MLLW inundation area of south of the road is about 256,400 square feet (5.886 acres). This is a reduction of approximately 7,900 square feet (0.181 acres) or about 3.0%. Note that at the time steps depicted in

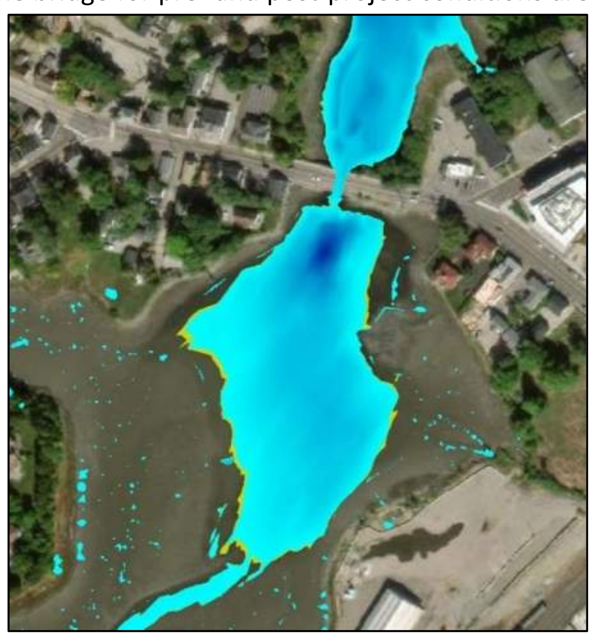


Figure 17 – Inundated areas at the MLLW tide stage trough with blue shading representing the post-project inundation area and yellow shading indicating the additional areas inundated under pre-project conditions

Figure 17, the water level south of Maplewood Avenue has just reached its lowest level, whereas the tide has been rising on the north side of the road for nearly 1½ hours.

Figure 18 – View south from Maplewood Avenue at the grade control feature just upstream from the bridge inlet (09-23-20)

The differences between the water levels on either side of Maplewood Avenue are due to two significant factors: (1) the flow restriction created by the crossing which prevents the pond on the south side of the road from draining as fast as the tide recedes on the north side and (2) what appears to be bedrock grade control on the pond bottom just upstream from the bridge (see Figure 18). The lowest elevation of the grade control was measured at about elevation -3.5 feet (NAVD88). The portion of the pond south of the grade control cannot drain below this elevation even when the water level on the north side of Maplewood Avenue is significantly lower.

Figure 19 shows the pre- and post-project MLLW tide stage hydrographs calculated at a point about 250 feet south of the bridge inlet where the water depth at MLLW is about four feet and Figure 20 shows a detailed view of the hydrographs at the tide cycle trough representing MLLW. The analysis shows that the project would lower the low water level at the tide stage trough by 0.10 feet and reduce the time to reach the low water level by 3 minutes.

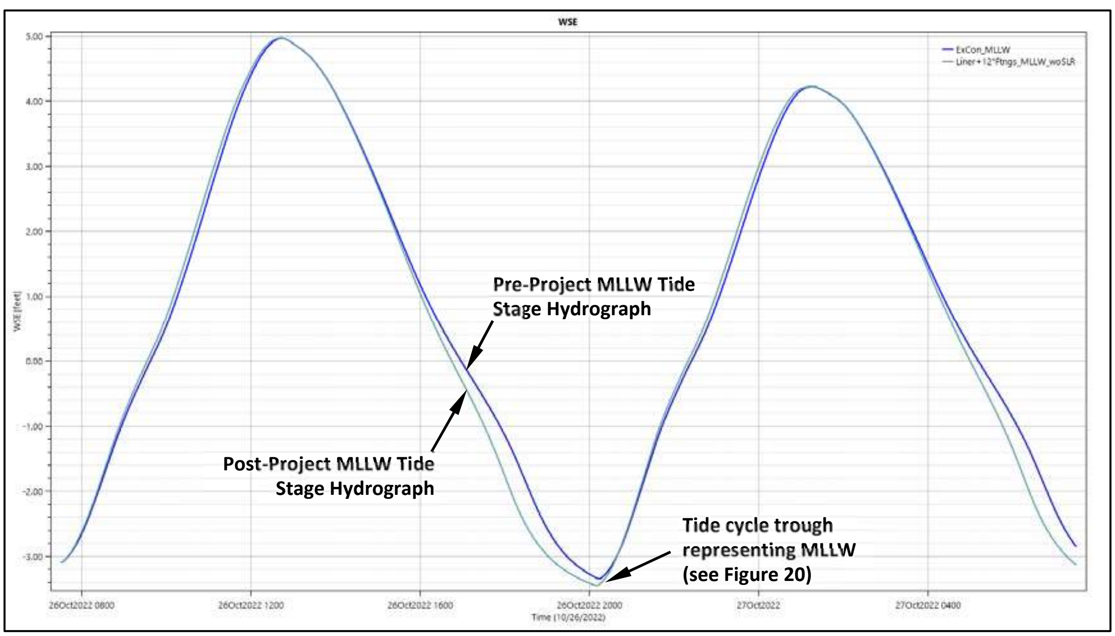


Figure 19 – Pre- and post-project MLLW tide stage hydrographs calculated in North Mill Pond south of Maplewood Avenue

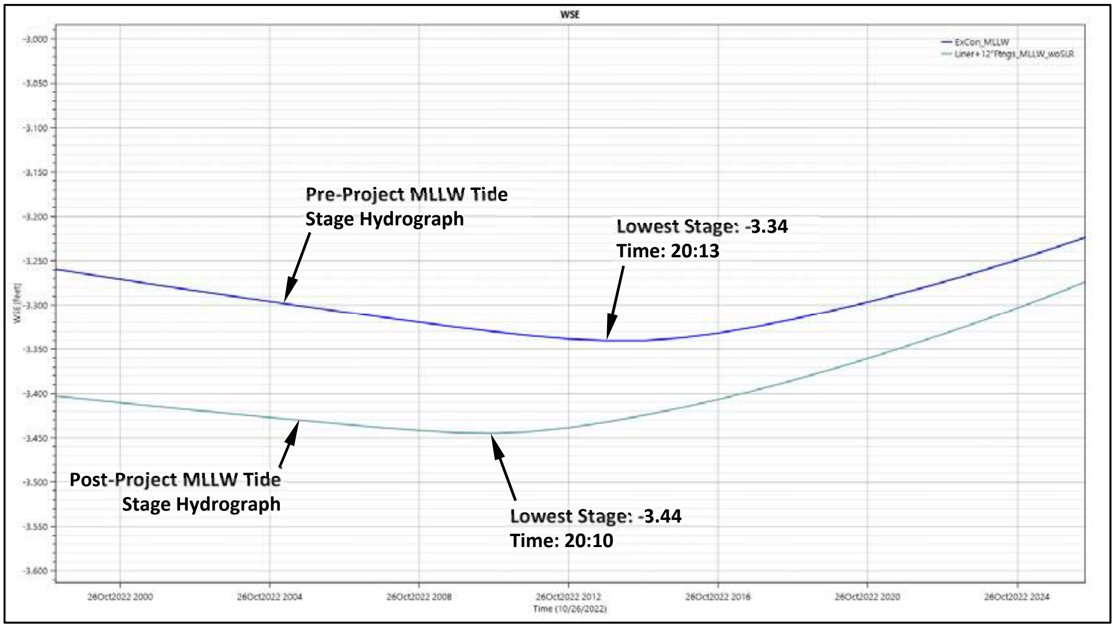


Figure 20 – Troughs of the pre- and post-project MLLW tide stage hydrographs calculated in the portion of North Mill Pond south of Maplewood Avenue

The lower water level, and faster time to reach that level, are explained by the proposed changes to the waterway opening. As compared to the pre-project bridge opening, the post-project opening will be smaller at the top due to the geopolymer liner, but larger at the bottom due to the footing removal. As a result, the bridge will have greater capacity when water levels are low and the portion of the pond on the south side of the road will drain faster as the tide cycle trough approaches. The faster drain time is important as it allows the water level south of the road to reach a lower stage before the water level on the north side of the road rises and the flow reverses.

B.9. Tidal Resource Impact

Because the bridge only restricts flow into and out of the portion of North Mill Pond on the south side of Maplewood Avenue, the project will not affect the tidal hydrograph in the portion of North Mill Pond on the north side of Maplewood Avenue.

Concerning the portion of North Mill Pond south of Maplewood Avenue, the project will not alter the MHHW high water level and changes to the MLLW low water level, inundation area, and water depths are not considered significant enough to adversely affect the tidal resource, particularly in light of the natural water level variability this area experiences due to astronomical tides and local wind and weather patterns.

C. Env-Wt 904.07(d)

Env-Wt 904.07(d) requires that "new, repaired, rehabilitated, or replaced tier 4 stream crossing shall be designed: (1) Based on a hydraulic analysis that accounts for daily fluctuating tides, bidirectional flows, tidal inundation, and coastal storm surge; (2) To prevent creating a restriction on tidal flows; and (3) To account for tidal channel morphology and potential impacts due to sea-level rise."

The four HEC-RAS 2D flow models described in Section B simulate pre- and post-project conditions under normal astronomical tide conditions (MHHW and MLLW) without sea-level rise (SLR). Twelve additional HEC-RAS 2D flow models were created to analyze the effects of the proposed bridge rehabilitation work under various storm and SLR scenarios. These include:

- MHHW and MLLW with SLR under pre- and post-project conditions;
- 50- and 100-year storms without SLR under pre- and post-project conditions; and
- 50- and 100-year storms with SLR under pre- and post-project conditions.

These models account for fluctuating tides, bidirectional flow, tidal inundation, storm surge, and SLR as required by Env-Wt 904.07(d). All of these models use the same geometry data (including pre- and post-project bridge geometries), roughness, and additional modeling parameters described in Section B. However, each model uses different boundary conditions to simulate the various tide cycle, storm surge, freshwater inflow, and SLR conditions.

The recommended SLR estimate published in Step 3 Table A of NHCFR STAP (2020)[3] for a project with a high tolerance for flood risk and a year 2040 timeframe, which is the timeframe that most closely matches that of the bridge rehabilitation project design life, is 1.0 ft (see Figure 21). For the models which account for SLR, this estimate was used to adjust the present-day tide stage hydrographs to simulate sea-level conditions at the end of the rehabilitated bridge service life. Additional information concerning the projects' flood risk tolerance and timeframe can be found in Section D.3.

STEP 3 TABLE A. RECOMMENDED DECADAL RSLR ESTIMATES (IN FEET ABOVE 2000 LEVELS) BASED ON RCP 4.5, PROJECT TIMEFRAME, AND TOLERANCE FOR FLOOD RISK.

TIMEFRAME	HIGH TOLERANCE FOR FLOOD RISK	MEDIUM TOLERANCE FOR FLOOD RISK	LOW TOLERANCE FOR FLOOD RISK	VERY LOW TOLERANCE FOR FLOOD RISK
	Plan for the following RSLR estimate (ft)* *compared to sea level in the year 2000*			
	Lower magnitude, Higher probability	⟵⟶		Higher magnitude, Lower probability
2030	0.7	0.9	1.0	1.1
2040	1.0	1.2	1.5	1.6
2050	1.3	1.6	2.0	2.3
2060	1.6	2.1	2.6	3.0
2070	2.0	2.5	3.3	3.7
2080	2.3	3.0	3.9	4.5
2090	2.6	3.4	4.6	5.3
2100	2.9	3.8	5.3	6.2
2110	3.3	4.4	6.1	7.3
2120	3.6	4.9	7.0	8.3
2130	3.9	5.4	7.9	9.3
2140	4.3	5.9	8.9	10.5
2150	4.6	6.4	9.9	11.7

Figure 21 – Step 3 Table A from NHCFR STAP (2020)

[3] NH Coastal Flood Risk Science and Technical Advisory Panel (2020). New Hampshire Coastal Flood Risk Summary, Part II: Guidance for Using Scientific Projections. Report published by the University of New Hampshire, Durham, NH.

The 50- and 100-year storm models assume that a tidal storm surge and a freshwater flood on Hodgson Brook occur simultaneously. These are believed to be conservative, but realistic, scenarios as coastal weather systems which generate storm surge also have the potential to produce extreme rainfall. In each storm model the recurrence interval of the tidal storm surge and the freshwater flood are assumed to be equal. For example, the 50-year storm models assume that a 50-year tidal storm surge and a 50-year freshwater flood occur simultaneously. Furthermore, in these models the tide stage hydrographs and the freshwater inflow hydrographs are assumed to peak concurrently so as to simulate near worst-case scenarios wherein the peak inland runoff enters North Mill Pond at the same time the storm tide reaches its maximum level.

Independent hydrology studies to estimate the rate and volume of rainfall runoff into North Mill Pond from various storms have been completed for the bridge rehabilitation project and the drainage outfall project. The hydrology study for the bridge rehabilitation project was performed by Headwaters Consulting and produced estimates of the 50- and 100-year rainfall runoff hydrographs for the entire watershed of North Mill Pond upstream from the bridge which encompasses the watershed of the drainage outfall. The hydrologic analysis for the drainage outfall project was done by Underwood Engineers and included only the watershed of the drainage outfall. For both studies the SCS unit hydrograph method was used with the HydroCAD computer program to estimate the freshwater inflow hydrographs. A complete copy of the Headwaters Consulting hydrology study is included in Appendix 2. Output from the HydroCAD models prepared by Underwood Engineers can be found in Appendices 3 and 4.

The watershed area of the drainage outfall at North Mill Pond (37 acres) represents about 1.4% of the overall watershed area of the pond at Maplewood Avenue (2,628 acres). The drainage outfall project proposes improvements to the stormwater collection system which would increase its maximum flow capacity, but it will not expand the watershed area, add impervious surfaces, or otherwise increase the overall stormwater runoff volume, except that it is designed to accommodate future separation of existing roof drains that are currently connected to the sanitary sewer system but have been incorporated into the outfall's drainage calculations. The pre- and post-project HydroCAD models for the drainage outfall project show no change to the watershed area, runoff curve numbers (CN), or total runoff volume (see Appendices 3 and 4). [Note that the HydroCAD outputs show a minor difference between the pre- and post-project total runoff volumes; however, this is because the two models used different time spans. The pre- and post-project runoff volumes would be identical if the same time span had been used.]

A comparison between the results of the bridge rehabilitation and drainage outfall hydrology studies shows that under both pre- and post-project conditions: (1) peak runoff at the bridge occurs about 7.3 hours after peak runoff from the drainage outfall enters the pond and (2) nearly the entire runoff volume from the drainage outfall watershed enters North Mill Pond by the time peak runoff from the overall watershed occurs. This is due to the small size of the drainage outfall watershed, the absence of any significant floodwater storage areas, and its close proximity to the pond. By contrast, runoff from the hydraulically most distant point of the overall watershed, located at the Portsmouth International Airport, must travel approximately 4.4 miles to the bridge.

Therefore, because the drainage outfall project is not expected to significantly increase the total runoff volume or alter the timing of runoff to North Mill Pond, it is not projected to change the peak flows, runoff volumes, or flow hydrographs calculated for the entire watershed draining to the bridge. Consequently, the same 50- and 100-year flow hydrographs calculated under the bridge rehabilitation project hydrology study (see Appendix 2) have been used in both the pre- and post-project HEC-RAS 2D flow models which simulate storm conditions.

Detailed descriptions of the boundary conditions used in the models and the analysis results are provided in the following sections.

C.1. Pre- and Post-Project MHHW Models without SLR

These are the same models described in Section B which use the pre- and post-project bridge geometries and the MHHW tidal hydrograph. Additional results from these models are presented in this section to meet the requirements of Env-Wt 904.07(d)(2) relative to tidal flow restriction.

Figures 22 and 23 show the MHHW stage and flow hydrographs at the bridge calculated for pre- and post-project conditions, respectively. The headwater stage is the water level at the bridge inlet on the south side of Maplewood Avenue and the tailwater stage is the water level at the bridge outlet on the north side of the road. Note that when the headwater stage is greater than the tailwater stage flow is from south to north and the flow values are positive. When the tailwater stage is higher than the headwater stage flow is from north to south and the flow values are negative.

The maximum flow through the bridge from south to north during the MHHW tide cycle is 721 cfs for pre-project conditions and 762 cfs for post-project conditions, an increase of 41 cfs, or approximately 5.7%. The maximum flow through the bridge from north to south during the MHHW tide cycle is 960 cfs for pre-project conditions and 946 cfs for post-project conditions, a reduction of 14 cfs, or approximately 1.5%.

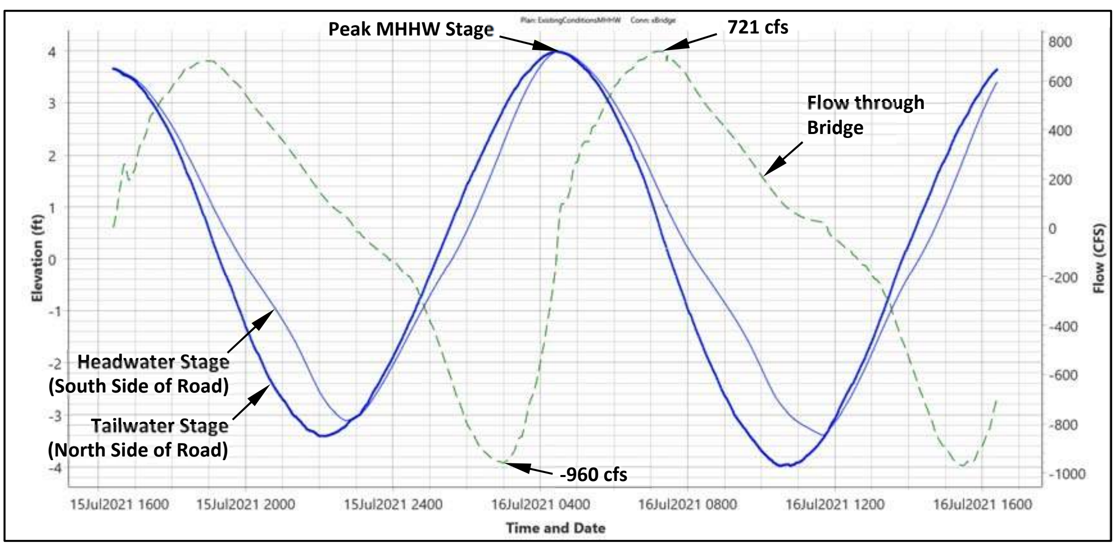


Figure 22 – Pre-project stage and flow hydrographs calculated at the bridge for MHHW without SLR

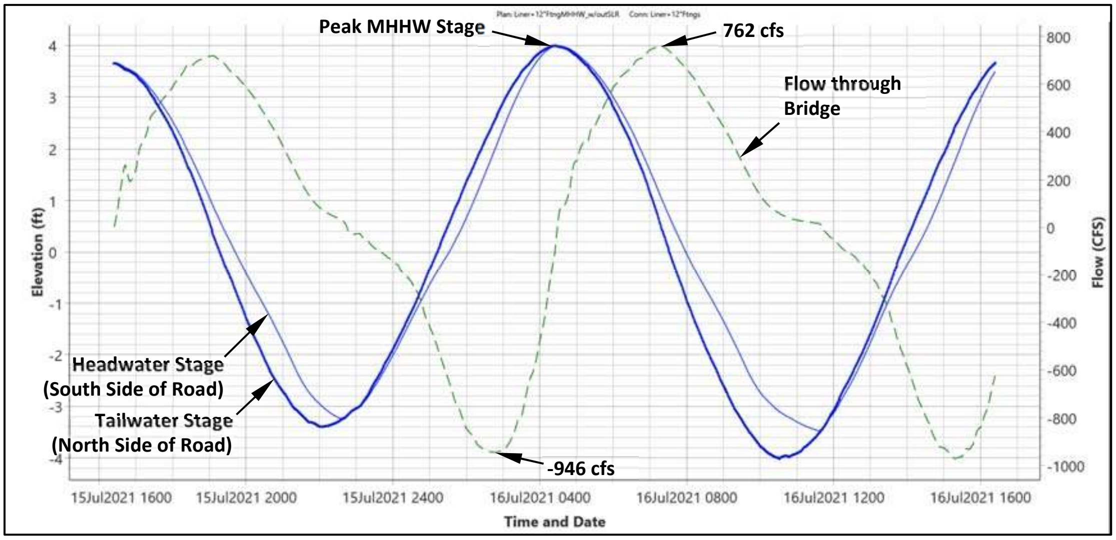


Figure 23 – Post-project stage and flow hydrographs calculated at the bridge for MHHW without SLR

The proposed bridge rehabilitation would result in increased peak flow through the bridge from south to north for the MHHW event, indicating that the project will not restrict tidal flows during the outgoing tide and would in fact reduce the existing flow restriction. The small reduction in peak flows from north to south is explained by the faster rate that the portion of the pond south of Maplewood Avenue would fill during the incoming tide (see Figure 15) which decreases the water level differential on either side of the bridge and reduces the maximum flow rate through it. This also indicates that the project will not restrict tidal flows, even though this decreased differential results in a slightly lower peak flow.

C.2. <u>Pre- and Post-Project MLLW Models without SLR</u>

These are the same models described in Section B which use the pre- and post-project bridge geometries and the MLLW tidal hydrograph. Additional results from these models are presented in this section to meet the requirements of Env-Wt 904.07(d)(2) relative to tidal flow restriction.

Figures 24 and 25 show the MLLW stage and flow hydrographs at the bridge calculated for pre- and post-project conditions, respectively. The maximum flow through the bridge from south to north during the MLLW tide cycle is 858 cfs for pre-project conditions and 895 cfs for post-project conditions, an increase of 37 cfs, or approximately 4.3%. The maximum flow through the bridge from north to south during the MLLW tide cycle is 1,092 cfs for pre-project conditions and 1,097 cfs for post-project conditions, an increase of 5 cfs, or approximately 0.5%.

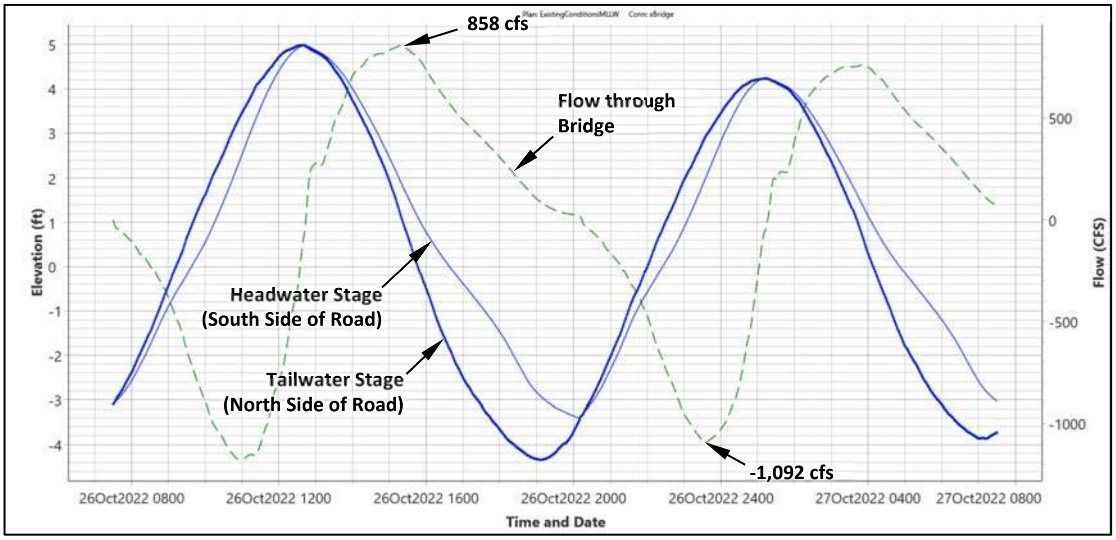


Figure 24 – Pre-project stage and flow hydrographs calculated at the bridge for MLLW without SLR

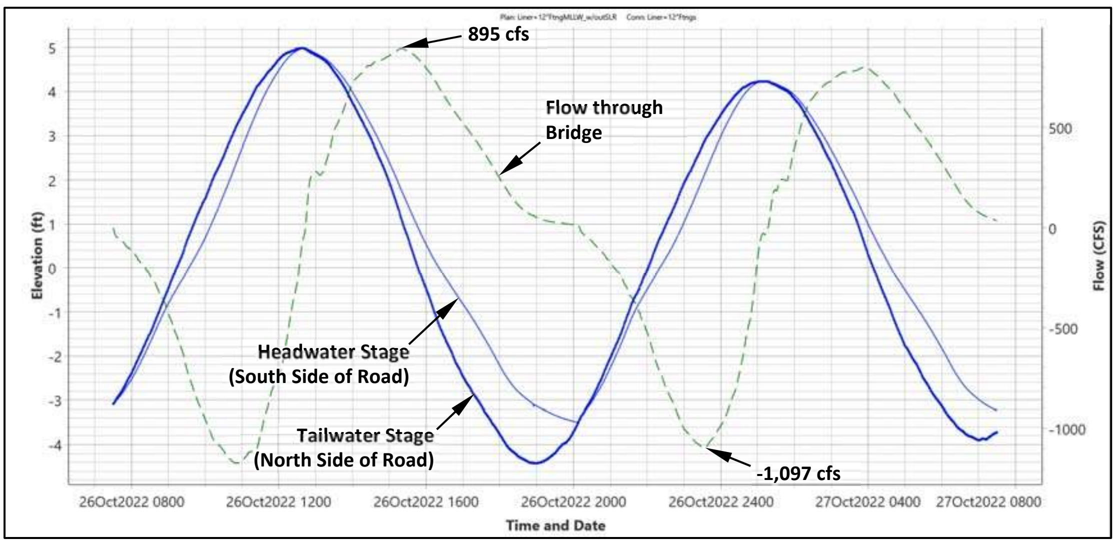


Figure 25 – Post-project stage and flow hydrographs calculated at the bridge for MLLW without SLR

The proposed bridge rehabilitation would increase flow rates through the bridge in both directions during the MLLW event; therefore, the project will not restrict tidal flows for this event under present-day sea-level conditions and would in fact reduce the existing flow restriction.

C.3. Pre- and Post-Project MHHW Models with SLR

The water level at each time step of the present-day MHHW tide stage hydrograph shown in Figure 12 was raised by 1.0 ft to develop an estimate of the MHHW tide stage hydrograph with SLR during the bridge rehabilitation project design life. This results in a MHHW stage of 5.0 ft (NAVD88) on the north side of the bridge. The estimated MHHW tide stage hydrograph with SLR shown in Figure 26 was used as the downstream boundary in the models. The same flow hydrograph used in the MHHW model without SLR, which assumes a constant base flow of 2 cfs in Hodgson Brook, was used as the upstream boundary in the models.

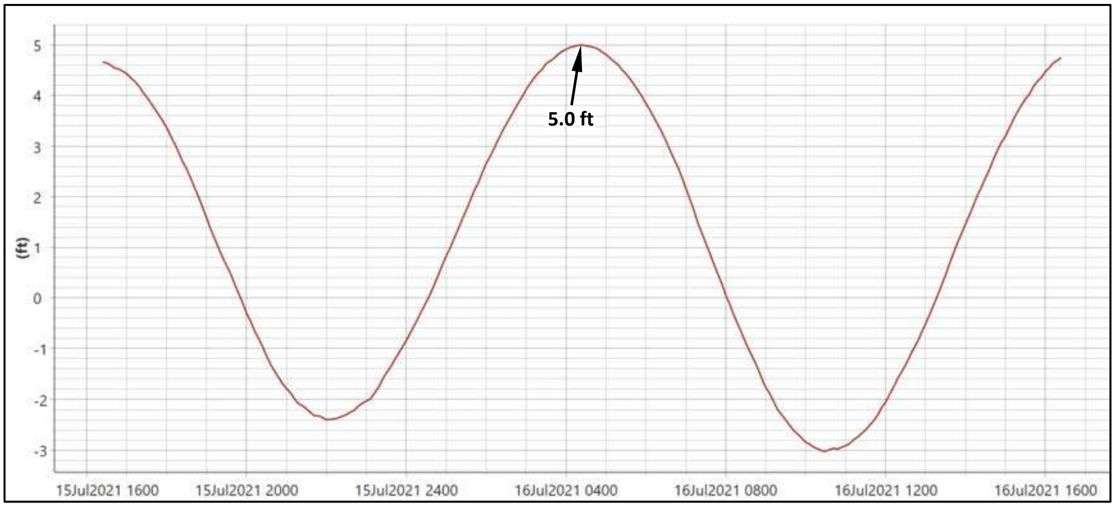


Figure 26 – Tide stage hydrograph simulating MHHW with 1.0' SLR at the downstream model boundary

Both the pre- and post-project MHHW models with SLR indicate that the peak stage in North Mill Pond south of the bridge would be only slightly lower (~0.01 ft) than on the north side of the bridge. Figure 27 shows the inundation area at the MHHW tide stage crest with 1.0 ft SLR for both pre- and post-project conditions.

Figure 27 – Inundation area at the MHHW tide stage crest with 1.0 ft SLR for both pre- and post-project conditions

Figure 28 shows the pre- and post-project MHHW tide stage hydrographs with 1.0 ft SLR calculated at the centroid of the portion of North Mill Pond south of Maplewood Avenue. The analysis shows very little difference in maximum water levels or the timing of the tide stage crest between pre- and post-project conditions. Consequently, the pre- and post-project stage hydrographs near the tide stage crest shown in Figure 28 cannot be distinguished from each other. Therefore, Figure 29 shows a zoomed in view of the hydrographs at the crest stage representing MHHW with 1.0 ft SLR so that the minor changes to the tidal hydrograph resulting from the project can be seen. As compared to pre-project conditions, the analysis shows that the peak stage would increase by less than 0.002 ft and the time to reach the peak stage would be reduced by 1 minute.

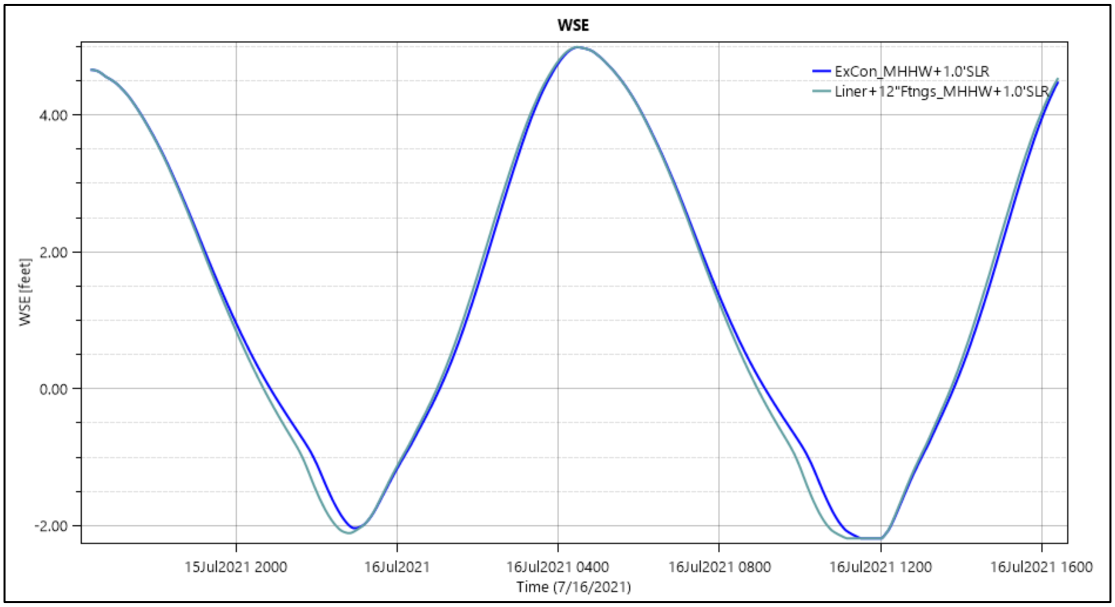


Figure 28 – Pre- and post-project MHHW tide stage hydrographs with 1.0 ft SLR calculated at the centroid of the portion of North Mill Pond south of Maplewood Avenue

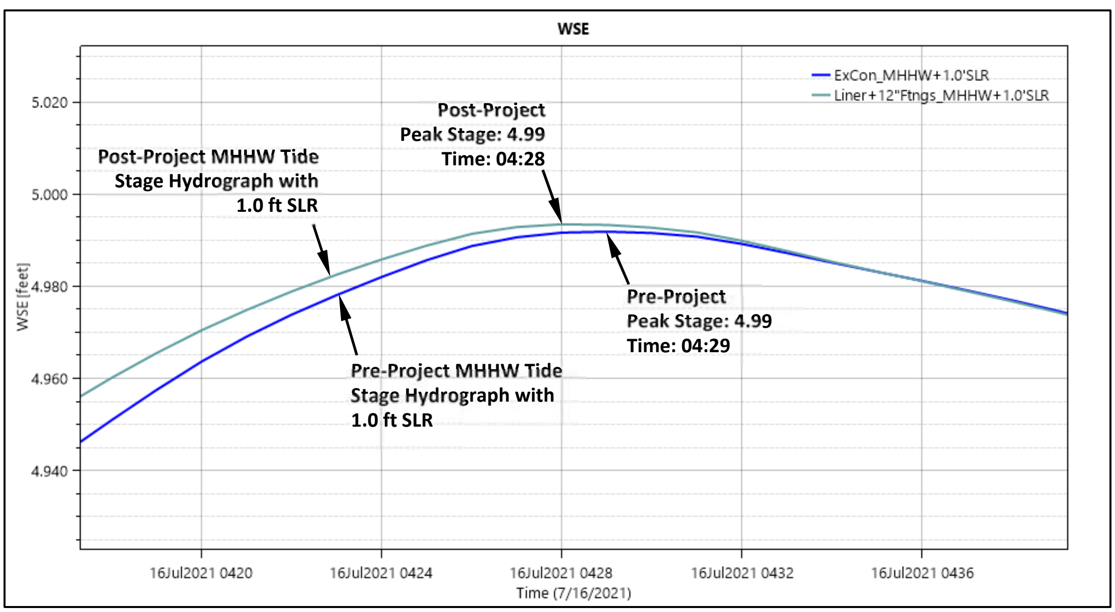


Figure 29 – Crest of the pre- and post-project MHHW tide stage hydrographs with 1.0 ft SLR calculated at the centroid of the portion of North Mill Pond south of Maplewood Avenue for MHHW

Figures 30 and 31 show the MHHW stage and flow hydrographs at the bridge calculated for pre- and post-project conditions with 1.0 ft SLR, respectively. The maximum flow through the bridge from south to north during the MHHW tide cycle with 1.0 ft SLR is 833 cfs for pre-project conditions and 865 cfs for post-project conditions, an increase of 32 cfs, or approximately 3.8%. The maximum flow through the bridge from north to south during the MHHW tide cycle with 1.0 ft SLR is 1,043 cfs for pre-project conditions and 1,035 cfs for post-project conditions, a reduction of 8 cfs, or approximately 0.8%.

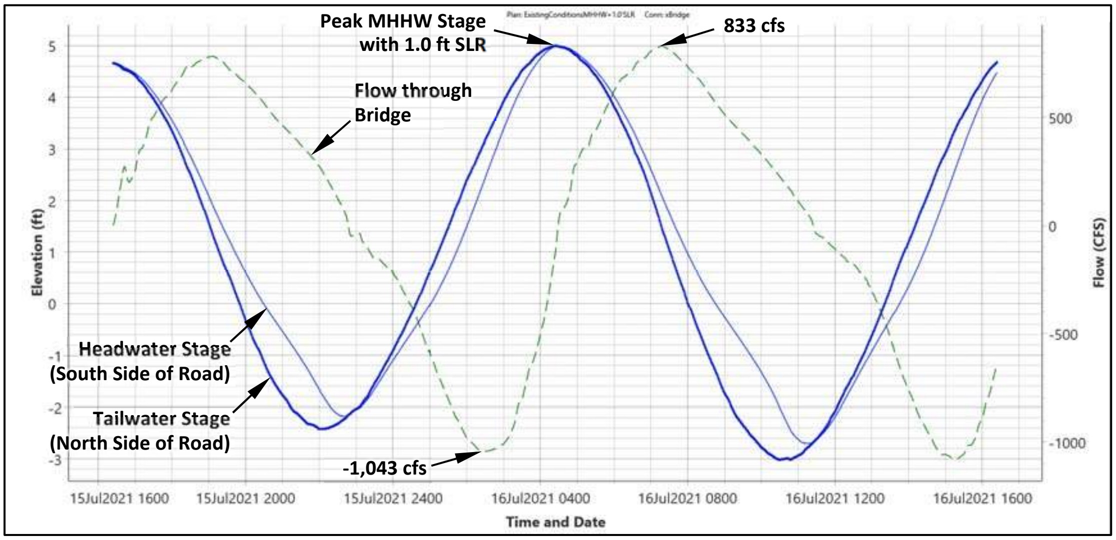


Figure 30 – Pre-project stage and flow hydrographs calculated at the bridge for MHHW with 1.0 ft SLR

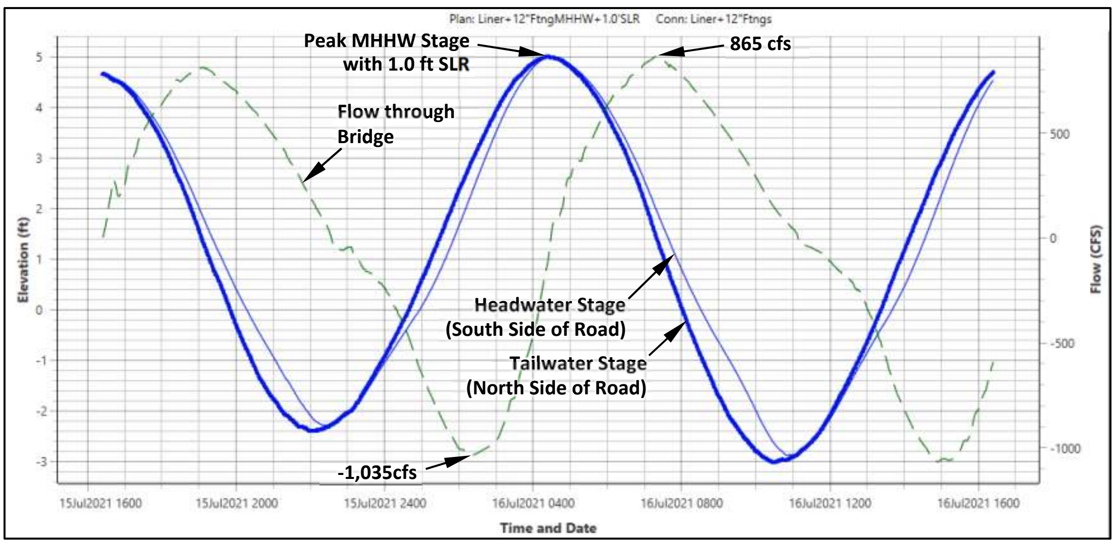


Figure 31 – Post-project stage and flow hydrographs calculated at the bridge for MHHW with 1.0 ft SLR

The models show that the proposed bridge rehabilitation would increase the peak flow rate through the bridge from south to north for the MHHW event with 1.0 ft SLR and therefore would not restrict tidal flows during the outgoing tide, but rather would reduce the existing flow restriction. The small reduction in the peak flow from north to south is due to the faster rate that the pond south of Maplewood Avenue would fill during the flood tide (see Figure 28) which increases the tailwater elevation and reduces the maximum flow rate through the bridge. This is another indication that the project will not restrict tidal flows, even though the faster fill rate and decreased tailwater result in a slightly lower peak flow during the incoming tide.

C.4. Pre- and Post-Project MLLW Models with SLR

The water level at each time step of the present-day MLLW tide stage hydrograph shown in Figure 13 was raised by 1.0 ft to develop an estimate of the MLLW tide stage hydrograph with

SLR during the bridge rehabilitation project design life (see Figure 32). This results in a MLLW stage of -3.5 feet (NAVD88) on the north side of the bridge. The estimated MLLW tide stage hydrograph with SLR shown in Figure 32 was used as the downstream boundary in the models. The same flow hydrograph used in the MLLW model without SLR, which assumes a constant base flow of 2 cfs in Hodgson Brook, was used as the upstream boundary in the models.

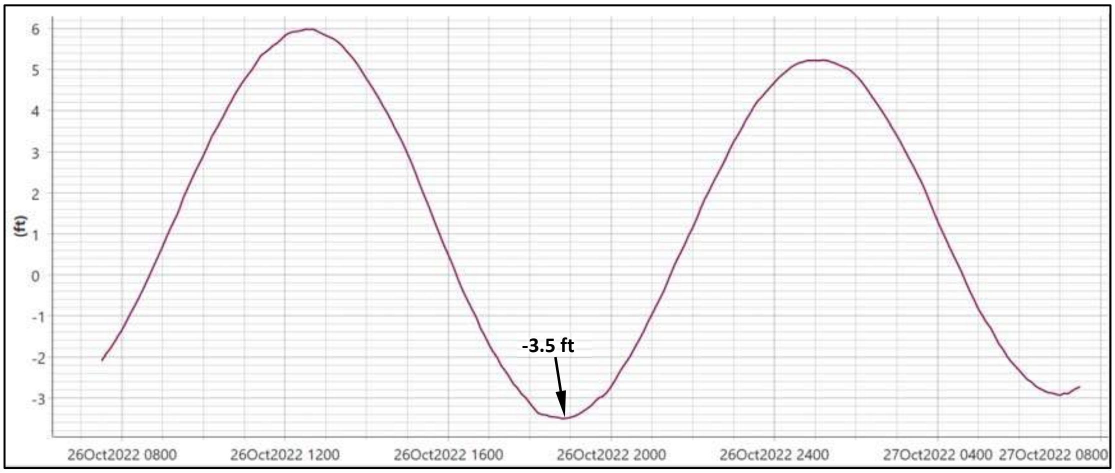


Figure 32 – Tide stage hydrograph simulating MLLW with 1.0' SLR at the downstream model boundary

The pre- and post-project MLLW models with 1.0 ft SLR indicate that the project would lower the low water level in the portion of North Mill Pond south of the bridge by 0.20 feet and reduce the difference between the low water levels on either side of the bridge from 0.65 feet to 0.45 feet. Figure 33 shows the pre- and post-project inundation areas at the MLLW tide stage trough with 1.0 ft SLR in the vicinity of Maplewood Avenue. Blue shading represents the post-project inundation area at MLLW with 1.0 ft SLR and yellow shading along the periphery of the blue shading indicates the additional areas inundated at MLLW with 1.0 ft SLR under pre-project conditions. The pre-project inundation area of the waterbody south of Maplewood Avenue is approximately 307,300 square feet (7.055 acres) and the post-project inundation area of south of the road is about 285,400 square feet (6.552 acres). This is a reduction of approximately 21,900 square feet (0.503 acres) or about 7.1%.

Figure 33 – Inundated areas at the MLLW tide stage trough with 1.0 ft SLR. Blue shading represents the post-project inundation area and yellow shading indicates the additional areas inundated under pre-project conditions

Figure 34 shows the pre- and post-project MLLW tide stage hydrographs with 1.0 ft SLR calculated at point about 250 feet south of the bridge inlet where the water depth at MLLW is approximately 4.5 feet under pre-project conditions and Figure 35 shows a detailed view of the hydrographs at the tide cycle through representing MLLW with 1.0 ft SLR. As compared to pre-project conditions, the analysis shows that the lowest stage would decrease by 0.20 feet and the time to reach the minimum stage would be reduced by 16 minutes.

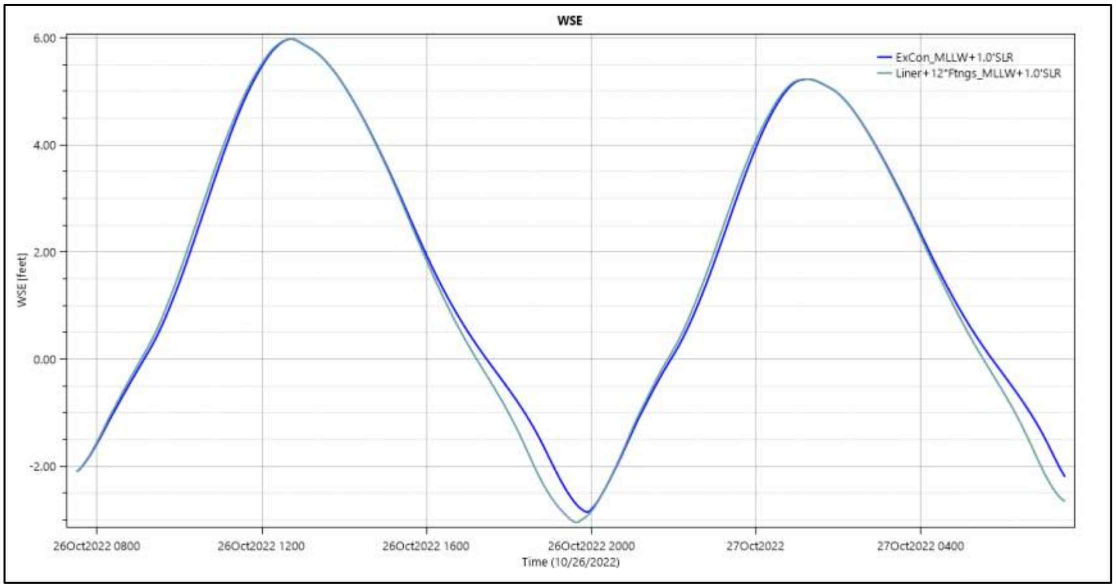


Figure 34 – Pre- and post-project MLLW tide stage hydrographs with 1.0 ft SLR calculated in North Mill Pond south of Maplewood Avenue

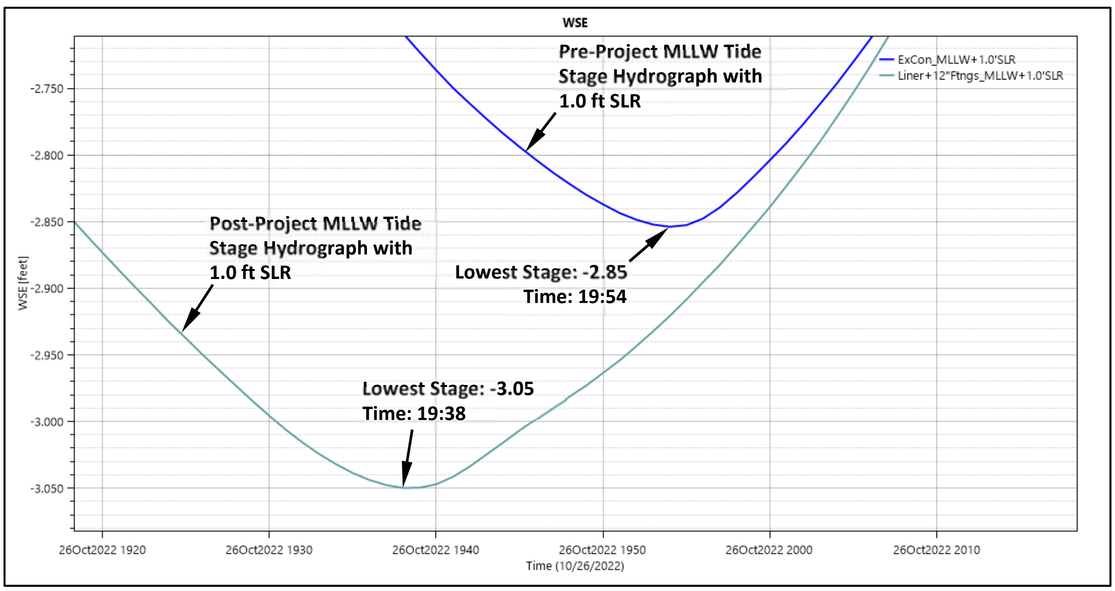


Figure 35 – Troughs of the pre- and post-project MLLW tide stage hydrographs with 1.0 ft SLR calculated in the portion of North Mill Pond south of Maplewood Avenue

The lower MLLW stage and reduced time to reach that stage are due to the proposed waterway opening modifications which would increase the rate that the portion of the pond south of the bridge drains during the ebb tide, allowing the water level south of the road to reach a lower stage before the flow reverses.

Figures 36 and 37 show the MLLW stage and flow hydrographs at the bridge calculated for pre- and post-project conditions with 1.0 ft SLR, respectively. The maximum flow through the bridge from south to north during the MLLW tide cycle with 1.0 ft SLR is 977 cfs for pre-project conditions and 1,010 cfs for post-project conditions, an increase of 33 cfs, or approximately 3.4%. The maximum flow through the bridge from north to south during the MLLW tide cycle with 1.0 ft SLR is 1,216 cfs for pre-project conditions and 1,195 cfs for post-project conditions, a reduction of 21 cfs, or approximately 1.7%.

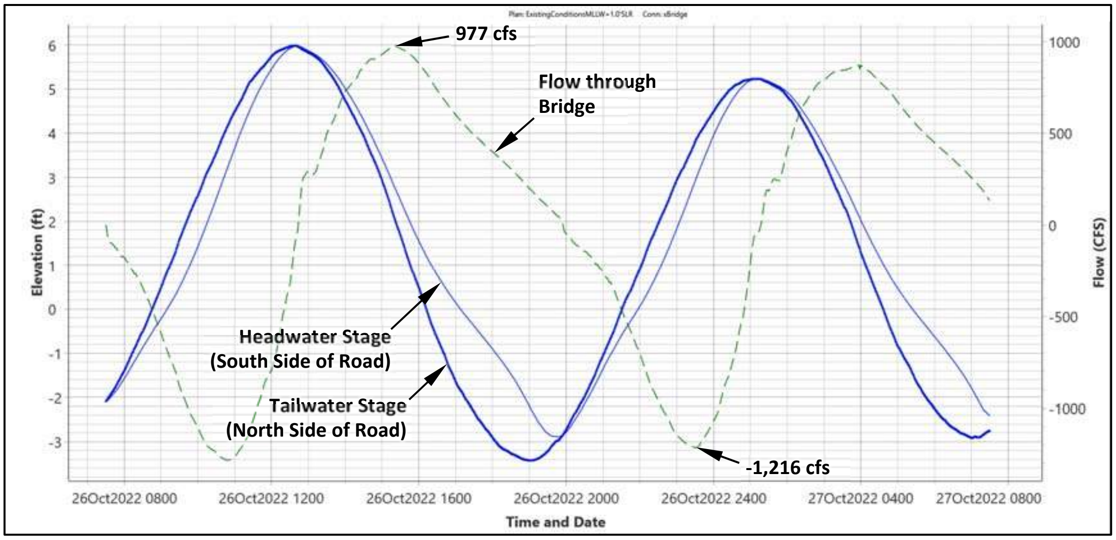


Figure 36 – Pre-project stage and flow hydrographs calculated at the bridge for MLLW with 1.0 ft SLR

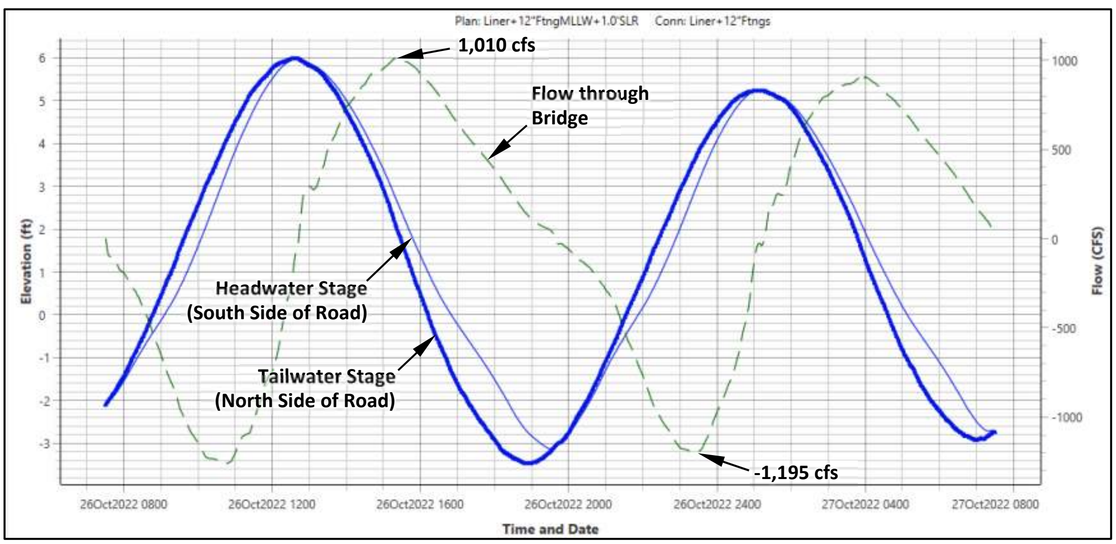


Figure 37 – Post-project stage and flow hydrographs calculated at the bridge for MLLW with 1.0 ft SLR

The models indicate that the proposed bridge rehabilitation would increase the peak flow rate through the bridge from south to north for the MLLW event with 1.0 ft SLR and therefore would not restrict tidal flows, but in fact would reduce the existing flow restriction during the ebb tide. The decreased peak flow rate from north to south during the flood tide also indicates that the project would reduce the existing flow restriction as this decrease is due to the faster rate that the pond south of Maplewood Avenue would fill (see Figure 34) which increases the tailwater elevation and reduces the maximum flow rate through the bridge.

C.5. Boundary Conditions for 50- and 100-year Storm Models

The 50- and 100-year rainfall runoff hydrographs from the Headwaters Consulting hydrology study were used as the upstream boundaries in the pre- and post-project 50- and 100-year storm models both with and without SLR. These are shown in Figures 38 and 39.

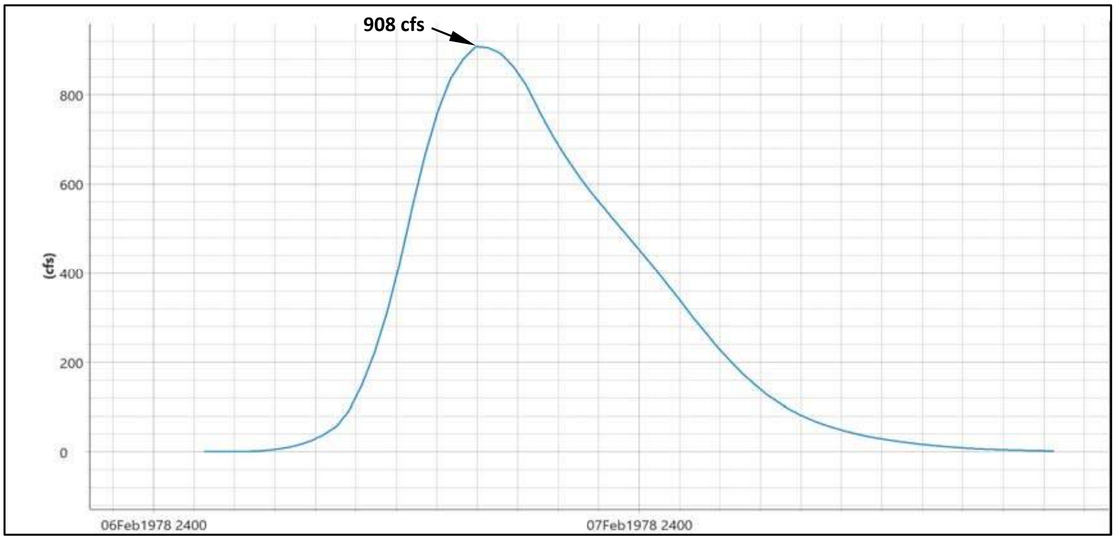


Figure 38 – 50-year rainfall runoff hydrograph used as the upstream boundary in the pre- and post-project 50-year storm models with and without SLR

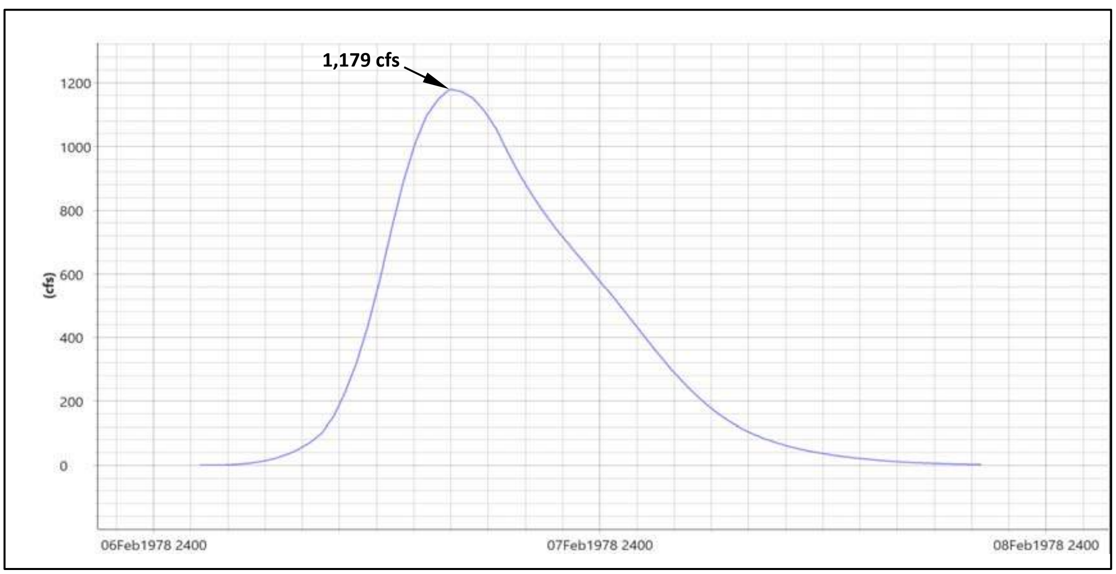


Figure 39 – 100-year rainfall runoff hydrograph used as the upstream boundary in the pre- and post-project 100-year storm models with and without SLR

Stage hydrographs representing the 50- and 100-year tidal storm surge events were used as the downstream boundaries in the storm models. These were developed from water levels measured at the NOAA Seavey Island tide station and the high water level exceedance probability curve published by NOAA for the tide gage (see Figure 40).

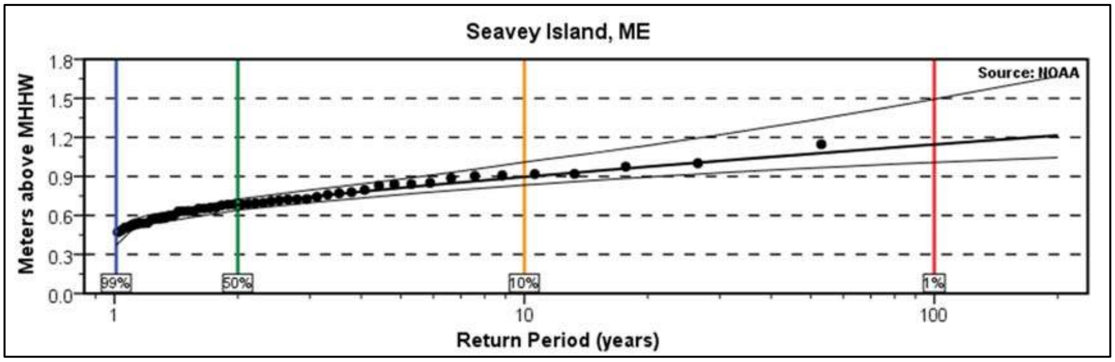


Figure 40 – High water annual exceedance probability curve for the Seavey Island tide station

The exceedance probability curve predicts the 100-year high water level is about 1.14 meters (3.74 ft) above mean higher high water (MHHW) and the 50-year high water level is approximately 1.07 meters (3.51 ft) above MHHW. Datum information for the tide station dated August 8, 2016 lists MHHW at the gage for the tidal epoch ending in 2001 as 4.22 ft above the North American Vertical Datum of 1988 (NAVD88). Adjusting the exceedence probabiliy water level estimates to fixed elevations relative to NAVD88 results in the following peak tidal storm surge water levels.

Table 3 – Peak tidal storm surge water levels predicted at NOAA station 8419870 (Seavey Island, ME)

Recurrence Interval (years)	**Peak Storm Surge Water Level (ft, NAVD88)**
50	7.73
100	7.96

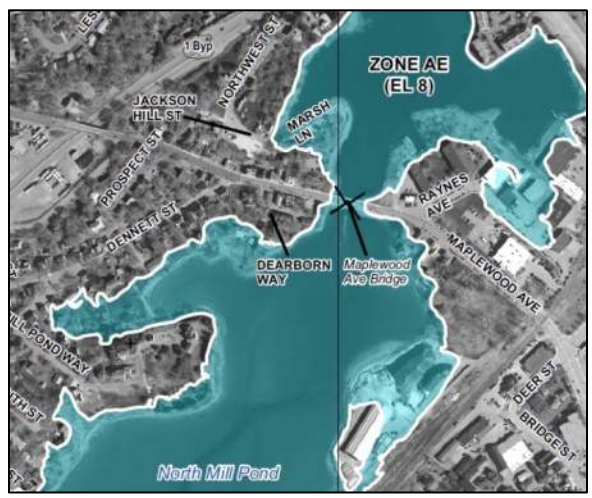


Figure 41 – Preliminary FIRM #33015C0259F

Section 3.2 of NHCRHC STAP (2014)[4] suggests that present recurrence intervals of New Hampshire tidal storm surges be basesd upon the preliminary FEMA Flood Insurance Rate Maps (FIRMs) for coastal NH. The prelimary FIRM covering the project area (#33015C0259F), dated April 9, 2014, shows the Base Flood Elevation (BFE) at elevation 8 ft (NAVD88) (see Figure 41). The effective FIRM, dated January 29, 2021, also shows the BFE at elevation 8 ft. The BFE, which corresponds to the 1% annual chance, or 100-year, flood level, is only 0.04 ft higher than the 100-year peak tidal storm surge water level predicted from the exceedance probability curve for the Seavey Island tide gage.

In keeping with the recommendations of NHCRHC STAP (2014), a 100-year peak tidal storm surge elevation of 8.00 ft was used in the pre- and post-project 100-year storm models without SLR. NHCRHC STAP (2014) does not provide guidance relative to 50-year tidal storm

[4] *Sea-level Rise, Storm Surges, and Extreme Precipitation in Coastal New Hampshire: Analysis of Past and Projected Future Trends*. 2014. New Hampshire Coastal Risk and Hazards Commission Science and Technical Advisory Panel (NHCRHC STAP). http://www.nhcrhc.org/wp-content/uploads/2014-STAP-final-report.pdf.

surge water levels and none are published on the FEMA FIRM or in the FEMA Flood Insurance Study (FIS) for Rockingham County. Therefore, the 50-year peak tidal storm surge water level predicted by the exceedance probability curve for the Seavey Island tide gage (7.73 ft) was used in the pre- and post-project 50-year storm models without SLR.

The 50- and 100-year tidal storm surge stage hydrographs used for the downstream boundaries in the pre- and post-project storm models without SLR were estimated using water levels measured during the highest tidal storm surge cycle recorded at the Seavey Island gage. This occurred on February 7, 1978 with a peak elevation of 8.06 ft (NAVD88) (see Figure 42), which is 0.33 ft above the estimated 50-year peak tidal storm surge water level and 0.06 ft above the estimated 100-year peak water level.

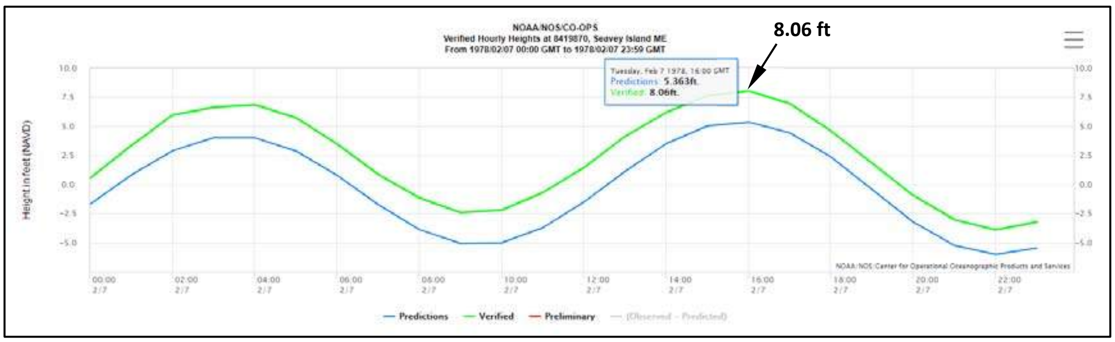


Figure 42 – Stage hydrograph showing water levels measured at the Seavey Island, ME tide gage on February 7, 1978. The green line represents measured water levels and the blue line represents predicted water levels.

Hourly water level data for February 6 through February 8, 1978 were downloaded from the NOAA website. The estimated 50- and 100-year peak tidal storm surge water levels are approximately 95.9% and 99.3% of the peak water level recorded at the gage on February 7, 1978, respectively. The measured water levels were multiplied by these percentages to generate the estimated 50- and 100-year tidal storm surge stage hydrographs used as the downstream boundaries in the storm models without SLR.

The 50- and 100-year freshwater inflow hydrographs have a duration of 42 hours with the peak flow occurring at hour 13.5 of the runoff events. The estimated storm surge stage hydrographs were generated so as to have the same 42-hour duration with peak water levels also occurring at hour 13.5. This results in the freshwater inflow hydrographs and the tidal storm surge stage hydrographs peaking concurrently so as to simulate near worst-case scenarios wherein the peak freshwater runoff enters North Mill Pond at the same time the storm tide reaches its maximum level. Figures 43 and 44 show the estimated 50- and 100-year tidal storm surge stage hydrographs used as the downstream boundaries in the storm models without SLR.

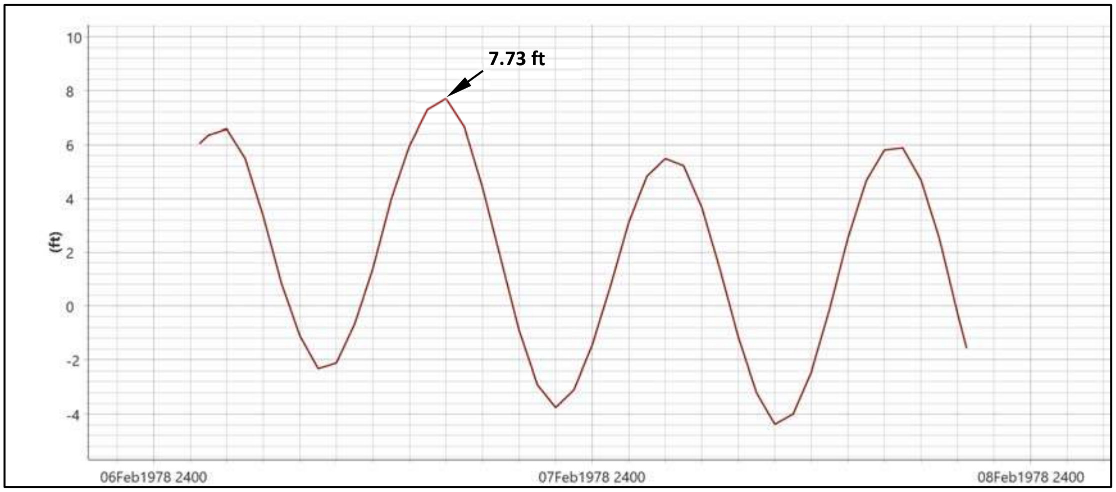


Figure 43 – Estimated 50-year tidal storm surge stage hydrograph used as the downstream boundary in the 50-year storm models without SLR

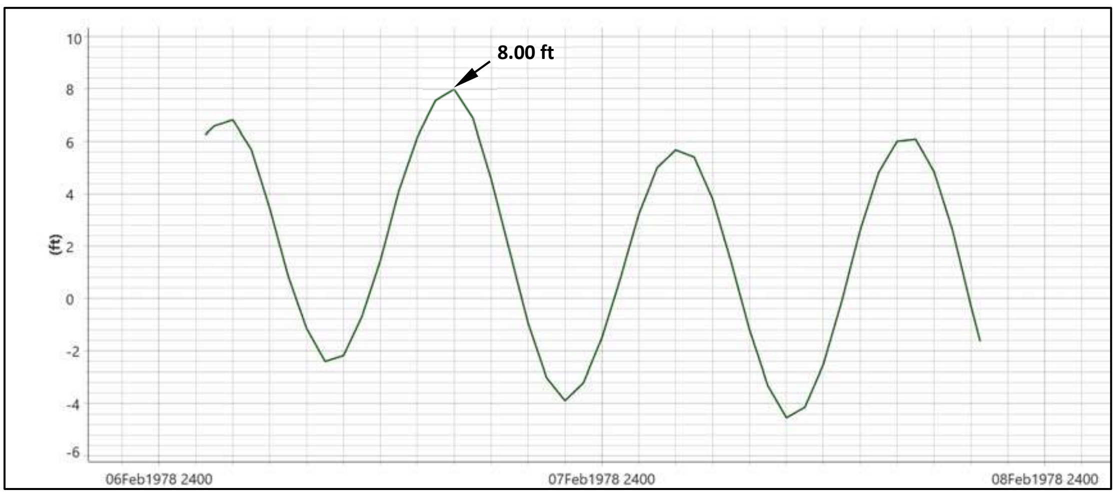


Figure 44 – Estimated 100-year tidal storm surge stage hydrograph used as the downstream boundary in the 100-year storm models without SLR

The 50- and 100-year tidal storm surge stage hydrographs used in the storm models with SLR were developed by adding 1.0 ft to the water level at each time step of the storm surge stage hydrographs used in the storm models without SLR. This results in peak water levels of 8.73 ft for the 50-year storm surge event and 9.00 ft for the 100-year storm surge event. The tidal storm surge stage hydrographs used as the downstream boundaries in the 50- and 100-year storm models with SLR are shown in Figures 45 and 46.

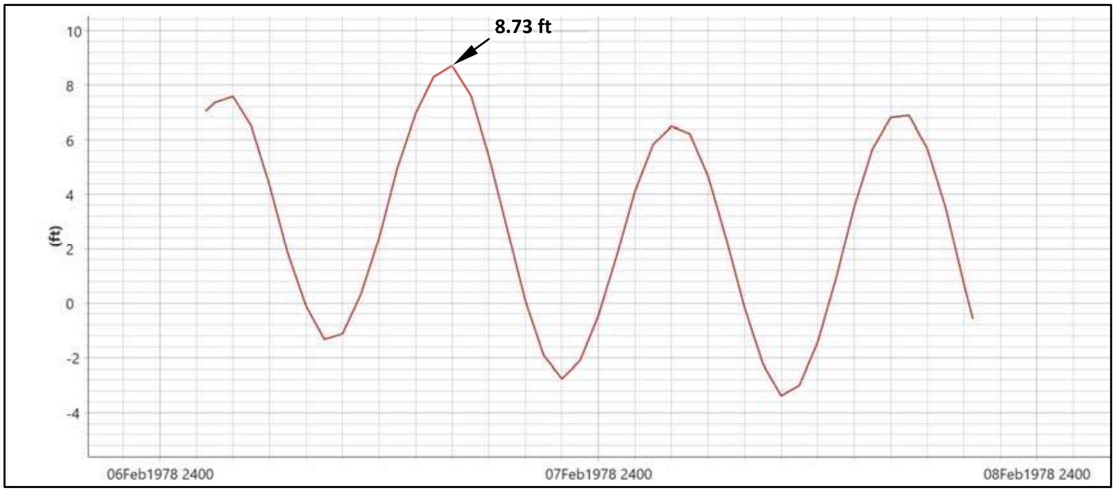


Figure 45 – Estimated 50-year tidal storm surge stage hydrograph used as the downstream boundary in the 50-year storm models with SLR

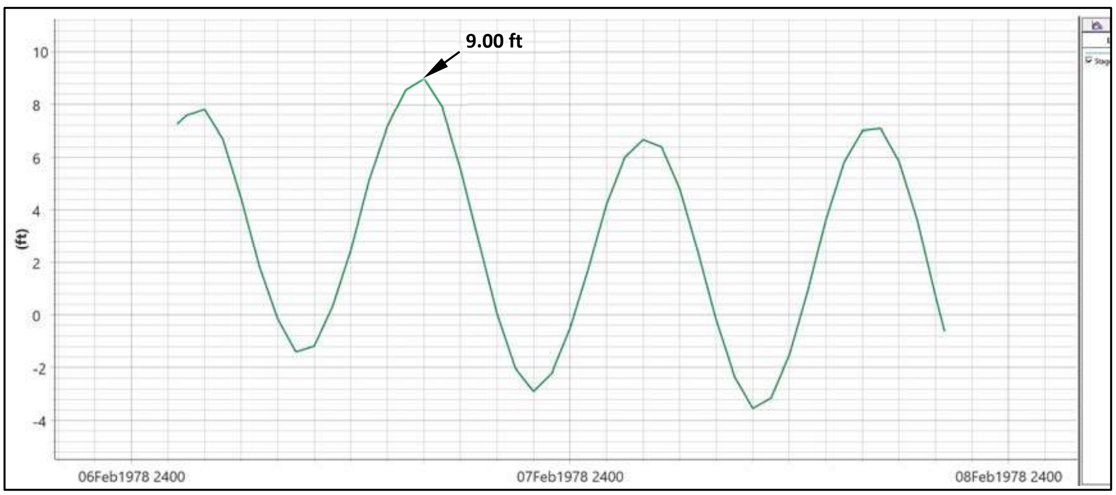


Figure 46 – Estimated 100-year tidal storm surge stage hydrograph used as the downstream boundary in the 100-year storm models with SLR

C.6. Pre- and Post-Project 50-year Storm Models without SLR

The pre-project 50-year storm model without SLR simulates the existing bridge geometry (see Section B.2.), runoff to North Mill Pond from the 50-year rainfall event (see Figure 38), and 50-year tidal storm surge unadjusted for SLR (see Figure 43).

The post-project 50-year storm model without SLR simulates the proposed bridge geometry after application of the geopolymer liner and removal of portions of the concrete footings (see Section B.3.), runoff to North Mill Pond from the 50-year rainfall event (see Figure 38), and 50-year tidal storm surge unadjusted for SLR (see Figure 43).

Table 4 summarizes the peak water levels in the portion of North Mill Pond south of Maplewood Avenue calculated with the pre- and post-project 50-year storm models without SLR. Note that maximum water levels at the south end of the pond below the outlet of the Bartlett Street culvert are slightly higher than in the majority of the pond. Similarly, maximum water levels at the bridge inlet are slightly lower than in the majority of the pond. The peak water levels listed in Table 4, and in subsequent tables which report maximum water levels, have been calculated at the centroid of the portion of North Mill Pond on the south side of Maplewood Avenue and represent the peak water levels in the majority of the waterbody on the south side of the road.

Table 4 – Peak water levels in the portion of North Mill Pond on the south side of Maplewood Avenue calculated with the pre- and post-project 50-year storm models without SLR

Model	**Peak Water Level in the portion of North Mill Pond on the South Side of Maplewood Avenue* (ft, NAVD88)**
Pre-Project 50-year Storm Model without SLR	7.96
Post-Project 50-year Storm Model without SLR	7.95

**calculated at the centroid of the waterbody on the south side of Maplewood Ave. (N 211315, E 1224317)*

As shown in Table 4, the maximum water level at the centroid would decrease by 0.01 ft for a storm event which includes a 50-year tidal storm surge and a 50-year freshwater flood occurring simultaneously under present-day sea-level conditions.

Figure 47 shows the inundation area when the calculated water levels are at their maximum. The area shaded light blue represents the post-project inundation area. The pink area along the periphery of the light blue shading, which due to the small water level decrease is unnoticeable at the scale shown in Figure 47, represents the additional area inundated under pre-project conditions. Because the peak water level would decrease, the projects will not exacerbate flooding on properties along the shoreline of North Mill Pond under this storm scenario.

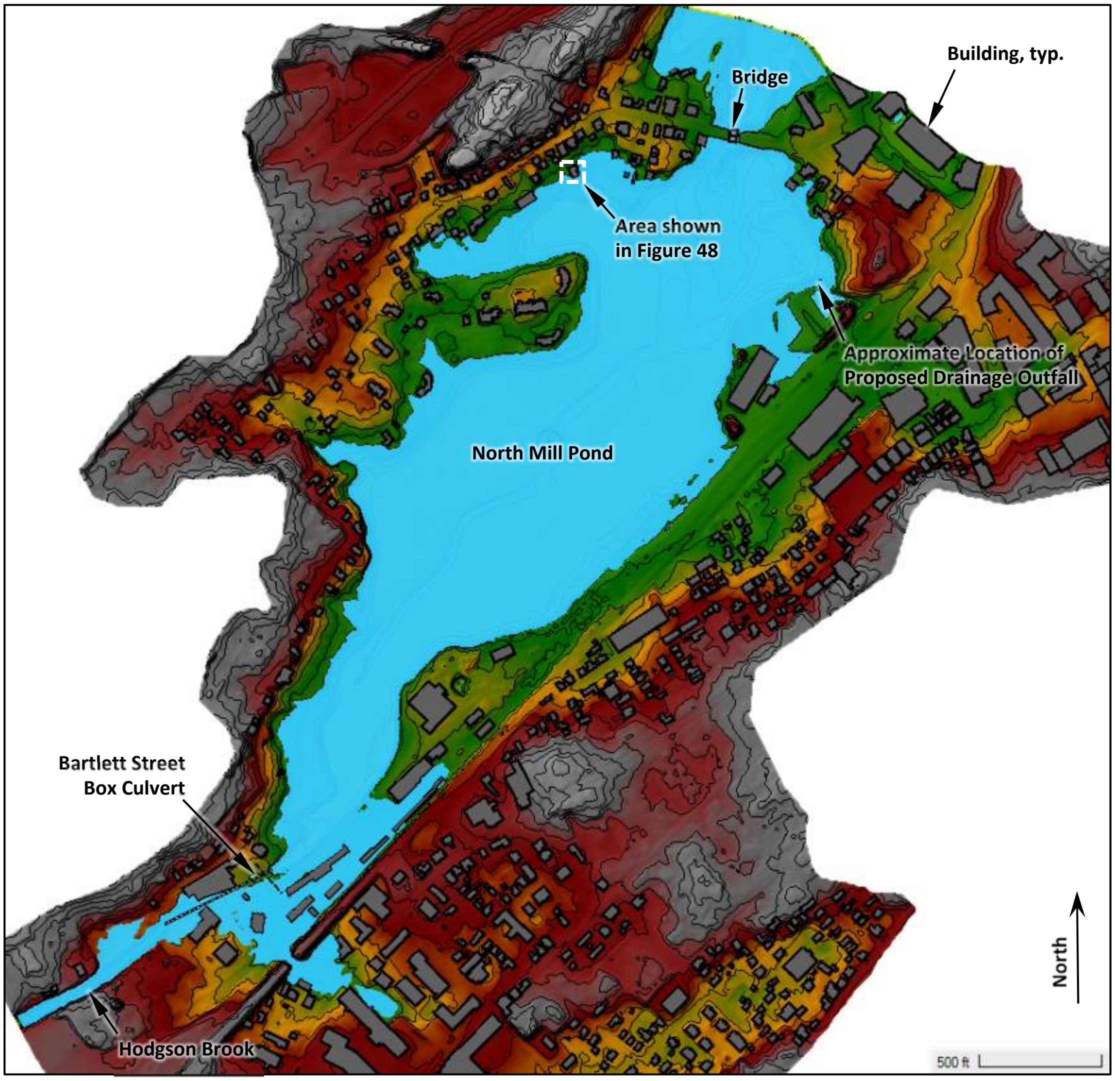


Figure 47 – Inundated areas calculated with the pre- and post-project 50-year storm models without SLR.

In order to visualize the magnitude of the reduced inundation in a typical area along the shoreline of North Mill Pond, Figure 48 shows a detailed view of an area southwest from the bridge.

Figure 48 – Detail view of a portion of the shoreline southwest from the bridge showing the inundated areas at the peak water levels calculated with the pre- and post-project 50-year storm models without SLR. The area shaded blue represents the post-project inundation area. The pink area along the periphery of the blue-shaded area represents the additional area flooded under pre-project conditions.

Figures 49 and 50 show the stage and flow hydrographs at the bridge calculated with the pre- and post-project 50-year storm models without SLR. Note that the maximum stage at the bridge inlet at the crest of each tide cycle is more or less equal to the water level at the bridge outlet except at the coincident peak of the freshwater inflow and tidal storm surge when the stage at the inlet is higher due to the freshwater inflow. Also note that due to the flow constriction created by the bridge and the grade control just south of the bridge inlet, low water levels in North Mill Pond south of the road at the trough of each tide cycle are higher than, and lag behind, low water levels at the bridge outlet with the greatest differences occurring at the tide cycle trough immediately after the coincident inflow and storm surge peaks. These same characteristics are also apparent on the stage hydrographs calculated with the other storm models.

The maximum flow through the bridge is 1,874 cfs for pre-project conditions and 1,907 cfs for post-project conditions. Both occur from south to north about two hours after the coincident inflow and storm surge peaks. Table 5 summarizes the peak flows through the bridge calculated with the pre- and post-project 50-year storm models without SLR.

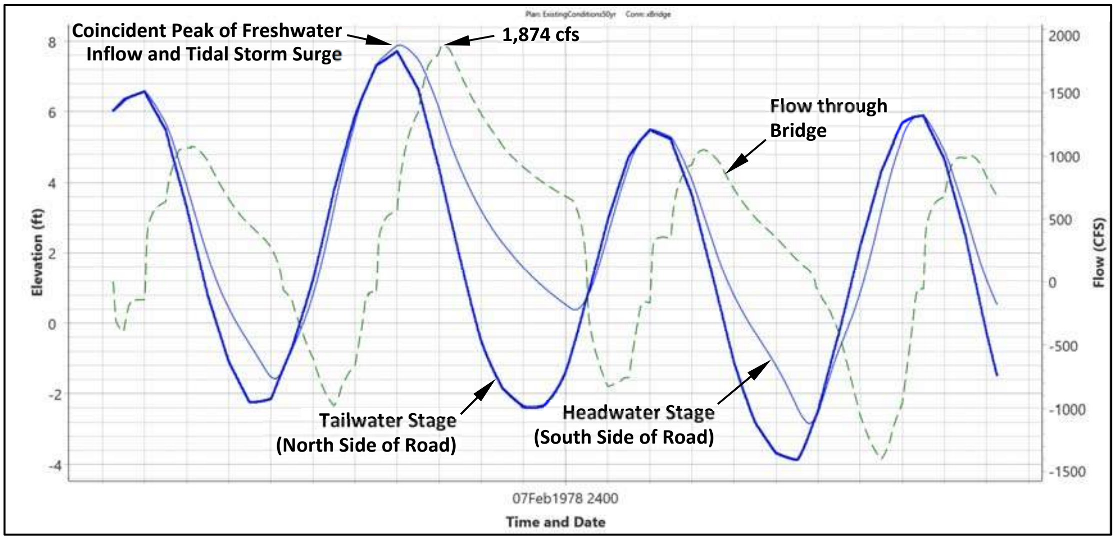


Figure 49 – Stage and flow hydrographs at the bridge calculated with the pre-project 50-year storm model without SLR

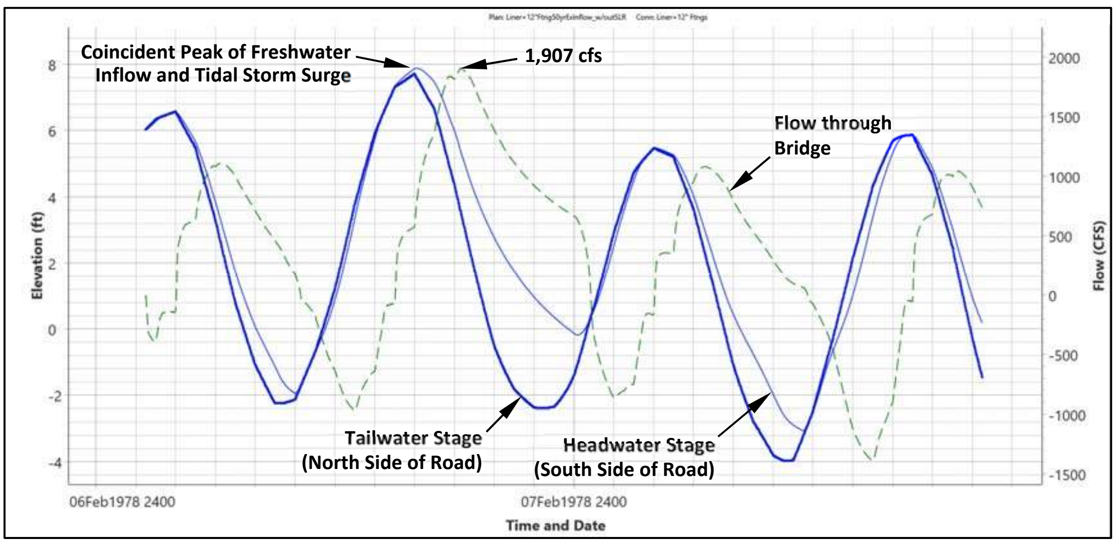


Figure 50 – Stage and flow hydrographs at the bridge calculated with the post-project 50-year storm model without SLR

Table 5 – Peak flows through the bridge calculated with the pre- and post-project 50-year storm models without SLR

Model	Peak Flow through Bridge (cfs)
Pre-Project 50-year Storm Model without SLR	1,874
Post-Project 50-year Storm Model without SLR	1,907

As shown in Table 5, due to the proposed waterway opening modifications, the maximum flow through the bridge would increase by 33 cfs for a storm event which includes a 50-year tidal storm surge and a 50-year freshwater flood occurring simultaneously under present-day sea-level conditions. This is an increase of approximately 1.8% and indicates that the bridge rehabilitation project will not restrict tidal flows as required by Env-Wt 904.07(d)(2).

C.7. Pre- and Post-Project 100-year Storm Models without SLR

The pre-project 100-year storm model without SLR includes the existing bridge geometry (see Section B.2.), runoff to North Mill Pond from the 100-year rainstorm (see Figure 39), and 100-year tidal storm surge unadjusted for SLR (see Figure 44).

The post-project 100-year storm model without SLR includes the proposed bridge geometry with the geopolymer liner applied and portions of the existing concrete footings removed (see Section B.3.), runoff to North Mill Pond from the 100-year rainstorm (see Figure 39), and 100-year tidal storm surge unadjusted for SLR (see Figure 44).

Table 6 lists the peak water levels calculated at the centroid of the portion of North Mill Pond south of Maplewood Avenue with the pre- and post-project 100-year storm models without SLR.

Table 6 – Peak water levels in the portion of North Mill Pond on the south side of Maplewood Avenue calculated with the pre- and post-project 100-year storm models without SLR

Model	Peak Water Level in the portion of North Mill Pond on the South Side of Maplewood Avenue* (ft, NAVD88)
Pre-Project 100-year Storm Model without SLR	8.41
Post-Project 100-year Storm Model without SLR	8.40

**calculated at the centroid of the waterbody on the south side of Maplewood Ave. (N 211315, E 1224317)*

The model results indicate that the maximum water level in the portion of North Mill Pond south of Maplewood Avenue would decrease by 0.01 ft for a storm which includes simultaneous 100-year tidal storm surge and 100-year freshwater flood events under current sea-level conditions.

Figures 51 and 52 show the pre- and post-project inundation areas associated with the calculated peak water levels listed in Table 6. Light blue shading indicates the post-project inundation area. Pink shading along the edge of the light blue-shaded area indicates the additional area flooded under pre-project conditions. Both the maximum water level and inundated area would decrease; therefore, the projects will not increase flooding on properties along the shoreline of North Mill Pond during the 100-year storm.

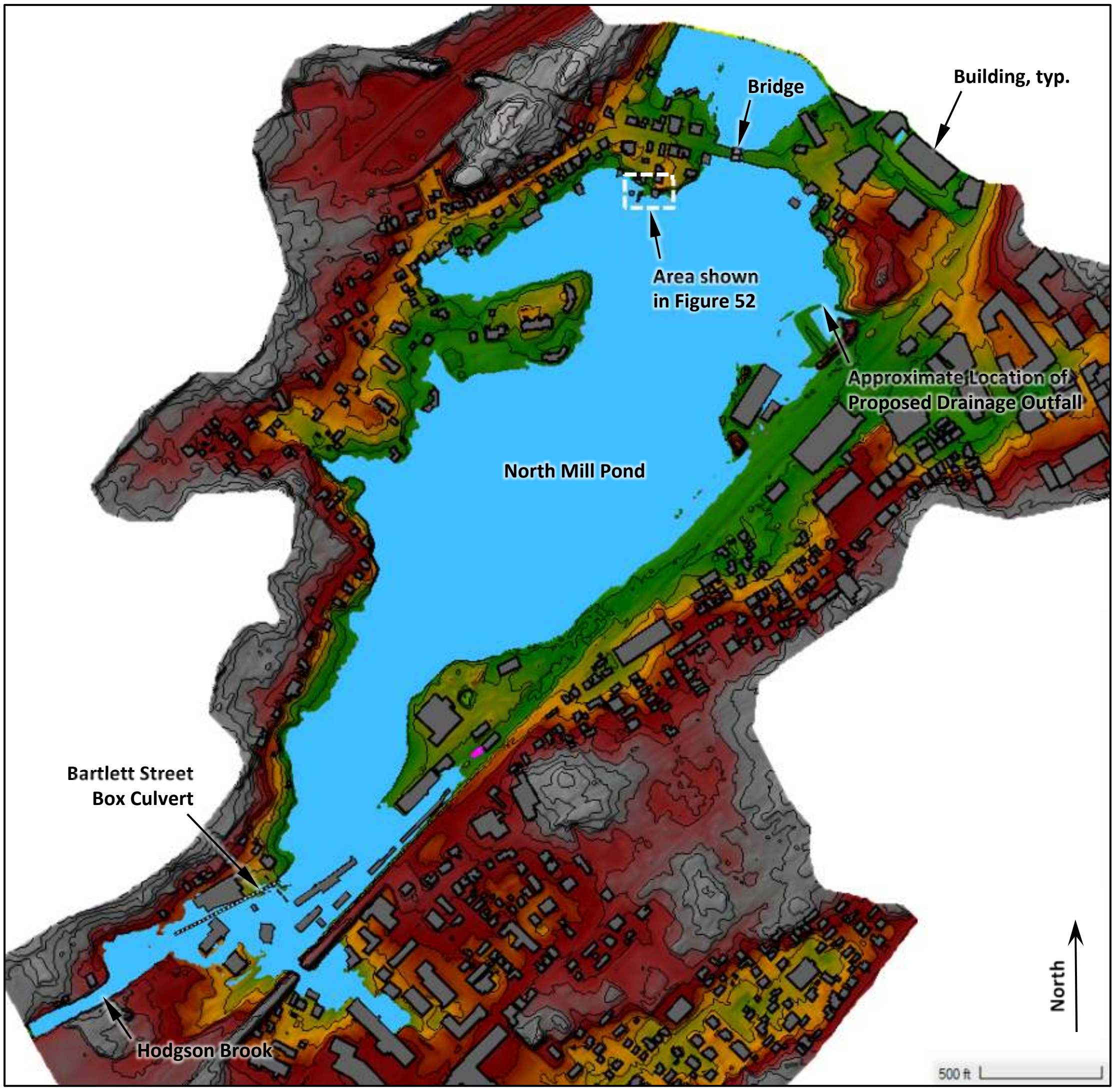


Figure 51 – Inundated areas calculated with the pre- and post-project 100-year storm models without SLR.

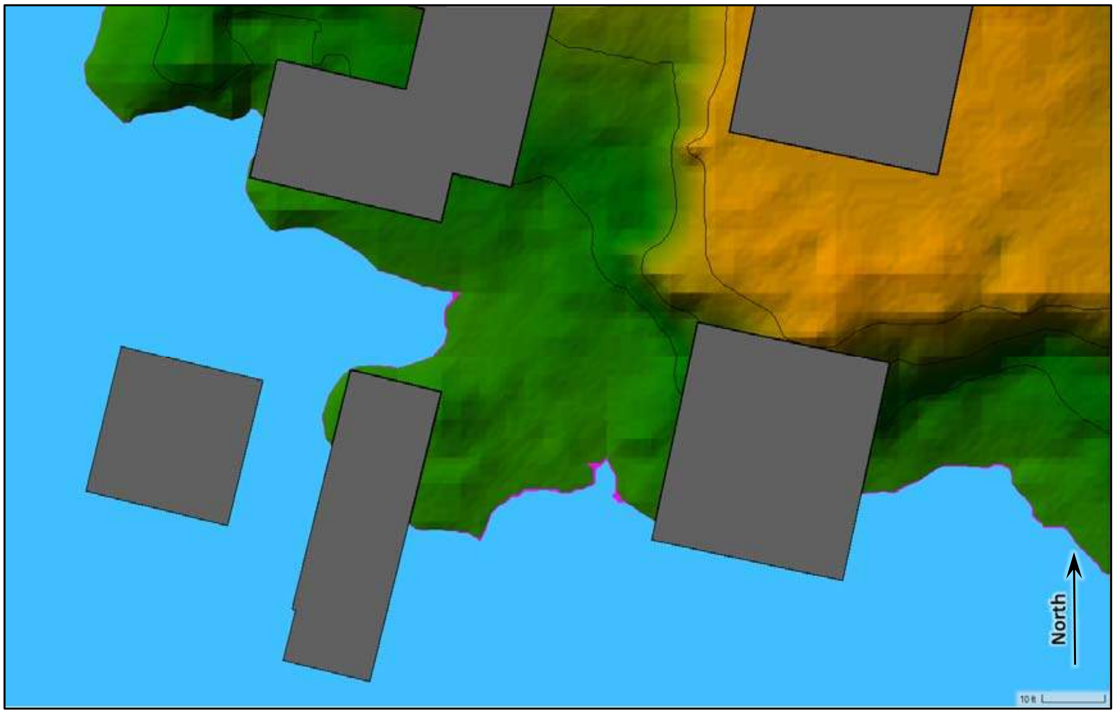


Figure 52 – Detail view of a portion of the North Mill Pond shoreline southwest from the bridge showing the inundated areas calculated with the pre- and post-project 100-year storm models without SLR. The area shaded blue represents the post-project inundation area. The pink area along the periphery of the blue-shaded area represents the additional area flooded under pre-project conditions.

Figures 53 and 54 show the stage and flow hydrographs at the bridge calculated with the pre- and post-project 100-year storm models without SLR and Table 7 summarizes the peak flows through the bridge, which are 2,129 cfs for pre-project conditions and 2,164 cfs for post-project conditions. Both occur from south to north about two hours after the coincident inflow and storm surge peaks.

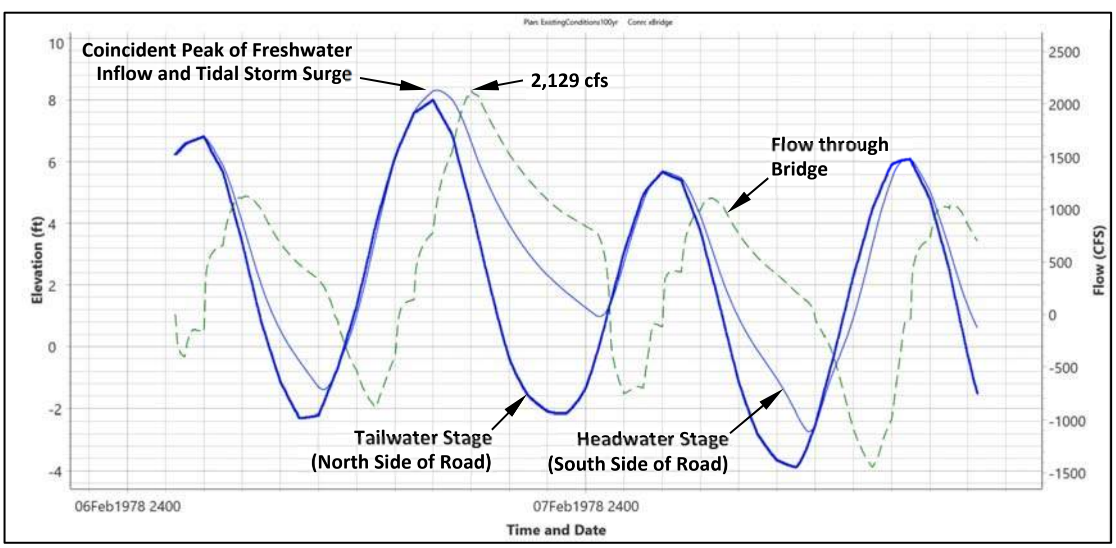


Figure 53 – Stage and flow hydrographs at the bridge calculated with the pre-project 100-year storm model without SLR

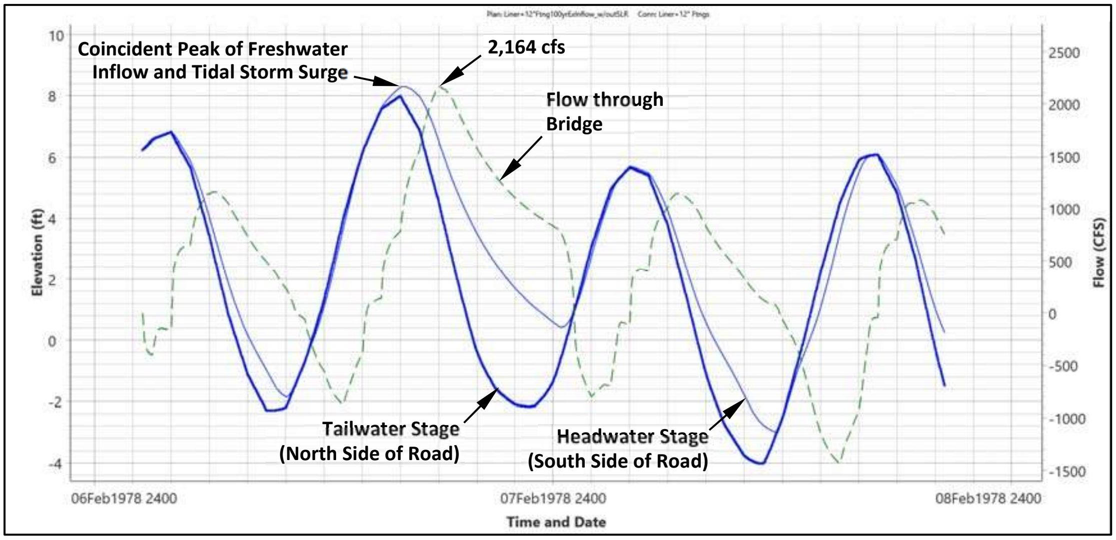


Figure 54 – Stage and flow hydrographs at the bridge calculated with the post-project 100-year storm model without SLR

Table 7 – Peak flows through the bridge calculated with the pre- and post-project 100-year storm models without SLR

Model	Peak Flow through Bridge (cfs)
Pre-Project 100-year Storm Model without SLR	2,129
Post-Project 100-year Storm Model without SLR	2,164

As shown in Table 7, for a storm event which includes a 100-year tidal storm surge and a 100-year freshwater flood occurring simultaneously under present-day sea-level conditions, the calculated peak flow through the bridge would increase by 35 cfs, or approximately 1.6%. The increased peak flow rate indicates that the proposed modifications to the bridge waterway opening will not restrict flows in accordance with Env-Wt 904.07(d)(2).

C.8. Pre- and Post-Project 50-year Storm Models with SLR

The pre-project 50-year storm model with SLR simulates the existing bridge geometry (see Section B.2.), runoff to North Mill Pond from the 50-year rainfall event (see Figure 38), and 50-year tidal storm surge adjusted for 1.0 ft SLR projected to occur during the bridge rehabilitation project design life (see Figure 45).

The post-project 50-year storm model with SLR simulates the proposed bridge geometry after the geopolymer liner has been applied (see Section B.3.), runoff to North Mill Pond from the 50-year rainfall event (see Figure 38), and 50-year tidal storm surge adjusted for 1.0 ft SLR (see Figure 45).

Table 8 summarizes the peak water levels in North Mill Pond south of Maplewood Avenue calculated with the pre- and post-project 50-year storm models with 1.0 ft SLR.

Table 8 – Peak water levels in the portion of North Mill Pond on the south side of Maplewood Avenue calculated with the pre- and post-project 50-year storm models with 1.0 ft SLR

Model	Peak Water Level in the portion of North Mill Pond on the South Side of Maplewood Avenue* (ft, NAVD88)
Pre-Project 50-year Storm Model with SLR	8.95
Post-Project 50-year Storm Model with SLR	8.94

**calculated at the centroid of the waterbody on the south side of Maplewood Ave. (N 211315, E 1224317)*

As shown in Table 8, with 1.0 ft of sea-level rise, the maximum water level in the portion of North Mill Pond south of Maplewood Avenue would decrease by 0.01 ft for a storm event which includes a 50-year tidal storm surge and a 50-year freshwater flood occurring simultaneously. This is the same decrease calculated for the 50-year storm event without SLR, which suggests that in regards to peak water levels, the projects would have more or less the same effect under both present-day sea-levels and those projected at the end of the bridge rehabilitation design life.

Figures 55 and 56 show the inundated areas at the peak water levels calculated with the pre- and post-project 50-year storm models with 1.0 ft SLR. Areas flooded under a scenario with the proposed bridge geometry and 1.0 ft SLR are shaded light blue. Pink shading along the limits of the light blue shading represents the additional areas which would be flooded with the existing bridge opening and 1.0 ft SLR. The models show that both the peak water level and inundation area would decrease; therefore, the projects will not increase flooding on properties along the shoreline of North Mill Pond under this scenario.

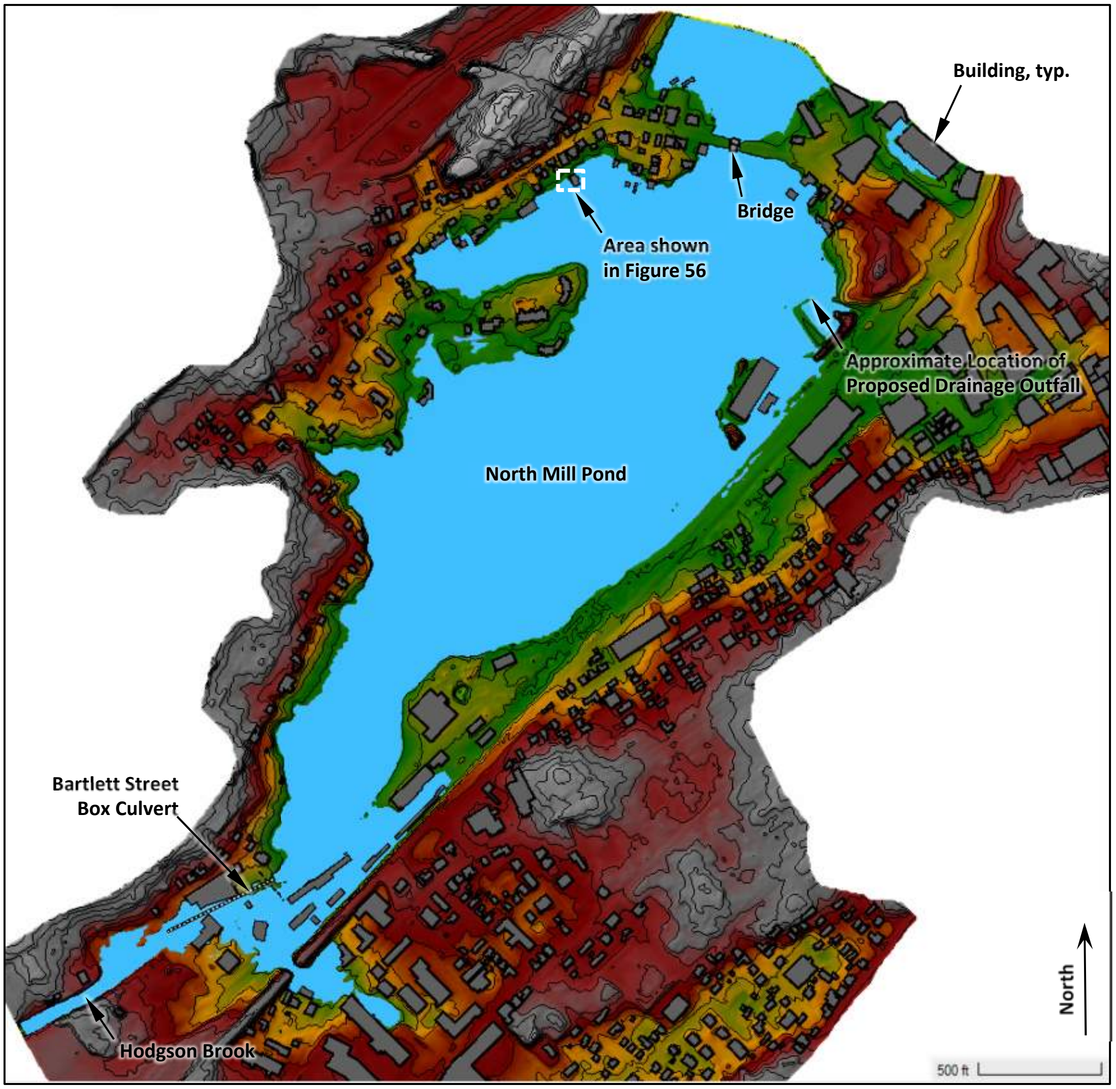


Figure 55 – Inundated areas calculated with the pre- and post-project 50-year storm models with 1.0 ft SLR

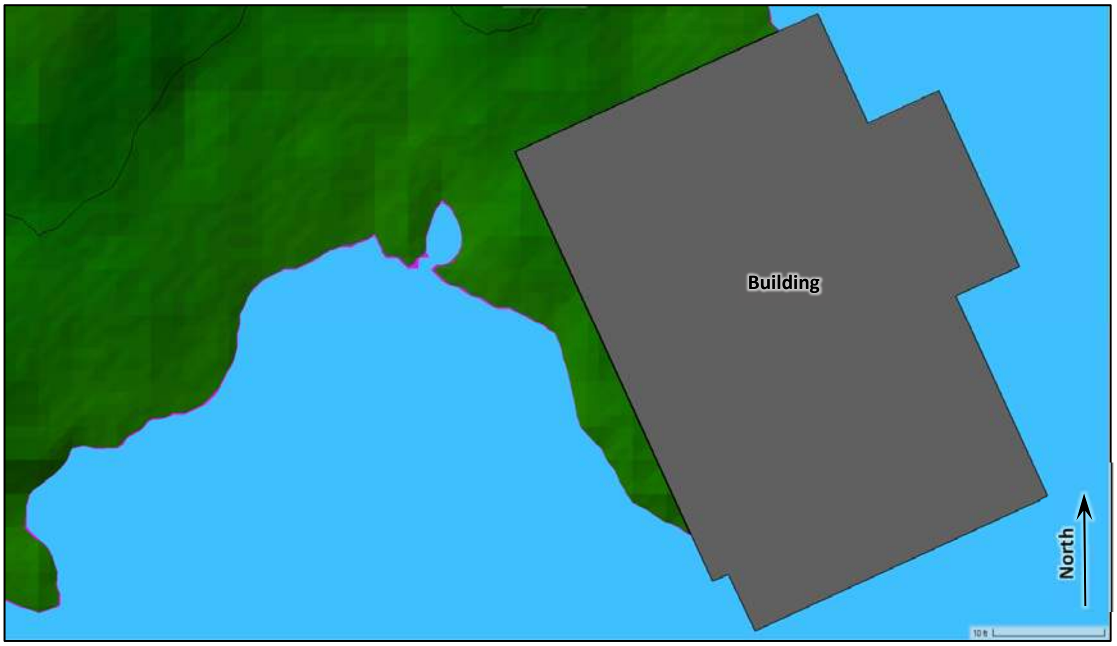


Figure 56 – Detail view of a portion of the shoreline southwest from the bridge showing the inundated areas at the peak water levels calculated with the pre- and post-project 50-year storm models with 1.0 ft SLR. The area shaded blue represents the post-project inundation area. The pink area along the periphery of the blue-shaded area represents the additional area flooded under pre-project conditions.

Figures 57 and 58 show the stage and flow hydrographs calculated at the bridge with the pre- and post-project 50-year storm models with 1.0 ft SLR. Maximum flows through the bridge are 2,016 cfs for pre-project conditions and 2,102 cfs for post-project conditions, both of which occur from south to north about two hours after the coincident freshwater inflow and tidal storm surge peaks. This is an increase of about 4.3% and indicates that the proposed waterway opening modifications would not restrict flows under a scenario which includes simultaneous 50-year tidal storm surge and 50-year freshwater flood events with 1.0 ft SLR.

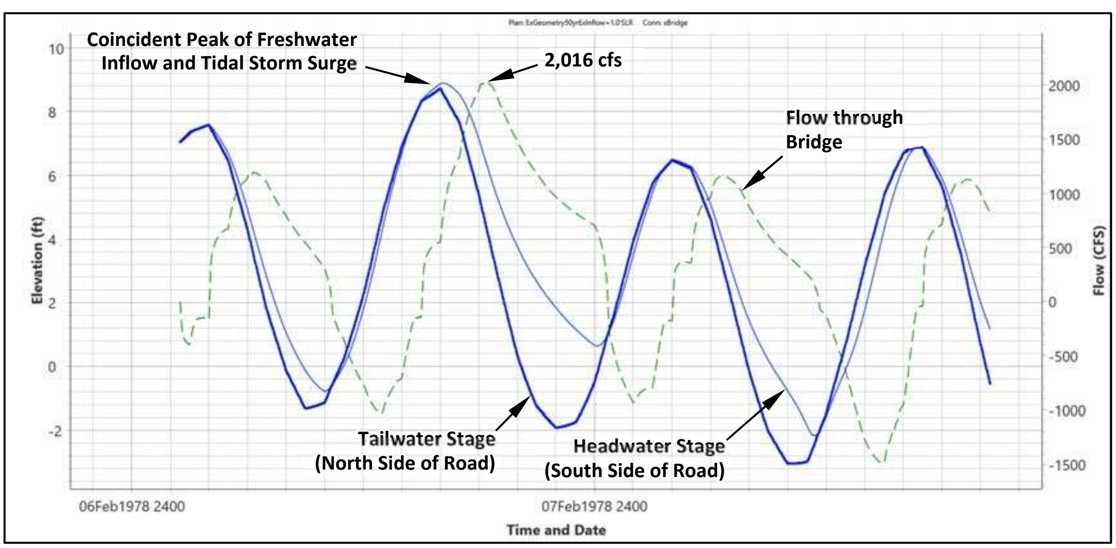


Figure 57 – Stage and flow hydrographs calculated at the bridge with the pre-project 50-year storm model with 1.0 ft SLR

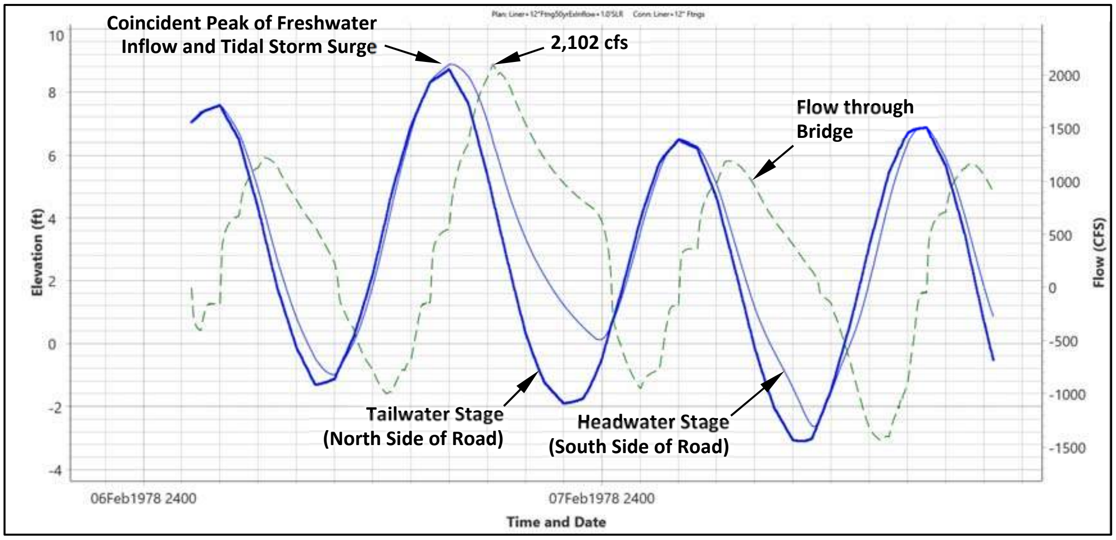


Figure 58 – Stage and flow hydrographs calculated at the bridge with the post-project 50-year storm model with 1.0 ft SLR

Table 9 – Peak flows through the bridge calculated with the pre- and post-project 50-year storm models with 1.0 ft SLR

Model	Peak Flow through Bridge (cfs)
Pre-Project 50-year Storm Model with SLR	2,016
Post-Project 50-year Storm Model with SLR	2,102

C.9. Pre- and Post-Project 100-year Storm Models with SLR

The pre-project 100-year storm model with SLR simulates a scenario which includes the existing bridge geometry (see Section B.2.), runoff to North Mill Pond from the 100-year rainfall event (see Figure 39), and 100-year tidal storm surge adjusted for 1.0 ft SLR projected to occur during the bridge rehabilitation project design life (see Figure 46).

The post-project 100-year storm model with SLR simulates a scenario which includes the proposed bridge geometry after the geopolymer liner has been applied and portions of the existing concrete footings have been removed (see Section B.3.), runoff to North Mill Pond from the 100-year rainfall event (see Figure 39), and 50-year tidal storm surge adjusted for 1.0 ft SLR (see Figure 46).

Table 10 lists the peak water levels calculated in the portion of North Mill Pond south of Maplewood Avenue with the pre- and post-project 100-year storm models with 1.0 ft SLR.

Table 10 – Peak water levels in the portion of North Mill Pond on the south side of Maplewood Avenue calculated with the pre- and post-project 100-year storm models with 1.0 ft SLR

Model	Peak Water Level in the portion of North Mill Pond on the South Side of Maplewood Avenue* (ft, NAVD88)
Pre-Project 100-year Storm Model with SLR	9.40
Post-Project 100-year Storm Model with SLR	9.39

**calculated at the centroid of the waterbody on the south side of Maplewood Ave. (N 211315, E 1224317)*

As indicated in Table 10, the model results show that the maximum water level in the portion of North Mill Pond south of Maplewood Avenue would decrease by 0.01 ft for a storm which includes simultaneous 100-year tidal storm surge and 100-year freshwater flood events under conditions with 1.0 ft of sea-level rise. This is the same decrease calculated for the 100-year storm event without SLR, suggesting that with respect to maximum water levels, the proposed waterway opening modifications would have about the same effect under both present-day sea-levels and elevated sea-levels predicted during the bridge rehabilitation design life.

Figures 59 and 60 show the inundation areas when water levels calculated with the pre- and post-project 100-year storm models with 1.0 ft SLR are at their maximum elevation. Areas shaded light blue are inundated under post-project conditions with 1.0 ft SLR. Pink shading along the edge of the post-project inundation area (see Figure 60) represents the additional area which would be flooded under pre-project conditions with 1.0 ft SLR. The peak water level and inundation area would both decrease; therefore, the projects will not exacerbate flooding on properties along the shoreline of North Mill Pond under this storm and SLR scenario.

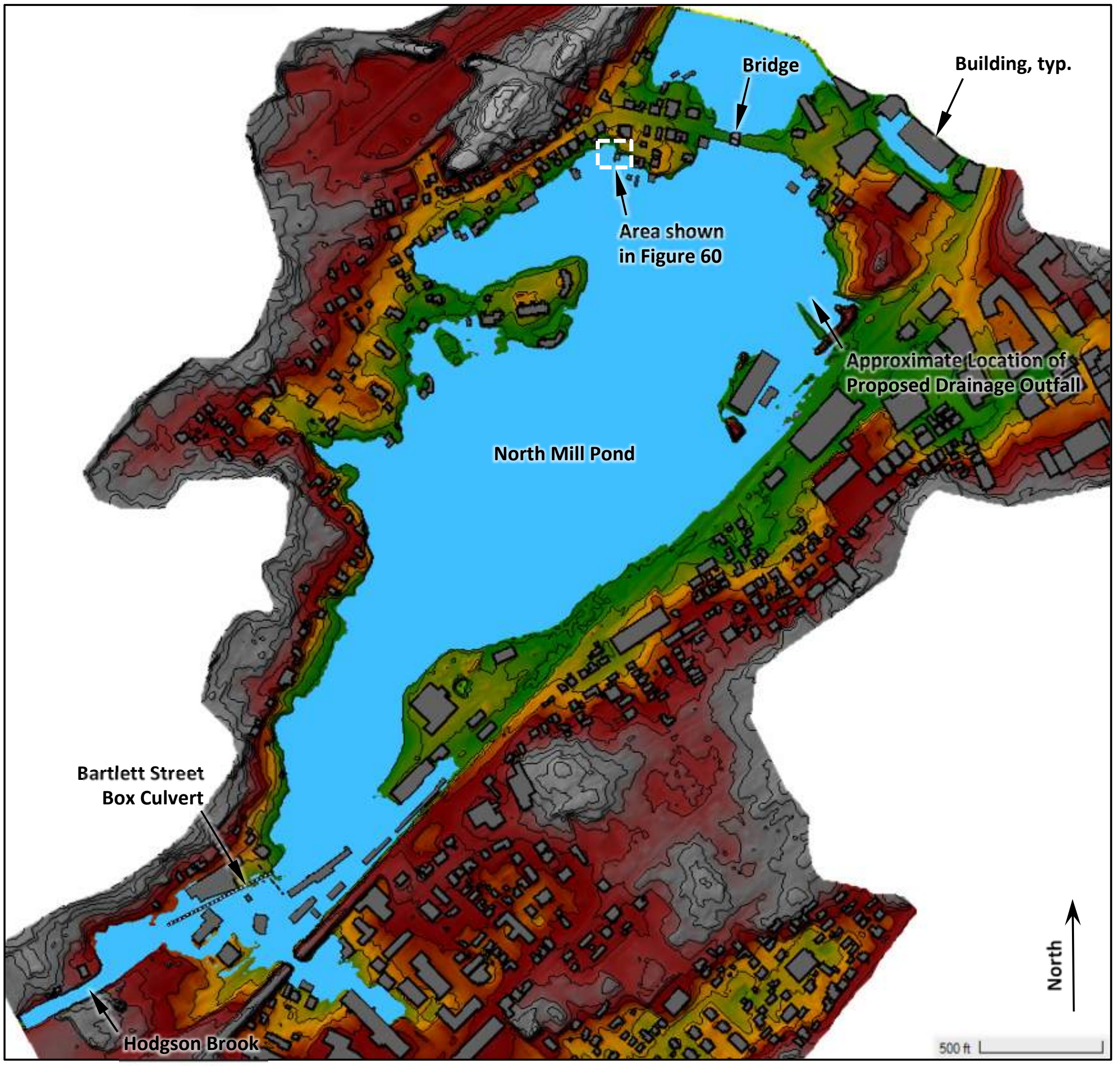


Figure 59 – Inundation areas calculated with the pre- and post-project 100-year storm models with 1.0 ft SLR

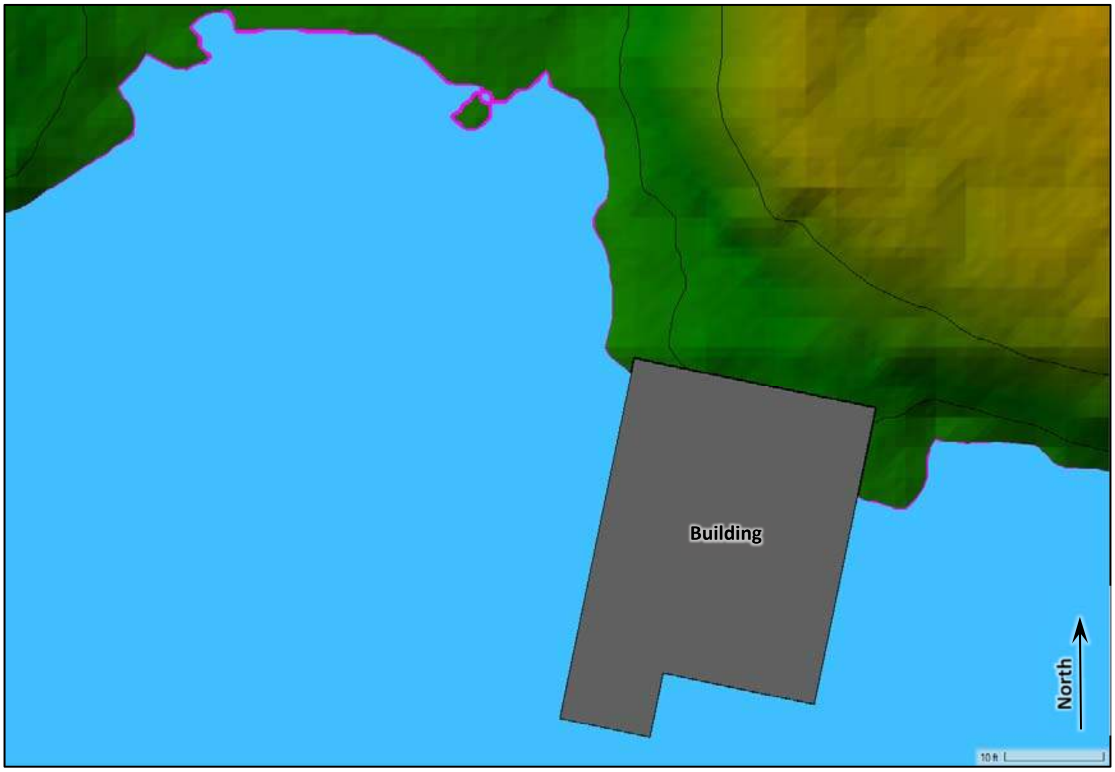


Figure 60 – Detail view of an area along the shore of North Mill Pond southwest from the bridge showing the inundated areas calculated with the pre- and post-project 100-year storm models with 1.0 ft SLR. The area shaded blue represents the post-project inundation area. The pink area along the periphery of the blue-shaded area represents the additional area flooded under pre-project conditions.

Figures 61 and 62 show the stage and flow hydrographs at the bridge calculated with the pre- and post-project 100-year storm models with 1.0 ft SLR. Maximum flows through the bridge are 2,209 cfs for pre-project conditions with 1.0 ft SLR and 2,250 cfs for post-project conditions with 1.0 ft SLR. Peak flows under both scenarios are from south to north and occur about two hours after the coincident freshwater inflow and tidal storm surge peaks.

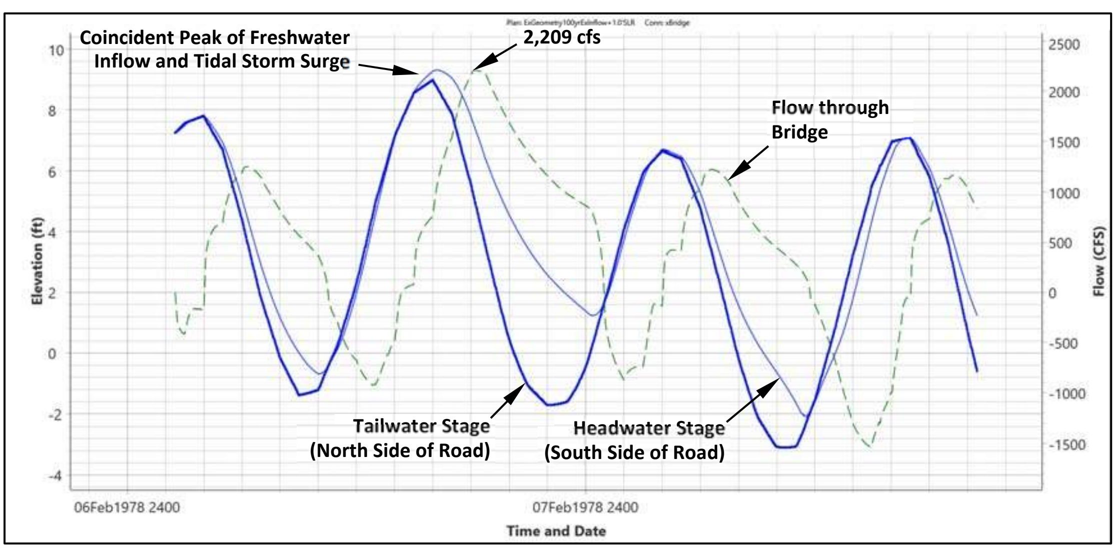


Figure 61 – Stage and flow hydrographs calculated at the bridge with the pre-project 100-year storm model with 1.0 ft SLR

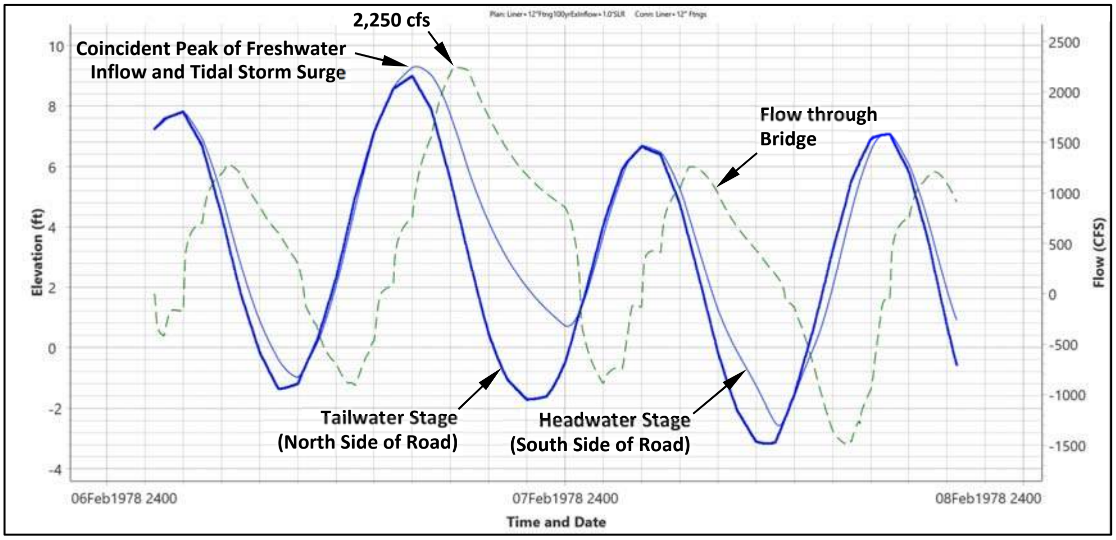


Figure 62 – Stage and flow hydrographs calculated at the bridge with the post-project 100-year storm model with 1.0 ft SLR

Table 11 – Peak flows through the bridge calculated with the pre- and post-project 100-year storm models with 1.0 ft SLR

Model	Peak Flow through Bridge (cfs)
Pre-Project 100-year Storm Model with SLR	2,209
Post-Project 100-year Storm Model with SLR	2,250

The models indicate the maximum flow through the bridge would increase by 41 cfs for a storm event which includes a 100-year tidal storm surge and a 100-year freshwater flood occurring simultaneously under conditions with 1.0 ft SLR. This is an increase of approximately 1.9% and indicates that the proposed modifications to the bridge waterway opening will not restrict flows under this storm and SLR scenario.

D. Env-Wt 603.05 Vulnerability Assessment

Results of the hydraulic analyses completed under Sections B and C have been used to complete a vulnerability assessment per Env-Wt 603.05.

D.1. Env-Wt 603.05(a)

The bridge rehabilitation project is intended to be a temporary repair which will maintain the functionality of the crossing until the structure can be completely replaced. It is expected to be in service for 10 to 20 years. Construction is anticipated to occur in the fall of 2023; therefore, the rehabilitated bridge is projected to be in service from 2023 to sometime between 2033 and 2043.

D.2. Env-Wt 603.05(b)

The corrugated metal arch bridge is a hydraulic structure that has been, and continues to be, frequently submerged since its construction in 1976. Granite block headwalls surround the metal arch at both ends of the structure and bedrock, boulders, and cobble line the pond bottom at the crossing (see Figures 3 and 18). Therefore, there is little risk for erosion of the roadway embankment or degradation of the pond bottom. Furthermore, because the surface of Maplewood Avenue is about 3 ft higher than the FEMA BFE, there is little risk of the roadway being overtopped during the project design life. The only damage potential is corrosion of the metal arch from regular saltwater exposure, which the geopolymer liner is intended to mitigate. Due to these characteristics, the rehabilitated bridge will have a low sensitivity to inundation and therefore a high tolerance for flood risk per the Step 2 Table (Framework for Determining Project Tolerance for Flood Risk) in NHCFR STAP (2020). Similarly, the drainage outfall is intended to be frequently submerged and will be constructed of erosion and corrosion resistant materials. Consequently, it too has a low sensitivity to inundation and a high tolerance for flood risks.

Although the bridge rehabilitation and drainage outfall projects themselves have a low sensitivity to inundation and a high tolerance for flood risks, the existing residential and commercial properties near the pond have a high sensitivity to inundation and low tolerance for flood risks. As described in Section C, detailed hydraulic analyses have been performed to assess the impact on these properties. These analyses found that the projects will not increase flood levels or flood inundation under any of the modeled storm scenarios, either with or without SLR, and will therefore not increase the flood risks to these properties.

The "SLAMM 2022 – Initial Conditions" layer in the NH Coastal Viewer shows narrow bands of existing salt marsh along most of the west shoreline of North Mill Pond south of Maplewood Avenue and about half of the east shoreline (see Figure 63). These salt marshes were also observed in the field (see Figure 64). Salt marsh migration is driven primarily by changes to ordinary water levels rather than changes to infrequent, storm-induced water levels. Therefore, the results of the hydraulic models which simulate MHHW and MLLW under pre- and post-project conditions with and without SLR are useful for evaluating the likely effect of the projects on these salt marshes. As described in Sections B.7., B.8., C.3., and C.4., the proposed projects will not significantly alter water levels during typical astronomical tide cycles, either with or without SLR. Therefore, the projects are not expected to adversely impact the salt marshes in North Mill Pond. There are no sand dunes or other known valuable coastal resources in the area which could be affected by the projects.

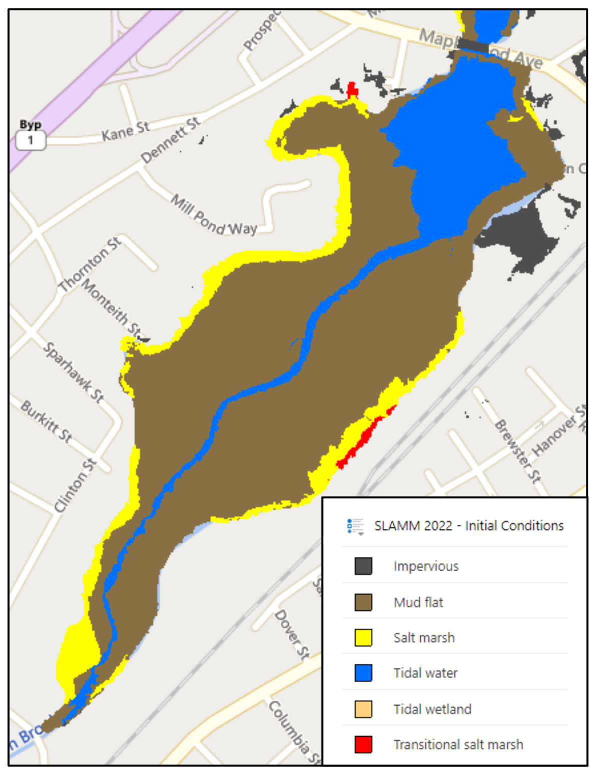


Figure 63 – SLAMM 2022 Initial Conditions layer showing existing salt marshes and other tidal resources in the portion of North Mill Pond south of Maplewood Avenue

Figure 64 – View north from the south end of North Mill Pond showing salt marshes along the shoreline (09-23-20)

D.3. Env-Wt 603.05(c)

NHCFR STAP (2019)[5] states in Section 4.5 (Relative Sea-Level Rise Projections): "For the purposes of this summary report, the preferred RSLR projections for coastal New Hampshire from 2000 to 2050 are based on K14 for the RCP 4.5 scenario (Table 4.2; Figure 4.5)." A copy of Table 4.2 from NHCFR STAP (2019) is shown as Figure 65 below. Per this table, as compared to sea-levels in the year 2000, there is a 67% probability that sea-levels will be between 0.3 and 0.7 ft higher in the year 2030 and between 0.5 and 1.3 ft higher in 2050.

Table 4.2. Projected local sea-level rise (in feet) estimates above 2000 levels for NH based on K14 and the Seavey Island tide-gauge.

Year	RCP	Central Estimate 50% probability SLR meets or exceeds:	Likely Range 67% probability SLR is between:	1-in-20 Chance 5% probability SLR meets or exceeds:	1-in-100 Chance 1% probability SLR meets or exceeds:	1-in-200 Chance 0.5% probability SLR meets or exceeds:	1-in-1000 Chance 0.1% probability SLR meets or exceeds:
2030	RCP 4.5*	0.5	0.3 - 0.7	0.9	1.0	1.1	1.3
2050	RCP 4.5*	**0.9**	**0.5 - 1.3**	**1.6**	**2.0**	**2.3**	2.9
2100	RCP 2.6	1.4	0.6 - 2.5	3.4	5.0	5.8	8.6
2100	RCP 4.5	**1.9**	**1.0 - 2.9**	**3.8**	**5.3**	**6.2**	8.7
2100	RCP 6.0	2.0	0.9 - 3.3	4.3	5.8	6.8	9.4
2100	RCP 8.5	2.6	1.5 - 3.8	4.9	6.5	7.5	10.0
2150	RCP 2.6	2.0	0.9 - 3.4	5.1	8.6	10.7	17.0
2150	RCP 4.5	**2.7**	**1.2 - 4.6**	**6.4**	**9.9**	**11.7**	18.1
2150	RCP 6.0**	N/A	N/A	N/A	N/A	N/A	N/A
2150	RCP 8.5	4.0	2.6 - 5.8	7.6	11.4	13.4	19.9

Figure 65 – Table 4.2 from NHCFR STAP (2019)

[5] Wake, C., Knott, J., Lippmann, T., Stampone, M., Ballestero, T., Bjerklie, D., Burakowski, E., Glidden, S., Hosseini-Shakib, I., Jacobs, J. (2019). *New Hampshire Coastal Flood Risk Summary – Part I: Science.* Prepared for the New Hampshire Coastal Flood Risk Science and Technical Advisory Panel. Report published by the University of New Hampshire, Durham, NH.

Step 3 Table A from NHCFR STAP (2020) lists recommended SLR estimates based on project design life and flood risk tolerance (see Figure 21). As described in Section D.1, the rehabilitated bridge is anticipated to be in service until sometime between 2033 and 2043. This most closely matches the year 2040 timeframe in Step 3 Table A. As described in Section D.2., the rehabilitated bridge will have a high tolerance for flood risk. Per Step 3 Table A, the recommended SLR estimate for a project with a 2040 timeframe and a high tolerance for flood risk is 1.0 ft relative to sea-levels in the year 2000. The hydraulic models described in Sections B and C which do not account for SLR use tide stage hydrographs simulating MHHW, MLLW, and tidal storm surge which are relative to the the tidal datum based on the 1983-2001 National Tidal Datum Epoch. Water levels at each time step of these stage hydrographs were raised by 1.0 ft to develop estimates of the MHHW, MLLW, and storm surge tide stage hydrographs which account for projected SLR during the bridge rehabilitation project design life. These SLR-adjusted tide stage hydrographs were used in the hydraulic models which account for SLR.

D.4. Env-Wt 603.05(d) and (e)

The area shaded light blue in Figure 66 represents the portion of the hydraulic study area which is currently within the 100-year floodplain. This is the area at and below the FEMA BFE, which is 8.0 ft (NAVD88). Pink shading indicates the additional areas which would be subject to flooding as a result of the projected SLR at the end of the project design life assuming the BFE is raised by 1.0 ft to elevation 9.0 ft.

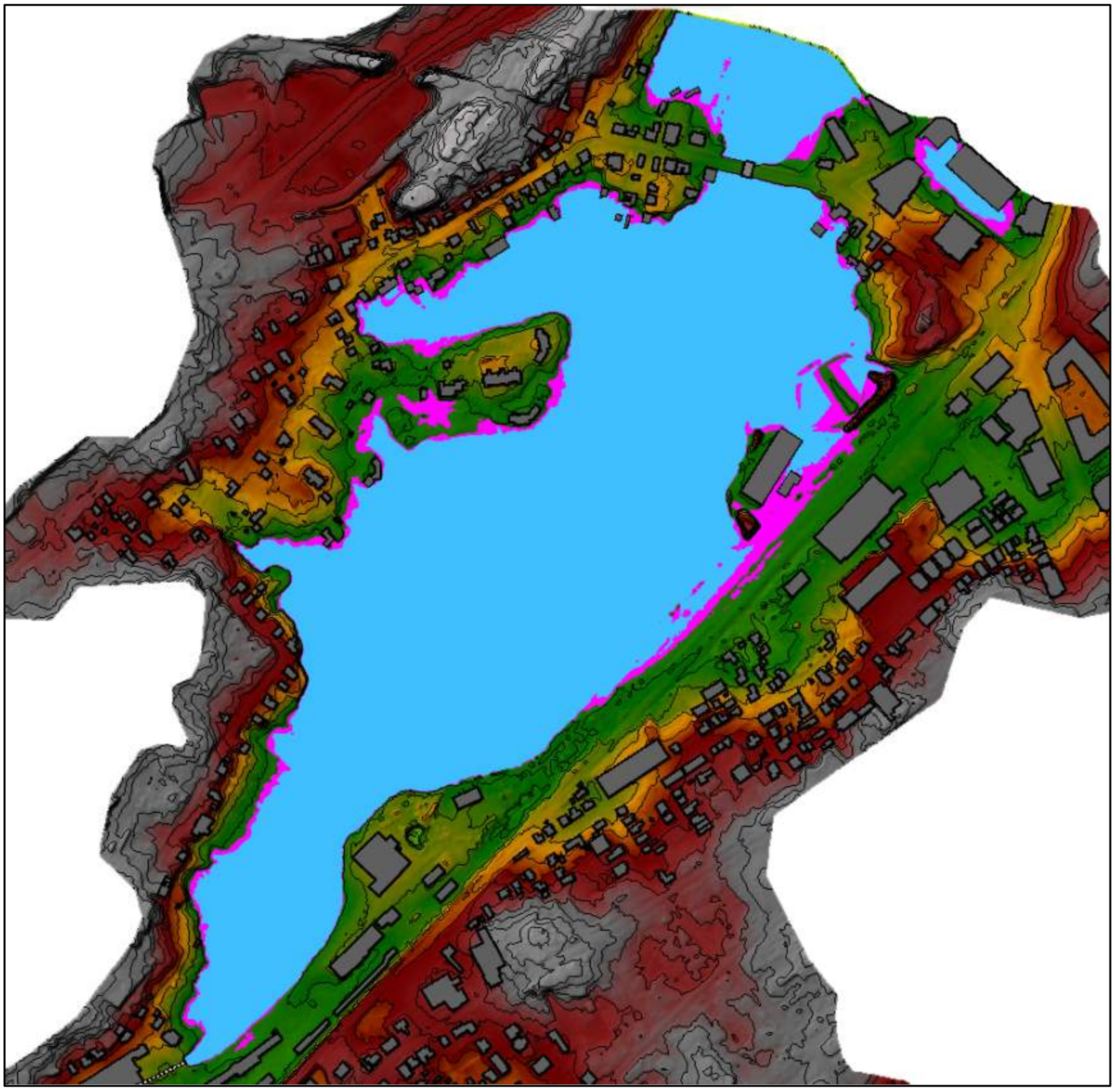


Figure 66 – Existing 100-year floodplain (blue shading, BFE 8.0 ft) and additional area subject to flooding with 1.0 ft SLR (pink shading, BFE 9.0 ft)

D.5. Env-Wt 603.05(f)

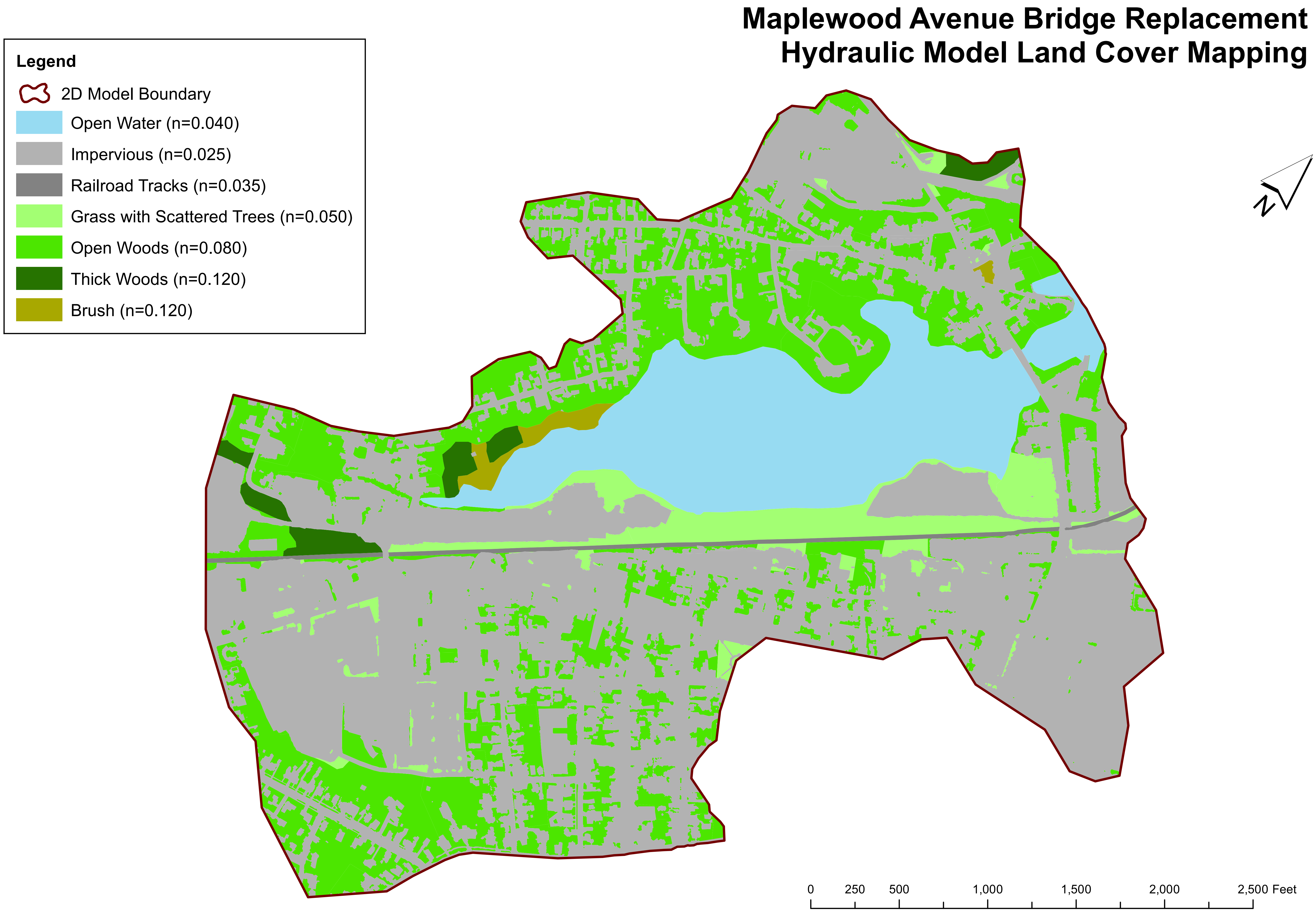
Since the bridge and outfall are intended to be submerged and Maplewood Avenue at the crossing would still be about 2 ft higher than the FEMA BFE increased by 1.0 ft to account for SLR (i.e., reasonably safe from flooding), no special design features are needed to accommodate SLR within the project design life. However, as described in Section C, SLR has been considered in the project design by evaluating the combined effects of the projects on flood levels, inundation extents, and bridge discharge capacities under scenarios where sea-levels have risen 1.0 ft.

D.6. Env-Wt 603.05(g)

There are no conflicts between the purpose of the projects and the vulnerability assessment results.

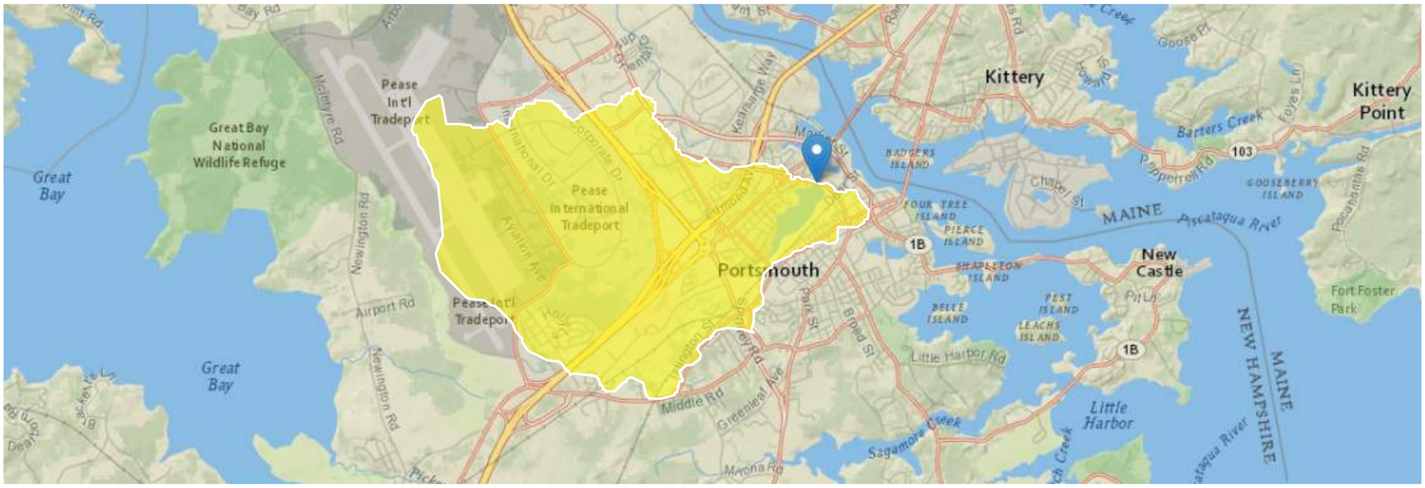
APPENDIX 1

SUPPORTING DOCUMENTATION FOR HYDRAULIC MODELS


Maplewood Avenue Bridge Replacement
Hydraulic Model Land Cover Mapping
Legend
2D Model Boundary
Open Water (n=0.040)
Impervious (n=0.025)
Railroad Tracks (n=0.035)
Grass with Scattered Trees (n=0.050)
Open Woods (n=0.080)
Thick Woods (n=0.120)
Brush (n=0.120)
N
0
250
500
1,000
1,500
2,000
2,500 Feet

StreamStats Report - North Mill Pond at Maplewood Ave.

Region ID: NH
Workspace ID: NH20221003123325873000
Clicked Point (Latitude, Longitude): 43.07969, -70.76530
Time: 2022-10-03 08:33:51 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
APRAVPRE	Mean April Precipitation	4.429	inches
BSLDEM30M	Mean basin slope computed from 30 m DEM	1.47	percent
CONIF	Percentaqe of land surface covered by coniferous forest	6.3785	percent
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	19	feet per mi
DRNAREA	Area that drains to a point on a stream	4.16	square miles
ELEVMAX	Maximum basin elevation	101.072	feet
MIXFOR	Percentage of land area covered by mixed deciduous and coniferous forest	2.2681	percent
PREBC0103	Mean annual precipitation of basin centroid for January 1 to March 15 winter period	9.25	inches
PREG_03_05	Mean precipitation at gaging station location for March 16 to May 31 spring period	9.6	inches
PREG_06_10	Mean precipitation at gaging station location for June to October summer period	17.2	inches
TEMP	Mean Annual Temperature	46.223	degrees F
TEMP_06_10	Basinwide average temperature for June to October summer period	62.036	degrees F
WETLAND	Percentage of Wetlands	7.3067	percent

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Peak Flow Statewide SIR2008 5206]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.16	square miles	0.7	1290
APRAVPRE	Mean April Precipitation	4.429	inches	2.79	6.23
WETLAND	Percent Wetlands	7.3067	percent	0	21.8
CSL10_85	Stream Slope 10 and 85 Method	19	feet per mi	5.43	543

Peak-Flow Statistics Flow Report [Peak Flow Statewide SIR2008 5206]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	ASEp	Equiv. Yrs.
50-percent AEP flood	115	ft^3/s	69.6	190	30.1	3.2
20-percent AEP flood	196	ft^3/s	117	329	31.1	4.7
10-percent AEP flood	266	ft^3/s	155	455	32.3	6.2
4-percent AEP flood	363	ft^3/s	204	644	34.3	8
2-percent AEP flood	445	ft^3/s	243	815	36.4	9
1-percent AEP flood	546	ft^3/s	287	1040	38.6	9.8
0.2-percent AEP flood	799	ft^3/s	386	1650	44.1	11

Peak-Flow Statistics Citations

Olson, S.A.,2009, Estimation of flood discharges at selected recurrence intervals for streams in New Hampshire: U.S.Geological Survey Scientific Investigations Report 2008-5206, 57 p. (http://pubs.usgs.gov/sir/2008/5206/)

Flow-Duration Statistics

Flow-Duration Statistics Parameters [Low Flow Statewide]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.16	square miles	3.26	689
PREG_06_10	Jun to Oct Gage Precipitation	17.2	inches	16.5	23.1
TEMP	Mean Annual Temperature	46.223	degrees F	36	48.7

Flow-Duration Statistics Flow Report [Low Flow Statewide]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	SE	ASEp
60 Percent Duration	1.94	ft^3/s	1.41	2.6	18	18
70 Percent Duration	1.21	ft^3/s	0.84	1.68	20.6	20.6
80 Percent Duration	0.64	ft^3/s	0.388	0.991	28	28
90 Percent Duration	0.289	ft^3/s	0.147	0.509	37.5	37.5
95 Percent Duration	0.164	ft^3/s	0.0741	0.313	44.1	44.1
98 Percent Duration	0.0948	ft^3/s	0.0356	0.203	54.3	54.3

Flow-Duration Statistics Citations

Flynn, R.H. and Tasker, G.D.,2002, Development of Regression Equations to Estimate Flow Durations and Low-Flow-Frequency Statistics in New Hampshire Streams: U.S.Geological Survey Scientific Investigations Report 02-4298, 66 p. (http://pubs.water.usgs.gov/wrir02-4298)

Seasonal Flow Statistics

Seasonal Flow Statistics Parameters [Low Flow Statewide]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.16	square miles	3.26	689
CONIF	Percent Coniferous Forest	6.3785	percent	3.07	56.2
PREBC0103	Jan to Mar Basin Centroid Precip	9.25	inches	5.79	15.1
BSLDEM30M	Mean Basin Slope from 30m DEM	1.47	percent	3.19	38.1
MIXFOR	Percent Mixed Forest	2.2681	percent	6.21	46.1
PREG_03_05	Mar to May Gage Precipitation	9.6	inches	6.83	11.5
TEMP	Mean Annual Temperature	46.223	degrees F	36	48.7
TEMP_06_10	Jun to Oct Mean Basinwide Temp	62.036	degrees F	52.9	64.4
PREG_06_10	Jun to Oct Gage Precipitation	17.2	inches	16.5	23.1
ELEVMAX	Maximum Basin Elevation	101.072	feet	260	6290

Seasonal Flow Statistics Disclaimers [Low Flow Statewide]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Seasonal Flow Statistics Flow Report [Low Flow Statewide]

Statistic	Value	Unit
Jan to Mar15 60 Percent Flow	4.67	ft^3/s
Jan to Mar15 70 Percent Flow	3.99	ft^3/s
Jan to Mar15 80 Percent Flow	3.25	ft^3/s
Jan to Mar15 90 Percent Flow	2.3	ft^3/s
Jan to Mar15 95 Percent Flow	1.77	ft^3/s
Jan to Mar15 98 Percent Flow	1.32	ft^3/s
Jan to Mar15 7 Day 2 Year Low Flow	2.95	ft^3/s
Jan to Mar15 7 Day 10 Year Low Flow	1.63	ft^3/s
Mar16 to May 60 Percent Flow	4.82	ft^3/s
Mar16 to May 70 Percent Flow	4.02	ft^3/s
Mar16 to May 80 Percent Flow	4.18	ft^3/s
Mar16 to May 90 Percent Flow	3.76	ft^3/s
Mar16 to May 95 Percent Flow	3.4	ft^3/s
Mar16 to May 98 Percent Flow	2.92	ft^3/s
Mar16 to May 7 Day 2 Year Low Flow	3.39	ft^3/s
Mar16 to May 7 Day 10 Year Low Flow	1.87	ft^3/s
Jun to Oct 60 Percent Flow	0.536	ft^3/s
Jun to Oct 70 Percent Flow	0.381	ft^3/s
Jun to Oct 80 Percent Flow	0.225	ft^3/s
Jun to Oct 90 Percent Flow	0.134	ft^3/s
Jun to Oct 95 Percent Flow	0.0875	ft^3/s
Jun to Oct 98 Percent Flow	0.0703	ft^3/s
Jun to Oct 7 Day 2 Year Low Flow	0.157	ft^3/s
Jun to Oct 7 Day 10 Year Low Flow	0.0492	ft^3/s
Nov to Dec 60 Percent Flow	2.14	ft^3/s
Nov to Dec 70 Percent Flow	1.37	ft^3/s
Nov to Dec 80 Percent Flow	0.814	ft^3/s
Nov to Dec 90 Percent Flow	0.42	ft^3/s
Nov to Dec 95 Percent Flow	0.227	ft^3/s
Nov to Dec 98 Percent Flow	0.107	ft^3/s
Oct to Nov 7 Day 2 Year Low Flow	0.848	ft^3/s
Oct to Nov 7 Day 10 Year Low Flow	0.182	ft^3/s

Seasonal Flow Statistics Citations

Flynn, R.H. and Tasker, G.D.,2002, Development of Regression Equations to Estimate Flow Durations and Low-Flow-Frequency Statistics in New Hampshire Streams: U.S.Geological Survey Scientific Investigations Report 02-4298, 66 p. (http://pubs.water.usgs.gov/wrir02-4298)

Low-Flow Statistics

Low-Flow Statistics Parameters [Low Flow Statewide]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.16	square miles	3.26	689
TEMP	Mean Annual Temperature	46.223	degrees F	36	48.7
PREG_06_10	Jun to Oct Gage Precipitation	17.2	inches	16.5	23.1

Low-Flow Statistics Flow Report [Low Flow Statewide]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SE	ASEp
7 Day 2 Year Low Flow	0.154	ft^3/s	0.0553	0.327	55.7	55.7
7 Day 10 Year Low Flow	0.0477	ft^3/s	0.0111	0.125	79.4	79.4

Low-Flow Statistics Citations

Flynn, R.H. and Tasker, G.D.,2002, Development of Regression Equations to Estimate Flow Durations and Low-Flow-Frequency Statistics in New Hampshire Streams: U.S.Geological Survey Scientific Investigations Report 02-4298, 66 p. (http://pubs.water.usgs.gov/wrir02-4298)

Application Version: 4.10.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

MAPLEWOOD AVE BRIDGE IN PORTSMOUTH, NH TIDAL STUDY (DOUCET SURVEY, LLC (DS~6032)) JUNE 16, 2022

KNOWN DATA AT SEAVEY ISLAND, ME STATION 8419870 (CONTROL STATION: 8418150 PORTLAND, ME) EPOCH 1983-2001 (STATUS ACCEPTED DEC. 6, 2021)		
5.87'	HAT	HIGHEST ASTRONOMICAL TIDE - REFERENCE LINE - HOTL
4.18'	MHHW	MEAN HIGHER-HIGH WATER
3.76'	MHW	MEAN HIGH WATER
-0.32'	MTL	MEAN TIDE LEVEL
-0.25'	MSL	MEAN SEA LEVEL
-0.26'	DTL	MEAN DIURNAL TIDE LEVEL
-4.39'	MLW	MEAN LOW WATER
-4.71'	MLLW	MEAN-LOWER-LOW WATER
0.00'	NAVD88	NORTH AMERICAN VERTICAL DATUM OF 1988
-6.98'	STND	STATION DATUM
8.89'	GT	GREAT DIURNAL RANGE
8.16'	MN	MEAN RANGE OF TIDE
0.42'	DHQ	MEAN DIURNAL HIGH WATER INEQUALITY
0.31'	DLQ	MEAN DIURNAL LOW WATER INEQUALITY

PRELIMINARY DATA AT CONTROL STATION, SEAVEY ISLAND, ME STATION 8419870 (DATUM NAVD88)

DATE: 2022-05-27

3.65' HIGH WATER AT 10:12 (GMT TIMEZONE: 14:12)

DATE: 2022-06-02

3.26' HIGH WATER AT 14:18 (GMT TIMEZONE: 18:18)

DATE: 2022-06-07

-3.56' LOW WATER AT 11:48 (GMT TIMEZONE: 15:48)

SITE DATA AT SUBORDINATE STATION BY NORTHEASTERLY (OCEAN-SIDE) OF MAPLEWOOD BRIDGE, PORTSMOUTH, NH

DATE: 2022-05-27

3.51' HIGH WATER AT 10:48 (GMT TIMEZONE: 14:48)

DATE: 2022-06-02

3.14' HIGH WATER AT 14:40 (GMT TIMEZONE: 18:40)

DATE: 2022-06-07

-3.36' LOW WATER AT 11:52 (GMT TIMEZONE: 15:52)

FINAL TIDAL STUDY INFORMATION

	MAPLEWOOD AVE BRIDGE	SEAVEY ISLAND
	ELEV.	ELEV.
HAT	5.6'	5.87'
MHHW	4.0'	4.18'
MHW	3.6'	3.76'
MTL	-0.3'	-0.32'
MLW	-4.2'	-4.39'
MLLW	-4.5'	-4.71'
NAVD88	0.0'	0.00'

APPENDIX 2

BRIDGE REHABILITATION PROJECT
HYDROLOGY STUDY REPORT

February 1, 2021

Jillian A. Semprini, P.E.
Hoyle, Tanner & Associates, Inc.
Pease International Tradeport
100 International Drive, Suite 360
Portsmouth, NH 03801
(603) 431-2520, ext 28
jsemprini@hoyletanner.com

Subject: **Maplewood Avenue over North Mill Pond Hydrologic Analysis**
Portsmouth, NH

Jillian:

This letter describes the hydrologic analysis we have completed for the Maplewood Avenue over North Mill Pond bridge replacement project in Portsmouth. Methods and results of the hydrology study are described below and supporting plans and calculations are attached.

A. Overview

Our approach to the hydrologic analysis was based on the requirements and recommendations included in the following documents:

- *Bridge Design Manual, Chapter 2, Bridge Selection*. January 2015 – v 2.0 (Revised August 2018). NH Department of Transportation (NHDOT); and

- *Sea-level Rise, Storm Surges, and Extreme Precipitation in Coastal New Hampshire: Analysis of Past and Projected Future Trends*. 2014. New Hampshire Coastal Risk and Hazards Commission Science and Technical Advisory Panel (NHCRHC STAP). http://www.nhcrhc.org/wp-content/uploads/2014-STAP-final-report.pdf.

Maplewood Avenue is classified as a Tier 5 highway (i.e. local road). Per the NHDOT Bridge Design Manual, the design flood for calculating freeboard to the superstructure of bridges on local roads is the 50-year event and the design flood for substructure scour analysis is the 100-year event.

The SCS unit hydrograph method was used with the HydroCAD computer program to estimate runoff hydrographs resulting from the 50-, and 100-year, 24-hour rainfalls. This method, which is an approved hydrologic analysis method listed in the Bridge Design Manual, uses the SCS unit hydrograph (representing the runoff resulting from 1 inch of excess precipitation), synthetic rainfall distribution curve (specifying the distribution of rainfall throughout the storm duration), and the following variables:

- Watershed Area;
- Rainfall depth;
- Runoff Curve Number (measure of the land's capacity to retain precipitation, based on soil and land cover characteristics); and
- Time of Concentration (time required for runoff to travel from the most hydraulically distant point of a watershed to its outlet).

B. <u>Watershed Delineation</u>

The main tributary to North Mill Pond is Hodgson Brook, which enters the southwest end of the pond at the outlet of a stone masonry box culvert beneath Bartlett Street. North Mill Pond also receives runoff from areas immediately north and south of the pond which drain directly to it, rather than to Hodgson Brook.

The following data was used to delineate the area draining to North Mill Pond at Maplewood Avenue:

- Digital elevation model (DEM) generated from 2011 LiDAR data downloaded from NHGRANIT (note that the 2011 LiDAR data is the most recent dataset which covers the entire watershed – more recent data only covers a portion of the watershed);
- Stormwater infrastructure GIS data (storm drains and drainage structures) provided by James McCarty, GIS Manager for the City of Portsmouth;
- 1-foot resolution color orthophotography captured in 2017 and 6-inch resolution color orthophotography captured in 2010; and
- Google Maps Street View.

The watershed includes a significant amount of commercial, industrial, and residential development which has altered the natural drainage patterns. Due to these alterations, the stormwater infrastructure GIS data provided by the City was invaluable in determining the current drainage pathways and watershed boundary. However, this data does not include all of the closed drainage pipes and structures nor does it contain other drainage information such as roof drain connections and parking garage stormwater infrastructure. Where the stormwater infrastructure GIS data was incomplete, the LiDAR DEM, orthophotography, and Google Maps Street View were used to estimate flow pathways and delineate the watershed boundary.

The area draining to North Mill Pond at Maplewood Avenue was determined to be 2,628 acres (4.11 square miles). The watershed boundary is shown on the attached Watershed Relief Map and Drainage Plan.

C. Rainfall

In accordance with the recommendations in NHDRHC STAP (2014), rainfall depths and distributions at the watershed centroid were obtained from the Northeast Regional Climate Center (NRCC) using their "Extreme Precipitation" web tool (http://precip.eas.cornell.edu). Table 1 summarizes the rainfall depths for the analyzed storms and Figure 1 shows the rainfall distribution curves for these events.

Table 1 – NRCC Rainfall Data

Storm Frequency	24-hour Rainfall Depth
50-year	7.39"
100-year	8.86"

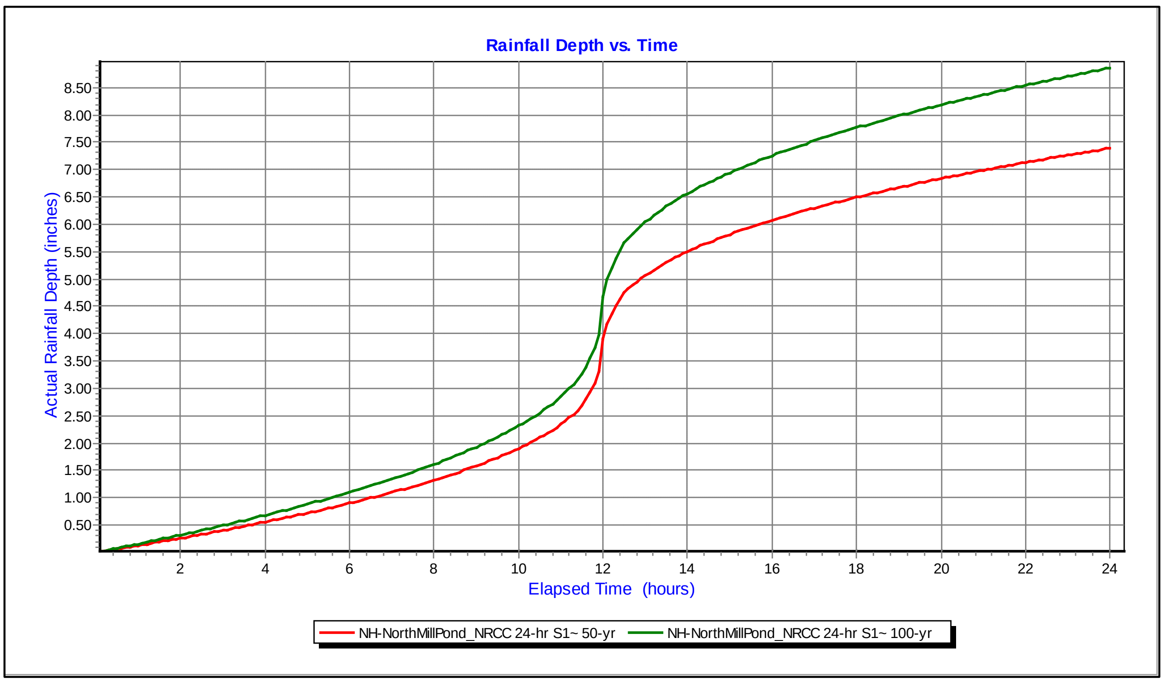


Figure 1 – Rainfall Distribution Curves for 50- and 100-year Storms

D. Runoff Curve Number

The composite runoff curve number (CN) for the watershed was estimated using the following data sources:

- "Impervious Surfaces in the Coastal Watershed of NH and Maine, High Resolution – 2015" GIS layer downloaded from NHGRANIT;
- "Land Use 2015 - Southeastern New Hampshire" GIS layer downloaded from NHGRANIT;
- 1-foot resolution color orthophotography captured in 2017; and

- digital NRCS soil mapping.

The Land Use polygons were clipped to remove those portions covered by the Impervious layer. The remaining portions of the Land Use polygons were then assigned one of the land cover types and conditions listed in Table 2-2 of the SCS Technical Release 55 (TR-55) publication by inspecting the ground cover of these polygons shown on 2017 orthophotography. For example, the orthophotography shows that the Land Use "Electric, gas, and other utilities" polygons, which generally cover utility right-of-ways, support predominantly brush and tall herbaceous vegetation over more than 75 percent of the ground surface, which most closely matches the "Brush, Good" cover type and condition in the TR-55 manual. The attached "North Mill Pond Watershed Land Cover" table summarizes the correlations between the Land Use layers and TR-55 cover types.

Once the land cover mapping was completed for the entire watershed, it was combined with NRCS soil mapping to create soil-land cover polygons for each combination of hydrologic soil group (HSG) and land cover (e.g. Brush, Good, HSG B). Each soil-land cover combination was then assigned a CN from Table 2-2 of the TR-55 manual. The attached "North Mill Pond Watershed Soil – Land Cover Map" shows the soil-land cover polygons and the attached "North Mill Pond Watershed Soil - Land Cover Polygons" table summarizes the areas and CNs for each soil-land cover combination.

This cumulative area of each soil-land cover combination was determined and used to calculate the area-weighted composite CN for the entire watershed. This value was determined to be 73, which suggests a relatively high runoff potential due to the extent of development in the watershed, approximately 36% of which was determined to be covered by impervious surfaces.

E. <u>Time of Concentration</u>

The time of concentration (Tc) – the time for runoff to travel from the hydraulically most distant point of the watershed to the bridge – was estimated using the velocity method. The flow path from the uppermost point of the watershed to the bridge was identified using the DEM and storm drain GIS data and has a total length of 23,320 feet (see attached Drainage Plan). Twenty-six discreet flow segments were delineated – one sheet flow segment and one shallow concentrated flow segment at the upper end of the watershed followed by alternating pipe and channel flow segments as the drainage path crosses multiple roadways on its way to North Mill Pond.

A terrain profile was cut along the flow path and used to identify the start and end of each channel and pipe segment, the invert elevations at these break points, and the length and slope of each segment. The storm drain GIS data included culvert diameter and material attribute information for a few of the pipe runs; however, most of these features did not include this data. For these pipe segments the pipe diameter and material were estimated. A typical cross-section was cut across each channel flow segment and the ground profile from the DEM was used to determine channel geometry for use in calculating travel time. Geometry was measured at an estimated maximum bankfull depth of one foot. The 2017 orthophotography was used to identify land cover along the channel flow segments from which Manning's roughness coefficients were estimated. Most channel segments have brush or forest cover and were assigned a roughness coefficient of 0.10. The numerous roadway embankments along the flow path likely have restricted outlets which provide floodwater storage and act to increase Tc and lag time between the start of the runoff event and its peak. Although the analysis did not directly account for the storage effects of these manmade basins, the assignment of relatively high roughness coefficients to the channel flow segments does, to some extent, account for these effects.

The total Tc for the watershed was calculated at 564 minutes (9.4 hours). The attached "North Mill Pond Watershed Time of Concentration" table summarizes the data for each flow segment.

F. Rainfall Runoff Simulation

The hydrologic model yielded the following peak discharges at the Maplewood Avenue Bridge.

Table 2 – Peak Discharge Estimates at Maplewood Avenue

Storm Frequency	Peak Discharge (cfs)
50-year	908
100-year	1,179

Output from the HydroCAD model is attached.

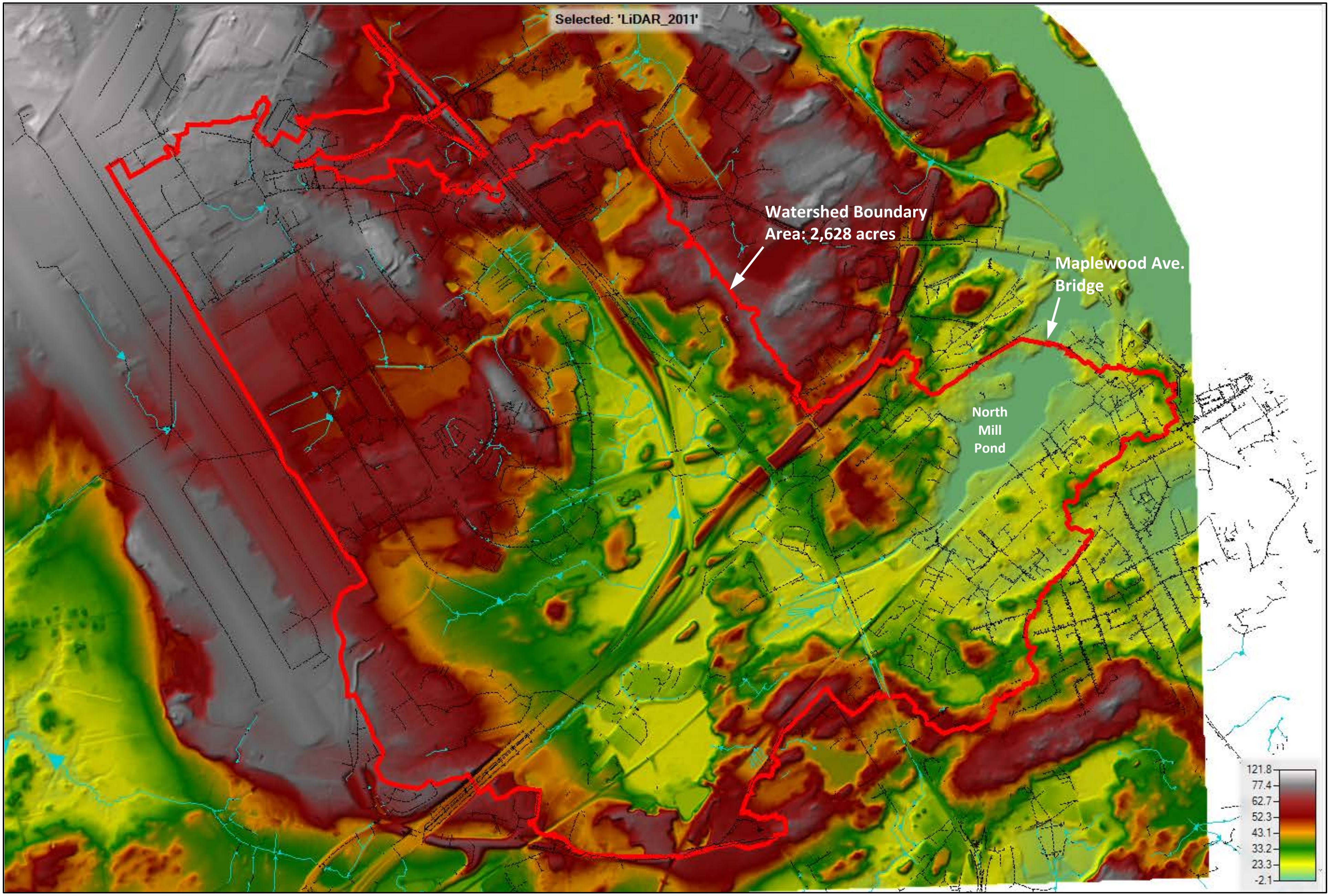
I can be reached at (603) 616-6850 or via email at sean@headwatershydrology.com if you have any questions.

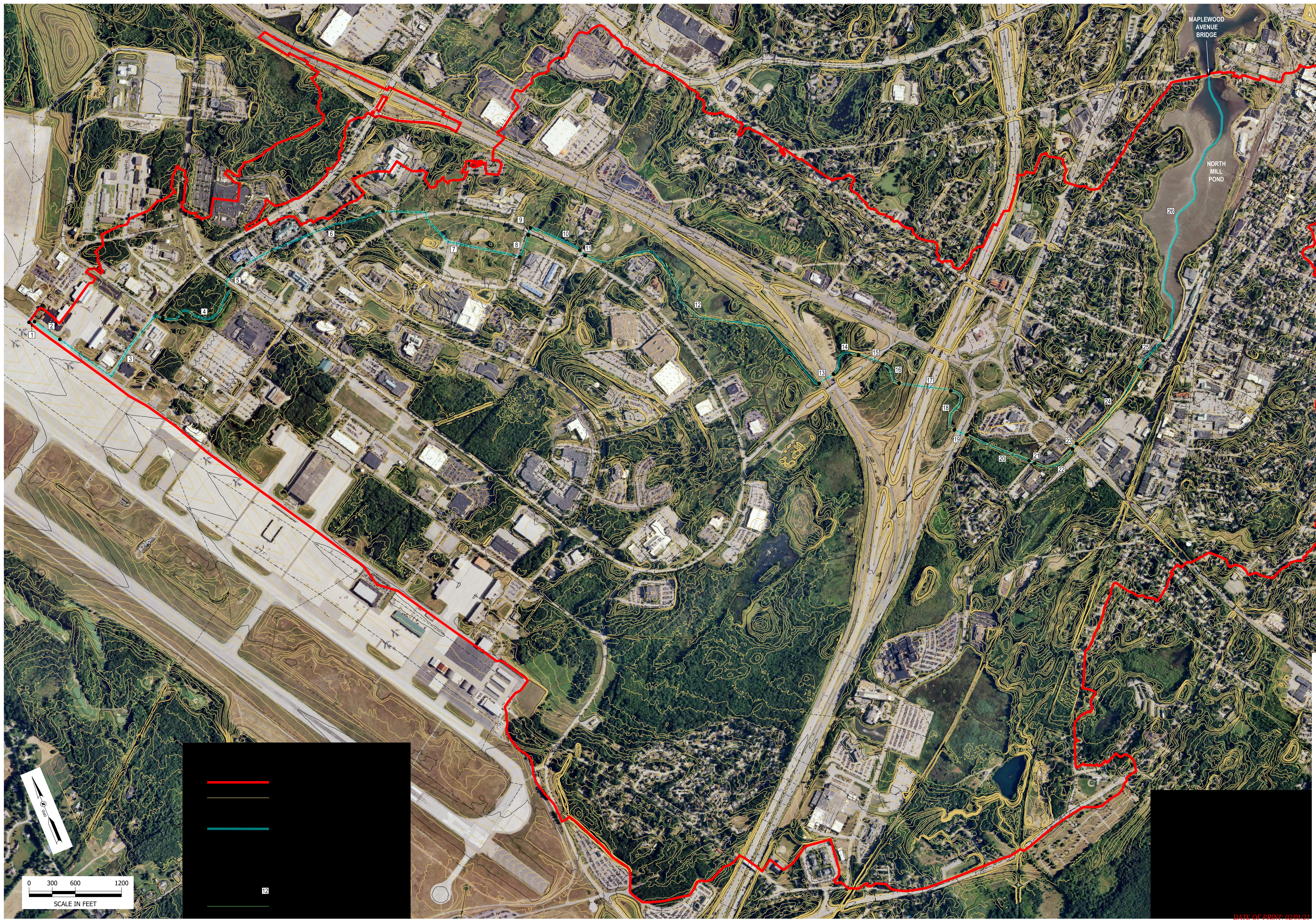
Respectfully submitted,

Sean P. Sweeney, P.E., CWS
Manager
Headwaters Consulting, LLC

Attachments:
- Watershed Relief Map
- Drainage Plan
- NRCC Precipitation Estimates
- Land Cover Table
- Soil – Land Cover Map
- Soil – Land Cover Polygons Table
- Time of Concentration Table
- HydroCAD Report

Maplewood Avenue over North Mill Pond
Watershed Relief Map





HEADWATERS Consulting, LLC

P.O. Box 744 Littleton, NH 03561 (603) 616-6850

HOYLE, TANNER & ASSOCIATES, INC.
MAPLEWOOD AVE. OVER NORTH MILL POND BRIDGE REPLACEMENT

PORTSMOUTH, NH

DRAINAGE PLAN

NO.	REVISION	DATE

DATE: FEB. 2021

PROJECT #: 1920

ENGINEERED BY: ---

DRAWN BY: SPS

SHEET 1 OF 1

Extreme Precipitation Tables

Northeast Regional Climate Center

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

Smoothing	No
State	New Hampshire
Location	
Longitude	70.792 degrees West
Latitude	43.074 degrees North
Elevation	0 feet
Date/Time	Mon, 01 Feb 2021 08:12:03 -0500

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	0.49	0.66	0.82	1.00	**1yr**	0.70	0.98	1.14	1.58	2.02	2.66	2.92	**1yr**	2.35	2.81	3.22	3.94	4.55	**1yr**
2yr	0.32	0.50	0.61	0.83	1.02	1.21	**2yr**	0.88	1.18	1.40	1.86	2.41	3.21	3.57	**2yr**	2.84	3.43	3.93	4.68	5.32	**2yr**
5yr	0.37	0.57	0.71	0.98	1.24	1.50	**5yr**	1.07	1.46	1.73	2.32	2.96	4.07	4.57	**5yr**	3.60	4.40	5.04	5.93	6.70	**5yr**
10yr	0.42	0.65	0.80	1.12	1.44	1.76	**10yr**	1.25	1.72	2.04	2.73	3.47	4.87	5.53	**10yr**	4.31	5.32	6.08	7.10	7.98	**10yr**
25yr	0.50	0.75	0.94	1.34	1.76	2.18	**25yr**	1.52	2.13	2.53	3.39	4.27	6.17	7.10	**25yr**	5.46	6.83	7.79	9.02	10.06	**25yr**
50yr	0.56	0.85	1.06	1.53	2.06	2.57	**50yr**	1.78	2.51	2.98	3.99	5.01	7.39	8.58	**50yr**	6.54	8.25	9.41	10.81	11.99	**50yr**
100yr	0.64	0.97	1.21	1.75	2.40	3.03	**100yr**	2.07	2.96	3.51	4.71	5.88	8.86	10.38	**100yr**	7.84	9.98	11.36	12.96	14.29	**100yr**
200yr	0.73	1.09	1.38	2.01	2.80	3.57	**200yr**	2.41	3.49	4.13	5.56	6.89	10.62	12.55	**200yr**	9.40	12.07	13.72	15.54	17.05	**200yr**
500yr	0.87	1.29	1.66	2.42	3.44	4.45	**500yr**	2.97	4.35	5.14	6.92	8.52	13.50	16.15	**500yr**	11.95	15.53	17.62	19.78	21.54	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.23	0.36	0.44	0.59	0.73	0.89	**1yr**	0.63	0.87	0.92	1.32	1.66	2.22	2.52	**1yr**	1.97	2.42	2.85	3.15	3.88	**1yr**
2yr	0.31	0.49	0.60	0.81	1.00	1.19	**2yr**	0.86	1.16	1.37	1.82	2.34	3.05	3.46	**2yr**	2.70	3.32	3.82	4.55	5.07	**2yr**
5yr	0.35	0.54	0.67	0.92	1.17	1.40	**5yr**	1.01	1.37	1.61	2.12	2.74	3.79	4.20	**5yr**	3.36	4.04	4.72	5.54	6.25	**5yr**
10yr	0.39	0.59	0.73	1.03	1.32	1.60	**10yr**	1.14	1.56	1.81	2.40	3.07	4.38	4.89	**10yr**	3.88	4.70	5.46	6.43	7.22	**10yr**
25yr	0.44	0.67	0.83	1.19	1.56	1.90	**25yr**	1.35	1.86	2.10	2.77	3.55	4.69	5.93	**25yr**	4.15	5.71	6.68	7.83	8.72	**25yr**
50yr	0.48	0.73	0.91	1.31	1.77	2.17	**50yr**	1.53	2.12	2.35	3.09	3.96	5.30	6.86	**50yr**	4.69	6.60	7.78	9.10	10.07	**50yr**
100yr	0.54	0.81	1.02	1.47	2.01	2.47	**100yr**	1.74	2.42	2.63	3.44	4.39	5.95	7.94	**100yr**	5.26	7.63	9.07	10.58	11.62	**100yr**
200yr	0.59	0.89	1.13	1.64	2.29	2.82	**200yr**	1.97	2.76	2.94	3.82	4.85	6.65	9.18	**200yr**	5.89	8.83	10.56	12.32	13.44	**200yr**
500yr	0.69	1.03	1.32	1.92	2.73	3.37	**500yr**	2.35	3.30	3.41	4.37	5.54	7.73	11.12	**500yr**	6.84	10.69	12.92	15.09	16.27	**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	0.44	0.54	0.72	0.89	1.08	**1yr**	0.77	1.06	1.26	1.75	2.21	3.00	3.14	**1yr**	2.65	3.02	3.58	4.38	5.05	**1yr**
2yr	0.33	0.52	0.64	0.86	1.06	1.26	**2yr**	0.92	1.24	1.48	1.96	2.51	3.43	3.69	**2yr**	3.04	3.55	4.07	4.83	5.64	**2yr**
5yr	0.40	0.61	0.76	1.05	1.33	1.61	**5yr**	1.15	1.58	1.88	2.53	3.24	4.34	4.94	**5yr**	3.84	4.75	5.37	6.35	7.13	**5yr**
10yr	0.47	0.72	0.89	1.24	1.60	1.97	**10yr**	1.38	1.92	2.27	3.10	3.93	5.34	6.17	**10yr**	4.72	5.93	6.77	7.81	8.72	**10yr**
25yr	0.57	0.87	1.08	1.54	2.03	2.55	**25yr**	1.75	2.50	2.94	4.05	5.11	7.81	8.28	**25yr**	6.92	7.96	9.05	10.28	11.36	**25yr**
50yr	0.66	1.01	1.26	1.81	2.44	3.10	**50yr**	2.10	3.03	3.58	4.97	6.25	9.79	10.37	**50yr**	8.66	9.97	11.29	12.65	13.90	**50yr**
100yr	0.78	1.18	1.48	2.13	2.93	3.77	**100yr**	2.53	3.69	4.34	6.11	7.67	12.25	12.97	**100yr**	10.85	12.48	14.08	15.59	17.01	**100yr**
200yr	0.91	1.37	1.74	2.52	3.51	4.60	**200yr**	3.03	4.50	5.30	7.52	9.40	15.38	16.26	**200yr**	13.61	15.63	17.58	19.21	20.82	**200yr**
500yr	1.13	1.68	2.16	3.14	4.46	5.96	**500yr**	3.85	5.83	6.87	9.93	12.33	20.80	21.91	**500yr**	18.41	21.07	23.59	25.31	27.22	**500yr**

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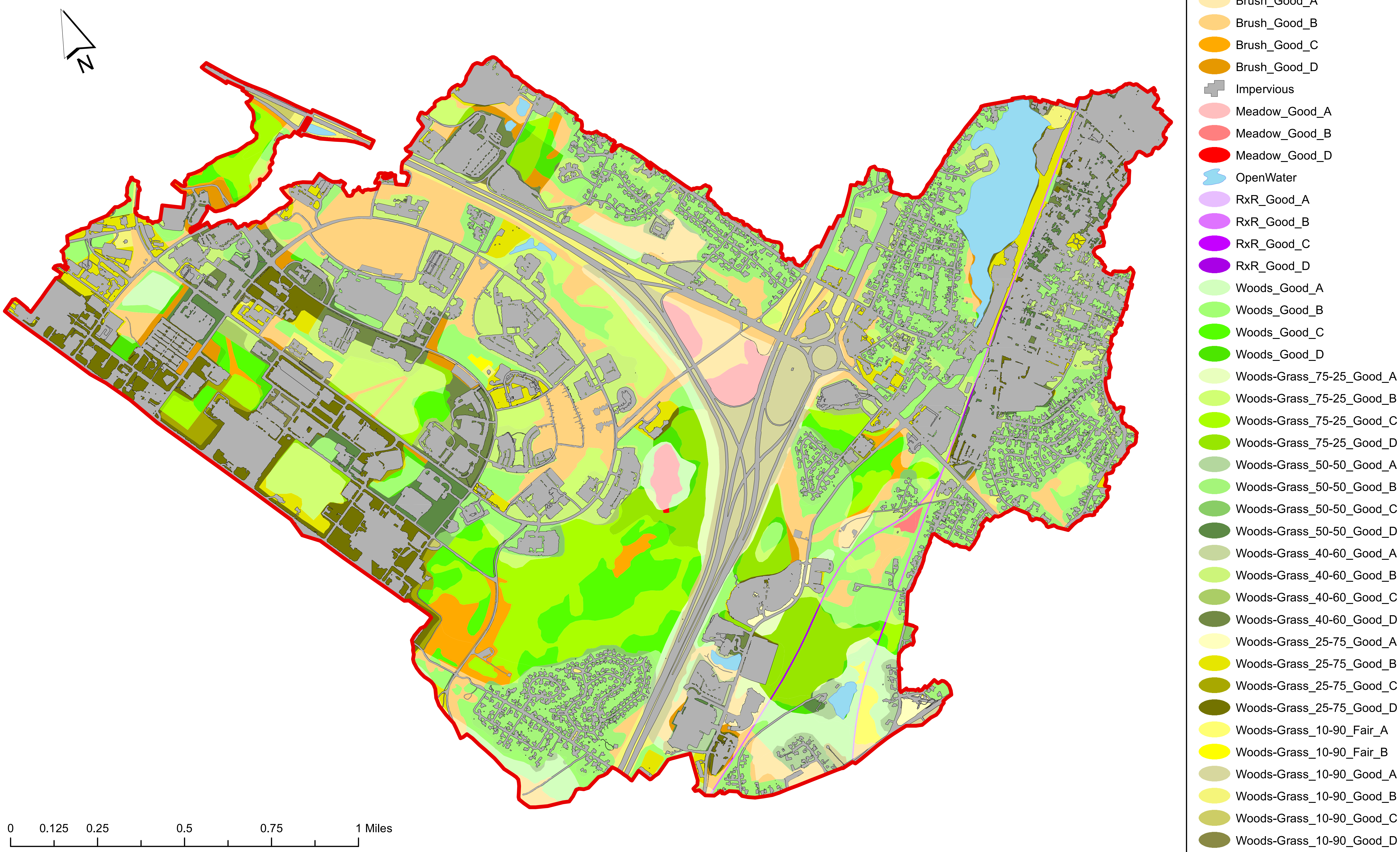
North Mill Pond Watershed Land Cover

categories from NHGRANIT "Land Use 2015 - Southeastern New Hampshire" layer

Note: Impervious areas have been removed from Land Use Category polygons such that the Cover Type applies to the land cover of the remaining polygons outside of impervious areas as estimated from 2017 orthophotography.

NHGRANIT Land Use Category	Cover Type	Condition
Brush or transitional between open & forested	Brush	Good
Electric, gas, and other utilities	Brush	Good
Limited & controlled highway right-of-way	Impervious	n/a
Park & ride lot	Impervious	n/a
Road right-of-way	Impervious	n/a
Agricultural land	Meadow	Good
Water	Open Water	n/a
Rail transportation	Railroad Tracks	n/a
Forest land	Woods	Good
Other transportation, communications, and utilities	Woods	Good
Auxilliary transportation	Woods/Grass 10/90	Good
Cemetaries	Woods/Grass 10/90	Good
Communication	Woods/Grass 10/90	Good
Disturbed land	Woods/Grass 10/90	Fair
Other commercial, services, and institutional	Woods/Grass 10/90	Good
Water and wastewater utilities	Woods/Grass 10/90	Good
Air transportation	Woods/Grass 25/75	Good
Commercial wholesale	Woods/Grass 25/75	Good
Government	Woods/Grass 25/75	Good
Institutional	Woods/Grass 25/75	Good
Lodging	Woods/Grass 25/75	Good
Multi-family (4 or more stories)	Woods/Grass 25/75	Good
Other commercial complexes	Woods/Grass 25/75	Good
Outdoor recreation	Woods/Grass 25/75	Good
Parking structure/lot	Woods/Grass 25/75	Good
Commercial retail	Woods/Grass 40/60	Good
Educational	Woods/Grass 40/60	Good
Multi-family (1-3 stories)	Woods/Grass 40/60	Good
Office park	Woods/Grass 40/60	Good
Other agricultural land	Woods/Grass 40/60	Good
Other industrial complexes	Woods/Grass 40/60	Good
Services	Woods/Grass 40/60	Good
Indoor cultural/ public assembly	Woods/Grass 50/50	Good
Industrial	Woods/Grass 50/50	Good
Other residential	Woods/Grass 50/50	Good
Single family/duplex	Woods/Grass 50/50	Good
Vacant land	Woods/Grass 50/50	Good
Wetlands	Woods/Grass 75/25	Good

North Mill Pond Watershed
Soil - Land Cover Map



North Mill Pond Watershed Soil-Land Cover Polygons

Land Cover	Hydrologic Condition	HSG	Area (AC)	CN
Brush	Good	A	58.81	30
Brush	Good	B	179.13	48
Brush	Good	C	32.85	65
Brush	Good	D	20.82	73
Impervious	n/a		930.36	98
Impervious2	n/a		5.67	98
Meadow	Good	A	23.27	30
Meadow	Good	B	1.73	58
Meadow	Good	C	0.00	71
Meadow	Good	D	0.12	78
Open Water	n/a		54.48	100
RxR	Good	A	1.28	76
RxR	Good	B	5.93	85
RxR	Good	C	0.20	89
RxR	Good	D	1.60	91
Woods	Good	A	60.28	30
Woods	Good	B	120.30	55
Woods	Good	C	80.53	70
Woods	Good	D	17.09	77
Woods-Grass 10-90	Fair	A	5.94	48
Woods-Grass 10-90	Fair	B	1.08	68
Woods-Grass 10-90	Fair	C	0.00	78
Woods-Grass 10-90	Fair	D	0.00	84
Woods-Grass 10-90	Good	A	69.10	38
Woods-Grass 10-90	Good	B	33.81	60
Woods-Grass 10-90	Good	C	2.13	74
Woods-Grass 10-90	Good	D	3.07	80
Woods-Grass 25-75	Good	A	5.89	36
Woods-Grass 25-75	Good	B	55.58	60
Woods-Grass 25-75	Good	C	10.22	73
Woods-Grass 25-75	Good	D	70.08	79
Woods-Grass 40-60	Good	A	5.06	33
Woods-Grass 40-60	Good	B	120.91	59
Woods-Grass 40-60	Good	C	7.04	72
Woods-Grass 40-60	Good	D	38.94	79
Woods-Grass 50-50	Good	A	16.68	32
Woods-Grass 50-50	Good	B	250.09	58
Woods-Grass 50-50	Good	C	7.28	72
Woods-Grass 50-50	Good	D	24.38	79
Woods-Grass 75-25	Good	A	16.01	30
Woods-Grass 75-25	Good	B	94.23	57
Woods-Grass 75-25	Good	C	120.21	71
Woods-Grass 75-25	Good	D	76.21	78
			2628.4	

	Curve Number - Good Condition			
Surface Description	A	B	C	D
Open Water	100	100	100	100
Impervious	98	98	98	98
Railroad Tracks	76	85	89	91
Grass	39	61	74	80
Meadow	30	58	71	78
Brush	30	48	65	73
Woods/Grass 10/90	38	60	74	80
Woods/Grass 25/75	36	60	73	79
Woods/Grass 40/60	33	59	72	79
Woods/Grass 50/50	32	58	72	79
Woods/Grass 60/40	31	57	72	78
Woods/Grass 75/25	30	57	71	78
Woods	30	55	70	77

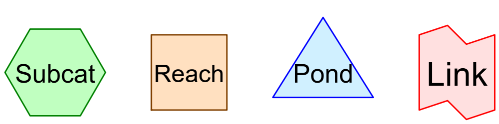
Note: CN values are for "good" hydrologic condition (>75% ground cover)

	Curve Number - Fair Condition			
Surface Description	A	B	C	D
Open Water	100	100	100	100
Impervious	98	98	98	98
Railroad Tracks	76	85	89	91
Grass	49	69	79	84
Meadow	30	58	71	78
Brush	35	56	70	77
Woods/Grass 10/90	48	68	78	84
Woods/Grass 25/75	46	67	78	83
Woods/Grass 40/60	44	65	77	82
Woods/Grass 50/50	43	65	76	82
Woods/Grass 60/40	41	64	75	81
Woods/Grass 75/25	39	62	75	80
Woods	36	60	73	79

Note: CN values are for "fair" hydrologic condition (50-75% ground cover)

North Mill Pond Watershed Time of Concentration

Flow Path Segment	Type	Start Sta	Inv In	End Sta	Inv Out	Dia	A	P	Length	Slope	Surface	Notes
1	sheet	0	97.28	73	96.31	-	-	-	73	0.01329	Pavement	
2	shallow	73	96.31	478	92.55	-	-	-	405	0.00928	Grass	
3	pipe	478	88.55	2389	81.02	15	-	-	1911	0.00394	RCP	pipe size & material estimated and inv in estimated at 4' below ground elevation at grate
4	channel	2389	81.02	3584	75.09	-	41	74	1195	0.00496	Forest	A & P measured at typical section at max depth of 1' (estimated bankfull stage)
5	pipe	3584	75.09	3991	71.71	26	-	-	407	0.00831	RCP	pipe slope estimated as average slope between inlet segment 5 and outlet segment 7
6	pipe	3991	71.71	5936	55.54	36	-	-	1945	0.00831	RCP	pipe slope estimated as average slope between inlet segment 5 and outlet segment 7
7	pipe	5936	55.54	7933	38.95	48	-	-	1997	0.00831	RCP	pipe slope estimated as average slope between inlet segment 5 and outlet segment 7
8	channel	7933	38.95	8243	37.04	-	57	123	310	0.00616	Brush	A & P measured at typical section at max depth of 0.87' (elev. Difference between thalwet & height of land in right overbank)
9	pipe	8243	37.04	8344	37.00	60	-	-	101	0.00040	RCP	pipe size & material estimated
10	channel	8344	37.00	9090	34.40	-	148	210	746	0.00349	Brush	A & P measured at typical section at max depth of 1' (estimated bankfull stage)
11	pipe	9090	34.40	9189	33.76	60	-	-	99	0.00646	RCP	pipe size & material estimated
12	channel	9189	33.76	13125	19.25	-	15	27	3936	0.00369	Brush/Forest	A & P measured at typical section at max depth of 1' (estimated bankfull stage)
13	pipe	13125	19.25	13346	18.58	72	-	-	221	0.00303	RCP	pipe size & material estimated
14	channel	13346	18.58	13858	18.14	-	17	26	512	0.00086	Brush/Forest	A & P measured at typical section at max depth of 1' (estimated bankfull stage)
15	pipe	13858	18.14	14194	17.39	72	-	-	336	0.00223	RCP	pipe size & material estimated
16	channel	14194	17.39	14550	17.04	-	18	29	356	0.00098	Brush/Forest	A & P measured at typical section at max depth of 1' (estimated bankfull stage)
17	pipe	14550	17.04	15234	16.40	96	-	-	684	0.00094	CMP	pipe size & material estimated
18	channel	15234	16.40	15909	15.47	-	17	26	675	0.00138	Brush/Forest	A & P measured at typical section at max depth of 1' (estimated bankfull stage)
19	pipe	15909	15.47	16084	15.41	96	-	-	175	0.00034	CMP	pipe size & material estimated
20	channel	16084	15.41	16960	15.35	-	21	32	876	0.00007	Brush/Forest	A & P measured at typical section at max depth of 1' (estimated bankfull stage)
21	pipe	16960	15.35	17041	15.32	96	-	-	81	0.00037	CMP	pipe size & material estimated
22	channel	17041	15.32	17622	15.31	-	13	22	581	0.00002	Forest	A & P measured at typical section at max depth of 1' (estimated bankfull stage)
23	pipe	17622	15.31	17712	13.54	96	-	-	90	0.01967	CMP	pipe size & material estimated
24	channel	17712	13.54	18977	5.58	-	16	23	1265	0.00629	Forest	A & P measured at typical section at max depth of 1' (estimated bankfull stage)
25	pipe	18977	5.58	19479	3.54	72Hx144W	-	-	502	0.00406	Concrete Box	pipe size & material from field measurements
26	channel	19479	1.05	23320	-3.40	-	32	34	3841	0.00116	Cobble/Gravel	channel inverts from field measurments, channel geometry estimated from aerial photography and are based on a channel bottom width of 30', 2:1 side slopes, and flow depth of 1'
									23320			



Routing Diagram for NorthMillPond
Prepared by Headwaters Consulting, LLC, Printed 2/1/2021

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	50-yr	NH-NorthMillPond_NRCC 24-hr S1	50-yr	Default	24.00	1	7.39	2
2	100-yr	NH-NorthMillPond_NRCC 24-hr S1	100-yr	Default	24.00	1	8.86	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1	76	Ballasted RxR Tracks, HSG A (1S)
6	85	Ballasted RxR Tracks, HSG B (1S)
0	89	Ballasted RxR Tracks, HSG C (1S)
2	91	Ballasted RxR Tracks, HSG D (1S)
59	30	Brush, Good, HSG A (1S)
179	48	Brush, Good, HSG B (1S)
33	65	Brush, Good, HSG C (1S)
21	73	Brush, Good, HSG D (1S)
936	98	Impervious (1S)
23	30	Meadow, non-grazed, HSG A (1S)
2	58	Meadow, non-grazed, HSG B (1S)
0	78	Meadow, non-grazed, HSG D (1S)
54	100	Open Water (1S)
60	30	Woods, Good, HSG A (1S)
120	55	Woods, Good, HSG B (1S)
80	70	Woods, Good, HSG C (1S)
17	77	Woods, Good, HSG D (1S)
6	48	Woods/grass 10/90, Fair, HSG A (1S)
1	68	Woods/grass 10/90, Fair, HSG B (1S)
69	38	Woods/grass 10/90, Good, HSG A (1S)
34	60	Woods/grass 10/90, Good, HSG B (1S)
2	74	Woods/grass 10/90, Good, HSG C (1S)
3	80	Woods/grass 10/90, Good, HSG D (1S)
6	36	Woods/grass 25/75, Good, HSG A (1S)
56	60	Woods/grass 25/75, Good, HSG B (1S)
10	73	Woods/grass 25/75, Good, HSG C (1S)
70	79	Woods/grass 25/75, Good, HSG D (1S)
5	33	Woods/grass 40/60, Good, HSG A (1S)
121	59	Woods/grass 40/60, Good, HSG B (1S)
7	72	Woods/grass 40/60, Good, HSG C (1S)
39	79	Woods/grass 40/60, Good, HSG D (1S)
17	32	Woods/grass 50/50, Good, HSG A (1S)
250	58	Woods/grass 50/50, Good, HSG B (1S)
7	72	Woods/grass 50/50, Good, HSG C (1S)
24	79	Woods/grass 50/50, Good, HSG D (1S)
16	30	Woods/grass 75/25, Good, HSG A (1S)
94	57	Woods/grass 75/25, Good, HSG B (1S)
120	71	Woods/grass 75/25, Good, HSG C (1S)
76	78	Woods/grass 75/25, Good, HSG D (1S)
2,628	**73**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
262	HSG A	1S
863	HSG B	1S
260	HSG C	1S
252	HSG D	1S
991	Other	1S
2,628		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1	6	0	2	0	9	Ballasted RxR Tracks	1S
59	179	33	21	0	292	Brush, Good	1S
0	0	0	0	936	936	Impervious	1S
23	2	0	0	0	25	Meadow, non-grazed	1S
0	0	0	0	54	54	Open Water	1S
60	120	80	17	0	278	Woods, Good	1S
6	1	0	0	0	7	Woods/grass 10/90, Fair	1S
69	34	2	3	0	108	Woods/grass 10/90, Good	1S
6	56	10	70	0	142	Woods/grass 25/75, Good	1S
5	121	7	39	0	172	Woods/grass 40/60, Good	1S
17	250	7	24	0	299	Woods/grass 50/50, Good	1S
16	94	120	76	0	307	Woods/grass 75/25, Good	1S
262	**863**	**260**	**252**	**991**	**2,628**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1S	0.00	0.00	1,911.0	0.0039	0.015	0.0	15.0	0.0
2	1S	0.00	0.00	407.0	0.0083	0.015	0.0	26.0	0.0
3	1S	0.00	0.00	1,945.0	0.0083	0.015	0.0	36.0	0.0
4	1S	0.00	0.00	1,997.0	0.0083	0.015	0.0	48.0	0.0
5	1S	0.00	0.00	101.0	0.0004	0.015	0.0	60.0	0.0
6	1S	0.00	0.00	99.0	0.0065	0.015	0.0	60.0	0.0
7	1S	0.00	0.00	221.0	0.0030	0.015	0.0	72.0	0.0
8	1S	0.00	0.00	336.0	0.0022	0.015	0.0	72.0	0.0
9	1S	0.00	0.00	684.0	0.0009	0.025	0.0	96.0	0.0
10	1S	0.00	0.00	175.0	0.0003	0.025	0.0	96.0	0.0
11	1S	0.00	0.00	81.0	0.0004	0.025	0.0	96.0	0.0
12	1S	0.00	0.00	90.0	0.0197	0.025	0.0	96.0	0.0
13	1S	0.00	0.00	502.0	0.0041	0.015	144.0	72.0	0.0

Summary for Subcatchment 1S: North Mill Pond Watershed

Runoff = 908 cfs @ 19.47 hrs, Volume= 936 af, Depth> 4.27"

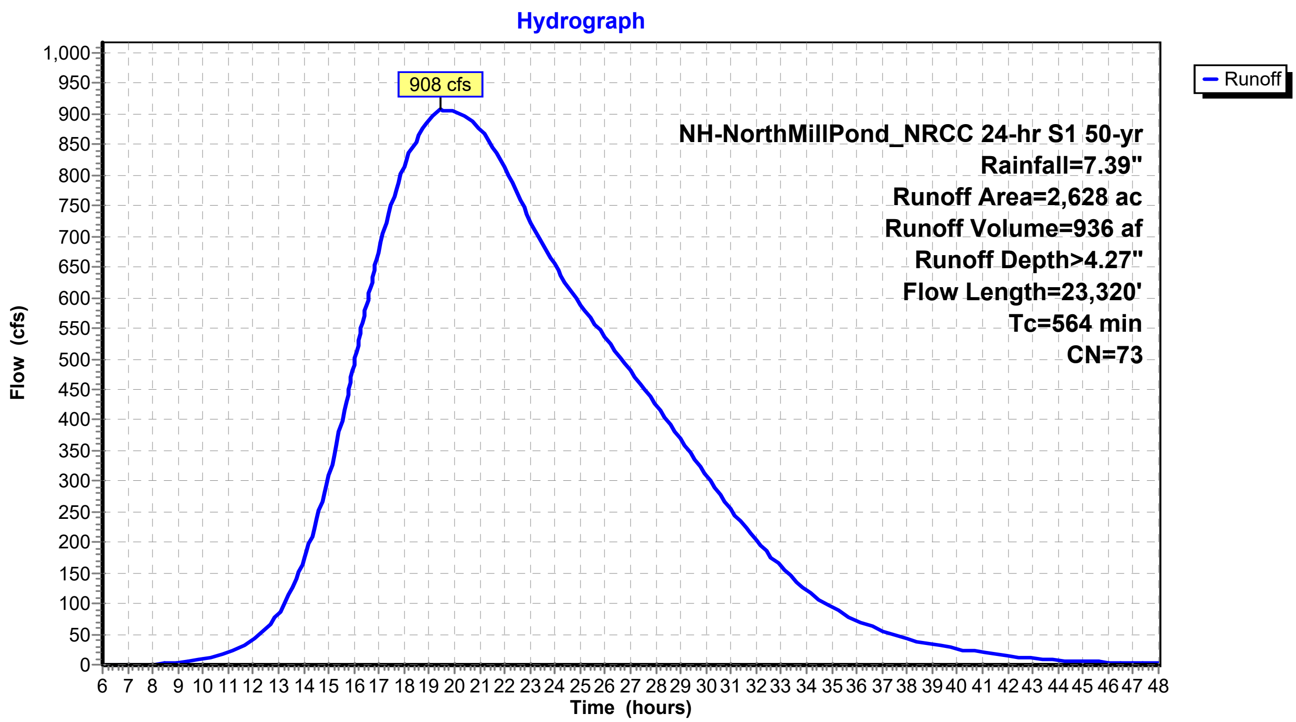
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 6.00-48.00 hrs, dt= 0.05 hrs
NH-NorthMillPond_NRCC 24-hr S1 50-yr Rainfall=7.39"

	Area (ac)	CN	Description
	59	30	Brush, Good, HSG A
	179	48	Brush, Good, HSG B
	33	65	Brush, Good, HSG C
	21	73	Brush, Good, HSG D
*	930	98	Impervious
*	6	98	Impervious
	23	30	Meadow, non-grazed, HSG A
	2	58	Meadow, non-grazed, HSG B
	0	78	Meadow, non-grazed, HSG D
*	54	100	Open Water
*	1	76	Ballasted RxR Tracks, HSG A
*	6	85	Ballasted RxR Tracks, HSG B
*	0	89	Ballasted RxR Tracks, HSG C
*	2	91	Ballasted RxR Tracks, HSG D
	60	30	Woods, Good, HSG A
	120	55	Woods, Good, HSG B
	80	70	Woods, Good, HSG C
	17	77	Woods, Good, HSG D
*	6	48	Woods/grass 10/90, Fair, HSG A
*	1	68	Woods/grass 10/90, Fair, HSG B
*	69	38	Woods/grass 10/90, Good, HSG A
*	34	60	Woods/grass 10/90, Good, HSG B
*	2	74	Woods/grass 10/90, Good, HSG C
*	3	80	Woods/grass 10/90, Good, HSG D
*	6	36	Woods/grass 25/75, Good, HSG A
*	56	60	Woods/grass 25/75, Good, HSG B
*	10	73	Woods/grass 25/75, Good, HSG C
*	70	79	Woods/grass 25/75, Good, HSG D
*	5	33	Woods/grass 40/60, Good, HSG A
*	121	59	Woods/grass 40/60, Good, HSG B
*	7	72	Woods/grass 40/60, Good, HSG C
*	39	79	Woods/grass 40/60, Good, HSG D
*	17	32	Woods/grass 50/50, Good, HSG A
*	250	58	Woods/grass 50/50, Good, HSG B
*	7	72	Woods/grass 50/50, Good, HSG C
*	24	79	Woods/grass 50/50, Good, HSG D
*	16	30	Woods/grass 75/25, Good, HSG A
*	94	57	Woods/grass 75/25, Good, HSG B
*	120	71	Woods/grass 75/25, Good, HSG C
*	76	78	Woods/grass 75/25, Good, HSG D
	2,628	73	Weighted Average
	1,638		62.31% Pervious Area
	991		37.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1	73	0.0133	1.12		**Sheet Flow, Segment 1** Smooth surfaces n= 0.011 P2= 3.33"
5	405	0.0093	1.45		**Shallow Concentrated Flow, Segment 2** Grassed Waterway Kv= 15.0 fps
11	1,911	0.0039	2.85	3.50	**Pipe Channel, Segment 3** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015 Concrete sewer w/manholes & inlets
28	1,195	0.0050	0.71	29.06	**Channel Flow, Segment 4** Area= 41.0 sf Perim= 74.0' r= 0.55' n= 0.100 Earth, dense brush, high stage
1	407	0.0083	6.00	22.11	**Pipe Channel, Segment 5** 26.0" Round Area= 3.7 sf Perim= 6.8' r= 0.54' n= 0.015 Concrete sewer w/manholes & inlets
4	1,945	0.0083	7.45	52.66	**Pipe Channel, Segment 6** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.015 Concrete sewer w/manholes & inlets
4	1,997	0.0083	9.03	113.42	**Pipe Channel, Segment 7** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.015 Concrete sewer w/manholes & inlets
7	310	0.0062	0.70	39.94	**Channel Flow, Segment 8** Area= 57.0 sf Perim= 123.0' r= 0.46' n= 0.100 Earth, dense brush, high stage
1	101	0.0004	2.30	45.14	**Pipe Channel, Segment 9** 60.0" Round Area= 19.6 sf Perim= 15.7' r= 1.25' n= 0.015 Concrete sewer w/manholes & inlets
18	746	0.0035	0.70	103.04	**Channel Flow, Segment 10** Area= 148.0 sf Perim= 210.0' r= 0.70' n= 0.100 Earth, dense brush, high stage
0	99	0.0065	9.27	181.98	**Pipe Channel, Segment 11** 60.0" Round Area= 19.6 sf Perim= 15.7' r= 1.25' n= 0.015 Concrete sewer w/manholes & inlets
107	3,936	0.0037	0.61	9.16	**Channel Flow, Segment 12** Area= 15.0 sf Perim= 27.0' r= 0.56' n= 0.100 Earth, dense brush, high stage
1	221	0.0030	7.11	201.04	**Pipe Channel, Segment 13** 72.0" Round Area= 28.3 sf Perim= 18.8' r= 1.50' n= 0.015 Concrete sewer w/manholes & inlets
25	512	0.0009	0.34	5.71	**Channel Flow, Segment 14** Area= 17.0 sf Perim= 26.0' r= 0.65' n= 0.100 Earth, dense brush, high stage
1	336	0.0022	6.09	172.16	**Pipe Channel, Segment 15** 72.0" Round Area= 28.3 sf Perim= 18.8' r= 1.50' n= 0.015 Concrete sewer w/manholes & inlets
17	356	0.0010	0.34	6.15	**Channel Flow, Segment 16** Area= 18.0 sf Perim= 29.0' r= 0.62' n= 0.100 Earth, dense brush, high stage
4	684	0.0009	2.83	142.28	**Pipe Channel, Segment 17** 96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00' n= 0.025 Corrugated metal
27	675	0.0014	0.42	7.12	**Channel Flow, Segment 18** Area= 17.0 sf Perim= 26.0' r= 0.65'

					n= 0.100 Earth, dense brush, high stage
2	175	0.0003	1.63	82.15	**Pipe Channel, Segment 19** 96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00' n= 0.025 Corrugated metal
130	876	0.0001	0.11	2.36	**Channel Flow, Segment 20** Area= 21.0 sf Perim= 32.0' r= 0.66' n= 0.100
1	81	0.0004	1.89	94.86	**Pipe Channel, Segment 21** 96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00' n= 0.025 Corrugated metal
93	581	0.0001	0.10	1.36	**Channel Flow, Segment 22** Area= 13.0 sf Perim= 22.0' r= 0.59' n= 0.100 Earth, dense brush, high stage
0	90	0.0197	13.24	665.68	**Pipe Channel, Segment 23** 96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00' n= 0.025 Corrugated metal
23	1,265	0.0063	0.93	14.82	**Channel Flow, Segment 24** Area= 16.0 sf Perim= 23.0' r= 0.70' n= 0.100
1	502	0.0041	10.07	725.00	**Pipe Channel, Segment 25** 144.0" x 72.0" Box Area= 72.0 sf Perim= 36.0' r= 2.00' n= 0.015 Concrete sewer w/manholes & inlets
52	3,841	0.0012	1.24	39.55	**Channel Flow, Segment 26** Area= 32.0 sf Perim= 34.0' r= 0.94' n= 0.040 Earth, cobble bottom, clean sides
564	23,320	Total			

Subcatchment 1S: North Mill Pond Watershed



Summary for Subcatchment 1S: North Mill Pond Watershed

Runoff = 1,179 cfs @ 19.46 hrs, Volume= 1,221 af, Depth> 5.58"

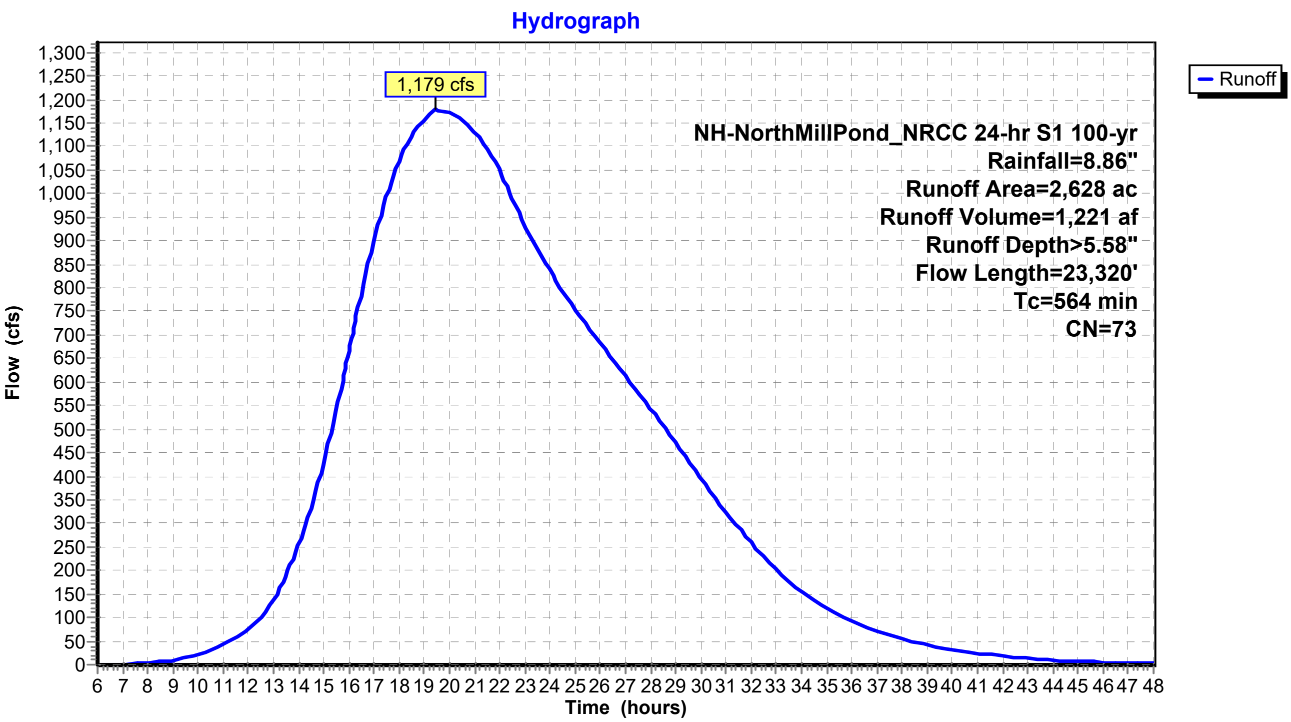
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 6.00-48.00 hrs, dt= 0.05 hrs
NH-NorthMillPond_NRCC 24-hr S1 100-yr Rainfall=8.86"

	Area (ac)	CN	Description
	59	30	Brush, Good, HSG A
	179	48	Brush, Good, HSG B
	33	65	Brush, Good, HSG C
	21	73	Brush, Good, HSG D
*	930	98	Impervious
*	6	98	Impervious
	23	30	Meadow, non-grazed, HSG A
	2	58	Meadow, non-grazed, HSG B
	0	78	Meadow, non-grazed, HSG D
*	54	100	Open Water
*	1	76	Ballasted RxR Tracks, HSG A
*	6	85	Ballasted RxR Tracks, HSG B
*	0	89	Ballasted RxR Tracks, HSG C
*	2	91	Ballasted RxR Tracks, HSG D
	60	30	Woods, Good, HSG A
	120	55	Woods, Good, HSG B
	80	70	Woods, Good, HSG C
	17	77	Woods, Good, HSG D
*	6	48	Woods/grass 10/90, Fair, HSG A
*	1	68	Woods/grass 10/90, Fair, HSG B
*	69	38	Woods/grass 10/90, Good, HSG A
*	34	60	Woods/grass 10/90, Good, HSG B
*	2	74	Woods/grass 10/90, Good, HSG C
*	3	80	Woods/grass 10/90, Good, HSG D
*	6	36	Woods/grass 25/75, Good, HSG A
*	56	60	Woods/grass 25/75, Good, HSG B
*	10	73	Woods/grass 25/75, Good, HSG C
*	70	79	Woods/grass 25/75, Good, HSG D
*	5	33	Woods/grass 40/60, Good, HSG A
*	121	59	Woods/grass 40/60, Good, HSG B
*	7	72	Woods/grass 40/60, Good, HSG C
*	39	79	Woods/grass 40/60, Good, HSG D
*	17	32	Woods/grass 50/50, Good, HSG A
*	250	58	Woods/grass 50/50, Good, HSG B
*	7	72	Woods/grass 50/50, Good, HSG C
*	24	79	Woods/grass 50/50, Good, HSG D
*	16	30	Woods/grass 75/25, Good, HSG A
*	94	57	Woods/grass 75/25, Good, HSG B
*	120	71	Woods/grass 75/25, Good, HSG C
*	76	78	Woods/grass 75/25, Good, HSG D
	2,628	73	Weighted Average
	1,638		62.31% Pervious Area
	991		37.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1	73	0.0133	1.12		**Sheet Flow, Segment 1** Smooth surfaces n= 0.011 P2= 3.33"
5	405	0.0093	1.45		**Shallow Concentrated Flow, Segment 2** Grassed Waterway Kv= 15.0 fps
11	1,911	0.0039	2.85	3.50	**Pipe Channel, Segment 3** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015 Concrete sewer w/manholes & inlets
28	1,195	0.0050	0.71	29.06	**Channel Flow, Segment 4** Area= 41.0 sf Perim= 74.0' r= 0.55' n= 0.100 Earth, dense brush, high stage
1	407	0.0083	6.00	22.11	**Pipe Channel, Segment 5** 26.0" Round Area= 3.7 sf Perim= 6.8' r= 0.54' n= 0.015 Concrete sewer w/manholes & inlets
4	1,945	0.0083	7.45	52.66	**Pipe Channel, Segment 6** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.015 Concrete sewer w/manholes & inlets
4	1,997	0.0083	9.03	113.42	**Pipe Channel, Segment 7** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.015 Concrete sewer w/manholes & inlets
7	310	0.0062	0.70	39.94	**Channel Flow, Segment 8** Area= 57.0 sf Perim= 123.0' r= 0.46' n= 0.100 Earth, dense brush, high stage
1	101	0.0004	2.30	45.14	**Pipe Channel, Segment 9** 60.0" Round Area= 19.6 sf Perim= 15.7' r= 1.25' n= 0.015 Concrete sewer w/manholes & inlets
18	746	0.0035	0.70	103.04	**Channel Flow, Segment 10** Area= 148.0 sf Perim= 210.0' r= 0.70' n= 0.100 Earth, dense brush, high stage
0	99	0.0065	9.27	181.98	**Pipe Channel, Segment 11** 60.0" Round Area= 19.6 sf Perim= 15.7' r= 1.25' n= 0.015 Concrete sewer w/manholes & inlets
107	3,936	0.0037	0.61	9.16	**Channel Flow, Segment 12** Area= 15.0 sf Perim= 27.0' r= 0.56' n= 0.100 Earth, dense brush, high stage
1	221	0.0030	7.11	201.04	**Pipe Channel, Segment 13** 72.0" Round Area= 28.3 sf Perim= 18.8' r= 1.50' n= 0.015 Concrete sewer w/manholes & inlets
25	512	0.0009	0.34	5.71	**Channel Flow, Segment 14** Area= 17.0 sf Perim= 26.0' r= 0.65' n= 0.100 Earth, dense brush, high stage
1	336	0.0022	6.09	172.16	**Pipe Channel, Segment 15** 72.0" Round Area= 28.3 sf Perim= 18.8' r= 1.50' n= 0.015 Concrete sewer w/manholes & inlets
17	356	0.0010	0.34	6.15	**Channel Flow, Segment 16** Area= 18.0 sf Perim= 29.0' r= 0.62' n= 0.100 Earth, dense brush, high stage
4	684	0.0009	2.83	142.28	**Pipe Channel, Segment 17** 96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00' n= 0.025 Corrugated metal
27	675	0.0014	0.42	7.12	**Channel Flow, Segment 18** Area= 17.0 sf Perim= 26.0' r= 0.65'

					n= 0.100 Earth, dense brush, high stage
2	175	0.0003	1.63	82.15	**Pipe Channel, Segment 19** 96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00' n= 0.025 Corrugated metal
130	876	0.0001	0.11	2.36	**Channel Flow, Segment 20** Area= 21.0 sf Perim= 32.0' r= 0.66' n= 0.100
1	81	0.0004	1.89	94.86	**Pipe Channel, Segment 21** 96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00' n= 0.025 Corrugated metal
93	581	0.0001	0.10	1.36	**Channel Flow, Segment 22** Area= 13.0 sf Perim= 22.0' r= 0.59' n= 0.100 Earth, dense brush, high stage
0	90	0.0197	13.24	665.68	**Pipe Channel, Segment 23** 96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00' n= 0.025 Corrugated metal
23	1,265	0.0063	0.93	14.82	**Channel Flow, Segment 24** Area= 16.0 sf Perim= 23.0' r= 0.70' n= 0.100
1	502	0.0041	10.07	725.00	**Pipe Channel, Segment 25** 144.0" x 72.0" Box Area= 72.0 sf Perim= 36.0' r= 2.00' n= 0.015 Concrete sewer w/manholes & inlets
52	3,841	0.0012	1.24	39.55	**Channel Flow, Segment 26** Area= 32.0 sf Perim= 34.0' r= 0.94' n= 0.040 Earth, cobble bottom, clean sides
564	23,320	Total			

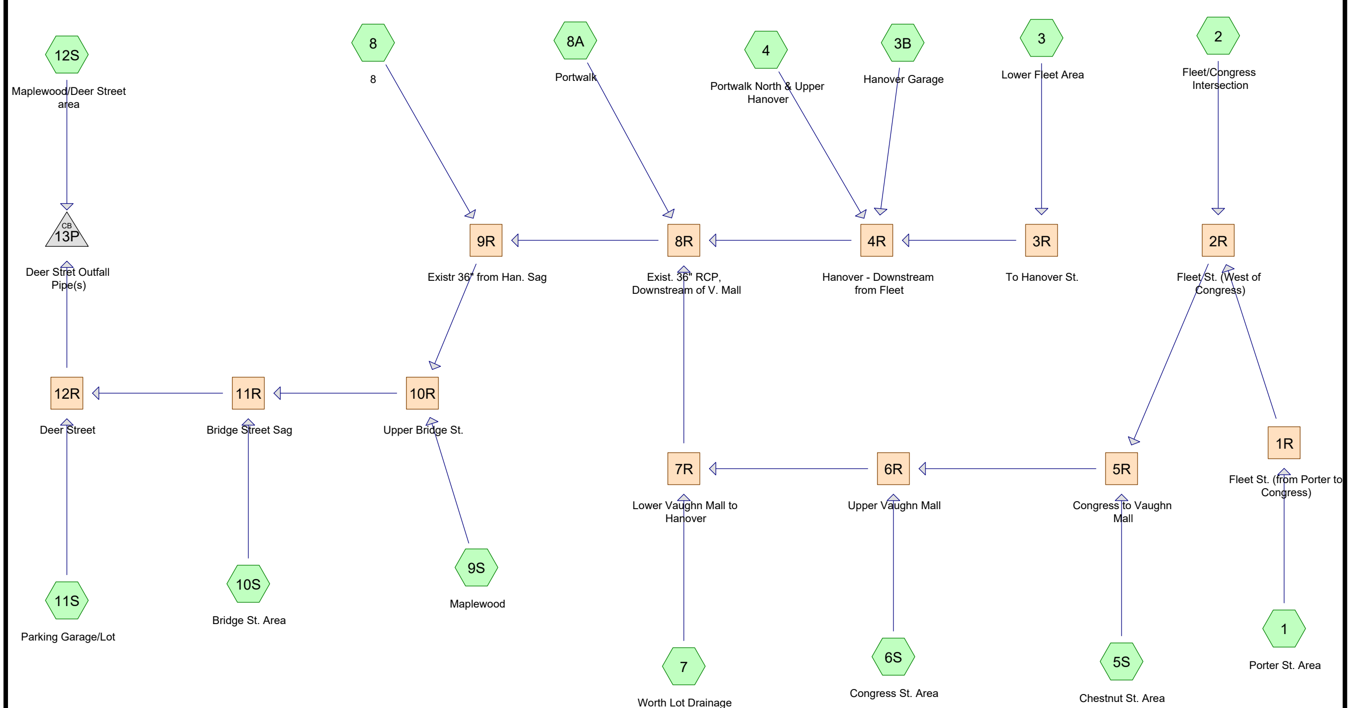
Subcatchment 1S: North Mill Pond Watershed

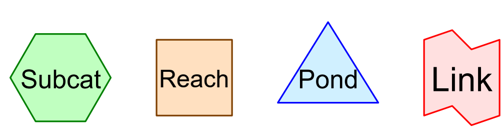


APPENDIX 3

DRAINAGE OUTFALL PROJECT

PRE-PROJECT HYDROLOGY CALCULATIONS





Routing Diagram for EXISTING FLOW PATTERN
Prepared by HP Inc., Printed 4/6/2023
HydroCAD® 10.00-26 s/n 10718 © 2020 HydroCAD Software Solutions LLC

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Porter St. Area Runoff Area=2.500 ac Runoff Depth>4.06"
Tc=6.0 min CN=94 Runoff=11.47 cfs 0.847 af

Subcatchment2: Fleet/Congress Intersection Runoff Area=1.100 ac Runoff Depth>4.25"
Tc=6.0 min CN=96 Runoff=5.17 cfs 0.390 af

Subcatchment3: Lower Fleet Area Runoff Area=1.300 ac Runoff Depth>4.25"
Tc=6.0 min CN=96 Runoff=6.11 cfs 0.461 af

Subcatchment3B: Hanover Garage Runoff Area=2.700 ac Runoff Depth>4.25"
Tc=6.0 min CN=96 Runoff=12.69 cfs 0.957 af

Subcatchment4: Portwalk North & Upper Hanover Runoff Area=4.100 ac Runoff Depth>3.86"
Tc=8.0 min CN=92 Runoff=17.23 cfs 1.320 af

Subcatchment5S: Chestnut St. Area Runoff Area=2.100 ac Runoff Depth>4.06"
Tc=6.0 min CN=94 Runoff=9.63 cfs 0.711 af

Subcatchment6S: Congress St. Area Runoff Area=1.100 ac Runoff Depth>4.06"
Tc=6.0 min CN=94 Runoff=5.05 cfs 0.373 af

Subcatchment7: Worth Lot Drainage Runoff Area=1.400 ac Runoff Depth>4.06"
Tc=6.0 min CN=94 Runoff=6.42 cfs 0.474 af

Subcatchment8: 8 Runoff Area=1.800 ac Runoff Depth>4.25"
Tc=6.0 min CN=96 Runoff=8.46 cfs 0.638 af

Subcatchment8A: Portwalk Runoff Area=1.200 ac Runoff Depth>3.86"
Tc=6.0 min CN=92 Runoff=5.34 cfs 0.386 af

Subcatchment9S: Maplewood Runoff Area=6.700 ac Runoff Depth>3.46"
Tc=9.0 min CN=88 Runoff=25.08 cfs 1.931 af

Subcatchment10S: Bridge St. Area Runoff Area=4.500 ac Runoff Depth>3.86"
Tc=6.0 min CN=92 Runoff=20.01 cfs 1.449 af

Subcatchment11S: Parking Garage/Lot Runoff Area=2.000 ac Runoff Depth>4.06"
Tc=6.0 min CN=94 Runoff=9.17 cfs 0.677 af

Subcatchment12S: Maplewood/Deer Street area Runoff Area=4.500 ac Runoff Depth>3.07"
Tc=10.0 min CN=84 Runoff=14.80 cfs 1.150 af

Reach 1R: Fleet St. (from Porter to Avg. Flow Depth=1.16' Max Vel=7.86 fps Inflow=11.47 cfs 0.847 af
18.0" Round Pipe n=0.010 L=180.0' S=0.0080 '/' Capacity=12.21 cfs Outflow=11.30 cfs 0.846 af

Reach 2R: Fleet St. (West of Congress) Avg. Flow Depth=1.67' Max Vel=5.84 fps Inflow=16.44 cfs 1.236 af
24.0" Round Pipe n=0.010 L=200.0' S=0.0030 '/' Capacity=16.11 cfs Outflow=15.95 cfs 1.235 af

Reach 3R: To Hanover St. Avg. Flow Depth=1.06' Max Vel=5.51 fps Inflow=6.11 cfs 0.461 af
15.0" Round Pipe n=0.010 L=80.0' S=0.0050 '/' Capacity=5.94 cfs Outflow=6.05 cfs 0.461 af

Reach 4R: Hanover - Downstream from Avg. Flow Depth=1.96' Max Vel=8.62 fps Inflow=35.74 cfs 2.738 af
30.0" Round Pipe n=0.012 L=180.0' S=0.0070 '/' Capacity=37.18 cfs Outflow=35.13 cfs 2.736 af

Reach 5R: Congress to Vaughn Mall Avg. Flow Depth=1.50' Max Vel=10.08 fps Inflow=25.40 cfs 1.946 af
24.0" Round Pipe n=0.012 L=100.0' S=0.0130 '/' Capacity=27.94 cfs Outflow=25.21 cfs 1.946 af

Reach 6R: Upper Vaughn Mall Avg. Flow Depth=1.60' Max Vel=11.19 fps Inflow=30.18 cfs 2.318 af
24.0" Round Pipe n=0.010 L=200.0' S=0.0110 '/' Capacity=30.84 cfs Outflow=29.74 cfs 2.318 af

Reach 7R: Lower Vaughn Mall to Avg. Flow Depth=1.70' Max Vel=12.61 fps Inflow=35.99 cfs 2.792 af
24.0" Round Pipe n=0.010 L=150.0' S=0.0140 '/' Capacity=34.80 cfs Outflow=35.62 cfs 2.791 af

Reach 8R: Exist. 36" RCP, Avg. Flow Depth=2.45' Max Vel=12.22 fps Inflow=75.93 cfs 5.914 af
36.0" Round Pipe n=0.012 L=200.0' S=0.0110 '/' Capacity=75.78 cfs Outflow=74.85 cfs 5.912 af

Reach 9R: Existr 36" from Han. Sag Avg. Flow Depth=2.57' Max Vel=12.76 fps Inflow=82.94 cfs 6.550 af
36.0" Round Pipe n=0.012 L=260.0' S=0.0120 '/' Capacity=79.15 cfs Outflow=81.35 cfs 6.548 af

Reach 10R: Upper Bridge St. Avg. Flow Depth=3.32' Max Vel=9.50 fps Inflow=106.28 cfs 8.478 af
48.0" Round Pipe n=0.012 L=170.0' S=0.0045 '/' Capacity=104.73 cfs Outflow=105.46 cfs 8.475 af

Reach 11R: Bridge Street Sag Avg. Flow Depth=3.34' Max Vel=10.93 fps Inflow=122.72 cfs 9.925 af
48.0" Round Pipe n=0.012 L=160.0' S=0.0060 '/' Capacity=120.54 cfs Outflow=122.01 cfs 9.922 af

Reach 12R: Deer Street Avg. Flow Depth=3.26' Max Vel=11.81 fps Inflow=129.83 cfs 10.599 af
48.0" Round Pipe n=0.012 L=160.0' S=0.0070 '/' Capacity=130.20 cfs Outflow=129.15 cfs 10.596 af

Pond 13P: Deer Stret Outfall Pipe(s) Peak Elev=6.00' Inflow=143.94 cfs 11.746 af
48.0" Round Culvert x 2.00 n=0.012 L=575.0' S=0.0020 '/' Outflow=143.94 cfs 11.746 af

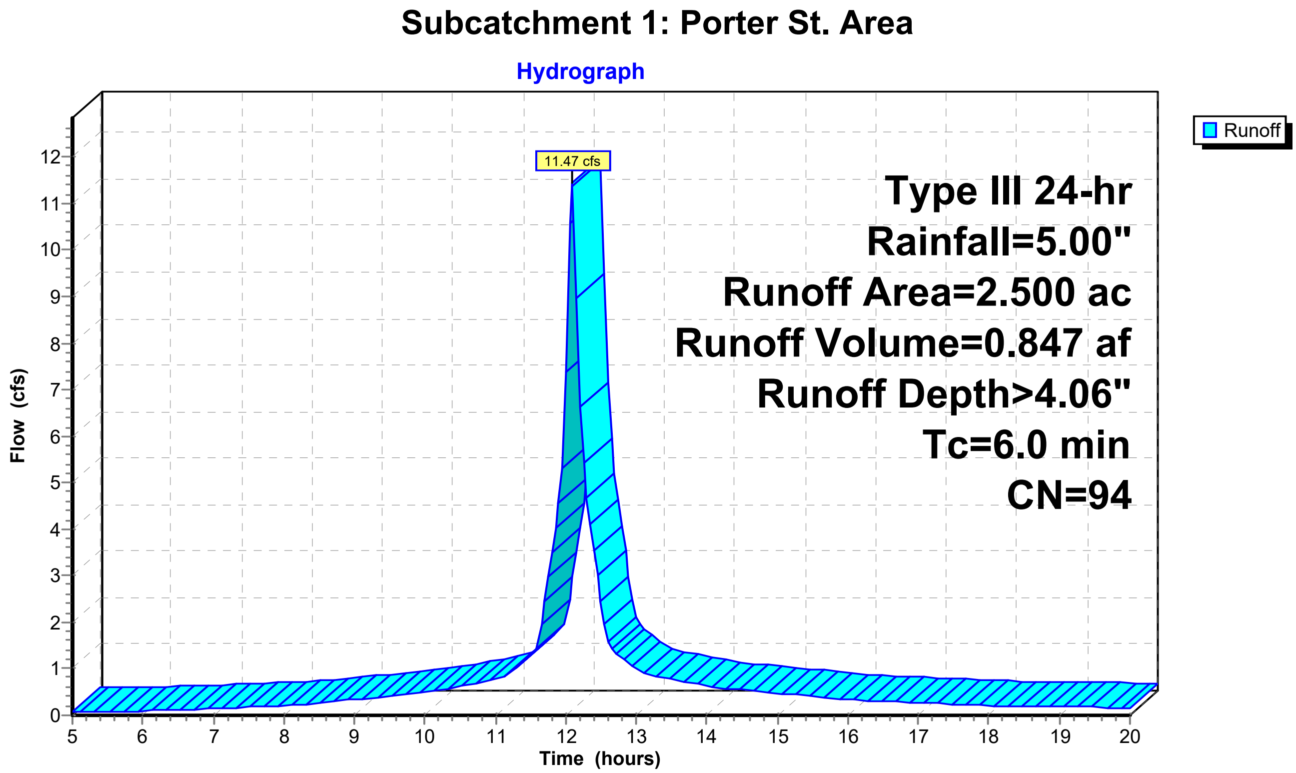
Summary for Subcatchment 1: Porter St. Area

Runoff = 11.47 cfs @ 12.09 hrs, Volume= 0.847 af, Depth> 4.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.00"

	Area (ac)	CN	Description
*	2.500	94	Upper Fleet St

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



Summary for Subcatchment 2: Fleet/Congress Intersection

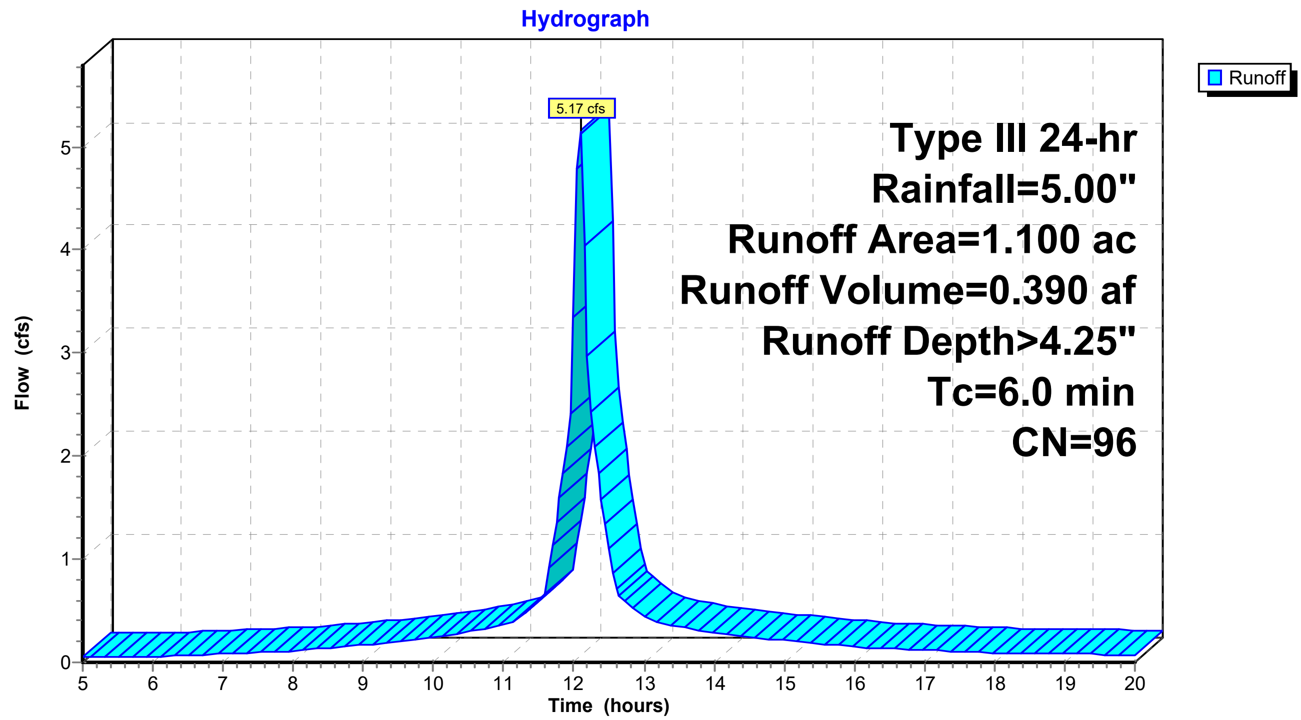
Runoff = 5.17 cfs @ 12.09 hrs, Volume= 0.390 af, Depth> 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.00"

	Area (ac)	CN	Description
*	1.100	96	

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

Subcatchment 2: Fleet/Congress Intersection



Summary for Subcatchment 3: Lower Fleet Area

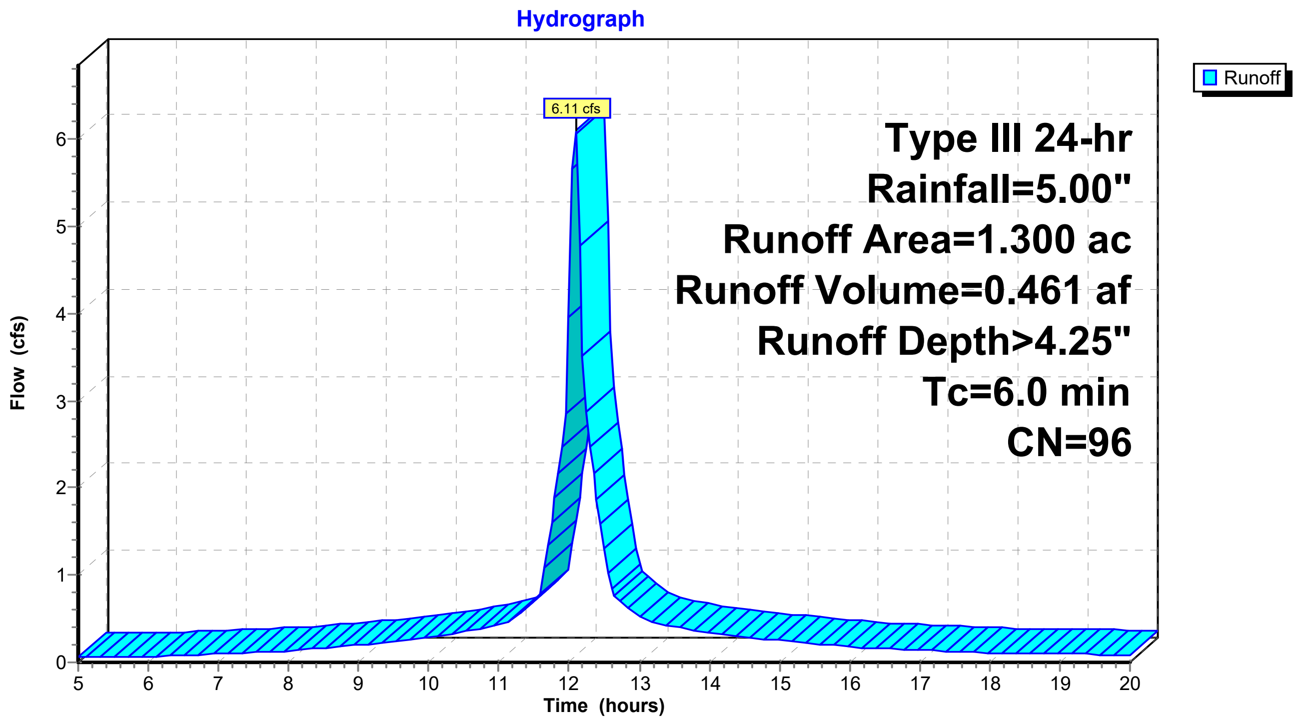
Runoff = 6.11 cfs @ 12.09 hrs, Volume= 0.461 af, Depth> 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.00"

	Area (ac)	CN	Description
*	1.300	96	

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

Subcatchment 3: Lower Fleet Area



Summary for Subcatchment 3B: Hanover Garage

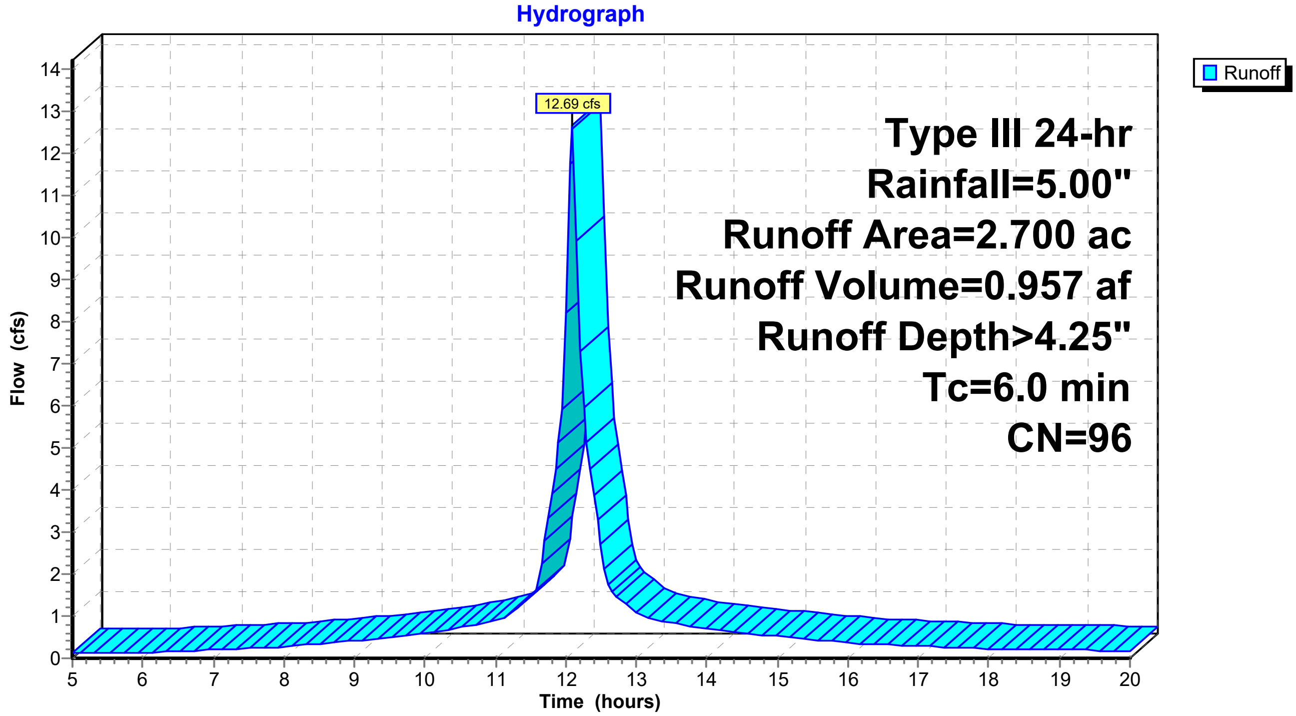
Runoff = 12.69 cfs @ 12.09 hrs, Volume= 0.957 af, Depth> 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.00"

	Area (ac)	CN	Description
*	2.700	96	

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

Subcatchment 3B: Hanover Garage



Summary for Subcatchment 4: Portwalk North & Upper Hanover

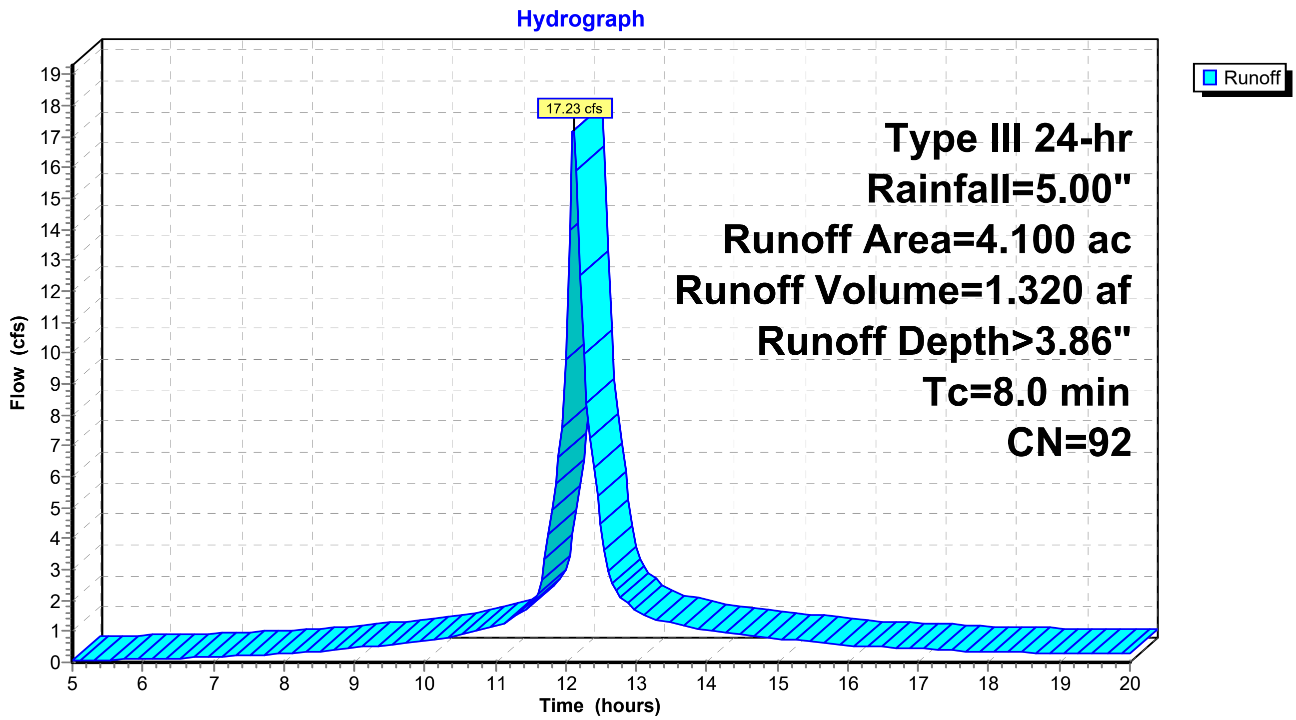
Runoff = 17.23 cfs @ 12.11 hrs, Volume= 1.320 af, Depth> 3.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.00"

	Area (ac)	CN	Description
*	4.100	92	

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

Subcatchment 4: Portwalk North & Upper Hanover



Summary for Subcatchment 5S: Chestnut St. Area

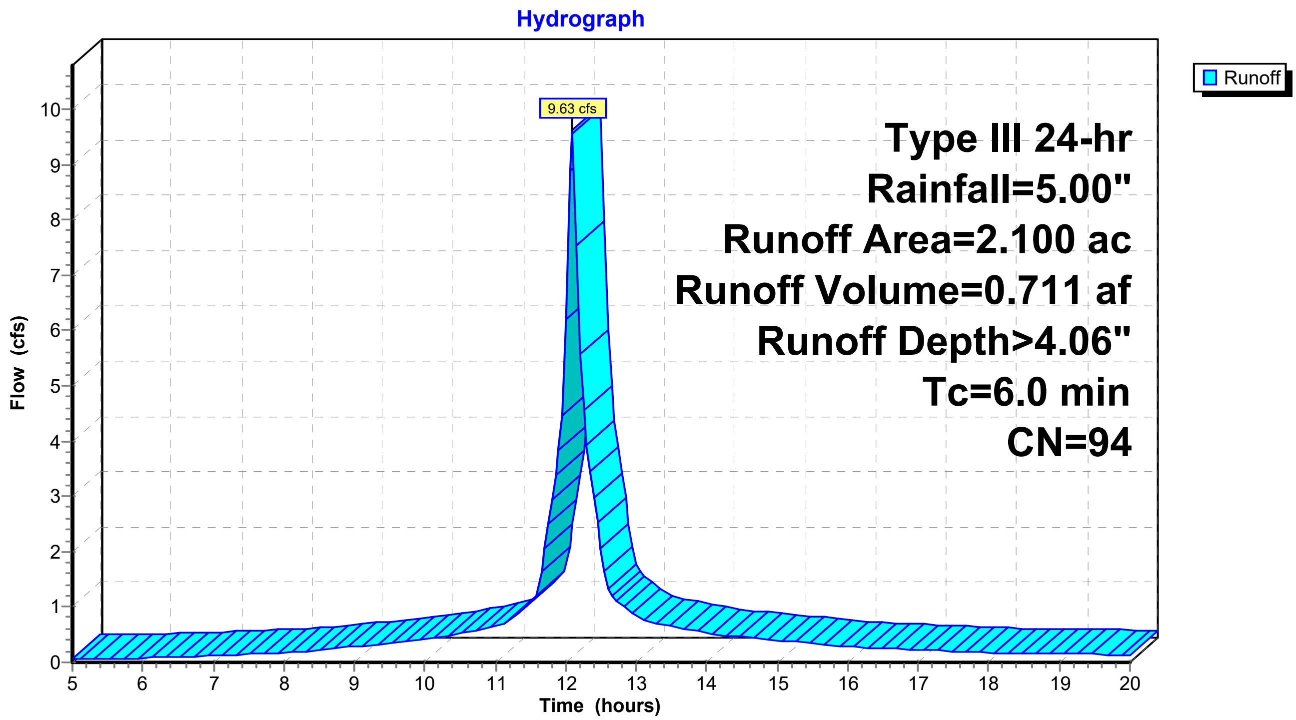
Runoff = 9.63 cfs @ 12.09 hrs, Volume= 0.711 af, Depth> 4.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.00"

	Area (ac)	CN	Description
*	2.100	94	

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

Subcatchment 5S: Chestnut St. Area



Summary for Subcatchment 6S: Congress St. Area

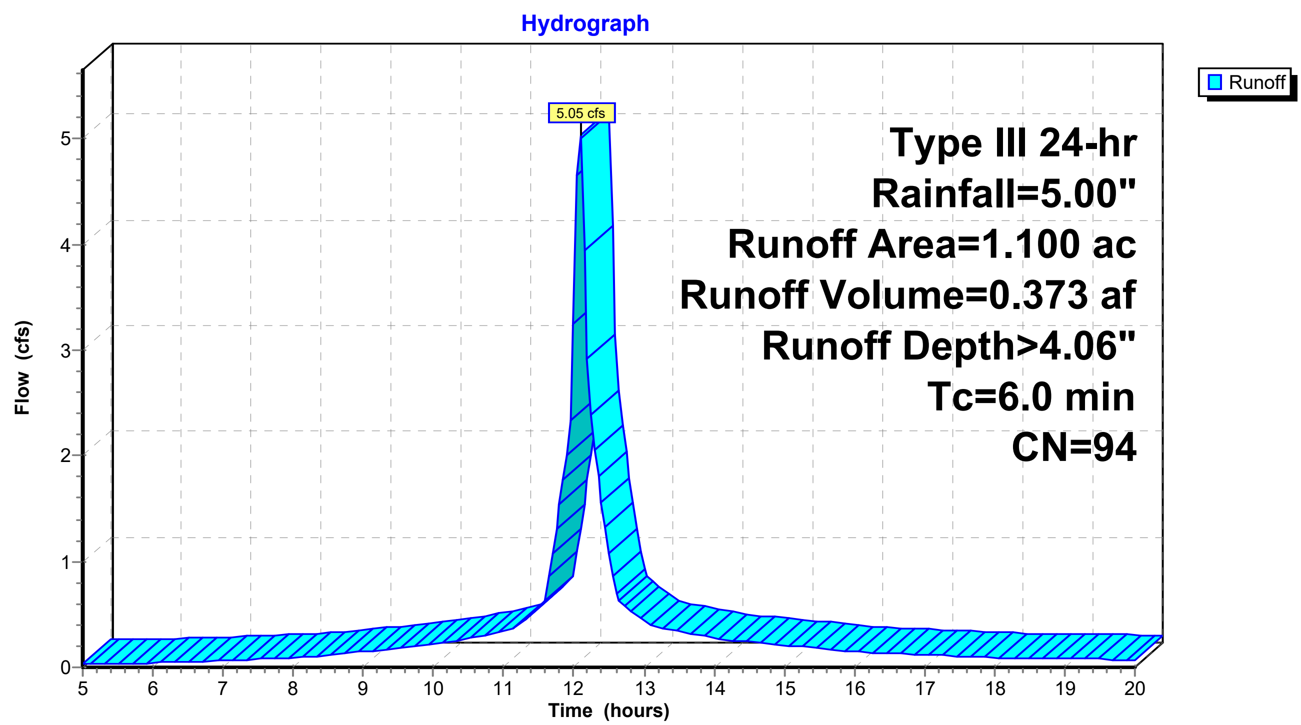
Runoff = 5.05 cfs @ 12.09 hrs, Volume= 0.373 af, Depth> 4.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.00"

	Area (ac)	CN	Description
*	1.100	94	

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

Subcatchment 6S: Congress St. Area



Summary for Subcatchment 7: Worth Lot Drainage

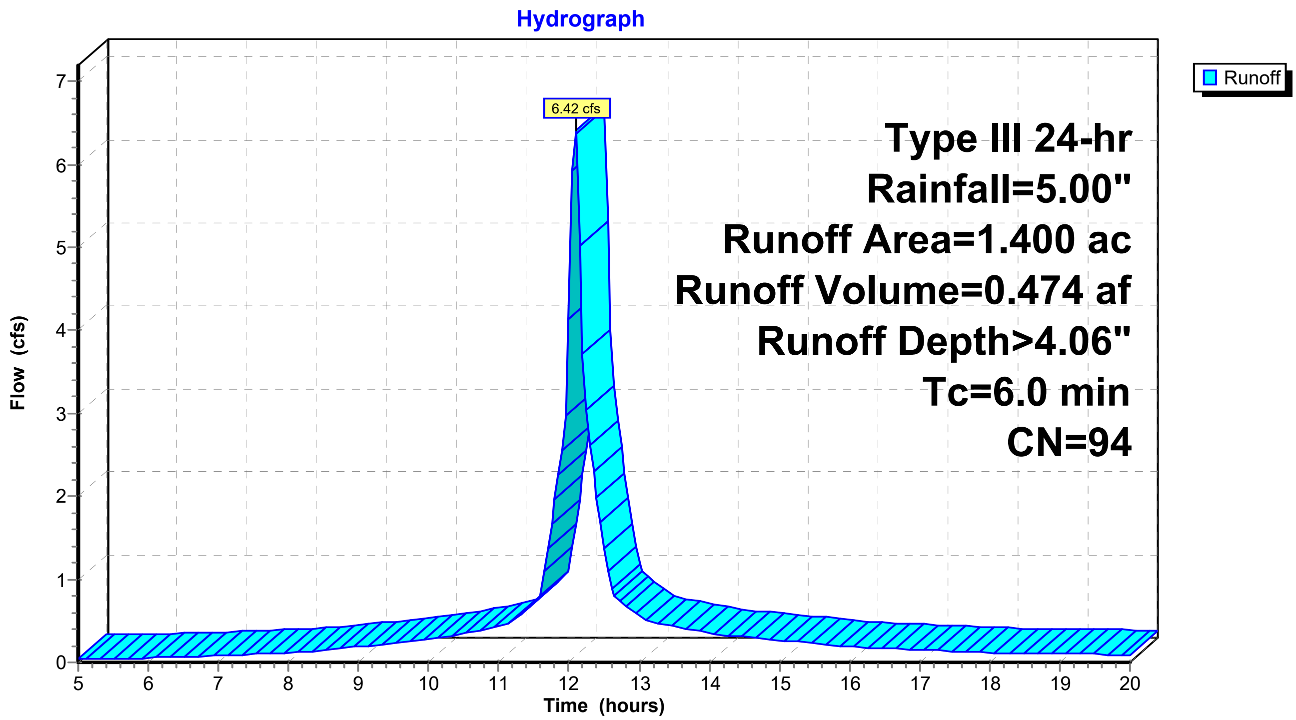
Runoff = 6.42 cfs @ 12.09 hrs, Volume= 0.474 af, Depth> 4.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.00"

	Area (ac)	CN	Description
*	1.400	94	

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

Subcatchment 7: Worth Lot Drainage



Summary for Subcatchment 8: 8

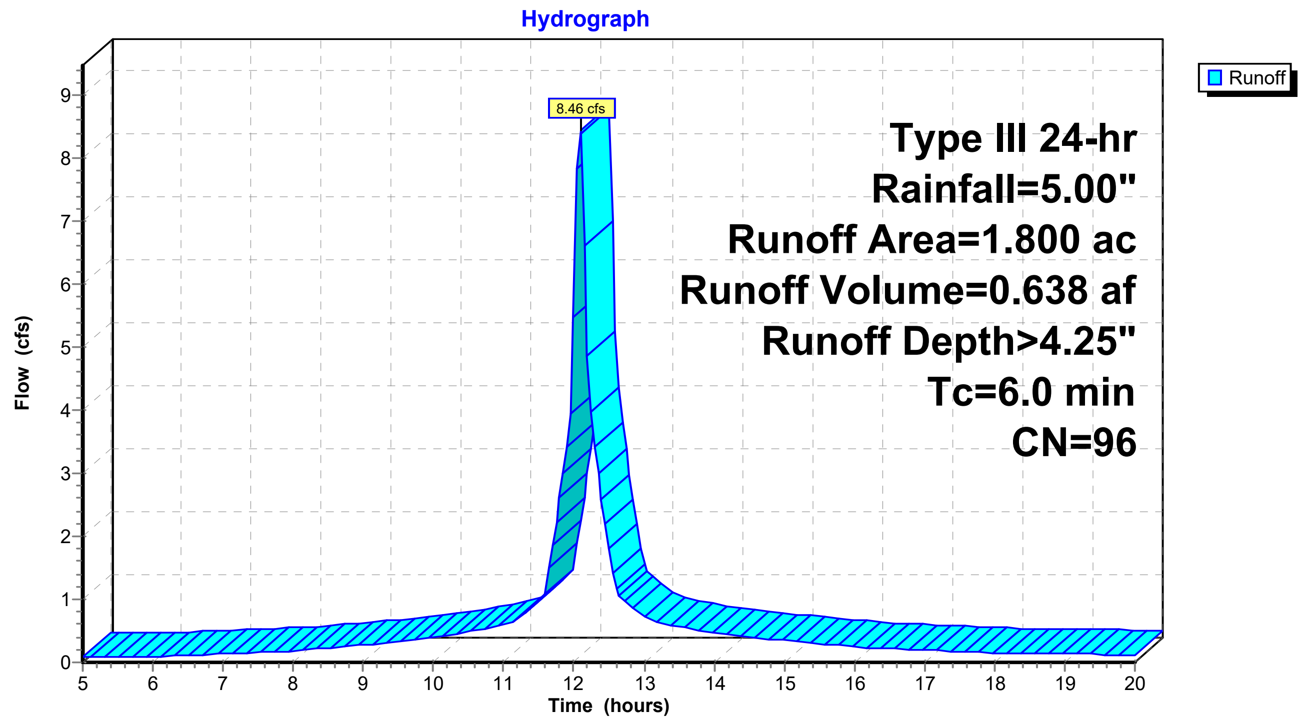
Runoff = 8.46 cfs @ 12.09 hrs, Volume= 0.638 af, Depth> 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.00"

	Area (ac)	CN	Description
*	1.800	96	

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

Subcatchment 8: 8



Summary for Subcatchment 8A: Portwalk

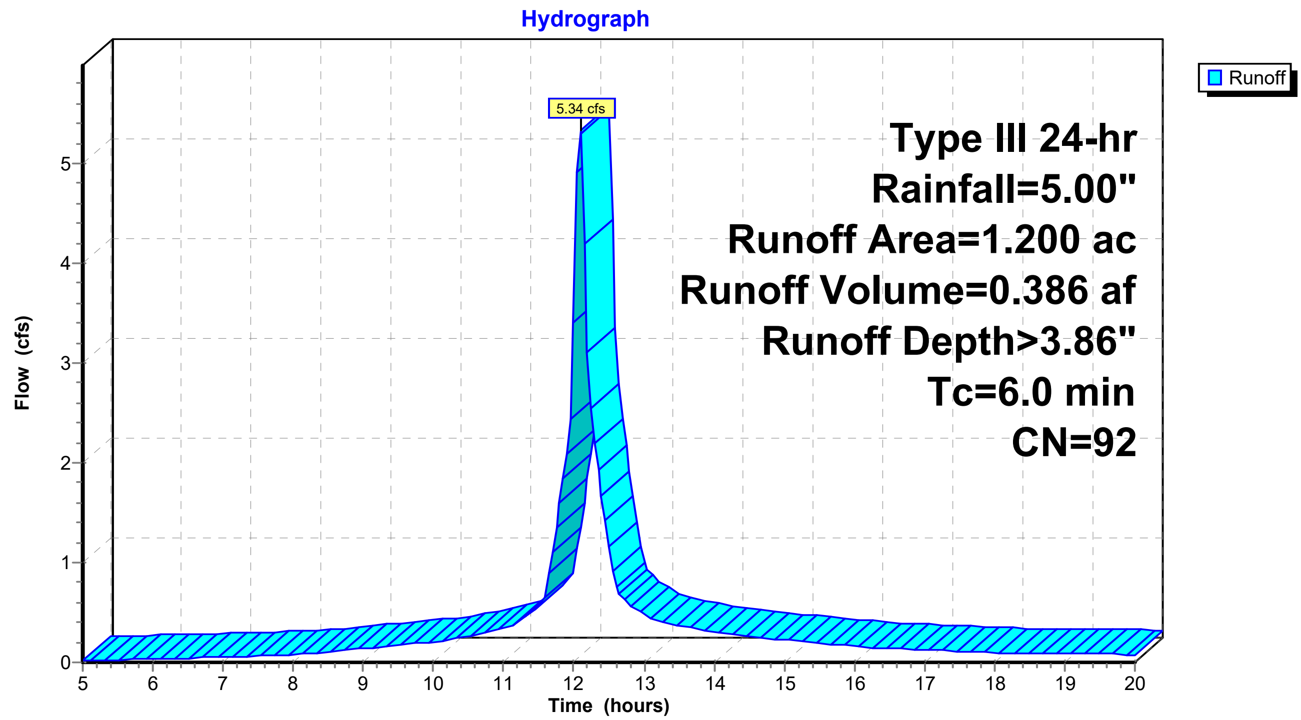
Runoff = 5.34 cfs @ 12.09 hrs, Volume= 0.386 af, Depth> 3.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.00"

	Area (ac)	CN	Description
*	1.200	92	

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

Subcatchment 8A: Portwalk



Summary for Subcatchment 9S: Maplewood

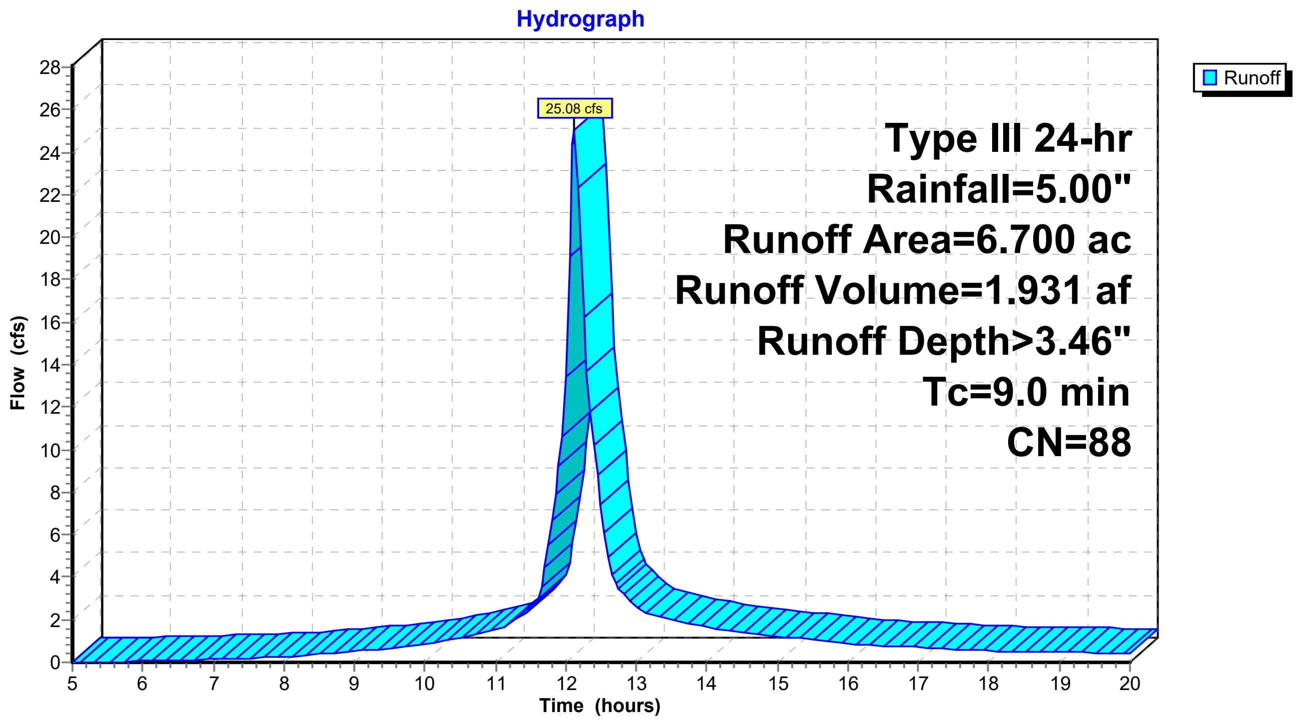
Runoff = 25.08 cfs @ 12.12 hrs, Volume= 1.931 af, Depth> 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.00"

	Area (ac)	CN	Description
*	6.700	88	

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

Subcatchment 9S: Maplewood



Summary for Subcatchment 10S: Bridge St. Area

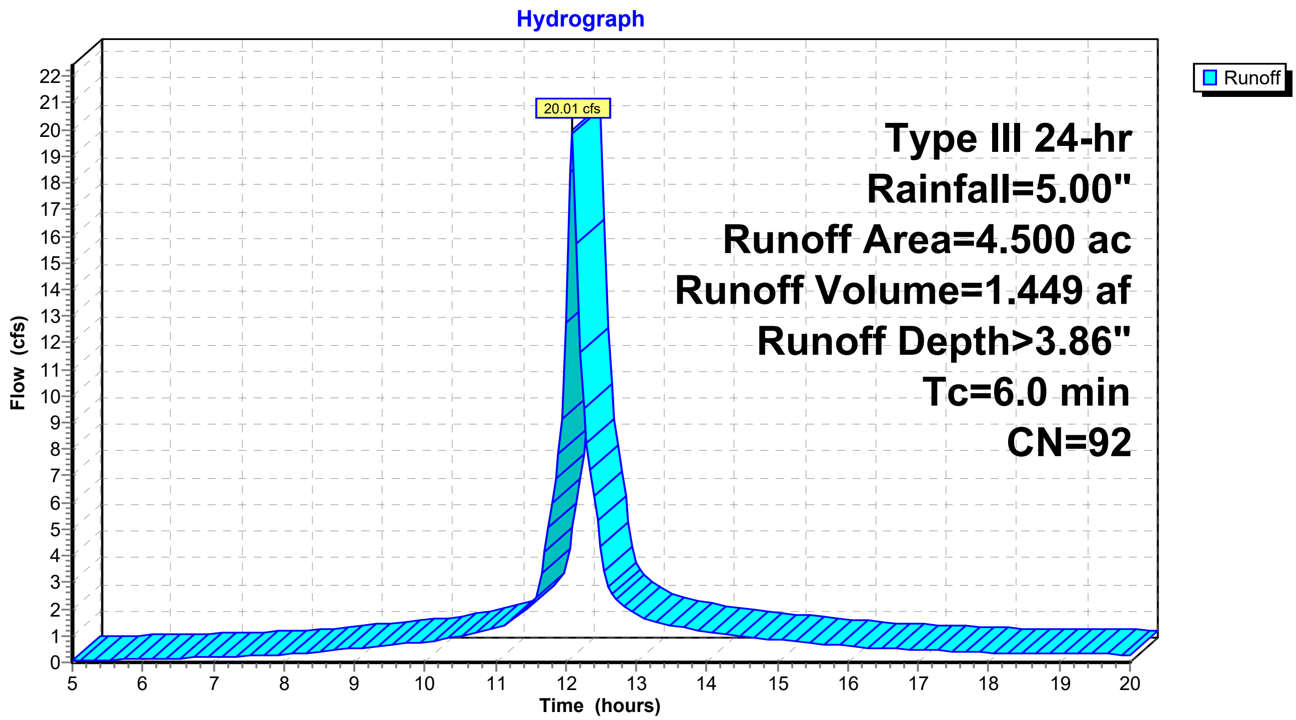
Runoff = 20.01 cfs @ 12.09 hrs, Volume= 1.449 af, Depth> 3.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.00"

	Area (ac)	CN	Description
*	4.500	92	

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

Subcatchment 10S: Bridge St. Area



Summary for Subcatchment 11S: Parking Garage/Lot

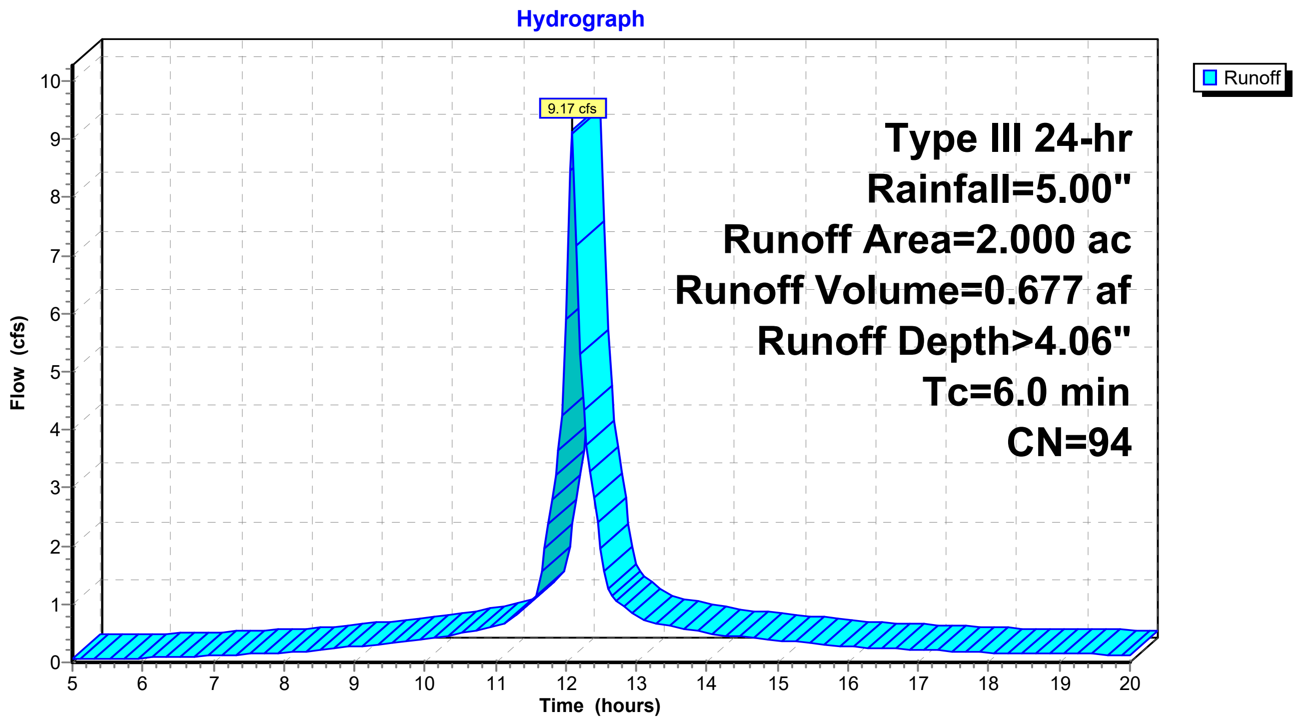
Runoff = 9.17 cfs @ 12.09 hrs, Volume= 0.677 af, Depth> 4.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.00"

	Area (ac)	CN	Description
*	2.000	94	

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

Subcatchment 11S: Parking Garage/Lot



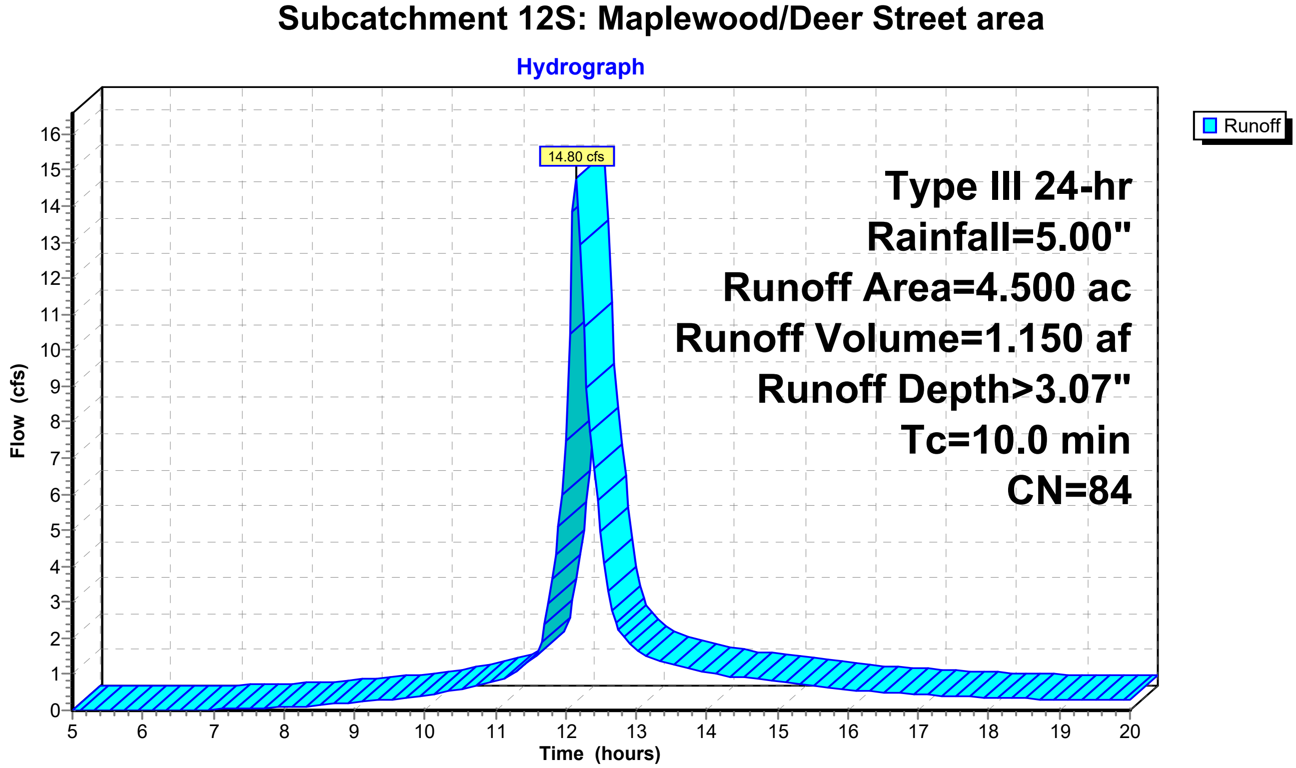
Summary for Subcatchment 12S: Maplewood/Deer Street area

Runoff = 14.80 cfs @ 12.14 hrs, Volume= 1.150 af, Depth> 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.00"

	Area (ac)	CN	Description
*	4.500	84	

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



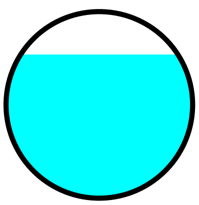
Summary for Reach 1R: Fleet St. (from Porter to Congress)

Inflow Area = 2.500 ac, Inflow Depth > 4.06"
Inflow = 11.47 cfs @ 12.09 hrs, Volume= 0.847 af
Outflow = 11.30 cfs @ 12.10 hrs, Volume= 0.846 af, Atten= 1%, Lag= 0.7 min

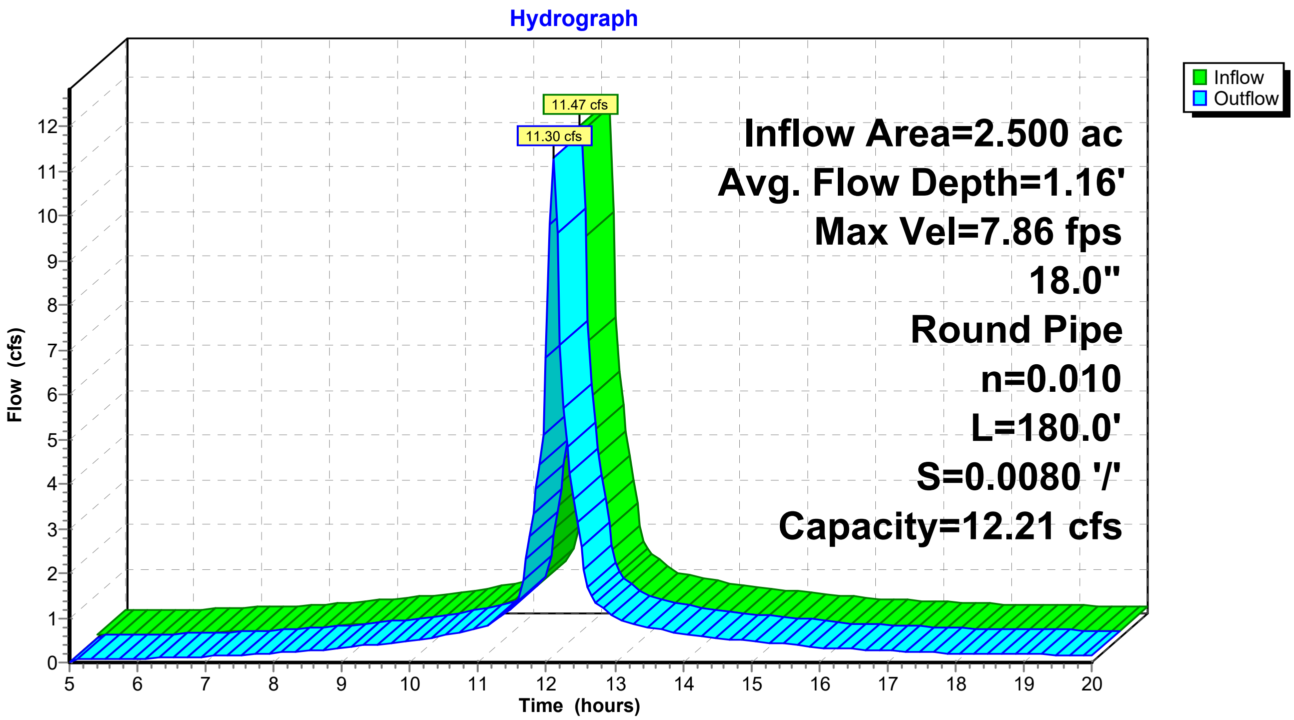
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.86 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 3.19 fps, Avg. Travel Time= 0.9 min

Peak Storage= 263 cf @ 12.09 hrs
Average Depth at Peak Storage= 1.16'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 12.21 cfs

18.0" Round Pipe
n= 0.010
Length= 180.0' Slope= 0.0080 '/'
Inlet Invert= 0.00', Outlet Invert= -1.44'



Reach 1R: Fleet St. (from Porter to Congress)



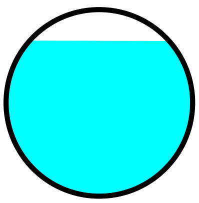
Summary for Reach 2R: Fleet St. (West of Congress)

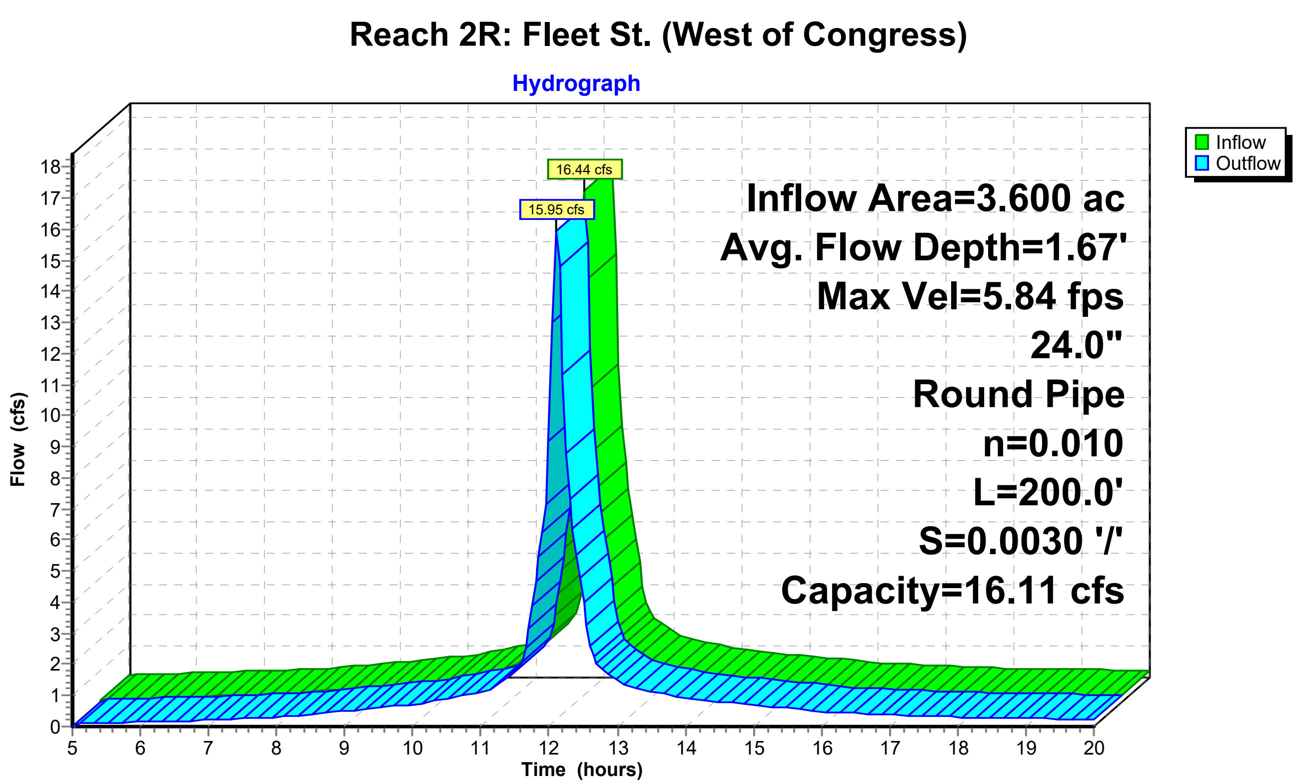
Inflow Area = 3.600 ac, Inflow Depth > 4.12"
Inflow = 16.44 cfs @ 12.09 hrs, Volume= 1.236 af
Outflow = 15.95 cfs @ 12.11 hrs, Volume= 1.235 af, Atten= 3%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.84 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.45 fps, Avg. Travel Time= 1.4 min

Peak Storage= 559 cf @ 12.10 hrs
Average Depth at Peak Storage= 1.67'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 16.11 cfs

24.0" Round Pipe
n= 0.010
Length= 200.0' Slope= 0.0030 '/'
Inlet Invert= 0.00', Outlet Invert= -0.60'





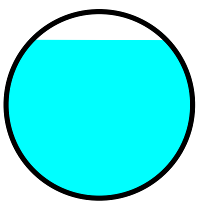
Summary for Reach 3R: To Hanover St.

Inflow Area = 1.300 ac, Inflow Depth > 4.25"
Inflow = 6.11 cfs @ 12.09 hrs, Volume= 0.461 af
Outflow = 6.05 cfs @ 12.09 hrs, Volume= 0.461 af, Atten= 1%, Lag= 0.4 min

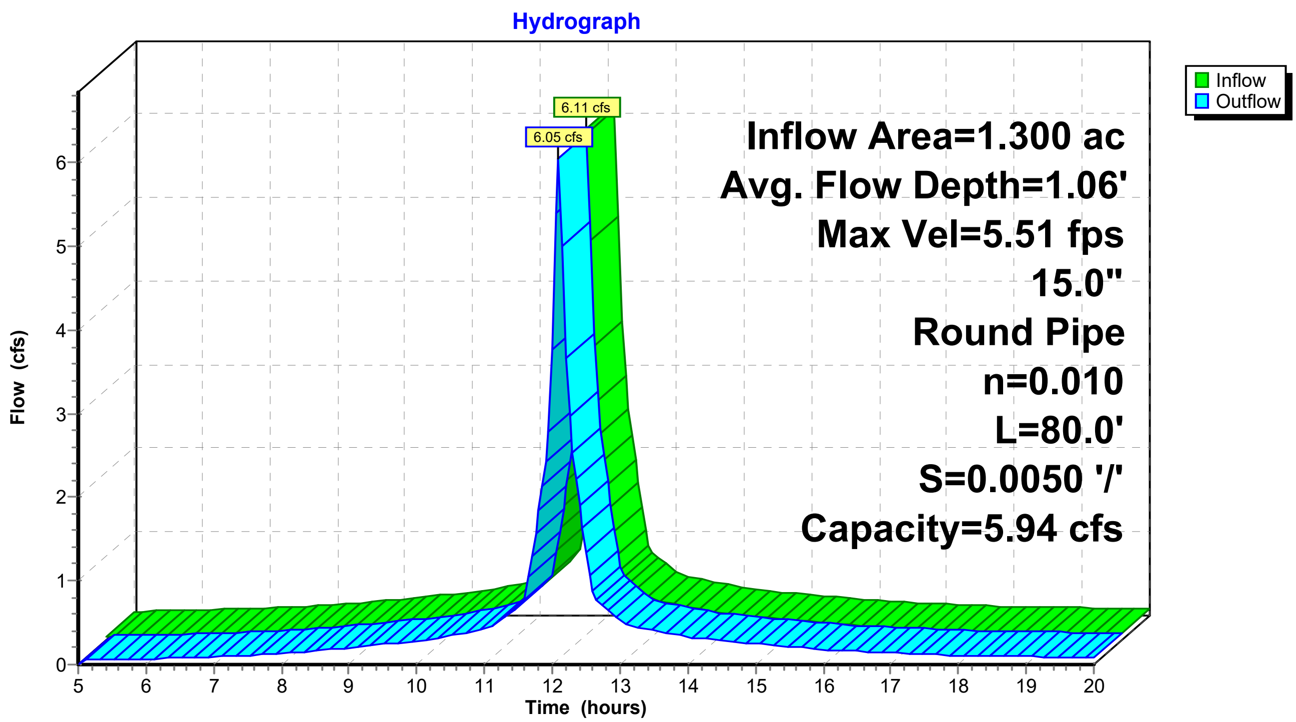
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.51 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.33 fps, Avg. Travel Time= 0.6 min

Peak Storage= 89 cf @ 12.09 hrs
Average Depth at Peak Storage= 1.06'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 5.94 cfs

15.0" Round Pipe
n= 0.010
Length= 80.0' Slope= 0.0050 '/'
Inlet Invert= 0.00', Outlet Invert= -0.40'



Reach 3R: To Hanover St.



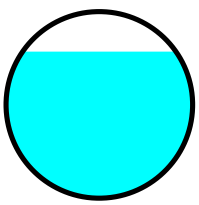
Summary for Reach 4R: Hanover - Downstream from Fleet

Inflow Area = 8.100 ac, Inflow Depth > 4.06"
Inflow = 35.74 cfs @ 12.10 hrs, Volume= 2.738 af
Outflow = 35.13 cfs @ 12.11 hrs, Volume= 2.736 af, Atten= 2%, Lag= 0.6 min

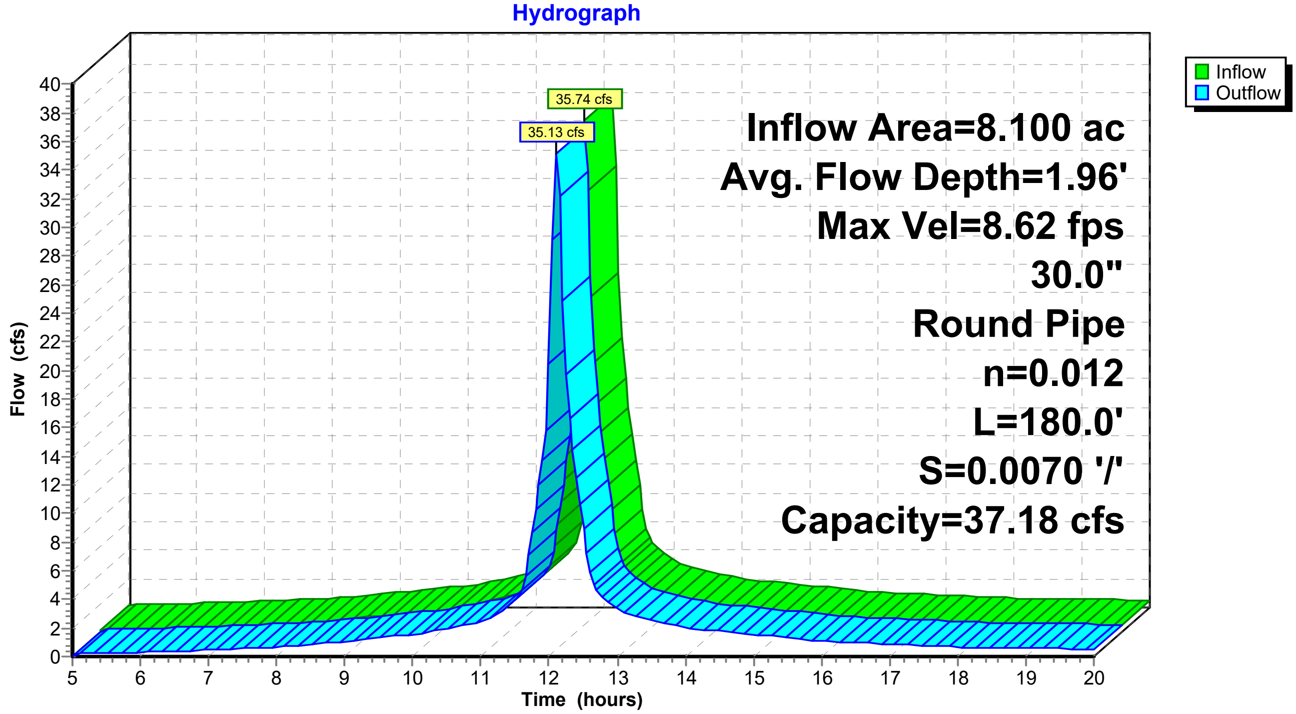
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.62 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.57 fps, Avg. Travel Time= 0.8 min

Peak Storage= 744 cf @ 12.10 hrs
Average Depth at Peak Storage= 1.96'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 37.18 cfs

30.0" Round Pipe
n= 0.012
Length= 180.0' Slope= 0.0070 '/'
Inlet Invert= 0.00', Outlet Invert= -1.26'



Reach 4R: Hanover - Downstream from Fleet



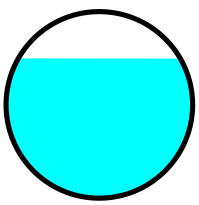
Summary for Reach 5R: Congress to Vaughn Mall

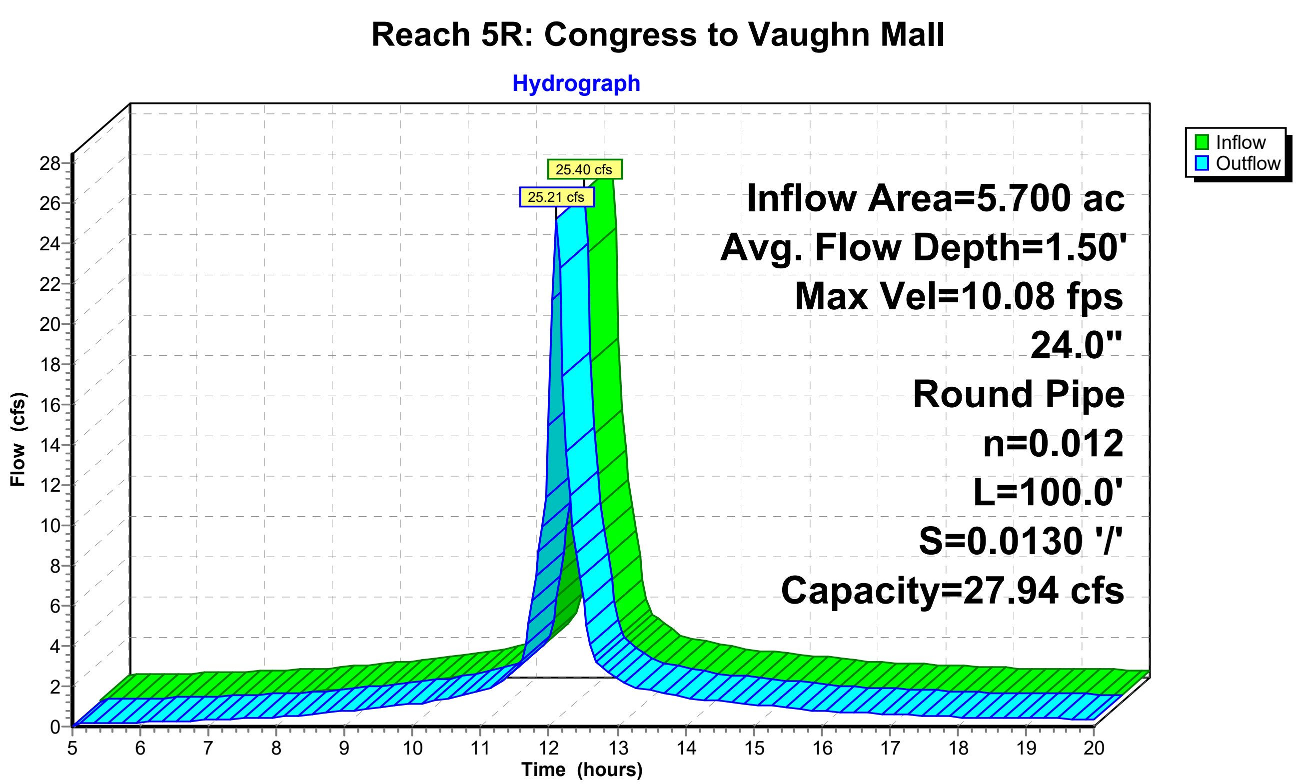
Inflow Area = 5.700 ac, Inflow Depth > 4.10"
Inflow = 25.40 cfs @ 12.10 hrs, Volume= 1.946 af
Outflow = 25.21 cfs @ 12.11 hrs, Volume= 1.946 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.08 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.12 fps, Avg. Travel Time= 0.4 min

Peak Storage= 252 cf @ 12.10 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 27.94 cfs

24.0" Round Pipe
n= 0.012
Length= 100.0' Slope= 0.0130 '/'
Inlet Invert= 0.00', Outlet Invert= -1.30'





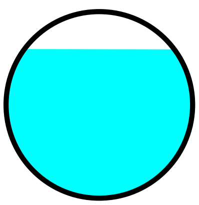
Summary for Reach 6R: Upper Vaughn Mall

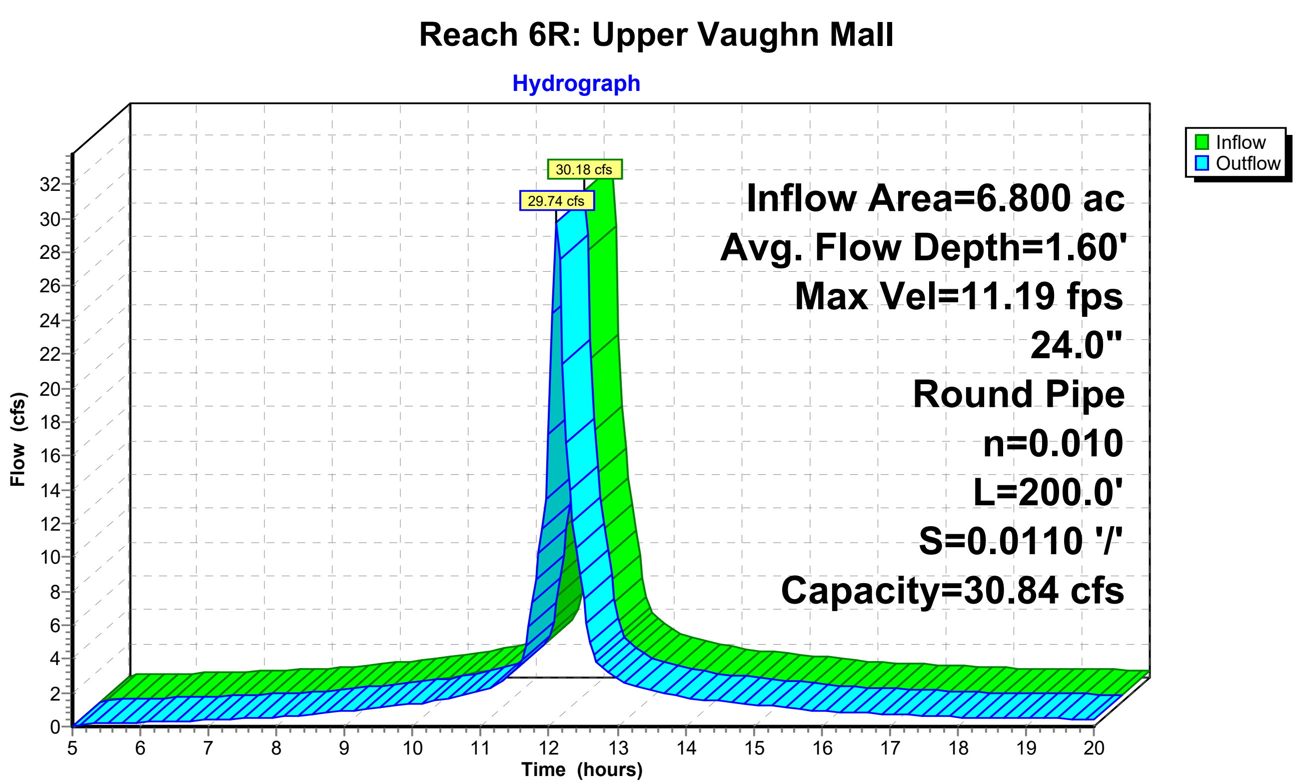
Inflow Area = 6.800 ac, Inflow Depth > 4.09"
Inflow = 30.18 cfs @ 12.10 hrs, Volume= 2.318 af
Outflow = 29.74 cfs @ 12.11 hrs, Volume= 2.318 af, Atten= 1%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.19 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 4.65 fps, Avg. Travel Time= 0.7 min

Peak Storage= 538 cf @ 12.11 hrs
Average Depth at Peak Storage= 1.60'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 30.84 cfs

24.0" Round Pipe
n= 0.010
Length= 200.0' Slope= 0.0110 '/'
Inlet Invert= 0.00', Outlet Invert= -2.20'





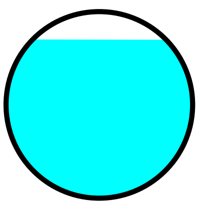
Summary for Reach 7R: Lower Vaughn Mall to Hanover

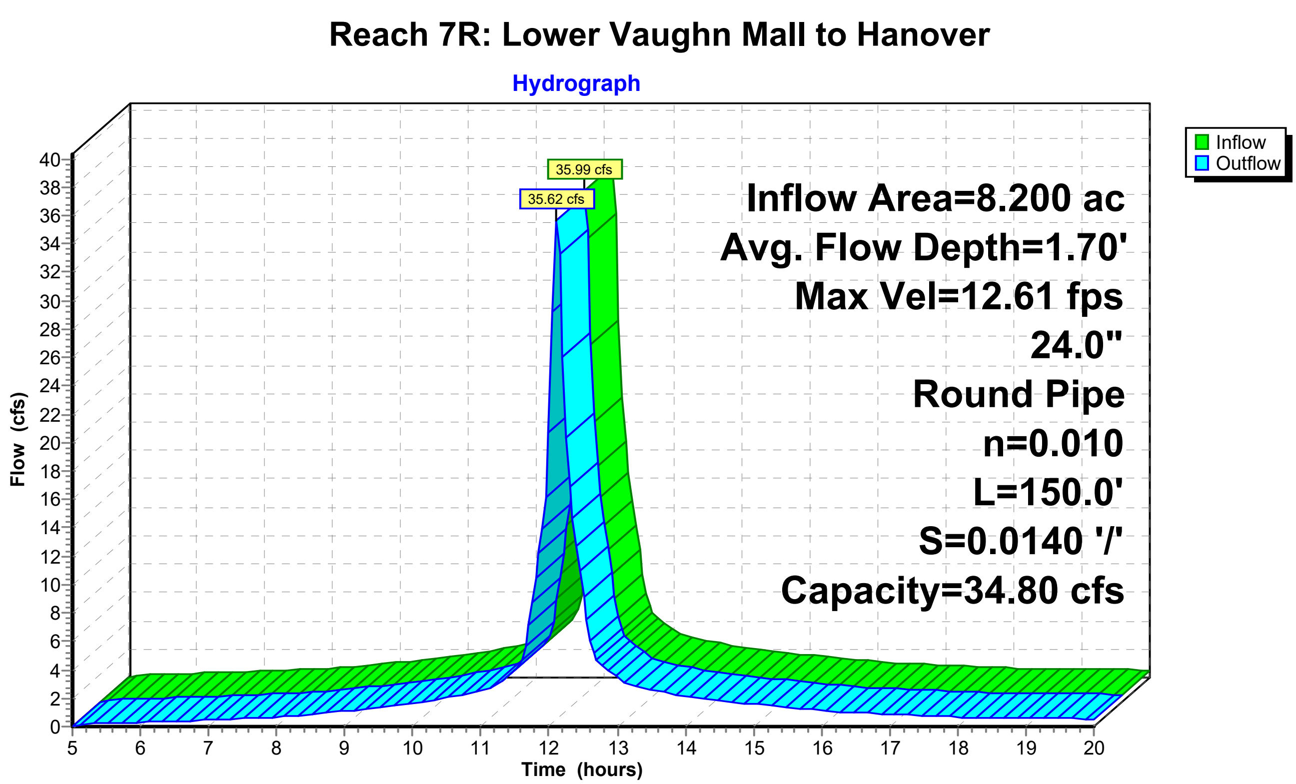
Inflow Area = 8.200 ac, Inflow Depth > 4.09"
Inflow = 35.99 cfs @ 12.11 hrs, Volume= 2.792 af
Outflow = 35.62 cfs @ 12.11 hrs, Volume= 2.791 af, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.61 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 5.35 fps, Avg. Travel Time= 0.5 min

Peak Storage= 427 cf @ 12.11 hrs
Average Depth at Peak Storage= 1.70'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 34.80 cfs

24.0" Round Pipe
n= 0.010
Length= 150.0' Slope= 0.0140 '/'
Inlet Invert= 0.00', Outlet Invert= -2.10'





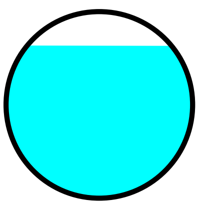
Summary for Reach 8R: Exist. 36" RCP, Downstream of V. Mall

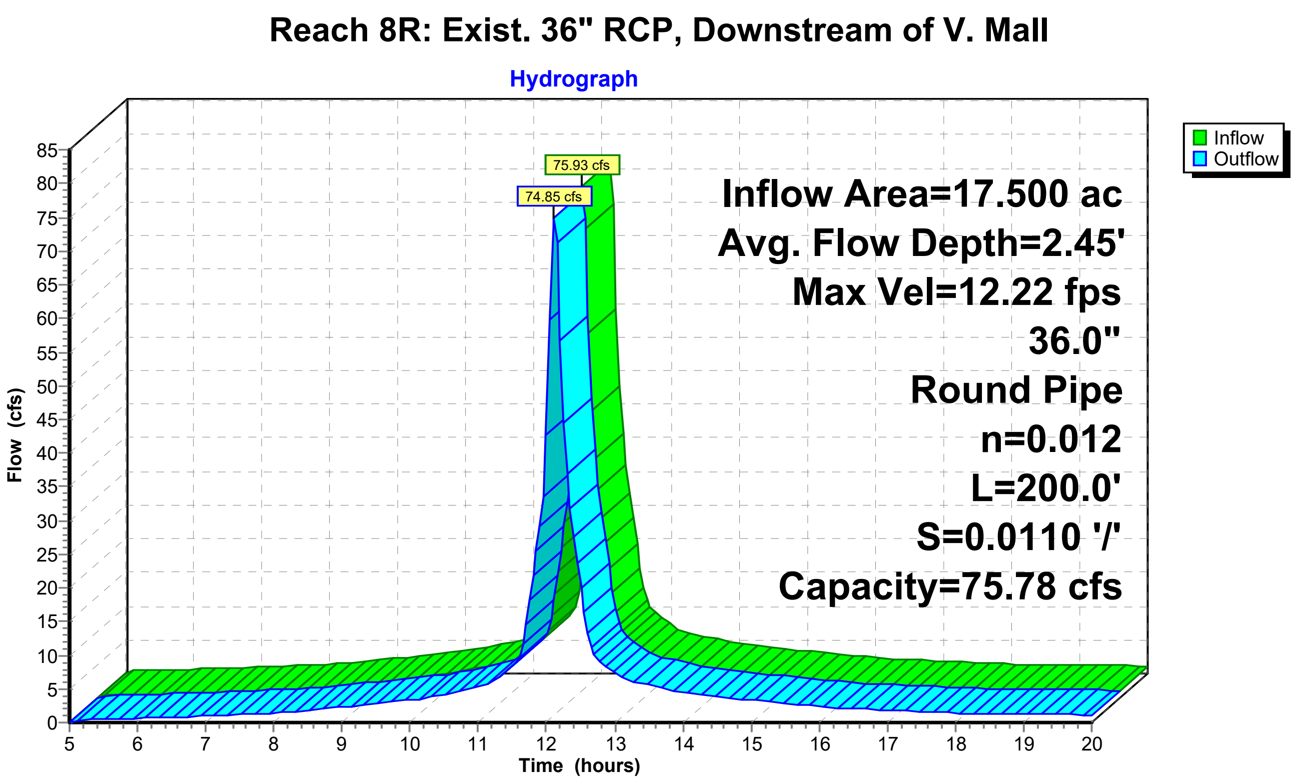
Inflow Area = 17.500 ac, Inflow Depth > 4.06"
Inflow = 75.93 cfs @ 12.11 hrs, Volume= 5.914 af
Outflow = 74.85 cfs @ 12.12 hrs, Volume= 5.912 af, Atten= 1%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.22 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 5.13 fps, Avg. Travel Time= 0.6 min

Peak Storage= 1,237 cf @ 12.11 hrs
Average Depth at Peak Storage= 2.45'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 75.78 cfs

36.0" Round Pipe
n= 0.012
Length= 200.0' Slope= 0.0110 '/'
Inlet Invert= 0.00', Outlet Invert= -2.20'





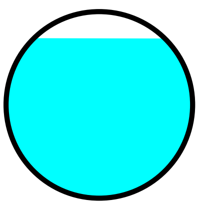
Summary for Reach 9R: Existr 36" from Han. Sag

Inflow Area = 19.300 ac, Inflow Depth > 4.07"
Inflow = 82.94 cfs @ 12.11 hrs, Volume= 6.550 af
Outflow = 81.35 cfs @ 12.13 hrs, Volume= 6.548 af, Atten= 2%, Lag= 0.7 min

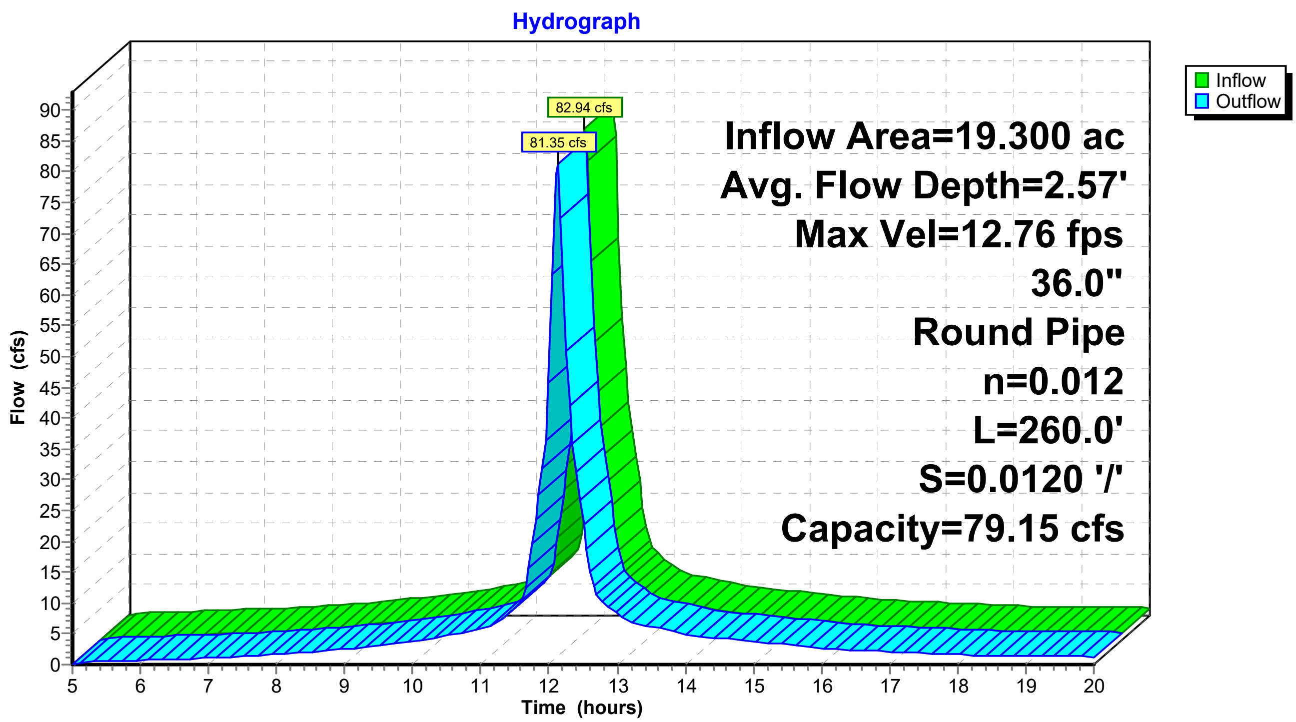
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.76 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 5.45 fps, Avg. Travel Time= 0.8 min

Peak Storage= 1,681 cf @ 12.12 hrs
Average Depth at Peak Storage= 2.57'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 79.15 cfs

36.0" Round Pipe
n= 0.012
Length= 260.0' Slope= 0.0120 '/'
Inlet Invert= 0.00', Outlet Invert= -3.12'



Reach 9R: Existr 36" from Han. Sag



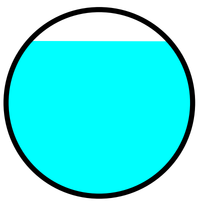
Summary for Reach 10R: Upper Bridge St.

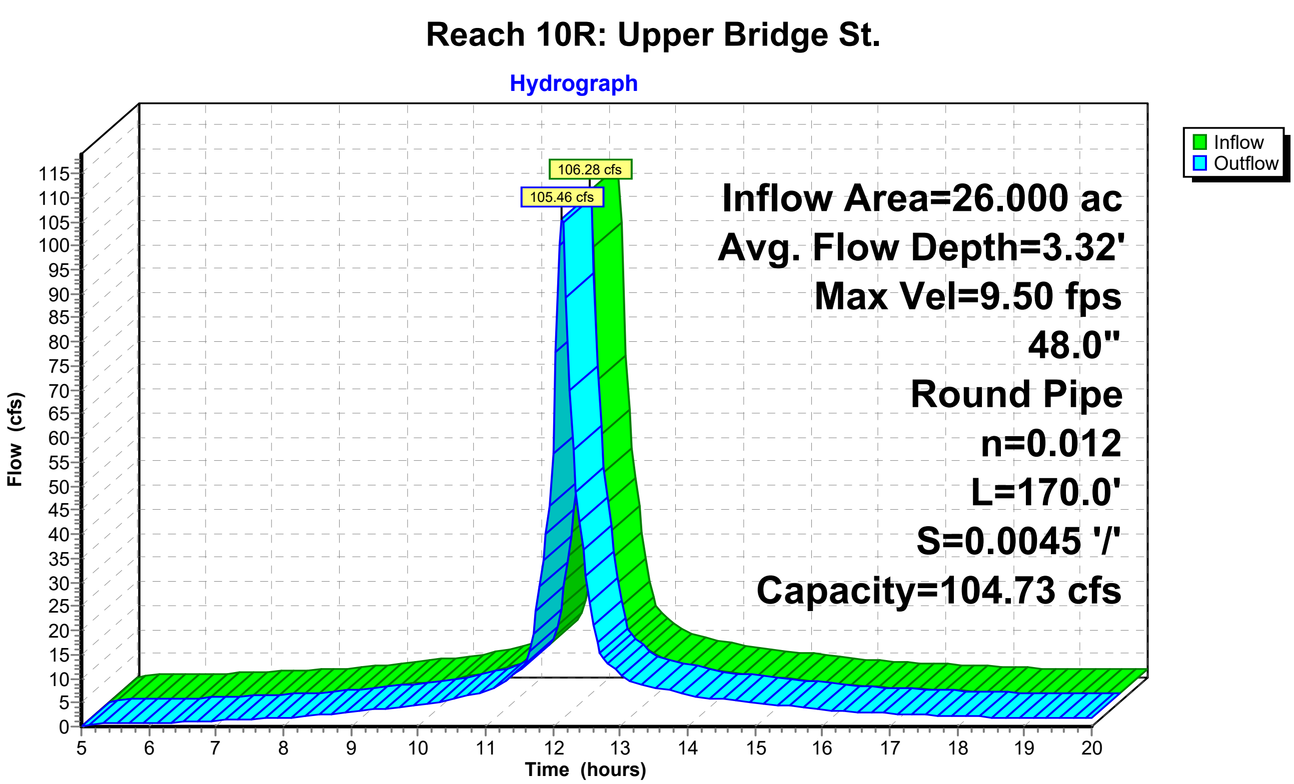
Inflow Area = 26.000 ac, Inflow Depth > 3.91"
Inflow = 106.28 cfs @ 12.13 hrs, Volume= 8.478 af
Outflow = 105.46 cfs @ 12.14 hrs, Volume= 8.475 af, Atten= 1%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.50 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 4.01 fps, Avg. Travel Time= 0.7 min

Peak Storage= 1,900 cf @ 12.13 hrs
Average Depth at Peak Storage= 3.32'
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 104.73 cfs

48.0" Round Pipe
n= 0.012
Length= 170.0' Slope= 0.0045 '/'
Inlet Invert= 0.00', Outlet Invert= -0.77'





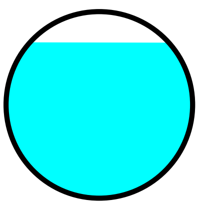
Summary for Reach 11R: Bridge Street Sag

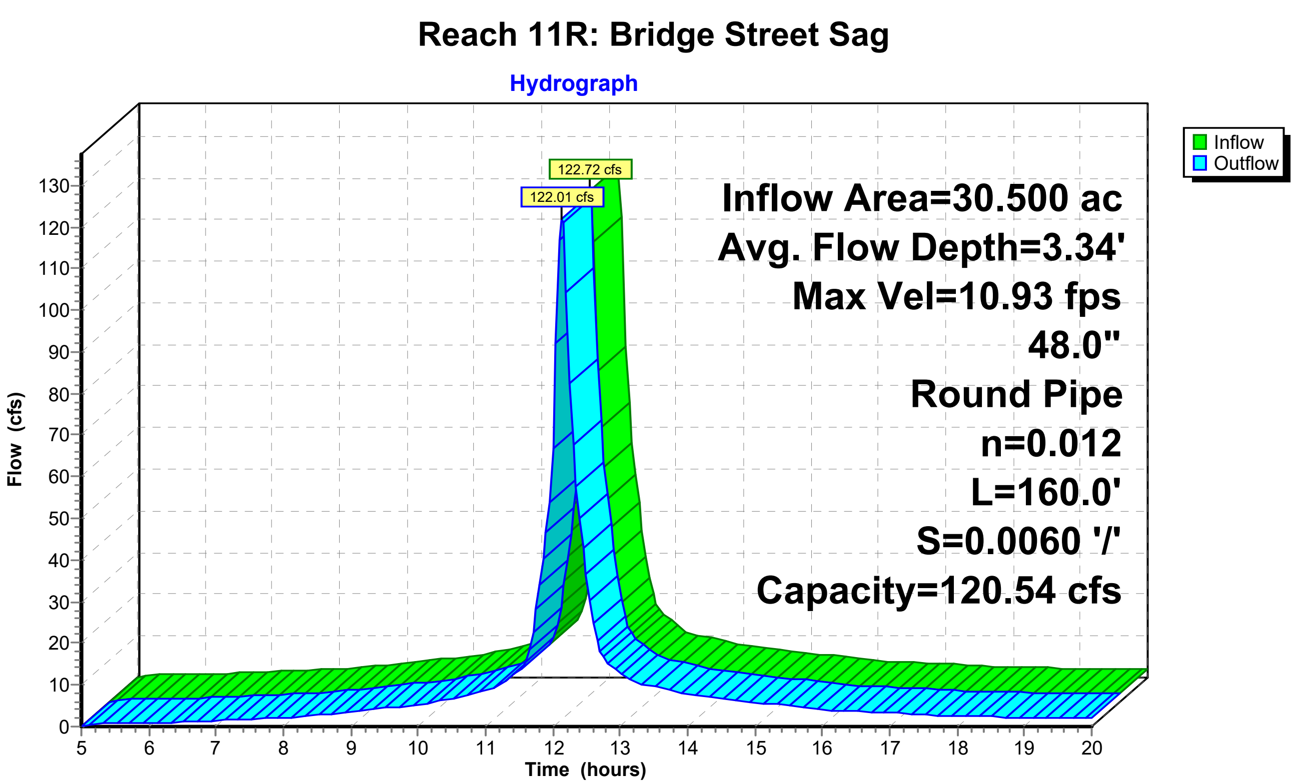
Inflow Area = 30.500 ac, Inflow Depth > 3.90"
Inflow = 122.72 cfs @ 12.13 hrs, Volume= 9.925 af
Outflow = 122.01 cfs @ 12.14 hrs, Volume= 9.922 af, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.93 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.63 fps, Avg. Travel Time= 0.6 min

Peak Storage= 1,795 cf @ 12.13 hrs
Average Depth at Peak Storage= 3.34'
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 120.54 cfs

48.0" Round Pipe
n= 0.012
Length= 160.0' Slope= 0.0060 '/'
Inlet Invert= 0.00', Outlet Invert= -0.96'





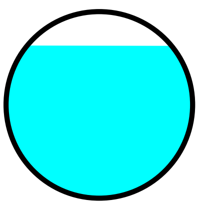
Summary for Reach 12R: Deer Street

Inflow Area = 32.500 ac, Inflow Depth > 3.91"
Inflow = 129.83 cfs @ 12.13 hrs, Volume= 10.599 af
Outflow = 129.15 cfs @ 12.14 hrs, Volume= 10.596 af, Atten= 1%, Lag= 0.5 min

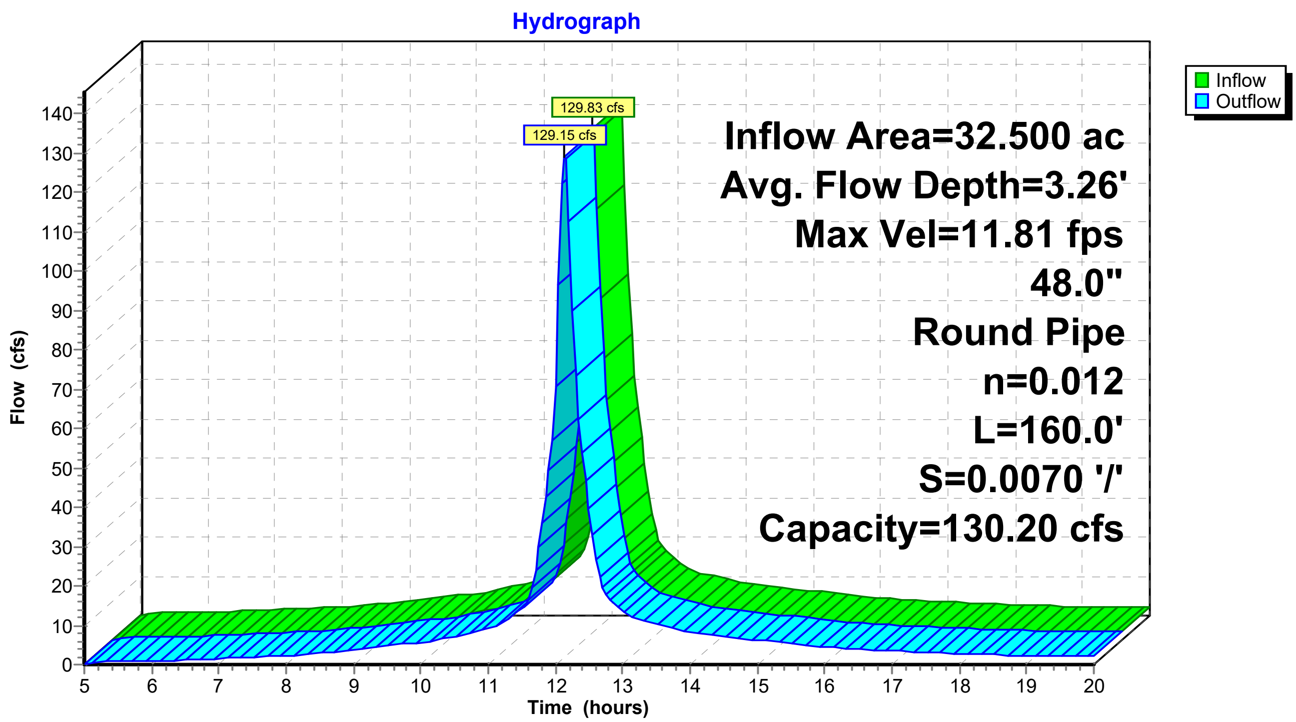
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.81 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.98 fps, Avg. Travel Time= 0.5 min

Peak Storage= 1,758 cf @ 12.14 hrs
Average Depth at Peak Storage= 3.26'
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 130.20 cfs

48.0" Round Pipe
n= 0.012
Length= 160.0' Slope= 0.0070 '/'
Inlet Invert= 0.00', Outlet Invert= -1.12'



Reach 12R: Deer Street



Summary for Pond 13P: Deer Stret Outfall Pipe(s)

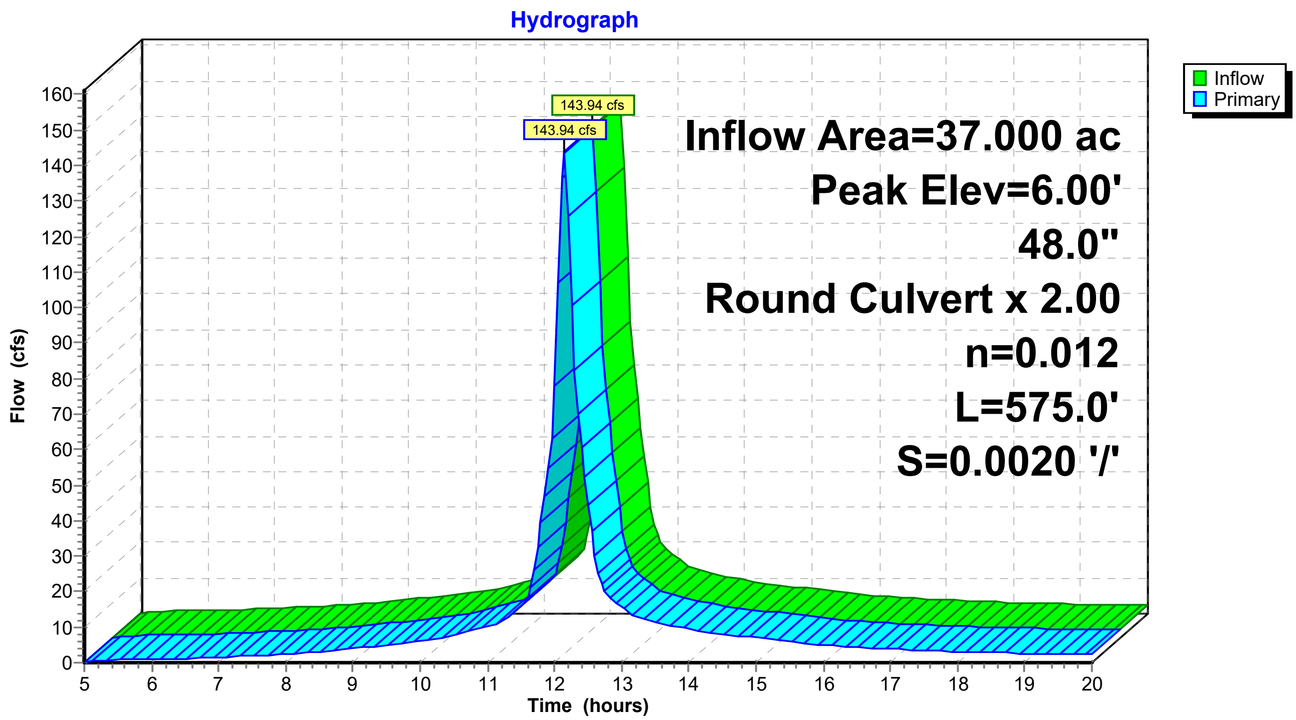
Inflow Area =	37.000 ac,	Inflow Depth > 3.81"		
Inflow =	143.94 cfs @	12.14 hrs, Volume=	11.746 af	
Outflow =	143.94 cfs @	12.14 hrs, Volume=	11.746 af,	Atten= 0%, Lag= 0.0 min
Primary =	143.94 cfs @	12.14 hrs, Volume=	11.746 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 6.00' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**48.0" Round Twin Culverts X 2.00** L= 575.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 0.00' / -1.15' S= 0.0020 '/' Cc= 0.900 n= 0.012, Flow Area= 12.57 sf

Primary OutFlow Max=141.87 cfs @ 12.14 hrs HW=5.94' TW=4.00' (Fixed TW Elev= 4.00')
└1=Twin Culverts (Outlet Controls 141.87 cfs @ 5.64 fps)

Pond 13P: Deer Stret Outfall Pipe(s)

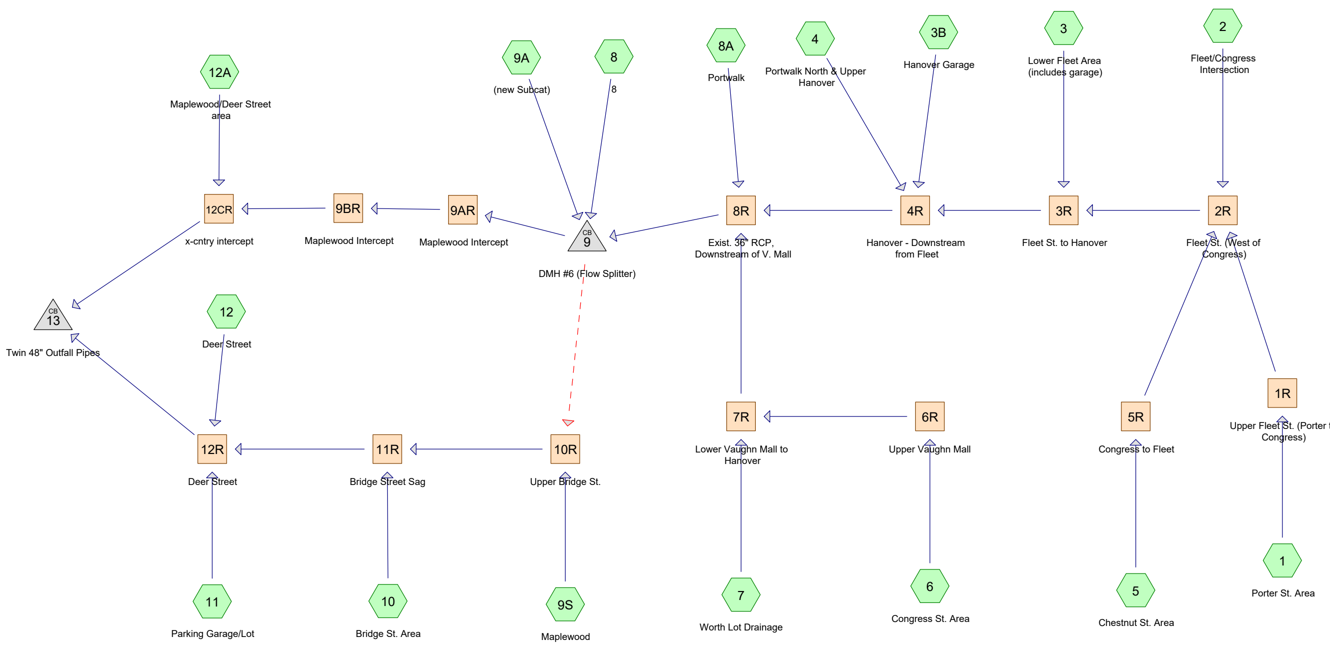


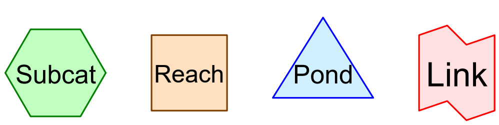
APPENDIX 4

DRAINAGE OUTFALL PROJECT

POST-PROJECT HYDROLOGY CALCULATIONS

Deer Street Outfall &
Fleet Street Drainage Areas
Portsmouth, New Hampshire
November 2020
SCALE: 1"=100'
Project Conditions
October 2022
Lighter colors, similar to the "existing conditions October 2022" created for Phil
Post Construction Basin 12A in to Maplewood Pipe
Post Construction Basin 9A into Maplewood pipe
SC1
SC2
SC3
SC3B
SC4
SC5
SC6
SC7
SC8
SC8A
SC9
SC10
SC11
SC12
3.39 ac
3.81 ac
2.75 ac
1.18 ac
1.87 ac
1.32 ac
1.41 ac
1.57 ac
1.1 ac
0.93 ac
2.9 ac
2.48 ac
5.48 ac
4.32 ac
12AR
9P
12R
11R
10R
8R
4R
3R
7R
2R
1R
5R





Routing Diagram for PROJECT CONDITIONS
Prepared by HP Inc., Printed 4/6/2023
HydroCAD® 10.00-26 s/n 10718 © 2020 HydroCAD Software Solutions LLC

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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Porter St. Area Runoff Area=2.500 ac Runoff Depth>4.31"
Tc=6.0 min CN=94 Runoff=11.47 cfs 0.897 af

Subcatchment2: Fleet/Congress Intersection Runoff Area=1.100 ac Runoff Depth>4.53"
Tc=6.0 min CN=96 Runoff=5.17 cfs 0.415 af

Subcatchment3: Lower Fleet Area (includes garage) Runoff Area=1.300 ac Runoff Depth>4.53"
Tc=6.0 min CN=96 Runoff=6.11 cfs 0.491 af

Subcatchment3B: Hanover Garage Runoff Area=2.700 ac Runoff Depth>4.53"
Tc=6.0 min CN=96 Runoff=12.69 cfs 1.019 af

Subcatchment4: Portwalk North & Upper Hanover Runoff Area=4.100 ac Runoff Depth>4.09"
Tc=8.0 min CN=92 Runoff=17.23 cfs 1.396 af

Subcatchment5: Chestnut St. Area Runoff Area=2.100 ac Runoff Depth>4.31"
Tc=6.0 min CN=94 Runoff=9.63 cfs 0.753 af

Subcatchment6: Congress St. Area Runoff Area=1.100 ac Runoff Depth>4.31"
Tc=6.0 min CN=94 Runoff=5.05 cfs 0.395 af

Subcatchment7: Worth Lot Drainage Runoff Area=1.400 ac Runoff Depth>4.31"
Tc=6.0 min CN=94 Runoff=6.42 cfs 0.502 af

Subcatchment8: 8 Runoff Area=1.800 ac Runoff Depth>4.53"
Tc=6.0 min CN=96 Runoff=8.46 cfs 0.679 af

Subcatchment8A: Portwalk Runoff Area=1.200 ac Runoff Depth>4.09"
Tc=6.0 min CN=92 Runoff=5.34 cfs 0.409 af

Subcatchment9A: (new Subcat)
Runoff=0.00 cfs 0.000 af

Subcatchment9S: Maplewood Runoff Area=6.700 ac Runoff Depth>3.66"
Tc=9.0 min CN=88 Runoff=25.08 cfs 2.046 af

Subcatchment10: Bridge St. Area Runoff Area=4.500 ac Runoff Depth>4.09"
Tc=6.0 min CN=92 Runoff=20.01 cfs 1.532 af

Subcatchment11: Parking Garage/Lot Runoff Area=2.000 ac Runoff Depth>4.31"
Tc=6.0 min CN=94 Runoff=9.17 cfs 0.718 af

Subcatchment12: Deer Street Runoff Area=1.500 ac Runoff Depth>3.27"
Tc=6.0 min CN=84 Runoff=5.59 cfs 0.408 af

Subcatchment12A: Maplewood/Deer Street area Runoff Area=3.000 ac Runoff Depth>3.27"
Tc=8.0 min CN=84 Runoff=10.53 cfs 0.817 af

Reach 1R: Upper Fleet St. (Porter to Avg. Flow Depth=1.23' Max Vel=7.37 fps Inflow=11.47 cfs 0.897 af
18.0" Round Pipe n=0.010 L=180.0' S=0.0070 '/' Capacity=11.43 cfs Outflow=11.27 cfs 0.897 af

Reach 2R: Fleet St. (West of Congress) Avg. Flow Depth=1.59' Max Vel=9.54 fps Inflow=25.76 cfs 2.065 af
24.0" Round Pipe n=0.010 L=380.0' S=0.0080 '/' Capacity=26.30 cfs Outflow=24.86 cfs 2.064 af

Reach 3R: Fleet St. to Hanover Avg. Flow Depth=1.72' Max Vel=10.67 fps Inflow=30.71 cfs 2.555 af
24.0" Round Pipe n=0.010 L=100.0' S=0.0100 '/' Capacity=29.41 cfs Outflow=30.45 cfs 2.554 af

Reach 4R: Hanover - Downstream from Avg. Flow Depth=2.42' Max Vel=9.75 fps Inflow=59.96 cfs 4.969 af
36.0" Round Pipe n=0.012 L=180.0' S=0.0070 '/' Capacity=60.45 cfs Outflow=59.02 cfs 4.968 af

Reach 5R: Congress to Fleet Avg. Flow Depth=1.22' Max Vel=6.23 fps Inflow=9.63 cfs 0.753 af
18.0" Round Pipe n=0.010 L=220.0' S=0.0050 '/' Capacity=9.66 cfs Outflow=9.38 cfs 0.753 af

Reach 6R: Upper Vaughn Mall Avg. Flow Depth=0.83' Max Vel=5.82 fps Inflow=5.05 cfs 0.395 af
15.0" Round Pipe n=0.013 L=200.0' S=0.0100 '/' Capacity=6.46 cfs Outflow=4.93 cfs 0.394 af

Reach 7R: Lower Vaughn Mall to Avg. Flow Depth=1.17' Max Vel=5.93 fps Inflow=11.31 cfs 0.897 af
24.0" Round Pipe n=0.013 L=150.0' S=0.0060 '/' Capacity=17.52 cfs Outflow=11.11 cfs 0.896 af

Reach 8R: Exist. 36" RCP, Avg. Flow Depth=2.55' Max Vel=11.65 fps Inflow=75.20 cfs 6.273 af
36.0" Round Pipe n=0.012 L=200.0' S=0.0100 '/' Capacity=72.26 cfs Outflow=74.07 cfs 6.272 af

Reach 9AR: Maplewood Intercept Avg. Flow Depth=2.36' Max Vel=10.93 fps Inflow=65.53 cfs 6.255 af
36.0" Round Pipe n=0.010 L=31.0' S=0.0061 '/' Capacity=67.88 cfs Outflow=65.38 cfs 6.255 af

Reach 9BR: Maplewood Intercept Avg. Flow Depth=2.68' Max Vel=8.14 fps Inflow=65.38 cfs 6.255 af
42.0" Round Pipe n=0.012 L=600.0' S=0.0040 '/' Capacity=68.93 cfs Outflow=62.79 cfs 6.249 af

Reach 10R: Upper Bridge St. Avg. Flow Depth=2.23' Max Vel=7.31 fps Inflow=41.55 cfs 2.742 af
36.0" Round Pipe n=0.012 L=170.0' S=0.0040 '/' Capacity=45.70 cfs Outflow=40.88 cfs 2.741 af

Reach 11R: Bridge Street Sag Avg. Flow Depth=2.61' Max Vel=9.02 fps Inflow=59.33 cfs 4.274 af
36.0" Round Pipe n=0.012 L=160.0' S=0.0060 '/' Capacity=55.97 cfs Outflow=58.29 cfs 4.273 af

Reach 12CR: x-cntry intercept Avg. Flow Depth=3.41' Max Vel=6.31 fps Inflow=72.44 cfs 7.066 af
48.0" Round Pipe n=0.012 L=210.0' S=0.0020 '/' Capacity=69.59 cfs Outflow=71.03 cfs 7.062 af

Reach 12R: Deer Street Avg. Flow Depth=3.39' Max Vel=6.31 fps Inflow=72.39 cfs 5.399 af
48.0" Round Pipe n=0.012 L=160.0' S=0.0020 '/' Capacity=69.59 cfs Outflow=70.96 cfs 5.397 af

Pond 9: DMH #6 (Flow Splitter) Peak Elev=9.69' Inflow=82.02 cfs 6.951 af
Primary=65.53 cfs 6.255 af Secondary=16.49 cfs 0.696 af Outflow=82.02 cfs 6.951 af

Pond 13: Twin 48" Outfall Pipes Peak Elev=6.46' Inflow=140.28 cfs 12.459 af
48.0" Round Culvert x 2.00 n=0.012 L=360.0' S=0.0020 '/' Outflow=140.28 cfs 12.459 af

Summary for Subcatchment 1: Porter St. Area

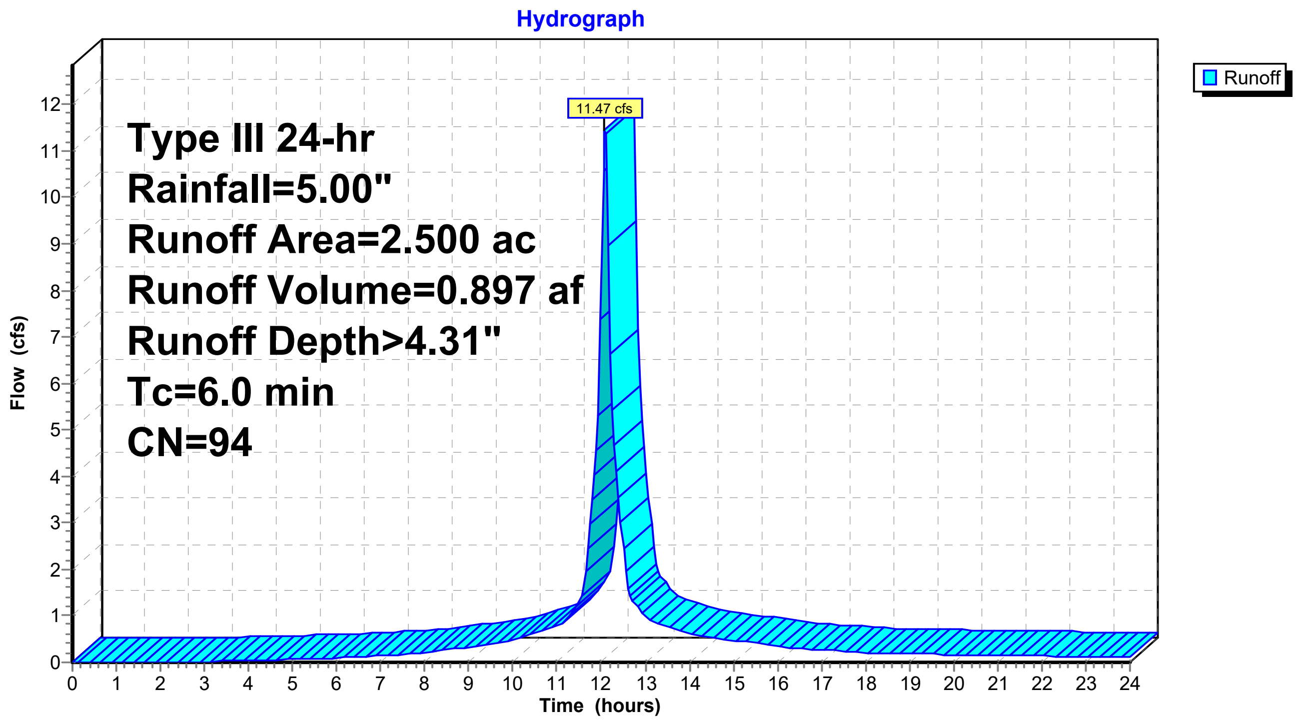
Runoff = 11.47 cfs @ 12.09 hrs, Volume= 0.897 af, Depth> 4.31"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	2.500	94	Upper Fleet St

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

Subcatchment 1: Porter St. Area



Summary for Subcatchment 2: Fleet/Congress Intersection

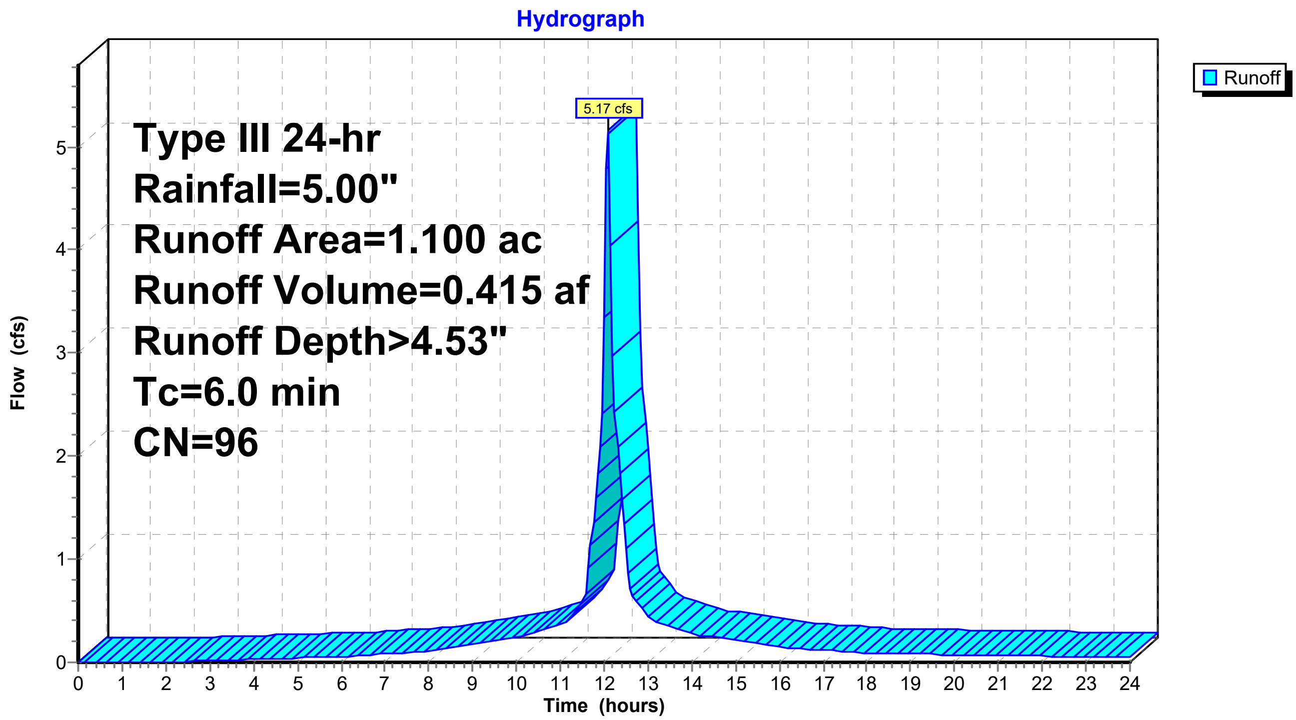
Runoff = 5.17 cfs @ 12.09 hrs, Volume= 0.415 af, Depth> 4.53"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	1.100	96	

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

Subcatchment 2: Fleet/Congress Intersection



Summary for Subcatchment 3: Lower Fleet Area (includes garage)

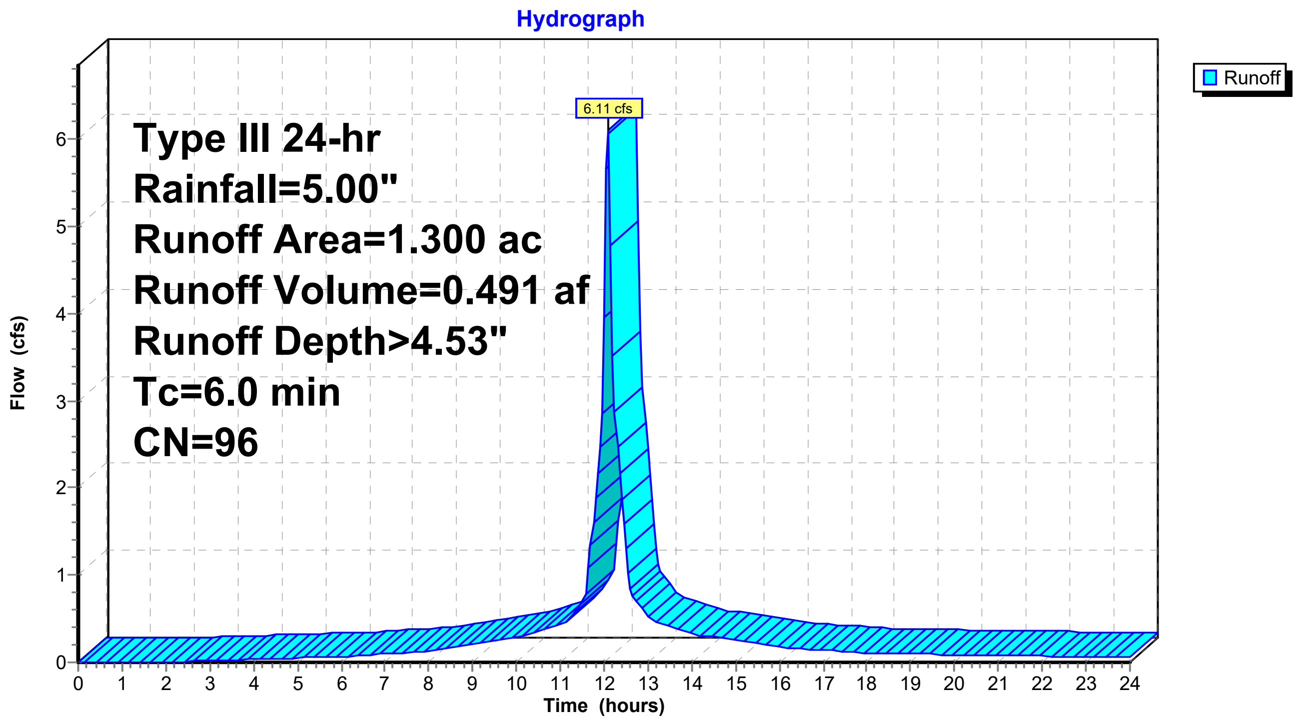
Runoff = 6.11 cfs @ 12.09 hrs, Volume= 0.491 af, Depth> 4.53"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	1.300	96	

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

Subcatchment 3: Lower Fleet Area (includes garage)



Summary for Subcatchment 3B: Hanover Garage

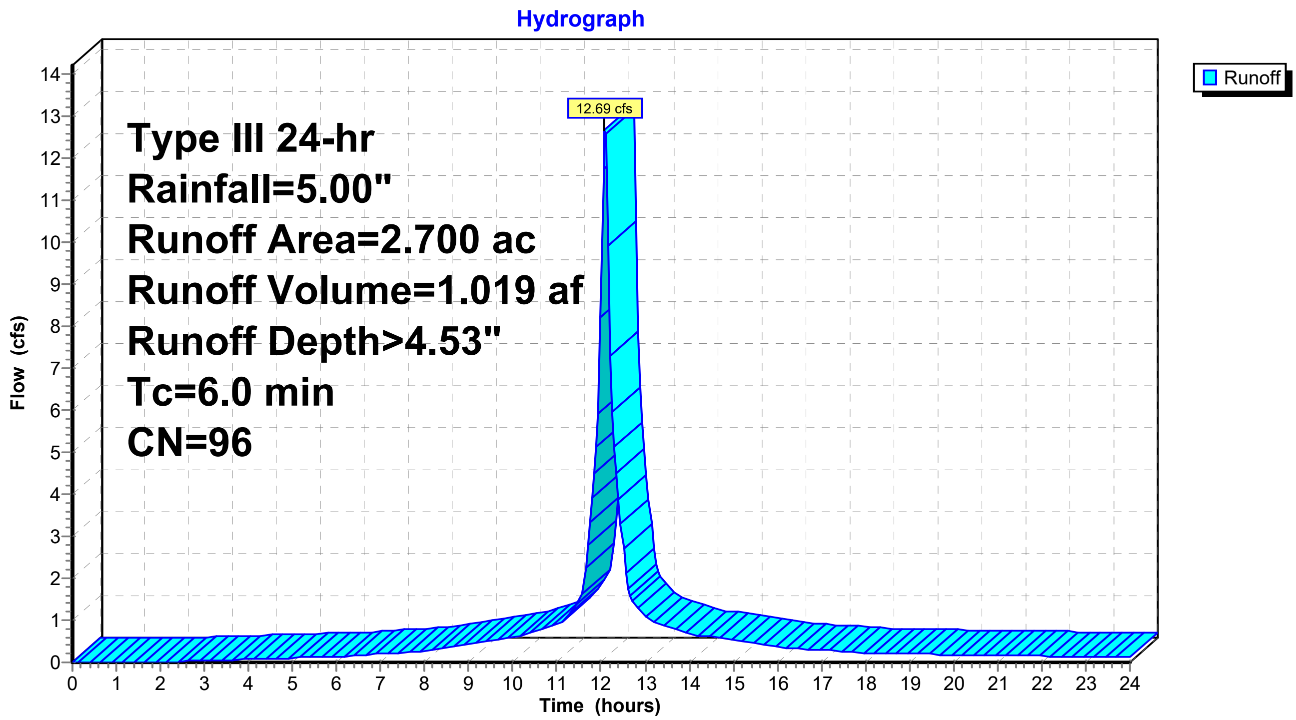
Runoff = 12.69 cfs @ 12.09 hrs, Volume= 1.019 af, Depth> 4.53"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	2.700	96	

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

Subcatchment 3B: Hanover Garage



Summary for Subcatchment 4: Portwalk North & Upper Hanover

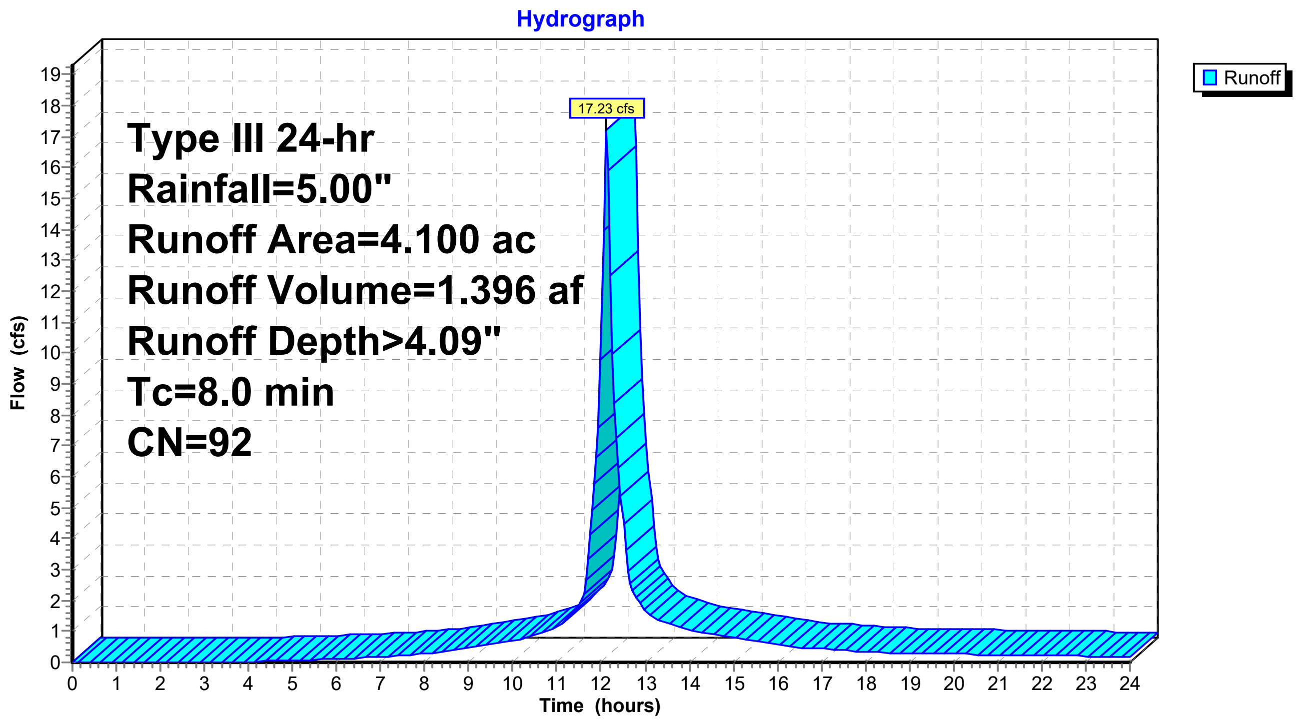
Runoff = 17.23 cfs @ 12.11 hrs, Volume= 1.396 af, Depth> 4.09"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	4.100	92	

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

Subcatchment 4: Portwalk North & Upper Hanover



Summary for Subcatchment 5: Chestnut St. Area

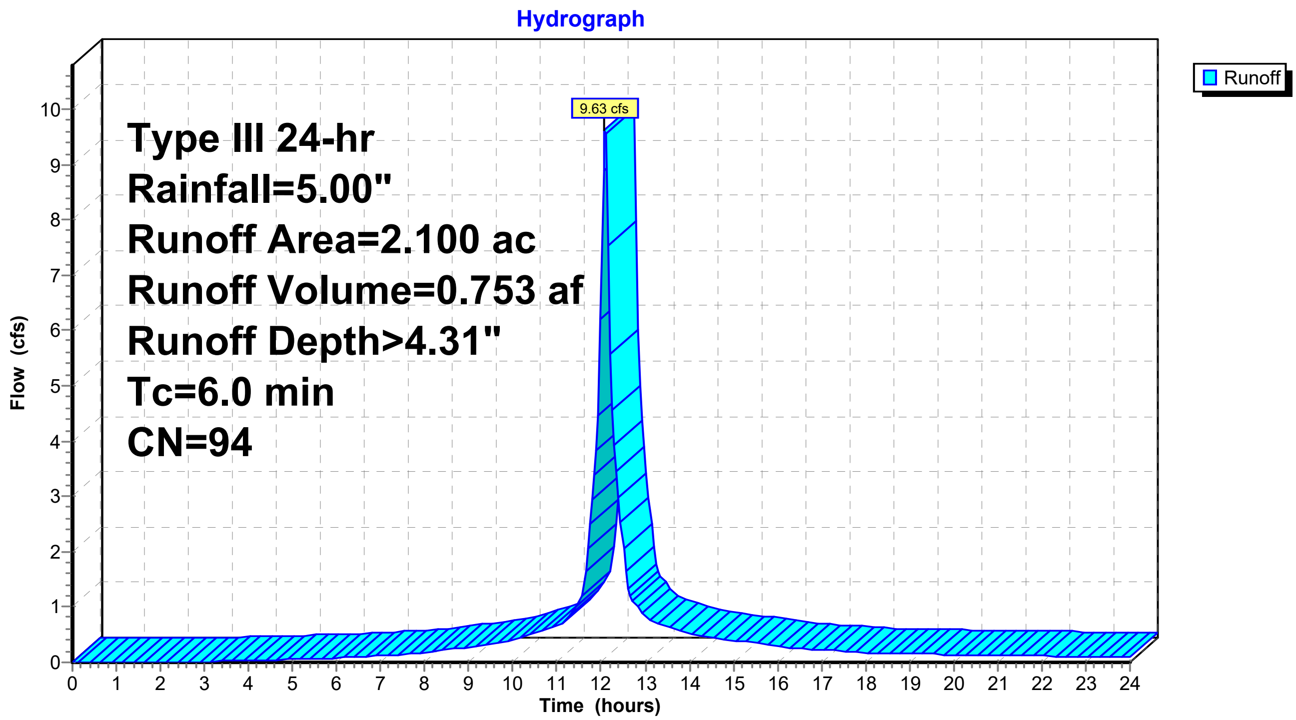
Runoff = 9.63 cfs @ 12.09 hrs, Volume= 0.753 af, Depth> 4.31"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	2.100	94	

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

Subcatchment 5: Chestnut St. Area



Summary for Subcatchment 6: Congress St. Area

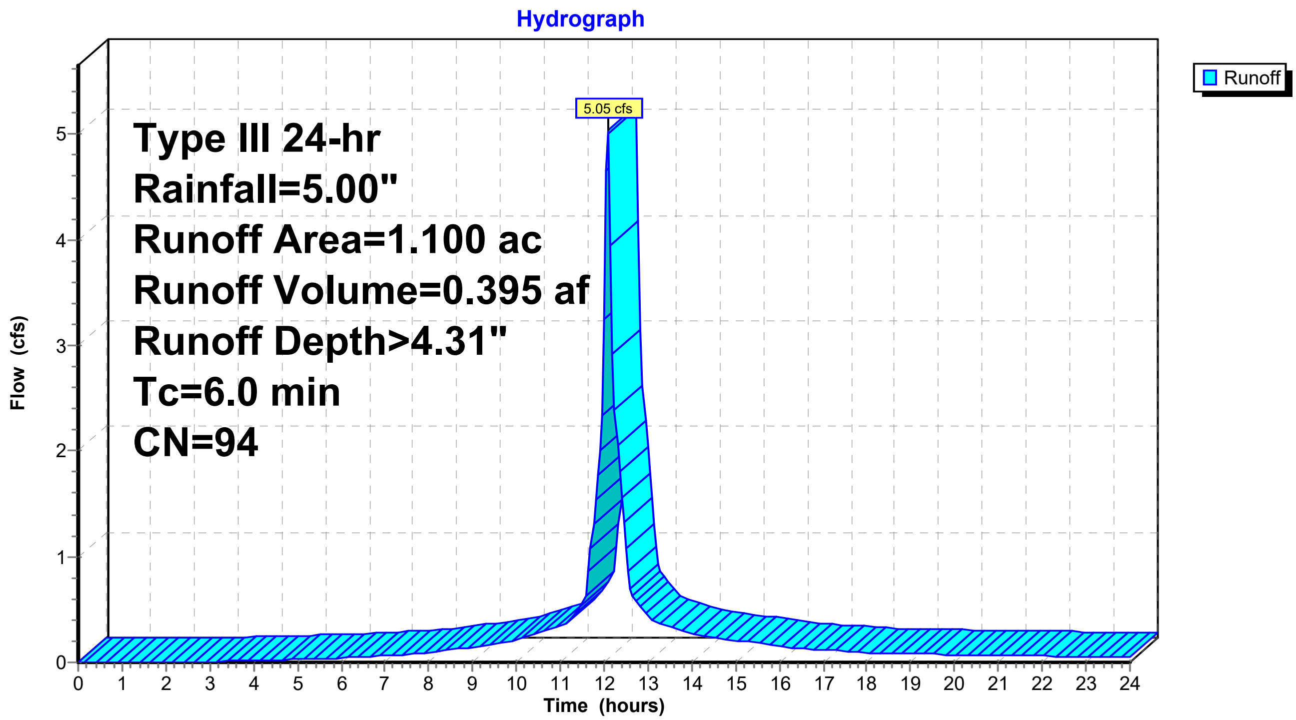
Runoff = 5.05 cfs @ 12.09 hrs, Volume= 0.395 af, Depth> 4.31"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	1.100	94	

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

Subcatchment 6: Congress St. Area



Summary for Subcatchment 7: Worth Lot Drainage

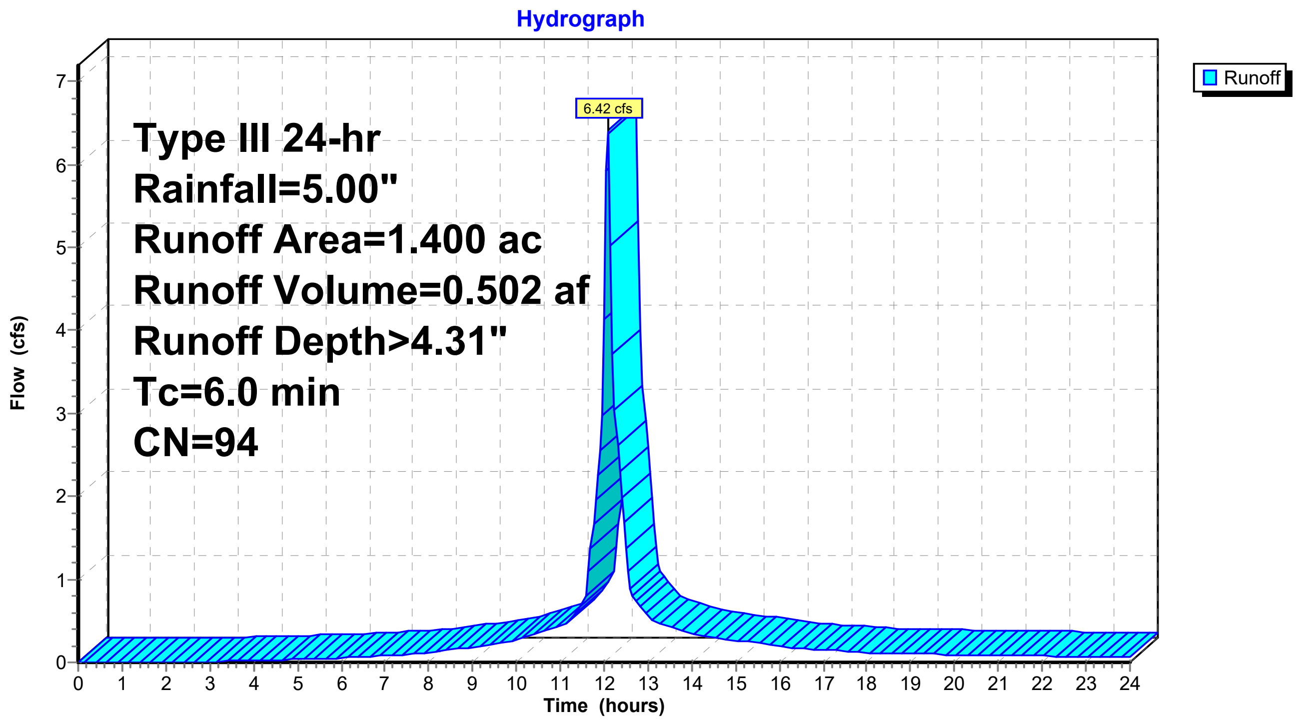
Runoff = 6.42 cfs @ 12.09 hrs, Volume= 0.502 af, Depth> 4.31"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	1.400	94	

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

Subcatchment 7: Worth Lot Drainage



Summary for Subcatchment 8: 8

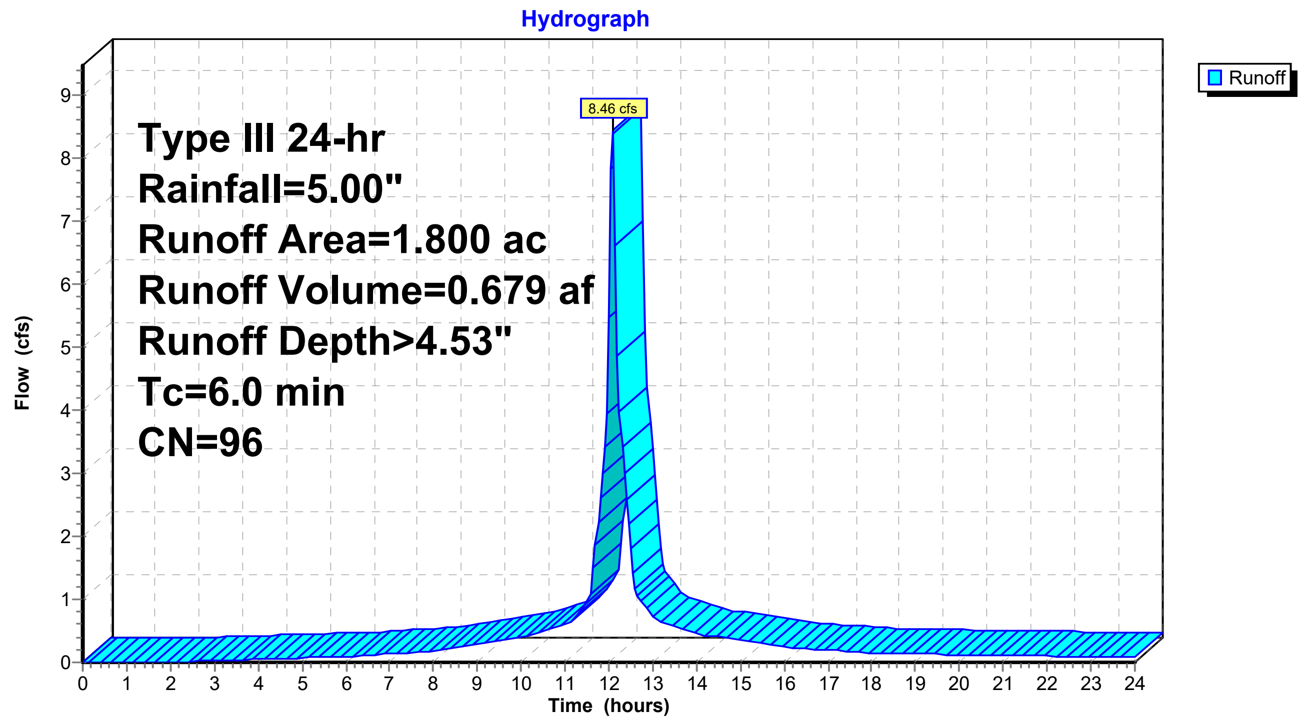
Runoff = 8.46 cfs @ 12.09 hrs, Volume= 0.679 af, Depth> 4.53"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	1.800	96	

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

Subcatchment 8: 8



Summary for Subcatchment 8A: Portwalk

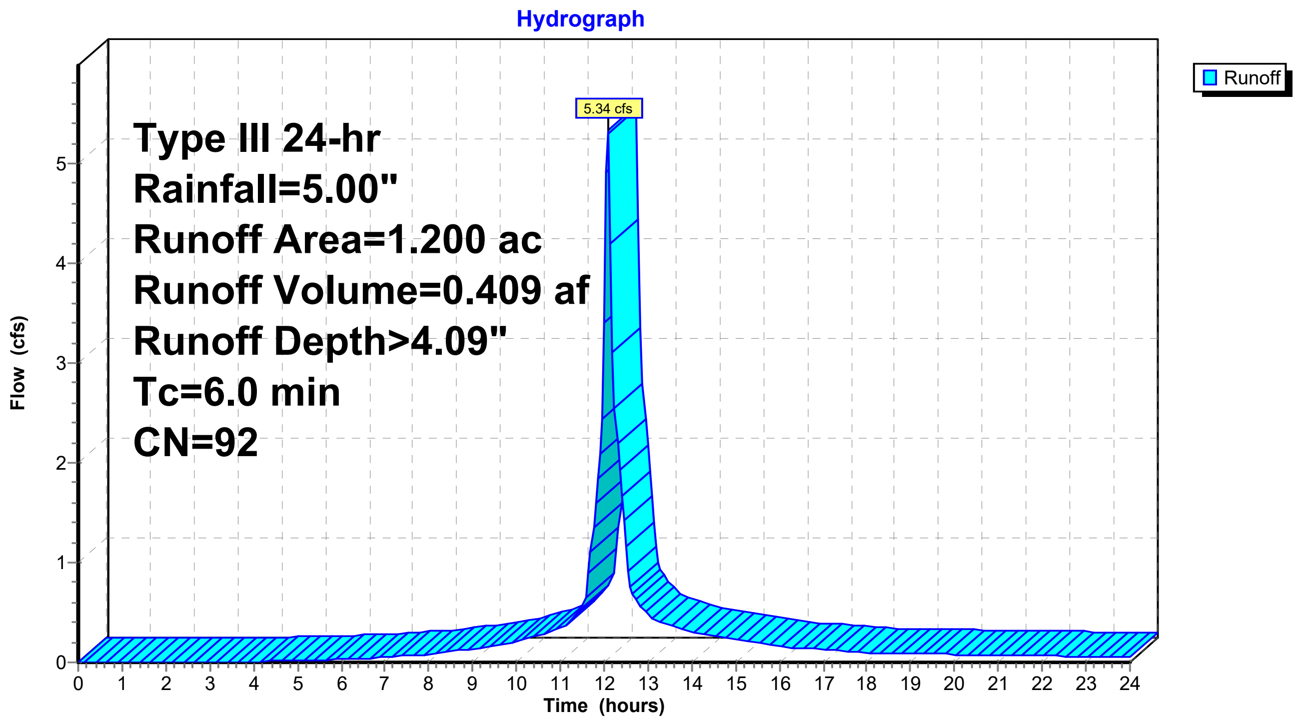
Runoff = 5.34 cfs @ 12.09 hrs, Volume= 0.409 af, Depth> 4.09"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	1.200	92	

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

Subcatchment 8A: Portwalk

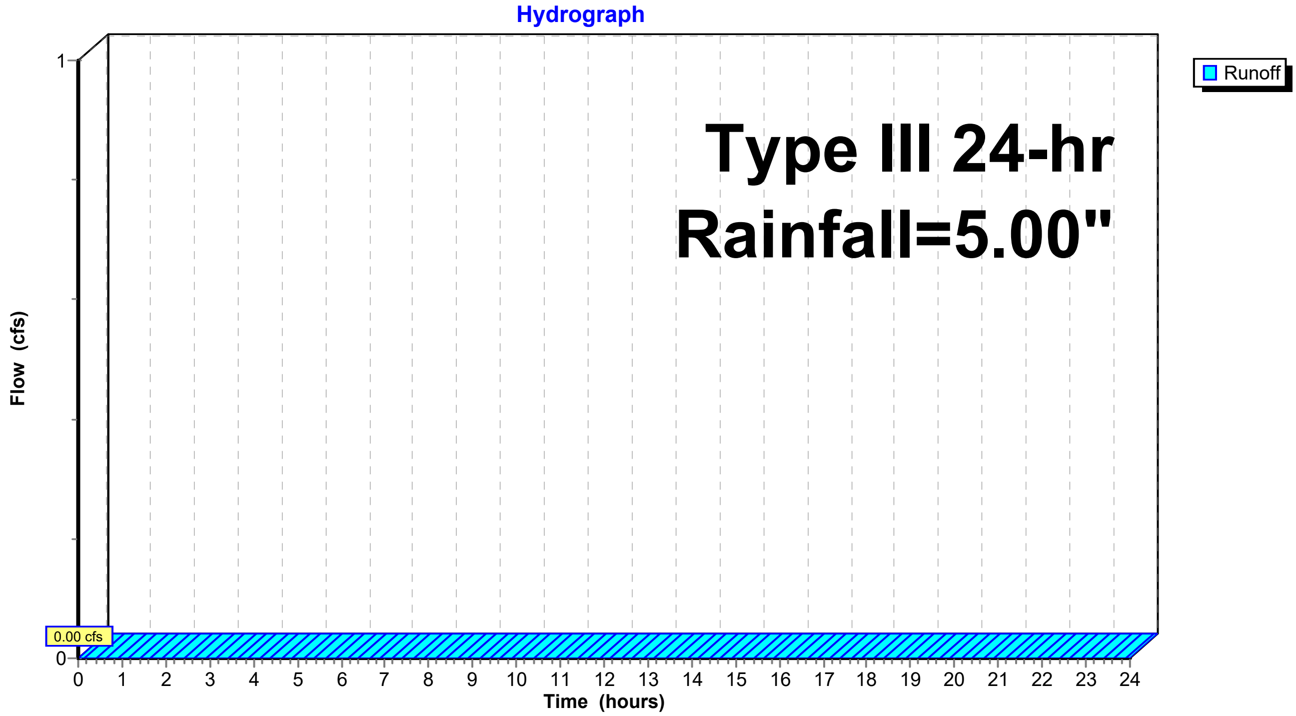


Summary for Subcatchment 9A: (new Subcat)

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

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 Rainfall=5.00"

Subcatchment 9A: (new Subcat)



Summary for Subcatchment 9S: Maplewood

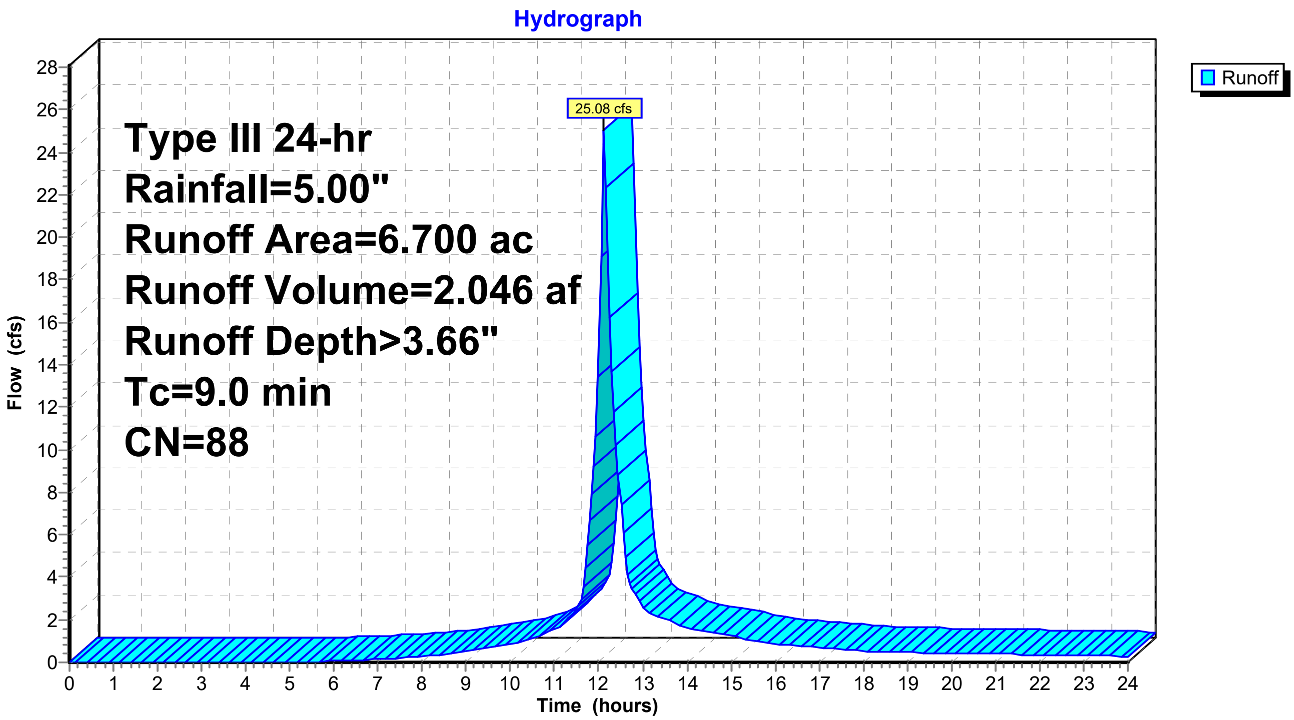
Runoff = 25.08 cfs @ 12.12 hrs, Volume= 2.046 af, Depth> 3.66"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	6.700	88	

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

Subcatchment 9S: Maplewood



Summary for Subcatchment 10: Bridge St. Area

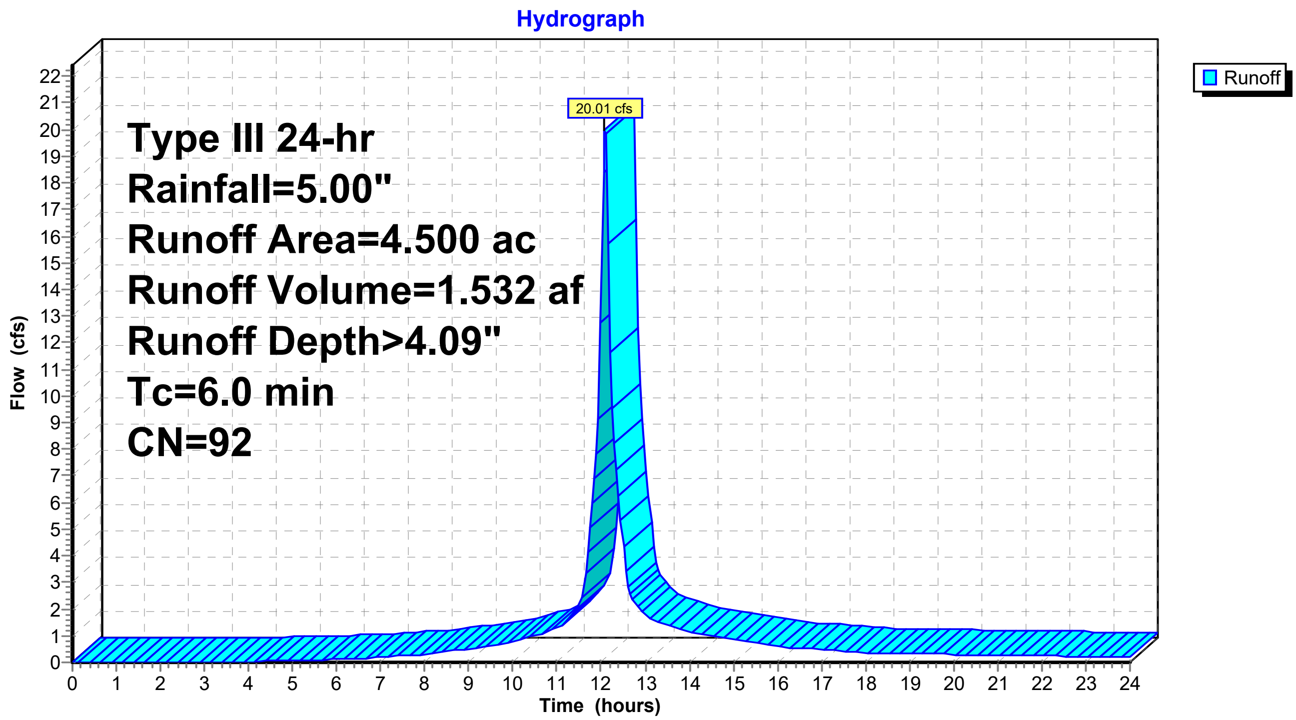
Runoff = 20.01 cfs @ 12.09 hrs, Volume= 1.532 af, Depth> 4.09"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	4.500	92	

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

Subcatchment 10: Bridge St. Area



Summary for Subcatchment 11: Parking Garage/Lot

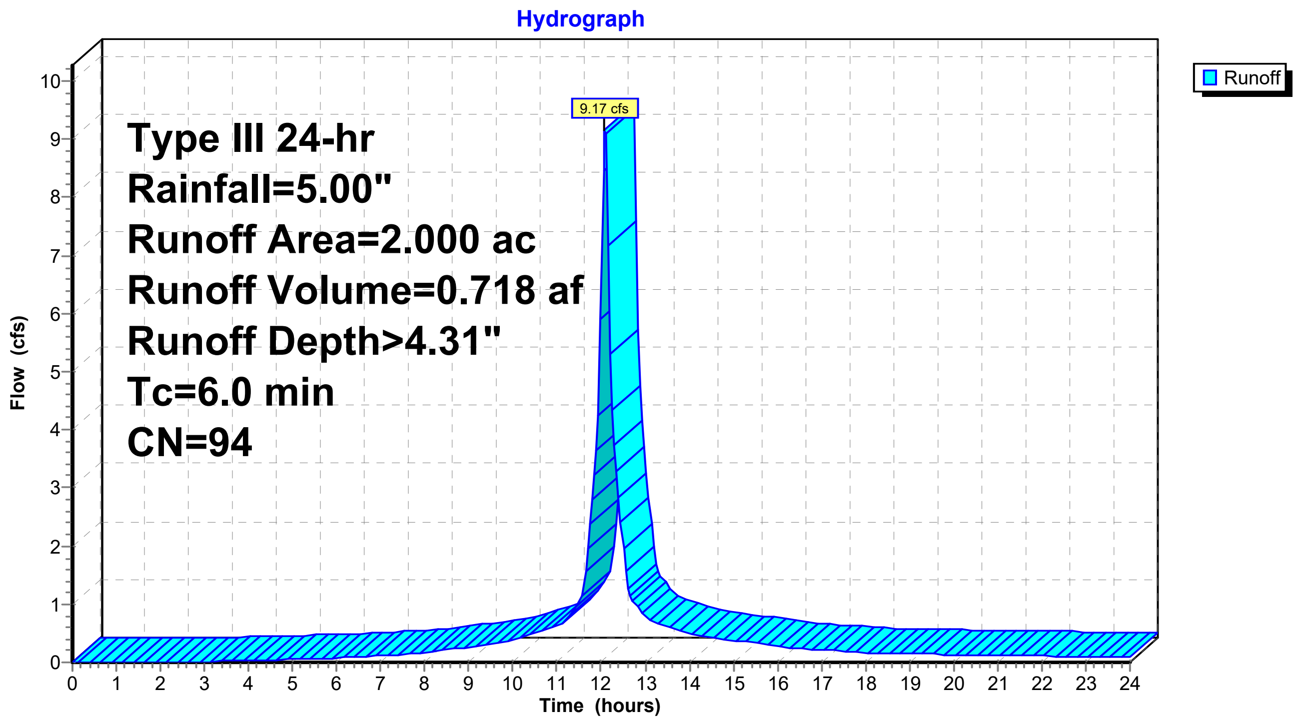
Runoff = 9.17 cfs @ 12.09 hrs, Volume= 0.718 af, Depth> 4.31"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	2.000	94	

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

Subcatchment 11: Parking Garage/Lot



Summary for Subcatchment 12: Deer Street

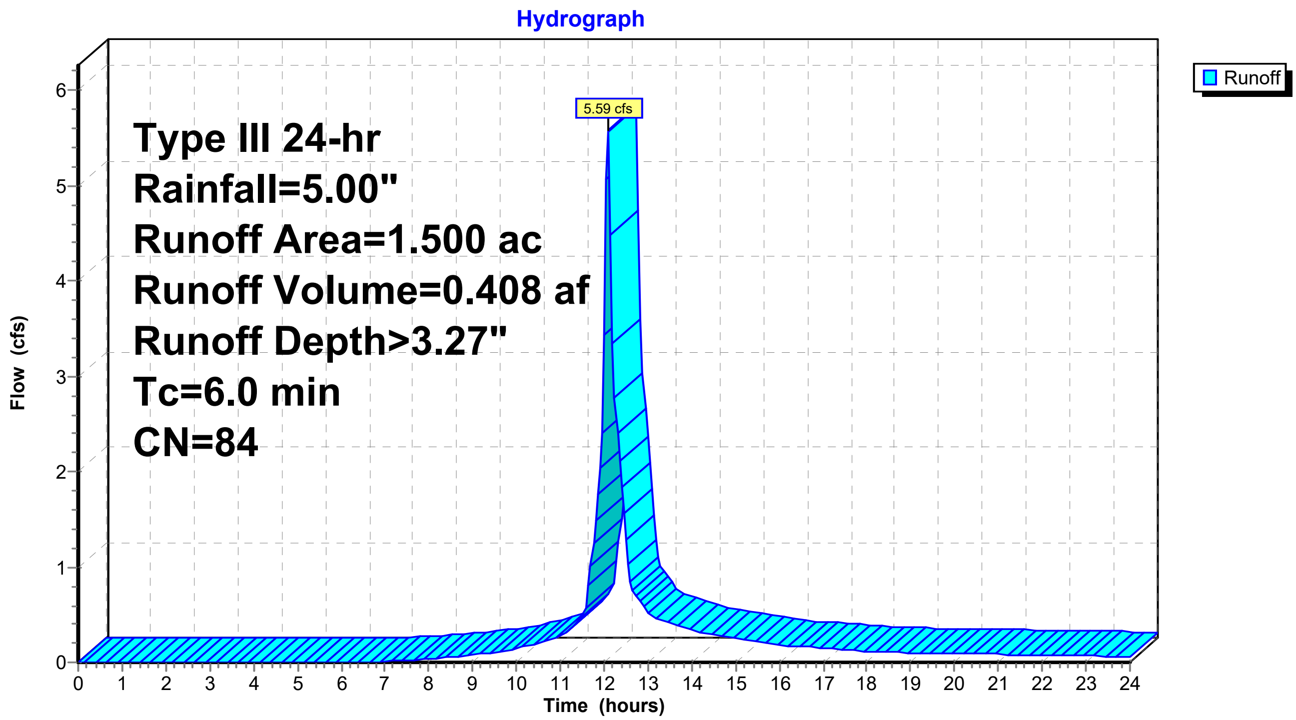
Runoff = 5.59 cfs @ 12.09 hrs, Volume= 0.408 af, Depth> 3.27"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	1.500	84	

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

Subcatchment 12: Deer Street



Summary for Subcatchment 12A: Maplewood/Deer Street area

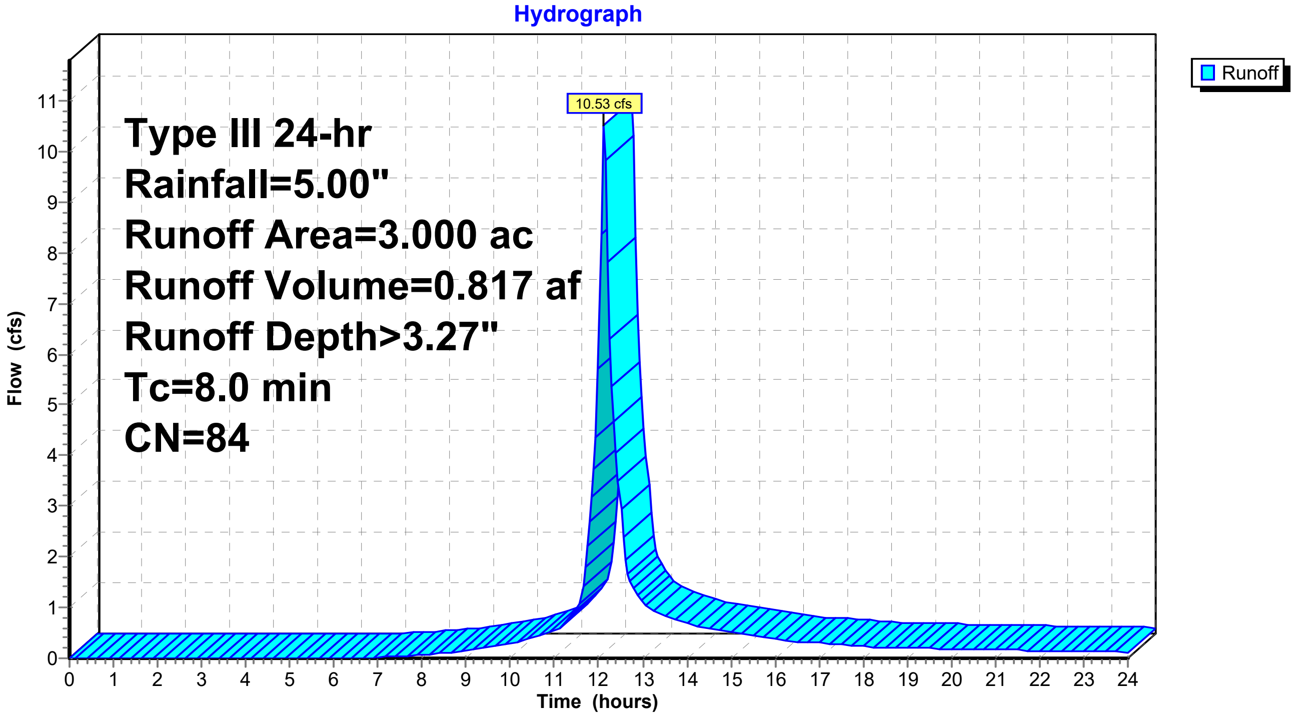
Runoff = 10.53 cfs @ 12.11 hrs, Volume= 0.817 af, Depth> 3.27"

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 Rainfall=5.00"

	Area (ac)	CN	Description
*	3.000	84	

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

Subcatchment 12A: Maplewood/Deer Street area



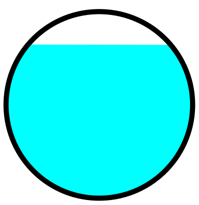
Summary for Reach 1R: Upper Fleet St. (Porter to Congress)

Inflow Area = 2.500 ac, Inflow Depth > 4.31"
Inflow = 11.47 cfs @ 12.09 hrs, Volume= 0.897 af
Outflow = 11.27 cfs @ 12.10 hrs, Volume= 0.897 af, Atten= 2%, Lag= 0.7 min

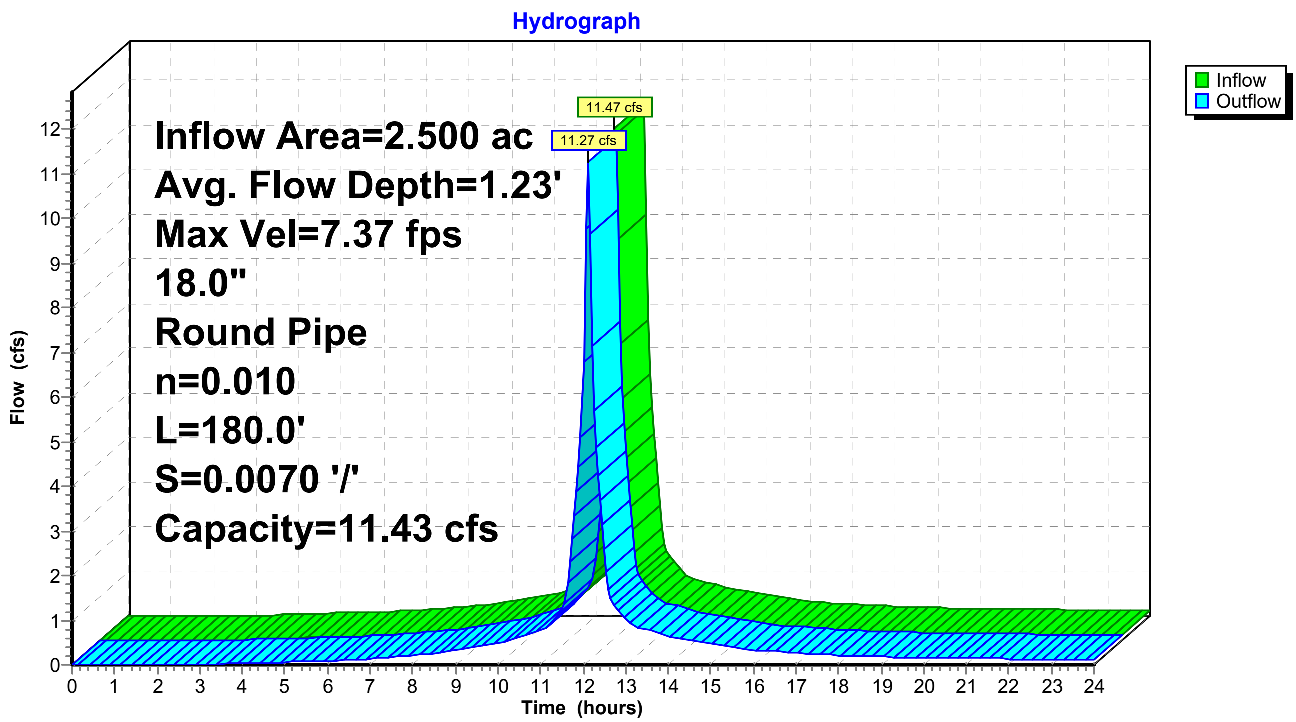
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.37 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.69 fps, Avg. Travel Time= 1.1 min

Peak Storage= 280 cf @ 12.09 hrs
Average Depth at Peak Storage= 1.23'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.43 cfs

18.0" Round Pipe
n= 0.010
Length= 180.0' Slope= 0.0070 '/'
Inlet Invert= 0.00', Outlet Invert= -1.26'



Reach 1R: Upper Fleet St. (Porter to Congress)



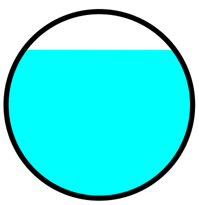
Summary for Reach 2R: Fleet St. (West of Congress)

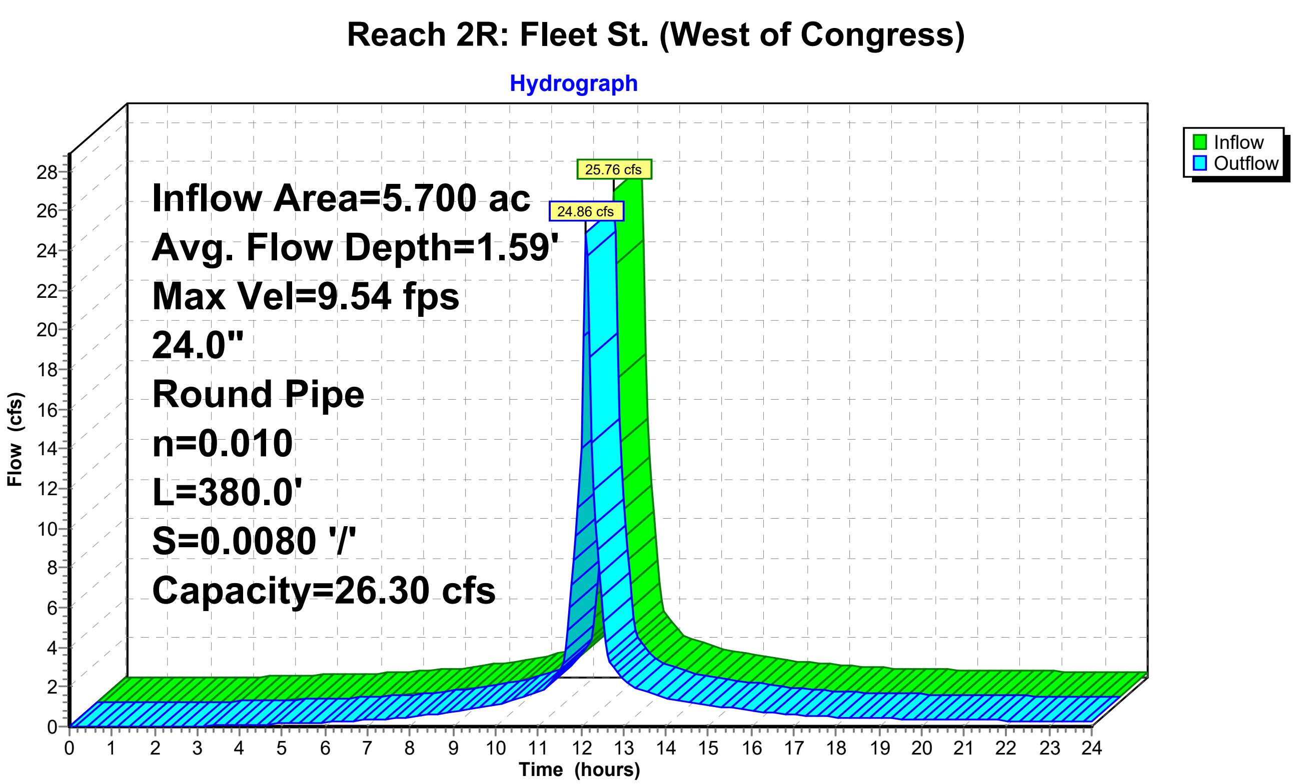
Inflow Area = 5.700 ac, Inflow Depth > 4.35"
Inflow = 25.76 cfs @ 12.10 hrs, Volume= 2.065 af
Outflow = 24.86 cfs @ 12.12 hrs, Volume= 2.064 af, Atten= 4%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.54 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 3.40 fps, Avg. Travel Time= 1.9 min

Peak Storage= 1,017 cf @ 12.11 hrs
Average Depth at Peak Storage= 1.59'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 26.30 cfs

24.0" Round Pipe
n= 0.010
Length= 380.0' Slope= 0.0080 '/'
Inlet Invert= 0.00', Outlet Invert= -3.04'





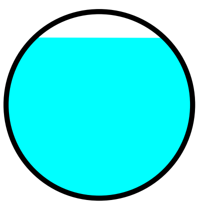
Summary for Reach 3R: Fleet St. to Hanover

Inflow Area = 7.000 ac, Inflow Depth > 4.38"
Inflow = 30.71 cfs @ 12.11 hrs, Volume= 2.555 af
Outflow = 30.45 cfs @ 12.12 hrs, Volume= 2.554 af, Atten= 1%, Lag= 0.3 min

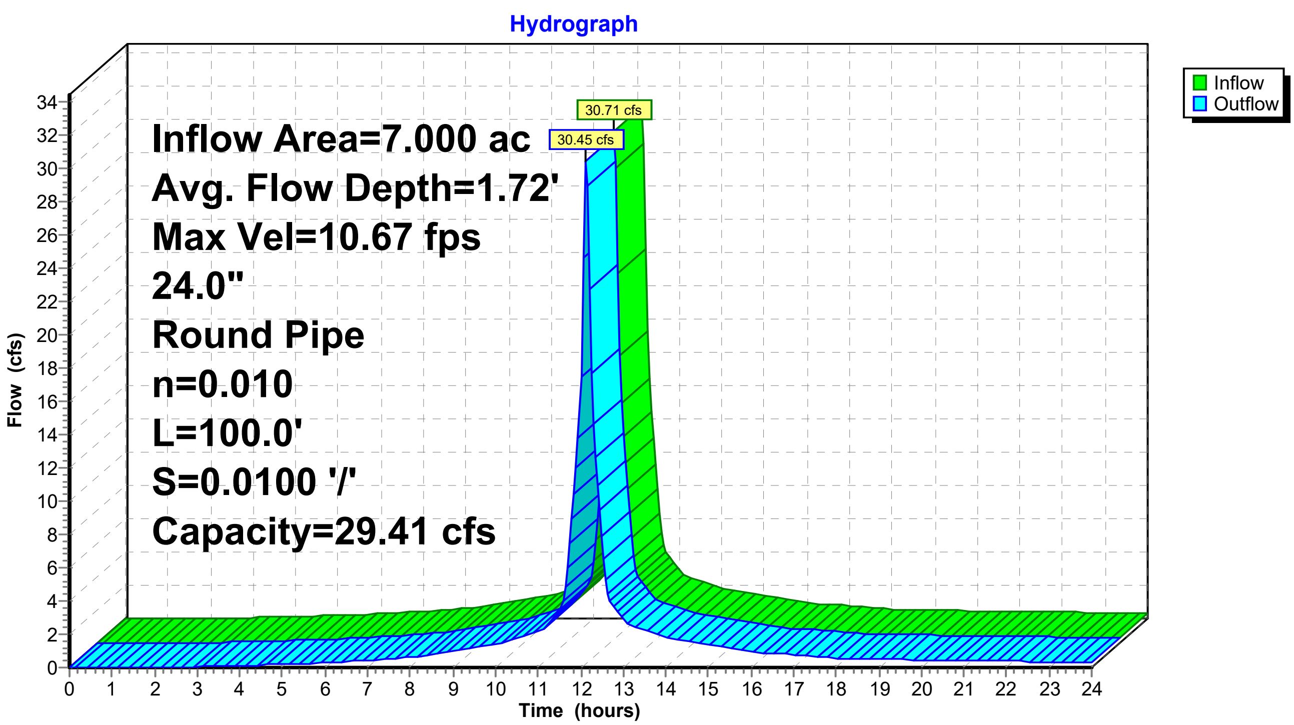
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.67 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.92 fps, Avg. Travel Time= 0.4 min

Peak Storage= 288 cf @ 12.11 hrs
Average Depth at Peak Storage= 1.72'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 29.41 cfs

24.0" Round Pipe
n= 0.010
Length= 100.0' Slope= 0.0100 '/'
Inlet Invert= 0.00', Outlet Invert= -1.00'



Reach 3R: Fleet St. to Hanover



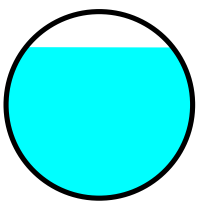
Summary for Reach 4R: Hanover - Downstream from Fleet

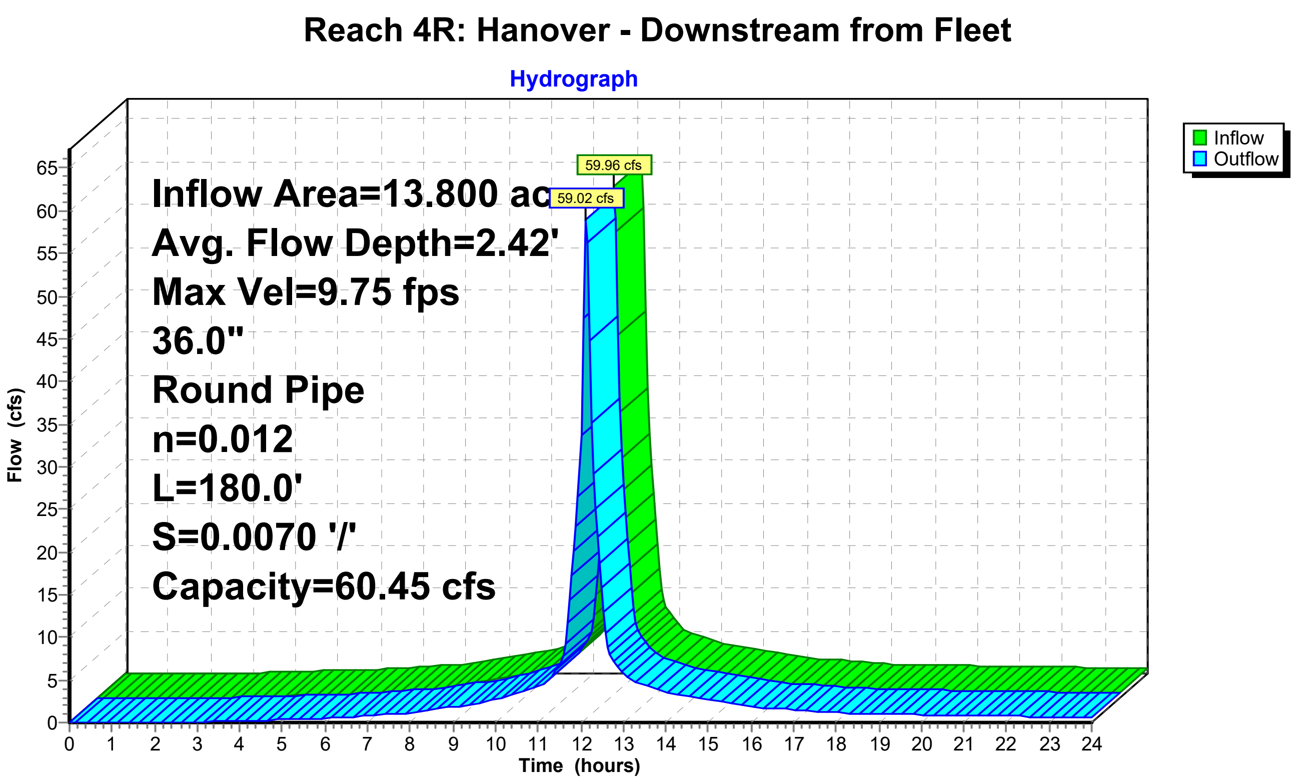
Inflow Area = 13.800 ac, Inflow Depth > 4.32"
Inflow = 59.96 cfs @ 12.11 hrs, Volume= 4.969 af
Outflow = 59.02 cfs @ 12.12 hrs, Volume= 4.968 af, Atten= 2%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.75 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.52 fps, Avg. Travel Time= 0.9 min

Peak Storage= 1,102 cf @ 12.11 hrs
Average Depth at Peak Storage= 2.42'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 60.45 cfs

36.0" Round Pipe
n= 0.012
Length= 180.0' Slope= 0.0070 '/'
Inlet Invert= 0.00', Outlet Invert= -1.26'





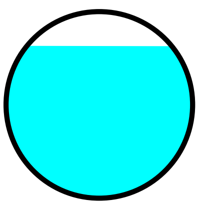
Summary for Reach 5R: Congress to Fleet

Inflow Area = 2.100 ac, Inflow Depth > 4.31"
Inflow = 9.63 cfs @ 12.09 hrs, Volume= 0.753 af
Outflow = 9.38 cfs @ 12.10 hrs, Volume= 0.753 af, Atten= 3%, Lag= 1.0 min

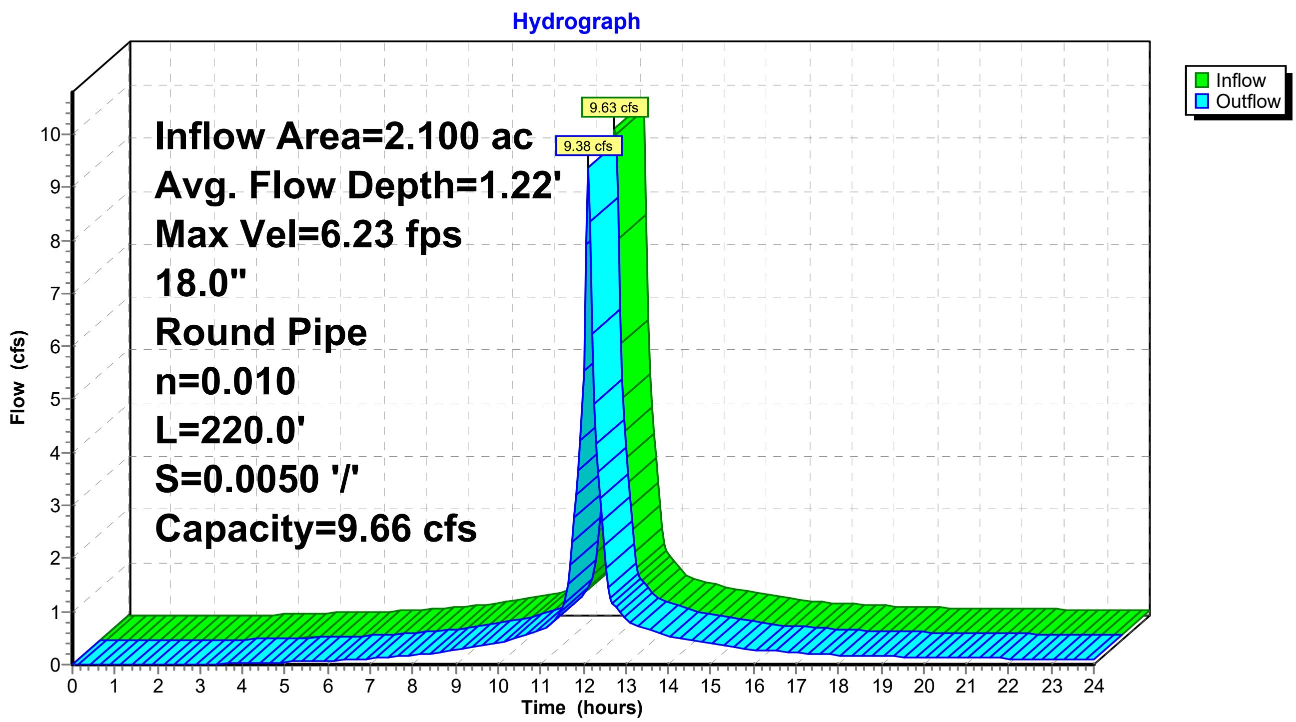
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.23 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.27 fps, Avg. Travel Time= 1.6 min

Peak Storage= 339 cf @ 12.10 hrs
Average Depth at Peak Storage= 1.22'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 9.66 cfs

18.0" Round Pipe
n= 0.010
Length= 220.0' Slope= 0.0050 '/'
Inlet Invert= 0.00', Outlet Invert= -1.10'



Reach 5R: Congress to Fleet



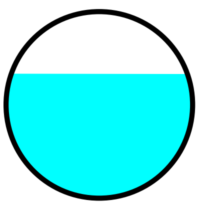
Summary for Reach 6R: Upper Vaughn Mall

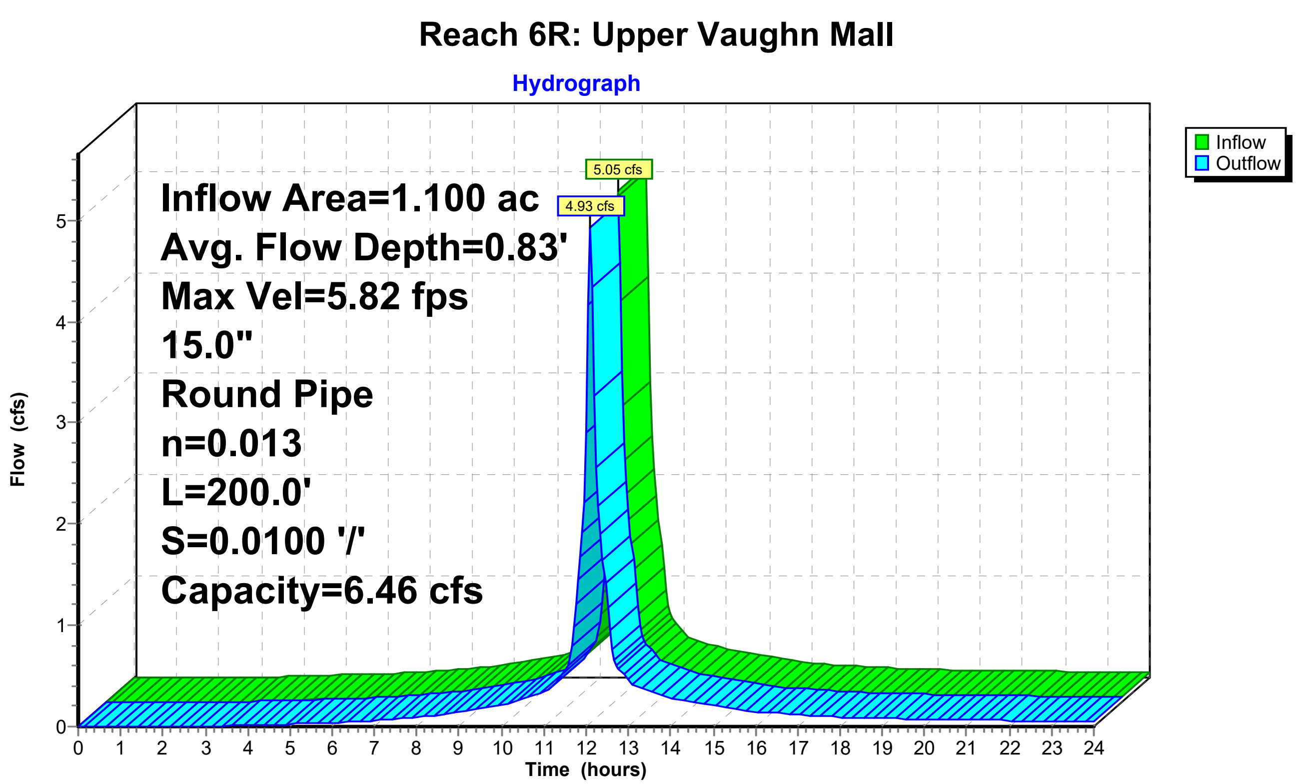
Inflow Area = 1.100 ac, Inflow Depth > 4.31"
Inflow = 5.05 cfs @ 12.09 hrs, Volume= 0.395 af
Outflow = 4.93 cfs @ 12.10 hrs, Volume= 0.394 af, Atten= 2%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.82 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.03 fps, Avg. Travel Time= 1.6 min

Peak Storage= 173 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.83'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 6.46 cfs

15.0" Round Pipe
n= 0.013
Length= 200.0' Slope= 0.0100 '/'
Inlet Invert= 0.00', Outlet Invert= -2.00'





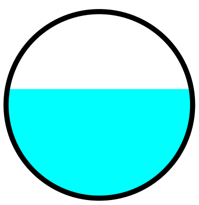
Summary for Reach 7R: Lower Vaughn Mall to Hanover

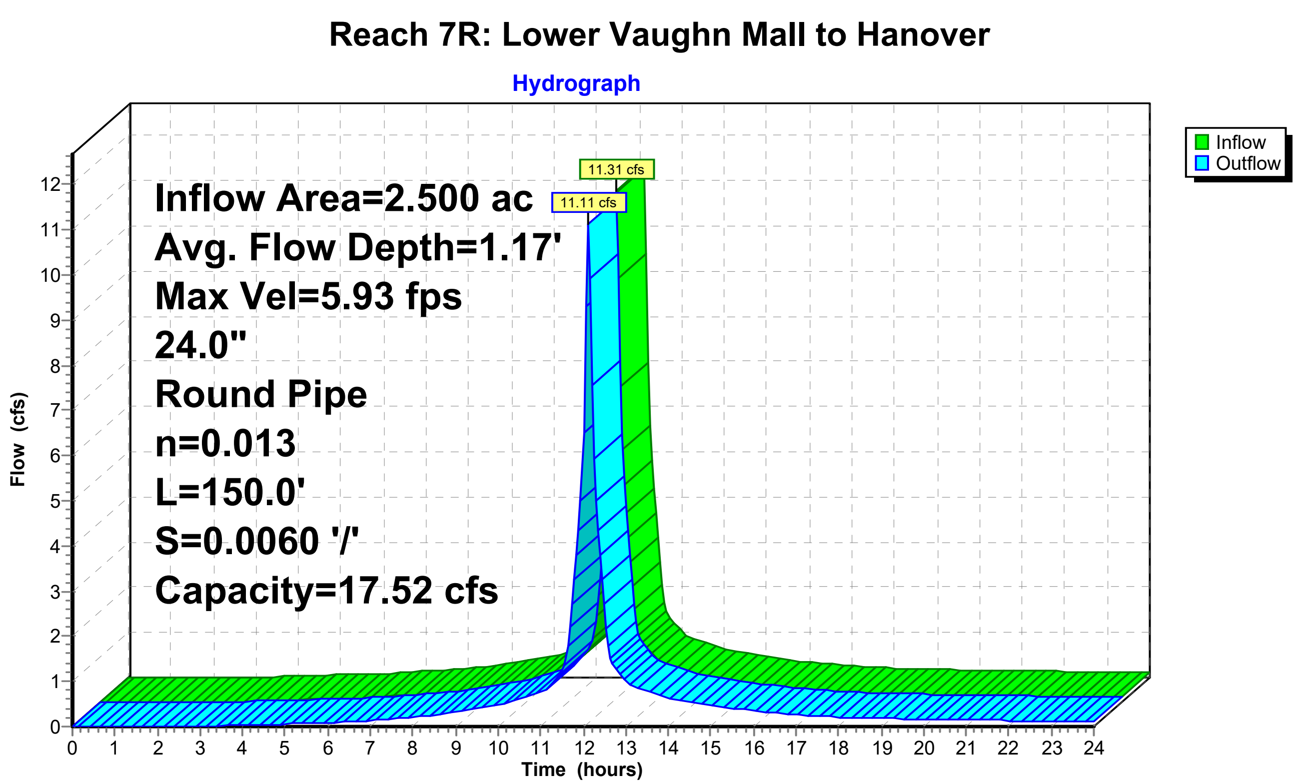
Inflow Area = 2.500 ac, Inflow Depth > 4.30"
Inflow = 11.31 cfs @ 12.09 hrs, Volume= 0.897 af
Outflow = 11.11 cfs @ 12.11 hrs, Volume= 0.896 af, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.93 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.04 fps, Avg. Travel Time= 1.2 min

Peak Storage= 286 cf @ 12.10 hrs
Average Depth at Peak Storage= 1.17'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 17.52 cfs

24.0" Round Pipe
n= 0.013
Length= 150.0' Slope= 0.0060 '/'
Inlet Invert= 0.00', Outlet Invert= -0.90'





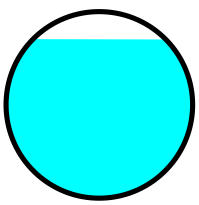
Summary for Reach 8R: Exist. 36" RCP, Downstream of V. Mall

Inflow Area = 17.500 ac, Inflow Depth > 4.30"
Inflow = 75.20 cfs @ 12.11 hrs, Volume= 6.273 af
Outflow = 74.07 cfs @ 12.12 hrs, Volume= 6.272 af, Atten= 2%, Lag= 0.6 min

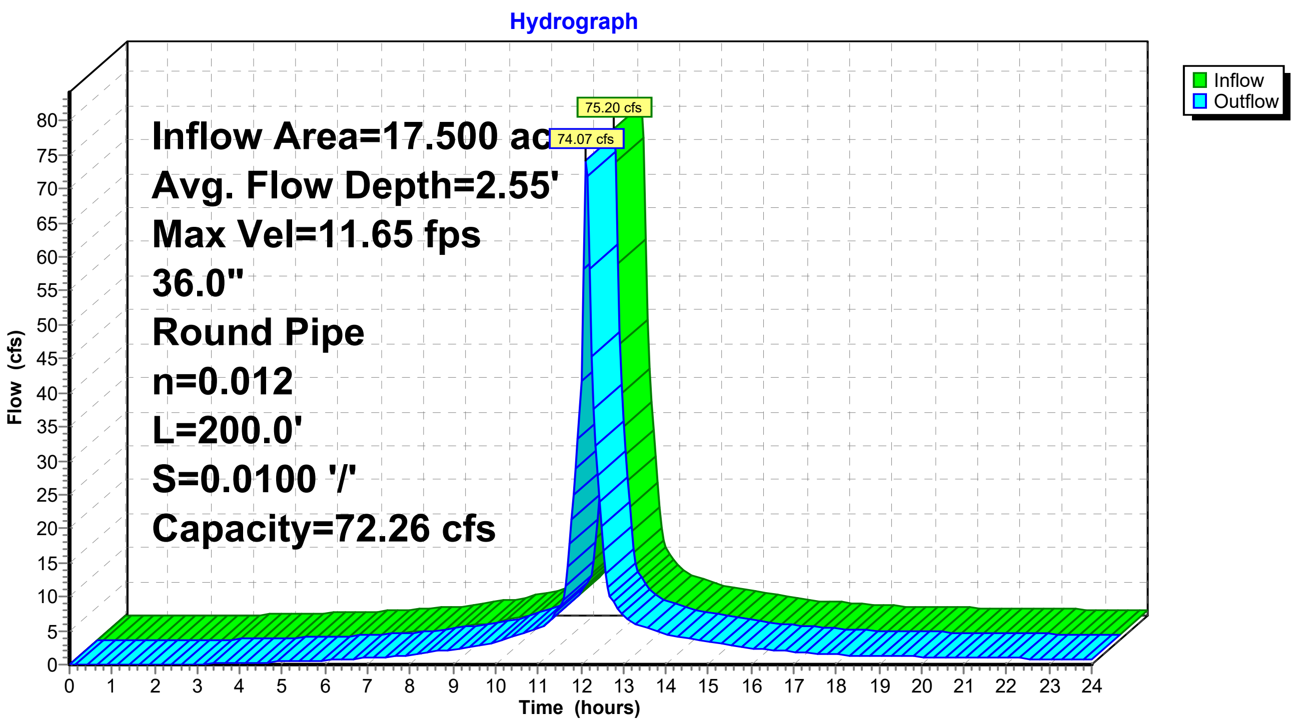
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.65 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 4.27 fps, Avg. Travel Time= 0.8 min

Peak Storage= 1,285 cf @ 12.12 hrs
Average Depth at Peak Storage= 2.55'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 72.26 cfs

36.0" Round Pipe
n= 0.012
Length= 200.0' Slope= 0.0100 '/'
Inlet Invert= 0.00', Outlet Invert= -2.00'



Reach 8R: Exist. 36" RCP, Downstream of V. Mall



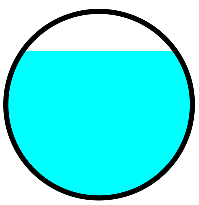
Summary for Reach 9AR: Maplewood Intercept

Inflow Area = 19.300 ac, Inflow Depth > 3.89"
Inflow = 65.53 cfs @ 12.12 hrs, Volume= 6.255 af
Outflow = 65.38 cfs @ 12.12 hrs, Volume= 6.255 af, Atten= 0%, Lag= 0.1 min

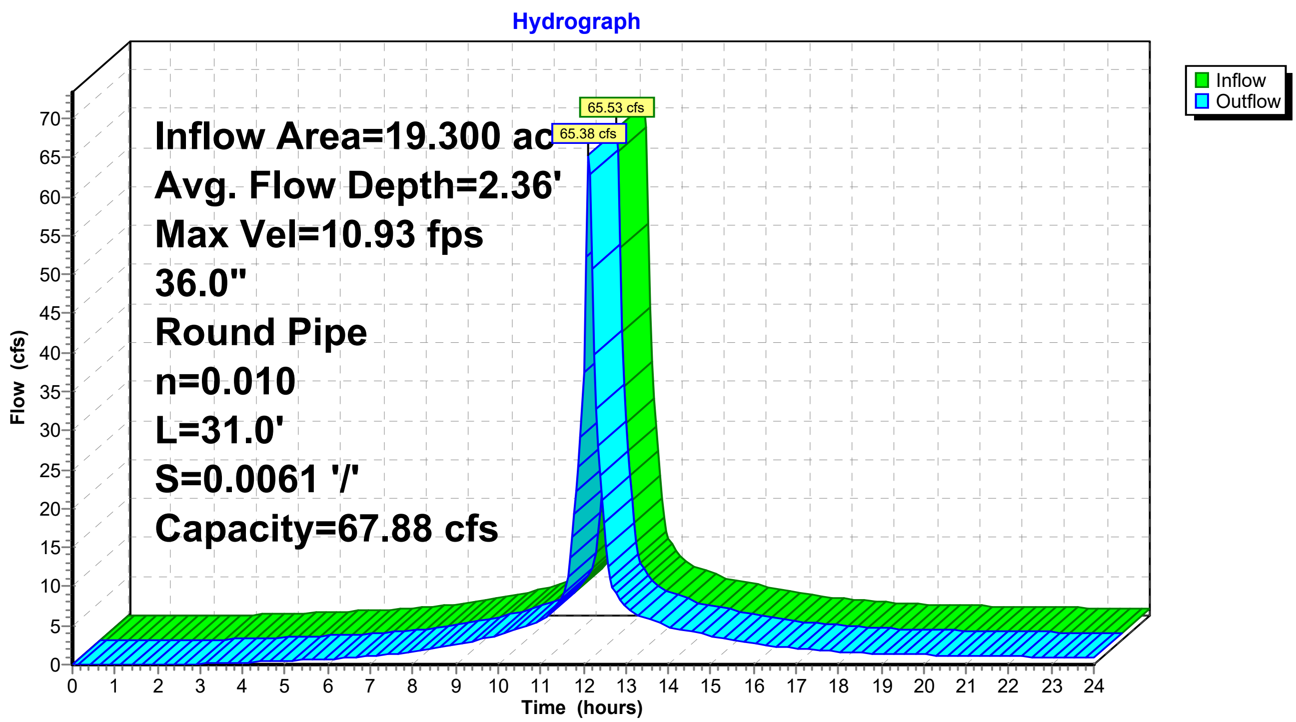
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.93 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.18 fps, Avg. Travel Time= 0.1 min

Peak Storage= 185 cf @ 12.12 hrs
Average Depth at Peak Storage= 2.36'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 67.88 cfs

36.0" Round Pipe
n= 0.010
Length= 31.0' Slope= 0.0061 '/'
Inlet Invert= 0.00', Outlet Invert= -0.19'



Reach 9AR: Maplewood Intercept



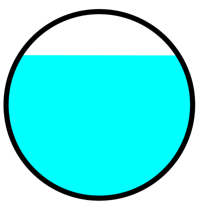
Summary for Reach 9BR: Maplewood Intercept

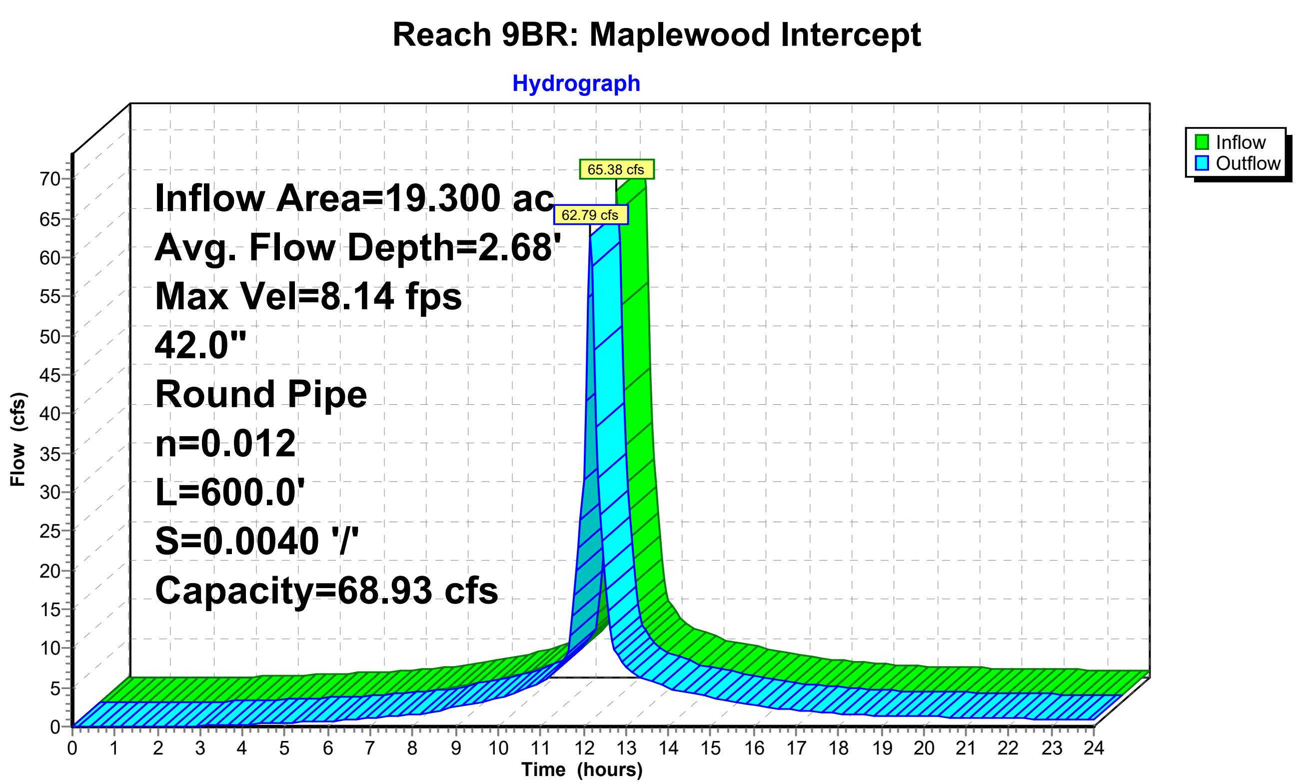
Inflow Area = 19.300 ac, Inflow Depth > 3.89"
Inflow = 65.38 cfs @ 12.12 hrs, Volume= 6.255 af
Outflow = 62.79 cfs @ 12.16 hrs, Volume= 6.249 af, Atten= 4%, Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.14 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 3.10 fps, Avg. Travel Time= 3.2 min

Peak Storage= 4,740 cf @ 12.14 hrs
Average Depth at Peak Storage= 2.68'
Bank-Full Depth= 3.50' Flow Area= 9.6 sf, Capacity= 68.93 cfs

42.0" Round Pipe
n= 0.012
Length= 600.0' Slope= 0.0040 '/'
Inlet Invert= 0.00', Outlet Invert= -2.40'





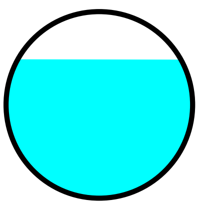
Summary for Reach 10R: Upper Bridge St.

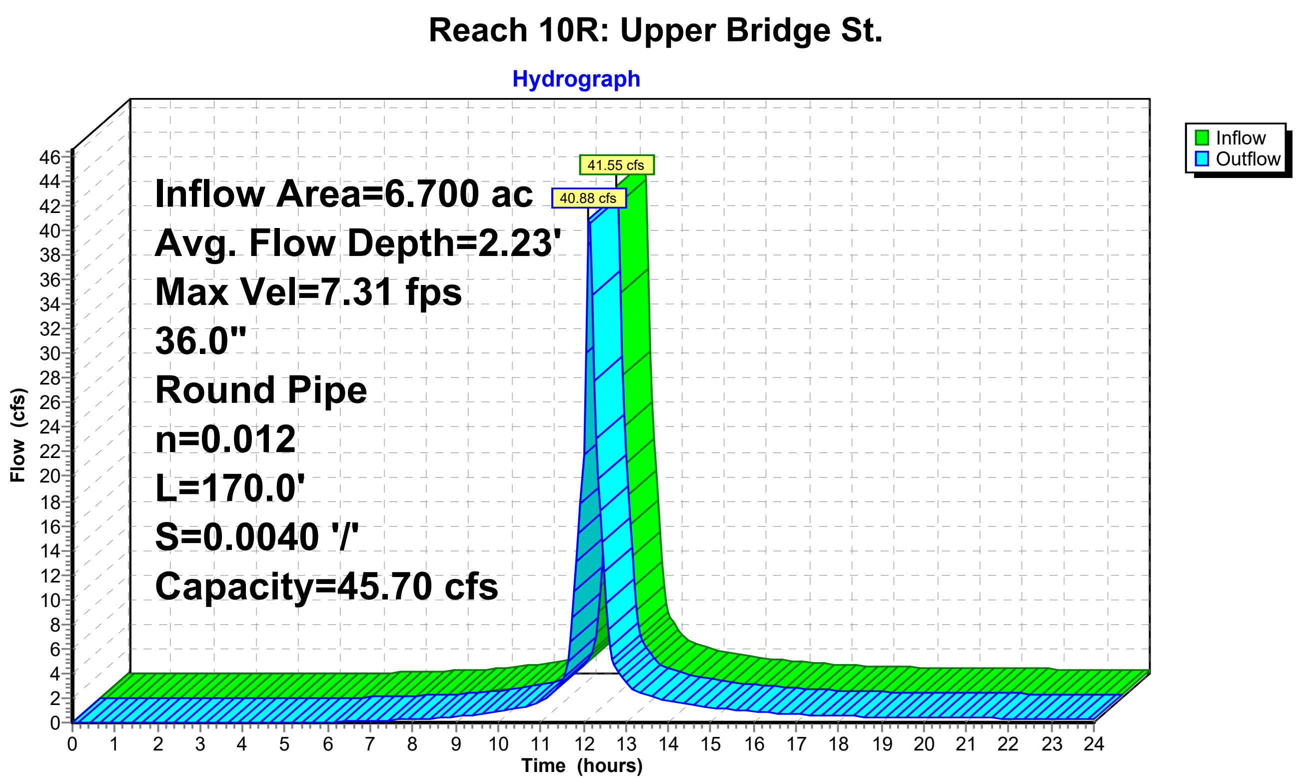
Inflow Area = 6.700 ac, Inflow Depth > 4.91"
Inflow = 41.55 cfs @ 12.12 hrs, Volume= 2.742 af
Outflow = 40.88 cfs @ 12.14 hrs, Volume= 2.741 af, Atten= 2%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.31 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.41 fps, Avg. Travel Time= 1.2 min

Peak Storage= 959 cf @ 12.13 hrs
Average Depth at Peak Storage= 2.23'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 45.70 cfs

36.0" Round Pipe
n= 0.012
Length= 170.0' Slope= 0.0040 '/'
Inlet Invert= 0.00', Outlet Invert= -0.68'





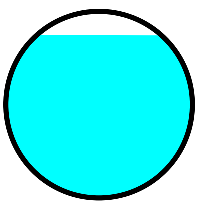
Summary for Reach 11R: Bridge Street Sag

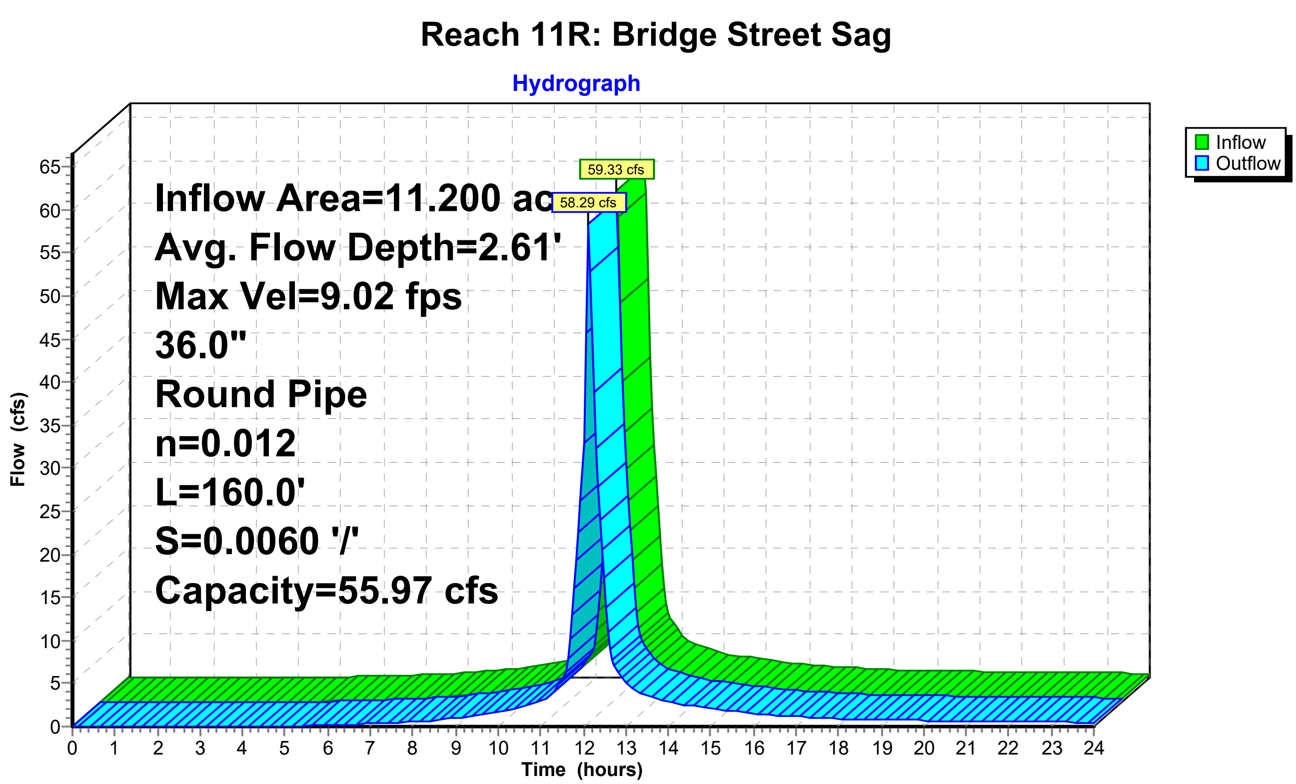
Inflow Area = 11.200 ac, Inflow Depth > 4.58"
Inflow = 59.33 cfs @ 12.12 hrs, Volume= 4.274 af
Outflow = 58.29 cfs @ 12.13 hrs, Volume= 4.273 af, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.02 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.12 fps, Avg. Travel Time= 0.9 min

Peak Storage= 1,049 cf @ 12.12 hrs
Average Depth at Peak Storage= 2.61'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 55.97 cfs

36.0" Round Pipe
n= 0.012
Length= 160.0' Slope= 0.0060 '/'
Inlet Invert= 0.00', Outlet Invert= -0.96'





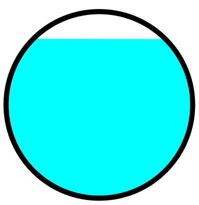
Summary for Reach 12CR: x-cntry intercept

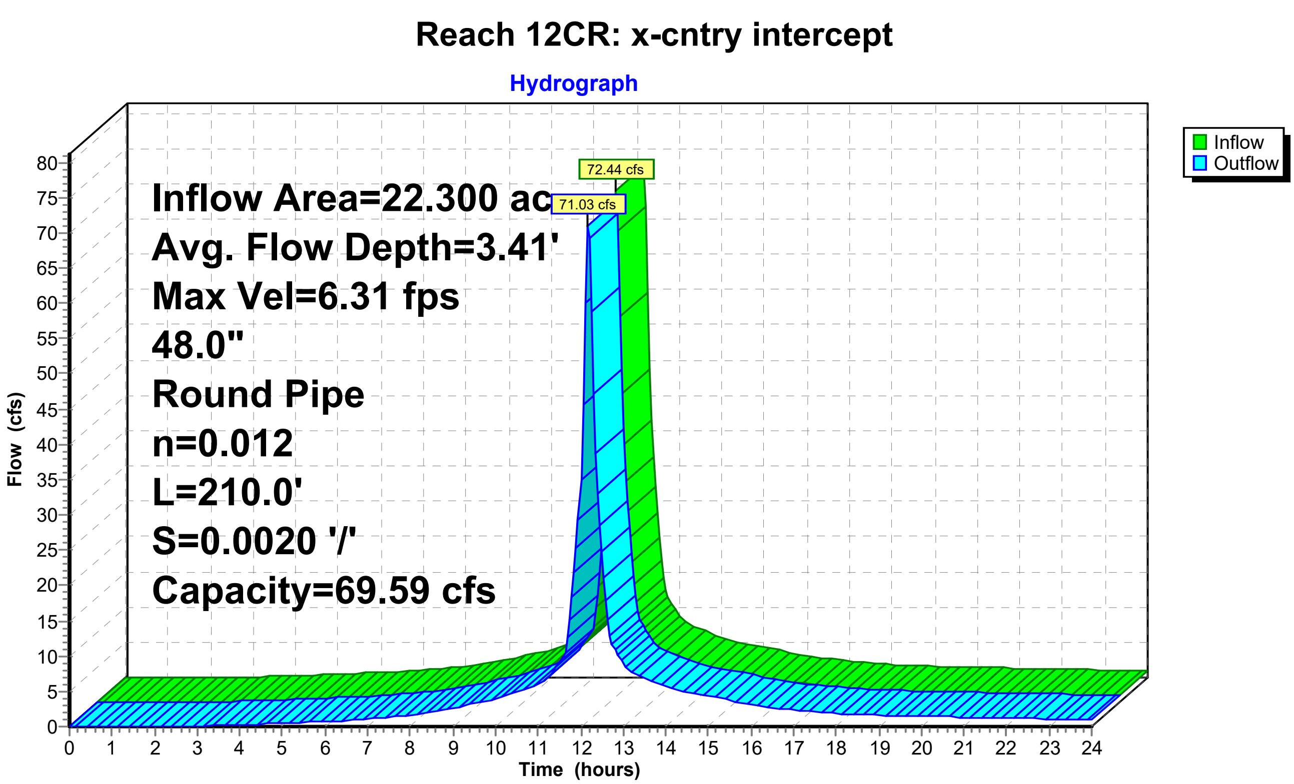
Inflow Area = 22.300 ac, Inflow Depth > 3.80"
Inflow = 72.44 cfs @ 12.15 hrs, Volume= 7.066 af
Outflow = 71.03 cfs @ 12.17 hrs, Volume= 7.062 af, Atten= 2%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.31 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.46 fps, Avg. Travel Time= 1.4 min

Peak Storage= 2,400 cf @ 12.16 hrs
Average Depth at Peak Storage= 3.41'
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 69.59 cfs

48.0" Round Pipe
n= 0.012
Length= 210.0' Slope= 0.0020 '/'
Inlet Invert= 0.00', Outlet Invert= -0.42'





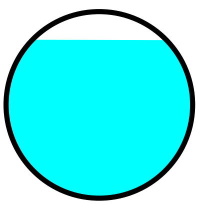
Summary for Reach 12R: Deer Street

Inflow Area = 14.700 ac, Inflow Depth > 4.41"
Inflow = 72.39 cfs @ 12.12 hrs, Volume= 5.399 af
Outflow = 70.96 cfs @ 12.13 hrs, Volume= 5.397 af, Atten= 2%, Lag= 1.0 min

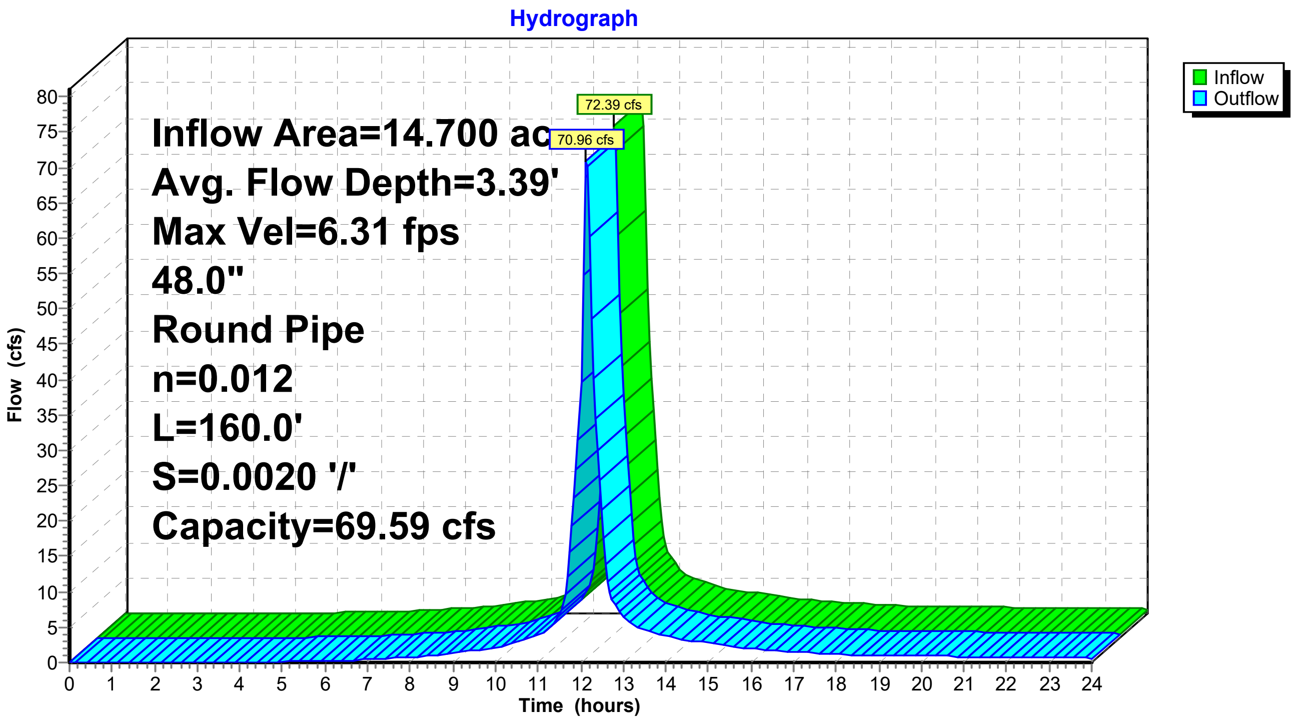
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.31 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.16 fps, Avg. Travel Time= 1.2 min

Peak Storage= 1,823 cf @ 12.12 hrs
Average Depth at Peak Storage= 3.39'
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 69.59 cfs

48.0" Round Pipe
n= 0.012
Length= 160.0' Slope= 0.0020 '/'
Inlet Invert= 0.00', Outlet Invert= -0.32'



Reach 12R: Deer Street



Summary for Pond 9: DMH #6 (Flow Splitter)

Inflow Area = 19.300 ac, Inflow Depth > 4.32"
Inflow = 82.02 cfs @ 12.12 hrs, Volume= 6.951 af
Outflow = 82.02 cfs @ 12.12 hrs, Volume= 6.951 af, Atten= 0%, Lag= 0.0 min
Primary = 65.53 cfs @ 12.12 hrs, Volume= 6.255 af
Secondary = 16.49 cfs @ 12.12 hrs, Volume= 0.696 af

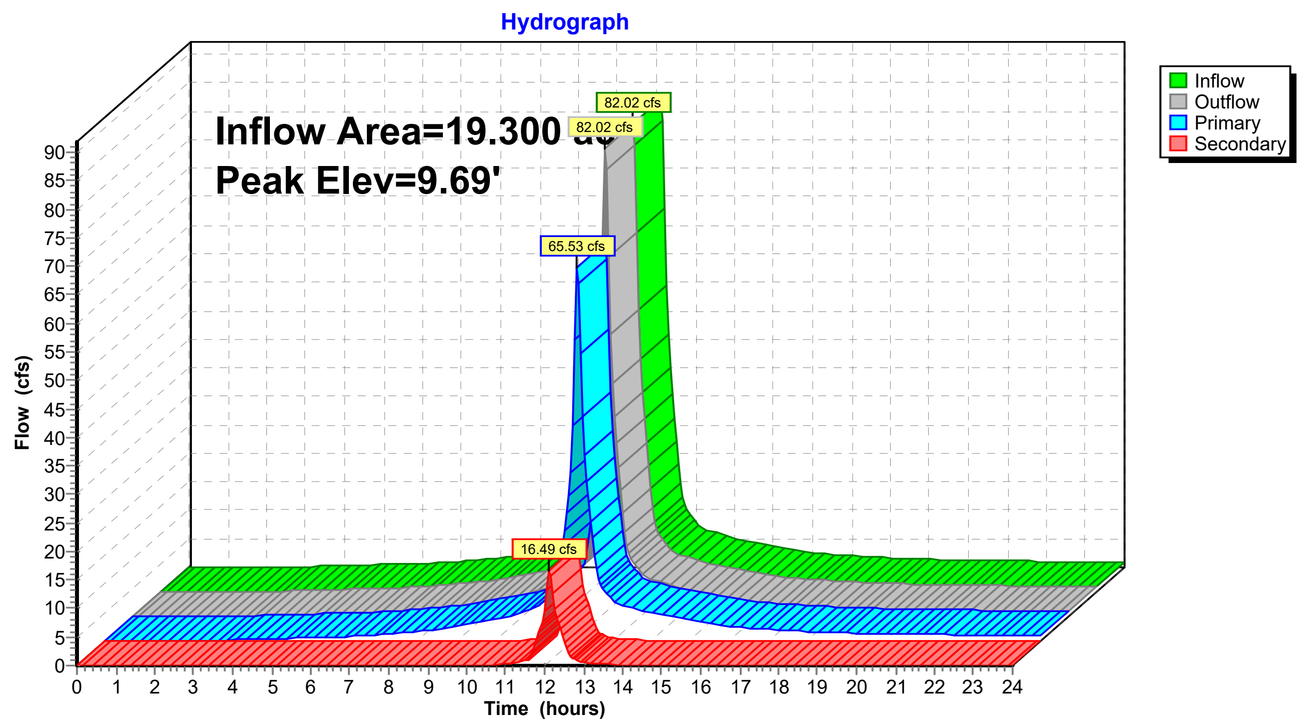
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 9.69' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	4.50'	**36.0" Vert. Orifice/Grate** C= 0.600
#2	Secondary	5.20'	**18.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=63.94 cfs @ 12.12 hrs HW=9.53' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 63.94 cfs @ 9.05 fps)

Secondary OutFlow Max=16.10 cfs @ 12.12 hrs HW=9.53' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 16.10 cfs @ 9.11 fps)

Pond 9: DMH #6 (Flow Splitter)



Summary for Pond 13: Twin 48" Outfall Pipes

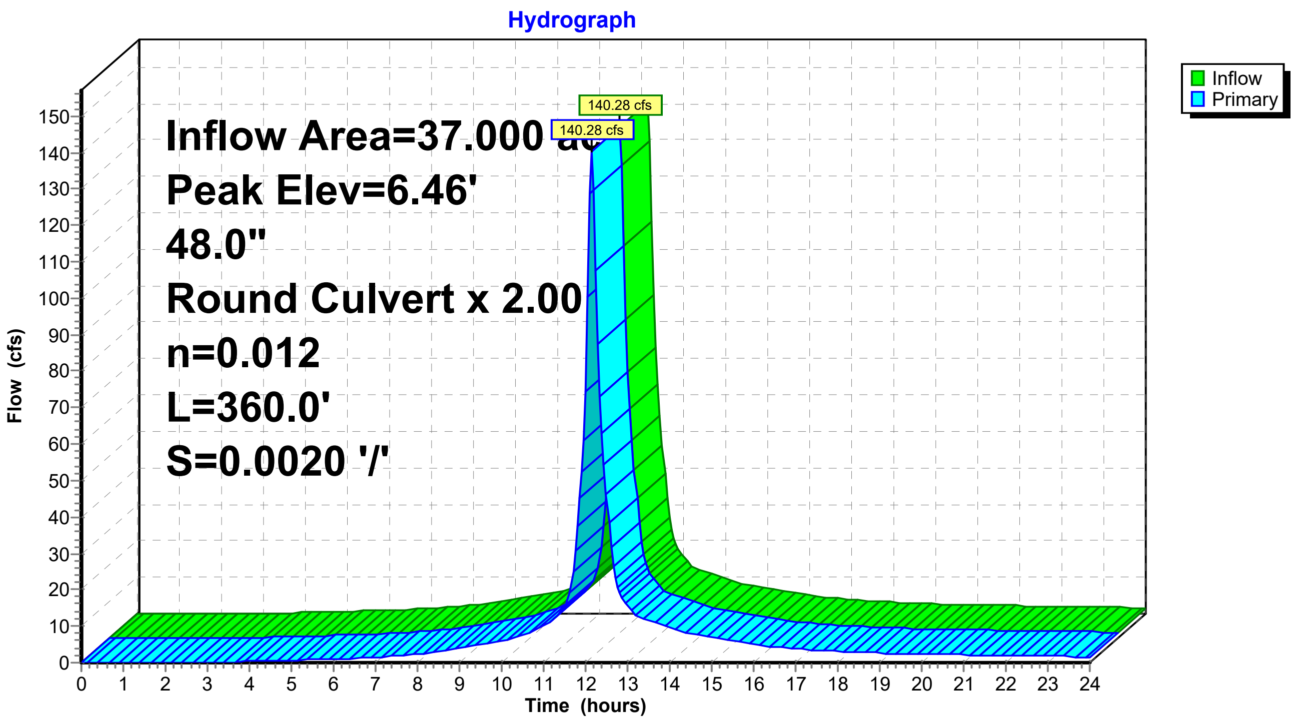
Inflow Area = 37.000 ac, Inflow Depth > 4.04"
Inflow = 140.28 cfs @ 12.15 hrs, Volume= 12.459 af
Outflow = 140.28 cfs @ 12.15 hrs, Volume= 12.459 af, Atten= 0%, Lag= 0.0 min
Primary = 140.28 cfs @ 12.15 hrs, Volume= 12.459 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 6.46' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	-0.40'	**48.0" Round New 48" X 2.00** L= 360.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= -0.40' / -1.12' S= 0.0020 '/' Cc= 0.900 n= 0.012, Flow Area= 12.57 sf

Primary OutFlow Max=140.08 cfs @ 12.15 hrs HW=6.46' TW=5.00' (Fixed TW Elev= 5.00')
↑—**1=New 48"** (Outlet Controls 140.08 cfs @ 5.57 fps)

Pond 13: Twin 48" Outfall Pipes



STANDARD DREDGE AND FILL WETLANDS PERMIT APPLICATION ATTACHMENT A: MINOR AND MAJOR PROJECTS

Water Division/Land Resources Management
Wetlands Bureau
Check the Status of your Application

RSA/ Rule: RSA 482-A/ Env-Wt 311.10; Env-Wt 313.01(a)(1); Env-Wt 313.03

APPLICANT'S NAME: **City of Portsmouth** **TOWN NAME:** City of Portsmouth

Attachment A is required for *all minor and major projects*, and must be completed *in addition* to the Avoidance and Minimization Narrative or Checklist that is required by Env-Wt 307.11.

For projects involving construction or modification of non-tidal shoreline structures over areas of surface waters having an absence of wetland vegetation, only Sections I.X through I.XV are required to be completed.

PART I: AVOIDANCE AND MINIMIZATION
In accordance with Env-Wt 313.03(a), the Department shall not approve any alteration of any jurisdictional area unless the applicant demonstrates that the potential impacts to jurisdictional areas have been avoided to the maximum extent practicable and that any unavoidable impacts have been minimized, as described in the Wetlands Best Management Practice Techniques For Avoidance and Minimization.
SECTION I.I - ALTERNATIVES (Env-Wt 313.03(b)(1)) Describe how there is no practicable alternative that would have a less adverse impact on the area and environments under the Department's jurisdiction.
THE ADDITION OF THE NEW PIPE PARALLEL TO THE EXISTING OUTFALL WILL LIMIT IMPACTS TO TIDAL EMBANKMENT WHERE EXISTING UTILITIES ALREADY EXIST. THIS IS MORE DESIREABLE THAN PROPOSING AN OUTFALL IN A NEW LOCATION THAT HAS BEEN PREVIOUSLY UNDISTURBED. THE GENERAL LOCATION OF THE OUTFALL IS ALSO ADJACENT TO A LOCATION THAT HAS BEEN PRE-DEVELOPED (PAVED LOT AND WAREHOUSE OR STABILIZED SHORE LINE). THEREFORE, OF ALL PRACTICABLE ALTERNATIVES, THE PROPOSED ALTERNATIVE WILL HAVE THE LEAST ADVERSE IMPACT ON THE AREA AND ENVIRONMENTS UNDER THE DEPARTMENT'S JURISDICTION.

SECTION I.II - MARSHES (Env-Wt 313.03(b)(2)) Describe how the project avoids and minimizes impacts to tidal marshes and non-tidal marshes where documented to provide sources of nutrients for finfish, crustacean, shellfish, and wildlife of significant value.
Proposed mitigation work adjacent to the outfall will re-establish a marsh in an area where they may have been one historically. The WPPT shows some limited marsh just to the east of the impact area and there is evidence of localized high marsh adjacent to the outfall and on the edge of the marsh restoration area. See Photos #9 and #11

SECTION I.III - HYDROLOGIC CONNECTION (Env-Wt 313.03(b)(3)) Describe how the project maintains hydrologic connections between adjacent wetland or stream systems.
The proposed work will not impact any existing hydrologic connections between adjacent wetland or stream systems.

SECTION I.IV - JURISDICTIONAL IMPACTS (Env-Wt 313.03(b)(4)) Describe how the project avoids and minimizes impacts to wetlands and other areas of jurisdiction under RSA 482-A, especially those in which there are exemplary natural communities, vernal pools, protected species and habitat, documented fisheries, and habitat and reproduction areas for species of concern, or any combination thereof.
The proposed work will be limited to the tidal embankment at North Mill Pond where an outfall currently exists. Per the Natural Heritage Bureau (NHB) data check one instance of the american eel was reported in the vicinity of the project area. A consultation with HFG has been requested to complete their environmental review for the project. Per the WPPT there are no prime wetlands or aquaculture sites in the vicinity of the project area.

SECTION I.V - PUBLIC COMMERCE, NAVIGATION, OR RECREATION (Env-Wt 313.03(b)(5)) Describe how the project avoids and minimizes impacts that eliminate, depreciate or obstruct public commerce, navigation, or recreation.
Impacts that eliminate, depreciate or obstruct public commerce, navigation, or recreation are not anticipated as a result of this project.

SECTION I.VI - FLOODPLAIN WETLANDS (Env-Wt 313.03(b)(6)) Describe how the project avoids and minimizes impacts to floodplain wetlands that provide flood storage.
There are no are no floodplains in the project area and impacts to those types or wetlands are not anticipated.

SECTION I.VII - RIVERINE FORESTED WETLAND SYSTEMS AND SCRUB-SHRUB – MARSH COMPLEXES (Env-Wt 313.03(b)(7)) Describe how the project avoids and minimizes impacts to natural riverine forested wetland systems and scrub-shrub – marsh complexes of high ecological integrity.
The WPPT described the impact area as mud flats. Therefore, no impacts to the wetlands categories listed.

SECTION I.VIII - DRINKING WATER SUPPLY AND GROUNDWATER AQUIFER LEVELS (Env-Wt 313.03(b)(8)) Describe how the project avoids and minimizes impacts to wetlands that would be detrimental to adjacent drinking water supply and groundwater aquifer levels.
There are no drinking water supplies in the vicinity of the project area.

SECTION I.IX - STREAM CHANNELS (Env-Wt 313.03(b)(9)) Describe how the project avoids and minimizes adverse impacts to stream channels and the ability of such channels to handle runoff of waters.
The project area is an outfall to a pond and no stream channels are impacted.

SECTION I.X - SHORELINE STRUCTURES - CONSTRUCTION SURFACE AREA (Env-Wt 313.03(c)(1))

Describe how the project has been designed to use the minimum construction surface area over surface waters necessary to meet the stated purpose of the structures.

The project will not require construction surface area over surface waters.

SECTION I.XI - SHORELINE STRUCTURES - LEAST INTRUSIVE UPON PUBLIC TRUST (Env-Wt 313.03(c)(2))

Describe how the type of construction proposed is the least intrusive upon the public trust that will ensure safe docking on the frontage.

North Mill Pond which has no docks is tidal with no water craft access due to the culvert/arch which connnects the pond hydraulically to the Piscataqua River. Therefore, the proposed work will not impact docking on the shoreline.

SECTION I.XII - SHORELINE STRUCTURES – ABUTTING PROPERTIES (Env-Wt 313.03(c)(3))

Describe how the structures have been designed to avoid and minimize impacts on ability of abutting owners to use and enjoy their properties.

The proposed drainage improvements are directly adjacent to existing drainage systems already located on abutting properties. The pipe have been placed as far to the edge as practical so that future development is not hindered. Abutting property owners have been provided draft easment documents and preliminary design plans for the outfall improvements and comments have been received. The proposed mitigation work is located within the tidal waters of the state and will not negatively impact future development by abutters.

SECTION I.XIII - SHORELINE STRUCTURES – COMMERCE AND RECREATION (Env-Wt 313.03(c)(4))

Describe how the structures have been designed to avoid and minimize impacts to the public's right to navigation, passage, and use of the resource for commerce and recreation.

The project impact area will be limited to the tidal embankment at North Mill Pond and will not cause any impacts to the public's right to navigation, passage, and use of the pond for commerce and recreation. The project is generally located on private property and public right to passge is limited. The project will improve grading at the outfall so that pipes and headwalls are no longer exposed as they are now. The stone apron will also allow for foot traffic (if any) to pass in front of the outfall at low tide rather than through the mud as is currently necessary. The outfall headwall will be relocated further into the bank and protrude less into the pond which will improve navigation of the shoreland for anyone recreating on the pond.

SECTION I.XIV - SHORELINE STRUCTURES – WATER QUALITY, AQUATIC VEGETATION, WILDLIFE AND FINFISH HABITAT (Env-Wt 313.03(c)(5))

Describe how the structures have been designed, located, and configured to avoid impacts to water quality, aquatic vegetation, and wildlife and finfish habitat.

The project impact area will be limited to the tidal embankment at North Mill Pond. Drainage improvements will include stormwater treatment to decrease the amount of nutrient pollutants discharged into North Mill Pond. Protective measures including temporary and permanent erosion control devices will be in place during construction to minimize any potential impacts that may occur. The outfall headwall will be relocated further into the bank and protrude less into the pond which will reduce its impact on the habitat. The proposed mitigation area will increase habitat diversity at the project site by re-establishing a marsh.

SECTION I.XV - SHORELINE STRUCTURES – VEGETATION REMOVAL, ACCESS POINTS, AND SHORELINE STABILITY (Env-Wt 313.03(c)(6))

Describe how the structures have been designed to avoid and minimize the removal of vegetation, the number of access points through wetlands or over the bank, and activities that may have an adverse effect on shoreline stability.

Minimal removal of vegetation will be required because the area is already partially developed and existing access points are available via paved driveways. The bank of the shoreline will be restored and stabilized and vegetation will be re-established once the construction of the new pipe and headwall is complete. The proposed mitigation will increase vegetation in the project area.

PART II: FUNCTIONAL ASSESSMENT
REQUIREMENTS Ensure that project meets the requirements of Env-Wt 311.10 regarding functional assessment (Env-Wt 311.04(j); Env-Wt 311.10).
FUNCTIONAL ASSESSMENT METHOD USED: Coastal functional assessment provided as separate attachment.
NAME OF CERTIFIED WETLAND SCIENTIST (FOR NON-TIDAL PROJECTS) OR QUALIFIED COASTAL PROFESSIONAL (FOR TIDAL PROJECTS) WHO COMPLETED THE ASSESSMENT: TOM SOKOLOSKI, NO. 127
DATE OF ASSESSMENT: MARCH 30, 2021
Check this box to confirm that the application includes a NARRATIVE ON FUNCTIONAL ASSESSMENT: ☒
For minor or major projects requiring a standard permit without mitigation, the applicant shall submit a wetland evaluation report that includes completed checklists and information demonstrating the RELATIVE FUNCTIONS AND VALUES OF EACH WETLAND EVALUATED. Check this box to confirm that the application includes this information, if applicable: ☐ Note: The Wetlands Functional Assessment worksheet can be used to compile the information needed to meet functional assessment requirements.

March 30, 2021

Ref: TES JN 19-0168

Mr. William Doucet, President
Doucet Survey, Inc.
2 Commerce Drive, Suite 202
Bedford, NH 03110

Re: Environmental Services (Wetland Description and Functions and Values Assessment)
Maplewood Avenue Over North Mill Pond, Portsmouth, New Hampshire
NHDOT Bridge No. 231/103

Dear Mr. Doucet:

TES Environmental Consultants, L.L.C. (TES) has prepared this report to document the physical and biological characteristics of the wetlands and surrounding lands in the vicinity of the proposed replacement of the existing culvert at Maplewood Avenue Over North Mill Pond in Portsmouth, New Hampshire, and to evaluate the functions and values associated with those wetlands. These observations are provided in support of the Survey Scope of Services related to the proposed project.

An on-site investigation was performed by TES on February 28, 2020 to delineate the boundaries of wetlands in the vicinity of the culvert (Figure 1) and to observe the characteristics of the wetlands and the upland portion of the surroundings. The wetland delineation was performed according to the standards of the Corps of Engineers Wetland Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0, January 2012, US Army Corps of Engineers. All wetlands in the survey area consist of coastal resources, therefore the limits of jurisdictional wetlands were identified as the highest observable tide line (HOTL) as defined at Env-Wt 602.23. The observations made during this field effort were during the mid-incoming tide, and together with the following published information, form the basis for this wetland functional assessment:

- USGS Portsmouth, NH-ME Quadrangle, 7.5 minute series topographic map
- Aerial photographs from Google Earth and other sources
- USDA-NRCS Soil Survey of Rockingham County, New Hampshire (via Web Soil Survey)
- National Wetlands Inventory map
- The New Hampshire Department of Environmental Services (NHDES) Wetlands Permit Planning Tool (WPPT)
- NH Natural Heritage Program Datacheck Program
- US Army Corps of Engineers The Highway Methodology Workbook – Supplement

Site Characterization

Uplands. The upland areas in the vicinity of this survey area are primarily in urban residential (to the west) and commercial/industrial use to the east (Figure 2). Essentially no undeveloped land exists in the vicinity of the site, although North Cemetery lies approximately 500 feet to the southeast. Trees exist

1494 Route 3A, Unit 1, Bow, New Hampshire 03304
Phone: 603-856-8925 E-Mail: tom@tesenviro.comcastbiz.net

only in yards and small roadside spaces, with boxelder (*Acer negundo*) and weeping willow (*Salix babylonica*) predominant, and choke cherry (*Prunus virginiana*), black locust (*Robinia pseudoacacia*), and staghorn sumac (*Rhus typhina*) present as shrub species. Two invasive shrub species are present within the project site: glossy buckthorn (*Frangula alnus*) and multiflora rose (*Rosa multiflora*). Two invasive vines are also present – Oriental bittersweet (*Celastrus orbiculatus*), and black swallowwort (*Cynanchum louiseae*). Herbaceous species present in the upland areas include turf grasses and Canada goldenrod (*Solidago canadensis*).

Upland soils in the vicinity of the survey area are shown in the Soil Survey of Rockingham County as being Urban Land (699) to the east of the culvert, and Urban Land-Canton complex (799) to the west. Canton fine sandy loam is a sandy soil formed in loose glacial till deposits. Urban Land components are developed lands, most likely having soils similar to Canton.

Wetlands. On February 28, 2020 a TES wetland scientist delineated and flagged the boundaries of the HOTL within the project survey area with numbered pink and black striped flags for location by ground survey and depiction on site plans. The principal jurisdictional wetland feature within the survey area consists of North Mill Pond (Figures 3 and 4) which is identified as Estuarine Water on the WPPT, with small, limited fringe areas of Irregularly Flooded (Tidal) Marsh and Tidal Flats in the vicinity of the project area. The project site lies approximately 1,500 feet south of the Piscataqua River at the Sarah Mildred Long Bridge on US Route 1 Bypass. Tidal Flats predominate landward from Maplewood Avenue, and Estuarine Water occupies most of the seaward portion of North Mill Pond.

Under the U.S. Fish and Wildlife Service's Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al., 1979), the Tidal Flats would be classified as Estuarine, Intertidal, Unconsolidated Shore, Mud, Regularly Flooded (E2US3N), and the Estuarine Water portions would be classified as Estuarine, Subtidal, Unconsolidated Bottom, Subtidal (E1UBL). The latter areas have a cobble bottom in the vicinity of the culvert, where tidal currents are strongest, and mud further away. Riprap is present along both sides of the Maplewood Avenue causeway, and rockweed (*Ascophyllum nodosum*) grows on the riprap and other rocky surfaces (Figure 5) in the project vicinity. Salt marsh cordgrass (*Spartina alterniflora*) grows in unconsolidated material (Figure 6) in the intertidal zone in only narrow strips in scattered areas near the project site. No eelgrass beds, shellfish beds, or oyster restoration beds are located near the project area.

No fish were observed within North Mill Pond, although various species such as winter flounder (*Pseudopleuronectes americanus*), juvenile (snapper) bluefish (*Pomatomus saltatrix*), and baitfish such as killifish (*Fundulus* spp.) and common mummichog (*Fundulus heteroclitus*) may be expected to occur seasonally. Various wading birds, shore birds, and waterfowl may also be expected to utilize North Mill Pond and its tidal flats seasonally.

Vernal Pool. No vernal pools were observed within the vicinity of the Maplewood Avenue Over North Mill Pond survey area, applying the following definition and methodologies: New Hampshire Department of Environmental Service definition of vernal pool at Env-Wt 101.106; delineation methods at Env-Wt 301.01(f); and guidelines for identifying and describing vernal pools given in "Identification and Documentation of Vernal Pools in New Hampshire" published by the New Hampshire Fish and Game Department. It is possible that vernal pool habitat is present in the forested floodplain wetlands further away from the survey corridor, although the depth of floodwaters during the field survey precluded observations in those areas.

Invasive Plant Species. The lands within the survey area for this project were investigated for the potential presence of invasive plants identified in the New Hampshire Department of Transportation (NHDOT) Best Management Practices for Roadside Invasive Plants. Four invasive plant species were observed in the survey area: Oriental bittersweet (*Celastrus orbiculatus*), glossy buckthorn (*Frangula alnus*), multiflora rose (*Rosa multiflora*), and black swallowwort (*Cynanchum louiseae*). Oriental bittersweet, glossy buckthorn, and multiflora rose are common in the uplands in the northwest quadrant of the survey area, and black swallowwort is present all along the north side of Maplewood Avenue. The extensive nature of the colonization of each of these invasive plants, along with the location of many of them on adjacent private property and along the shoreline extending well away from the project site, lead to a recommendation of no attempts to control these invasive species. Soil and plant material removed from this site, however, should not be re-used on site or on other sites, but rather should be disposed of in accordance with the New Hampshire Department of Transportation's Best Management Practices for Roadside Invasive Plants (2008).

Wetland Functional Assessment Methodology

Wetland functions and values, and their significance were evaluated using the US Army Corps Highway Methodology guidelines. The following is a list of the 14 wetland functions and values with a brief description of each.

1. **Groundwater Recharge** should relate to the potential for the wetland to contribute water to an aquifer (often combined with the following).
2. **Groundwater Discharge** should relate to the potential for the wetland to serve as an area where ground water can be discharged to the surface.
3. **Floodflow Alteration:** This function considers the effectiveness of the wetland in reducing flood damage by attenuation of floodwaters for prolonged periods following precipitation events.
4. **Fish and Shellfish Habitat:** This function considers the effectiveness of seasonal or permanent water bodies associated with the wetland in question for fish and shell fish habitat.
5. **Sediment/Toxicant/Pathogen Retention:** This function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland as a trap for sediments, toxicants or pathogens.
6. **Nutrient Removal/Retention/Transformation:** This function relates to the effectiveness of the wetland to prevent adverse effects of excess nutrients entering aquifers or surface waters such as ponds, lakes, streams, rivers or estuaries.
7. **Production Export:** This function relates to the effectiveness of the wetland to produce food or usable products for humans or other living organisms.
8. **Sediment/Shoreline Stabilization:** This function relates to the effectiveness of a wetland to stabilize stream banks and shorelines against erosion.
9. **Wildlife Habitat:** This function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and the wetland edge. Both resident and or migrating species must be considered.
10. **Recreation:** This value considers the effectiveness of the wetland and associated watercourses to provide recreational opportunities such as canoeing, boating, fishing, hunting and other active or

passive recreational activities. Consumptive opportunities consume or diminish the plants, animals or other resources that are intrinsic to the wetland, whereas non-consumptive opportunities do not.

11. **Educational/Scientific Value:** This value considers the effectiveness of the wetland as a site for an "outdoor classroom" or as a location for scientific study or research.
12. **Uniqueness/Heritage:** This value relates to the effectiveness of the wetland or its associated water bodies to produce certain special values. Special values may include such things as archeological sites, unusual aesthetic quality, historical events, or unique plants, animals, or geological features.
13. **Visual Quality/Aesthetics:** This value relates to the visual and aesthetic qualities of the wetland.
14. **Threatened or Endangered Species Habitat:** This value relates to the effectiveness of the wetland or associated water bodies to support threatened or endangered species.

Wetland Functions and Values in the Survey Area

The functions and values of the wetland resources in the survey area are associated with North Mill Pond and contiguous wetlands landward and seaward from the site.

Of the 14 recognized potential functions and values of wetlands, 8 are considered to be present at some level at the location of this project, of which 4 rise to principal or significant levels within this wetland resource:

- sediment/toxicant retention,
- nutrient removal/transformation,
- sediment/shoreline stabilization, and
- visual quality/aesthetics.

Principal Functions and Values.

Sediment/toxicant retention potential is present at a principal level within the North Mill Pond wetland system due in large part to the low gradient of Pond bottom and extensive mud flats. The slow water flow present in most of the Pond (except at the Maplewood Avenue culvert) during incoming and outgoing tides, along with the Pond sediments, provide potential for settling of sediment and toxicants, as well as binding of toxicants to Pond sediment. Potential sources of sediment and toxicants are present within the Pond watershed.

Nutrient removal/transformation is also considered to be present at a principal level at this location. This function generally follows sediment/toxicant retention, as both require a wetland having a low gradient and slow flowing water. The North Mill Pond does generally lack sufficient vegetation to slow water flow, and to provide significant uptake of excessive nutrients, however. Potential sources of excess nutrients are present within the Pond watershed.

Sediment/shoreline stabilization is a function clearly provided to some degree by the wetlands along the banks of North Mill Pond, although mechanical stabilization including riprap and retaining walls are prominent in the vicinity of the Maplewood Avenue causeway. Stable bank soils contribute to reduced sediment entering downgradient channels with silt, maintaining their ability to convey flows and boat traffic.

Visual quality/aesthetics is a value considered to be present at a significant level at this location due to the presence of expansive surface waters, and a public road elevated above the water offering an open vista. This affords the public opportunities to view the setting while travelling along Maplewood Avenue, the primary public viewing location.

Functions and Values Present at Moderate Levels. Four potential functions and values of wetlands are considered to be present at moderate but not principal levels at this location:

- fish and shellfish habitat,
- production export,
- wildlife habitat, and
- recreation.

Fish and shellfish habitat is considered to be present, or potentially present, at moderate levels within North Mill Pond due to the presence of permanent surface water connected to the Piscataqua River. Some marine or estuarine fish species may inhabit the Pond seasonally at some point in their life cycle, although the minimal submerged and emergent vegetation in the Pond limits potential food and cover. The existing Maplewood Avenue culvert is sufficiently wide to allow fish passage. No fish or shellfish were noted during the field investigation, but some examples of fish that may occur seasonally include winter flounder (*Pseudopleuronectes americanus*), juvenile (snapper) bluefish (*Pomatomus saltatrix*), and baitfish such as killifish (*Fundulus* spp.) and common mummichog (*Fundulus heteroclitus*). The sole tributary to North Mill Pond is Hodgson Brook, and no significant fresh surface waters exist along that drainageway, limiting potential for anadromous or catadromous fish usage.

Production export consists of the transport of vegetation or its decomposing material from a wetland to connected wetlands or surface waters. High potential for wetlands to perform production export is typically exemplified by high levels of vegetative production within a wetland coupled with a broad pathway for that production to be conveyed from that wetland to another wetland or water body. There is minimal vegetative growth with North Mill Pond or in wetlands along its shores, and therefore little export of vegetation occurs here, although a limited amount occurs from the small fringe marsh vegetation (primarily *Spartina alterniflora*) and submerged vegetation such as rockweed (*Ascophyllum nodosum*).

Wildlife habitat is a function related to all of the physical and biological elements of a wetland complex and its surrounding landscapes. The setting of North Mill Pond and associated wetlands within a highly-developed area corridor detracts greatly from its overall habitat potential. However, the significant open water (especially at high tide) provides potential resting areas for migrating waterfowl, and shorebirds and wading birds may find limited foraging habitat along the shore and on exposed mud flats. For the purposes of wetland function and values assessments, the function of wildlife habitat focuses on habitat for wildlife dependent on wetlands for part or all of their life cycles.

Recreation potential related to the wetland resources present at this location relate primarily to potential active recreation (fishing, canoe/kayak use) related to North Mill Pond, and passive recreation potentially provided by viewing the open vista or possibly birding from Maplewood Avenue, which has sidewalks along both sides. The primary limiting factor for both active and passive recreation in this location is the general lack of public access. Metered parallel parking is present off the eastern end of the survey corridor, although little visual interest is present for passive public recreation. The existing culvert appears to provide sufficient width and overhead clearance for the passage of small craft such as canoes or kayaks, although during peak tidal flow the current may be too strong to paddle against, and at high tide the overhead clearance may be insufficient for passage.

Functions and Values Absent or Present at Negligible Levels. Five potential functions and values of wetlands are considered to be absent or present at negligible levels at this location:

- groundwater recharge and discharge,
- floodflow alteration
- educational/scientific value,
- uniqueness/heritage value, and
- endangered species habitat.

Groundwater recharge and discharge are generally considered insignificant functions in Estuarine environments such as North Mill Pond. Coastal areas may have brackish groundwater, recharged by coastal surface waters. Fresh groundwater from inland areas "pushes" against this brackish groundwater, and the brackish front may push inland during periods of little rainfall, or seaward during periods of heavier rainfall. Over time, rising sea levels may increase saltwater intrusion into coastal aquifers that were previously exclusively or mostly freshwater, rendering that groundwater unpotable at least until freshwater recharge pushes out the salt intrusion. These occurrences are not so much related to the functions of the wetlands as they are to fluctuations, seasonal and long-term, in weather and climate variations.

Floodflow alteration can be considered a significant function in coastal wetlands such as where extensive salt marshes or dunes provide buffers to storm surges. The narrow and discontinuous marsh fringes along North Mill Pond provide negligible protection against storm surges, and constructed barriers such as riprap banks and retaining walls are the principal features providing such protection in the vicinity of Maplewood Avenue.

Potential for educational/scientific value associated with North Mill Pond at this site is limited by the minimal controlled public access to the Pond and adjacent wetlands. A sidewalk along both sides of Maplewood Avenue permits visual access, but physical access is obstructed by retaining walls, steep slopes, and adjacent private property. In general, the potential for limited use of the site as an "outdoor classroom" is present, and the educational opportunity provided by the view of the Pond and adjacent developed land is intriguing, but this value is deemed negligible due to access issues including limited parking and safety issues related to vehicular traffic.

Uniqueness/heritage value was determined to be negligible for this location. Although the area was developed during early colonial times, no historic or archaeological interests associated with the Pond or adjacent wetlands were observed at this location.

Endangered species habitat is a potential value of wetlands. A New Hampshire Natural Heritage Bureau preliminary online datacheck for this location was performed to assess the potential for the presence of threatened or endangered species in the vicinity. This preliminary datacheck resulted in a finding of no known occurrences of threatened or endangered species or exemplary natural communities in the vicinity of the project. Such datachecks consist of reviews of all known occurrences of such species or communities within one mile of a proposed project, and is subject to change over time as new occurrences are recorded. A complete review of this matter will be required during the New Hampshire wetland permitting process for this project, although it is considered unlikely that the proposed culvert replacement would be found to have an adverse impact on any such sensitive species or habitats.

In general, the proposed project to replace the culvert at Maplewood Avenue over North Mill Pond would not be expected to cause any degradation of the functions and values associated with the Pond and the adjacent wetlands. Continued unrestricted passage of flows, sediment, and movement of fish and wildlife through the area will continue as under the present conditions. With the implementation of best management construction practices, the project would avoid potential construction-phase impacts related to sedimentation and erosion.

Please feel free to contact me with any questions or comments regarding this report.

Sincerely,

Thomas E. Sokoloski
New Hampshire Certified Wetland Scientist #127

STATE OF NEW HAMPSHIRE
THOMAS
E.
SOKOLOSKI
3/30/2021
No. 127
CERTIFIED WETLAND SCIENTIST

Wetland Function-Value Evaluation Form

Total area of wetland 60 acres +/- Human made? No Is wetland part of a wildlife corridor? No or a "habitat island"? No

Adjacent land use Residential, commercial, industrial Distance to nearest roadway or other development 0 feet

Dominant wetland systems present Estuarine Contiguous undeveloped buffer zone present No

Is the wetland a separate hydraulic system? No If not, where does the wetland lie in the drainage basin? Tidal

How many tributaries contribute to the wetland? 1 (Hodgson Brook) Wildlife & vegetation diversity/abundance ~~(see attached list)~~

Wetland I.D. North Mill Pond
Latitude 43.0797 Longitude 70.7655
Prepared by: TES Date 3/27/2021
Wetland Impact: Type TBD Area TBD
Evaluation based on: Office ✓ Field ✓
Corps manual wetland delineation completed? Y ✓ N ___ (OHW)

Function/Value	Occurence Y	Occurence N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
Groundwater Recharge/Discharge		✓			Absent - tidal resource.
Floodflow Alteration		✓			North Mill Pond has limited flood storage/desynchronization.
Fish and Shellfish Habitat	✓		1,4		Limited known potential; no shellfish beds (WPPT)
Sediment/Toxicant Retention	✓		1,2,3,4,8,9	✓	Opportunity present; sediments provide toxicant retention.
Nutrient Removal	✓		1,2,3,4,6,7	✓	Sediment binding potential; minimal vegetative uptake
Production Export	✓				Limited vegetative production present in Pond overall
Sediment/Shoreline Stabilization	✓		1,2,3,10,11	✓	Much of shoreline at road stabilized by riprap, walls.
Wildlife Habitat	✓		6,12,18		Modest habitat due to minimal vegetation and development.
Recreation	✓		7,9		Limited accessibility and interest on Pond itself.
Educational Scientific Value		✓			Generally inaccessible to public; high disturbance
Uniqueness/Heritage		✓	1,3,13,14,17		No observed unique/significant historic features.
Visual Quality/Aesthetics	✓		2,6,12	✓	Open water, mud flats, viewshed from road.
ES Endangered Species Habitat		✓			Preliminary NH NHB datacheck - negative results.
Other					

* Refer to back up list of numbered considerations.

Notes:

TES

TES ENVIRONMENTAL CONSULTANTS, L.L.C.

FIGURE 1
Arch Culvert at Maplewood Avenue Over North Mill Pond, Portsmouth, View Southwest of Seaward Side of Culvert from Shoreline (2/28/2020)

FIGURE 2
Residential and Commercial/Industrial Development on East Side of Project Site, View East from Western Shoreline of North Mill Pond (2/28/2020)

1494 Route 3A, Unit 1 Bow, NH 03304 Phone 856-8925
Email: Soilsurfer@comcast.net

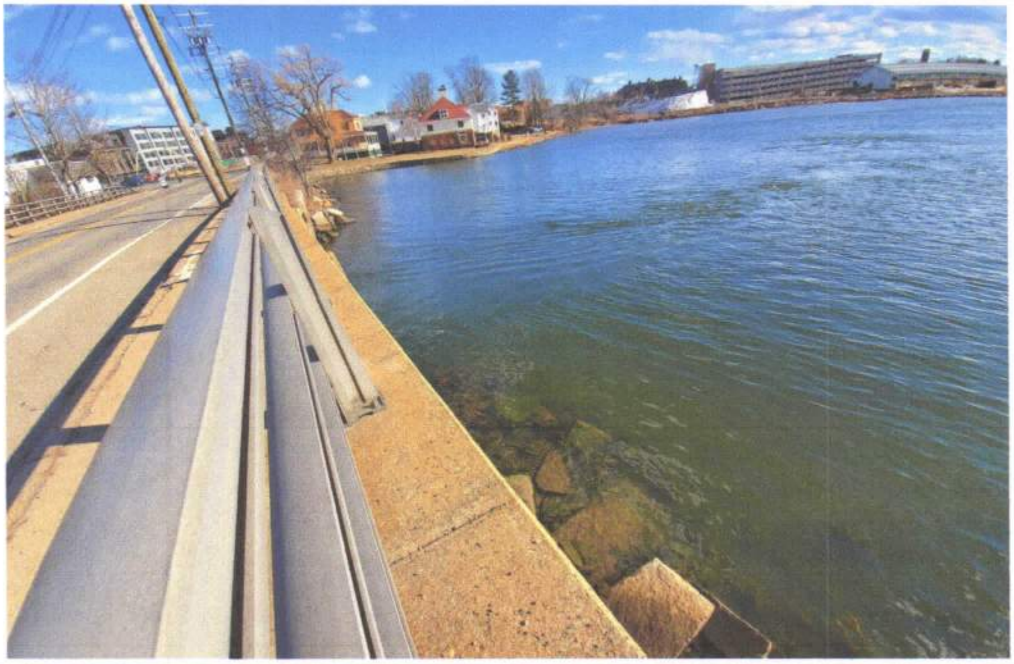


FIGURE 3
North Mill Pond, Landward Side, View Southeast from West Side of Culvert in Maplewood Road, Mid-Incoming Tide (2/28/2020)

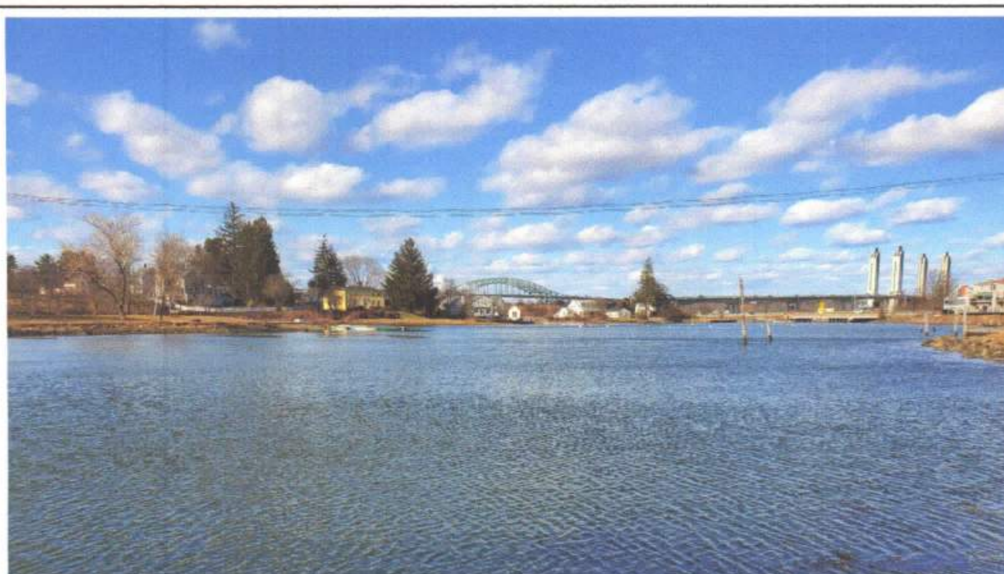


FIGURE 4
North Mill Pond, Seaward Side, View North from East Side of Culvert in Maplewood Road, Mid-Incoming Tide (2/28/2020)

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Email: Soilsurfer@comcast.net

FIGURE 5

Rockweed Growing on Stones and Riprap in the Subtidal and Lower Intertidal Areas Near the Maplewood Avenue Culvert Site (2/28/2020)

FIGURE 6

Remnants of Salt Marsh Cordgrass Growing within the Intertidal Zone Near the Maplewood Avenue Culvert Site (2/28/2020)

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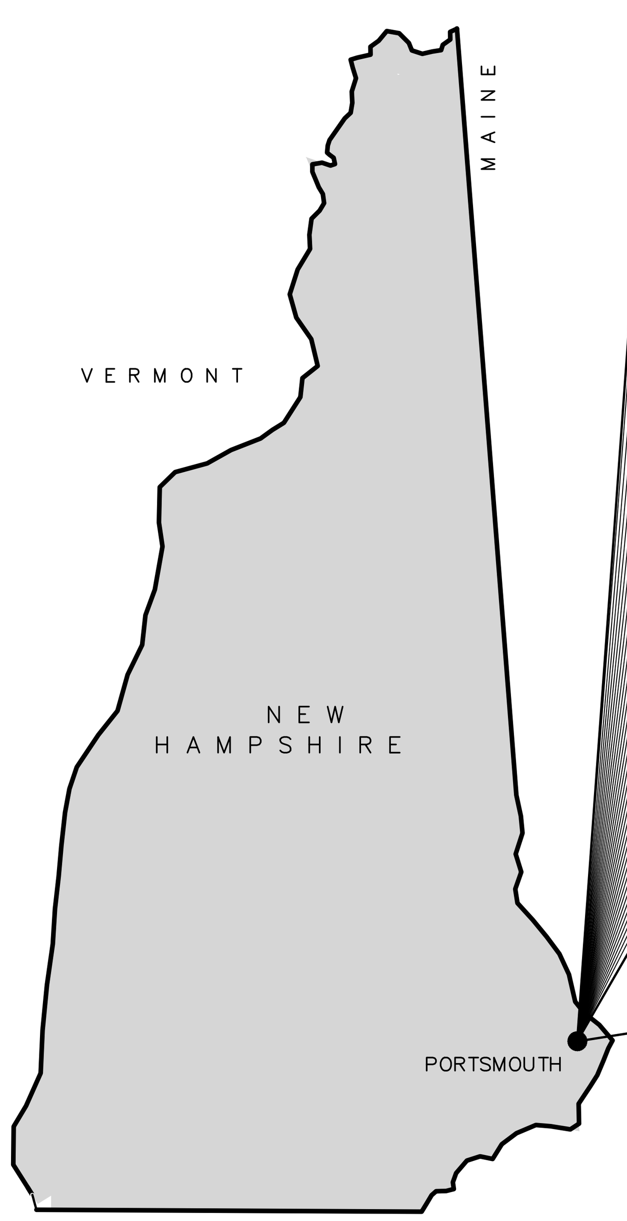
City of Portsmouth, New Hampshire

PERMIT APPLICATION DRAWINGS

MAPLEWOOD AVENUE - DRAINAGE INTERCEPT

LOCATION PLAN

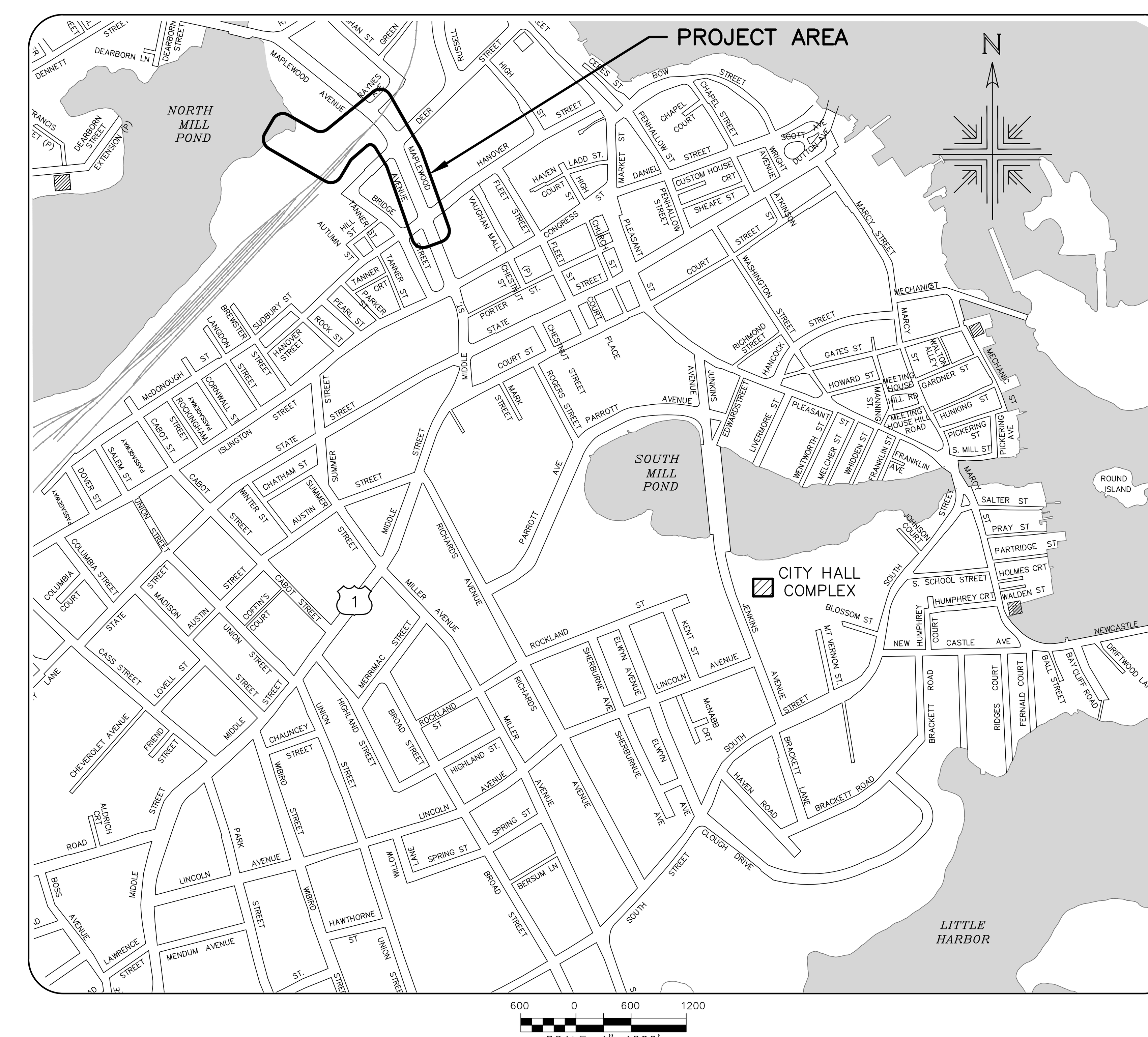


PREPARED BY
UNDERWOOD ENGINEERS, INC.
PORTSMOUTH, NEW HAMPSHIRE
MARCH, 2024

FOR REVIEW
MARCH, 2024
NOT FOR CONSTRUCTION

TABLE OF CONTENTS

VICINITY MAP



UE #2542

UNDERWOOD engineers

LEGEND:

EXISTING | PROPOSED

- STRUCTURES/BUILDINGS
- APPROXIMATE PROPERTY LINE
- PAVED ROAD/DRIVE
- VERTICAL FACED GRANITE CURB (VGC)
- MODULAR BLOCK RETAINING WALL (RWBL)
- MORTARED BRICK RETAINING WALL (RWB)
- CONCRETE RETAINING WALL (RWC)
- GRANITE RETAINING WALL (RWG)
- GRANITE POST
- PARK METER KIOSK
- PARKING METER
- BOLLARD
- SIGN
- HANDICAP SPACE
- LIGHT POLE
- UTILITY POLE WITH ARM & LIGHT
- UTILITY POLE
- PUBLIC SERVICE CO. OF NH (PSNH)
- ELECTRICAL MANHOLE
- ELECTRICAL CONDUIT
- ELECTRICAL METER/BOX
- GAS METER
- GAS SHUT OFF
- GAS VALVE
- WATER GATE VALVE
- WATER SHUT OFF VALVE
- HYDRANT
- FIRE CONNECTION
- TEE CONNECTION
- FITTINGS (11.25°, 22.5°, 45°)
- REDUCER
- THRUST BLOCK
- COUPLING
- CATCH BASIN (NEW)
- CATCH BASIN (REMOVE & REPLACE)
- DRAIN MANHOLE
- ROOF DOWNSPOUT
- SEWER MANHOLE
- SEWER CLEANOUT
- TELEPHONE MANHOLE
- TELEPHONE BOX
- CABLE MANHOLE
- FIRE ALARM
- DECIDUOUS TREE
- CONIFEROUS SHRUB
- DECIDUOUS SHRUB
- OVERHEAD UTILITIES (OHW)
- WATER LINE (W)
- SEWER LINE (S)
- DRAIN LINE (D)
- GAS LINE (G)
- UNDERGROUND ELECTRIC (UGE)
- UNDERGROUND COMMUNICATIONS (UGT)
- CEMENT CONCRETE
- BRICK PAVERS
- LANDSCAPED AREA (LA)
- MULCHED AREA (LAM)

LEGEND (cont.):

EXISTING | PROPOSED

- GRASS COVER (LWN)
- SPOT GRADE (25.4)
- ELEVATION TO MATCH/NOT EXCEED (27.79)
- 2' CONTOUR ELEVATION (28)
- 10' CONTOUR ELEVATION (30)
- SIGN – SEE SIGNAGE TABLE
- TAX SHEET – LOT NUMBER (117-45)
- ROCK
- POLE
- SEWER LATERALS APPROXIMATE LOCATION
- SEWER LATERALS ASSUMED DIRECTION OF EXIT (A)
- WATER LATERALS APPROXIMATE LOCATION
- DRAIN LATERALS APPROXIMATE LOCATION (D)
- RAILROAD SIGNAL
- RAILROAD TRACKS
- BORING (B-101)
- SUBSURFACE REFUSAL (R)
- SUBSURFACE NO REFUSAL (N/R)
- SUBSURFACE GROUNDWATER
- SILT BOOM
- SILT FENCE

ABBREVIATIONS

AC/ACP	ASPHALT CONCRETE PIPE
CB	CATCH BASIN
CI/CIP	CAST IRON PIPE
CL 52	CLASS 52 PIPE
CMP	CORRUGATED METAL PIPE
DI	DUCTILE IRON PIPE
DMH	DRAIN MANHOLE
GIS	CITY OF PORTSMOUTH GIS SYSTEM
HDPE	HIGH DENSITY POLYETHYLENE PIPE
I	INVERT ELEVATION
PE	POLYETHYLENE PIPE
PVC	POLYVINYL CHLORIDE PIPE
R	RIM ELEVATION
RCP	REINFORCED CONCRETE PIPE
RCRD	ROCKINGHAM COUNTY REGISTRY OF DEEDS
RCSC	ROCKINGHAM COUNTY SUPERIOR COURT
S	SLOPE (PIPE)
SMH	SEWER MANHOLE
UP	UTILITY POLE

SEWER TABLE

SMH# 5
RIM EL= 15.03
TOP OF TANK= 11.4±
(GREASE SEPERATOR)

SMH# 6
RIM EL= 15.02
TOP OF TANK= 11.4±
(GREASE SEPERATOR)

SMH# 1494
RIM EL= 10.62
CL FLOW= −1.16
(48" BRICK TUNNEL)

SMH# 1497
RIM EL= 11.04
(1) INV IN 10"___= 3.51
(2) INV IN 15"___= 2.98
(3) INV IN 8"___= 2.95
(4) INV OUT 15"VCP= 2.91

SMH# 1489
RIM EL= 9.39
(1) INV IN 12"___= 2.04

SMH# 1499
RIM EL= 15.61
(1) INV IN 48" BRICK= −1.84
(2) INV IN ___= −0.99
(3) INV OUT 48" BRICK= −1.94
(48" BRICK TUNNEL)

SMH# 1500
NOT FIELD OBSERVED
(STRUCTURE & LINE ABANDONED
PER PORTSMOUTH DPW)

SMH# 1501
RIM EL= 13.38
(1) INV IN 21"?___= −0.57
(2) INV OUT 24"___= −0.67

SMH# 1503
RIM EL= 15.13
(1) INV IN ___= 0.53
(2) INV OUT ___= ?

SMH# 1519
RIM EL= 13.30
(NO INVERT DATA)

SMH# 1570
RIM EL= 17.30
(1) INV IN 48" BRICK=
(48" BRICK TUNNEL)

SMH# 2746
RIM EL= 14.67
(1) INV IN ___= 5.4±
(2) INV IN ___= 5.3±
(3) INV OUT ___= 5.3±
(STRUCTURE INACTIVE)
(NO FLOW OBSERVED)

DRAIN TABLE

CB# 1352
RIM EL= 12.85
(1) INV IN 12"HDPE= 9.60
(2) INV OUT 12"HDPE= 9.50

CB# 3743
RIM EL= 12.83
(1) INV OUT 12"RCP= 9.58

CB# 3750
RIM EL= 10.91
(1) INV OUT 12"RCP= 7.39

CB# 3761
RIM EL= 10.52
(1) INV OUT 12"RCP= 7.03

CB# 3771
RIM EL= 15.14
(1) 6"PVC (PLUGGED)
(2) INV IN 6"PVC= 12.85
(3) INV OUT 12"RCP= 12.52

CB# 3772
RIM EL= 16.01
(1) INV OUT 12"RCP= 12.08

CB# 3773
RIM EL= 13.64
(1) INVERT INACCESSIBLE

CB# 3774
RIM EL= 13.25
(1) INV OUT 12"RCP= 8.60

CB# 3775
RIM EL= 12.97
(1) INV OUT 12"RCP= 9.87

CB# 3776
RIM EL= 12.93
(1) INV OUT 12"RCP= 8.25

CB# 3777
RIM EL= 12.94
(1) INV OUT 12"RCP= 8.64

CB# 3778
RIM EL= 14.59
(1) INV OUT 12"RCP= 11.09

CB# 3779
RIM EL= 14.51
(1) INV OUT 12"RCP= 11.20

CB# 25172
RIM EL= 15.28
(1) INV OUT 18"HDPE= 10.98

DMH# 6
RIM EL= 13.65
(1) INV IN 18"RCP= 4.25
(2) INV IN 12"HDPE= 5.40
(3) INV OUT 18"RCP= 4.33

DMH# 7
RIM EL= 14.29
(1) INV IN 6"PVC= 6.48
TOP OF CONCRETE WEIR= 9.96
(2) INV OUT 12"HDPE= 6.30

DMH# 8
RIM EL= 13.58
(1) INV IN 6"PVC= 9.83
TOP OF CONCRETE WEIR= 11.30
(2) INV OUT 12"HDPE= 9.68

DMH# 4979 (4'X6' VAULT)
RIM EL= 10.44
CL FLOW 48"RCP= *1.03
*RECORD GIS VALUE

DMH# 4980
RIM EL= 10.58
(1) INV IN 18"RCP= 3.03
(2) NO INVERT DATA
(3) INV OUT ___= 1.46

DMH# 4984
RIM EL= 9.40
(1) INV IN 36"RCP= 4.15

DMH# 5205
RIM EL= 15.81
(1) INV IN 12"RCP= 4.91
(2) INV IN 12"RCP= 12.26
(3) INV IN 18"HDPE= 8.71
(4) INV IN 12"RCP= 11.71
(5) INV OUT 18"RCP= 4.81

DMH# 5206
RIM EL= 13.32
(1) INV IN 12"RCP= 8.47
(2) INV IN 12"RCP= 9.29
(3) INV IN 12"RCP= 5.42
(4) INV OUT 12"RCP= 5.40

DMH# 5207
RIM EL= 13.01
(1) INV IN 12"RCP= 9.62
(2) INV IN 12"RCP= 5.56
(3) INV OUT 12"RCP= 5.56

DMH# 5208
RIM EL= 13.00
(1) INV IN 12"RCP= 7.95
(2) INV IN 12"RCP= 5.78
(3) INV IN 12"RCP= 7.90
(4) INV OUT 12"RCP= 5.77

DMH# 5209
RIM EL= 14.67
(1) INV IN 12"RCP= 10.39
(2) INV IN 12"RCP= 10.54
(3) INV OUT 12"RCP= 7.75

DMH# 5404
RIM EL= 13.35
(1) INV IN 12"RCP= 9.45
(2) INV IN 12"RCP= 9.28
(3) INV OUT 12"RCP= 7.12

DMH# 5438 (4'X6' VAULT)
RIM EL= 12.79
CL FLOW 48"RCP= 1.24

DMH# 5439 (4'X6' VAULT)
RIM EL= 7.21
CL FLOW 48"RCP= 0.76

DMH# 5677
RIM EL= 11.07
(1) INV IN 12"RCP= 6.97
(2) INV IN 10"RCP= 6.47
(3) INV IN 12"RCP= 6.98
(4) INV OUT 12"RCP= 6.37

DMH# 5678
RIM EL= 11.32
(1) INV IN 12"RCP= 6.07
(2) FLOW LINE 36"RCP= 4.60
(3) INV IN 12"RCP= 7.48
(4) INV IN 12"RCP= 6.45
(5) INV IN 12"RCP= 7.88

ISSUE FOR: BIDDING Date – By – | CONSTRUCTION Date – By – | RECORD DRAWING Date – By –

NO. | REVISIONS | APP'D

Drawn/Chk. RMG
Designed PDM
Checked –
Approved –
Date MARCH 2024
Book No. –
Project No. 2542
Dwg. ID 2542_general_M
Scale

FOR REVIEW
MARCH 2024
NOT FOR CONSTRUCTION

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

LEGEND & ABBREVIATIONS,
EXISTING STRUCTURE TABLES
MAPLEWOOD AVE – DRAINAGE INTERCEPT
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO G1 | SHEET 2 OF 14

H:\Real Numbers\Portsmouth\2542-Fleet Street\CADD\Design Maplewood\Drawings\2542_general_M.dwg, G1, 3/27/2024 11:25:02 AM, rmg

ISSUE FOR	Date	By
BIDDING	–	–
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RECORD DRAWING	–	–

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PLAN INDEX

MAPLEWOOD AVE – DRAINAGE INTERCEPT

CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO G2

SHEET 3 OF 14

GENERAL NOTES:

1. THE LINE WORK REPRESENTING THE EXISTING UNDERGROUND STRUCTURES AND PIPES IS BASED ON A FIELD SURVEY, TIE SHEETS, AND OTHER INFORMATION AVAILABLE, INCLUDED IN THE PROJECT MANUAL APPENDIX. THE ENGINEER/SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN ON THE PLANS OR THE PROJECT MANUAL APPENDIX COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE ENGINEER/SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. IN ADDITION, CONTRACTOR SHALL ANTICIPATE THAT EVERY BUILDING OR UNIT WITHIN THE PROJECT AREA HAS A LEAST ONE GAS, SEWER AND WATER SERVICE EXTENDING FROM THE MAIN IN THE STREET TO THE BUILDING. THEREFORE THE CONTRACTOR SHOULD CONSIDER CONFLICTS, HAND EXCAVATION AND POSSIBLE DELAYS IN CONSTRUCTION, WHEN PREPARING THEIR BID.

2. THE CONTRACTOR IS RESPONSIBLE FOR THE LOCATION, PROTECTION AND REPAIR (IF DAMAGED) OF ALL EXISTING UTILITY MAINS AND SERVICES. THE LOCATIONS OF KNOWN SEWER, WATER AND GAS, MAINS, SHOWN ON THESE DRAWINGS ARE APPROXIMATE. HOWEVER, WATER AND SEWER SERVICE LATERALS ARE NOT SHOWN AND THE CONTRACTOR IS TO ANTICIPATE THEIR EXISTENCE. TIE SHEETS FOR THE KNOWN UTILITIES (INCLUDING GAS AND WATER) ARE PROVIDED IN THE APPENDIX OF THE PROJECT MANUAL. VIDEO LOGS AND SANITARY SURVEYS FOR SEWER LATERALS ARE AVAILABLE FROM THE ENGINEER UPON REQUEST. NOTIFY DIG-SAFE PRIOR TO COMMENCING CONSTRUCTION (1-888-344-7233). CONTRACTOR SHALL GIVE ADEQUATE NOTICE TO THE ENGINEER OF CONFLICTS OF PROPOSED WORK WITH MARKED UTILITIES PRIOR TO CONSTRUCTING THE PROPOSED WORK.

3. ALL CONFLICTS WITH GAS LINES SHALL BE COORDINATED WITH UNITIL, SUBSIDIARY.

4. THE CONTRACTOR SHALL MAINTAIN SINGLE LANE TRAFFIC AND ACCESS TO BUSINESSES AND PROPERTIES AT ALL TIMES DURING WORKING HOURS. TRAFFIC CONTROL WARNING DEVICES SHALL BE IN ACCORDANCE WITH MUTCD (LATEST EDITION) REQUIREMENTS AND SECTION 01570 OF THE PROJECT MANUAL.

5. ALL STREET OPENINGS SHALL BE BACKFILLED AT THE END OF EACH DAYS OPERATIONS TO ENSURE SAFE VEHICULAR AND PEDESTRIAN TRAFFIC. THE CONTRACTOR SHALL MAINTAIN SAFE PASSAGE FOR 2-LANES OF TRAFFIC AT THE END OF EACH WORK DAY. DUST CONTROL OPERATIONS ARE TO BE CONTINUOUS THROUGHOUT CONSTRUCTION AND IS INCIDENTAL TO THE WORK.

6. THE USE OF PLATES TO COVER OPEN EXCAVATIONS IN LIEU OF BACKFILLING WILL NOT BE PERMITTED UNLESS PRIOR APPROVAL HAS BEEN GRANTED BY THE OWNER.

7. A NPDES PERMIT FOR CONSTRUCTION ACTIVITIES IS REQUIRED FOR THIS PROJECT. THE CONTRACTOR IS REQUIRED TO PREPARE A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND TO SUBMIT A NOTICE OF INTENT (NOI) TO THE EPA TO FULFILL PROJECT REQUIREMENTS. THE SWPPP MUST BE PREPARED IN ACCORDANCE WITH THE EPA'S REQUIREMENTS. NO WORK IS TO PROCEED UNTIL THE SWPPP AND THE NOI IS SUBMITTED AND ACCEPTED BY THE OWNER. A COPY OF THE NOI, SWPPP REQUIREMENTS, AND EXAMPLE SWPPP ARE INCLUDED IN THE PROJECT MANUAL APPENDIX.

8. THIS SET OF PLANS HAS BEEN CREATED TO BE USED IN CONJUNCTION WITH A TECHNICAL SPECIFICATION ENTITLED "PROJECT MANUAL, MAPLEWOOD AVENUE – DRAINAGE INTERCEPT, PORTSMOUTH, NH".

9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL AND DISPOSAL OF ALL SURPLUS EARTHEN MATERIALS, LEDGE, CURB, PIPE, AND SEWER OR DRAIN STRUCTURES EXCAVATED DURING CONSTRUCTION, UNLESS MATERIALS ARE CLAIMED BY THE OWNER OR OTHERWISE INDICATED IN THE PROJECT MANUAL OR THE DRAWINGS.

10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL PROPERTY RESTORATION BOTH PUBLIC AND PRIVATE. UTILITIES DAMAGED AS A RESULT OF THE CONTRACTORS OPERATIONS SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.

11. PAVING REPAIRS SHALL MAINTAIN EXISTING LINE AND GRADE UNLESS OTHERWISE INDICATED OR DIRECTED.

12. OVERHEAD WIRES AND WIRE DROPS TO BUILDINGS ARE NOT SHOWN IN ENTIRETY. THE CONTRACTOR SHALL ANTICIPATE THEIR EXISTENCE IN ALL OPERATIONS.

13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE OF ROADWAY SIGNS. ANY SIGN DAMAGED DURING THE COMPLETION OF WORK SHALL BE REPLACED AT NO ADDITIONAL COST TO THE OWNER.

14. 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.

15. CONTRACTOR SHALL NOT USE ANY ADJACENT DRIVEWAYS OR PARKING LOTS WITHOUT WRITTEN PERMISSION FOR PROPERTY OWNER. DAMAGE RESULTING FROM CONSTRUCTION LOADS OUTSIDE PROPOSED LIMITS OF WORK SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO OWNER.

16. EXISTING PROPERTY LINE MONUMENTATION DISTURBED DURING CONSTRUCTION SHALL BE SET OR RESET BY A LICENSED LAND SURVEYOR (LLS), SUBSIDIARY.

REFERENCE PLANS:

1. PORTWALK SITE PLAN, PREPARED BY APPLEDORE ENGINEERS INC., DATE/LAST REVISED 3/5/2010.
2. 195 HANOVER STREET AS BUILT, PREPARED BY S.U.R., DATE/LAST REVISED 7/21/2015.
3. PORTWALK AS BUILT, PREPARED BY MSC, DATE/LAST REVISED 9/15/2015.

SURVEY NOTES:

1. THIS PLAN IS BASED ON A FIELD SURVEY BY JAMES VERRA AND ASSOCIATES, INC. 12/2019-6/2022. ON SITE CONTROL ESTABLISHED USING SURVEY GRADE GPS UNITS.
HORIZONTAL DATUM: NAD 1983 (1986 ADJUSTMENT)
PRIMARY BM: NHDOT 379-0150 (PORTSMOUTH TRAFFIC CIRCLE)
VERTICAL DATUM: NAVD 1988
PRIMARY BM: CITY CONTROL POINT "ALBA"

2. CONTRACTOR TO VERIFY SITE BENCHMARKS BY LEVELING BETWEEN 2 BENCHMARKS PRIOR TO THE SETTING OR ESTABLISHMENT OF ANY GRADES/ELEVATIONS. DISCREPANCIES ARE TO BE REPORTED TO JAMES VERRA AND ASSOC., INC.

3. THE LOCATION OF ALL UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE AND ARE BASED UPON THE FIELD LOCATION OF ALL VISIBLE STRUCTURES (IE CATCH BASINS, MANHOLES, WATER GATES ETC.) AND INFORMATION COMPILED FROM PLANS PROVIDED BY UTILITY COMPANIES AND GOVERNMENTAL AGENCIES. ALL CONTRACTORS SHOULD NOTIFY, IN WRITING, SAID AGENCIES PRIOR TO ANY EXCAVATION WORK AND CALL DIG-SAFE @ 1-888-DIG-SAFE.

NOTE: VERY LITTLE UNDERGROUND UTILITY MARKING WAS COMPLETED PRIOR TO CONDUCTING THE FIELD SURVEY.

SANITARY SEWER NOTES:

1. ALL NEW SEWER SERVICE LATERALS SHALL BE 6" DIAMETER, UNLESS DIRECTED OTHERWISE. PRIOR TO CONSTRUCTION OF NEW SEWER MAINS IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY EXACT SEWER SERVICE LOCATIONS, SIZES, AND ELEVATIONS, BY VIDEO INSPECTION WITH TRANSMITTER AND LOCATOR, PAY ITEM 1.18. SEWER LATERALS SHALL BE INSTALLED TO THE PROPERTY LINE (UNLESS SHOWN OTHERWISE ON THE DRAWINGS). ANY SERVICE WORK EXTENDING PAST THE PROPERTY LINE SHALL BE APPROVED BY THE PROPERTY OWNER, THE CITY, AND THE ENGINEER PRIOR TO CONSTRUCTION. MIN. SLOPE OF SERVICE PIPE = SHALL BE 0.02 FT/FT.

2. WORK ON PRIVATE PROPERTY SHALL BE COORDINATED WITH THE CITY AND THE PROPERTY OWNER.

3. SEWER CONSTRUCTION SHALL PROCEED FROM THE LOWEST POINT UPWARD UNLESS OTHERWISE APPROVED BY THE ENGINEER.

4. SMH RIMS SHALL BE SET 1/8" TO 1/4" BELOW GRADE WHEN IN PAVEMENT OR GRAVEL ROADS (I.E., PLOWED AREAS). RIMS SHALL BE SET AT GRADE IN NON-PLOWED AREAS UNLESS OTHERWISE INDICATED.

5. ALL EXISTING SEWER STRUCTURES (PIPE AND MANHOLES) TO BE ABANDONED SHALL BE PREPARED AS FOLLOWS:

MANHOLES – SHALL BE REMOVED TO A MINIMUM DEPTH OF 4' BELOW GRADE. THE BASE OF STRUCTURES SHALL BE FILLED WITH FLOWFILL OR GRAVEL, COMPACTED IN 8" LIFTS, SUBSIDIARY, UNLESS OTHERWISE PAID FOR.
PIPE – ALL PIPE TO BE ABANDONED IN PLACE AND SHALL BE CUT & PLUGGED AT BOTH ENDS, SUBSIDIARY. PIPES EXCEEDING 12-INCH DIAMETER, TO BE ABANDONED, WILL BE FILLED WITH FLOWABLE FILL (WHERE DIRECTED BY ENGINEER) AND PAID FOR UNDER ITEM 1.11.

6. IN ORDER OF PREFERENCE SEWER SERVICE CLEANOUTS SHALL BE PLACED:
1) BEHIND CONCRETE SIDEWALKS.
2) IN BRICK STRIP.
3) IN CONCRETE SIDEWALKS.

7. ALL SEWER PIPE SHALL BE SDR 35 PVC UNLESS SHOWN OTHERWISE ON THE DRAWINGS.

DRAINAGE SYSTEM NOTES

1. IN GENERAL, NEW CB'S WILL BE SET AT THE LOCATIONS SHOWN. EXISTING CB STRUCTURES ARE TO BE REMOVED. (SUBSIDIARY). ALL FRAMES AND GRATES SHALL BE DELIVERED TO THE PORTSMOUTH DPW (SUBSIDIARY). ALL NEW CATCH BASIN RIMS SHALL BE SET 1/2" BELOW FINISH GRADE ELEVATION. REMOVAL OF CB'S OUTSIDE NORMAL EXCAVATION LIMITS WILL BE PAID AS ITEM 202.5.

2. MANHOLE AND CATCH BASIN BASES, RISERS, CONE SECTIONS, AND SLAB TOPS SHALL BE DESIGNED SUCH THAT THERE EXISTS A MINIMUM 6" PERIPHERY OF MONOLITHIC SOLID WALL SEPARATION BETWEEN OPENINGS (CORINGS AND SECTIONS).

3. ALL CATCH BASINS, DRAIN MANHOLES, & DRAIN LINES SHALL BE CLEANED PRIOR TO ACCEPTANCE.

4. ALL REQUIRED STORM DRAIN SERVICES MAY NOT BE SHOWN ON THE PLANS, AND SHALL BE PROVIDED WHERE DIRECTED BY THE ENGINEER.

5. DMH RIMS SHALL BE SET 1/8" TO 1/4" BELOW GRADE WHEN IN PAVEMENT OR GRAVEL ROADS (I.E., PLOWED AREAS). RIMS SHALL BE SET AT GRADE IN NON-PLOWED AREAS UNLESS OTHERWISE INDICATED.

6. LOCATIONS OF NEW DRAIN SERVICES ARE BASED ON EXISTING ROOF LEADERS OBSERVED. ACTUAL LOCATION AND CONFIGURATION MAY CHANGE BASED ON FINAL REVIEW WITH PROPERTY OWNER DURING CONSTRUCTION.

WATER DISTRIBUTION SYSTEM NOTES:

1. THE CONTRACTOR SHALL MAINTAIN AND PROTECT THE EXISTING WATER SYSTEM AT ALL TIMES. LOCATE AND IDENTIFY ALL EXISTING MAINS AND SERVICE LOCATIONS IN ADVANCE.

2. WATER BOXES, OR OTHER CASTINGS, DISTURBED OR RELOCATED BY CONSTRUCTION ACTIVITIES SHALL BE ADJUSTED TO EXISTING LINE AND GRADE, UNLESS SHOWN OTHERWISE ON THESE PLANS OR AS DIRECTED BY THE ENGINEER (SUBSIDIARY).

CONSTRUCTION SEQUENCE:

PERFORM WORK IN ACCORDANCE WITH APPROVED SCHEDULE, GENERALLY ACCEPTED INDUSTRY ORDER OF OPERATIONS UNLESS OTHERWISE APPROVED IN WRITING BY THE ENGINEER.

1. PRIOR TO THE START OF CONSTRUCTION PROVIDE A WRITTEN NARRATIVE OF THE CONSTRUCTION METHODS TO BE USED AND INCLUDE A PRELIMINARY SCHEDULE OF KEY MILESTONES, INCLUDING COORDINATION OF UTILITY PIPE INSTALLATIONS AND COORDINATION WITH GAS COMPANY, AND OTHER UTILITIES AS APPLICABLE.

2. REFER TO SECTION 01010 (SUMMARY OF WORK) AND SECTION POW (PROSECUTION OF WORK) FOR ADDITIONAL SCHEDULE AND PROJECT REQUIREMENTS.

3. INSTITUTE EXPLORATORY EXCAVATION PROGRAM WITH ENGINEER TO IDENTIFY POTENTIAL CONFLICTS AT UTILITY CROSSINGS. EXPLORATORY EXCAVATION COMPLETED WITHOUT PRIOR APPROVAL FROM THE ENGINEER WILL BE AT NO ADDITIONAL COST TO THE OWNER.

4. INSTALL AND MAINTAIN TEMPORARY AND PERMANENT EROSION CONTROL DEVICES THROUGHOUT THE CONSTRUCTION PERIOD (INCLUDING WINTER SHUT DOWN PERIODS AS REQUIRED) AS SHOWN IN THE APPROVED SWPPP, ON THE DRAWINGS, OR AS APPROVED BY THE ENGINEER.

5. PRE-DRAIN AND/OR DEWATER EXCAVATIONS BEFORE INSTALLING PIPE. INSTALL PIPE ON STABLE BEDDING (IN DRY CONDITIONS) TO THE ELEVATIONS SHOWN ON DRAWINGS.

6. DISPOSE OF SURPLUS AND UNSUITABLE MATERIALS AS THE WORK PROGRESSES, STOCKPILE OF MATERIALS WILL ONLY BE PERMITTED IN AREAS APPROVED BY THE CITY OF PORTSMOUTH, DPW.

7. INSTALL CRUSHED GRAVEL OR RECLAIMED BASE AS SHOWN ON DRAWINGS, IN TRENCH AT END OF EACH DAY. VISUAL INSPECTION, ALIGNMENT TESTS AND DEFLECTION TESTS OF PIPES SHALL BE COMPLETED NO LESS THAN THIRTY (30) DAYS FOLLOWING INSTALLATION. CONSTRUCT PAVEMENT REPAIRS AS SOON AS PRACTICAL, FOLLOWING UTILITY INSTALLATIONS AND TESTING.

8. IMMEDIATELY STABILIZE DISTURBED AREAS AFTER PIPE INSTALLATION AND REESTABLISH TEMPORARY EROSION CONTROL DEVICES MOVED DURING CONSTRUCTION.

9. FINISH GRADING, LOAM AND SEED DISTURBED AREAS AND BACK UP PAVEMENT WITH GRAVEL IMMEDIATELY FOLLOWING PAVEMENT REPAIRS.

10. REMOVE ALL TEMPORARY EROSION CONTROL DEVICES AS SOON AS VEGETATION IS ESTABLISHED AND AREAS ARE STABILIZED.

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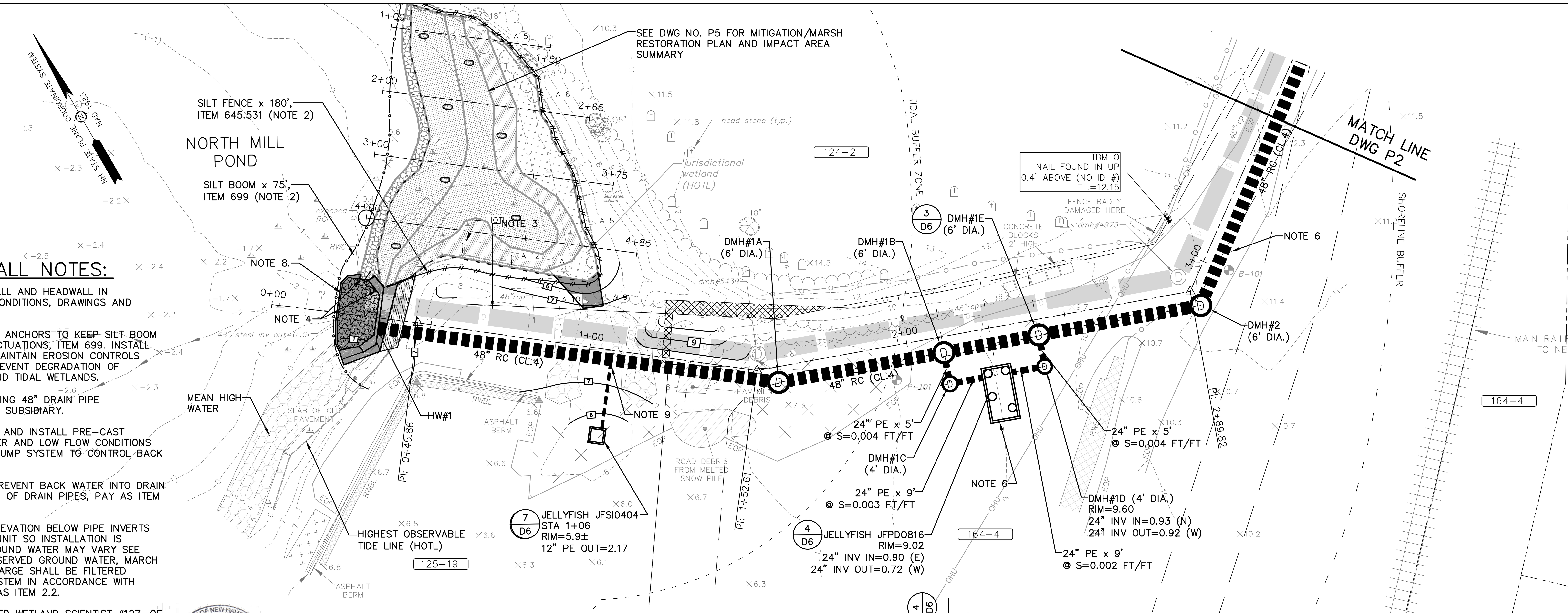
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

UTILITY PLAN NOTES
MAPLEWOOD AVE – DRAINAGE INTERCEPT
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO G3



NORTH MILL POND AREA PLAN VIEW

SCALE: 1 INCH = 20 FT.

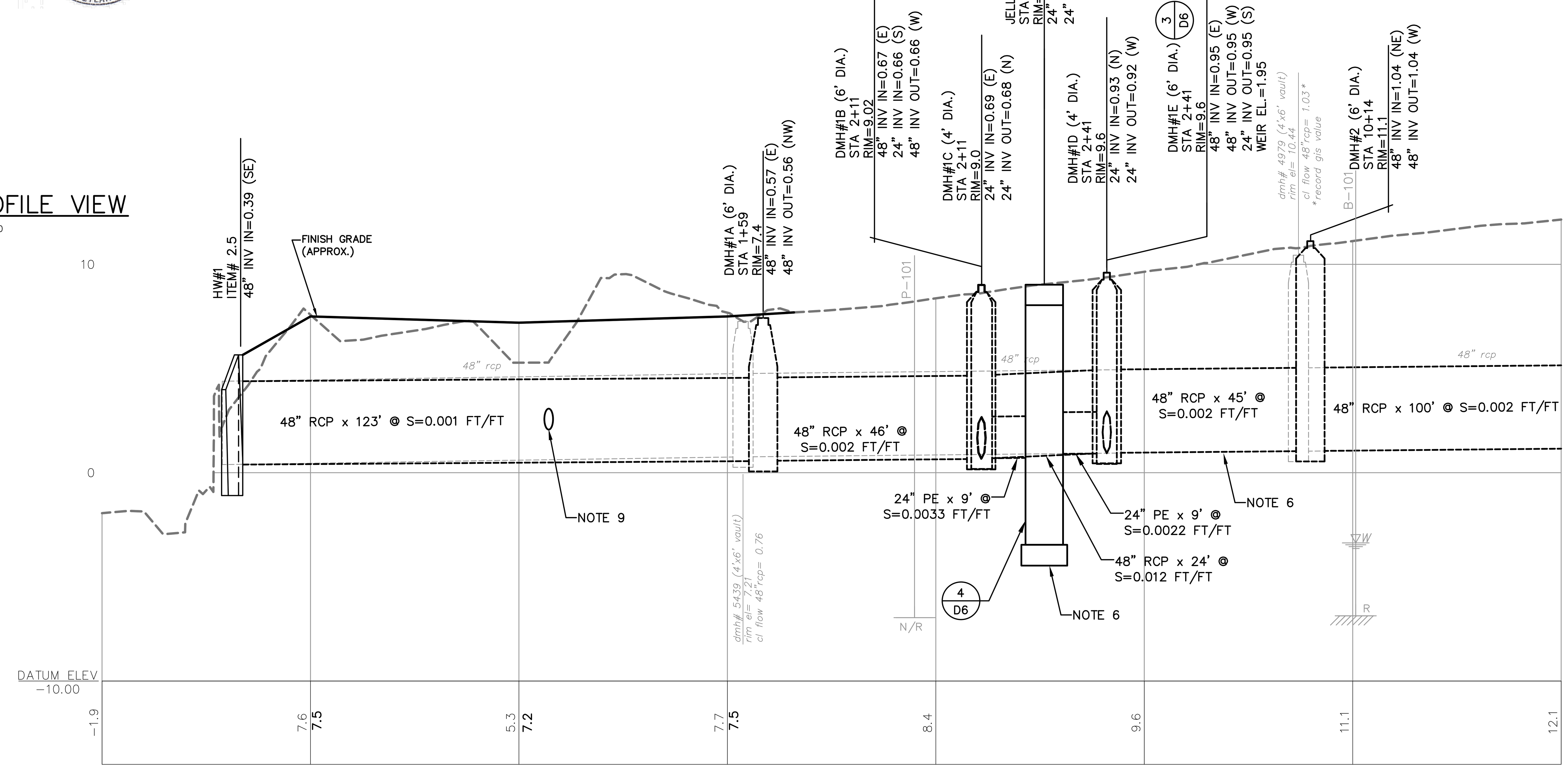
DRAINAGE OUTFALL NOTES:

1. CONSTRUCT DRAINAGE OUTFALL AND HEADWALL IN ACCORDANCE WITH PERMIT CONDITIONS, DRAWINGS AND SPECIFICATIONS.
2. INSTALL SILT BOOM AND SET ANCHORS TO KEEP SILT BOOM IN PLACE DURING TIDAL FLUCTUATIONS, ITEM 699. INSTALL SILT FENCE, ITEM 645.531. MAINTAIN EROSION CONTROLS THROUGH CONSTRUCTION, PREVENT DEGRADATION OF DOWNSTREAM PROPERTIES AND TIDAL WETLANDS.
3. MAINTAIN FLOW IN THE EXISTING 48" DRAIN PIPE THROUGHOUT CONSTRUCTION, SUBSIDIARY.
4. REMOVE EXISTING HEADWALL AND INSTALL PRE-CAST HEADWALL DURING LOW WATER AND LOW FLOW CONDITIONS OR INSTALL SHEETING AND PUMP SYSTEM TO CONTROL BACK WATER, PAY AS ITEM 2.5.
5. INSTALL TIDE VALVES AND PREVENT BACK WATER INTO DRAIN PIPES DURING CONSTRUCTION OF DRAIN PIPES, PAY AS ITEM 2.6.
6. MAINTAIN GROUND WATER ELEVATION BELOW PIPE INVERTS AND BOTTOM OF JELLYFISH UNIT SO INSTALLATION IS COMPLETED IN THE DRY. GROUND WATER MAY VARY SEE B-101, APPENDIX A FOR OBSERVED GROUND WATER, MARCH 2022. GROUND WATER DISCHARGE SHALL BE FILTERED THROUGH A CONTROLLED SYSTEM IN ACCORDANCE WITH CONTRACTORS SWPPP, PAY AS ITEM 2.2.
7. THOMAS SOKOLOSKI, CERTIFIED WETLAND SCIENTIST #127, OF TES ENVIRONMENTAL CONSULTANTS, L.L.C. OF BOW, NH, PERFORMED THE WETLAND IDENTIFICATION AND DELINEATION ON JUNE 28, 2022 ACCORDING TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL AND THE REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: NORTHCENTRAL AND NORTHEAST REGION, VERSION 2.0, JANUARY 2012, US ARMY CORPS OF ENGINEERS.
8. CONSTRUCT STABILIZED OUTLET. SEE DETAILS (DWG D6).
9. CONNECT 12" PE TO 48" RCP WITH INSERT TEE TYPE CONNECTION. 12" PE INVERT=1.97, INCIDENTAL TO ITEM 603.82212.

STATE OF NEW HAMPSHIRE — THOMAS E. SOKOLOSKI — No. 127 — CERTIFIED WETLAND SCIENTIST

NORTH MILL POIND AREA PROFILE VIEW

HORIZ: 1 INCH = 20 FT.
VERT: 1 INCH = 4 FT.



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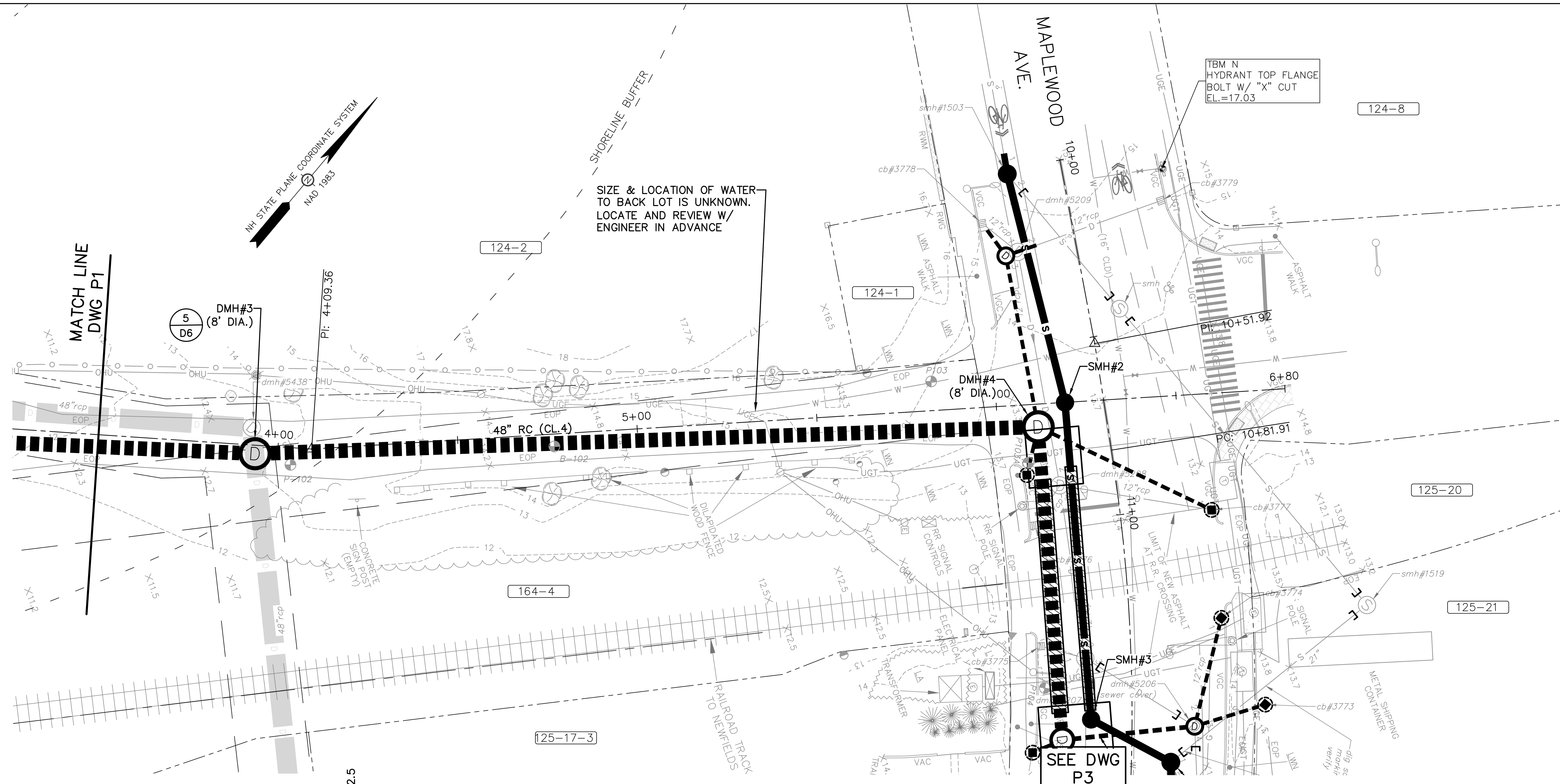
NORTH MILL POND DRAINAGE OUTFALL PIPE PLAN AND PROFILES

MAPLEWOOD AVE – DRAINAGE INTERCEPT

CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO P1
SHEET 5 OF 14

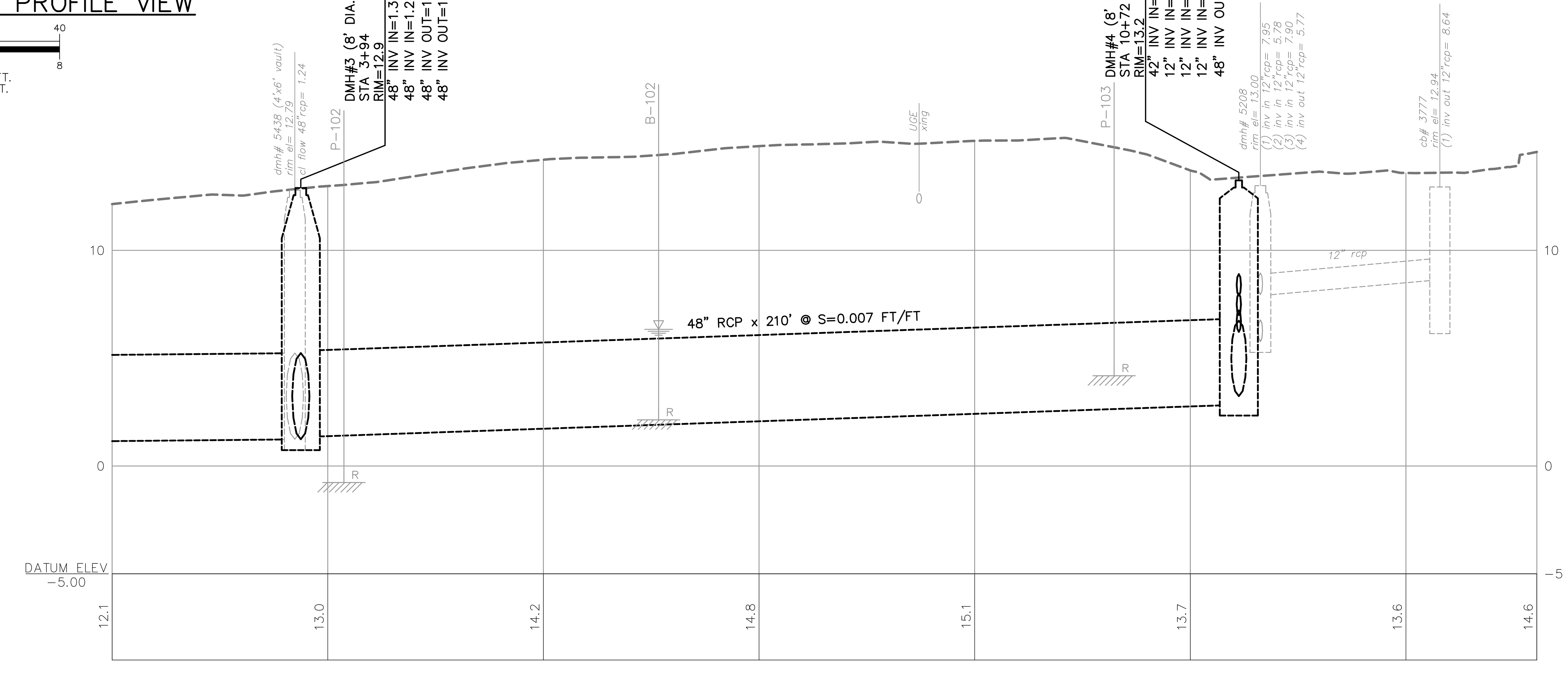


NORTH MILL POND AREA PLAN VIEW

SCALE: 1 INCH = 20 FT.

NORTH MILL POIND AREA PROFILE VIEW

HORIZ: 1 INCH = 20 FT.
VERT: 1 INCH = 4 FT.



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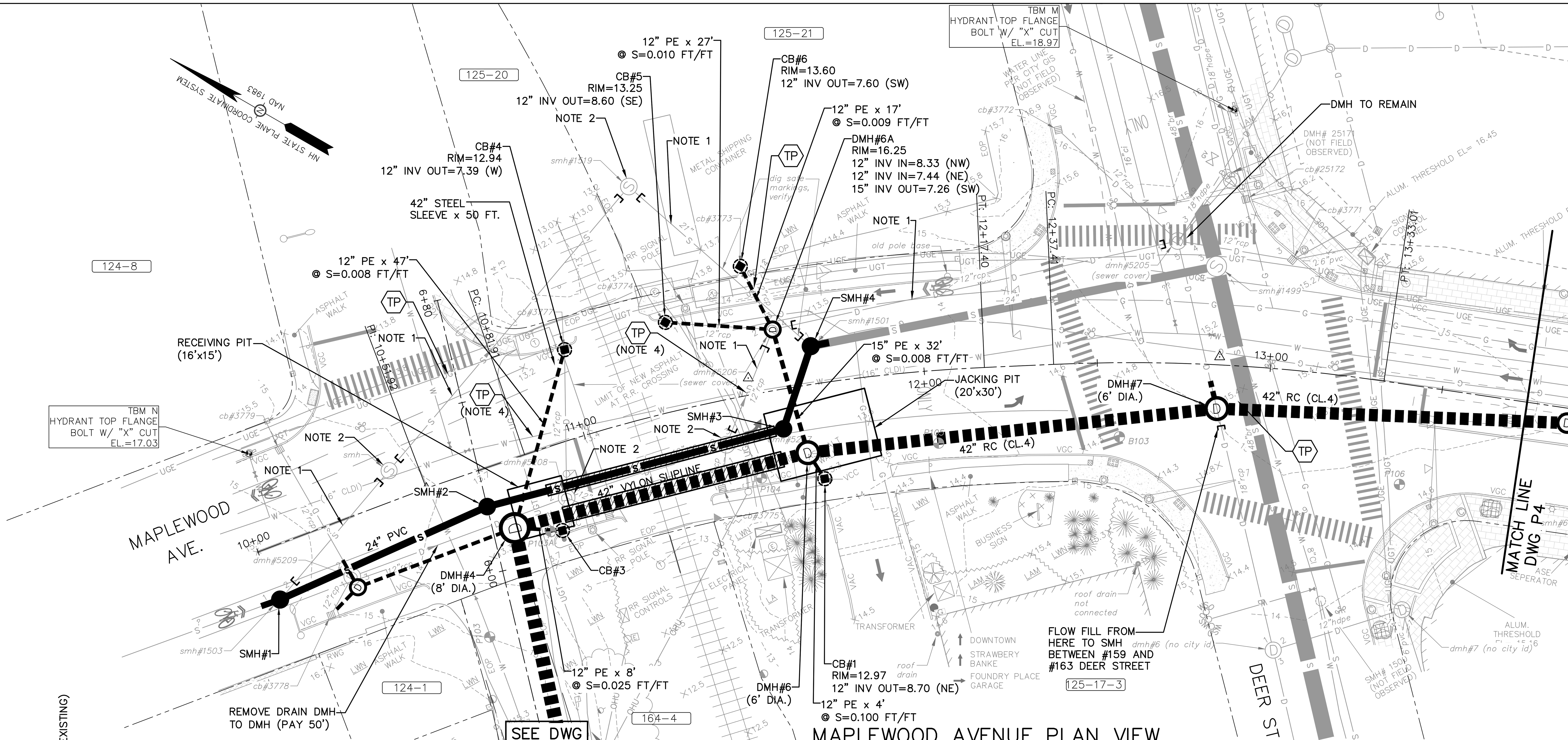
NORTH MILL POND AREA
PIPE PLAN AND PROFILES
MAPLEWOOD AVE – DRAINAGE INTERCEPT
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO P2

NOTES:

1. ABANDON EXISTING PIPES IN PLACE. PLUG AND CAP PIPE AT MANHOLES AND FILL WITH FLOWABLE FILL.
2. REMOVE EXISTING MANHOLE FOLLOWING INSTALLATION OF NEW SEWER.
3. DURING THE JACKING OPERATION THE FRONT OF THE CASING PIPE SHALL BE PROVIDED WITH MECHANICAL ARRANGEMENTS OR DEVICES THAT WILL POSITIVELY PREVENT THE AUGER FROM LEADING THE PIPE SO THAT NO UNSUPPORTED EXCAVATION IS AHEAD OF THE PIPE. *CSXT PIPELINE SPECS. PAGE 23, ii, (c)*
4. CONTRACTOR TO PERFORM TEST PIT TO CONFIRM LOCATION OF WATER MAIN PRIOR TO JACKING AND RECEIVING PIT EXCAVATION.

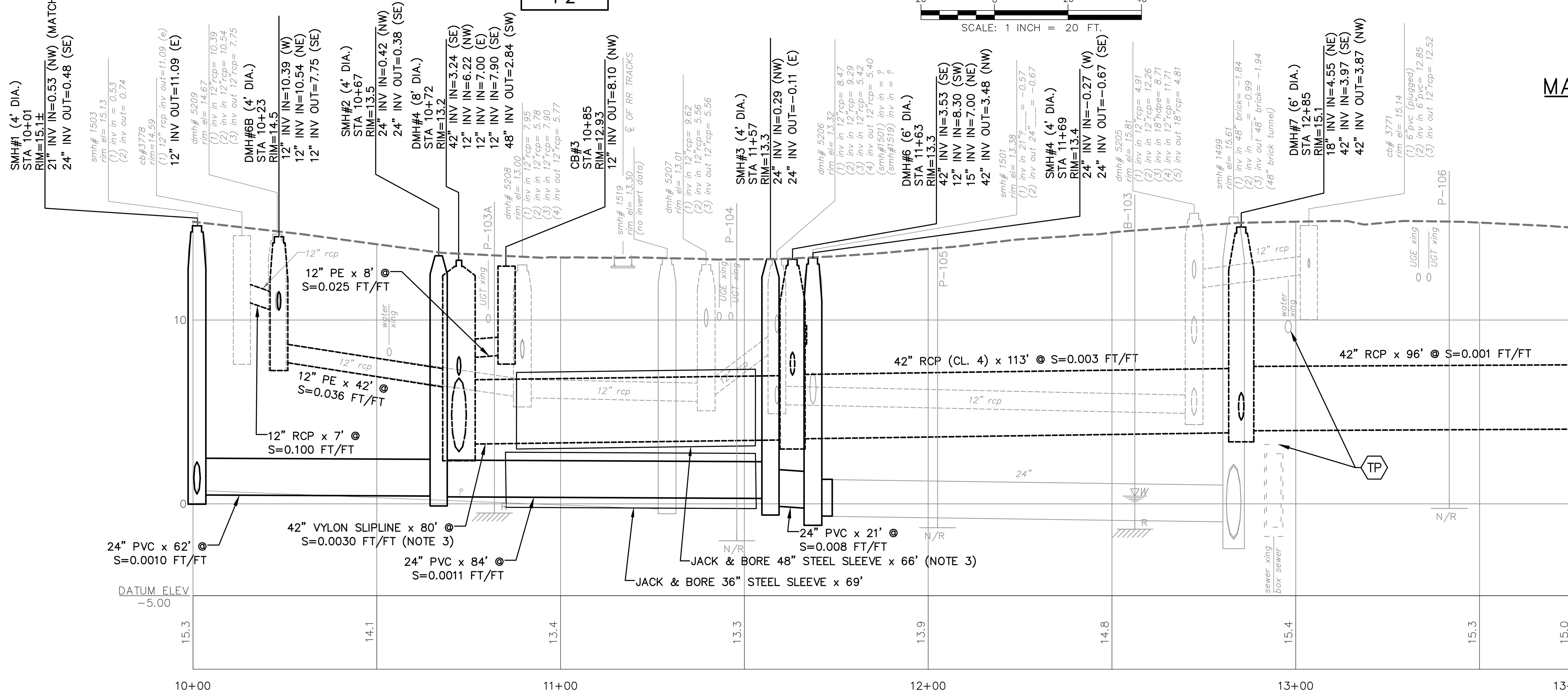


MAPLEWOOD AVENUE PLAN VIEW

SCALE: 1 INCH = 20 FT.

MAPLEWOOD AVENUE PROFILE VIEW

HORIZ: 1 INCH = 20 FT.
VERT: 1 INCH = 4 FT.



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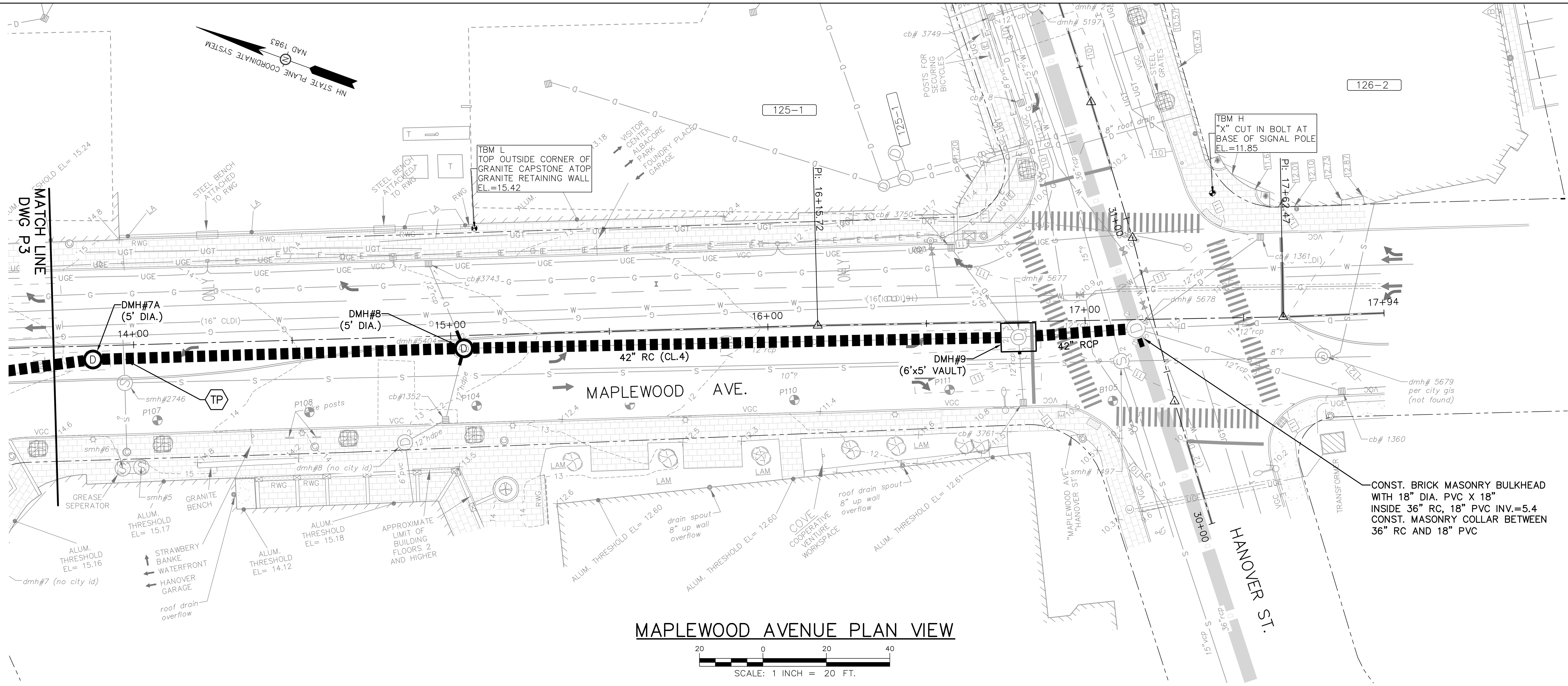
MAPLEWOOD AVENUE PIPE PLAN AND PROFILES

MAPLEWOOD AVE – DRAINAGE INTERCEPT

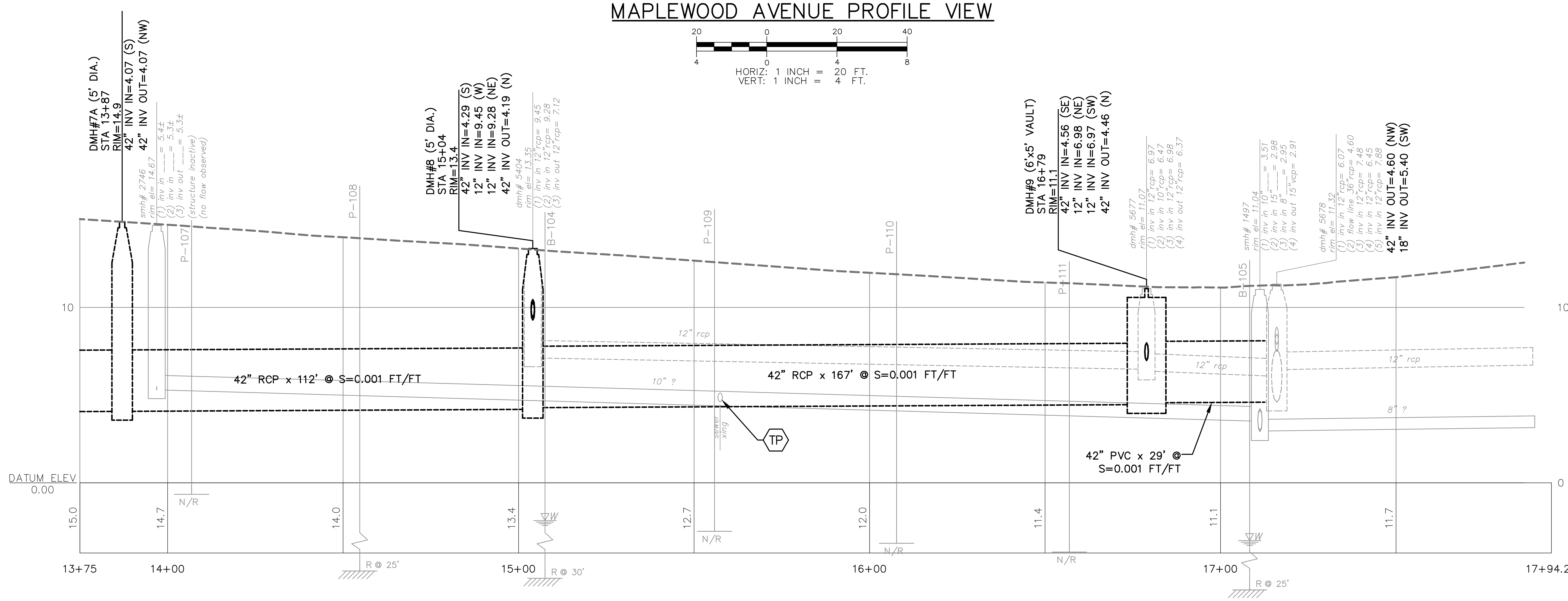
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO P3

MAPLEWOOD AVENUE PLAN VIEW



MAPLEWOOD AVENUE PROFILE VIEW



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MAPLEWOOD AVENUE PIPE PLAN AND PROFILES

MAPLEWOOD AVE – DRAINAGE INTERCEPT

CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

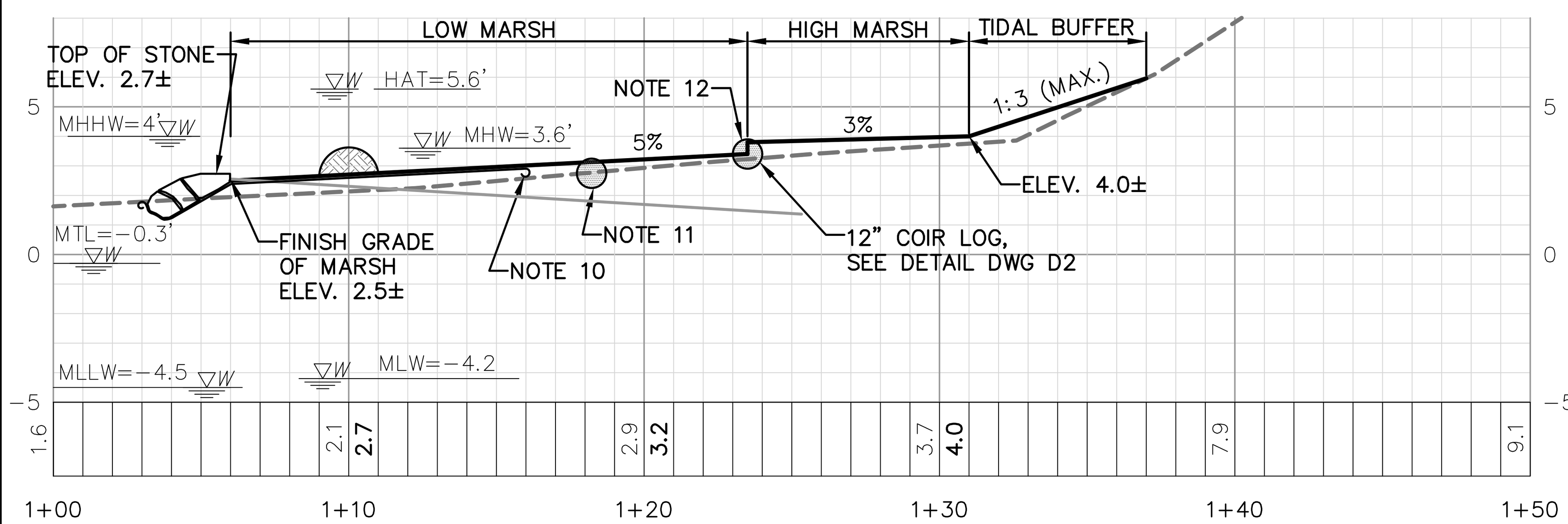
DWG NO P4

NOTES:

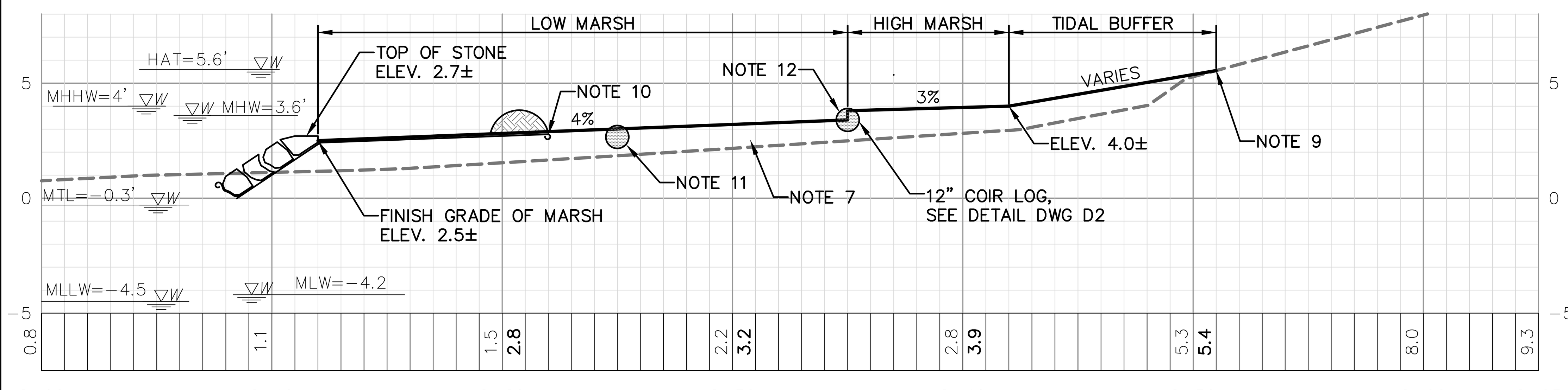
1. CONSTRUCT ROCK STABILIZED 1.5:1 SLOPE. CONTRACTOR SHALL GRADE SLOPE TO THE APPROXIMATE GRADES SHOWN AND PLACE NHDOT CLASS C STONE FILL (18" THICKNESS MIN) ON TOP OF COIR BLANKET (900 GRAM WEIGHT, DOUBLE THICKNESS). CONTRACTOR SHALL USE STOCKPILED STONE FROM SITE TO THE GREATEST EXTENT PRACTICAL, SEE NOTE 2.
2. CONTRACTOR SHALL PRESERVE AND STOCKPILE EXISTING STONE FOUND ON-SITE, AND PREVIOUSLY EXPOSED TO TIDAL ACTION, TO BE USED FOR STONE STABILIZATION AND BOULDERS WHERE SPECIFIED. ON-SITE SOURCES OF STONE ARE THE RANDOM STONES FOUND IN THE MARSH AREA, AND THE EXISTING STONE EMBANKMENT TO THE NORTH OF THE EXISTING OUTFALL.
3. CONTRACTOR SHALL PLACE BOULDERS (24" MIN) IN THE PROPOSED MARSH AREA FOR THE PURPOSE OF BREAKING UP SHEET ICE IN THE WINTER TIME. PLACE BOULDERS RANDOMLY APPROXIMATELY 75' APART.
4. ALL EXISTING TREES TO REMAIN.
5. TRIM TREES TO RAISE THE LOWEST PORTION OF THE CANOPY APPROXIMATELY 20' ABOVE GROUND TO PROMOTE ADDITIONAL SUNLIGHT TO THE MARSH.
6. ALL SHRUB VEGETATION TO REMAIN. PER THE FUNCTIONAL ASSESSMENT COMPLETED AS PART OF THE PERMITTING PROCESS, MUCH OF THIS VEGETATION IS INVASIVE AND SHOULD REMAIN IN PLACE. REMOVAL OF VEGETATION WILL ONLY BE PERMITTED WITH APPROVAL OF THE ENGINEER AND THE CITY ARBORIST. ANY REMOVAL OF INVASIVE SPECIES SHALL BE COMPLETED IN ACCORDANCE TO ALL LOCAL, STATE, AND FEDERAL GUIDELINES.
7. CONTRACTOR SHALL ENDEAVOR TO INCORPORATE AS MUCH SURPLUS SOIL FROM THE OUTFALL IMPROVEMENTS AS POSSIBLE. IMPORTED SOIL USED FOR MARSH GRADING SHALL MEET THE FOLLOWING:

SIZE (mm)	PASSING
12.5	100%
2	90%
0.5	80%
0.1	20%

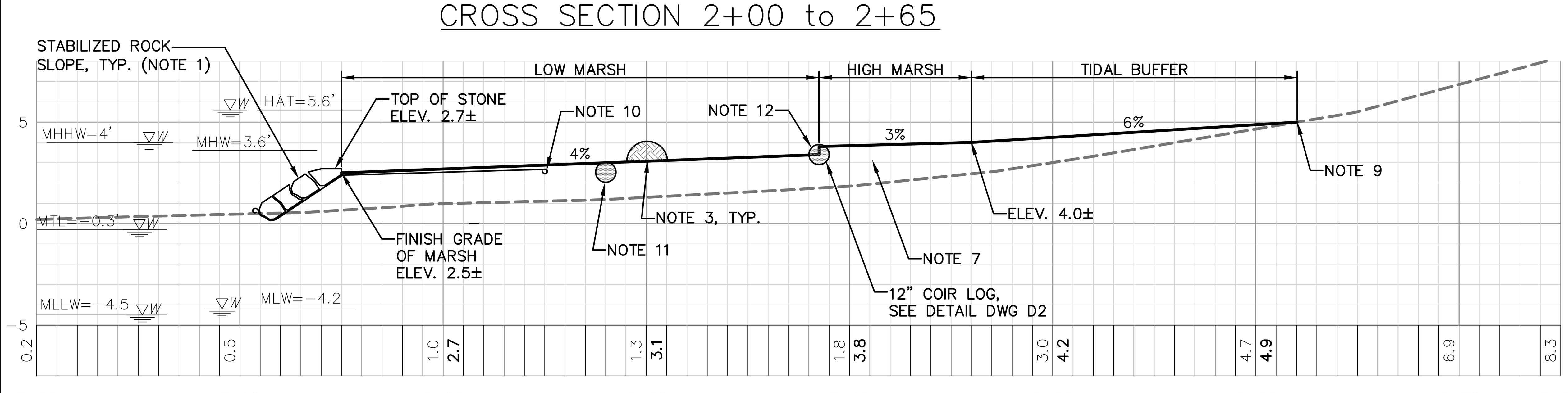
8. PLANTING WITHIN THE PROPOSED MARSH SHALL BE WITH SPECIES NATIVE TO THE AREA. ALL PLANTINGS SHALL BE NURSERY GROWN, BARE ROOT SEEDLINGS. SEEDING OF THE SITE WILL NOT BE PERMITTED. LOW MARSH AREA SHALL BE PLANTED WITH VEGETATION SHEETS (MATS) AT THE RATE OF ONE MAT PER 1.65 SQ. FT. OF SMOOTH CORDGRASS (SPARTINA ALTERNIFLORA). HIGH MARSH AREA SHALL BE PLANTED WITH VEGETATION SHEETS (MATS) AT THE RATE OF ONE MAT PER 1.65 SQ. FT. OF SALTMEADOW CORDGRASS (SPARTINA PATENS). INCREASE DIVERSITY IN THE HIGH MARSH ZONE BY PLANTING SPIKE GRASS (DISTICHLIS SPICATA), BLACK GRASS (JUNCUS GERARDII), AND SEA LAVENDER (LIMONIUM) AT RANDOM AT A RATE OF ONE PLANT PER 80 SQ FT. THE TIDAL BUFFER ZONE SHALL BE PLANTED WITH BAYBERRY (MYRICA PENSYLVANICA), SHADBUSH (AMELANCHIER CANADENSIS), SWITCHGRASS (PANICUM VIRGATUM), SWEET-FERN (COMPTONIA PEREGRINA), AND SWEET PEPPERBUSH (CLETHRA ALNIFOLIA) AT RANDOM, AT A RATE OF ONE PLANT PER 80 SQ. FT. CERTIFICATION THAT SEEDLING STOCK IS OF SPECIFIED SPECIES SHALL BE PROVIDED BY THE NURSERY OR QUALIFIED PROFESSIONAL. SEE NOTE 13 FOR PLANTING ZONES.
9. LIMIT OF FINAL GRADING WILL BE REVIEWED IN THE FIELD PRIOR TO COMMENCEMENT OF WORK. ACTUAL FINAL LIMIT OF GRADING WILL BE DEPENDANT ON ACTUAL CONDITIONS FOUND ON-SITE AND IMPACTS TO EXISTING VEGETATION AND THE NEED FOR INVASIVE SPECIES REMOVAL.
10. EXTEND COIR BLANKET (SINGLE THICKNESS) 10' ONTO SURFACE OF MARSH IMMEDIATELY FOLLOWING COMPLETION OF GRADING AND PRIOR TO SEEDING.
11. INSTALL 12" COIR LOG BURIED APPROXIMATELY 9" TO SERVE AS AN EROSION BARRIER AND TO AREA FOR ROUTINE INSPECTIONS OF MARSH AREA. SET COIR LOG APPROXIMATELY LEVEL ACROSS A CONTOUR TO PREVENT CONCENTRATION OF WATER. TOP OF LOG ELEVATION = 3.2'±.
12. INSTALL 12" COIR LOG MARSH TRANSITION, TOP OF LOG = ELEV 3.9'±. ELEVATION OF LOW MARSH SHALL BE 3.4'± AND ELEVATION OF HIGH MARSH SHALL BE 3.8'±.
13. PLANTING ZONES SHALL GENERALLY AS FOLLOWS:
    A. LOW MARSH PLANTS BELOW ELEVATION 3.6' (BELOW MHW)
    B. HIGH MARSH PLANTS BETWEEN ELEVATIONS 3.6' AND 4.0' (BETWEEN MHW AND MHHW)
    C. TIDAL BUFFER PLANTINGS ABOVE ELEVATION 4.0' (ABOVE MHHW)



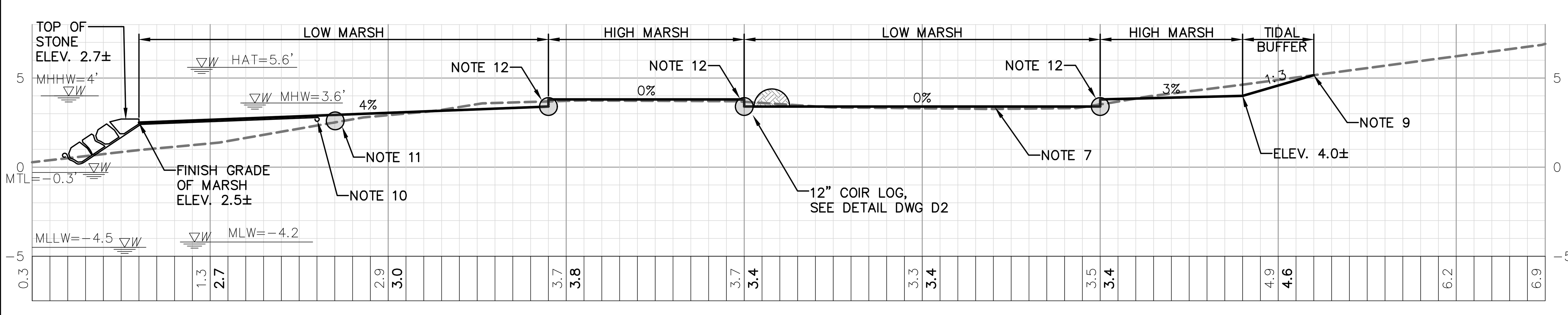
CROSS SECTION 1+00 to 1+50



CROSS SECTION 2+00 to 2+65



CROSS SECTION 3+00 to 3+75

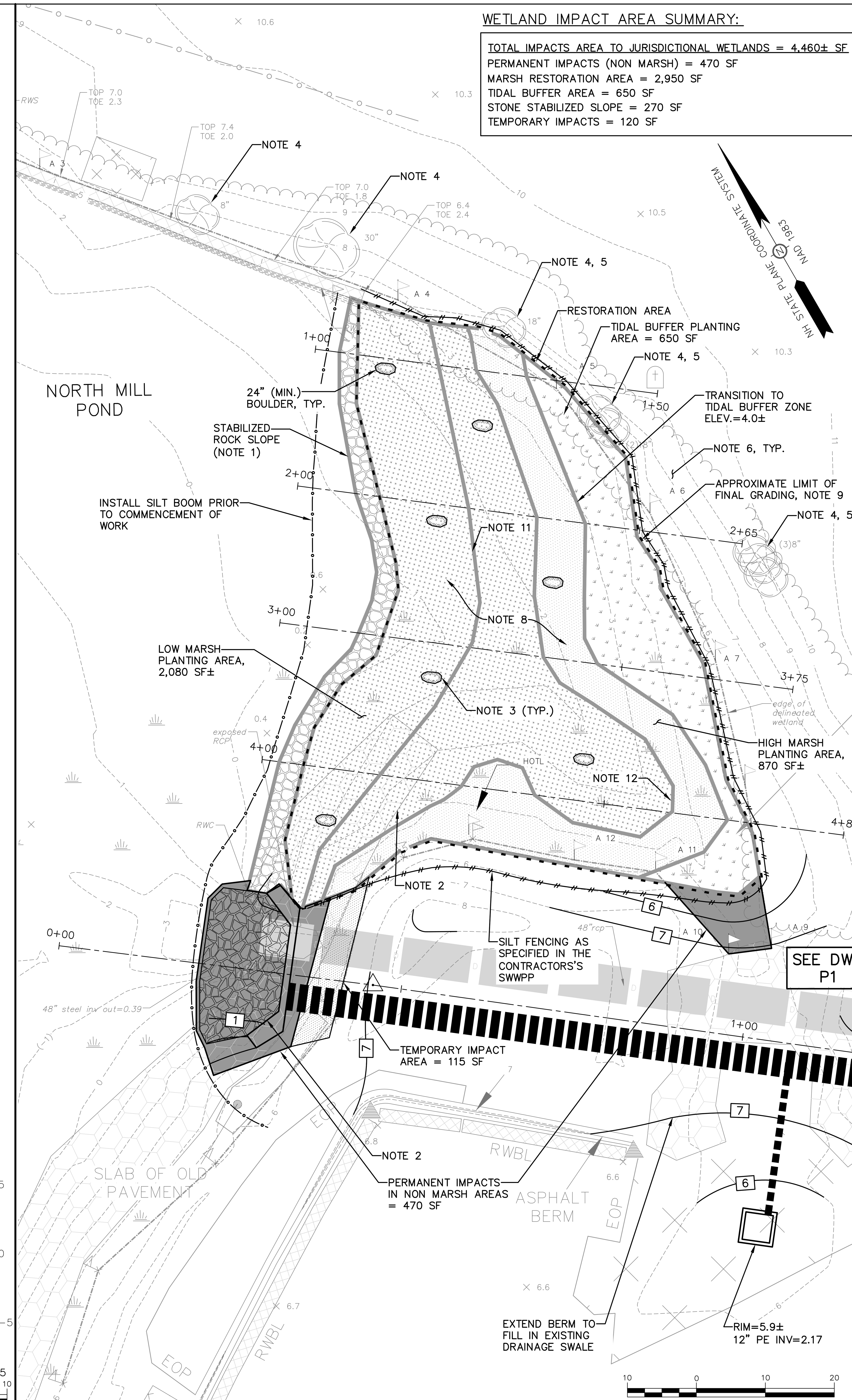


CROSS SECTION 4+00 to 4+85

SCALE: 1 INCH = 5 FT.

WETLAND IMPACT AREA SUMMARY:

TOTAL IMPACTS AREA TO JURISDICTIONAL WETLANDS = 4,460± SF
PERMANENT IMPACTS (NON MARSH) = 470 SF
MARSH RESTORATION AREA = 2,950 SF
TIDAL BUFFER AREA = 650 SF
STONE STABILIZED SLOPE = 270 SF
TEMPORARY IMPACTS = 120 SF



SCALE: 1 INCH = 10 FT.

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25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

NORTH MILL POND RESTORATION AREA PLAN AND PROFILES

MAPLEWOOD AVE – DRAINAGE INTERCEPT

CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO P5
SHEET ? OF 14

STANDARD MANHOLE NOTES:

1. GENERAL: SEWER MANHOLES, INCLUDING ALL COMPONENT PARTS, SHALL BE ASSEMBLED OF PRECAST SECTIONS, WITH STEEL REINFORCEMENT. IN ANY APPROVED MANHOLE, THE COMPLETE STRUCTURE SHALL BE OF SUCH MATERIAL AND QUALITY AS TO WITHSTAND LOADS OF 8 TONS (H20 LOADING) WITHOUT FAILURE, AND TO PREVENT LEAKAGE IN EXCESS OF ONE GALLON PER DAY PER VERTICAL FOOT OF MANHOLE, CONTINUOUSLY FOR THE LIFE OF THE STRUCTURE. A PERIOD GENERALLY IN EXCESS OF 25 YEARS IS TO BE UNDERSTOOD IN BOTH CASES.

2. BARRELS AND CONE SECTIONS; SHALL BE PRECAST REINFORCED CONCRETE.

3. PRECAST CONCRETE; BARREL SECTIONS, CONES, AND BASES SHALL CONFORM TO ASTM C478.

4. LEAKAGE TEST; SHALL BE PERFORMED IN ACCORDANCE WITH THE SPECIFICATIONS. INVERT AND SHELF TO BE PRIOR TO BACKFILL PLACED AFTER TESTING.

5. INVERTS AND SHELVES; MANHOLES SHALL HAVE A BRICK PAVED SHELF AND INVERT, CONSTRUCTED TO CONFORM TO THE SIZE OF PIPE AND FLOW. CARE SHALL BE TAKEN TO INSURE THAT THE BRICK INVERT IS A SMOOTH CONTINUATION OF THE SEWER INVERT. INVERT BRICKS SHALL BE LAID ON EDGE. AT CHANGES IN DIRECTION, THE INVERTS SHALL BE LAID OUT IN CURVES OF THE LONGEST POSSIBLE TANGENT TO THE CENTER LINE OF THE SEWER PIPES. SHELVES SHALL BE CONSTRUCTED TO AN ELEVATION OF 1" ABOVE THE HIGHEST PIPE CROWN AND SLOPE TO DRAIN TOWARD THE FLOWING THROUGH CHANNEL. UNDERLAYMENT OF INVERT AND SHELF SHALL CONSIST OF BRICK MASONRY.

6. FRAMES AND COVERS; MANHOLE FRAMES AND COVERS SHALL BE CITY OF PORTSMOUTH STANDARD AND SHALL BE PICKED UP BY THE CONTRACTOR AT PORTSMOUTH DPW.

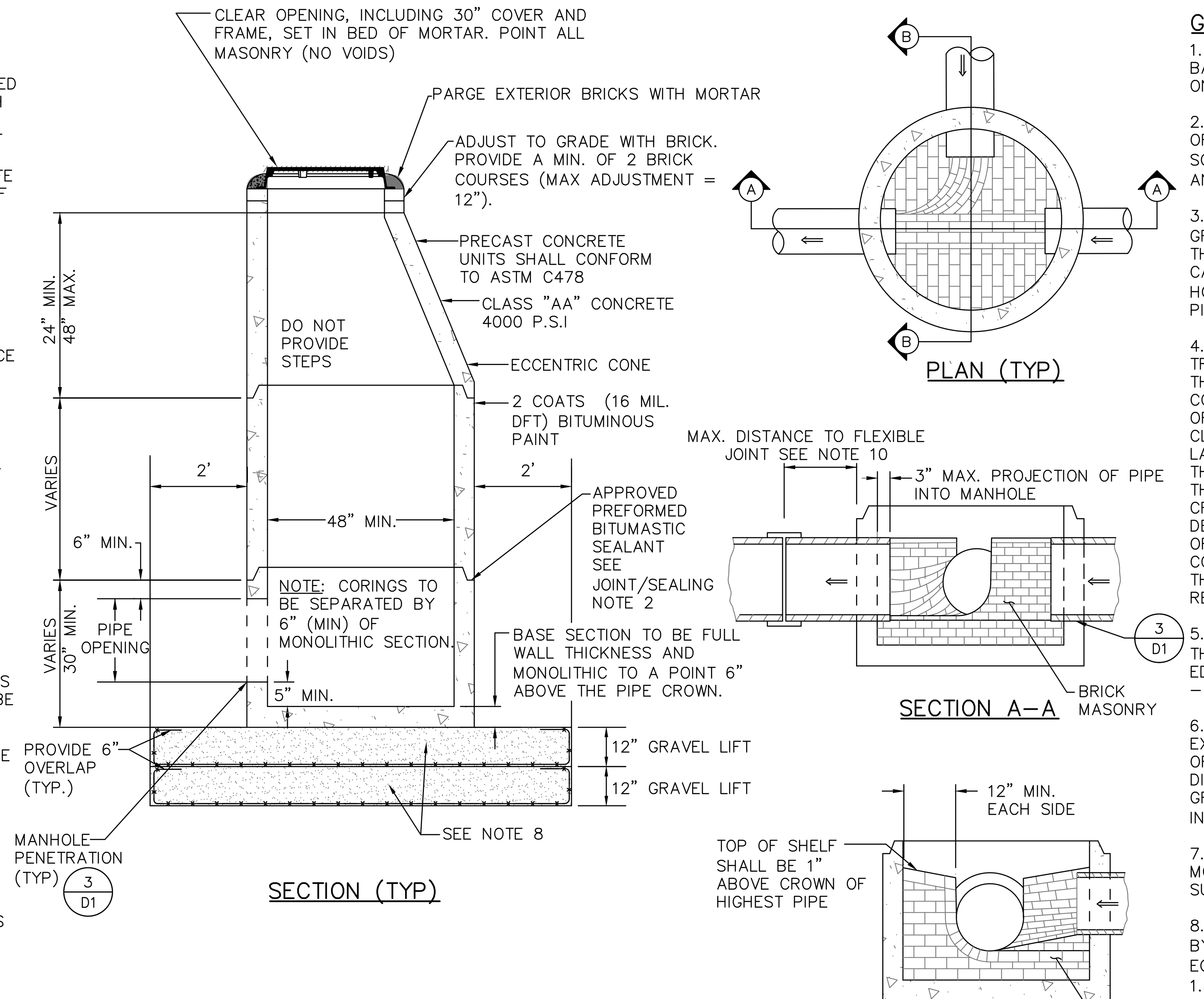
7. BEDDING; SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATTER AND MEETING ASTM C33, STONE SIZE NO. 67.
   - 100% PASSING 1 INCH SCREEN
   - 90-100% PASSING 3/4 INCH SCREEN
   - 20-55% PASSING 3/8 INCH SCREEN
   - 0-10% PASSING #4 SIEVE
   - 0-5% PASSING #8 SIEVE

8. WHERE THE MATERIAL BELOW MANHOLE STRUCTURE IS SOFT OR YIELDING, AND WHERE DIRECTED BY THE ENGINEER, INSTALL DOUBLE LAYER OF GEOGRID (TENSAR TX160 OR EQUAL). PAY AS ITEM 1.8B (LFx2).

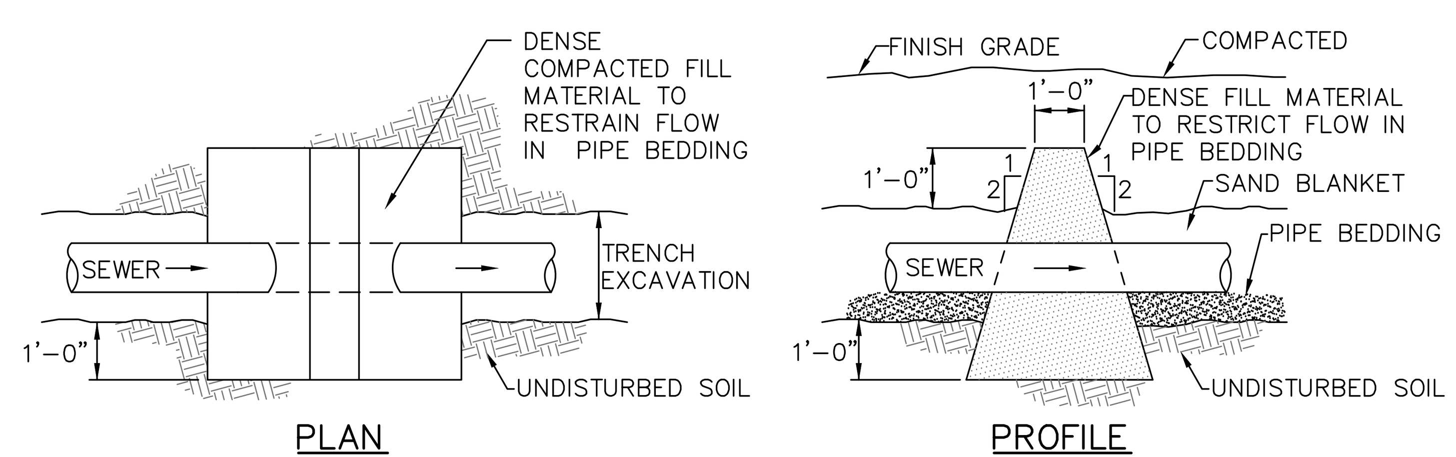
9. SHALLOW MANHOLE: IN LIEU OF A CONE SECTION, WHEN MANHOLE IS LESS THAN 6 FEET, A REINFORCED CONCRETE SLAB COVER HAVING AN ECCENTRIC ENTRANCE AND CAPABLE OF SUPPORTING H-20 LOADS MAY BE USED.

10. FLEXIBLE JOINT; A FLEXIBLE JOINT SHALL BE PROVIDED WITHIN THE FOLLOWING DISTANCES:
RCP AND CI PIPE – ALL SIZES – 48"
AC AND VC PIPE – UP THROUGH 12" DIA. – 18"
AC AND VC PIPE – LARGER THAN 12" DIA. – 36"
DI PIPE – NONE REQUIRED
PVC – UP THROUGH 15" DIA. – NONE REQUIRED
PVC – LARGER THAN 15" DIA. – 48"/60"
ABS (ASTM D2680) – ALL SIZES – SAME AS VC ABOVE.

11. SPECIFICATIONS; ADDITIONAL CONSTRUCTION SPECIFICATIONS ARE INCLUDED IN THE CONTRACT DOCUMENTS. THESE STANDARD MANHOLE DRAWINGS ARE NOT COMPLETE WITHOUT THESE SPECIFICATIONS.



1 D1 SEWER MANHOLE
NOT TO SCALE



NOTES:

1. TRENCH DRAINS TO BE AT LOCATIONS SHOWN ON THE PLAN OR AS DIRECTED TO CONTROL BACK WATER IN STONE BEDDING, SUBSIDIARY.

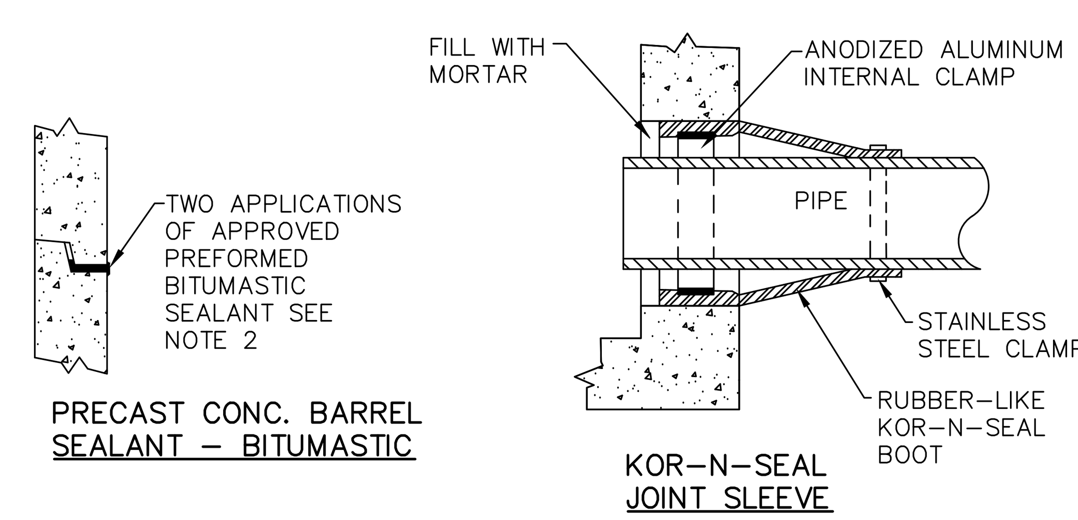
4 D1 TRENCH DAM
NOT TO SCALE

JOINTING AND SEALING NOTES

1. PIPE TO MANHOLE JOINTS SHALL BE ONLY AS APPROVED BY THE ENGINEER AND IN GENERAL, WILL DEPEND UPON AN ELASTOMERIC SEALANT FOR WATERTIGHTNESS.

2. FOR BITUMASTIC TYPE JOINTS THE AMOUNT OF SEALANT SHALL BE SUFFICIENT TO FILL AT LEAST 75% OF THE JOINT CAVITY. APPROVED BITUMASTIC SEALANTS: RAM-NEK E Z KENT SEAL NO.2

3. ALL GASKETS, SEALANTS, MORTAR, ETC., SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS WRITTEN INSTRUCTIONS.



3 D1 MANHOLE PENETRATIONS
NOT TO SCALE

SERVICE CONNECTION NOTES:

1. SEE DETAILS FOR SERVICE CONNECTION REQUIREMENTS.

2. SERVICE CONNECTION SHALL BE INSTALLED BELOW WATER MAIN WHERE POSSIBLE.

3. CLEANOUTS SHALL BE INSTALLED AT EACH SERVICE CONNECTION.

4. REBAR SHALL BE PLACED AT SIDE OF CLEANOUT.

5. CLEANOUT SHALL BE USED TO PLUG AND TEST ALL NEW LATERALS WITH MINIMAL INTERRUPTION TO OPERATION OF HOMEOWNER SANITARY SYSTEM.

6. CLEANOUT RISER PIPE AND FITTINGS SHALL BE INCIDENTAL AND SHALL NOT BE CONSIDERED FOR PAYMENT.

GRAVITY SEWER TRENCH NOTES:

1. ORDERED EXCAVATION OF UNSUITABLE MATERIAL BELOW GRADE; BACKFILL AS STATED IN THE TECHNICAL SPECIFICATIONS OR AS SHOWN ON THE DRAWINGS.

2. BEDDING; SEE NOTE 7 OF STANDARD MANHOLE NOTES. WHERE ORDERED BY THE ENGINEER TO STABILIZE THE TRENCH BASE, GRADED SCREENED GRAVEL OR CRUSHED STONE 1/2 INCH TO 1-1/2 INCH AND/OR THE USE OF GEOGRID FABRIC (ITEM 1.8B) MAY BE REQUIRED.

3. SAND BLANKET; CLEAN SAND FREE FROM ORGANIC MATTER, SO GRADED THAT 90-100% PASSES A 1/2 INCH SIEVE AND NOT MORE THAN 15% WILL PASS A #200 SIEVE. BLANKET MAY BE OMITTED FOR CAST-IRON, DUCTILE IRON, AND REINFORCED CONCRETE PIPE PROVIDED HOWEVER, THAT NO STONE LARGER THAN 2" IS IN CONTACT WITH THE PIPE.

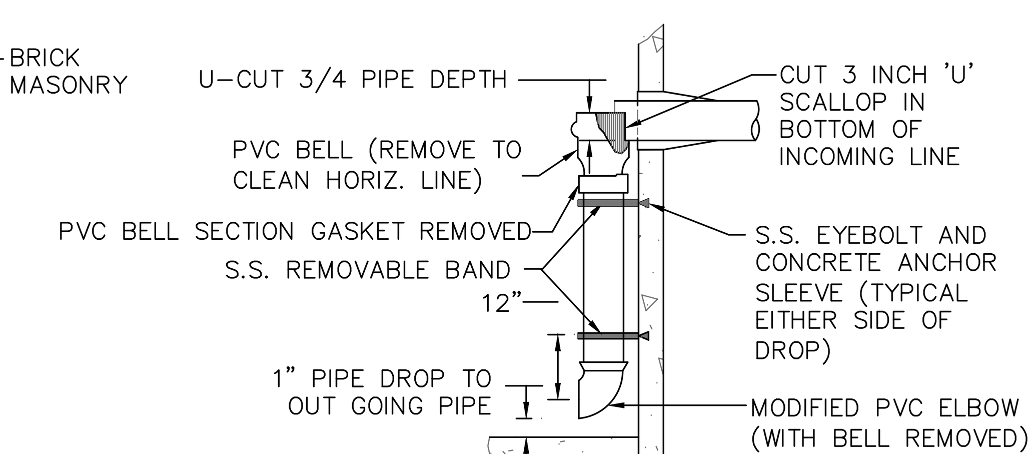
4. SUITABLE MATERIAL; IN ROADS, ROAD SHOULDERS, WALKWAYS AND TRAVELED WAYS, SUITABLE MATERIAL FOR TRENCH BACKFILL SHALL BE THE NATURAL MATERIAL EXCAVATED DURING THE COURSE OF CONSTRUCTION, BUT SHALL EXCLUDE DEBRIS; PIECES OF PAVEMENT; ORGANIC MATTER; TOP SOIL; ALL WET OR SOFT MUCK, PEAT, OR SOFT CLAY; ALL EXCAVATED LEDGE MATERIAL; ALL ROCKS OVER 6 INCHES IN LARGEST DIMENSION; AND ANY MATERIAL WHICH, AS DETERMINED BY THE ENGINEER, WILL NOT PROVIDE SUFFICIENT SUPPORT OR MAINTAIN THE COMPLETED CONSTRUCTION IN A STABLE CONDITION. IN CROSS-COUNTRY CONSTRUCTION, SUITABLE MATERIAL SHALL BE AS DESCRIBED ABOVE, EXCEPT THAT THE ENGINEER MAY PERMIT THE USE OF TOP SOIL, LOAM, MUCK, OR PEAT, IF HE IS SATISFIED THAT THE COMPLETED CONSTRUCTION WILL BE ENTIRELY STABLE AND PROVIDED THAT EASY ACCESS TO THE SEWER, FOR MAINTENANCE AND POSSIBLY RECONSTRUCTION, WILL BE PRESERVED.

5. BASE COURSE AND PAVEMENT SHALL MEET THE REQUIREMENTS OF THE NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION'S LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES – DIVISIONS 300 AND 400 RESPECTIVELY.

6. W = MAXIMUM ALLOWABLE TRENCH PAYMENT WIDTH FOR ROCK EXCAVATION, FOR ORDERED EXCAVATION BELOW GRADE AND HANDLING OF EXCAVATED CONTAMINATED SOILS. FOR PIPES 15 INCHES NOMINAL DIAMETER OR LESS, W SHALL BE NO MORE THAN 36 INCHES. FOR PIPES GREATER THAN 15 INCHES IN NOMINAL DIAMETER, W SHALL BE 24 INCHES PLUS PIPE OUTSIDE DIAMETER (O.D.)

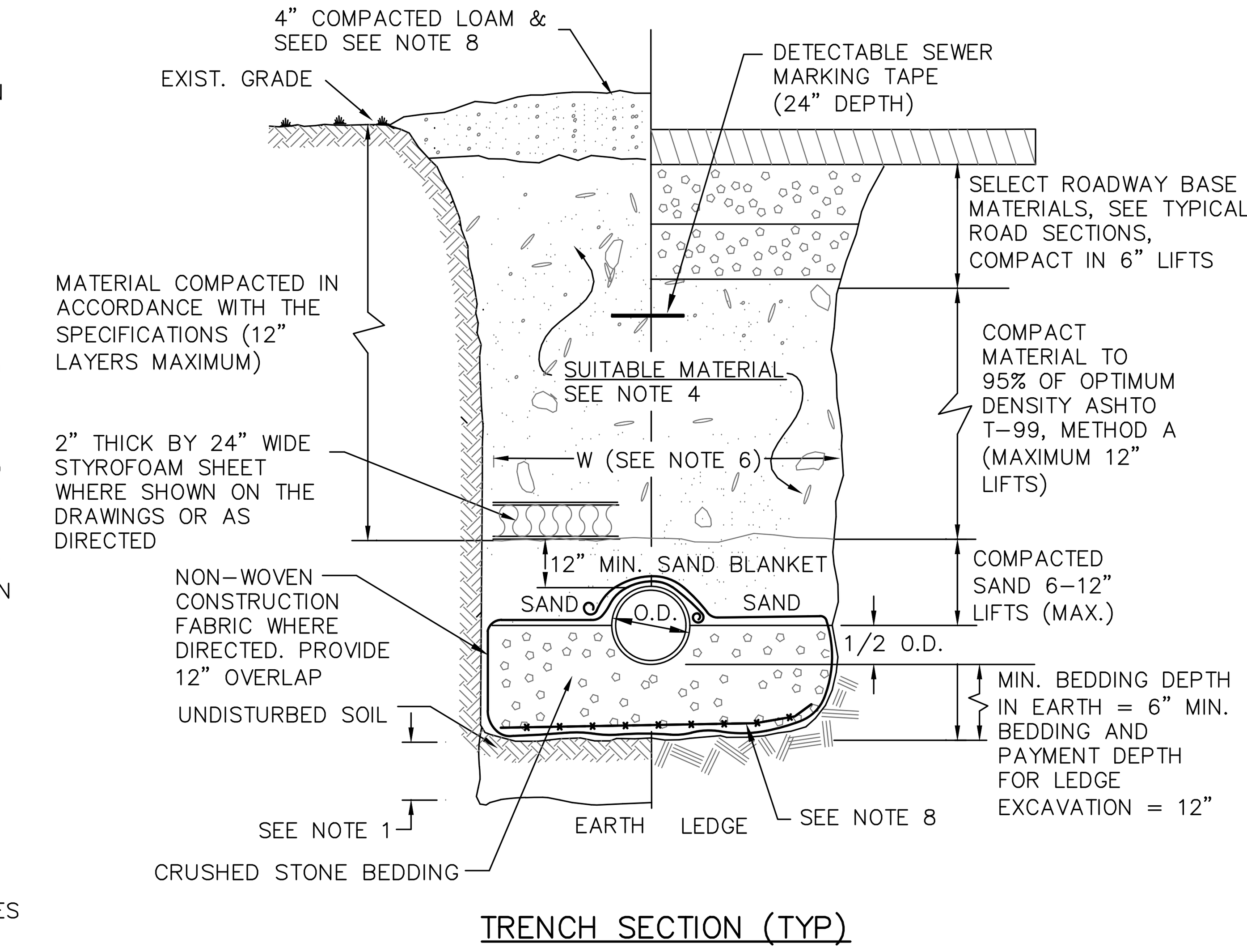
7. FOR CROSS COUNTRY CONSTRUCTION, BACKFILL OR FILL SHALL BE MOUNDED TO A HEIGHT OF 6 INCHES ABOVE THE ORIGINAL GROUND SURFACE.

8. WHERE TRENCH BOTTOM IS SOFT OR YIELDING, AND WHERE DIRECTED BY THE ENGINEER, INSTALL SINGLE LAYER OF GEOGRID (TX160 OR EQUAL) ACROSS THE ENTIRE WIDTH OF TRENCH BOTTOM. PAY AS ITEM 1.8A (L.F.).

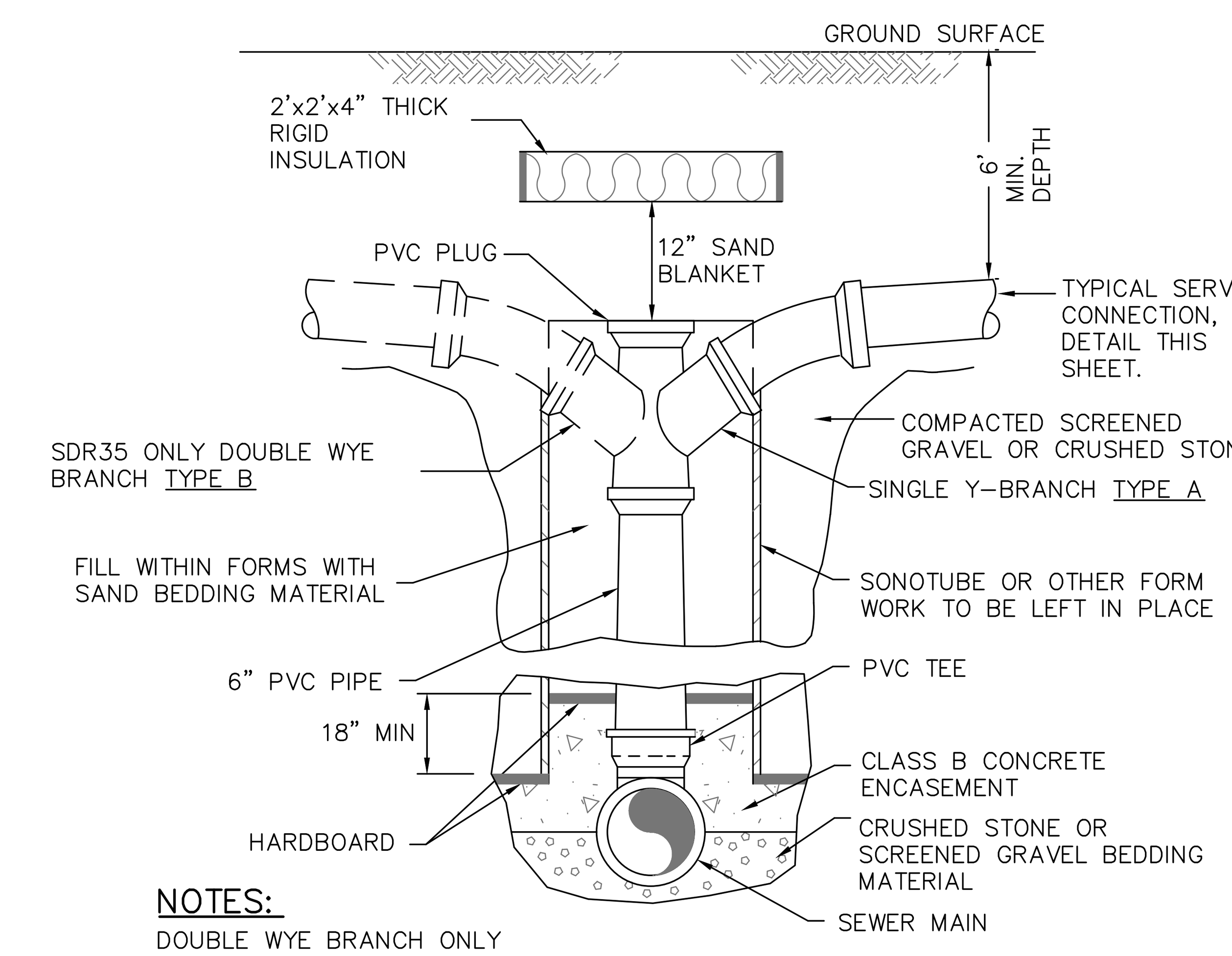


SIZE GUIDE:
1-8" OR 10" DROP: 4'-0" DIA. M.H.
2-8" OR 10" DROP: 5'-0" DIA. M.H.
1-12" DROP: 5'-0" DIA. M.H.
1-15" DROP: 5'-0" DIA. M.H.

5 D1 DROP MANHOLE
NOT TO SCALE

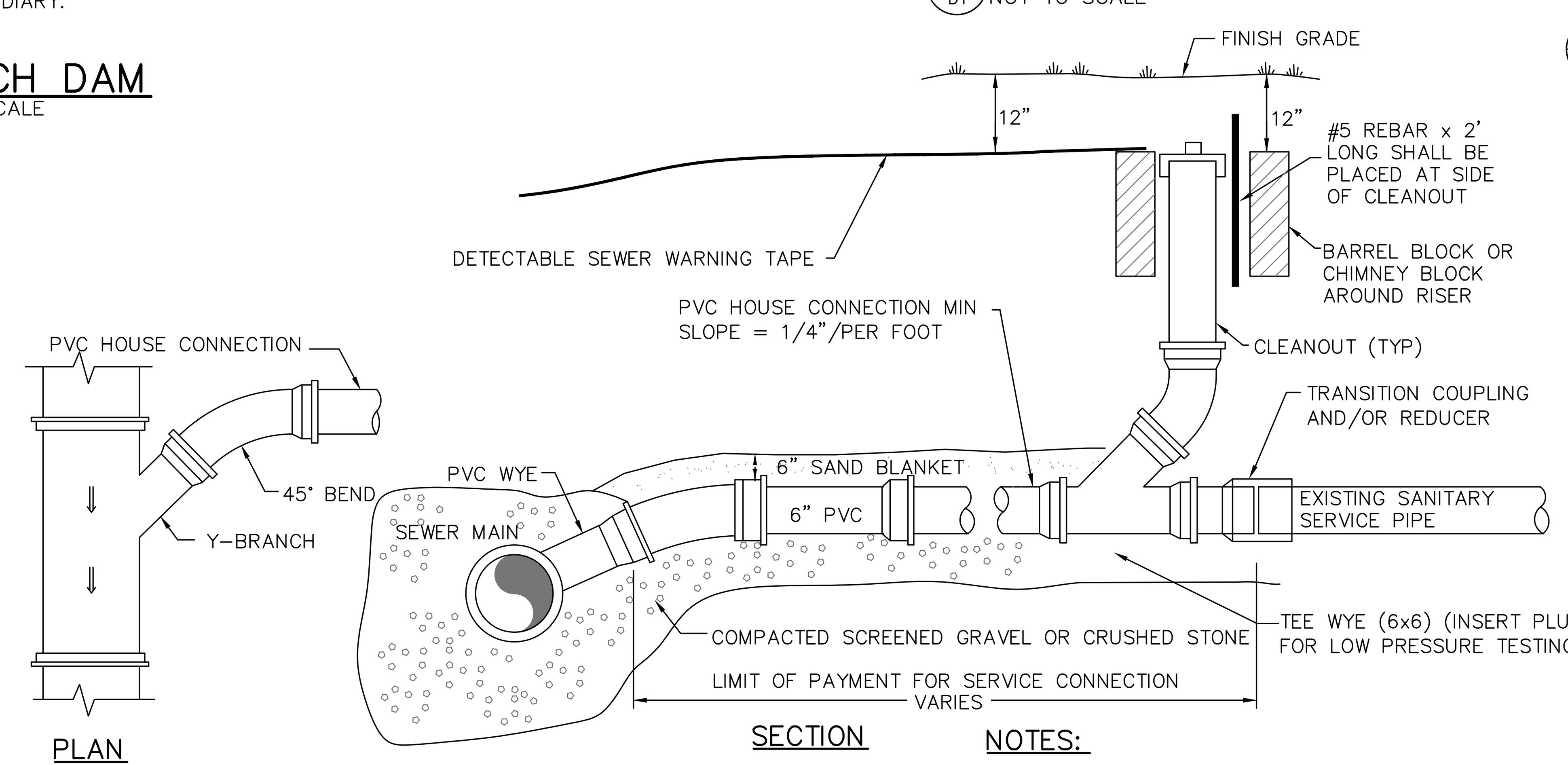


2 D1 TRENCH – GRAVITY SEWER
NOT TO SCALE



NOTES:
DOUBLE WYE BRANCH ONLY TO BE USED WHERE APPROVED BY ENGINEER

7 D1 PVC SEWER SERVICE CHIMNEY WITH WYE
NOT TO SCALE



NOTES:

1. MAINTAIN 18" SEPARATION BETWEEN NEW SEWER SERVICE AND NEW OR EXISTING WATER MAIN (WATER SHALL BE OVER SEWER).

6 D1 SERVICE CONNECTION
NOT TO SCALE

ISSUE FOR	Date	By
BIDDING	–	–
CONSTRUCTION	–	–
RECORD DRAWING	–	–

NO.	REVISIONS	APP'D

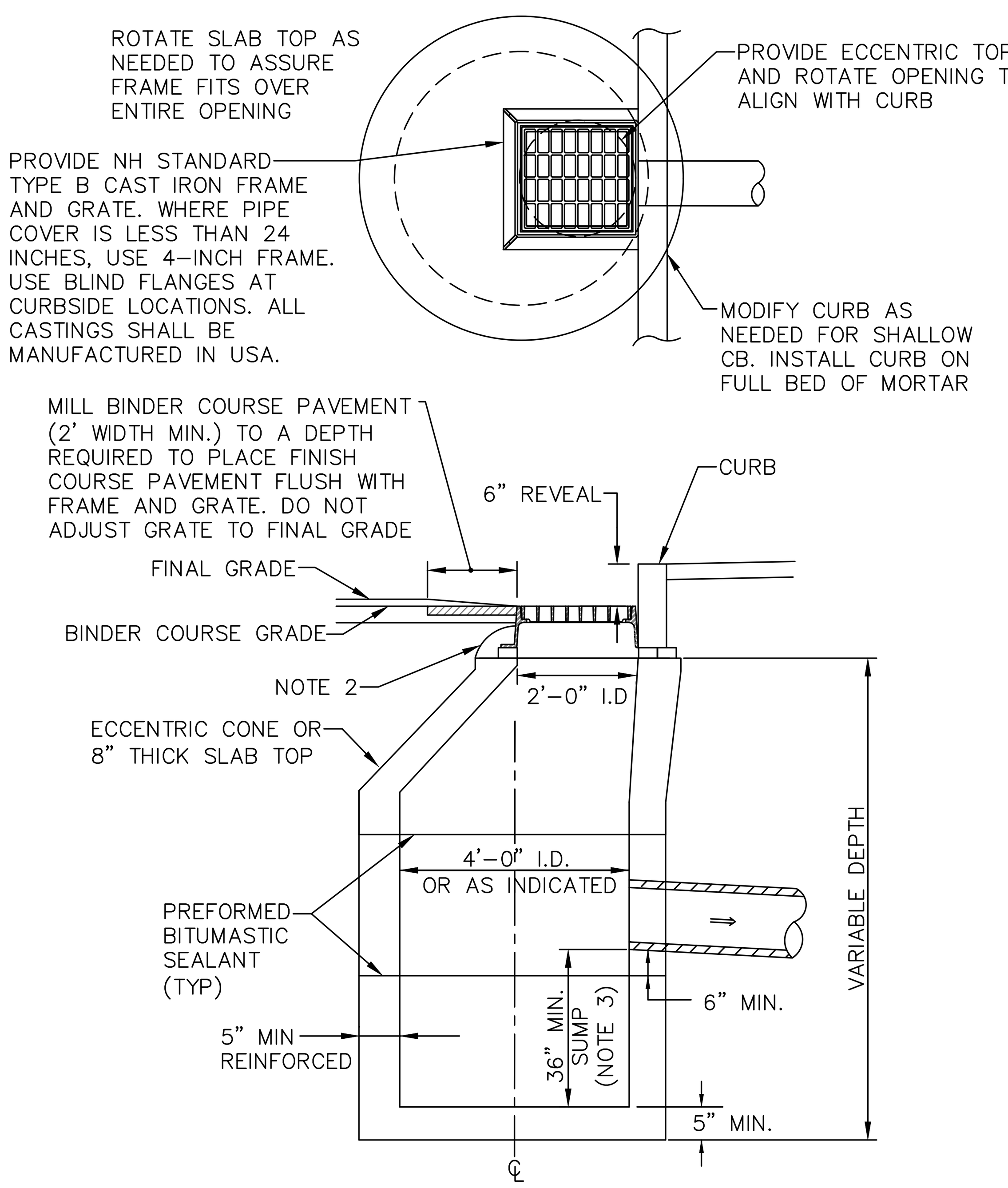
Drawn/Chk. RMG
Designed PDM
Checked –
Approved –
Date MARCH 2024
Book No. –
Project No. 2542
Dwg. ID 2542_details_M
Scale –

FOR REVIEW
MARCH 2024
NOT FOR CONSTRUCTION

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

SEWER DETAILS
MAPLEWOOD AVE – DRAINAGE INTERCEPT
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

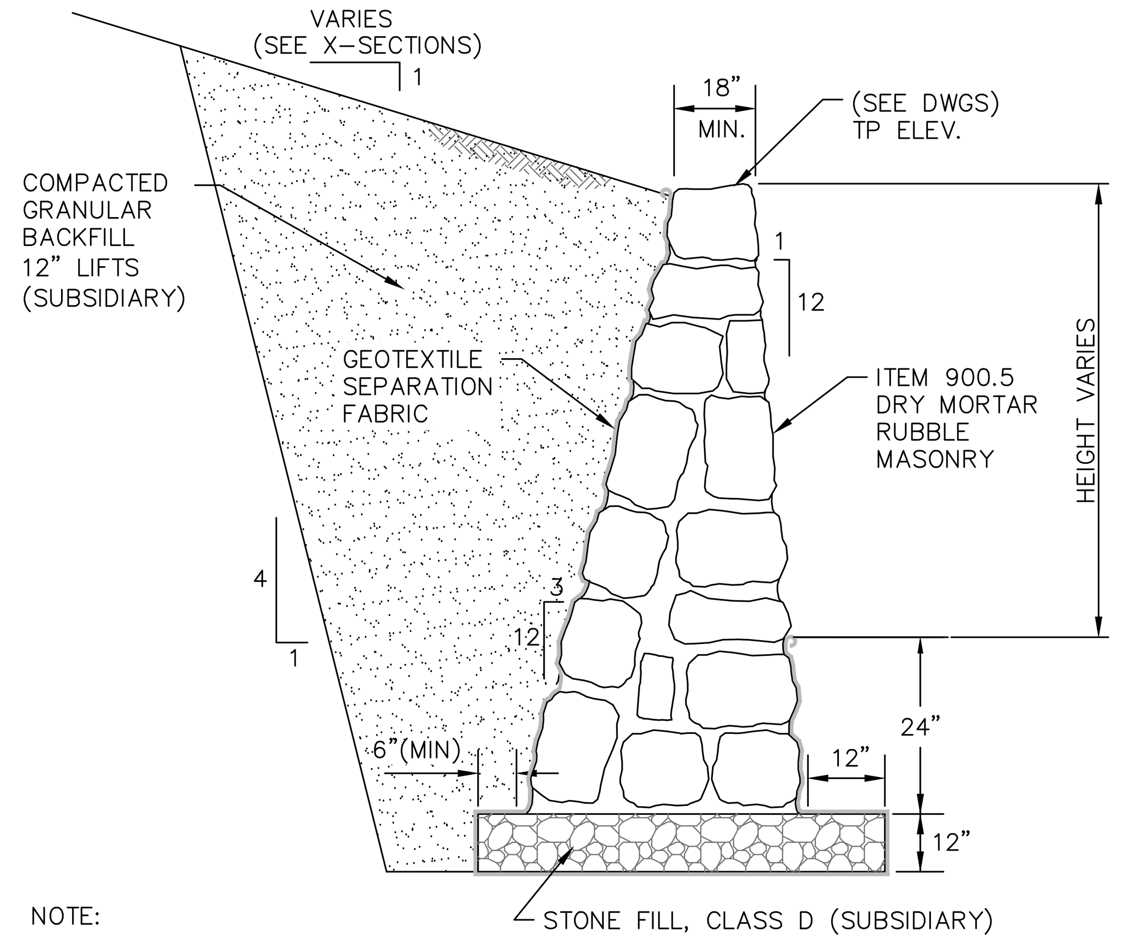
DWG NO D1



1 D2 CATCH BASIN DETAIL
NOT TO SCALE

CATCH BASIN NOTES:

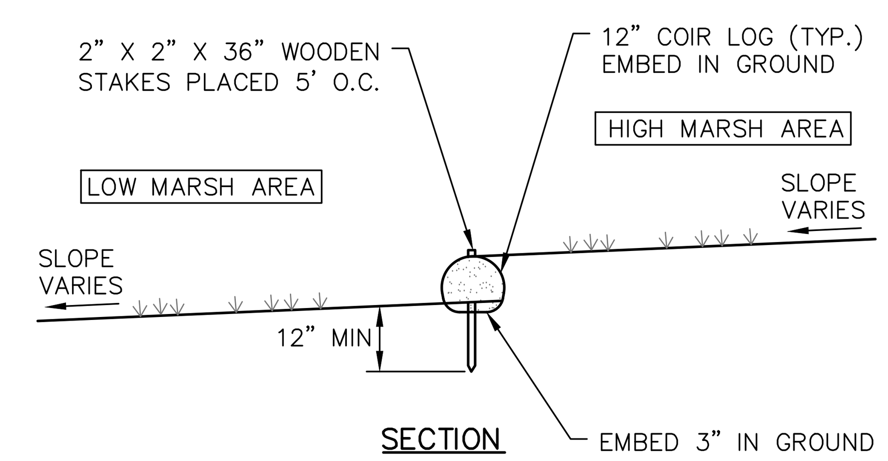
1. ENTIRE STRUCTURE SHALL BE CAPABLE OF WITHSTANDING AN H – 20 LOAD DETAILS OF REINFORCEMENT TO BE FURNISHED BY MANUFACTURER.
2. ADJUST FRAME AND GRATE TO BINDER COURSE ELEVATION, WITH BRICK SET IN A FULL BED OF MORTAR. POINT ALL MASONRY (NO VOIDS) AND PARGE EXTERIOR BRICK WITH MORTAR.
3. WHERE SUMP IS OMITTED PROVIDE MASONRY INVERT PER DETAIL 4/D2



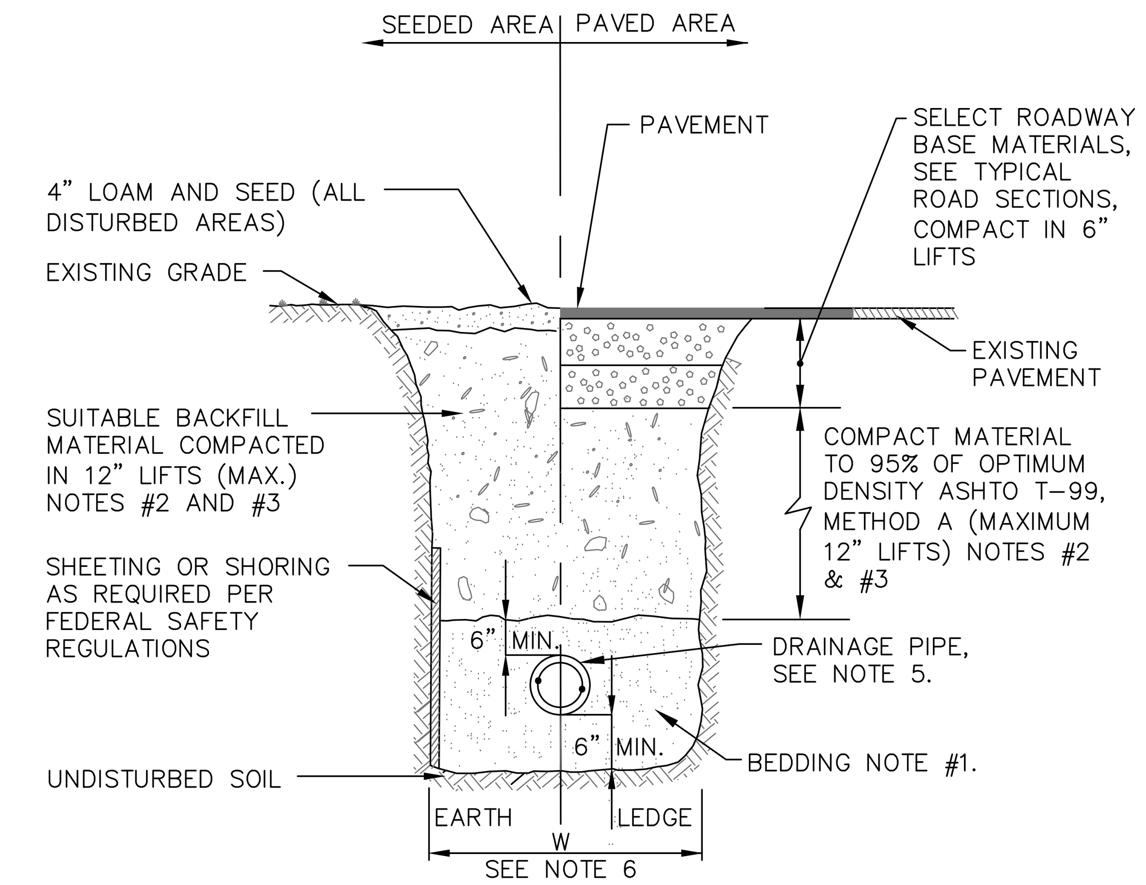
NOTE:

1. THE CONTRACTOR MAY REUSE GRANITE FROM EXISTING HEAD WALL. RETAIN STABLE SECTIONS OF EXISTING HEADWALLS REVIEW RE-CONSTRUCTION LIMITS WITH THE ENGINEER BEFORE COMMENCING WITH THE WORK.
2. UNSUITABLE MATERIAL SHALL BE REMOVED AND REPLACED WITH STRUCTURAL FILL.
3. IF GROUNDWATER IS ENCOUNTERED, DEWATERING MEASURES WILL BE NECESSARY TO PREVENT DISRUPTANCE OF THE BEARING SOILS. PUMPING EQUIPMENT AND SUMP AREAS SHOULD BE LOCATED OUTSIDE. PUMP DISCHARGE SHALL BE PROPERLY FILTERED TO PREVENT THE DISCHARGE OF SILT TO WETLANDS.
4. WALLS SHALL BLEND INTO EXISTING SLOPES.

2 D2 MORTAR RUBBLE MASONRY RETAINING DETAIL
NOT TO SCALE



7 D2 COIR LOG DETAIL
NOT TO SCALE



3 D2 TRENCH DETAIL – STORM DRAIN
NOT TO SCALE

TRENCH NOTES – STORM DRAIN

1. BEDDING: BEDDING FOR PIPES SHALL CONSIST OF PREPARING THE BOTTOM OF THE TRENCH TO SUPPORT THE ENTIRE LENGTH OF THE PIPE AT A UNIFORM SLOPE AND ALIGNMENT. CRUSHED GRAVEL (NHDOT ITEM 304.3) OR CRUSHED STONE SHALL BE USED TO BED THE PIPE TO THE ELEVATION SHOWN ON THE DRAWINGS.

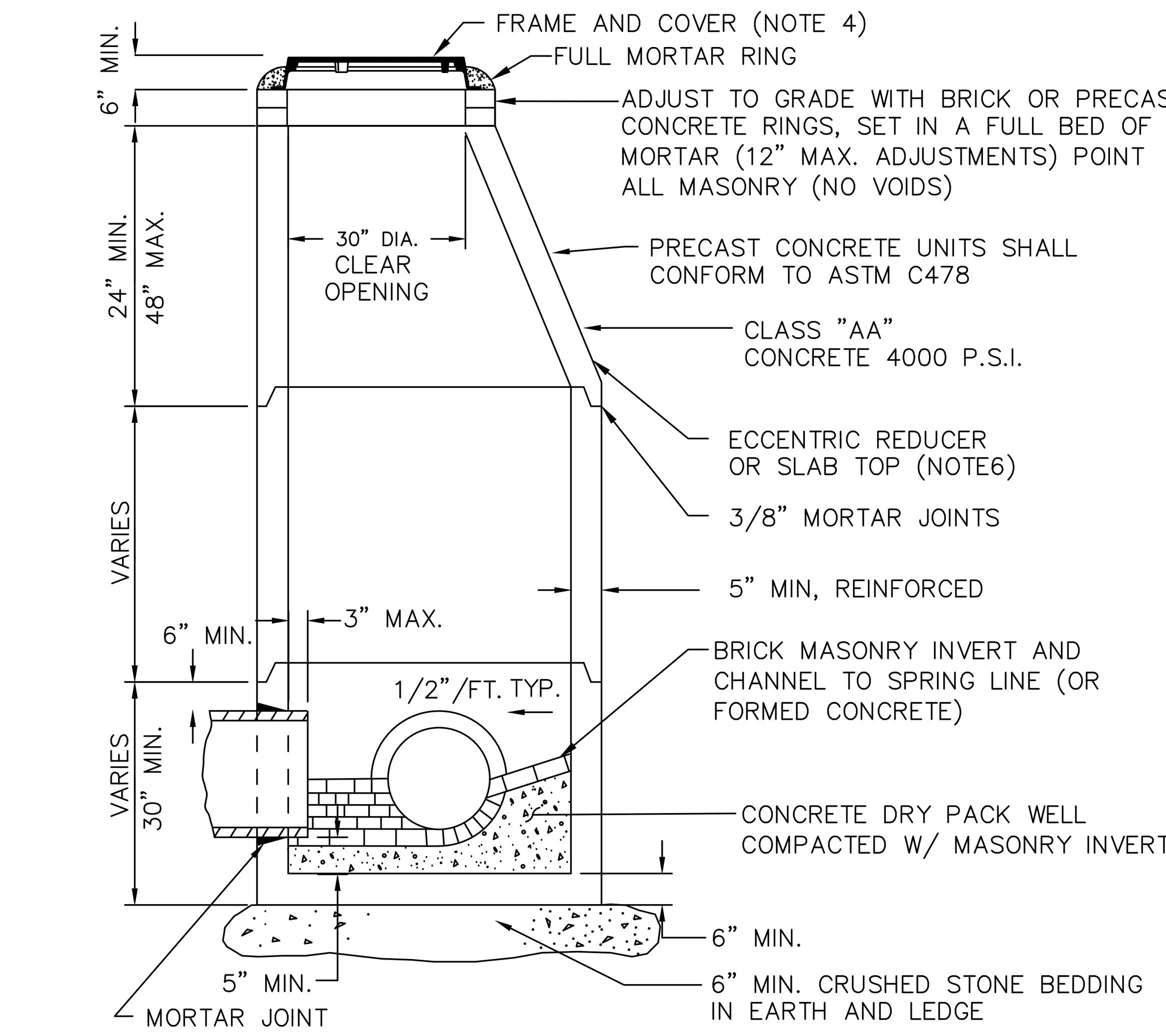
2. COMPACTION: ALL BACKFILL SHALL BE COMPACTED AT OR NEAR OPTIMUM MOISTURE CONTENT BY PNEUMATIC TAMPERS, VIBRATORY COMPACTORS OR OTHER APPROVED MEANS. BACKFILL BENEATH PAVED SURFACES SHALL BE COMPACTED TO NOT LESS THAN 95 PERCENT OF AASHTO T99, METHOD C.

3. SUITABLE MATERIAL: IN ROADS, ROAD SHOULDERS, WALKWAYS AND TRAVELED WAYS, SUITABLE MATERIAL FOR TRENCH BACKFILL SHALL BE THE NATURAL MATERIAL EXCAVATED DURING THE COURSE OF CONSTRUCTION, BUT SHALL EXCLUDE DEBRIS; PIECES OF PAVEMENT; ORGANIC MATTER; TOP SOIL; ALL WET OR SOFT MUCK, PEAT, OR CLAY; ALL EXCAVATED LEDGE MATERIAL; ROCKS OVER 6 INCHES IN LARGEST DIMENSION; FROZEN EARTH AND ANY MATERIAL WHICH, AS DETERMINED BY THE ENGINEER, WILL NOT PROVIDE SUFFICIENT SUPPORT OR MAINTAIN THE COMPLETED CONSTRUCTION IN A STABLE CONDITION. IN SEEDED AREAS, SUITABLE MATERIAL SHALL BE AS DESCRIBED ABOVE, EXCEPT THAT THE ENGINEER MAY PERMIT THE USE OF TOP SOIL, LOAM, ROCKS UNDER 12", EXCEPT FROZEN EARTH OR CLAY, IF HE/SHE IS SATISFIED THAT THE COMPLETED CONSTRUCTION WILL BE ENTIRELY STABLE AND PROVIDED THAT EASY ACCESS TO THE PIPE WILL BE PRESERVED.

4. BASE COURSE AND PAVEMENT: SHALL MEET THE REQUIREMENTS OF THE NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION'S LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES – DIVISIONS 300 AND 400 RESPECTIVELY.

5. DRAINAGE PIPE: PIPE MATERIALS SHALL BE EITHER PVC SDR 35 OR POLYETHYLENE (PE).

6. W=MAXIMUM ALLOWABLE TRENCH WIDTH: FOR ROCK EXCAVATION, FOR ORDERED EXCAVATION BELOW GRADE AND HANDLING OF CONTAMINATED SOILS. FOR PIPES 15 INCHES NOMINAL DIAMETER OR LESS, W SHALL BE NO MORE THAN 36 INCHES. FOR PIPES GREATER THAN 15 INCHES IN NOMINAL DIAMETER, W SHALL BE 24 INCHES PLUS PIPE OUTSIDE DIAMETER (O.D.)



4 D2 TYPICAL DRAINAGE MANHOLE
NOT TO SCALE

DRAIN MANHOLE NOTES:

1. BARRELS AND CONE SECTIONS SHALL BE PRECAST REINFORCED CONCRETE.

2. PRECAST CONCRETE BARREL SECTIONS, CONES, AND BASES SHALL CONFORM TO ASTM C478.

3. INVERTS AND SHELVES: MANHOLES SHALL HAVE A BRICK PAVED SHELF AND INVERT (OR FORMED CONCRETE), CONSTRUCTED TO CONFORM TO THE SIZE OF PIPE AND FLOW. CARE SHALL BE TAKEN TO INSURE THAT THE BRICK INVERT IS A SMOOTH CONTINUATION OF THE INVERT. INVERT BRICKS SHALL BE LAID ON EDGE. AT CHANGES IN DIRECTION, THE INVERTS SHALL BE LAID OUT IN CURVES OF THE LONGEST POSSIBLE TANGENT TO THE CENTER LINE OF THE PIPES. SHELVES SHALL BE CONSTRUCTED TO AN ELEVATION OF 1/2 THE PIPE DIA. AND SLOPE TO DRAIN TOWARD THE FLOWING THROUGH CHANNEL.

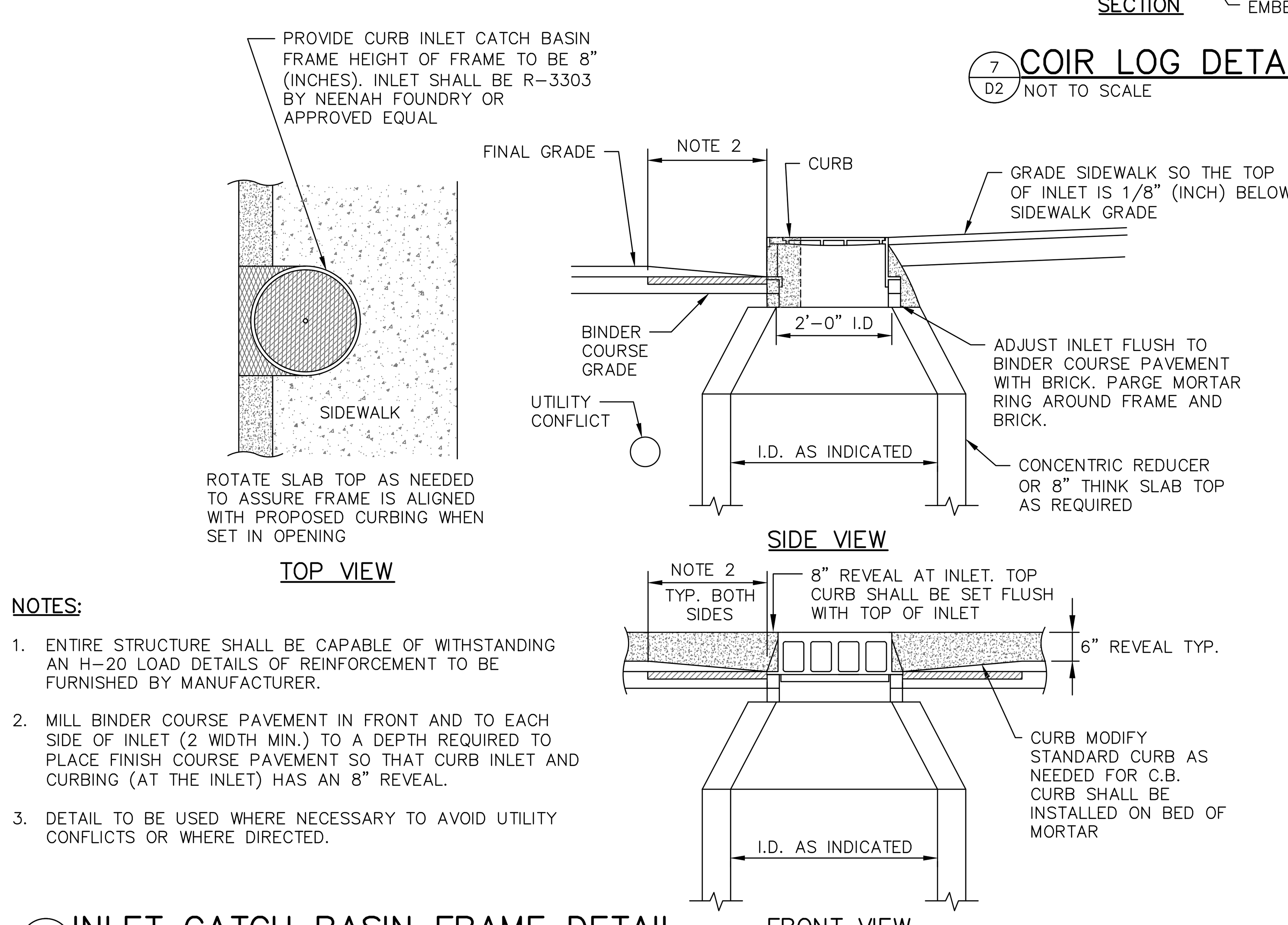
4. FRAMES AND COVERS: MANHOLE FRAMES AND COVERS SHALL BE HINGED, ERGO XL BY EAST JORDON IRON WORKS, AND PROVIDE A 30-INCH (MIN.) CLEAR OPENING. THE WORD "DRAIN", IN 3-INCH LETTERS SHALL BE PLAINLY CAST INTO THE CENTER OF EACH COVER.

5. BEDDING: SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATTER AND MEETING ASTM C33. STONE SIZE NO. 67.

100% PASSING 1 INCH SCREEN
90–100% PASSING 3/4 INCH SCREEN
20– 55% PASSING 3/8 INCH SCREEN
0–10% PASSING #4 SIEVE
0– 5% PASSING #8 SIEVE

WHERE ORDERED BY THE ENGINEER TO STABILIZE THE BASE, SCREENED GRAVEL OR CRUSHED STONE 1-1/2 INCH TO 1/2 INCH OR USE OF GEOGRID FABRIC (ITEM 1.8B) MAY BE REQUIRED.

6. SLAB TOP COVERS: MAY BE APPROVED IN LIEU OF A CONE SECTION, WHEN MANHOLE IS LESS THAN 5 FEET AND FOR LARGE DIAMETER MANHOLES. SLAB TOP COVERS SHALL BE REINFORCED CONCRETE HAVING AN ECCENTRIC ENTRANCE AND CAPABLE OF SUPPORTING H-20 LOADS.



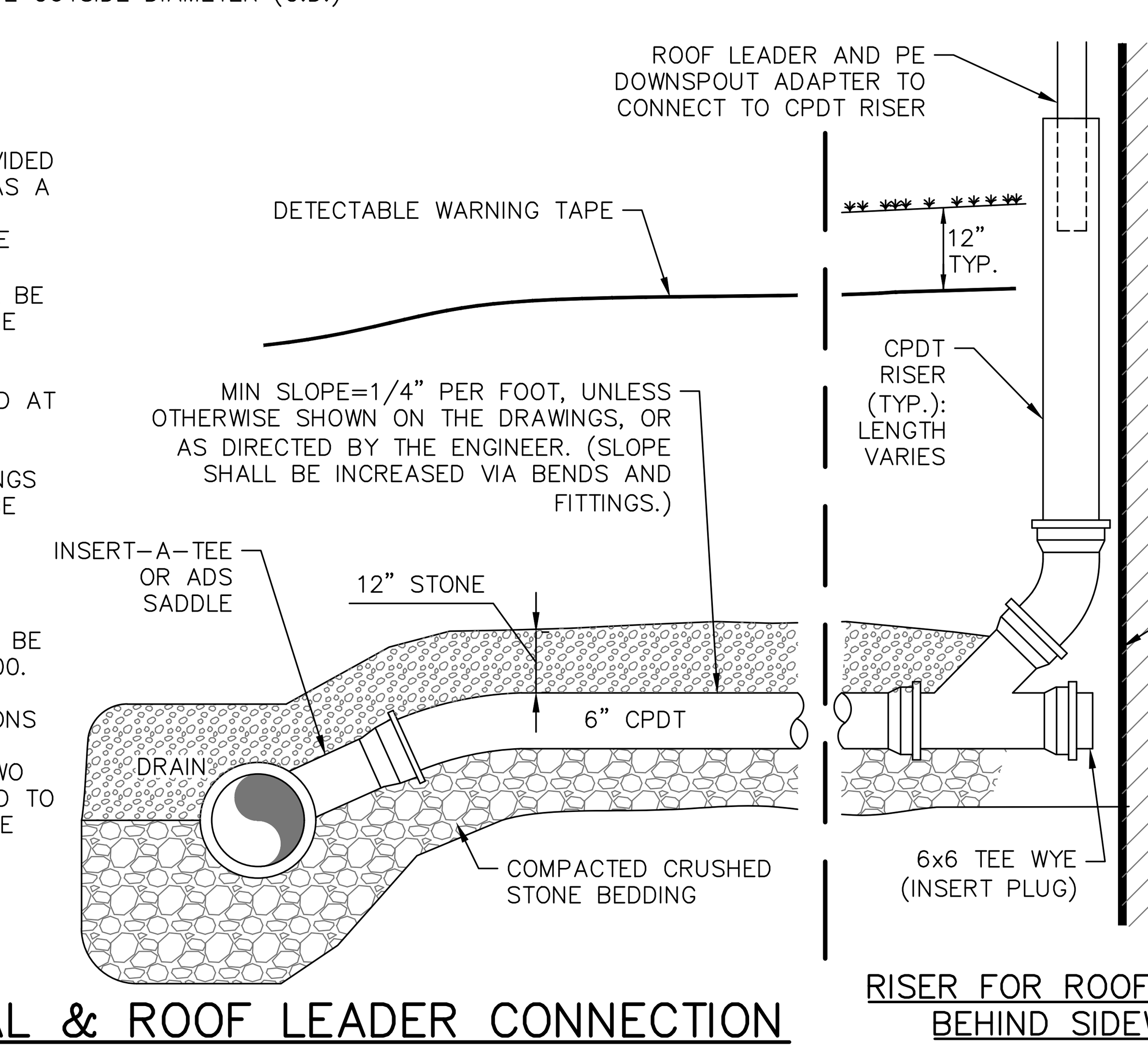
NOTES:

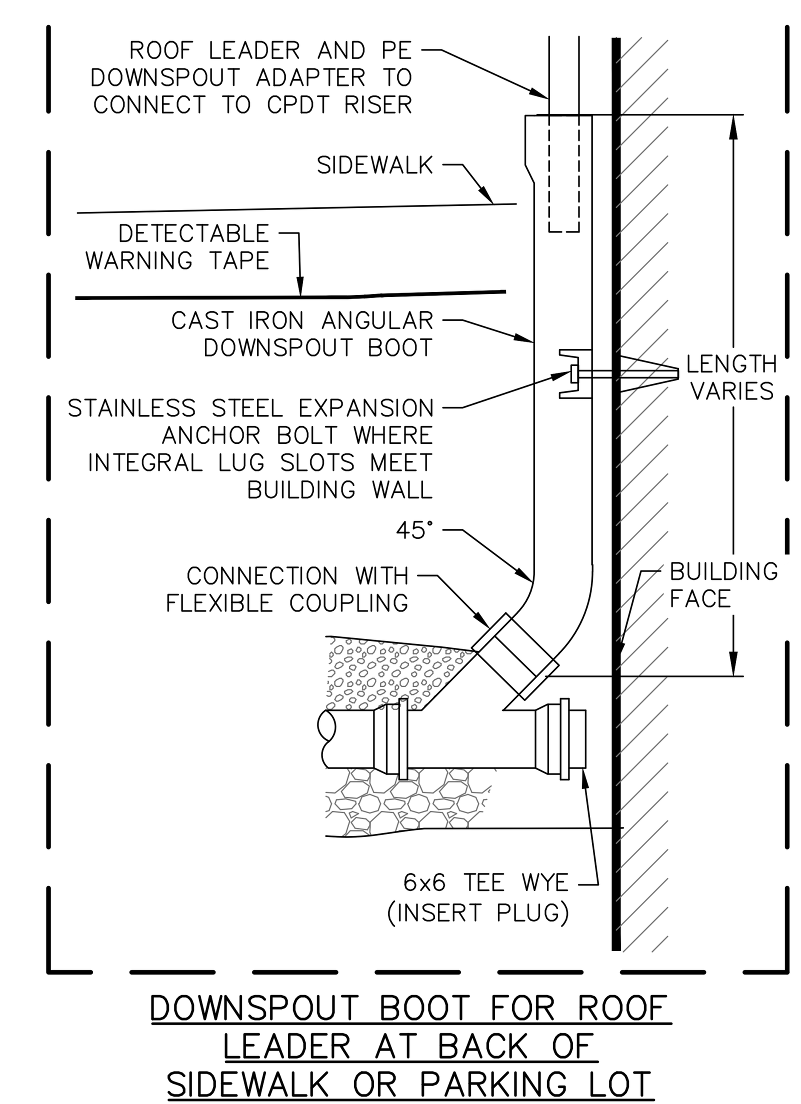
1. ENTIRE STRUCTURE SHALL BE CAPABLE OF WITHSTANDING AN H-20 LOAD DETAILS OF REINFORCEMENT TO BE FURNISHED BY MANUFACTURER.
2. MILL BINDER COURSE PAVEMENT IN FRONT AND TO EACH SIDE OF INLET (2 WIDTH MIN.) TO A DEPTH REQUIRED TO PLACE FINISH COURSE PAVEMENT SO THAT CURB INLET AND CURBING (AT THE INLET) HAS AN 8" REVEAL.
3. DETAIL TO BE USED WHERE NECESSARY TO AVOID UTILITY CONFLICTS OR WHERE DIRECTED.

5 D2 INLET CATCH BASIN FRAME DETAIL
NOT TO SCALE

NOTES:

1. SERVICE LATERALS WILL BE PROVIDED AT EACH DOWNSPOUT AS WELL AS A SEPARATE CLEANOUT FOR EACH PROPERTY TO FACILITATE PRIVATE SUMP PUMP /DRAIN SERVICE CONNECTIONS. CLEANOUTS SHALL BE INSTALLED AT THE PROPERTY LINE FOR EACH SERVICE LATERAL.
2. REBAR OR 2X4 SHALL BE PLACED AT SIDE OF CLEANOUT.
3. CLEANOUT RISER PIPE AND FITTINGS ARE INCIDENTAL AND WILL NOT BE CONSIDERED FOR PAYMENT.
4. SERVICES SHALL BE ORIENTED @ 10:30 OR 1:30 (TYP). UNDER NO CIRCUMSTANCES SHALL SERVICES BE LOCATED BETWEEN 3:00 AND 9:00.
5. LOCATE ROOF LEADER CONNECTIONS AT EXISTING DOWNSPOUTS. AT ADJACENT BUILDING CORNERS, TWO DOWNSPOUTS MAY BE CONNECTED TO ONE LATERAL USING APPROPRIATE WYE (AND OTHER) FITTING(S).





6 D2 DRAIN LATERAL & ROOF LEADER CONNECTION
NOT TO SCALE

ISSUE FOR BIDDING Date By
CONSTRUCTION Date – By –
RECORD DRAWING Date – By –

NO.	REVISIONS	APP'D

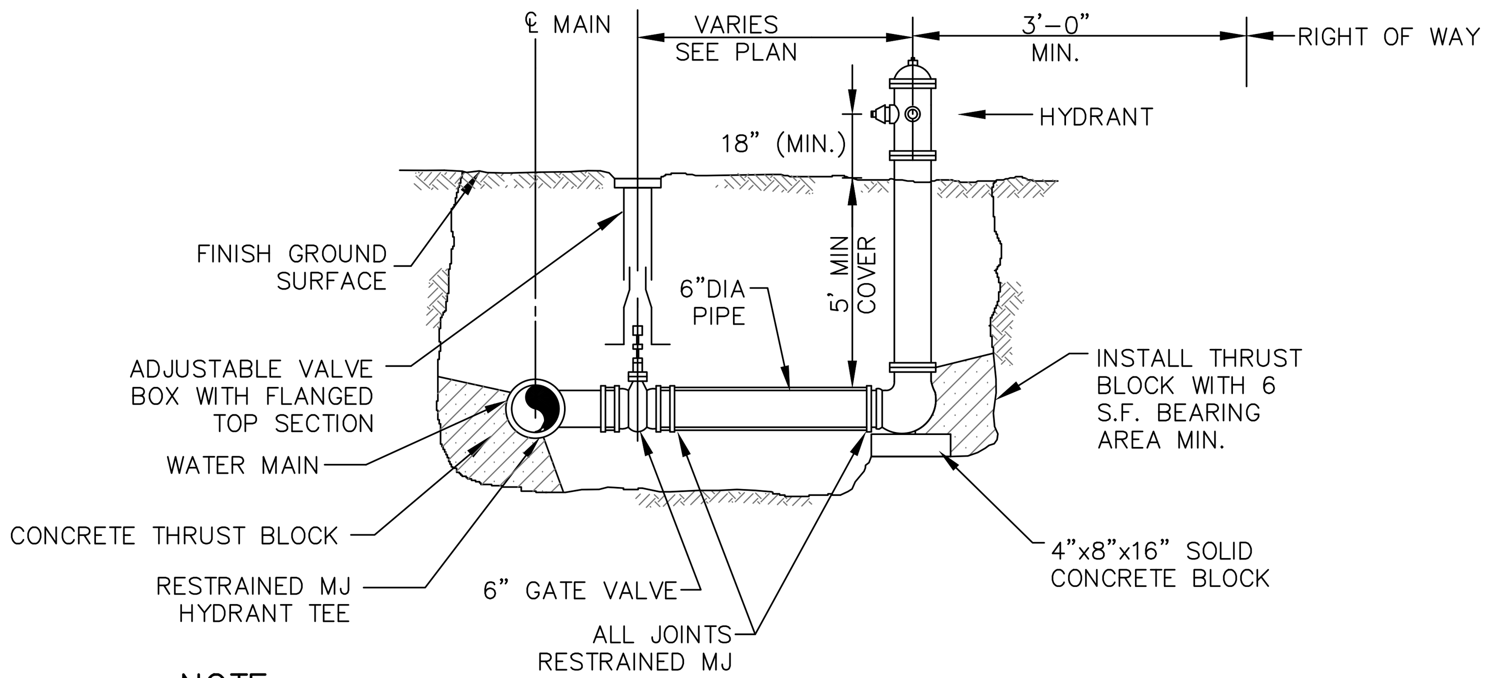
Drawn/Chk. RMG
Designed PDM
Checked –
Approved –
Date MARCH 2024
Book No. –
Project No. 2542
Dwg. ID
Scale

FOR REVIEW
MARCH 2024
NOT FOR CONSTRUCTION

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

DRAINAGE DETAILS
MAPLEWOOD AVE – DRAINAGE INTERCEPT
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO D2
SHEET 10 OF 14

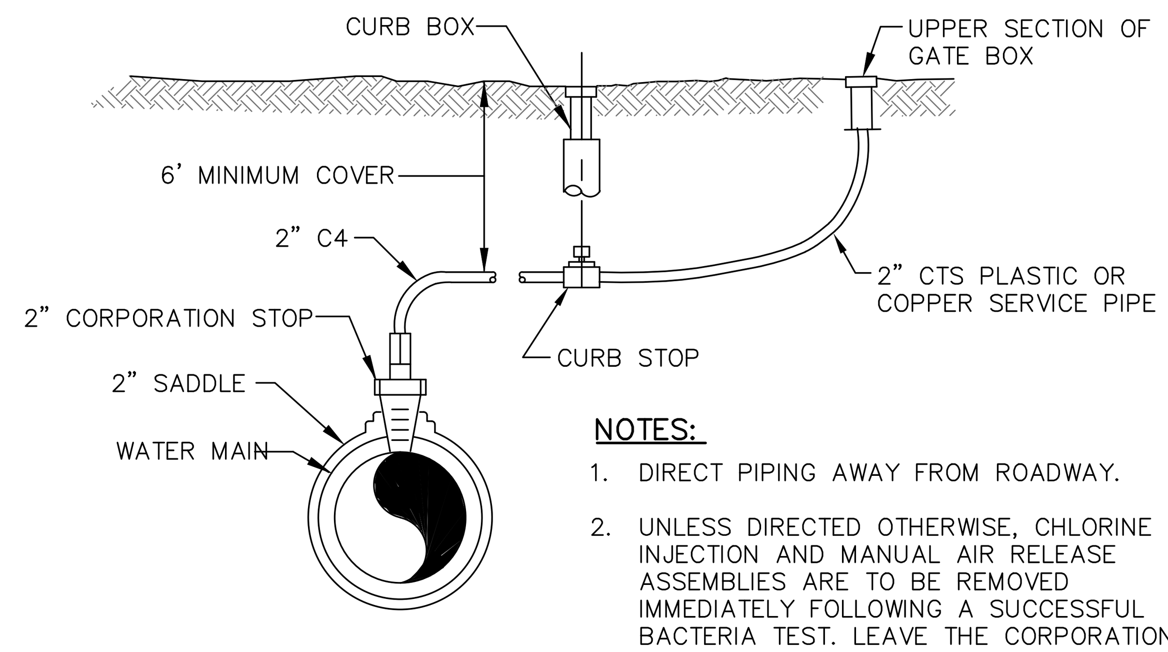


NOTE:

1. HYDRANTS SHALL BE DELIVERED FROM FACTORY W/O DRAIN HOLES.
2. HYDRANT ASSEMBLY INCLUDES MJ HYDRANT TEE.
3. HYDRANT SHALL BE KENNEDY K-81A GUARDIAN, PER CITY OF PORTSMOUTH STANDARDS.
4. LOCATE HYDRANTS A MINIMUM OF 18" BEHIND CURBING UNLESS OTHERWISE DIRECTED. REVIEW HYDRANT LOCATIONS WITH PROJECT REPRESENTATIVE PRIOR TO WATER MAIN INSTALLATIONS.

1/D3 TYPICAL HYDRANT ASSEMBLY SECTION

NOT TO SCALE



NOTES:

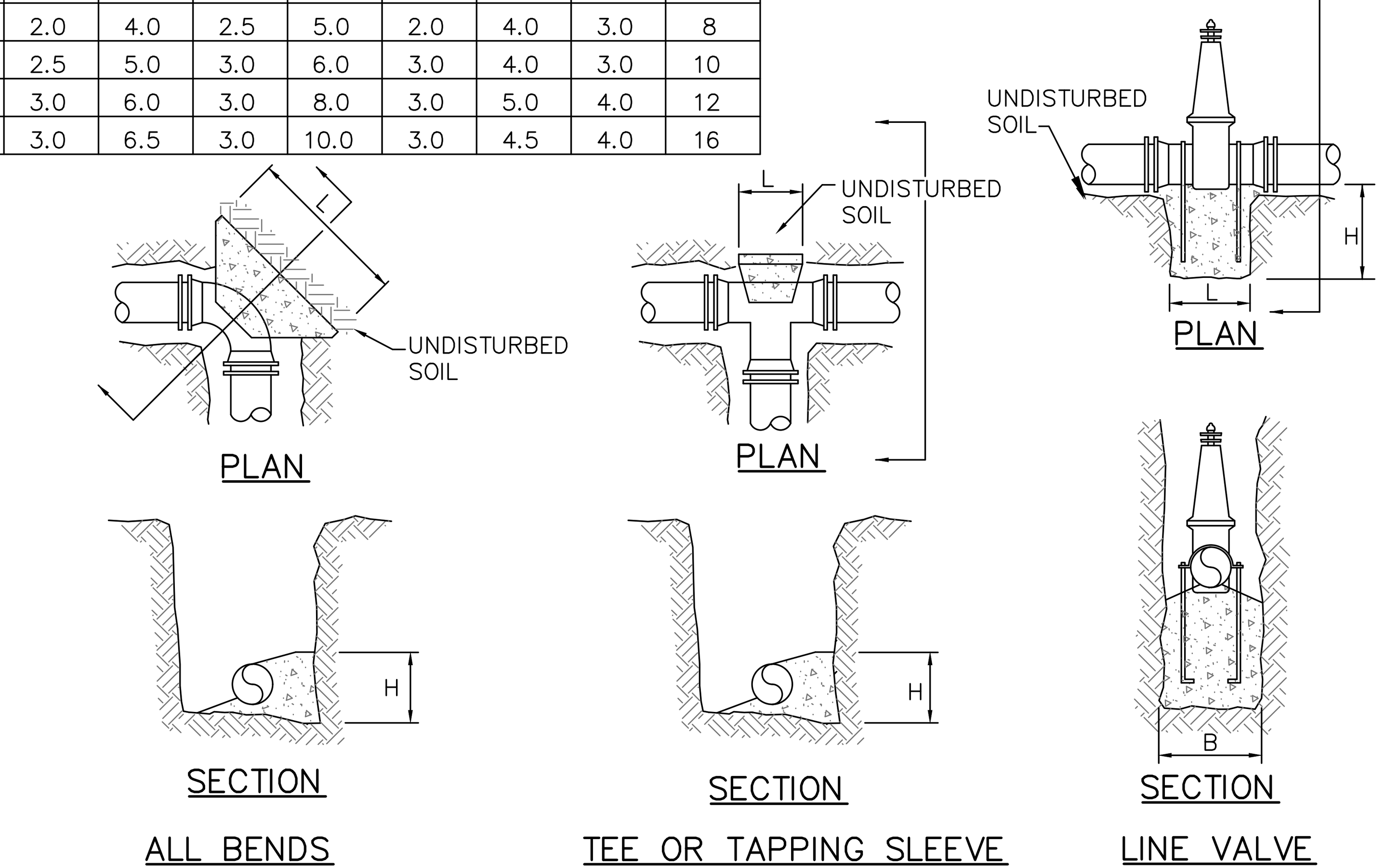
1. DIRECT PIPING AWAY FROM ROADWAY.
2. UNLESS DIRECTED OTHERWISE, CHLORINE INJECTION AND MANUAL AIR RELEASE ASSEMBLIES ARE TO BE REMOVED IMMEDIATELY FOLLOWING A SUCCESSFUL BACTERIA TEST. LEAVE THE CORPORATION STOP AND 12" LENGTH OF TUBING (WITH A CRIMPED END) IN PLACE.

2/D3 TEMPORARY BLOW-OFF TAP ASSEMBLY

NOT TO SCALE

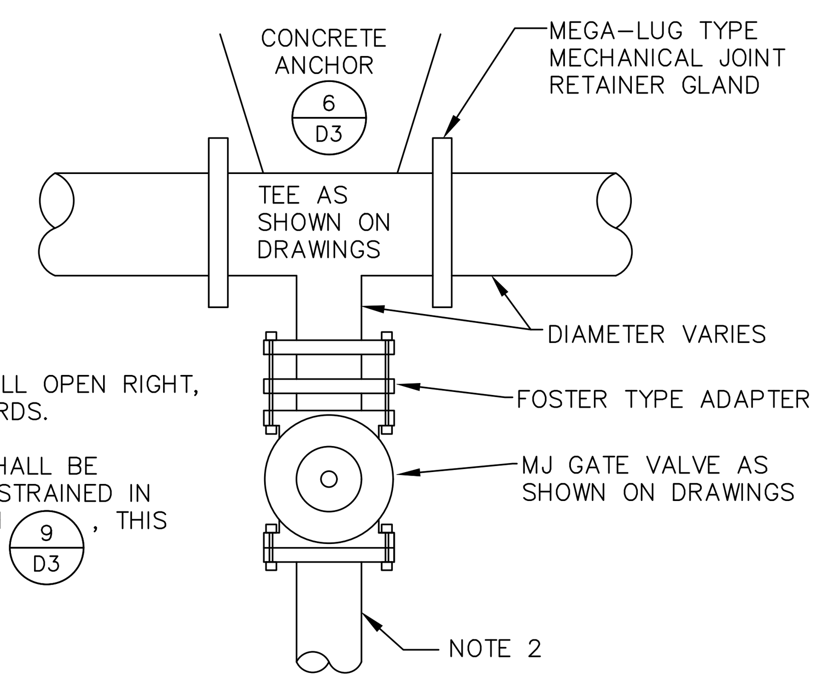
MINIMUM CONCRETE ANCHOR DIMENSIONS									
BENDS, TEES AND LINE VALVES AT 250 PSI									
PIPE SIZE INCHES	TEE OR PLUG FT.		ALL BENDS FT.		ALL LINE VALVES FT.			PIPE SIZE INCHES
	H	L	H	L	H	L	B	
6	1.5	3.0	2.0	3.5	1.5	3.0	2.5	6
8	2.0	4.0	2.5	5.0	2.0	4.0	3.0	8
10	2.5	5.0	3.0	6.0	3.0	4.0	3.0	10
12	3.0	6.0	3.0	8.0	3.0	5.0	4.0	12
16	3.0	6.5	3.0	10.0	3.0	4.5	4.0	16

BASIS: SOIL BEARING CAPACITY OF 2000 PSF AND 5 FEET COVER IN GRANULAR SOIL. HEIGHT OF BLOCK MUST BE LESS THAN 1/2 DEPTH OF TRENCH. 6 MIL THICK POLYETHYLENE SHALL BE PLACED AROUND FITTINGS PRIOR TO CONCRETE PLACEMENT. USE FOR HORIZONTAL OR DOWNWARD THRUST ONLY.



6/D3 CONCRETE ANCHORS

NOT TO SCALE

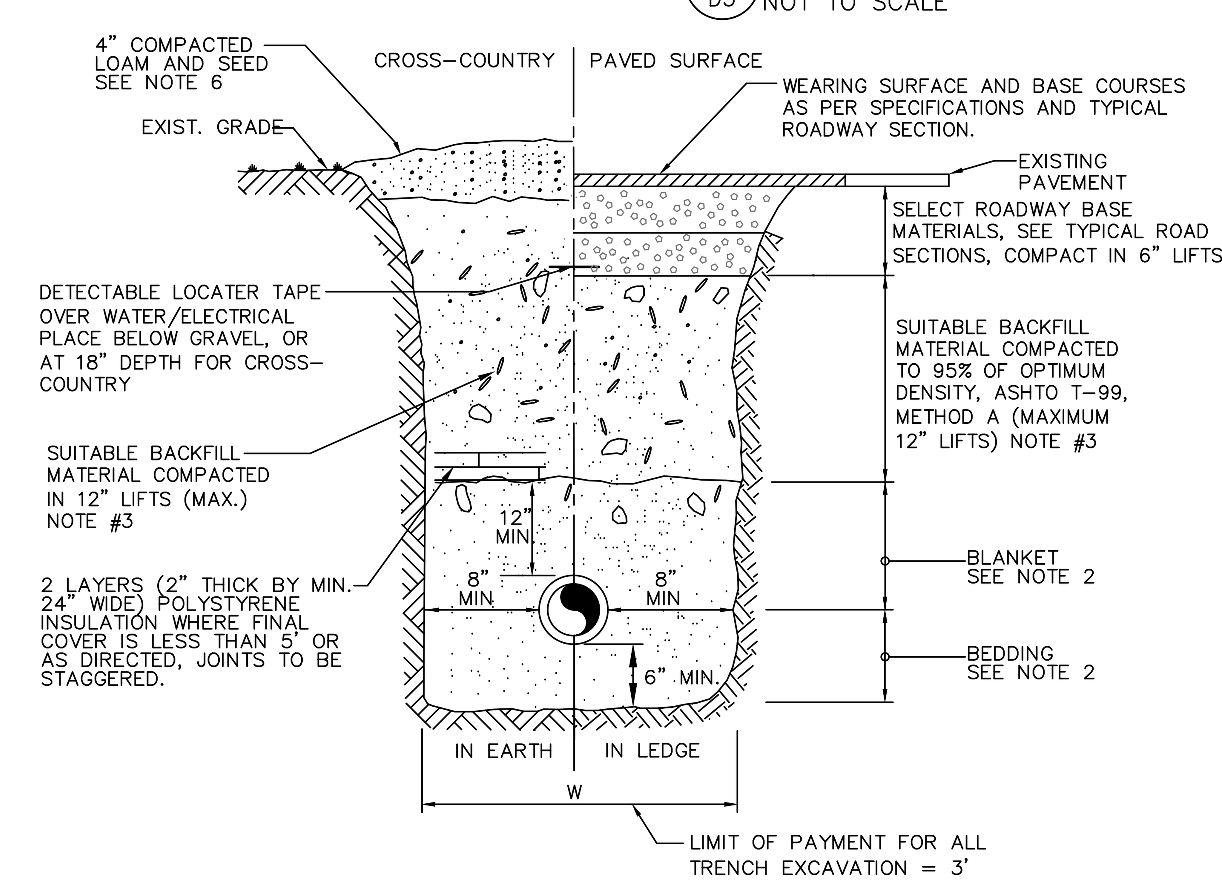


NOTE:

1. GATE VALVES SHALL OPEN RIGHT, PER CITY STANDARDS.
2. BRANCH PIPING SHALL BE MECHANICALLY RESTRAINED IN ACCORDANCE WITH 9/D3, THIS SHEET

5/D3 TEE & GATE VALVE ASSEMBLY DETAIL (TYP.)

NOT TO SCALE



8/D3 TYPICAL TRENCH DETAIL

NOT TO SCALE

STANDARD TRENCH NOTES

1. ORDERED EXCAVATION OF UNSUITABLE MATERIAL BELOW GRADE: BACKFILL AS STATED IN THE TECHNICAL SPECIFICATIONS OR AS SHOWN ON THE DRAWINGS.

2. BEDDING AND BLANKET: CLEAN SAND FREE FROM ORGANIC MATTER (SECTION 02228). BLANKET MAY BE OMITTED FOR DUCTILE IRON AND REINFORCED CONCRETE PIPE, PROVIDED HOWEVER, THAT NO STONE LARGER THAN 2" IS IN CONTACT WITH THE PIPE.

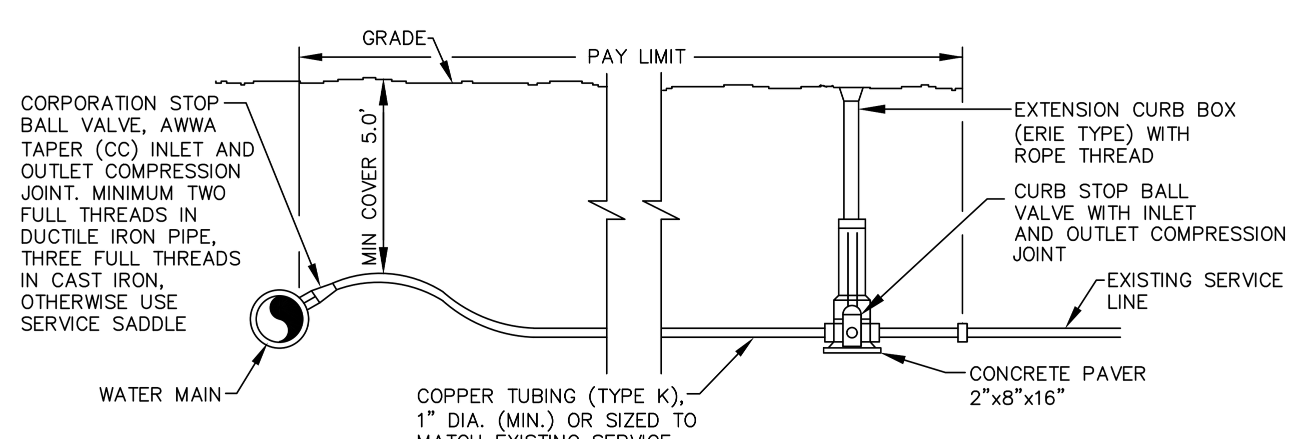
3. BACKFILL MATERIAL: IN ROADS, ROAD SHOULDERS, WALKWAYS AND TRAVELED WAYS, SUITABLE MATERIAL FOR TRENCH BACKFILL SHALL BE THE NATURAL MATERIAL EXCAVATED DURING THE COURSE OF CONSTRUCTION, BUT SHALL EXCLUDE DEBRIS; PIECES OF PAVEMENT; ORGANIC MATTER; TOP SOIL; ALL WET OR SOFT MUCK, PEAT, OR CLAY; ALL EXCAVATED LEDGE MATERIAL; ALL ROCKS OVER 6 INCHES IN LARGEST DIMENSION; AND ANY MATERIAL WHICH, AS DETERMINED BY THE ENGINEER, WILL NOT PROVIDE SUFFICIENT SUPPORT OR MAINTAIN THE COMPLETED CONSTRUCTION IN A STABLE CONDITION.

IN CROSS-COUNTRY CONSTRUCTION, SUITABLE MATERIAL SHALL BE AS DESCRIBED ABOVE, EXCEPT THAT THE ENGINEER MAY PERMIT THE USE OF TOP SOIL, LOAM, MUCK, OR PEAT, IF ENGINEER IS SATISFIED THAT THE COMPLETED CONSTRUCTION WILL BE ENTIRELY STABLE AND PROVIDED THAT EASY ACCESS TO THE PIPE LINE, FOR MAINTENANCE AND POSSIBLY RECONSTRUCTION, WILL BE PRESERVED.

4. MINIMUM COVER: NOT LESS THAN 5.5 FEET, 7 MAX, EXCEPT TO AVOID SUBSURFACE STRUCTURES.

6. FOR CROSS COUNTRY CONSTRUCTION, BACKFILL OR FILL SHALL BE MOUNDED TO A HEIGHT OF 6 INCHES ABOVE THE ORIGINAL GROUND SURFACE.

7. DRIVEWAYS: CRUSHED GRAVEL IN DRIVEWAYS SHALL MATCH EXISTING WITH A MINIMUM OF 6". EXISTING GRAVEL SHALL BE REMOVED AND REPLACED AND SHALL NOT BE MEASURED FOR PAYMENT.

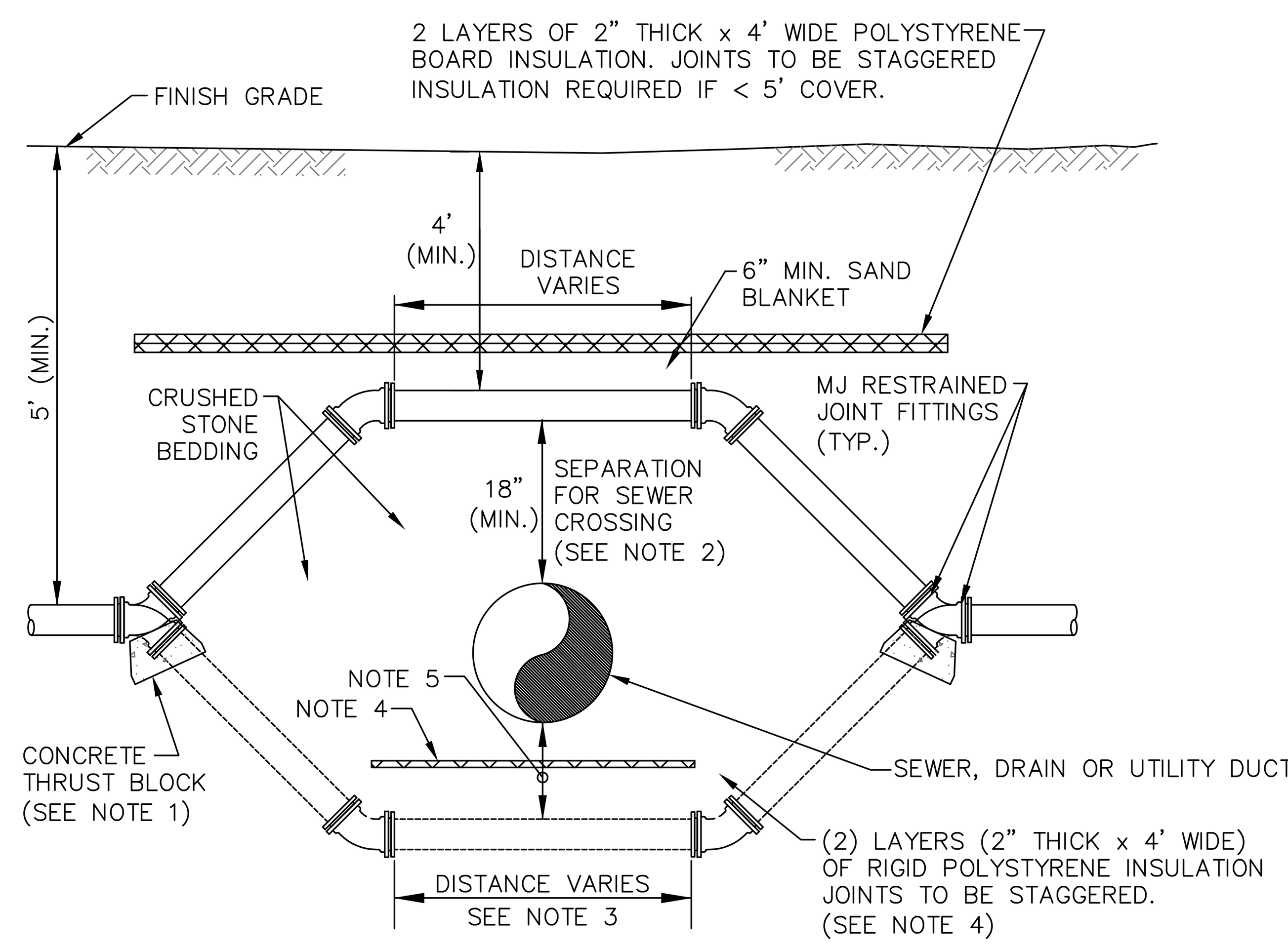


NOTES:

1. PROVIDE NEW LINE USING CONTINUOUS LENGTHS OF COPPER. NO COUPLING ALLOWED IN ROADWAY WITHOUT APPROVAL OF ENGINEER.
2. TAPS TO BE MADE AT APPROX. 2:00 AND 10:00.
3. PROVIDE FOR SERVICE LINE CONTRACTION AND EXPANSION BY INSTALLING "S" IN SERVICE LINE NEAR MAIN.
4. IF SERVICE IS INSTALLED WITH LESS THAN 5' COVER, INSULATE OVER LINE.
5. REMOVE EXISTING CURB STOP (SALVAGE AS IDENTIFIED IN SECT. 01611).
6. CONNECT CURB STOP TO EXISTING SERVICE LINE AT PROPERTY LINE OR AT LOCATION APPROVED BY THE ENGINEER (NO COUPLING WITHOUT APPROVAL OF ENGINEER) AFTER PRESSURE TESTING AND DISINFECTION.
7. SHUT OFF EXISTING CORPORATION AND REMOVE OR ABANDON EXISTING SERVICE LINE.
8. CURB BOX SHALL BE SET IN THE GRASS AREA BETWEEN CURB AND SIDEWALK UNLESS DIRECTED OTHERWISE.
9. 2" SERVICE CONNECTIONS SHALL USE A STAINLESS STEEL SERVICE SADDLE.
10. MAINTAIN 18" SEPARATION BETWEEN THE NEW WATER SERVICE AND THE NEW OR EXISTING SEWER MAIN (WATER SHALL BE OVER SEWER).

4/D3 TYPICAL SERVICE CONNECTION

NOT TO SCALE



NOTE:

1. INSTALL (4) FOUR 45° MJ BENDS WITH RESTRAINED JOINT FITTINGS.
2. VERTICAL SEPARATION DEPTH BETWEEN WATER AND SEWER SHALL BE AT LEAST 18", WITH WATER ABOVE SEWER, PER NHDES ENV-Wq 704.12. VERTICAL SEPARATION OF LESS THAN 18" ALLOWED ONLY WITH WAIVER FROM NHDES. IF CONSTRUCTION OF WATER MAIN UNDER SEWER MAIN IS UNAVOIDABLE, SEWER MAIN SHALL BE CONSTRUCTED OF C900 PVC PIPE FROM MANHOLE TO MANHOLE.
3. CENTER CROSSING PIPE BETWEEN BELLS. SEWER PIPE JOINT SHALL BE A MINIMUM OF OF 6 FT. HORIZONTALLY FROM THE WATER MAIN.
4. PROVIDE INSULATION IF DRAIN CROSSES OVER WATER MAIN.
5. PROVIDE 8" TO 12" SEPARATION FOR DRAIN OR OTHER UTILITY CROSSINGS.

7/D3 WATER MAIN CONFLICT – CROSSING DETAIL

NOT TO SCALE

HORIZONTAL BENDS:

Nominal Pipe Diameter	Bend Angle			
	90°	45°	22.5°	11.25°
4"	6'	3'	2'	1'
6"	9'	4'	2'	2'
8"	11'	5'	3'	2'
10"	13'	6'	3'	2'
12"	16'	7'	3'	2'
16"	20'	9'	4'	2'

REDUCERS:

Nom. Diameter of Large Pipe	Nominal Diameter of Small Pipe (Note 4)				
	4"	6"	8"	10"	12"
8"	17'	10'	-	-	-
10"	23'	17'	10'	-	-
12"	29'	24'	18'	10'	-
16"	39'	36'	31'	28'	18'

DEAD ENDS:

Nom. Pipe Diameter	Restarined Length (ft)
4"	13'
6"	18'
8"	23'
10"	28'
12"	33'
16"	43'

TEES:

Nominal Pipe	Nominal Branch Diameter (Note 5)			
	8"	10"	12"	16"
8"	6'	-	-	-
10"	8'	11'	-	-
12"	1'	7'	16'	-
16"	1'	1'	9'	25'

NOTES:

1. ALL FITTINGS SHALL HAVE MECHANICAL RETAINING GLANDS AT ALL ENDS AND A MINIMUM OF ONE JOINT SHALL BE RESTRAINED BEYOND EACH SIDE OF FITTING.
2. PIPE EXTENDING FROM ALL FITTINGS SHALL BE MECHANICALLY RESTRAINED TO THE MINIMUM LENGTHS SHOWN.
3. ALL MINIMUM LENGTHS SHOWN ABOVE WERE CALCULATED USING THE EBAA IRON RESTRAINT LENGTH CALCULATOR VERSION 6.3 USING THE FOLLOWING ASSUMPTIONS: DUCTILE IRON PIPE, TYPE 4 TRENCH, 5 FOOT DEPTH OF BURY, A TEST PRESSURE OF 150 PSI AND SOILS CONSISTING OF WELL GRADED SANDS AND GRAVELLY SANDS WITH LITTLE OR NO FINES.
4. ENGINEER RESERVES THE RIGHT TO MODIFY RESTRAINT LENGTHS REQUIRED BASED ON VARYING TRENCH CONDITIONS, DEPTH OF BURY OR PIPE MATERIALS.
5. FOR REDUCERS, RESTRAIN LENGTH SHOWN IS FOR THE LARGER PIPE.
6. MECHANICALLY RESTRAIN ONE JOINT ON EITHER SIDE OF THE NOMINAL PIPE OF TEE AT A MINIMUM DISTANCE OF 5'.

9/D3 MECHANICAL JOINT RESTRAINT

NOT TO SCALE

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Drawn/Chk. RMG
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Date MARCH 2024
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Project No. 2542
Dwg. ID
Scale

FOR REVIEW
MARCH 2024
NOT FOR CONSTRUCTION

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

WATER DETAILS

MAPLEWOOD AVE – DRAINAGE INTERCEPT

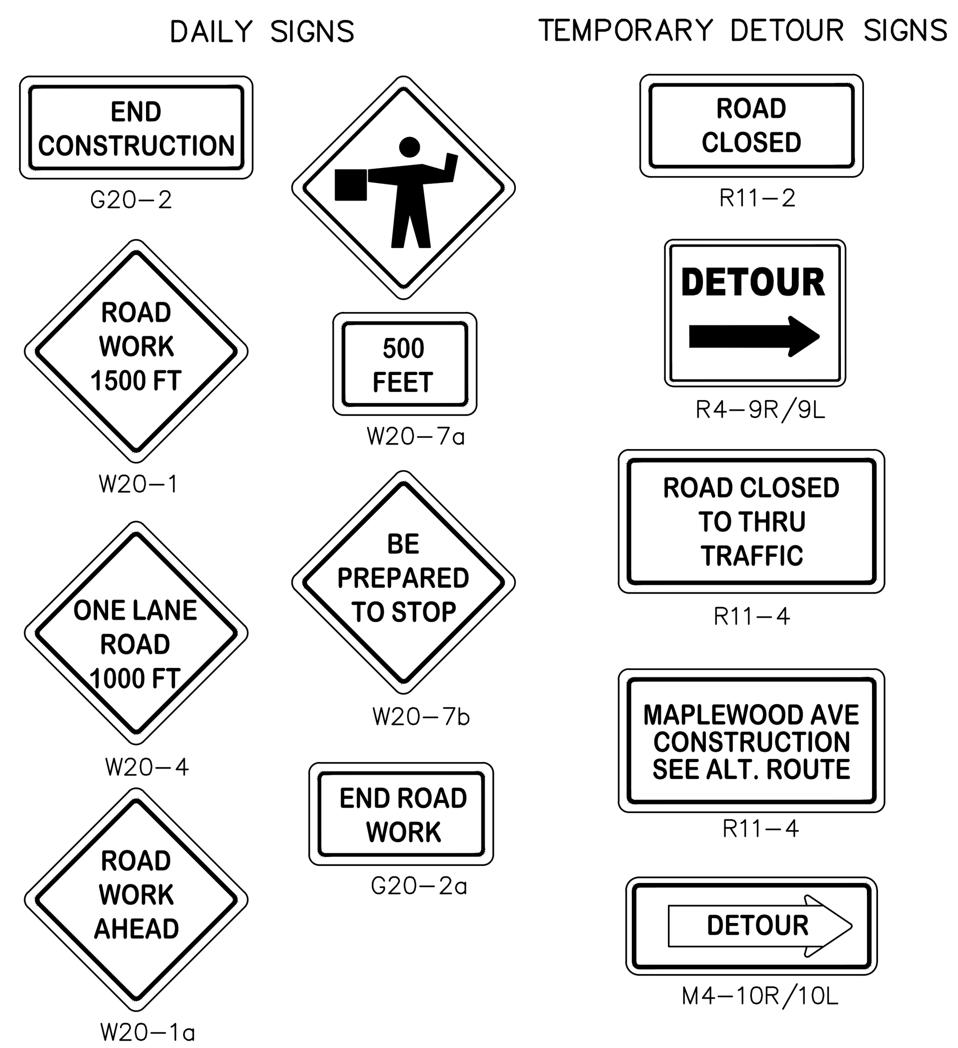
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO D3

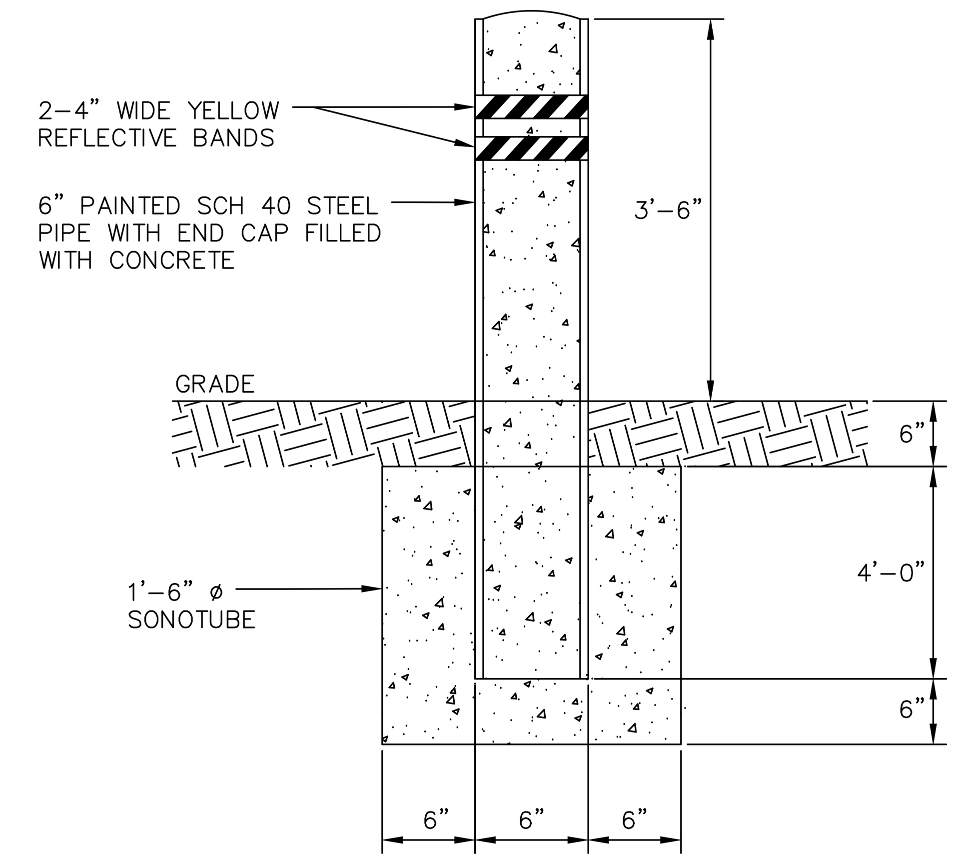
SHEET 11 OF 14

TRAFFIC CONTROL NOTES:

1. TYPICAL SIGN DETAILS ARE BASED ON THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) AND IS NOT INTENDED AS AN ALL-INCLUSIVE LIST. ALL SIGNAGE AND OTHER TRAFFIC CONTROL DEVICES SHALL CONFORM TO THE MUTCD (LATEST EDITION) AND NHDOT REQUIREMENTS.
2. CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING THE TRAFFIC CONTROL PLAN AS SHOWN. ANY MODIFICATIONS MUST BE SUBMITTED IN WRITING FOR APPROVAL BY THE ENGINEER, CITY OF PORTSMOUTH AND THE NHDOT. SEE PROJECT MANUAL FOR ADDITIONAL REQUIREMENTS.
3. CONTRACTOR SHALL ERECT ALL DAILY USE SIGNS IN THE MORNING PRIOR TO WORK BEGINNING AND REMOVE ALL DAILY USE SIGNS AT THE END OF EACH DAY.
4. DAILY SIGNS SHALL INCLUDE SIGNAGE NECESSARY TO ENSURE THE SAFETY OF THE PUBLIC (I.E. ROAD CLOSED, FLAGGER AHEAD, ONE LANE TRAFFIC, ETC).
5. DETOUR SIGNS ARE TO BE USED WITH PHASE I CONSTRUCTION (CULVERT INSTALLATION) ONLY. REFER TO PROSECUTION OF WORK ON SHEET G-1)
6. ALL SIGNS SHALL BE ERECTED AND PLACED IN ACCORDANCE WITH MUTCD (LATEST EDITION).

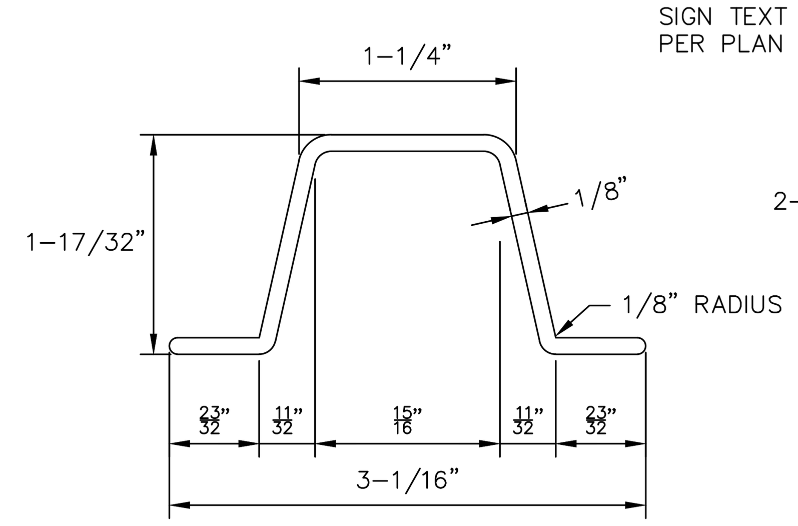


(1/D4) TRAFFIC CONTROL SIGNS
NOT TO SCALE

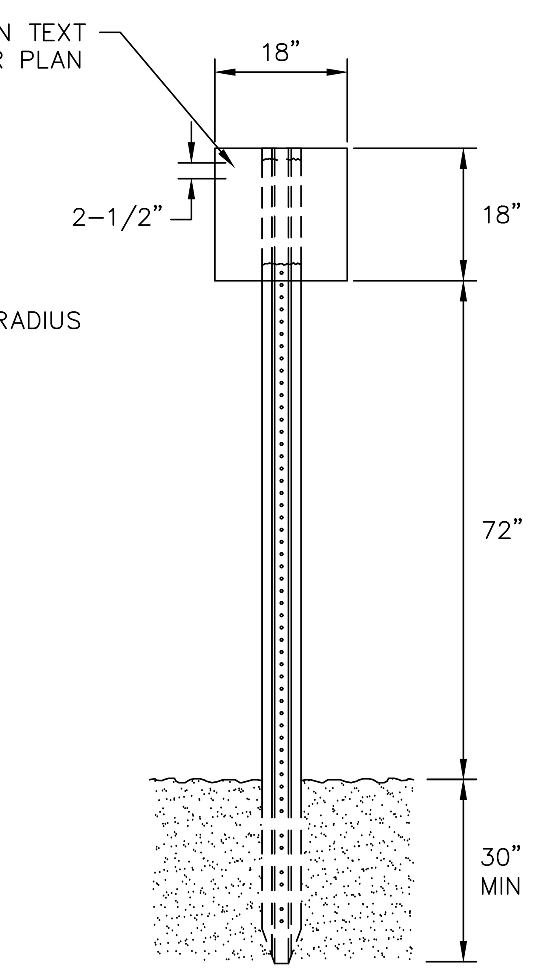


(3/D4) STEEL BOLLARD DETAIL
NOT TO SCALE

LENGTH (P2-10): 10'-0"
WEIGHT PER LINEAR FOOT: 2.00 LBS
HOLES: 3/8" DIA., 1" C-C FULL LENGTH
STEEL: SHALL CONFORM TO ASTM A-499 (AISI C1060)
FINISH: SHALL BE PAINTED WITH TWO COATS OF AN APPROVED MED. GREEN, BAKED PAINT OR AIR DRIED, PAINT OF WEATHER-RESISTANT QUALITY. ALL FABRICATION SHALL BE COMPLETED BEFORE PAINTING.



POST SECTION



P2-10 POST

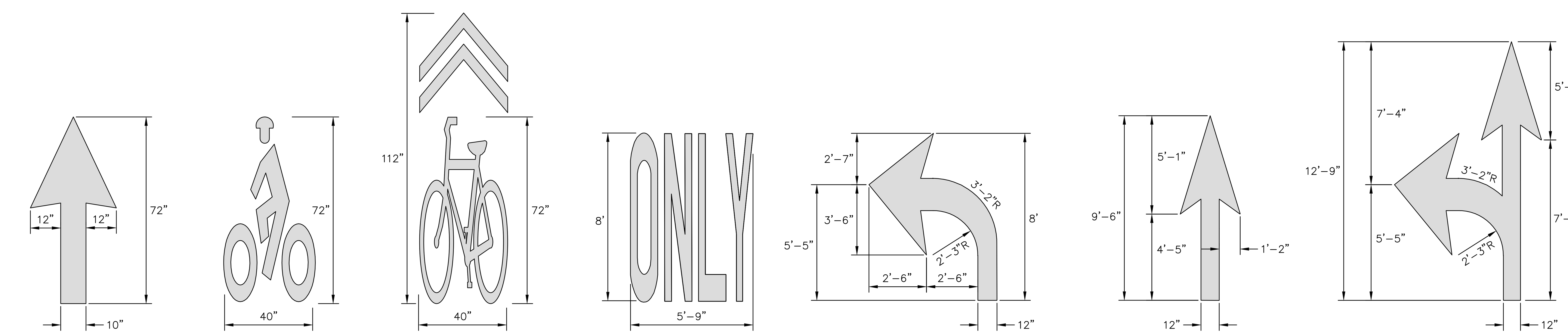
NOTES:

1. POSTS SHALL BE P2-10 AS REQUIRED.
2. POSTS SHALL BE PLUMB; ANY POST BENT OR OTHERWISE DAMAGED SHALL BE REMOVED AND PROPERLY PLACED.
3. POSTS MAY BE SET OR DRIVEN. WHEN POSTS ARE SET, HOLES SHALL BE DUG TO THE PROPER DEPTH; AFTER INSERTING POSTS, THE HOLES SHALL BE BACKFILLED WITH SUITABLE MATERIAL IN LAYERS NOT TO EXCEED 6" DEEP AND THOROUGHLY COMPACTED, CARE BEING TAKEN TO PRESERVE THE ALIGNMENT OF THE POST. WHEN POSTS ARE DRIVEN, A SUITABLE DRIVING CAP SHALL BE USED AND AFTER DRIVING THE TOP OF THE POST; BATTERING HEADS WILL NOT BE ACCEPTED. POST SHALL NOT BE DRIVEN WITH THE SIGN ATTACHED TO THE POST.

(2/D4) SIGN DETAIL
NOT TO SCALE

GENERAL NOTES:

1. ALL WORDS AND SYMBOLS SHALL BE RETROREFLECTIVE WHITE AND SHALL CONFORM TO THE LATEST VERSION OF THE MUTCD.
2. MULTI-WORD MESSAGES SHALL READ "UP"; THAT IS, THE FIRST WORD SHALL BE NEAREST THE APPROACHING DRIVER.
3. THE WORD "ONLY" SHALL NOT BE USED WITH THROUGH OR COMBINATION ARROWS, AND SHALL NOT BE USED ADJACENT TO A BROKEN LANE LINE. A WORD/SYMBOL SHALL PRECEDED THE WORD "ONLY".
4. PREFORMED WORDS AND SYMBOLS SHALL BE PRE-CUT BY THE MANUFACTURER.
5. WRONG-WAY ARROWS SHALL NOT BE SUBSTITUTED FOR THROUGH ARROWS.
6. ALL STOP BARS, WORDS, SYMBOLS AND ARROWS SHALL BE THERMOPLASTIC.



BICYCLE LANE DIRECTIONAL ARROW
PAY QUANTITY = 6.0 FT²

BICYCLE LANE SYMBOL
PAY QUANTITY = 8.1 FT²

BICYCLE LANE SYMBOL
PAY QUANTITY = 12.8 FT²

ONLY
PAY QUANTITY = 22.3 FT²

TURN ARROW
(RIGHT TURN OPPOSITE IN KIND)
PAY QUANTITY = 17.0 FT²

THROUGH (STRAIGHT ARROW)
PAY QUANTITY = 12.5 FT²

COMBINATION ARROW
PAY QUANTITY = 28.8 FT²

ITEM 632.32

(4/D4) PAVEMENT MARKING – WORD AND SYMBOLS
NOT TO SCALE

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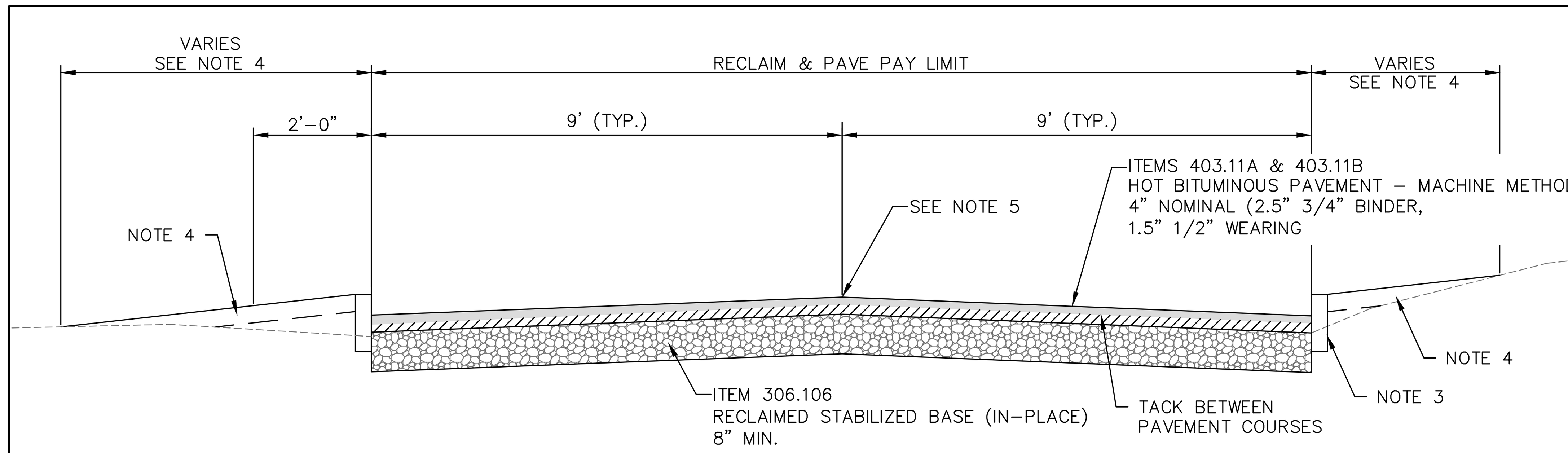
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

TRAFFIC CONTROL SIGNS & PAVEMENT MARKINGS
MAPLEWOOD AVE – DRAINAGE INTERCEPT
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO D4
SHEET 12 OF 14



ROAD RE-CONSTRUCTION NOTES:

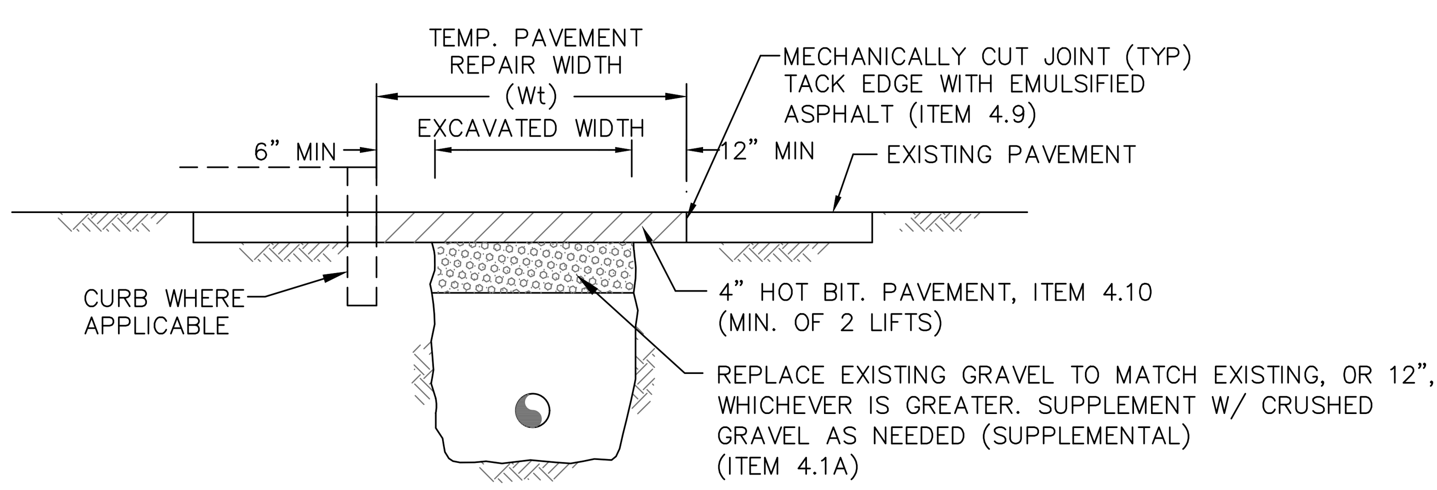
1. SAWCUT DRIVEWAYS AND CONSTRUCT DRIVEWAY APRON FOLLOWING CONSTRUCTION OF PAVEMENT BINDER COURSE (SEE DRIVEWAY APRON DETAILS, THIS DRAWING).
2. GRADE RECLAIM (UNIFORMLY) TO MINIMIZE IMPACTS TO DRIVEWAYS AND SIDE SLOPES. REVIEW GRADING WITH ENGINEER IN ADVANCE OF RECLAIM. RECLAIM AT 10" DEPTH, REMOVE AND DISPOSE OF SURPLUS RECLAIM WHERE DIRECTED TO MINIMIZE GRADING IMPACTS, SUBSIDIARY. TYPICAL CROSS SLOPE = 3% UNLESS DIRECTED OTHERWISE.T, SUBSIDIARY.
3. INSTALL GRANITE CURB (WHERE DIRECTED), ITEM 609.01. SEE DETAIL 6/D5.
4. LOAM, SEED & MULCH ROADSIDE SLOPES, PAY AS ITEM 912.
5. ALL SEAMS AND JOINTS SHALL BE RAKED AND LUTED PRIOR TO COMPACTION AND ROLLING.

1/D5 TYPICAL ROADWAY SECTION – RAILROAD EASEMENT AREA
NOT TO SCALE

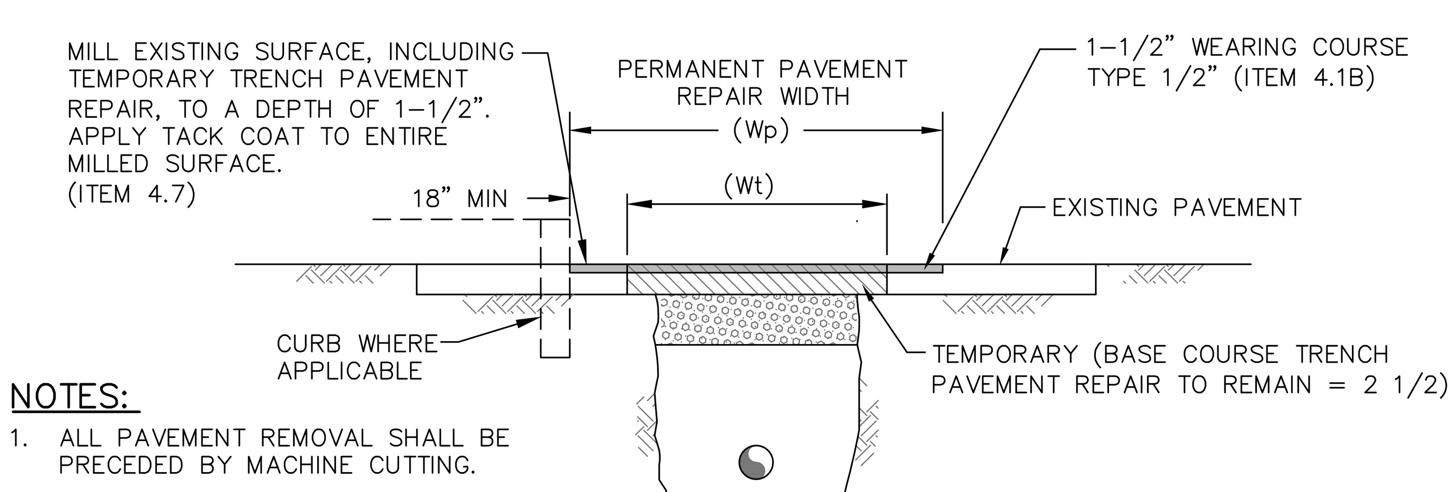
MINIMUM TRENCH PAVEMENT WIDTHS

PIPE I.D.	Wt (INCHES)	Wp (INCHES)
1-21 INCHES	84	108
24-30 INCHES	96	120
> 30 INCHES	108	132

NOTE:
THE DIMENSIONS SHOWN SHALL BE CONSIDERED MAXIMUM PAVEMENT PAYMENT WIDTHS FOR 0-10' DEEP CONSTRUCTION. Wt AND Wp SHALL BE INCREASED BY 4'-0" FOR TRENCHES 10' TO 15' AND BY 8'-0" FOR TRENCHES 15' TO 20' IN DEPTH.

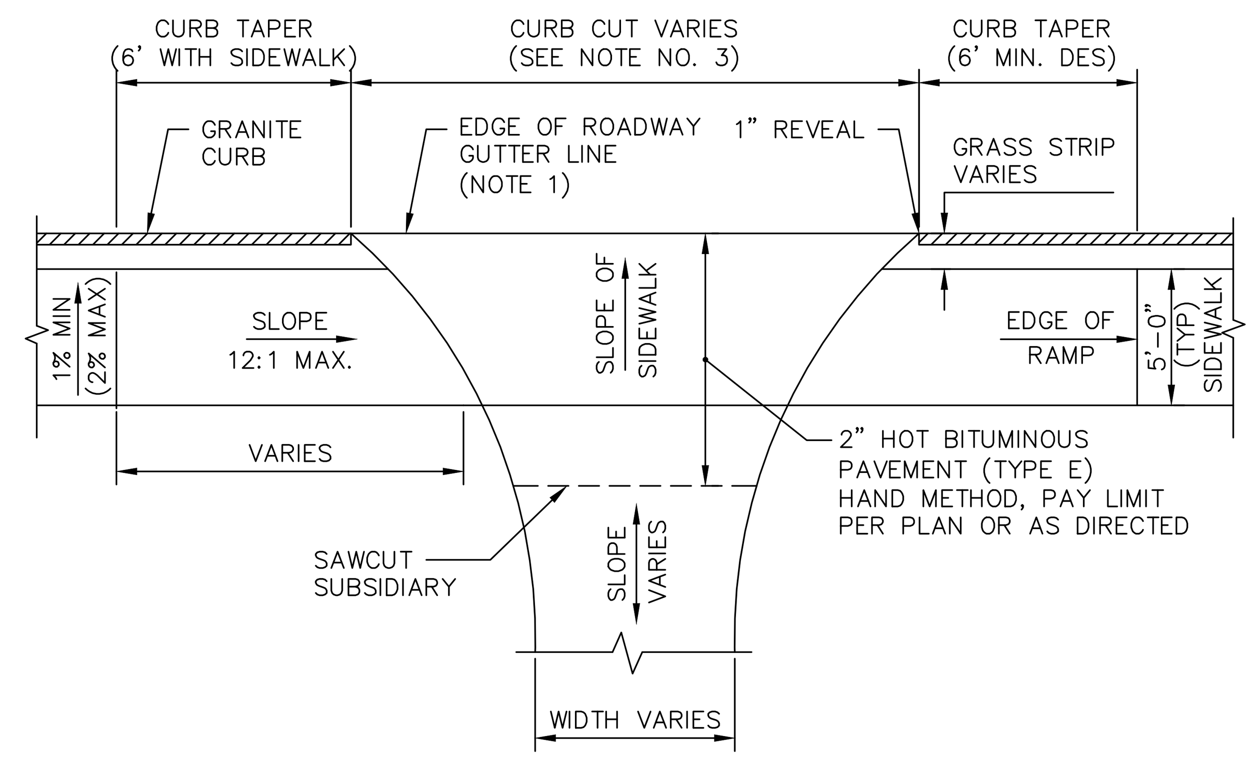


2/D-5 TEMPORARY TRENCH PAVEMENT REPAIR
NOT TO SCALE



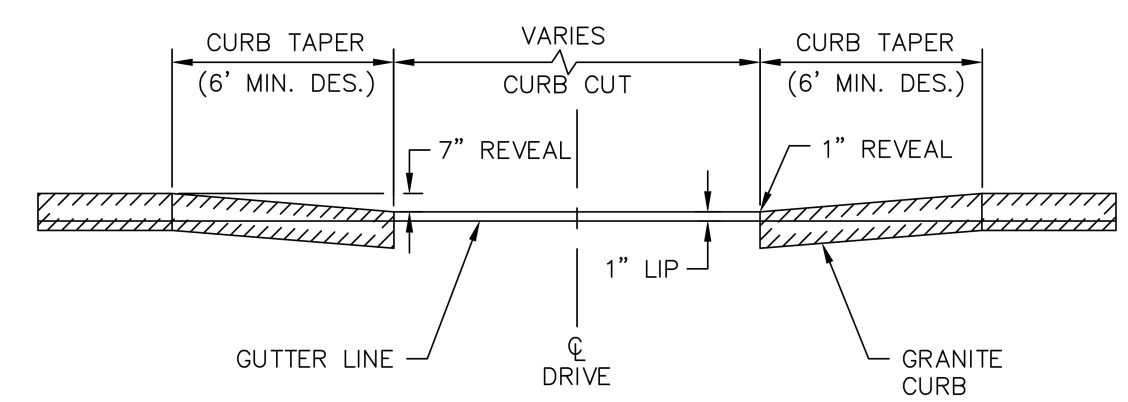
NOTES:
1. ALL PAVEMENT REMOVAL SHALL BE PRECEDED BY MACHINE CUTTING.
2. ALL TEMPORARY, DAMAGED OR DEFECTIVE PAVEMENT SHALL BE REMOVED PRIOR TO PLACEMENT OF PERMANENT TRENCH REPAIRS.
3. SEE TABLE IN "TEMPORARY TRENCH PAVEMENT REPAIRS" FOR MINIMUM TRENCH WIDTHS.

3/D-5 PERMANENT TRENCH PAVEMENT REPAIR
NOT TO SCALE



PLAN VIEW WITH SIDEWALK RAMP

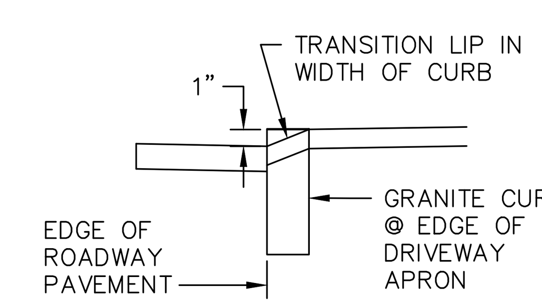
NOTES:
1. ALL PAVEMENT MATCHES AT DRIVEWAY SHALL BE SAWCUT AND KEYED FOR SMOOTH TRANSITION (SUBSIDIARY)



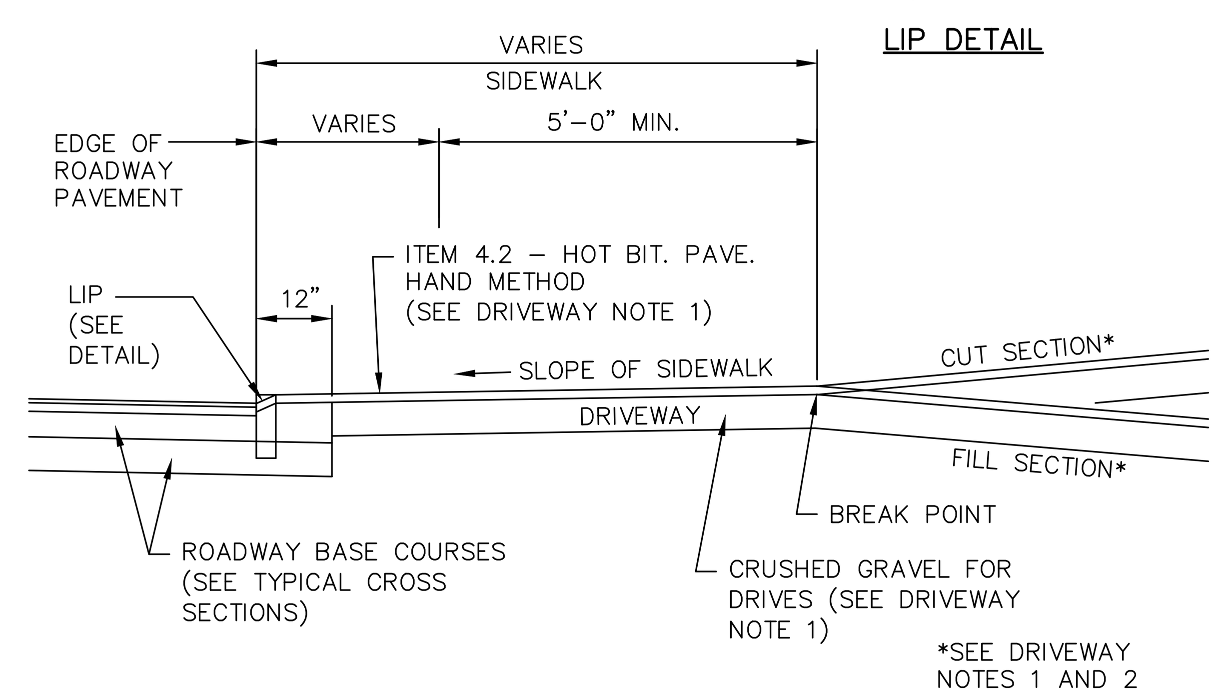
PROFILE

DRIVEWAY NOTES:
1. PAVEMENT & GRAVEL DEPTHS FOR RESIDENTIAL DRIVES SHALL BE 8" CRUSHED GRAVEL WITH 2" H.B.P. (HAND METHOD) SINGLE COURSE.
2. CURBING CAN BE FLARED TO FIT DRIVE RADII IF APPROPRIATE OR ENDED AS DETAILED ABOVE.
3. DRIVEWAY CURB CUTS SHALL MATCH EXISTING APRON WIDTHS UNLESS OTHERWISE DIRECTED.
4. FOR UNPAVED DRIVES, THE PAVED APRON NORMALLY ENDS AT THE RADIUS TANGENT POINT OR BACK OF SIDEWALK, WHICHEVER IS GREATER.

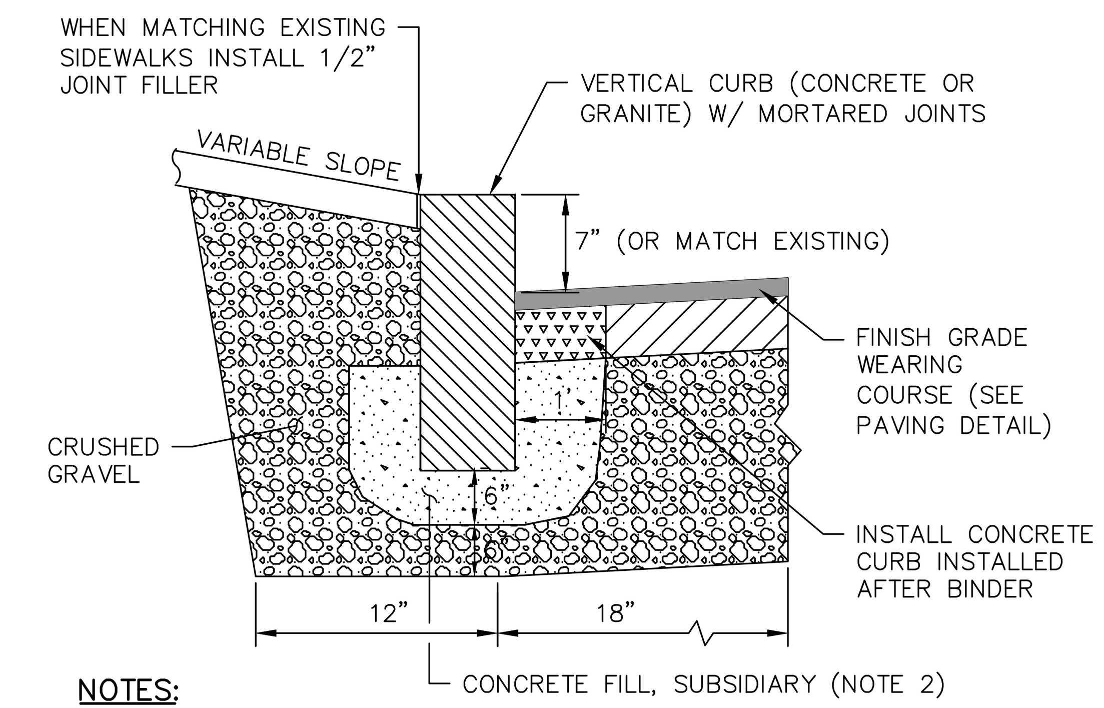
4/D5 DRIVEWAY APRON/CURB CUT (FINAL GRADING PLAN)
NOT TO SCALE



LIP DETAIL

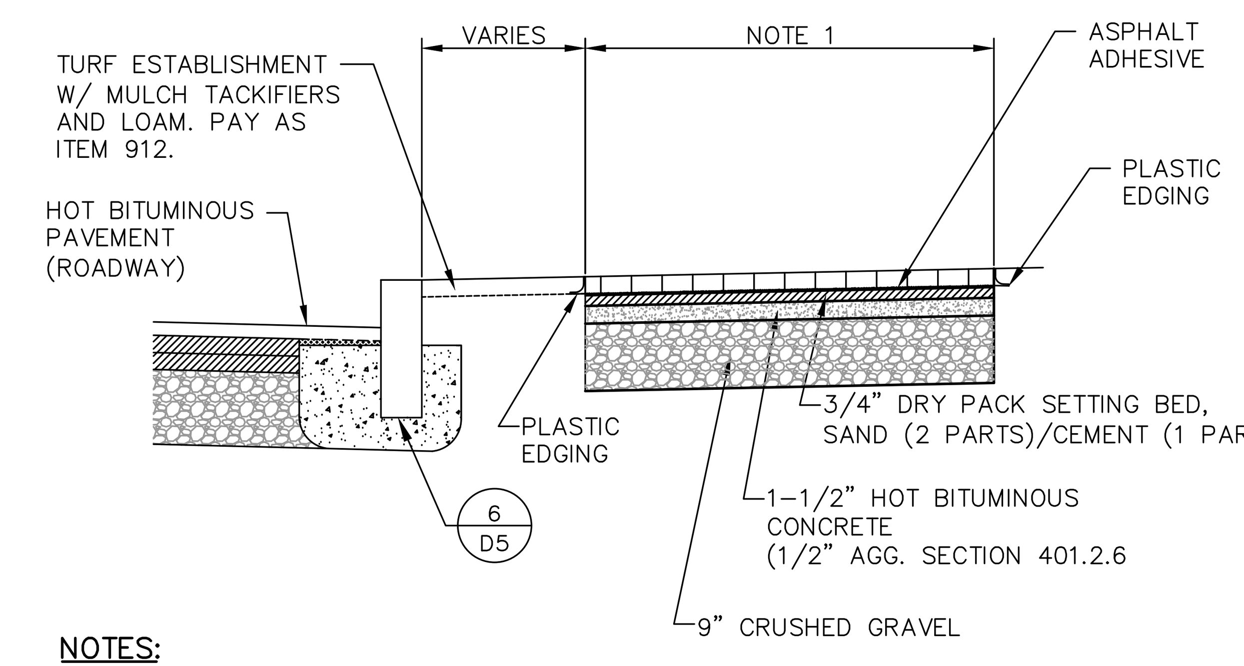


5/D5 TYPICAL URBAN CURBED DRIVE IN CUT/FILL SECTION
NOT TO SCALE



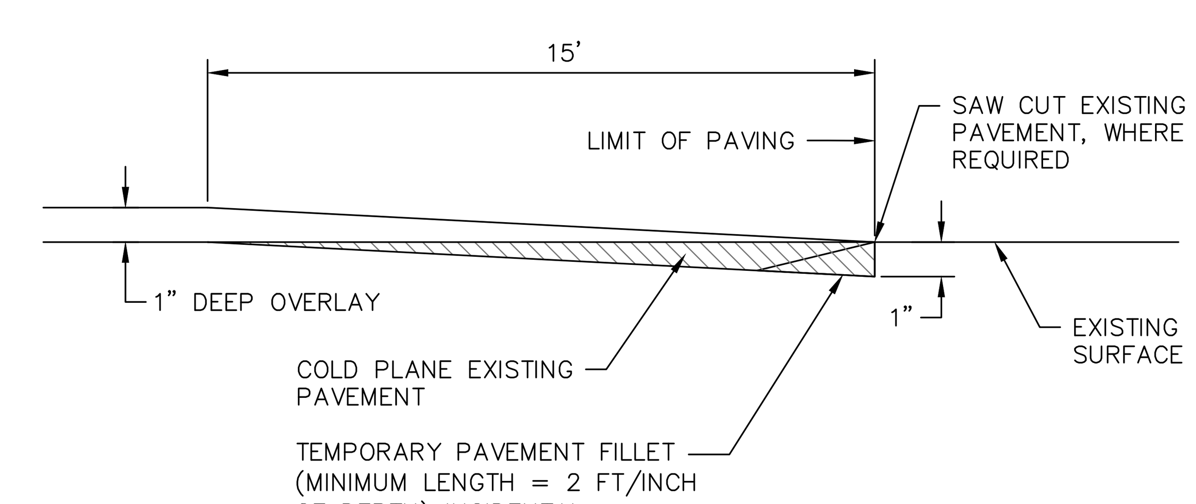
NOTES:
1. DAMAGED OR IMPACTED CURB (WHETHER GRANITE OR CONCRETE) IS TO BE REPLACED AT THE CONTRACTORS OWN EXPENSIVE, UNLESS OTHERWISE NOTED ON PLAN.
2. CLASS AA CONCRETE FILL SHALL BE PLACED IN VOIDS IN FRONT, BEHIND, AND BELOW CURBING PRIOR TO INSTALLATION OF GRAVEL BACKING AND FINISH GRADE WEARING COURSE PAVEMENT.

6/D5 VERTICAL CURB (NEW OR RESET) (GRANITE OR CONCRETE)
NOT TO SCALE



NOTES:
1. RE-CONSTRUCT CURB AND SIDEWALKS IMPACTED FROM CONSTRUCTION OR WHERE DIRECTED. CURB AND SIDEWALKS DAMAGED OUTSIDE TRENCH LIMITS (THREE-FEET FROM OUTSIDE OF PIPE) SHALL BE RESTORED AT CONTRACTOR'S COST AND WILL NOT BE MEASURED FOR PAYMENT.

7/D5 BRICK SIDEWALK DETAIL (NEW OR RECONSTRUCT)
NOT TO SCALE



NOTES:
THE LENGTH OF THE TAPER MAY BE ADJUSTED AS ORDERED TO PROVIDE FOR VARYING FIELD CONDITIONS OR CHANGES IN SINGLE COURSE DEPTH.

8/D5 OVERLAY PAVEMENT MATCH
NOT TO SCALE

ISSUE FOR: BIDDING Date – By –; CONSTRUCTION Date – By –; RECORD DRAWING Date – By –

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Date MARCH 2024
Book No. –
Project No. 2542
Dwg. ID 2542_details_M
Scale –

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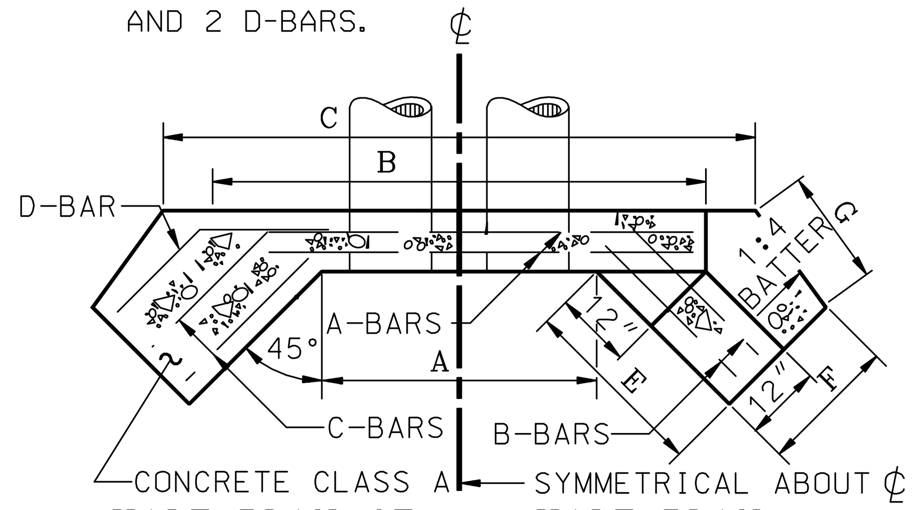
MARCH 2024
NOT FOR CONSTRUCTION

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

ROADWAY AND SIDEWALK DETAILS
MAPLEWOOD AVE – DRAINAGE INTERCEPT
CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

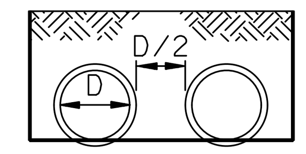
DWG NO D5 | SHEET 13 OF 14

NOTE:
ALL LIKE BARS IN EACH HEADWALL ARE THE SAME SIZE. EACH STD. HEADER HAS 4 A, B & C-BARS, AND 2 D-BARS.



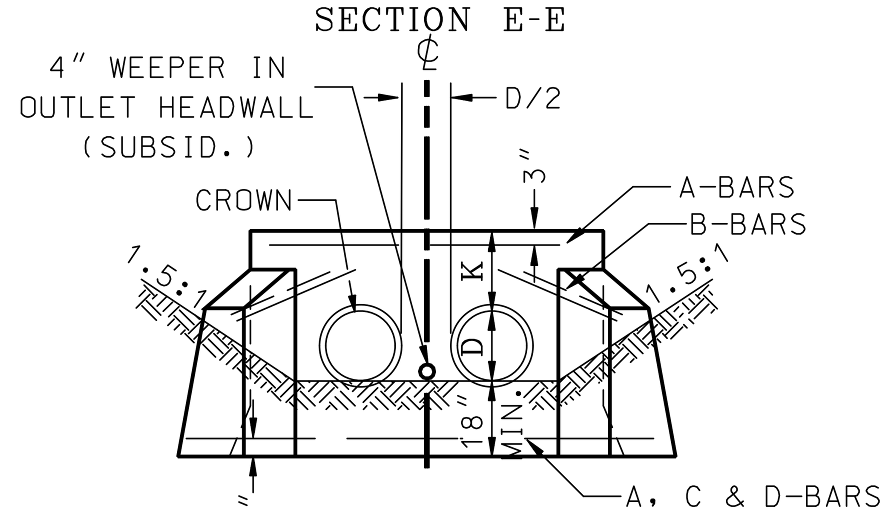
HALF PLAN OF BOTTOM STEEL

HALF PLAN OF TOP STEEL

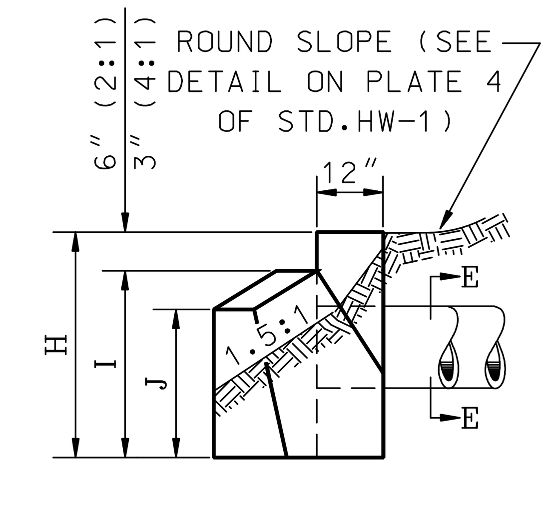


SECTION E-E

EXCAVATION BETWEEN PIPES INCLUDED IN STRUCTURE EXCAVATION



END ELEVATION



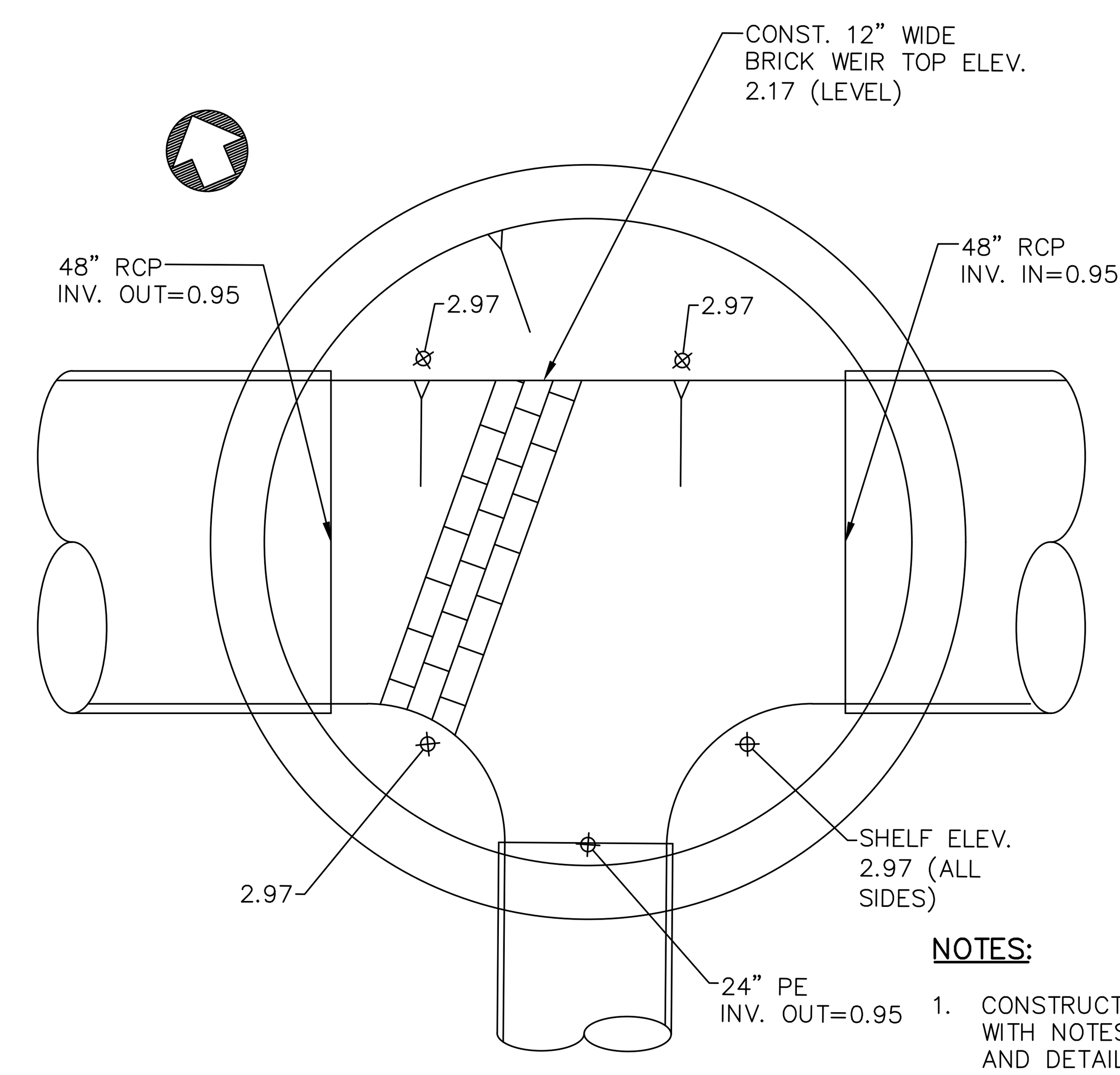
SIDE ELEVATION

2:1 SLOPE

DIA. D INCHES	QUANTITIES PER HEADER: CONC. CU. YD.	STEEL LB.	EXC. FOR 1' DEPTH CU. YD.	DIMENSIONS: A	B	C	E	F	G	H	I	J	K	D/2	REINFORCING STEEL: SIZE	LENGTH: A BARS	B BARS	C BARS	D BARS	D-BARS: a	b
24	2.44	46	1.96	6'-0"	8'-10"	10'-0"	3'-0"	1'-11"	2'-3"	5'-0"	4'-6"	3'-10"	1'-6"	1'-0"	#4	8'-6"	3'-2"	3'-0"	4'-8"	2'-5"	2'-3"
30	3.18	53	2.28	7-5	10-3	11-9	3-7	2-0	2-9	5-6	5-0	4-1	1-6	1-3	#4	9-11	3-9	3-7	5-3	2-6	2-9
36	3.99	61	2.69	8-10	11-8	13-7	4-2	2-1	3-3	6-0	5-6	4-4	1-6	1-6	#4	11-4	4-3	4-1	5-10	2-8	3-2
42	5.43	161	3.22	10-3	13-1	15-6	5-1	2-2	4-0	6-9	6-3	4-10	1-9	1-9	#6	12-9	5-3	4-11	7-10	3-10	4-0
48	6.53	180	3.64	11-8	14-6	17-3	5-9	2-3	4-6	7-3	6-9	5-1	1-9	2-0	#6	14-2	5-11	5-7	8-5	3-10	4-7
54	7.76	197	4.00	13-1	15-11	19-1	6-4	2-4	5-0	7-9	7-3	5-4	1-9	2-3	#6	15-7	6-7	6-1	9-2	4-1	5-1
60	9.10	214	4.45	14-6	17-4	20-10	6-11	2-5	5-6	8-3	7-9	5-8	1-9	2-6	#6	17-0	7-1	6-8	9-9	4-1	5-8
66	10.56	232	4.84	15-11	18-9	22-5	7-6	2-6	6-0	8-9	8-3	5-11	1-9	2-9	#6	18-5	7-8	7-3	10-5	4-2	6-3
72	12.28	249	5.25	17'-4"	20'-2"	24'-2"	8'-2"	2'-7"	6'-6"	9'-3"	8'-9"	6'-3"	1'-9"	3'-0"	#6	19'-10"	8'-3"	7'-10"	11'-0"	4'-3"	6'-9'
4:1 SLOPE																					
24	3.05	53	2.29	6'-0"	8'-10"	10'-0"	3'-11"	2'-1"	3'-2"	5'-0"	4'-9"	4'-3"	1'-6"	1'-0"	#4	8'-6"	4'-3"	4'-0"	5'-6"	2'-6"	3'-0'
30	3.92	61	2.70	7-5	10-3	11-9	4-8	2-2	3-9	5-6	5-3	4-7	1-6	1-3	#4	9-11	5-0	4-8	6-3	2-8	3-7
36	5.09	70	3.15	8-10	11-8	13-7	5-5	2-3	4-5	6-0	5-9	5-0	1-6	1-6	#4	11-4	5-9	5-4	7-1	2-10	4-3
42	6.97	185	3.78	10-3	13-1	15-6	6-7	2-5	5-4	6-9	6-6	5-6	1-9	1-9	#6	12-9	6-11	6-5	9-3	4-0	5-3
48	8.44	204	4.24	11-8	14-6	17-3	7-4	2-6	6-0	7-3	7-0	5-11	1-9	2-0	#6	14-2	7-8	7-1	10-1	4-2	5-11
54	10.13	225	4.74	13-1	15-11	19-1	8-2	2-7	6-9	7-9	7-6	6-3	1-9	2-3	#6	15-7	8-6	7-10	10-11	4-3	6-8
60	11.90	245	5.23	14-6	17-4	20-10	8-11	2-8	7-4	8-3	8-0	6-7	1-9	2-6	#6	17-0	9-3	8-8	11-9	4-4	7-5
66	13.87	266	5.75	15-11	18-9	22-5	9-8	2-9	8-0	8-9	8-6	7-0	1-9	2-9	#6	18-5	10-0	9-5	12-8	4-7	8-1
72	16.13	283	6.29	17'-4"	20'-2"	24'-2"	10'-6"	2'-10"	8'-8"	9'-3"	9'-0"	7'-4"	1'-9"	3'-0"	#6	19'-10"	10'-10"	9'-9"	13'-5"	4'-8"	8'-9'

1/D6 CONCRETE HEADWALLS WITH 45° WINGS FOR TWIN R.C. PIPE (48" DIA. W/4:1 SLOPE)

NOT TO SCALE



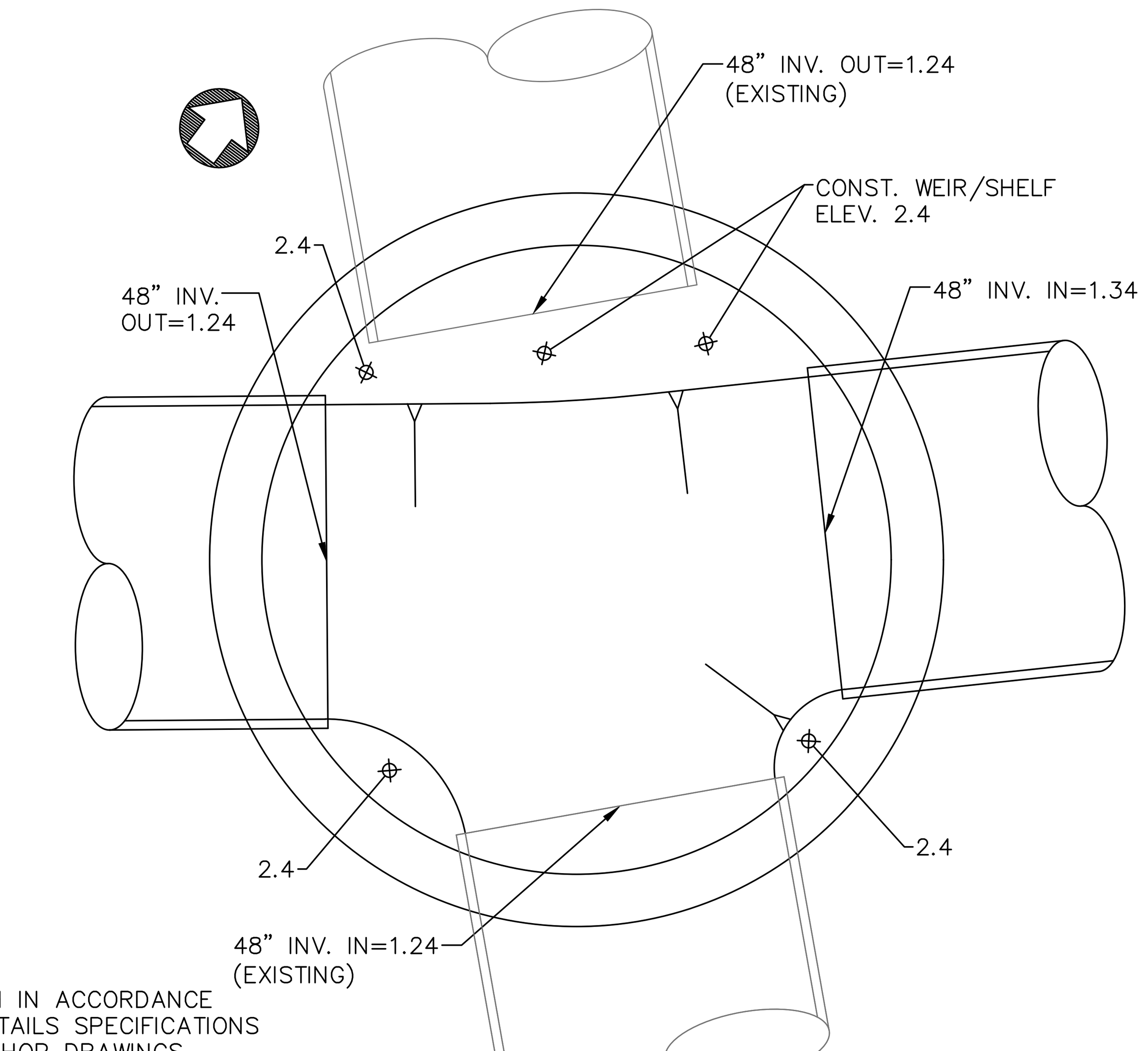
(ITEM ______)

3/D6 DMH#1E

NOT TO SCALE

NOTES:

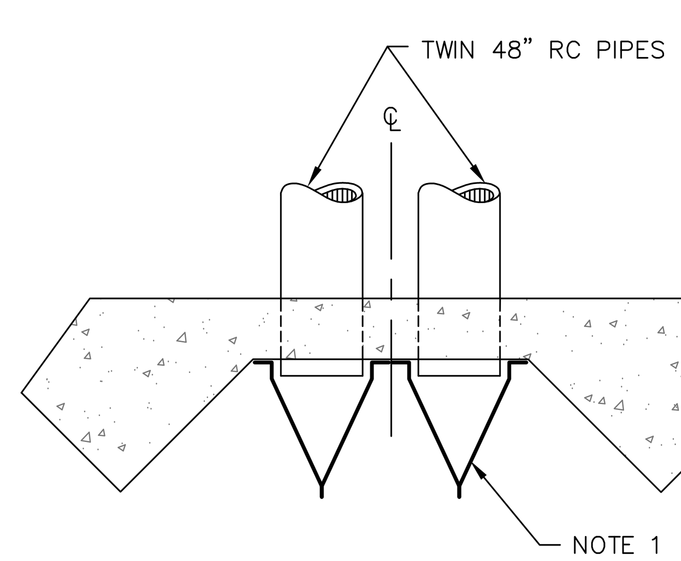
1. CONSTRUCT DMH IN ACCORDANCE WITH NOTES, DETAILS SPECIFICATIONS AND DETAILED SHOP DRAWINGS. PROVIDED BY MANUFACTURER.
2. FORM BRICK CHANNEL TO SPRING LINE AND CONSTRUCT SHELF TO ELEVATIONS PROVIDED.
3. CONST. BRICK WEIR OR REMOVABLE PLATE WEIR TO ELEVATION PROVIDED.



(ITEM ______)

5/D6 DMH#3

NOT TO SCALE

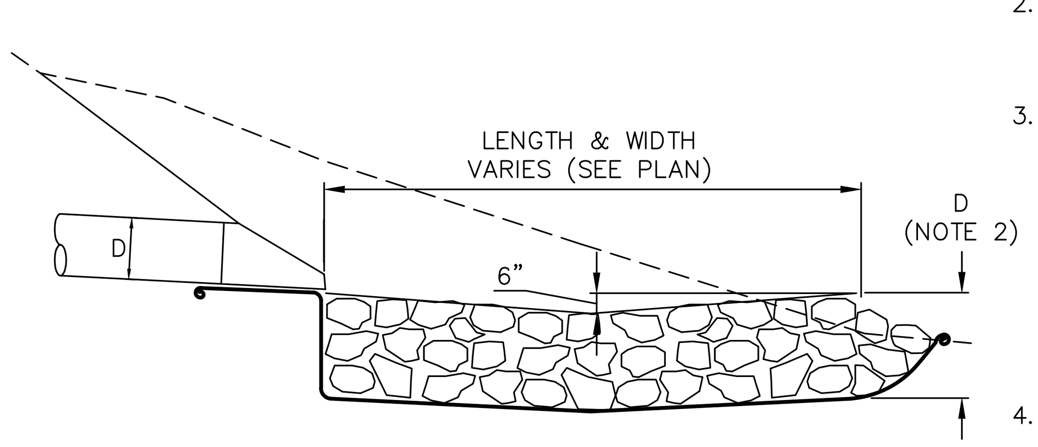


2/D6 TIDE VALVE DETAIL

NOT TO SCALE

NOTES:

1. TIDE VALVES SHALL BE TIDE FLEX TF-1 OR APPROVED EQUAL. ATTACH DIRECTLY TO HEADWALL USING THIMBLE PLATE IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS. PROVIDE THIMBLE PLATE INSTALLATION DETAILS OR RECOMMENDED ALTERNATIVE. THE TIDE VALVES WILL BE MOUNTED TO THE HEADWALL

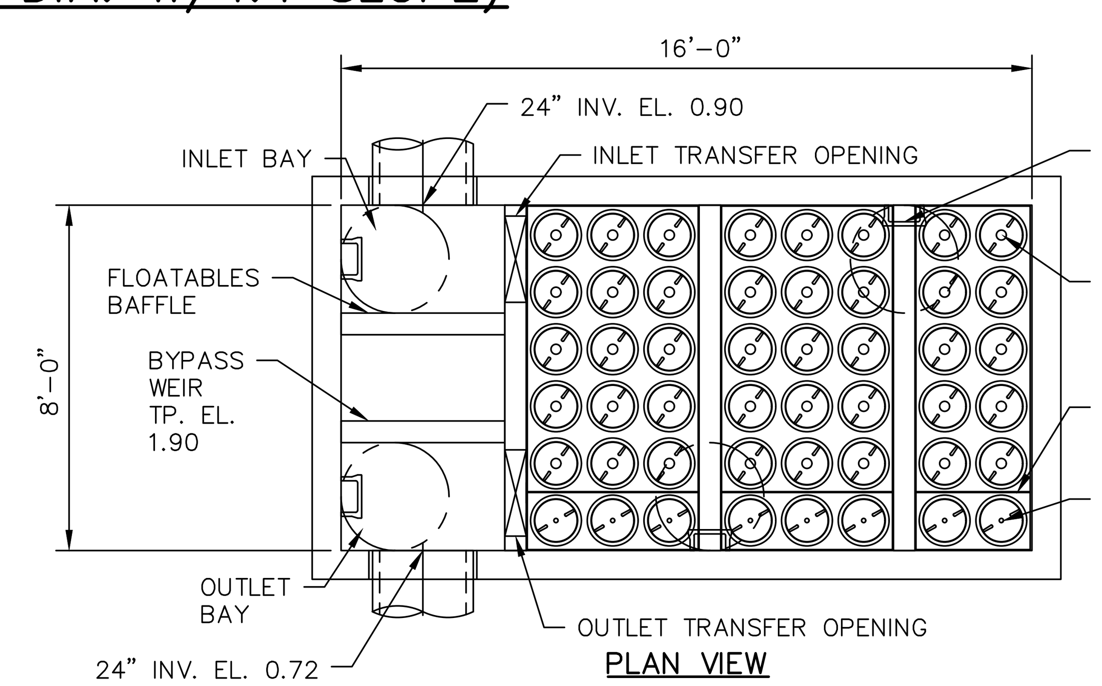


6/D6 STABILIZED DRAIN OUTLET

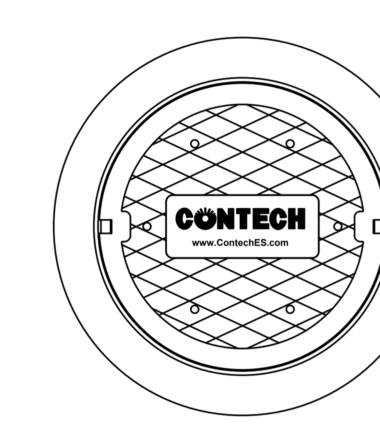
NOT TO SCALE

CONSTRUCTION SPECIFICATIONS:

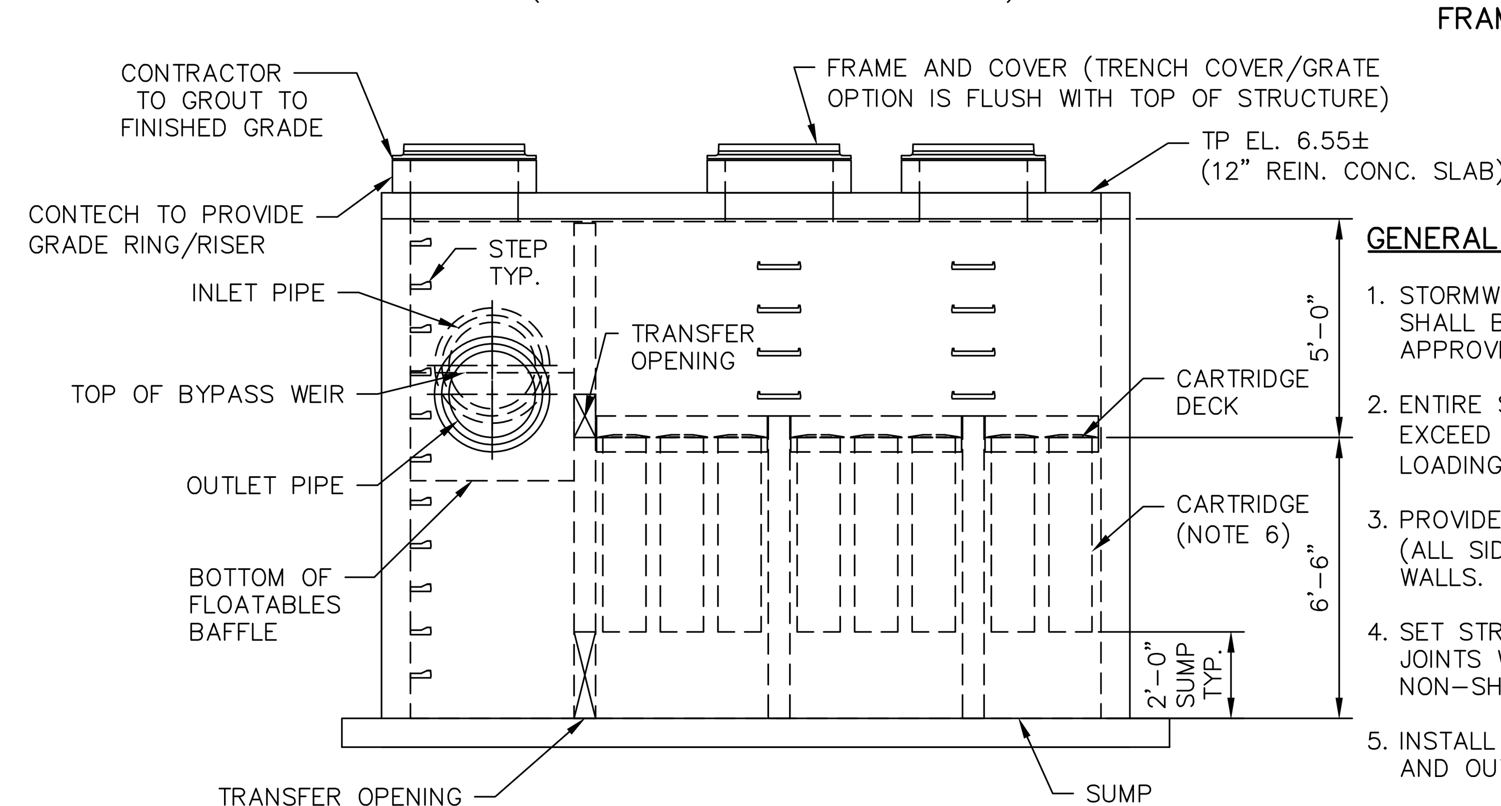
1. THE SUBGRADE FOR THE GEOTEXTILE FABRIC AND STONE FILL SHALL BE PREPARED TO LINES AND GRADES SHOWN ON THE PLANS.
2. GRADATION: CLASS B STONE CONFORMING TO 585.2.1.2 SHALL BE USED. DEPTH OF STONE SHALL BE 18".
3. GEOTEXTILE FABRICS SHALL BE PROTECTED FROM PUNCTURE OR TEARING DURING THE PLACEMENT OF THE RIPRAP. 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 18 INCHES.
4. THE RIPRAP 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. CONSTRUCT FLARED END SECTIONS (OR HEADWALLS) AS SHOWN ON THE PLANS. MATERIALS AND SIZES SHALL BE CONSISTENT WITH NHDOT STANDARD DETAILS.



PLAN VIEW
(TOP SLAB NOT SHOWN FOR CLARITY)



TOP VIEW
FRAME AND COVER



ELEVATION VIEW

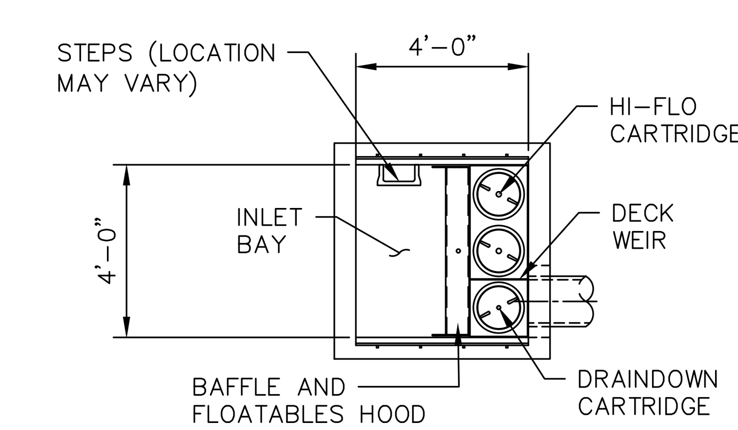
GENERAL NOTES:

1. STORMWATER TREATMENT STRUCTURE SHALL BE PROVIDED BY CONTECH OR APPROVED EQUIVALENT.
2. ENTIRE STRUCTURE SHALL MEET OR EXCEED HS-20 RATING (HEAVY LOADING).
3. PROVIDE ANTI-FLOTATION COLLARS (ALL SIDES), TO EXTEND 12" BEYOND WALLS.
4. SET STRUCTURE LEVEL. SEAL ALL JOINTS WITH APPROVED SEALANT OR NON-SHRINK GROUT.
5. INSTALL FLEXIBLE BOOT AT INLET AND OUTLET.
6. CARTRIDGE LENGTH SHALL BE 54", INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

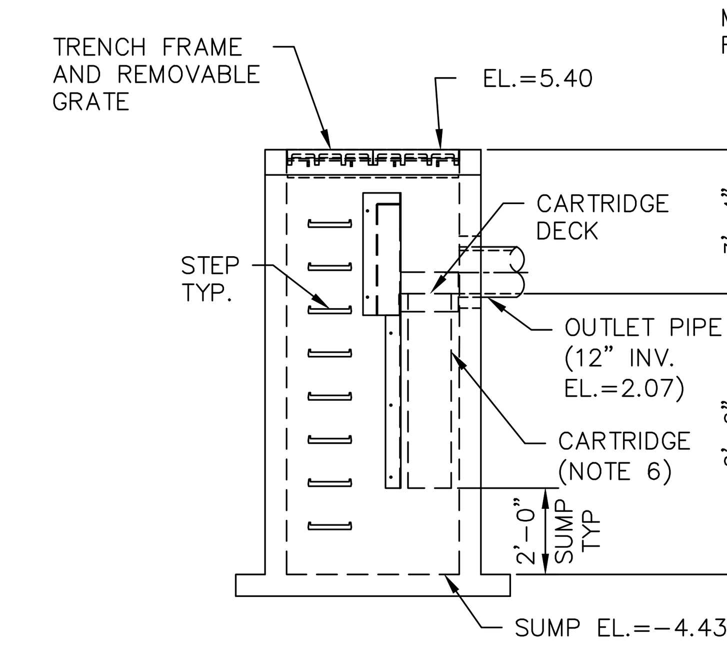
4/D6 JELLYFISH (JFPD0816) DETAILS

NOT TO SCALE

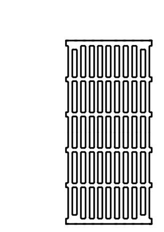
ITEM ______



PLAN VIEW
(TOP SLAB NOT SHOWN FOR CLARITY)



ELEVATION VIEW



24" TRENCH GRATE

GENERAL NOTES:

1. STORMWATER TREATMENT STRUCTURE SHALL BE PROVIDED BY CONTECH OR APPROVED EQUIVALENT.
2. ENTIRE STRUCTURE SHALL MEET OR EXCEED HS-20 RATING (HEAVY LOADING).
3. PROVIDE ANTI-FLOTATION COLLARS (ALL SIDES), TO EXTEND 12" BEYOND WALLS.
4. SET STRUCTURE LEVEL. SEAL ALL JOINTS WITH APPROVED SEALANT OR NON-SHRINK GROUT.
5. INSTALL FLEXIBLE BOOT OUTLET.
6. CARTRIDGE LENGTH SHALL BE 54", INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

7/D6 JELLYFISH (JFSI0404) DETAILS

NOT TO SCALE

ITEM ______

ISSUE FOR: BIDDING Date – By – ; CONSTRUCTION Date – By – ; RECORD DRAWING Date – By –

REVISIONS | APP'D | NO.

Drawn/Chk. RMG
Designed PDM
Checked –
Approved –
Date MARCH 2024
Book No. –
Project No. 2542
Dwg. ID 2542_details_M
Scale –

FOR REVIEW
MARCH 2024
NOT FOR CONSTRUCTION

UNDERWOOD engineers
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

DRAINAGE OUTFALL DETAILS

MAPLEWOOD AVE – DRAINAGE INTERCEPT

CITY OF PORTSMOUTH
PORTSMOUTH, NEW HAMPSHIRE

DWG NO D6 | SHEET 14 OF 14