DRAINAGE REPORT

890 North Broadway (575-2-8)
Haverhill, Massachusetts 01832

CIVIL DESIGN CONSULTANTS, INC
344 North Main Street | Andover · MA 01810
(978) 416-0920 | www.civildci.com

APPLICANT:
Sterling Golf Management, Inc.
212 Kendrick Street
Newton, MA 02458

SUBMITTED TO:
City of Haverhill
4 Summer Street
Haverhill, MA 01830

ISSUED:
February 26, 2026

REVISED:
May 11, 2026

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TABLE OF CONTENTS

CIVIL DESIGN CONSULTANTS, INC
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SECTION V – Supplemental Information

Stormwater Checklist
Stormwater Management Calculations
Total Phosphorous Removal Graphs
Soil Logs
Construction Period Pollution Prevention & Erosion and Sedimentation Control Plan
Long-Term Operation and Maintenance Program
Pipe Sizing Calculations
Grate Inlet Capacity Calculations
Barracuda MAX Water Quality Unit Sizing Calculations
Illicit Discharge Compliance Statement

SECTION VI – Watershed Plans

Pre-Development Watershed Plan
Post-Development Watershed Plan

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SECTION I - Project Summary

Project Narrative
Exhibit A (2008)
Exhibit B (2023)

DRAINAGE REPORT

Crystal Lake Golf Course
Haverhill, Massachusetts

REVISION #1

Revisions made to address a Peer Review Letter from Comprehensive Environmental Incorporated (CEI) dated April 8, 2024. Please see the attached response letter from our office dated May 14, 2026 for further details in regards to changes made to the site plans and drainage report.

PROJECT DESCRIPTION

The Applicant proposes improvements to a portion of the property located at 940 North Broadway in Haverhill, Massachusetts, also known as Crystal Lake Golf Course. The proposed work includes construction of a clubhouse, cart barn, and paved parking lot to support golf course operations. Portions of the proposed improvements are located within jurisdictional buffer zones to wetland resource areas.

SITE DESCRIPTION

The property is located within the Rural Residential zoning district and is presently developed and operated as a golf course. The overall parcel contains ±125-AC and has frontage along Front Nine Drive and North Broadway. The proposed limit of work is confined to ±3.1-AC in the vicinity of the existing clubhouse area.

Existing site conditions within the project area includes a temporary ±1,850-SF clubhouse and associated gravel and paved parking areas.

On-site resource areas within the limit of work area include two Bordering Vegetated Wetlands (BVWs) located to the east and west of the proposed work area. The 100-FT Wetland Buffer, the local 50-FT No Build Zone, and the 25-FT No Disturb Zone all extend into the proposed work area.

Elevations across the project area range from approximately 213-FT at the site's frontage along Front Nine Drive (about 550-FT from North Broadway) to approximately 190-FT near the eastern BVW. Wetland resource areas were delineated by Norse Environmental in April 2025.

According to the Natural Resource Conservation Service Soil Survey for Middlesex County, Massachusetts, on-site soils consist of Montauk fine sandy loam (300) and Ridgebury fine sandy loam. For the purposes of the drainage calculations, HSG-C was used. Test pits were conducted by this office in August of 2025 to determine soil texture and estimated seasonal high groundwater elevations. Test pit logs are provided under Tab 5 of this report. According to the Flood Insurance Rate Map for Middlesex County, Massachusetts Panels 25009C0067G, the site is not located within the any designated flood hazard area.

PROJECT SITE BACKGROUND AND PERMITTING HISTORY

In 2009, the Haverhill Conservation Commission issued an Order of Conditions (DEP File No. 033-1279) for the construction of residential development and golf course improvements on the project site. The approved project included the following:

- Developing a portion of the existing Crystal Lake Golf Couse into 50-single family homes.
- Construction of a ±2,400-FT roadway (Front Nine Drive) supporting 34-single family homes
- Construction of ±590-FT of roadway (Back Nine Drive) to support 16-single family homes
- A ±10,000-SF clubhouse
- A ±2,000-SF maintenance building

Stormwater runoff from impervious areas was collected and treated through structural stormwater management systems throughout the site prior to discharge to several on-site wetland resource areas. The stormwater management systems were designed to provide peak rate attenuation, water quality treatment and groundwater recharge, consistent with MassDEP Stormwater Management Standards.

As illustrated on Exhibits A (2008) and B (2023), portions of the site improvements associated with the clubhouse approved in 2009 were begun. A temporary gravel parking area and pro-shop were constructed but not completed.

In 2022, an amendment to the original Notice of Intent (DEP File No. 033-1476) was filed and approved by the Haverhill Conservation Commission. The amendment removed all work associated with the previously approved clubhouse and its paved parking lot. Modifications were made to the stormwater management system, including the removal of Proposed Wet Swale-1 and its replacement with a smaller treatment pond designed to manage runoff from a limited segment of Front Nine Drive and an associated gravel parking area.

Following completion of the amended work, a Certification of Compliance was issued in 2024, confirming that the construction of the revised treatment pond had been completed in substantial compliance with approved amended plans. As-built drainage calculations were submitted as part of the compliance with approved design.

2026 PROPOSED CLUBHOUSE DEVELOPMENT AND DRAINAGE APPROACH

As of 2026, the Applicant intends to proceed with construction of a revised clubhouse facility. The current proposal includes a ±4,710-SF clubhouse, a ±5,000-SF cart barn, along with a paved parking lot and supporting utilities. Although the overall golf course layout has evolved from the 2009 approval, the proposed improvements remain generally consistent with the previously developed clubhouse footprint area.

The stormwater management strategy for the 2026 design is based on comparison to the 2009 post-development design rather than the original pre-development conditions. This approach is appropriate because the original 2009 project included a comprehensive system of BMPs that achieved compliance with MassDEP Stormwater Management Standards for peak flow attenuation, water quality treatment, and groundwater recharge.

Proposed Wet Swale-1, receives flow from the proposed parking area and existing Front Nine Drive consistent with the 2009 drainage design and Order of Conditions. The drainage analysis compares runoff flows directed to Wet Swale-1 under the 2026 design to the runoff predicted under the 2009 post-development condition, demonstrating that peak flows are consistent with, or reduced from, previously approved levels.

Groundwater recharge is also consistent with the 2009 post-development design. In the original 2009 design, recharge was provided for rooftop runoff from the clubhouse via a subsurface chamber system. For the 2026 design, recharge will similarly be limited to rooftop runoff from the proposed clubhouse and cart barn; however, due to shallow estimated seasonal high groundwater conditions identified during recent test pit investigations, recharge will be provided via an infiltration basin rather than a subsurface chamber system. The proposed infiltration basin has been sized to provide slightly greater recharge volume than what was proposed in the 2009 design.

DRAINAGE ANALYSIS METHODOLOGY

The 2009 post-development drainage analysis divided the project site into nine (9) separate watershed areas, each draining to one of the three (3) design points. For purposes of the current 2026 evaluation, the analysis focuses specifically on watershed PWA-2D, which drains to the proposed Wet Swale-1.

Under the 2009 post-development design, PWA-2D encompassed a portion of Front Nine Drive adjacent to the clubhouse, as well as the clubhouse itself and its associated parking lot. The 2009 PWA-2D watershed

consisted of ±2.80-AC, with a weighted Curve Number of 87, and a time of concentration of 12.1-minutes. Proposed Wet Swale-1 functioned as the primary BMP for water quality treatment and detention prior to discharge to downstream wetland resource areas.

Under the 2026 proposal, PWA-2D consists of±2.85-AC, with a weighted Curve Number of 89, and a time of concentration of 12.1-minutes.The 2026 analysis compares runoff entering proposed Wet Swale-1 from a portion of Front Nine Drive, the proposed paved parking lot, and overflows from the proposed infiltration basin, to the 2009 post-development PWA-2D conditions.

Peak Discharge Comparison

The 2026 stormwater management design reinstates the originally approved wet swale, provides recharge consistent with the previously approved methodology, and results in peak discharge rates that are reduced relative to the 2009 post-development condition.

As illustrated in the following table, the impacts of the proposed improvements have been mitigated through the use of best management practices including: deep-sump catch basins, a wet swale, and an infiltration basin for up to and including the 100-year, 24-hour storm event.

Design Point #2

TP-40 Rainfall

	2-YR	10-YR	25-YR	100-YR
	(3.10-IN)	(4.50-IN)	(5.40-IN)	(6.50-IN)
	CFS	CFS	CFS	CFS
2008 PWA-2D	3.7	6.9	9.0	11.6
2026 PWA-2D	3.4	6.9	9.0	11.1

NOAA Atlas 14 Rainfall

	2-YR	10-YR	25-YR	100-YR
	(3.18-IN)	(5.03-IN)	(6.19-IN)	(7.98-IN)
	CFS	CFS	CFS	CFS
2008 PWA-2D	4.1	8.4	11.4	15.6
2026 PWA-2D	3.6	8.2	10.9	11.6

METHODOLOGY

Drainage calculations were performed using the computer program HydroCAD by HydroCAD Software Solutions, LLC based upon Technical Release 20 (TR-20), developed by the NRCS, formerly the Soils Conservation Service. Drainage calculations were prepared for the 2-YR, 10-YR, 25-YR, and 100-YR, Type III 24-hour storm events developed by the National Weather Service and published in Technical Paper 40 and NOAA Atlas 14. Curve numbers were generated using the information provided in TR-55 and the SCS Soils Survey.

EXHIBIT A - 2008

FOR REGISTRY USE ONLY

I CERTIFY THAT THIS PLAN CONFORMS WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.

ALBERT T. TRUDEL P.L.S. # 36869 DATE

APPROVED BY THE CITY OF HAVERHILL PLANNING BOARD

DATE OF APPLICATION _____

DATE OF HEARING _____

DATE OF APPROVAL _____

DATE OF ENDORSEMENT _____

MATCHLINE

MATCHLINE

575-2-8
137.7 ACRES±

LOCUS

NORTH BROADWAY

LAKE STREET

PARSONAGE HILL RD.

571-2-38E
571-2-38D
571-2-38C
571-2-38B
571-2-38A
571-2-38
571-2-39A
571-2-39
571-3-1
575-1-1
575-1-2
575-1-3
575-3-4B
575-3-4C
575-3-4D
575-3-4E
575-3-4F
575-2-

S65°25'40"W 113.71'
S61°42'21"W 68.99'
S61°35'38"W 117.38'
S53°33'10"W 106.87'
S22°29'10"W 163.93'
S15°20'16"W 110.91'
R=150.00' L=83.07'
S47°04'13"W 32.27'
S62°12'59"W 52.15'
S83°15'15"W 47.84'
S87°18'20"W 37.62'
S86°23'47"W 50.07'
S84°01'09"W 56.24'
S86°17'42"W 46.73'
S85°34'38"W 359.13'
R=275.00' L=130.20'
S58°27'01"W 145.57'
R=30.00' L=48.13'
239.04' S33°12'52"E
161.63' S33°55'03"E
80.11' S33°32'36"E
77.59' S33°09'06"E
30.55' S33°09'06"E
69.44' S33°06'41"E
174.92' S33°06'41"E
S19°21'36"W 8.06'
S21°21'46"E 8.81'
180.31' S32°21'48"E
176.12' S32°40'33"E
131.71' S34°43'06"E
15.13' S32°36'14"E
N60°45'35"E 6.41'
203.04' S33°09'27"E
240.07' S33°04'56"E
176.87' S32°45'13"E
S31°05'09"E 187.97'
N75°50'43"E 137.39'
N75°17'21"E 211.28'
N73°17'24"E 171.29'
N82°28'41"E 49.09'
N69°54'38"E 38.54'
N70°48'14"E 141.99'
N69°13'28"E 115.41'

DH(F) DH(S) EXISTING UTILITY POLE

160 170 180 182 184 186 188 190 191 192 193 194 198 200 208 210

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

NOTES:

1. SEE SHEET C1 & C2 FOR SUBJECT PARCEL NOTES.
2. SITE TOPOGRAPHY FOR THIS PLAN IS A COMPILATION OF ACTUAL FIELD SURVEY DATA PROVIDED BY THIS OFFICE AND TOPOGRAPHIC DATA ACQUIRED FROM THE CITY OF HAVERHILL TOPOGRAPHIC PLANS.
3. LOCATION OF EXISTING SEPTIC COMPONENTS IS APPROXIMATE. THE CONTRACTOR IS TO CONFIRM THE LOCATIONS AND ABANDON ALL COMPONENTS IN COMPLIANCE WITH TITLE 310 CMR 15.000.

LEGEND

- STONE BOUND FOUND
- IRON PIN FOUND
- DRILL HOLE FOUND
- EDGE OF PAVEMENT
- EDGE OF WETLANDS
- RR ZONE — ZONING BOUNDARY
- SOILS LINE TYPE
- BUILDING SETBACK LINE
- BOUNDARY LINE
- 102 — 2 FOOT CONTOUR
- 100 — 10 FOOT CONTOUR
- UTILITY POLE W/GUY
- STONE WALL
- TREE LINE

EXISTING CONDITIONS PLAN

PROJECT: **TAX MAP 52 BLOCK 1 LOT 3**
CRYSTAL SPRINGS
HAVERHILL, MASSACHUSETTS

SCALE: 1" = 100' | DRAWN BY: JSS

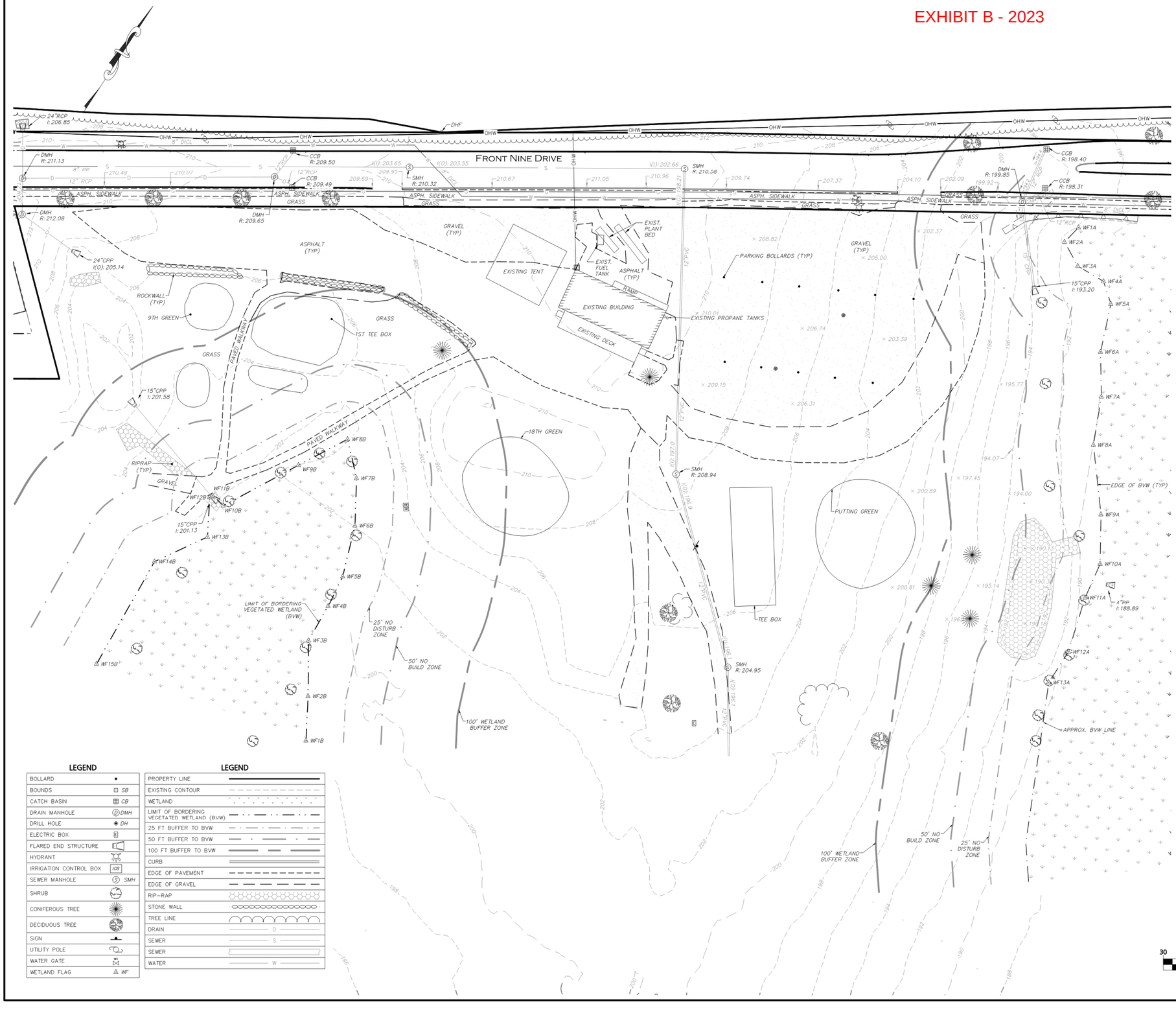
DATE: | REVISED: 1. 08-11-09 | 2. 09-16-09 | 3. 10-14-09 | 4. | 5.

APPLICANT: PREMIERE REALTY TRUST
423 EAST BROADWAY
HAVERHILL, MA 01830

PREPARED BY: S.E.C. & ASSOCIATES, INC.
SURVEYING & ENGINEERING CONSULTANTS
P.O. BOX 1337 - PLAISTOW, NH 03865 PHONE: (603)-382-5065
~ SERVING N.H. & MA. ~ FAX: (603)-382-5216

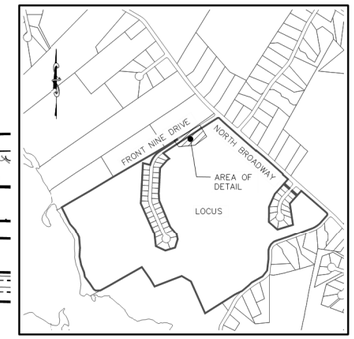
JOB NO. 08-1563
C4

EXHIBIT B - 2023



LOCUS MAP

(SCALE: 1:1,000)



NOTES:

1. LOCATION: 890–940 NORTH BROADWAY, HAVERHILL, MA 01832. PARCEL ID: M 575–2–8
2. DEED: SOUTHERN ESSEX DISTRICT REGISTRY OF DEEDS BOOK 36727 PAGE 171
3. ZONE: RURAL RESIDENTIAL (RR)
4. USE: GOLF COURSE
5. APPLICANT: STERLING GOLF MANAGEMENT INC. 212 KENRICK STREET NEWTON, MA 02458
6. OWNER: STERLING GOLF CRYSTAL LAKE LLC 212 KENRICK ST. NEWTON, MA 02458
7. EXISTING CONDITIONS INFORMATION GENERATED FROM AN ON THE GROUND SURVEY PERFORMED BY SEC & ASSOCIATES, INC. IN JUNE 2024 AND CIVIL DESIGN CONSULTANTS INC. IN MAY 2025.
8. PROPERTY IS NOT LOCATED WITHIN A DESIGNATED FLOOD HAZARD AREA PER FLOOD INSURANCE RATE MAP NUMBER 25009C0067G DATED JULY 8, 2025.
9. ALL ELEVATIONS REFER TO THE NATIONAL GEODETIC VERTICAL DATUM (NAVD88), PER GPS OBSERVATIONS.
10. UTILITY LOCATIONS ARE SHOWN PER READILY AVAILABLE RECORD INFORMATION AND OBSERVABLE FIELD EVIDENCE. OTHER UNDERGROUND UTILITIES MAY EXIST WHICH ARE NOT SHOWN ON THIS PLAN. CDCI MAKES NO CLAIM TO THE ACCURACY OR COMPLETENESS OF UTILITY INFORMATION. 72 HOURS PRIOR TO ANY EXCAVATION ON SITE, THE CONTRACTOR SHALL CONTACT DIG–SAFE AT 811.
11. WETLANDS DELINEATED BY NORSE ENVIRONMENTAL SERVICES, INC., 2100 LAKEVIEW AVE UNIT 3A DRACUT, MA 01826, IN APRIL 2025.

LEGEND

BOLLARD	•
BOUNDS	⊡ SB
CATCH BASIN	⊞ CB
DRAIN MANHOLE	Ⓓ DMH
DRILL HOLE	◉ DH
ELECTRIC BOX	E
FLARED END STRUCTURE	
HYDRANT	
IRRIGATION CONTROL BOX	ICB
SEWER MANHOLE	Ⓢ SMH
SHRUB	
CONIFEROUS TREE	
DECIDUOUS TREE	
SIGN	
UTILITY POLE	
WATER GATE	W
WETLAND FLAG	◬ WF

LEGEND

PROPERTY LINE	
EXISTING CONTOUR	
WETLAND	
LIMIT OF BORDERING VEGETATED WETLAND (BVW)	
25 FT BUFFER TO BVW	
50 FT BUFFER TO BVW	
100 FT BUFFER TO BVW	
CURB	
EDGE OF PAVEMENT	
EDGE OF GRAVEL	
RIP–RAP	
STONE WALL	
TREE LINE	
DRAIN	D
SEWER	S
SEWER	
WATER	W

HORIZONTAL SCALE

30 0 15 30 60 120

(IN FEET)

1"=30'

DATE	
REVISIONS	

PREPARED FOR:

STERLING GOLF MANAGEMENT, INC

212 KENRICK STREET

NEWTON, MA 02458

PROJECT:

890 NORTH BROADWAY

HAVERHILL, MA 01832

DATE ISSUED:	FEBRUARY 26, 2026
PROJECT #:	24-10594
PREPARED BY:	MEY / LRD

COMMONWEALTH OF MASSACHUSETTS
EDWARD A. CUOCO SR. No. 58441
REGISTERED PROFESSIONAL LAND SURVEYOR

2/26/26

PROFESSIONAL LAND SURVEYOR FOR CIVIL DESIGN CONSULTANTS, INC.

CIVIL DESIGN CONSULTANTS, INC.

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DRAWING TITLE:

EXISTING CONDITIONS PLAN

DRAWING #:

C-2

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SECTION II - Maps

Locus Orthophoto
USGS Topographic Map
Parcel Map
Soils Map
FEMA Flood Map
NHESP Map
HPRSI Map

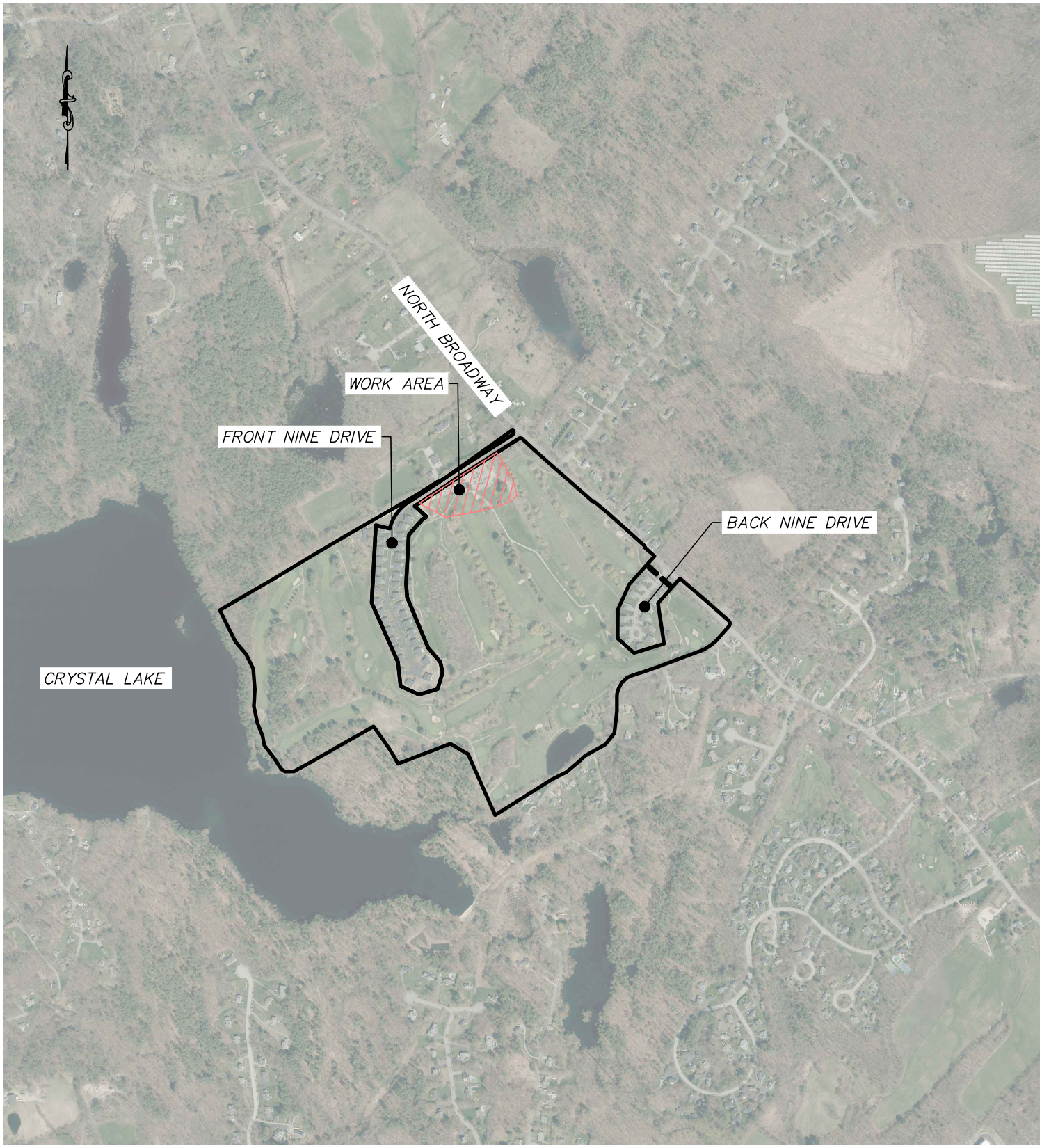

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FIGURE 1: ORTHO

PREPARED BY: TJS
SCALE: 1"=1000'
CDCI FILE #: 24-10594
DATE: FEBRUARY 26, 2026

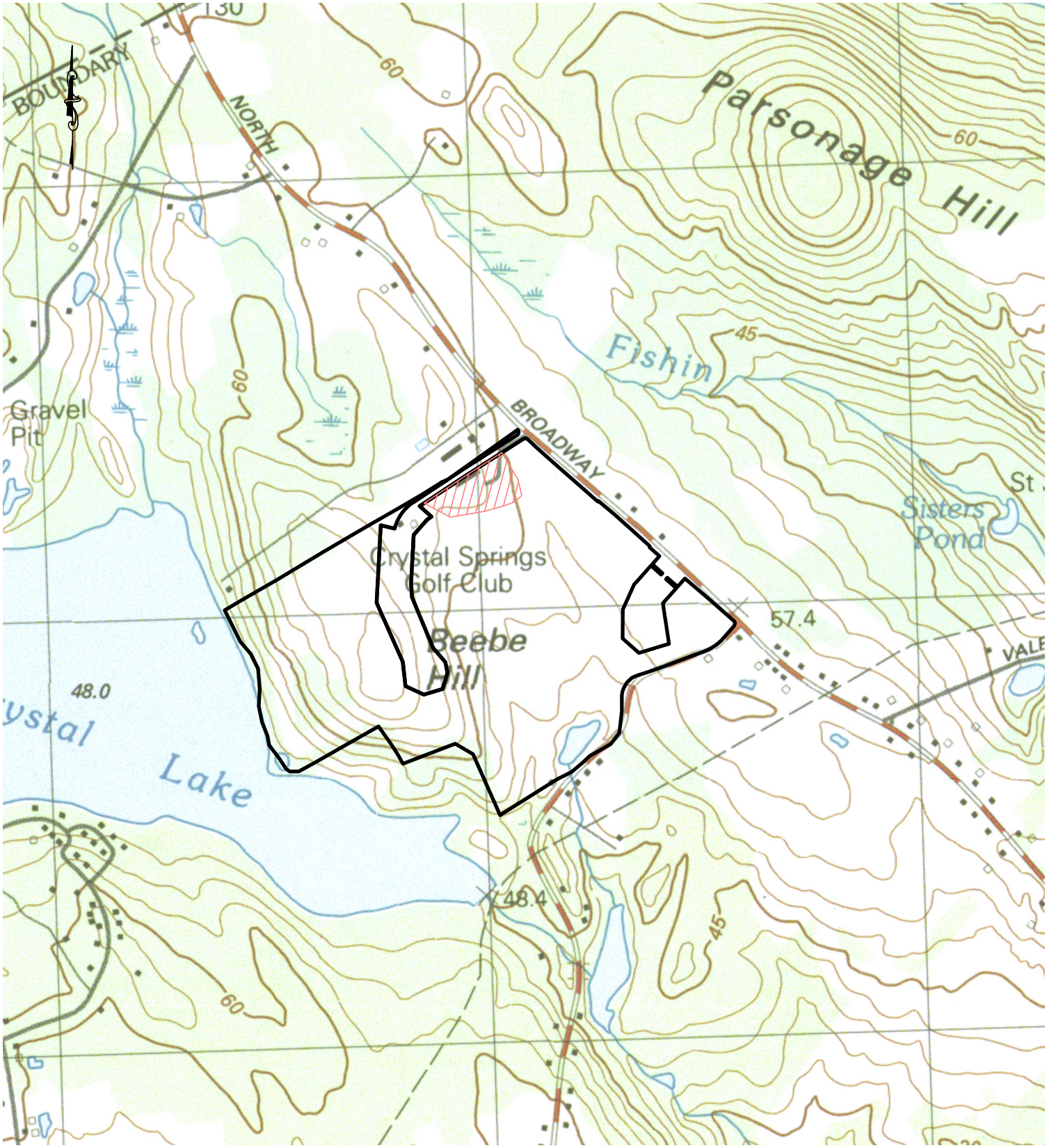

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FIGURE 2: USGS

PREPARED BY: TJS
SCALE: 1"=1000'
CDCI FILE #: 24-10594
DATE: FEBRUARY 26, 2026

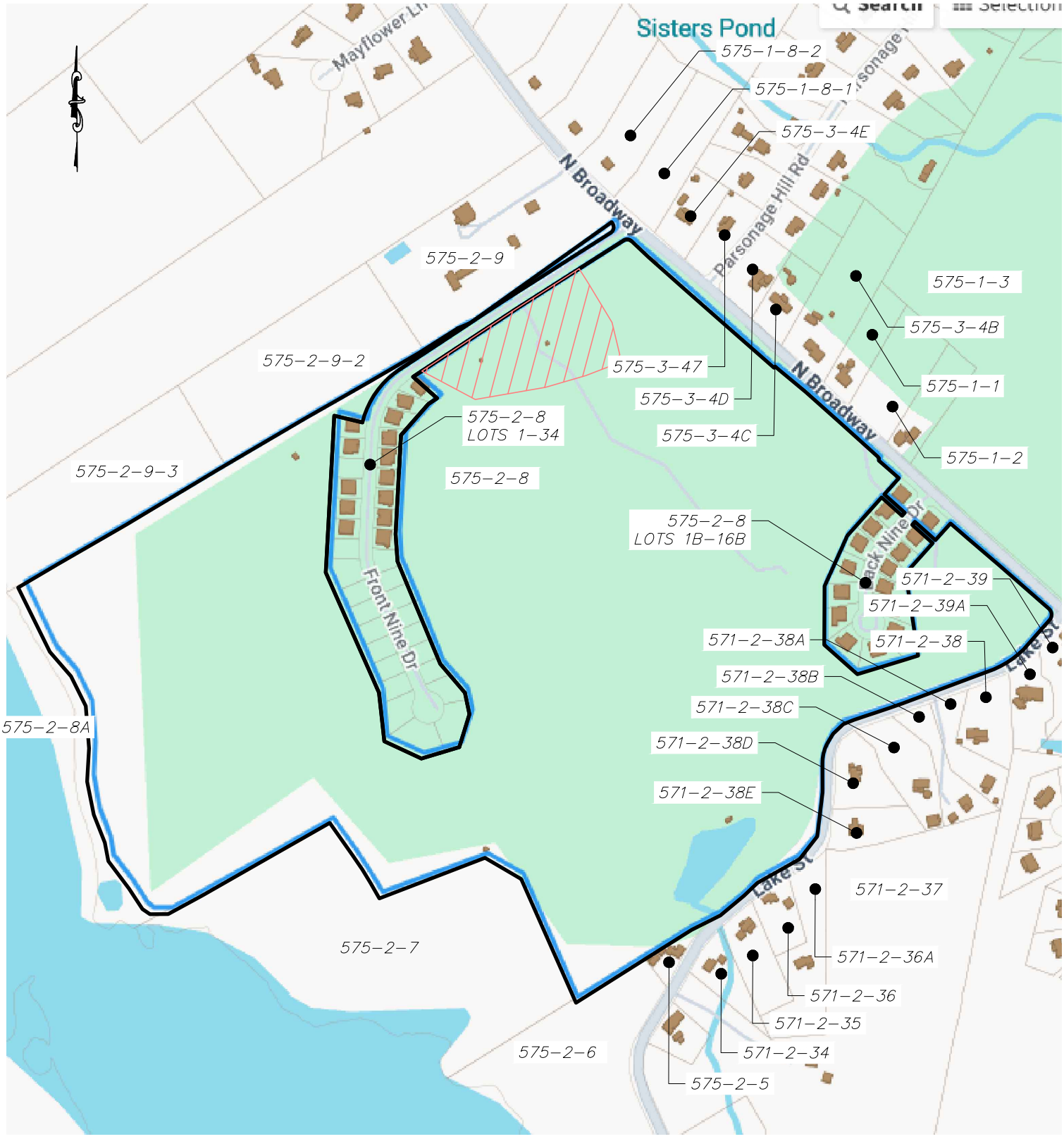

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FIGURE 3: PARCEL MAP

PREPARED BY: TJS
SCALE: 1"=500'
CDCI FILE #: 24-10594
DATE: FEBRUARY 26, 2026

Map unit symbol	Map unit name	Rating
1	Water	
51A	Swansea muck, 0 to 1 percent slopes	B/D
52A	Freetown muck, 0 to 1 percent slopes	B/D
70A	Ridgebury fine sandy loam, 0 to 3 percent slopes	D
70B	Ridgebury fine sandy loam, 3 to 8 percent slopes	D
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D
300B	Montauk fine sandy loam, 3 to 8 percent slopes	C
300C	Montauk fine sandy loam, 8 to 15 percent slopes	C
300D	Montauk fine sandy loam, 15 to 25 percent slopes	C
301B	Montauk fine sandy loam, 0 to 8 percent slopes, very stony	C
301C	Montauk fine sandy loam, 8 to 15 percent slopes, very stony	C
301D	Montauk fine sandy loam, 15 to 35 percent slopes, very stony	C
302C	Montauk fine sandy loam, 8 to 15 percent slopes, extremely stony	C
310A	Woodbridge fine sandy loam, 0 to 3 percent slopes	C/D
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	C/D
311C	Woodbridge fine sandy loam, 8 to 15 percent slopes, very stony	C/D
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	C/D
711B	Charlton-Rock outcrop-Hollis complex, 3 to 8 percent slopes	A
711C	Charlton-Rock outcrop-Hollis complex, 8 to 15 percent slopes	A
711D	Charlton-Rock outcrop-Hollis complex, 15 to 25 percent slopes	A
715A	Ridgebury and Leicester fine sandy loams, 0 to 3 percent slopes, extremely stony	D
715B	Ridgebury and Leicester fine sandy loams, 3 to 8 percent slopes, extremely stony	D

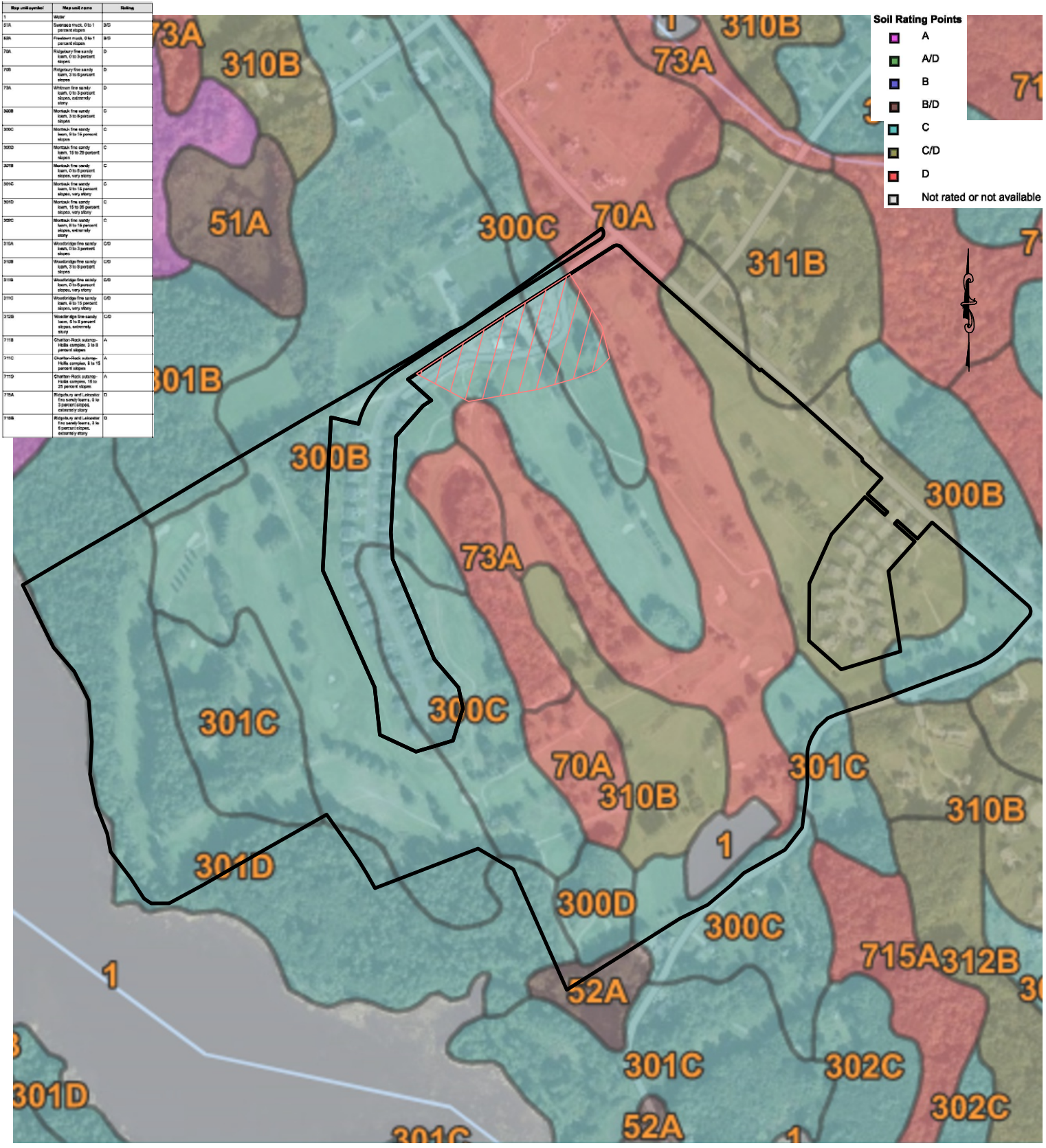

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FIGURE 4: SOILS MAP

PREPARED BY: TJS
SCALE: 1"=500'
CDCI FILE #: 24-10594
DATE: FEBRUARY 26, 2026

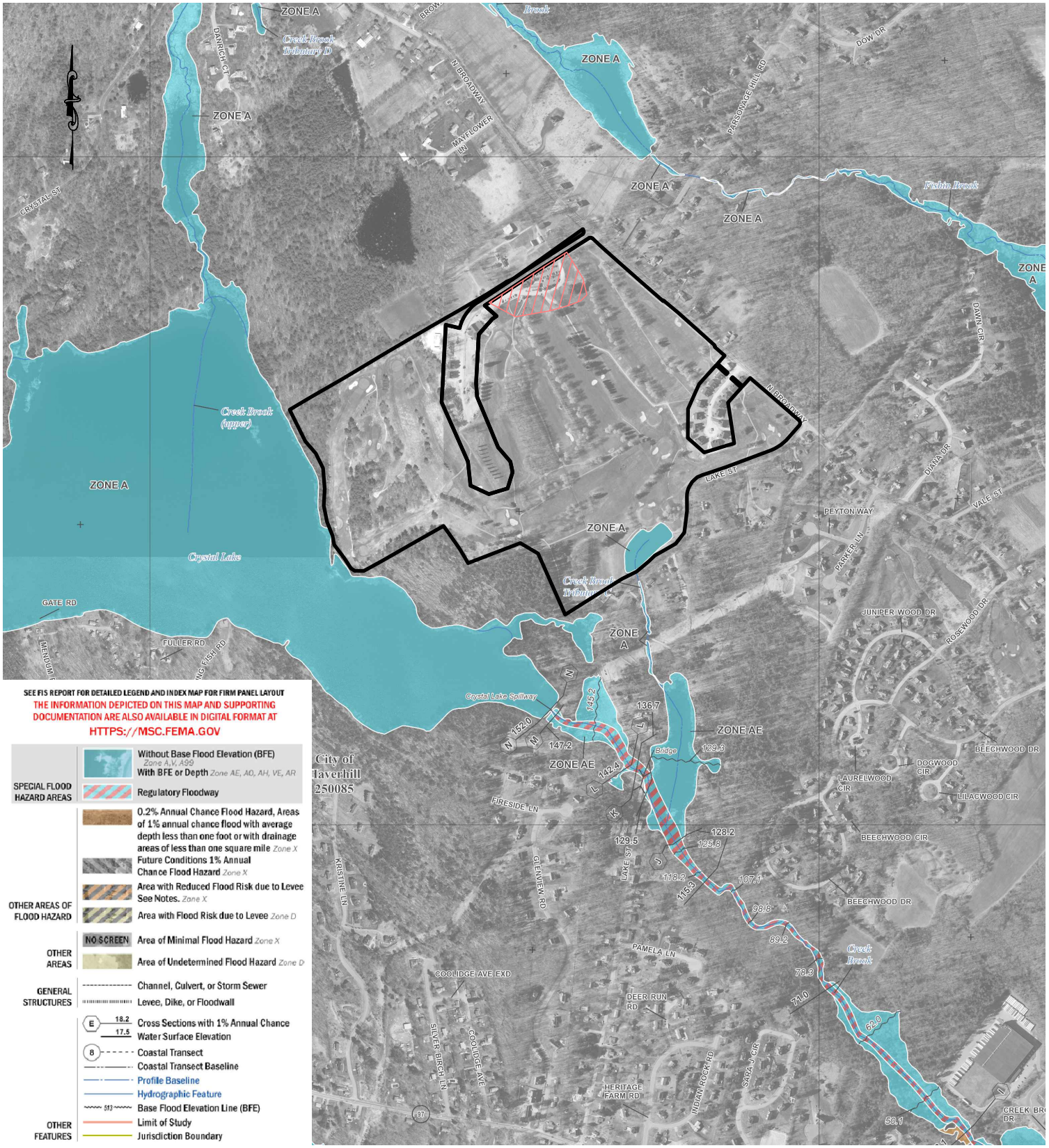

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FIGURE 5: FEMA MAP

PREPARED BY: TJS
SCALE: 1"=1000'
CDCI FILE #: 24-10594
DATE: FEBRUARY 26, 2026

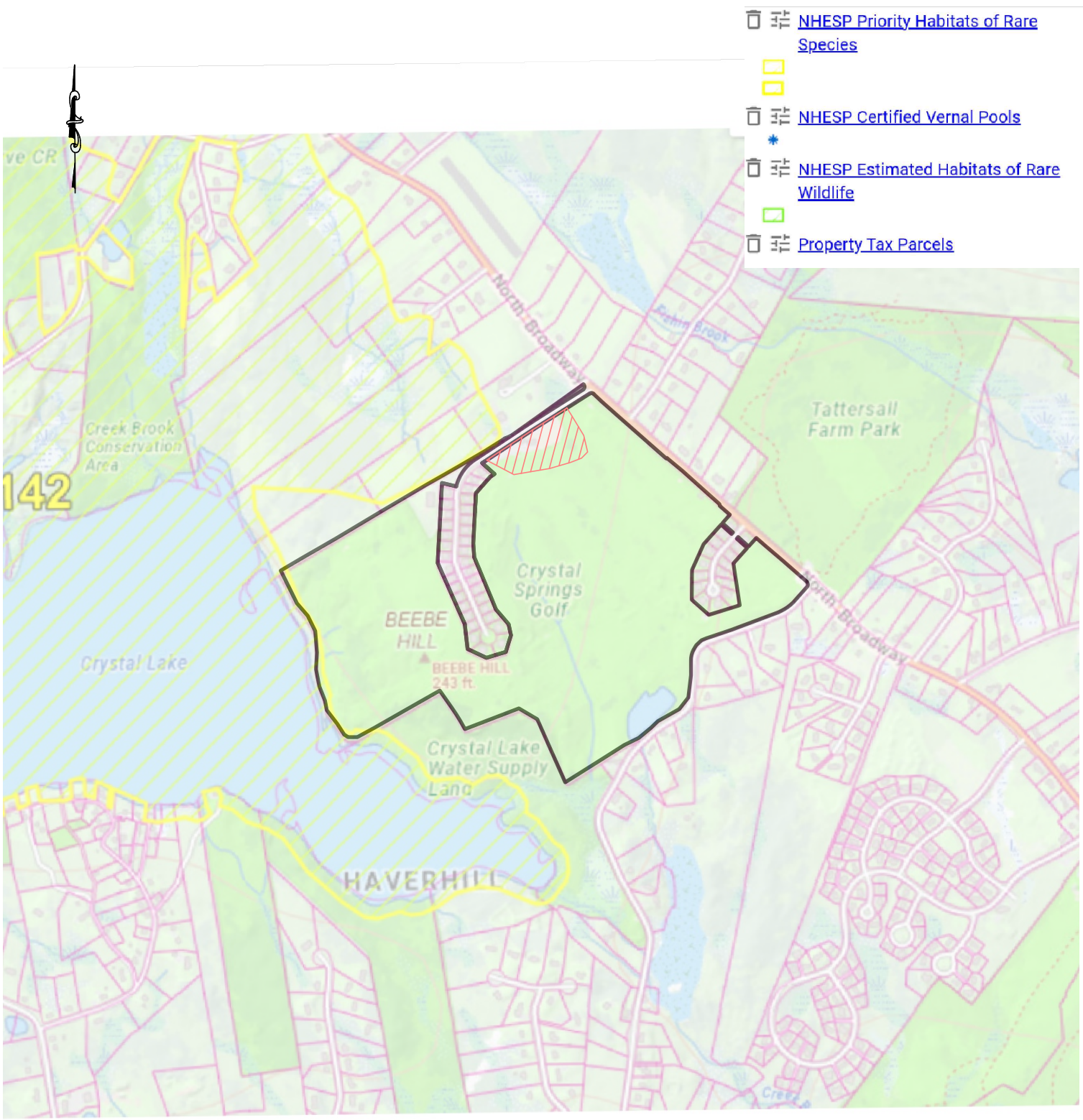

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FIGURE 6: NHESP MAP

PREPARED BY: TJS
SCALE: 1"=1000'
CDCI FILE #: 24-10594
DATE: FEBRUARY 26, 2026

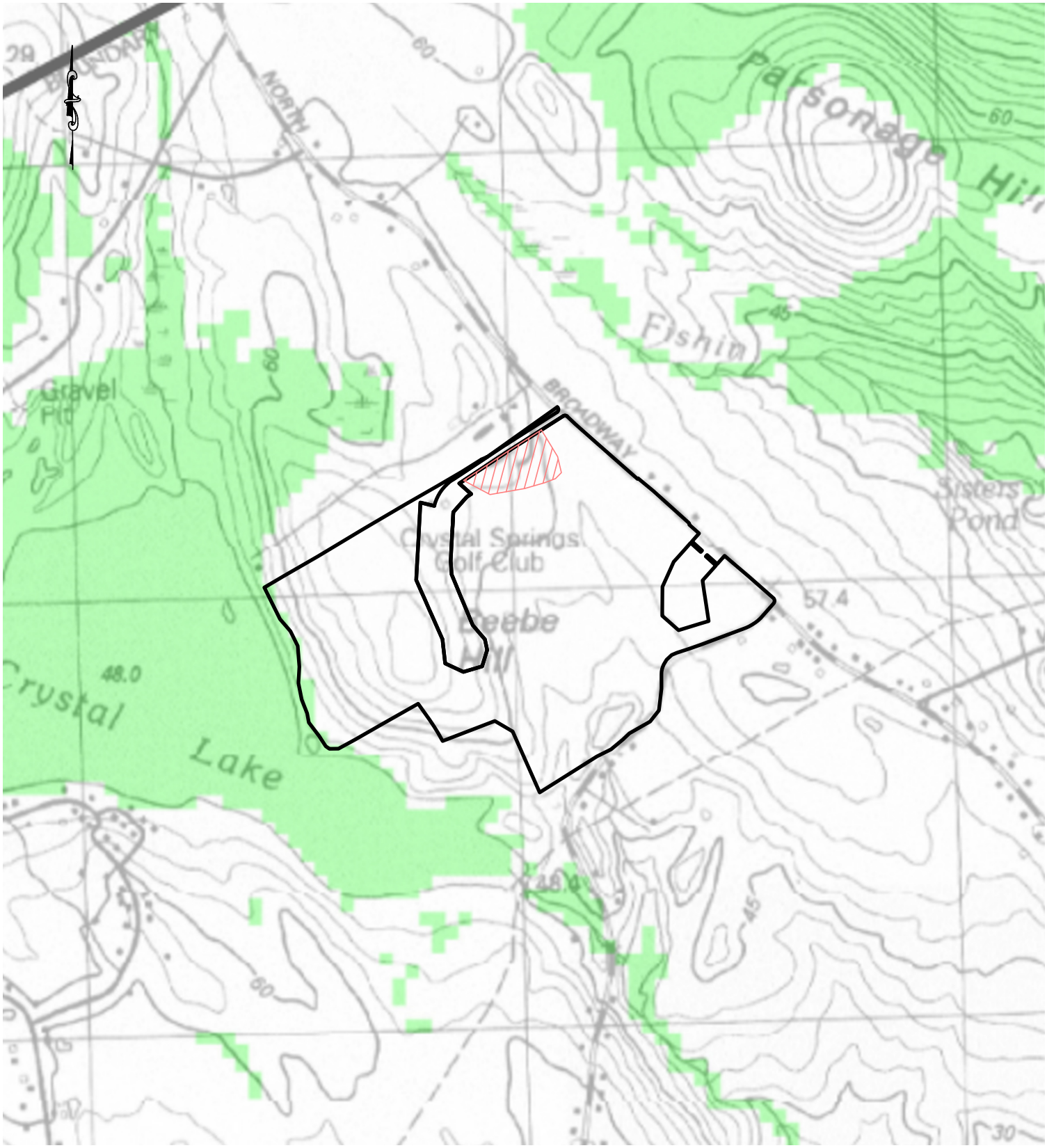

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FIGURE 7: HPRSI MAP

PREPARED BY: TJS
SCALE: 1"=1000'
CDCI FILE #: 24-10594
DATE: FEBRUARY 26, 2026

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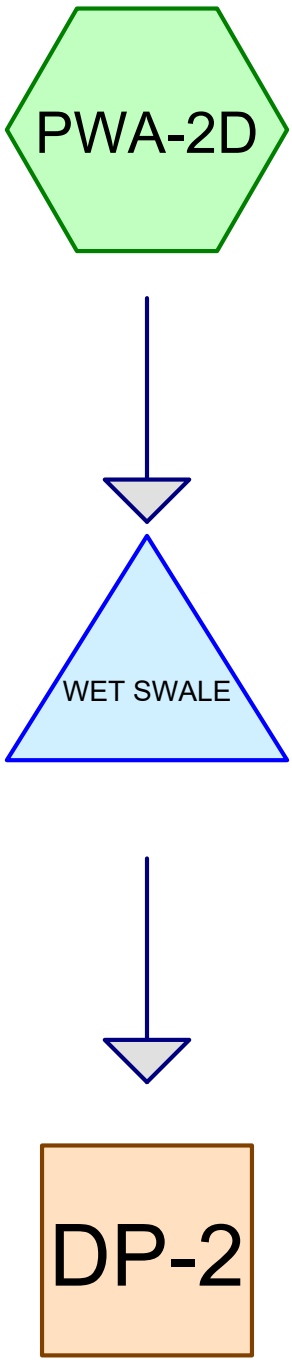
SECTION III – 2009 Post-Development

Drainage Calculations (HydroCAD Data) (TP-40)
2-Yr Storm Event Summary (TP-40)
10-Yr Storm Event Summary (TP-40)
25-Yr Storm Event Summary (TP-40)
100-Yr Storm Event Summary (TP-40)
Drainage Calculations (HydroCAD Data) (NOAA Atlas 14)
2-Yr Storm Event Summary (NOAA Atlas 14)
10-Yr Storm Event Summary (NOAA Atlas 14)
25-Yr Storm Event Summary (NOAA Atlas 14)
100-Yr Storm Event Summary (NOAA Atlas 14)



Subcat Reach Pond Link

Routing Diagram for 2008 Post-Development R1
Prepared by Civil Design Consultants, Inc, Printed 5/8/2026

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	100-Year	Type III 24-hr		Default	24.00	1	6.50	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.30	74	>75% Grass cover, Good, HSG C (PWA-2D)
1.50	98	Paved parking, HSG C (PWA-2D)
2.80	**87**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.00	HSG A	
0.00	HSG B	
2.80	HSG C	PWA-2D
0.00	HSG D	
0.00	Other	
2.80		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.00	0.00	1.30	0.00	0.00	1.30	>75% Grass cover, Good	PWA-2D
0.00	0.00	1.50	0.00	0.00	1.50	Paved parking	PWA-2D
0.00	**0.00**	**2.80**	**0.00**	**0.00**	**2.80**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	No Na
1	WET SWALE	190.11	190.00	22.0	0.0050	0.013	0.0	24.0	0.0	

2008 Post-Development R1 *Type III 24-hr 2-Year Rainfall=3.10"*

Prepared by Civil Design Consultants, Inc

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D: EWA-1 Runoff Area=2.80 ac 53.57% Impervious Runoff Depth=1.83"
Flow Length=338' Tc=12.1 min CN=87 Runoff=4.9 cfs 0.43 af

Reach DP-2: DP-2 Inflow=3.6 cfs 0.42 af
Outflow=3.6 cfs 0.42 af

Pond WET SWALE: Peak Elev=192.93' Storage=3,894 cf Inflow=4.9 cfs 0.43 af
Outflow=3.6 cfs 0.42 af

Total Runoff Area = 2.80 ac Runoff Volume = 0.43 af Average Runoff Depth = 1.83"
46.43% Pervious = 1.30 ac 53.57% Impervious = 1.50 ac

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D: EWA-1 Runoff Area=2.80 ac 53.57% Impervious Runoff Depth=3.10"
Flow Length=338' Tc=12.1 min CN=87 Runoff=8.2 cfs 0.72 af

Reach DP-2: DP-2 Inflow=6.6 cfs 0.72 af
Outflow=6.6 cfs 0.72 af

Pond WET SWALE: Peak Elev=193.19' Storage=5,222 cf Inflow=8.2 cfs 0.72 af
Outflow=6.6 cfs 0.72 af

Total Runoff Area = 2.80 ac Runoff Volume = 0.72 af Average Runoff Depth = 3.10"
46.43% Pervious = 1.30 ac 53.57% Impervious = 1.50 ac

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D: EWA-1 Runoff Area=2.80 ac 53.57% Impervious Runoff Depth=3.95"
Flow Length=338' Tc=12.1 min CN=87 Runoff=10.3 cfs 0.92 af

Reach DP-2: DP-2 Inflow=8.5 cfs 0.92 af
Outflow=8.5 cfs 0.92 af

Pond WET SWALE: Peak Elev=193.32' Storage=5,956 cf Inflow=10.3 cfs 0.92 af
Outflow=8.5 cfs 0.92 af

Total Runoff Area = 2.80 ac Runoff Volume = 0.92 af Average Runoff Depth = 3.95"
46.43% Pervious = 1.30 ac 53.57% Impervious = 1.50 ac

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D: EWA-1 Runoff Area=2.80 ac 53.57% Impervious Runoff Depth=5.00"
Flow Length=338' Tc=12.1 min CN=87 Runoff=13.0 cfs 1.17 af

Reach DP-2: DP-2 Inflow=10.9 cfs 1.16 af
Outflow=10.9 cfs 1.16 af

Pond WET SWALE: Peak Elev=193.45' Storage=6,782 cf Inflow=13.0 cfs 1.17 af
Outflow=10.9 cfs 1.16 af

Total Runoff Area = 2.80 ac Runoff Volume = 1.17 af Average Runoff Depth = 5.00"
46.43% Pervious = 1.30 ac 53.57% Impervious = 1.50 ac

Summary for Subcatchment PWA-2D: EWA-1

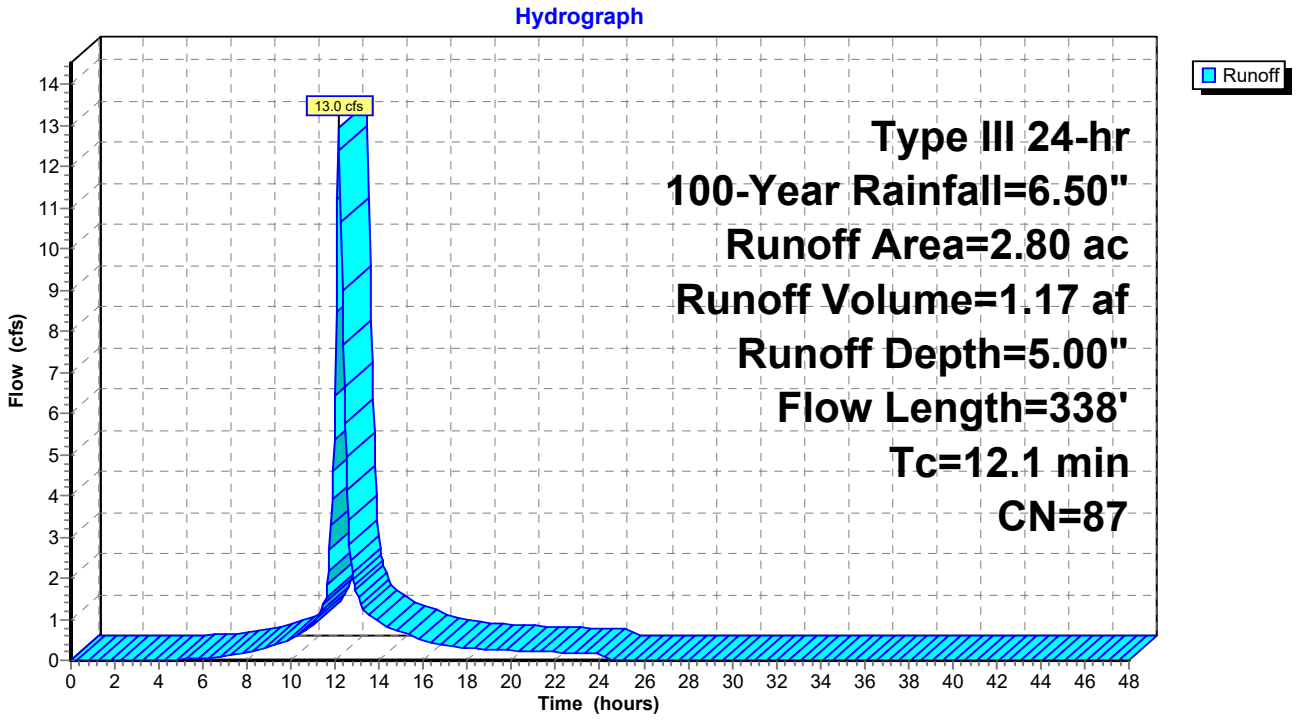
Runoff = 13.0 cfs @ 12.16 hrs, Volume= 1.17 af, Depth= 5.00"
Routed to Pond WET SWALE :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
1.50	98	Paved parking, HSG C
1.30	74	>75% Grass cover, Good, HSG C
2.80	87	Weighted Average
1.30		46.43% Pervious Area
1.50		53.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	100	0.0400	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
1.1	238	0.0460	3.45		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.1	338	Total			

Subcatchment PWA-2D: EWA-1



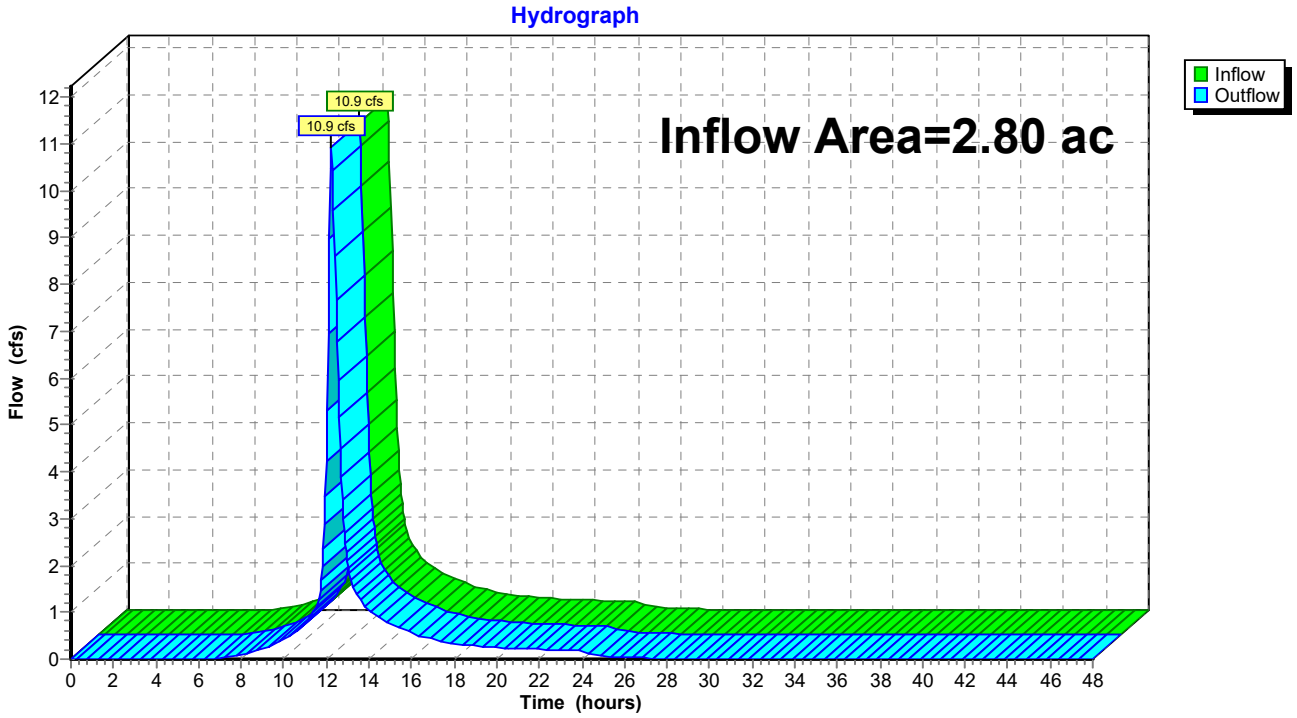
Summary for Reach DP-2: DP-2

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

Inflow Area = 2.80 ac, 53.57% Impervious, Inflow Depth = 4.98" for 100-Year event
Inflow = 10.9 cfs @ 12.25 hrs, Volume= 1.16 af
Outflow = 10.9 cfs @ 12.25 hrs, Volume= 1.16 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach DP-2: DP-2



Summary for Pond WET SWALE:

Inflow Area = 2.80 ac, 53.57% Impervious, Inflow Depth = 5.00" for 100-Year event
Inflow = 13.0 cfs @ 12.16 hrs, Volume= 1.17 af
Outflow = 10.9 cfs @ 12.25 hrs, Volume= 1.16 af, Atten= 16%, Lag= 5.1 min
Primary = 10.9 cfs @ 12.25 hrs, Volume= 1.16 af
Routed to Reach DP-2 : DP-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 193.45' @ 12.25 hrs Surf.Area= 6,273 sf Storage= 6,782 cf

Plug-Flow detention time= 37.0 min calculated for 1.16 af (100% of inflow)
Center-of-Mass det. time= 36.6 min (834.1 - 797.5)

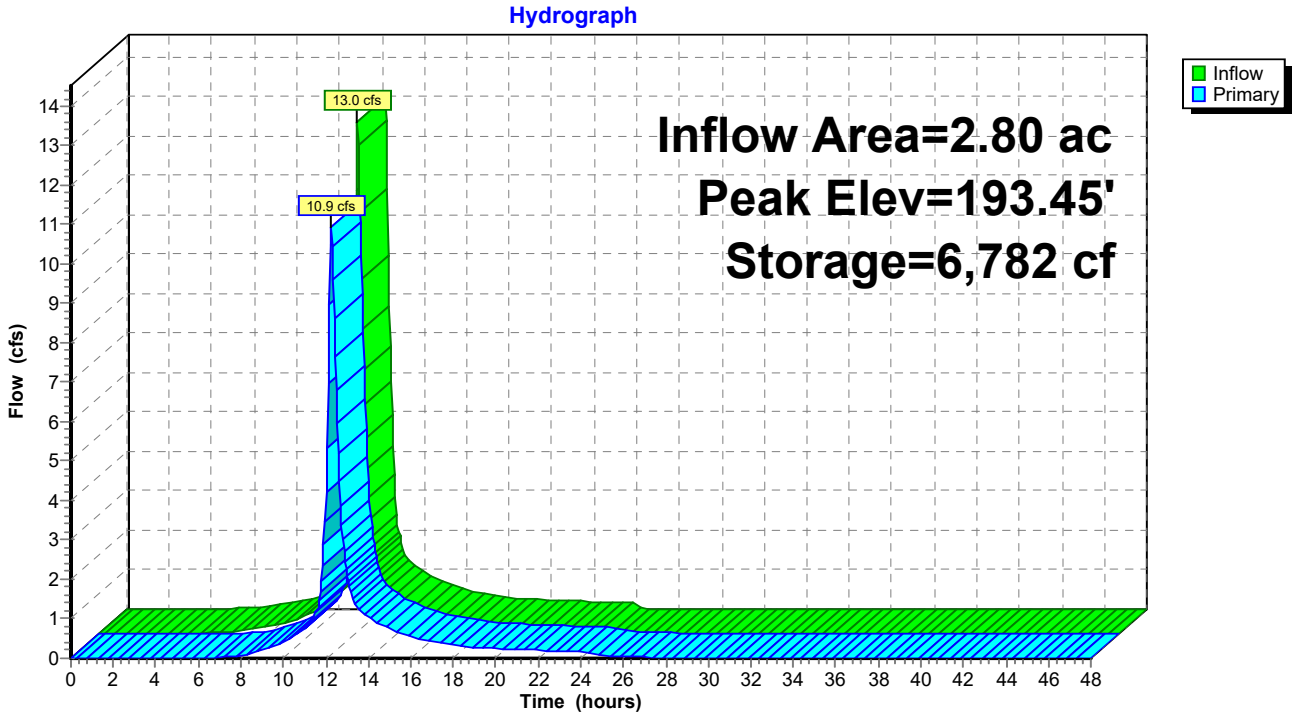
Volume	Invert	Avail.Storage	Storage Description
#1	192.00'	10,707 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
192.00	3,603	0	0	3,603
193.00	4,935	4,252	4,252	4,955
194.00	8,106	6,455	10,707	8,139

Device	Routing	Invert	Outlet Devices
#1	Primary	190.11'	**24.0" Round Culvert** L= 22.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 190.11' / 190.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	192.00'	**120.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.48 (C= 3.10)

Primary OutFlow Max=10.9 cfs @ 12.25 hrs HW=193.45' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 10.9 cfs of 18.3 cfs potential flow)
↑**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 10.9 cfs @ 2.99 fps)

Pond WET SWALE:



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D: EWA-1 Runoff Area=2.80 ac 53.57% Impervious Runoff Depth=1.90"
Flow Length=338' Tc=11.9 min CN=87 Runoff=5.1 cfs 0.44 af

Reach DP-2: DP-2 Inflow=4.1 cfs 0.44 af
Outflow=4.1 cfs 0.44 af

Pond WET SWALE: Peak Elev=192.78' Storage=3,215 cf Inflow=5.1 cfs 0.44 af
Outflow=4.1 cfs 0.44 af

Total Runoff Area = 2.80 ac Runoff Volume = 0.44 af Average Runoff Depth = 1.90"
46.43% Pervious = 1.30 ac 53.57% Impervious = 1.50 ac

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D: EWA-1 Runoff Area=2.80 ac 53.57% Impervious Runoff Depth=3.60"
Flow Length=338' Tc=11.9 min CN=87 Runoff=9.5 cfs 0.84 af

Reach DP-2: DP-2 Inflow=8.4 cfs 0.84 af
Outflow=8.4 cfs 0.84 af

Pond WET SWALE: Peak Elev=193.04' Storage=4,428 cf Inflow=9.5 cfs 0.84 af
Outflow=8.4 cfs 0.84 af

Total Runoff Area = 2.80 ac Runoff Volume = 0.84 af Average Runoff Depth = 3.60"
46.43% Pervious = 1.30 ac 53.57% Impervious = 1.50 ac

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D: EWA-1 Runoff Area=2.80 ac 53.57% Impervious Runoff Depth=4.70"
Flow Length=338' Tc=11.9 min CN=87 Runoff=12.3 cfs 1.10 af

Reach DP-2: DP-2 Inflow=11.4 cfs 1.09 af
Outflow=11.4 cfs 1.09 af

Pond WET SWALE: Peak Elev=193.14' Storage=4,981 cf Inflow=12.3 cfs 1.10 af
Outflow=11.4 cfs 1.09 af

Total Runoff Area = 2.80 ac Runoff Volume = 1.10 af Average Runoff Depth = 4.70"
46.43% Pervious = 1.30 ac 53.57% Impervious = 1.50 ac

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D: EWA-1 Runoff Area=2.80 ac 53.57% Impervious Runoff Depth=6.43"
Flow Length=338' Tc=11.9 min CN=87 Runoff=16.6 cfs 1.50 af

Reach DP-2: DP-2 Inflow=15.6 cfs 1.50 af
Outflow=15.6 cfs 1.50 af

Pond WET SWALE: Peak Elev=193.26' Storage=5,658 cf Inflow=16.6 cfs 1.50 af
Outflow=15.6 cfs 1.50 af

Total Runoff Area = 2.80 ac Runoff Volume = 1.50 af Average Runoff Depth = 6.43"
46.43% Pervious = 1.30 ac 53.57% Impervious = 1.50 ac

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SECTION IV – Proposed Conditions

Drainage Calculations (HydroCAD Data) (TP-40)
2-Yr Storm Event Summary (TP-40)
10-Yr Storm Event Summary (TP-40)
25-Yr Storm Event Summary (TP-40)
100-Yr Storm Event Summary (TP-40)
Drainage Calculations (HydroCAD Data) (NOAA Atlas 14)
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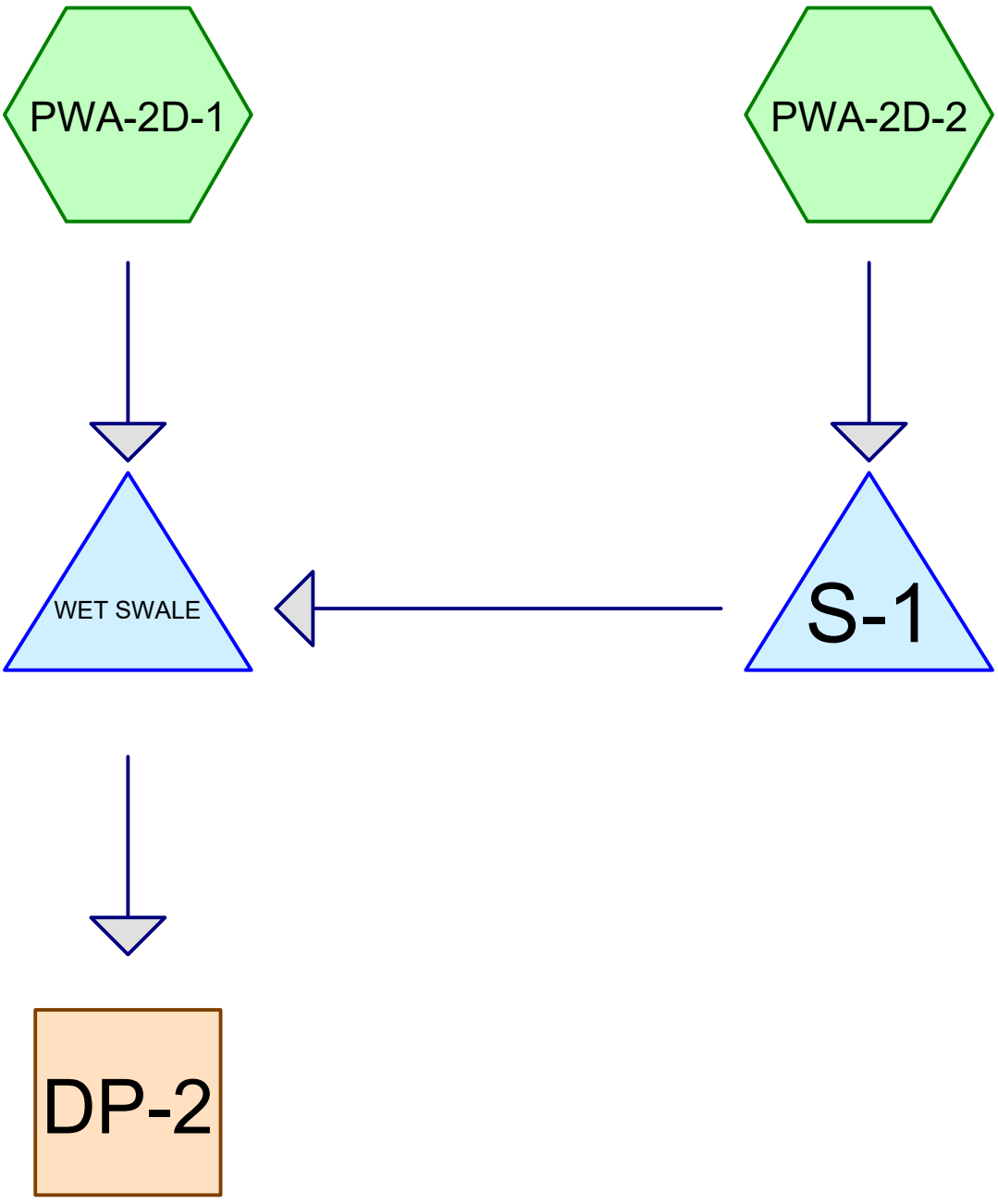


Subcat Reach Pond Link

Routing Diagram for 2026 Post-Development R1
Prepared by Civil Design Consultants, Inc, Printed 5/11/2026

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.00	74	>75% Grass cover, Good, HSG C (PWA-2D-1, PWA-2D-2)
1.63	98	Paved parking, HSG C (PWA-2D-1, PWA-2D-2)
0.22	98	Roofs, HSG C (PWA-2D-2)

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.00	HSG A	
0.00	HSG B	
2.85	HSG C	PWA-2D-1, PWA-2D-2
0.00	HSG D	
0.00	Other	

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.00	0.00	1.00	0.00	0.00	1.00	>75% Grass cover, Good	PWA-2D-1, PWA-2D-2
0.00	0.00	1.63	0.00	0.00	1.63	Paved parking	PWA-2D-1, PWA-2D-2
0.00	0.00	0.22	0.00	0.00	0.22	Roofs	PWA-2D-2

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	No Na
1	S-1	191.10	191.00	17.0	0.0059	0.013	0.0	12.0	0.0	
2	WET SWALE	190.11	189.89	22.0	0.0100	0.013	0.0	18.0	0.0	

2026 Post-Development R1 *Type III 24-hr 2-Year Rainfall=3.10"*

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D-1: (new Subcat) Runoff Area=2.47 ac 65.18% Impervious Runoff Depth=2.08"
Flow Length=338' Tc=12.1 min CN=90 Runoff=4.9 cfs 0.43 af

Subcatchment PWA-2D-2: (new Subcat) Runoff Area=0.38 ac 63.16% Impervious Runoff Depth=1.99"
Tc=6.0 min CN=89 Runoff=0.9 cfs 0.06 af

Reach DP-2: Inflow=3.4 cfs 0.45 af
Outflow=3.4 cfs 0.45 af

Pond S-1: Peak Elev=193.17' Storage=767 cf Inflow=0.9 cfs 0.06 af
Discarded=0.0 cfs 0.04 af Primary=0.4 cfs 0.03 af Outflow=0.4 cfs 0.06 af

Pond WET SWALE: Peak Elev=193.13' Storage=4,894 cf Inflow=5.3 cfs 0.45 af
Outflow=3.4 cfs 0.45 af

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D-1: (new Subcat) Runoff Area=2.47 ac 65.18% Impervious Runoff Depth=3.40"
Flow Length=338' Tc=12.1 min CN=90 Runoff=7.9 cfs 0.70 af

Subcatchment PWA-2D-2: (new Subcat) Runoff Area=0.38 ac 63.16% Impervious Runoff Depth=3.30"
Tc=6.0 min CN=89 Runoff=1.4 cfs 0.10 af

Reach DP-2: Inflow=6.9 cfs 0.75 af
Outflow=6.9 cfs 0.75 af

Pond S-1: Peak Elev=193.40' Storage=1,137 cf Inflow=1.4 cfs 0.10 af
Discarded=0.0 cfs 0.05 af Primary=0.7 cfs 0.06 af Outflow=0.7 cfs 0.10 af

Pond WET SWALE: Peak Elev=193.36' Storage=6,220 cf Inflow=8.5 cfs 0.76 af
Outflow=6.9 cfs 0.75 af

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D-1: (new Subcat) Runoff Area=2.47 ac 65.18% Impervious Runoff Depth=4.26"
Flow Length=338' Tc=12.1 min CN=90 Runoff=9.8 cfs 0.88 af

Subcatchment PWA-2D-2: (new Subcat) Runoff Area=0.38 ac 63.16% Impervious Runoff Depth=4.16"
Tc=6.0 min CN=89 Runoff=1.8 cfs 0.13 af

Reach DP-2: Inflow=9.0 cfs 0.96 af
Outflow=9.0 cfs 0.96 af

Pond S-1: Peak Elev=193.52' Storage=1,341 cf Inflow=1.8 cfs 0.13 af
Discarded=0.0 cfs 0.05 af Primary=1.1 cfs 0.08 af Outflow=1.1 cfs 0.13 af

Pond WET SWALE: Peak Elev=193.46' Storage=6,854 cf Inflow=10.6 cfs 0.96 af
Outflow=9.0 cfs 0.96 af

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D-1: (new Subcat) Runoff Area=2.47 ac 65.18% Impervious Runoff Depth=5.33"
Flow Length=338' Tc=12.1 min CN=90 Runoff=12.1 cfs 1.10 af

Subcatchment PWA-2D-2: (new Subcat) Runoff Area=0.38 ac 63.16% Impervious Runoff Depth=5.22"
Tc=6.0 min CN=89 Runoff=2.2 cfs 0.17 af

Reach DP-2: Inflow=11.1 cfs 1.20 af
Outflow=11.1 cfs 1.20 af

Pond S-1: Peak Elev=193.67' Storage=1,601 cf Inflow=2.2 cfs 0.17 af
Discarded=0.0 cfs 0.05 af Primary=1.2 cfs 0.11 af Outflow=1.2 cfs 0.17 af

Pond WET SWALE: Peak Elev=193.58' Storage=7,583 cf Inflow=13.1 cfs 1.21 af
Outflow=11.1 cfs 1.20 af

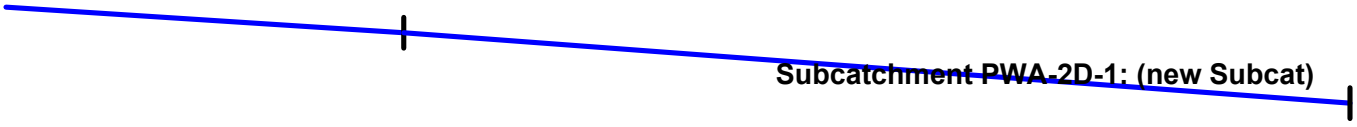
Summary for Subcatchment PWA-2D-1: (new Subcat)

Runoff = 12.1 cfs @ 12.16 hrs, Volume= 1.10 af, Depth= 5.33"
Routed to Pond WET SWALE :

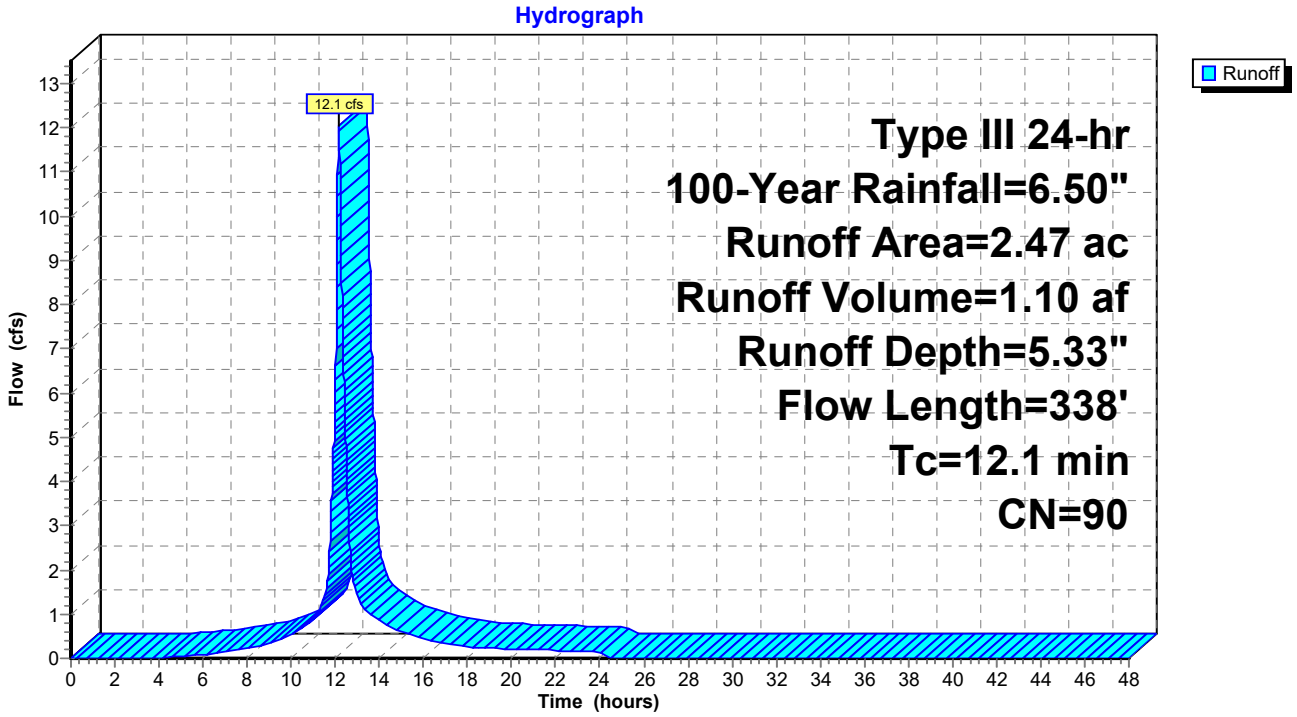
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
1.61	98	Paved parking, HSG C
0.86	74	>75% Grass cover, Good, HSG C
2.47	90	Weighted Average
0.86		34.82% Pervious Area
1.61		65.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	100	0.0400	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
1.1	238	0.0460	3.45		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.1	338	Total			



Subcatchment PWA-2D-1: (new Subcat)



Summary for Subcatchment PWA-2D-2: (new Subcat)

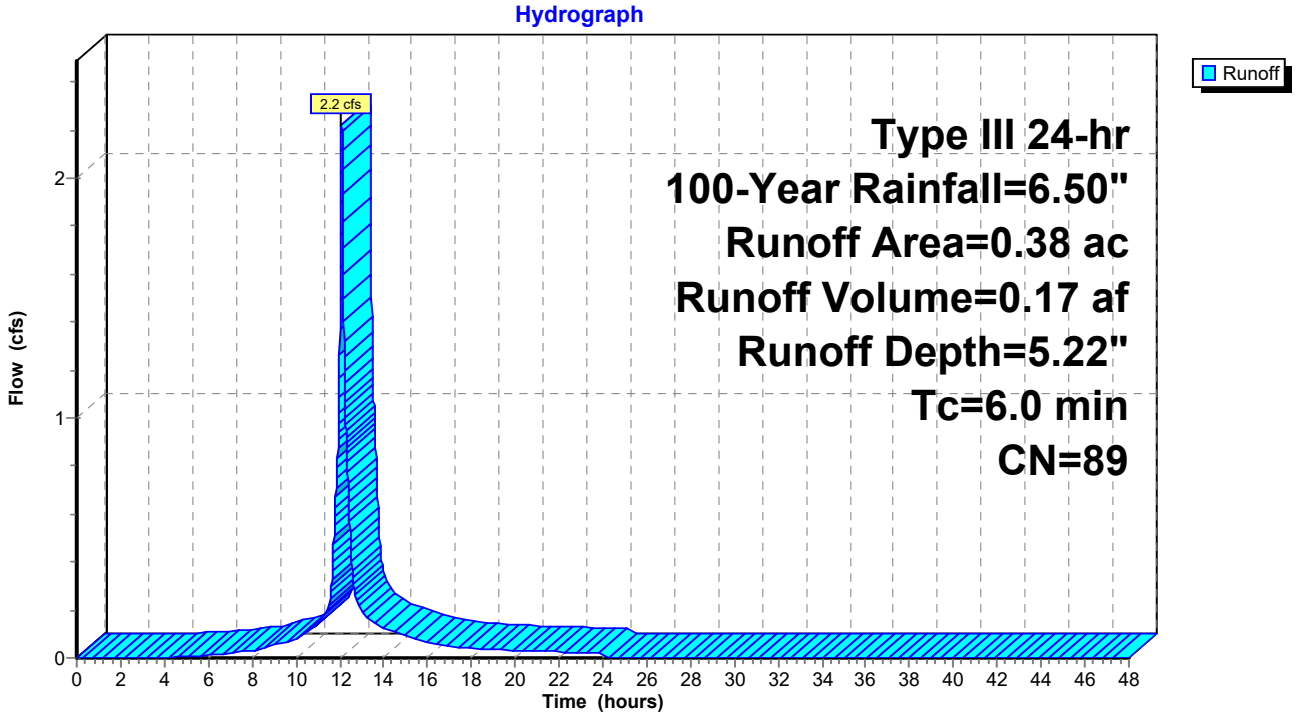
Runoff = 2.2 cfs @ 12.08 hrs, Volume= 0.17 af, Depth= 5.22"
Routed to Pond S-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.22	98	Roofs, HSG C
0.02	98	Paved parking, HSG C
0.14	74	>75% Grass cover, Good, HSG C
0.38	89	Weighted Average
0.14		36.84% Pervious Area
0.24		63.16% Impervious Area

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

Subcatchment PWA-2D-2: (new Subcat)



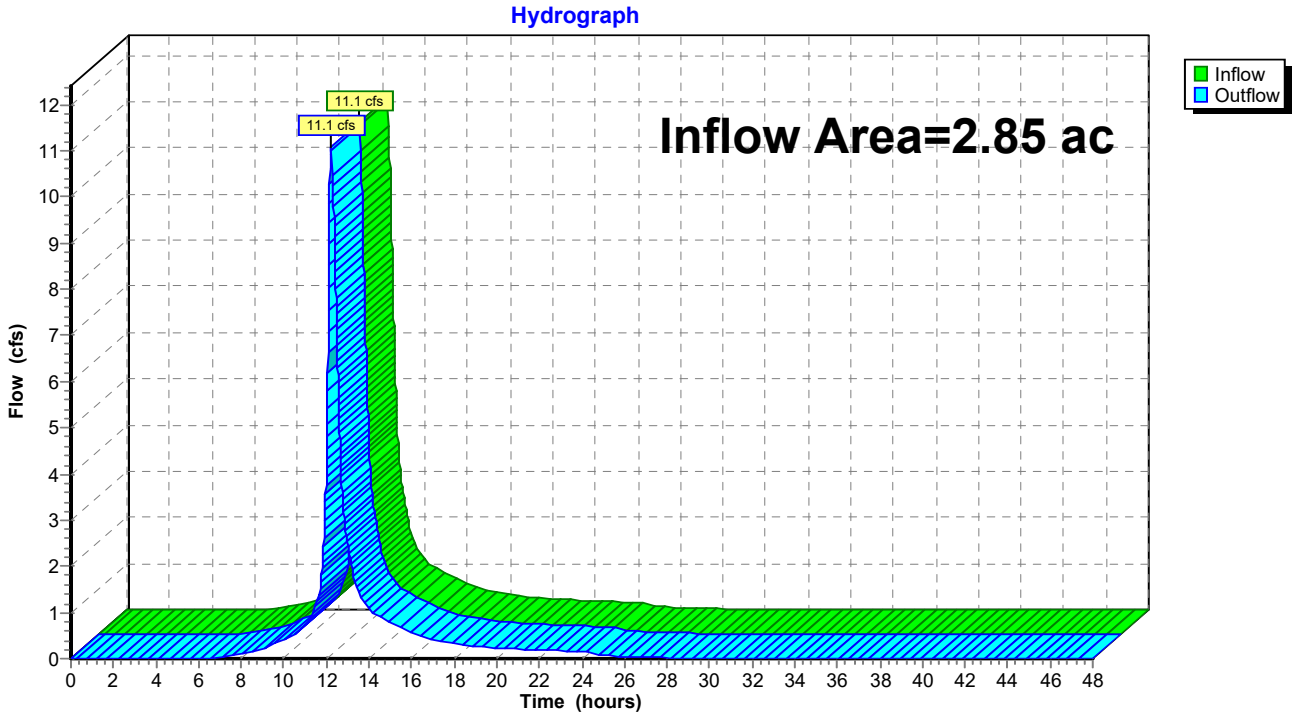
Summary for Reach DP-2:

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

Inflow Area = 2.85 ac, 64.91% Impervious, Inflow Depth > 5.07" for 100-Year event
Inflow = 11.1 cfs @ 12.24 hrs, Volume= 1.20 af
Outflow = 11.1 cfs @ 12.24 hrs, Volume= 1.20 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach DP-2:



Summary for Pond S-1:

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 0.38 ac, 63.16% Impervious, Inflow Depth = 5.22" for 100-Year event
Inflow = 2.2 cfs @ 12.08 hrs, Volume= 0.17 af
Outflow = 1.2 cfs @ 12.07 hrs, Volume= 0.17 af, Atten= 46%, Lag= 0.0 min
Discarded = 0.0 cfs @ 12.27 hrs, Volume= 0.05 af
Primary = 1.2 cfs @ 12.07 hrs, Volume= 0.11 af
Routed to Pond WET SWALE :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 193.67' @ 12.27 hrs Surf.Area= 1,813 sf Storage= 1,601 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 59.8 min (845.3 - 785.6)

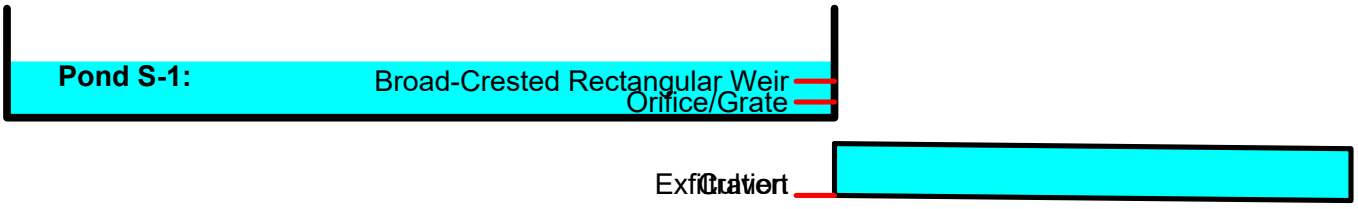
Volume	Invert	Avail.Storage	Storage Description
#1	192.60'	3,755 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
192.60	1,195	0	0
193.00	1,417	522	522
194.00	2,010	1,714	2,236
194.70	2,330	1,519	3,755

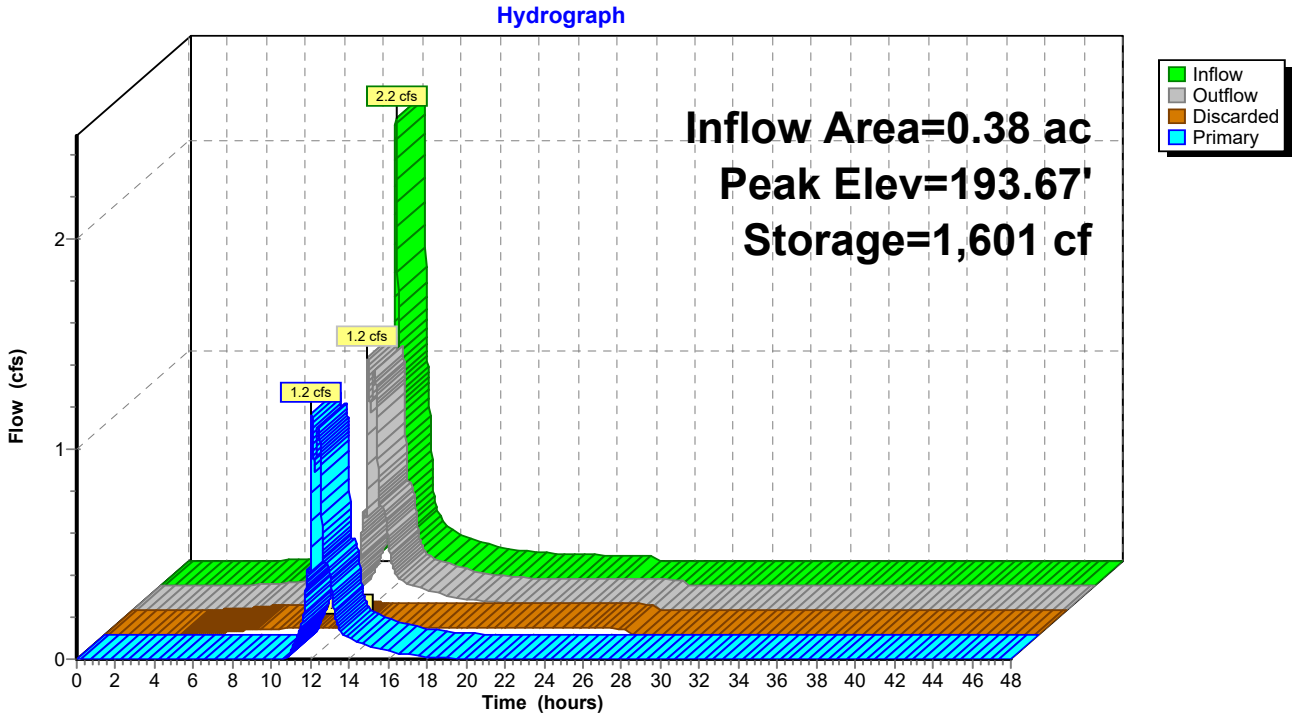
Device	Routing	Invert	Outlet Devices
#1	Discarded	192.60'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	191.10'	**12.0" Round Culvert** L= 17.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 191.10' / 191.00' S= 0.0059 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	192.90'	**18.0" W x 2.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	193.30'	**5.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.0 cfs @ 12.27 hrs HW=193.67' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=1.1 cfs @ 12.07 hrs HW=193.46' TW=193.33' (Dynamic Tailwater)
└**2=Culvert** (Inlet Controls 1.1 cfs @ 1.35 fps)
  ├**3=Orifice/Grate** (Passes < 0.4 cfs potential flow)
  └**4=Broad-Crested Rectangular Weir** (Passes < 0.8 cfs potential flow)


Pond S-1:
Broad-Crested Rectangular Weir
Orifice/Grate
Exfiltration
Culvert

Pond S-1:


Hydrograph
Inflow Area=0.38 ac
Peak Elev=193.67'
Storage=1,601 cf
2.2 cfs
1.2 cfs
1.2 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0
1
2
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
Time (hours)

Stage-Area-Storage for Pond S-1:

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
192.60	1,195	0	193.12	1,488	697
192.61	1,201	12	193.13	1,494	712
192.62	1,206	24	193.14	1,500	727
192.63	1,212	36	193.15	1,506	742
192.64	1,217	48	193.16	1,512	757
192.65	1,223	60	193.17	1,518	772
192.66	1,228	73	193.18	1,524	787
192.67	1,234	85	193.19	1,530	802
192.68	1,239	97	193.20	1,536	818
192.69	1,245	110	193.21	1,542	833
192.70	1,250	122	193.22	1,547	848
192.71	1,256	135	193.23	1,553	864
192.72	1,262	147	193.24	1,559	880
192.73	1,267	160	193.25	1,565	895
192.74	1,273	173	193.26	1,571	911
192.75	1,278	185	193.27	1,577	927
192.76	1,284	198	193.28	1,583	942
192.77	1,289	211	193.29	1,589	958
192.78	1,295	224	193.30	1,595	974
192.79	1,300	237	193.31	1,601	990
192.80	1,306	250	193.32	1,607	1,006
192.81	1,312	263	193.33	1,613	1,022
192.82	1,317	276	193.34	1,619	1,038
192.83	1,323	290	193.35	1,625	1,055
192.84	1,328	303	193.36	1,630	1,071
192.85	1,334	316	193.37	1,636	1,087
192.86	1,339	329	193.38	1,642	1,104
192.87	1,345	343	193.39	1,648	1,120
192.88	1,350	356	193.40	1,654	1,137
192.89	1,356	370	193.41	1,660	1,153
192.90	1,362	383	193.42	1,666	1,170
192.91	1,367	397	193.43	1,672	1,187
192.92	1,373	411	193.44	1,678	1,203
192.93	1,378	425	193.45	1,684	1,220
192.94	1,384	438	193.46	1,690	1,237
192.95	1,389	452	193.47	1,696	1,254
192.96	1,395	466	193.48	1,702	1,271
192.97	1,400	480	193.49	1,708	1,288
192.98	1,406	494	193.50	1,714	1,305
192.99	1,411	508	193.51	1,719	1,322
193.00	1,417	522	193.52	1,725	1,339
193.01	1,423	537	193.53	1,731	1,357
193.02	1,429	551	193.54	1,737	1,374
193.03	1,435	565	193.55	1,743	1,391
193.04	1,441	580	193.56	1,749	1,409
193.05	1,447	594	193.57	1,755	1,426
193.06	1,453	608	193.58	1,761	1,444
193.07	1,459	623	193.59	1,767	1,462
193.08	1,464	638	193.60	1,773	1,479
193.09	1,470	652	193.61	1,779	1,497
193.10	1,476	667	193.62	1,785	1,515
193.11	1,482	682	193.63	1,791	1,533

ELEV. OF LOWEST INVERT

Stage-Area-Storage for Pond S-1: (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
193.64	1,797	1,551
193.65	1,802	1,569
193.66	1,808	1,587
193.67	1,814	1,605
193.68	1,820	1,623
193.69	1,826	1,641
193.70	1,832	1,660
193.71	1,838	1,678
193.72	1,844	1,696
193.73	1,850	1,715
193.74	1,856	1,733
193.75	1,862	1,752
193.76	1,868	1,771
193.77	1,874	1,789
193.78	1,880	1,808
193.79	1,885	1,827
193.80	1,891	1,846
193.81	1,897	1,865
193.82	1,903	1,884
193.83	1,909	1,903
193.84	1,915	1,922
193.85	1,921	1,941
193.86	1,927	1,960
193.87	1,933	1,980
193.88	1,939	1,999
193.89	1,945	2,018
193.90	1,951	2,038
193.91	1,957	2,057
193.92	1,963	2,077
193.93	1,968	2,097
193.94	1,974	2,116
193.95	1,980	2,136
193.96	1,986	2,156
193.97	1,992	2,176
193.98	1,998	2,196
193.99	2,004	2,216
194.00	2,010	2,236
194.01	2,015	2,256
194.02	2,019	2,276
194.03	2,024	2,296
194.04	2,028	2,317
194.05	2,033	2,337
194.06	2,037	2,357
194.07	2,042	2,378
194.08	2,047	2,398
194.09	2,051	2,419
194.10	2,056	2,439
194.11	2,060	2,460
194.12	2,065	2,480
194.13	2,069	2,501
194.14	2,074	2,522
194.15	2,079	2,543
194.16	2,083	2,563
194.17	2,088	2,584
194.18	2,092	2,605
194.19	2,097	2,626
194.20	2,101	2,647
194.21	2,106	2,668
194.22	2,111	2,689
194.23	2,115	2,710
194.24	2,120	2,731
194.25	2,124	2,753
194.26	2,129	2,774
194.27	2,133	2,795
194.28	2,138	2,817
194.29	2,143	2,838
194.30	2,147	2,859
194.31	2,152	2,881
194.32	2,156	2,903
194.33	2,161	2,924
194.34	2,165	2,946
194.35	2,170	2,967
194.36	2,175	2,989
194.37	2,179	3,011
194.38	2,184	3,033
194.39	2,188	3,055
194.40	2,193	3,076
194.41	2,197	3,098
194.42	2,202	3,120
194.43	2,207	3,142
194.44	2,211	3,165
194.45	2,216	3,187
194.46	2,220	3,209
194.47	2,225	3,231
194.48	2,229	3,253
194.49	2,234	3,276
194.50	2,239	3,298
194.51	2,243	3,320
194.52	2,248	3,343
194.53	2,252	3,365
194.54	2,257	3,388
194.55	2,261	3,411
194.56	2,266	3,433
194.57	2,271	3,456
194.58	2,275	3,479
194.59	2,280	3,501
194.60	2,284	3,524
194.61	2,289	3,547
194.62	2,293	3,570
194.63	2,298	3,593
194.64	2,303	3,616
194.65	2,307	3,639
194.66	2,312	3,662
194.67	2,316	3,685

Stage-Area-Storage for Pond S-1: (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
194.68	2,321	3,708
194.69	2,325	3,732
194.70	**2,330**	**3,755**

Summary for Pond WET SWALE:

Inflow Area = 2.85 ac, 64.91% Impervious, Inflow Depth = 5.09" for 100-Year event
Inflow = 13.1 cfs @ 12.16 hrs, Volume= 1.21 af
Outflow = 11.1 cfs @ 12.24 hrs, Volume= 1.20 af, Atten= 15%, Lag= 4.8 min
Primary = 11.1 cfs @ 12.24 hrs, Volume= 1.20 af
Routed to Reach DP-2 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 193.58' @ 12.24 hrs Surf.Area= 6,667 sf Storage= 7,583 cf

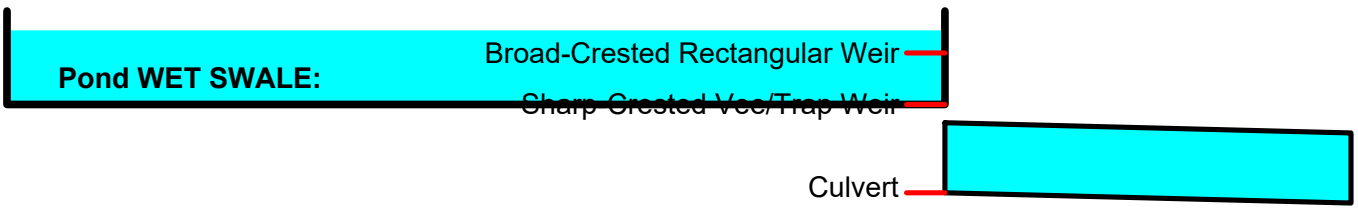
Plug-Flow detention time= 46.8 min calculated for 1.20 af (100% of inflow)
Center-of-Mass det. time= 44.9 min (831.4 - 786.5)

Volume	Invert	Avail.Storage	Storage Description
#1	192.00'	10,707 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

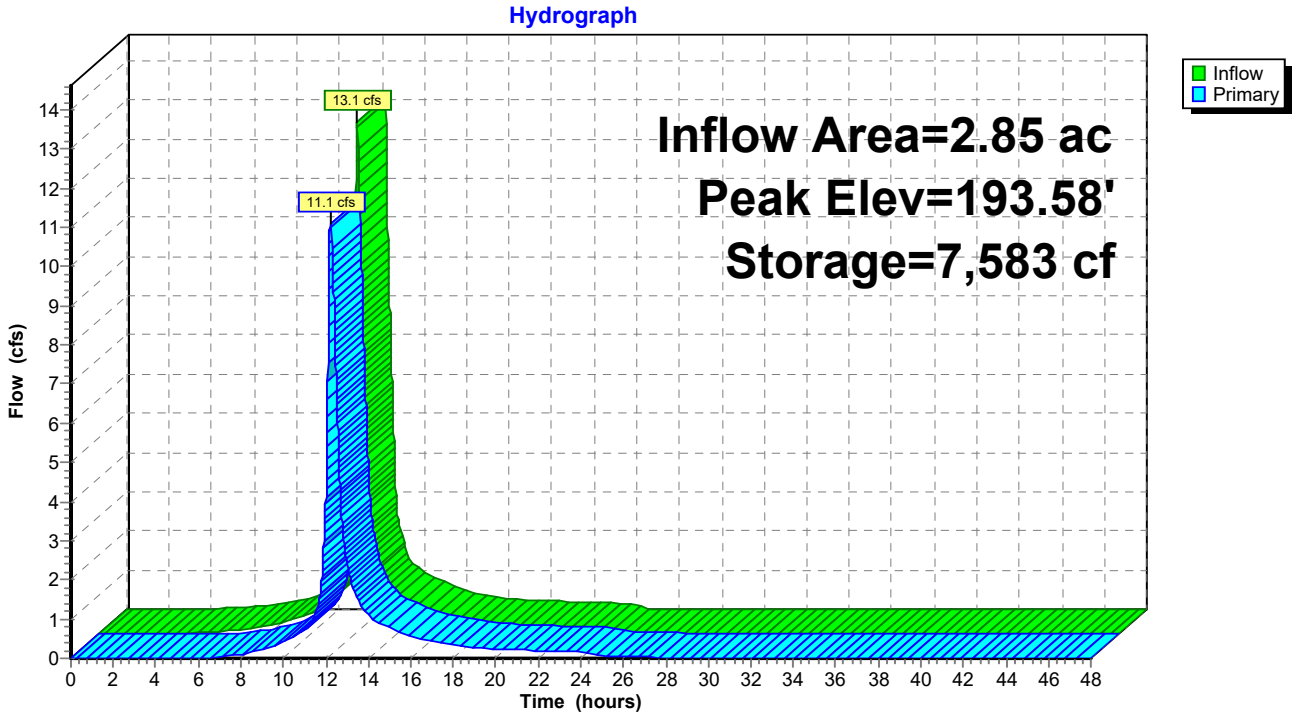
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
192.00	3,603	0	0	3,603
193.00	4,935	4,252	4,252	4,955
194.00	8,106	6,455	10,707	8,139

Device	Routing	Invert	Outlet Devices
#1	Primary	190.11'	**18.0" Round Culvert** L= 22.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 190.11' / 189.89' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	192.00'	**90.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.50 (C= 3.13)
#3	Device 1	193.10'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=11.1 cfs @ 12.24 hrs HW=193.58' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 11.1 cfs @ 6.26 fps)
└─**2=Sharp-Crested Vee/Trap Weir** (Passes < 7.8 cfs potential flow)
└─**3=Broad-Crested Rectangular Weir** (Passes < 3.9 cfs potential flow)



Pond WET SWALE:



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D-1: (new Subcat) Runoff Area=2.47 ac 65.18% Impervious Runoff Depth=2.15"
Flow Length=338' Tc=11.9 min CN=90 Runoff=5.1 cfs 0.44 af

Subcatchment PWA-2D-2: (new Subcat) Runoff Area=0.38 ac 63.16% Impervious Runoff Depth=2.06"
Tc=6.0 min CN=89 Runoff=0.9 cfs 0.07 af

Reach DP-2: Inflow=3.6 cfs 0.47 af
Outflow=3.6 cfs 0.47 af

Pond S-1: Peak Elev=193.19' Storage=800 cf Inflow=0.9 cfs 0.07 af
Discarded=0.0 cfs 0.04 af Primary=0.4 cfs 0.03 af Outflow=0.5 cfs 0.07 af

Pond WET SWALE: Peak Elev=193.14' Storage=4,990 cf Inflow=5.5 cfs 0.47 af
Outflow=3.6 cfs 0.47 af

Total Runoff Area = 2.85 ac Runoff Volume = 0.51 af Average Runoff Depth = 2.14"
35.09% Pervious = 1.00 ac 64.91% Impervious = 1.85 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D-1: (new Subcat) Runoff Area=2.47 ac 65.18% Impervious Runoff Depth=3.91"
Flow Length=338' Tc=11.9 min CN=90 Runoff=9.0 cfs 0.80 af

Subcatchment PWA-2D-2: (new Subcat) Runoff Area=0.38 ac 63.16% Impervious Runoff Depth=3.80"
Tc=6.0 min CN=89 Runoff=1.6 cfs 0.12 af

Reach DP-2: Inflow=8.2 cfs 0.87 af
Outflow=8.2 cfs 0.87 af

Pond S-1: Peak Elev=193.47' Storage=1,259 cf Inflow=1.6 cfs 0.12 af
Discarded=0.0 cfs 0.05 af Primary=0.9 cfs 0.07 af Outflow=1.0 cfs 0.12 af

Pond WET SWALE: Peak Elev=193.43' Storage=6,613 cf Inflow=9.9 cfs 0.88 af
Outflow=8.2 cfs 0.87 af

Total Runoff Area = 2.85 ac Runoff Volume = 0.92 af Average Runoff Depth = 3.89"
35.09% Pervious = 1.00 ac 64.91% Impervious = 1.85 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D-1: (new Subcat) Runoff Area=2.47 ac 65.18% Impervious Runoff Depth=5.03"
Flow Length=338' Tc=11.9 min CN=90 Runoff=11.5 cfs 1.04 af

Subcatchment PWA-2D-2: (new Subcat) Runoff Area=0.38 ac 63.16% Impervious Runoff Depth=4.92"
Tc=6.0 min CN=89 Runoff=2.1 cfs 0.16 af

Reach DP-2: Inflow=10.9 cfs 1.13 af
Outflow=10.9 cfs 1.13 af

Pond S-1: Peak Elev=193.63' Storage=1,528 cf Inflow=2.1 cfs 0.16 af
Discarded=0.0 cfs 0.05 af Primary=1.2 cfs 0.10 af Outflow=1.2 cfs 0.16 af

Pond WET SWALE: Peak Elev=193.54' Storage=7,356 cf Inflow=12.4 cfs 1.14 af
Outflow=10.9 cfs 1.13 af

Total Runoff Area = 2.85 ac Runoff Volume = 1.19 af Average Runoff Depth = 5.02"
35.09% Pervious = 1.00 ac 64.91% Impervious = 1.85 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PWA-2D-1: (new Subcat) Runoff Area=2.47 ac 65.18% Impervious Runoff Depth=6.79"
Flow Length=338' Tc=11.9 min CN=90 Runoff=15.2 cfs 1.40 af

Subcatchment PWA-2D-2: (new Subcat) Runoff Area=0.38 ac 63.16% Impervious Runoff Depth=6.67"
Tc=6.0 min CN=89 Runoff=2.8 cfs 0.21 af

Reach DP-2: Inflow=11.6 cfs 1.55 af
Outflow=11.6 cfs 1.55 af

Pond S-1: Peak Elev=193.93' Storage=2,104 cf Inflow=2.8 cfs 0.21 af
Discarded=0.0 cfs 0.06 af Primary=1.4 cfs 0.15 af Outflow=1.5 cfs 0.21 af

Pond WET SWALE: Peak Elev=193.84' Storage=9,463 cf Inflow=16.4 cfs 1.55 af
Outflow=11.6 cfs 1.55 af

Total Runoff Area = 2.85 ac Runoff Volume = 1.61 af Average Runoff Depth = 6.77"
35.09% Pervious = 1.00 ac 64.91% Impervious = 1.85 ac

Summary for Pond WET SWALE:

Inflow Area = 2.85 ac, 64.91% Impervious, Inflow Depth = 6.52" for 100-Year event
Inflow = 16.4 cfs @ 12.15 hrs, Volume= 1.55 af
Outflow = 11.6 cfs @ 12.28 hrs, Volume= 1.55 af, Atten= 29%, Lag= 7.8 min
Primary = 11.6 cfs @ 12.28 hrs, Volume= 1.55 af
Routed to Reach DP-2 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 193.84' @ 12.28 hrs Surf.Area= 7,550 sf Storage= 9,463 cf

Plug-Flow detention time= 41.6 min calculated for 1.54 af (100% of inflow)
Center-of-Mass det. time= 40.2 min (821.1 - 781.0)

Volume	Invert	Avail.Storage	Storage Description
#1	192.00'	10,707 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
192.00	3,603	0	0	3,603
193.00	4,935	4,252	4,252	4,955
194.00	8,106	6,455	10,707	8,139

Device	Routing	Invert	Outlet Devices
#1	Primary	190.11'	**18.0" Round Culvert** L= 22.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 190.11' / 189.89' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	192.00'	**90.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.50 (C= 3.13)
#3	Device 1	193.10'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=11.6 cfs @ 12.28 hrs HW=193.84' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 11.6 cfs @ 6.56 fps)
└**2=Sharp-Crested Vee/Trap Weir** (Passes < 11.5 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Passes < 8.3 cfs potential flow)

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SECTION V – Supplemental Information

Stormwater Checklist
Stormwater Management Calculations
Total Phosphorous Removal Graphs
Soil Logs
Construction Period Pollution Prevention & Erosion and Sedimentation Control Plan
Long-Term Operation and Maintenance Program
Pipe Sizing Calculations
Grate Inlet Capacity Calculations
Barracuda MAX Water Quality Unit Sizing Calculations
Illicit Discharge Compliance Statement

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

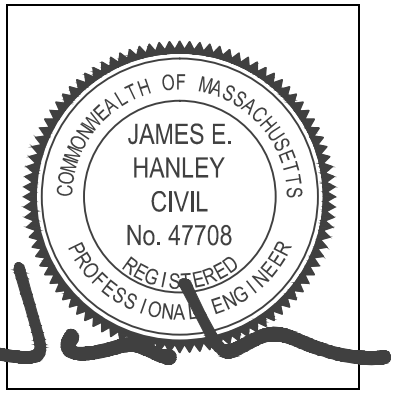
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



02/26/2026

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☒ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☒ Other (describe): Infiltration Basin

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

☒ Site is comprised solely of C and D soils and/or bedrock at the land surface

☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Project: **Crystal Lake Golf Course**
Location: Haverhill, MA
Client: Sterling Golf

Project Number: 24-10594
Prepared By: MAC
Date: February 23, 2026
Rev: 11-May-26

STORMWATER MANAGEMENT STANDARDS CALCULATIONS

Standard 1: Stormwater Discharge

Conclusion: This project does not propose any new untreated stormwater discharges. The Stormwater Management System conforms to Standard 1.

Standard 2: Peak Discharge Summary

(TP-40 Rainfall Data)

Design Point 1	2-Year (3.10-IN)	10-Year (4.50-IN)	25-Year (5.40-IN)	100-Year (6.50-IN)
2008 Post-Development Conditions:	3.7	6.9	9.0	11.6
2026 Post Development Conditions:	3.4	6.9	9.0	11.1

(NOAA Atlas 14 Rainfall Data)

Design Point 1	2-Year (3.18-IN)	10-Year (5.03-IN)	25-Year (6.19-IN)	100-Year (7.98-IN)
2008 Post-Development Conditions:	4.1	8.4	11.4	15.6
2026 Post Development Conditions:	3.6	8.2	10.9	11.6

Standard 3: Recharge Calculations (Static Method)

Infiltration Basin-1

	A	B	C	D		
Hydrologic Soils Group:						
Total Proposed Impervious Area:	0.00	0.00	0.24	0.00	0.24	AC
Target Factor:	0.60	0.35	0.25	0.10		
Required Recharge Volume:	0	0	218	0	218	CF

Volume Below Lowest Outlet:	**383**	CF
Elevation of Lowest Invert:	192.90	FT

Determine Drawdown Time

Saturated Hydraulic Conductivity (Rawls Rate):	1.02	IN/HR
Bottom Area of Infiltration Basin:	1,195	SF
Drawdown Time:	**3.8**	HRS

Standard 4: Water Quality Volume Calculations

Wet Swale

Water Quality Depth:	0.5	IN
Impervious Area Draining to Wet Swale:	1.61	Acres
Required Water Quality Volume:	2,922	CF
Provided Water Quality Volume:	**2,999**	**CF**

Inifltration Trench

Water Quality Depth:	0.5	IN
Impervious Area Draining to Infiltration Trench:	0.09	Acres
Required Water Quality Volume:	163	CF
Provided Water Quality Volume:	**952**	**CF**

TSS Removal Rate Calculations

Parking Lot Treatment Train

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load	
Deep Sump Catch Basins (w/ hood)	25%	1.00	0.25	0.75	
Water Quality Unit (Barracuda Max S6	80%	0.75	0.60	0.15	
Sediment Forebay & Wet Swale	70%	0.15	0.11	0.05	
TSS Removed:				95.5%	**OK**

Cart Path Treatment Train

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load	
Infiltration Trench	80%	1.00	0.80	0.20	
Vegetated Filter Strip	10%	0.20	0.02	0.18	
TSS Removed:				82.0%	**OK**

Cart Barn Treatment Train

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load	
Deep Sump Catch Basins (w/ hood)	25%	1.00	0.25	0.75	
Infiltration Basin	96%	0.75	0.72	0.03	
TSS Removed:				96.6%	**OK**

Conclusion: The Best Management Practices treats the required Water Quality Volume and the Weighted Average TSS Removal Rate meets the Local 90% requirement. The Stormwater Management System conforms to Standard 4.

Standard 5: Land Uses With Higher Potential Pollutant Loads

Conclusion: The proposed use is not considered a Land Use with Higher Potential Pollutant Loads. This Standard is NOT Applicable.

Standard 6: Critical Areas

Conclusion: The proposal is not located within a Critical Area. This Standard is NOT Applicable.

Standard 7: Redevelopment

Conclusion: The project is not considered a redevelopment project . This Standard is NOT Applicable.

Standard 8: Construction Period Controls

Conclusion: The project will require a NPDES Construction General Permit. The SWPPP will be submitted prior to construction to address construction period pollution prevention measures and to reduce the potential for erosion and sedimentation. The Stormwater Management System Conforms to Standard 8.

Standard 9: Operations and Maintenance Plan

Conclusion: An Operations and Maintenance Plan has been prepared and provided with this summary. The Stormwater Management System Conforms to Standard 9.

Standard 10: Illicit Discharges to Drainage System

Conclusion: All off-site discharges are comprised entirely of stormwater. The Stormwater Management System Conforms to Standard 10. An illicit discharge statement has been provided.

Project: Crystal Lake Golf Course
Location: Haverhill, MA
Client: Sterling Golf

Project Number: 24-10594
Prepared By: MAC
Date: February 23, 2026

WET SWALE FOREBAY SIZING:

Watershed Characteristics

Impervious Area (Ai):	1.61	Acres
Required (0.1-IN x Ai):	584	CF
Sediment Forebay Volume:	591	CF
	OK	

Stage / Storage Tables

Sediment Forebay: Elevation	Surface Area (SF)	Incremental Storage (CF)	Total Storage (CF)
191.0	402	0	0
192.0	780	591	591

INFILTRATION BASIN SEDIMENT FOREBAY SIZING:

Watershed Characteristics

Impervious Area (Ai):	0.24	Acres
Required (0.1-IN x Ai):	87	CF
Sediment Forebay Volume:	117	CF
	OK	

Stage / Storage Tables

Sediment Forebay: Elevation	Surface Area (SF)	Incremental Storage (CF)	Total Storage (CF)
192.6	70	0	0
193.0	120	38	38
193.5	197	79	117

WETPOND PERMANENT POOL SIZING CALCULATIONS

Watershed Characteristics

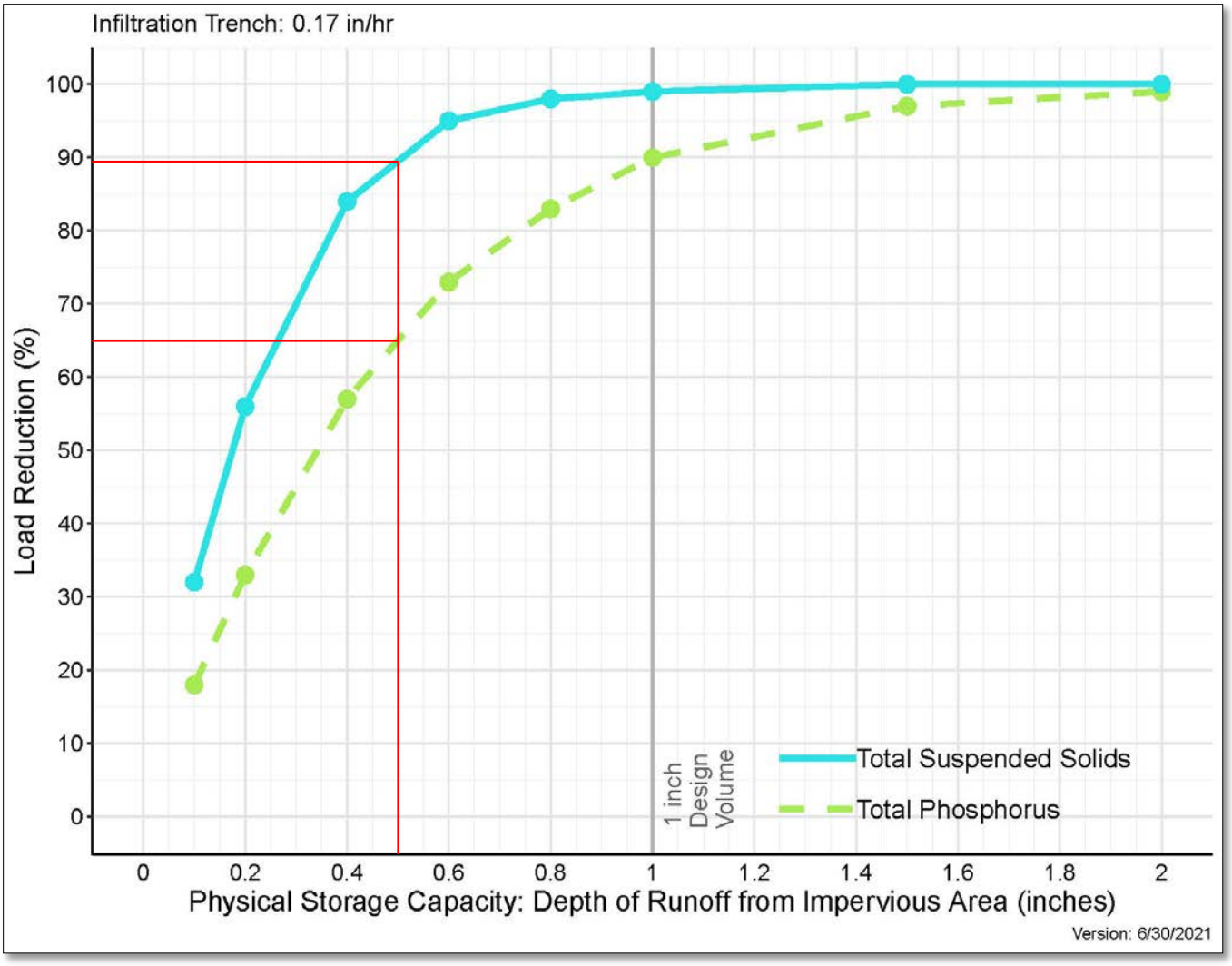
Impervious Area (Ai):	1.61	Acres
Water Quality Depth:	0.5	IN
Required Water Quality Volume (WQV):	2922	CF
Provided Permanent Pool Volume:	**2999**	**CF**
	OK	

Stage / Storage Table:

Elevation	Surface Area (SF)	Incremental Storage (CF)	Total Storage (CF)
191.00	2394	0	0
192.00	3603	2999	2999

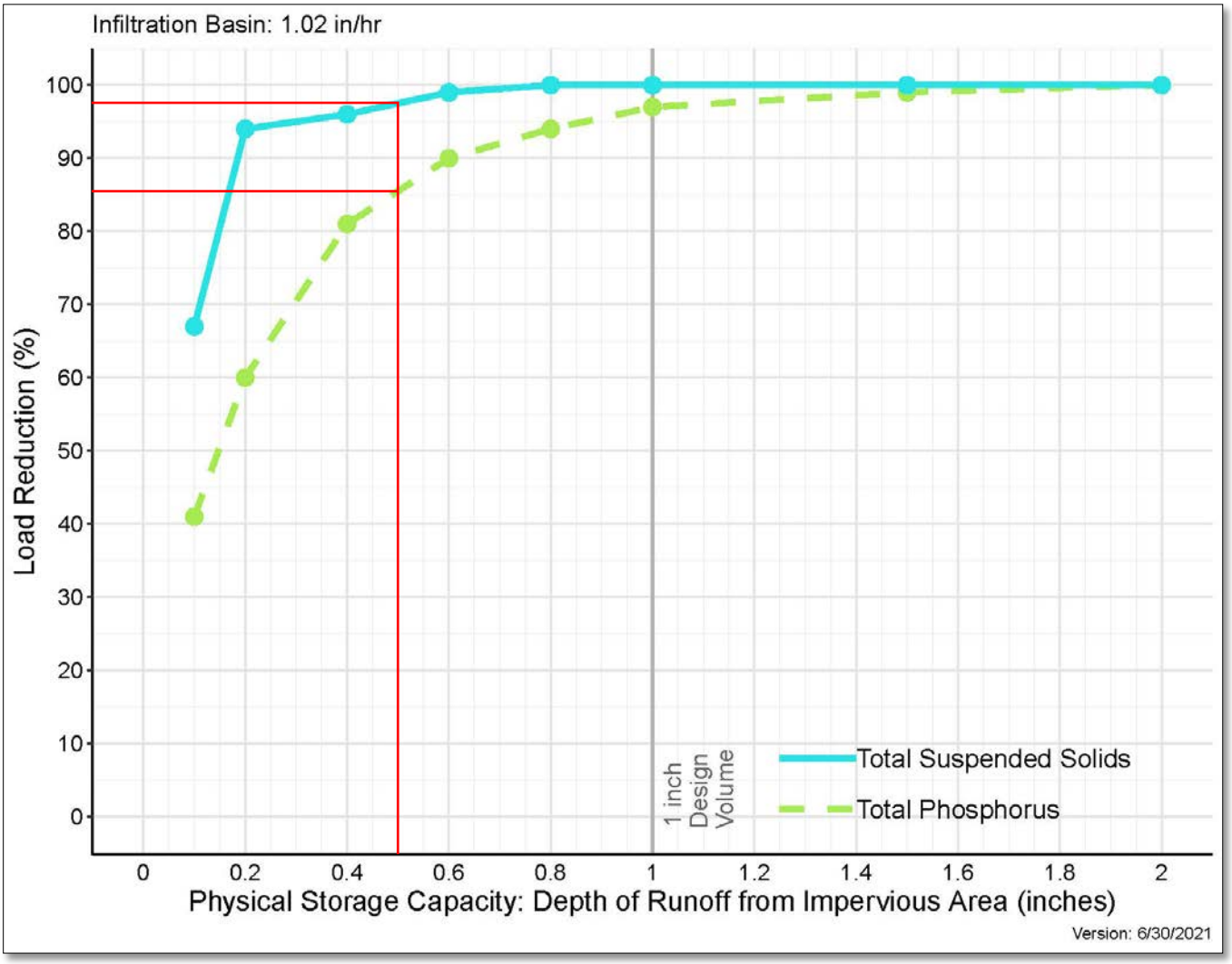
Infiltration Trench Series

The Infiltration Trench Series includes an EPA-PRC for six different infiltration rates: 0.17, 0.27. 0.52, 1.02, 2.41, and 8.27 inches per hour.



Infiltration Trench (0.17 in/hr) BMP Performance Table: Long-Term Load Reduction								
Storage Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1	1.5	2
Cumulative Phosphorus Load Reduction	18.0%	33.0%	57.0%	73.0%	83.0%	90.0%	97.0%	99.0%
Cumulative TSS Load Reduction	32.0%	56.0%	84.0%	95.0%	98.0%	99.0%	100.0%	100.0%

TOTAL PHOSPHORUS CALCULATION: (57.0% + 73.0%) / 2 = 65.0%
TOTAL SUSPENDED SOLIDS CALCULATION: (84.0% + 95.0%) / 2 = 89.5%



Infiltration Basin (1.02 in/hr) BMP Performance Table: Long-Term Load Reduction								
Storage Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1	1.5	2
Cumulative Phosphorus Load Reduction	41.0%	60.0%	81.0%	90.0%	94.0%	97.0%	99.0%	100.0%
Cumulative TSS Load Reduction	67.0%	94.0%	96.0%	99.0%	100.0%	100.0%	100.0%	100.0%

TOTAL PHOSPHORUS CALCULATION: (81.0% + 90.0%) / 2 = 85.5%
TOTAL SUSPENDED SOLIDS CALCULATION: (96.0% + 99.0%) / 2 = 97.5%

Address: CRYSTAL GOLF COURSE
Date: AUGUST 7 2025
S.E.: Thomas Schomburg
Witness: N/a

TP-1

Depth	Horizon	Color	Texture
0-78	FILL		
78-90	C	10YR6/2	Very Fine Loamy Sand

Mottles @ 20"
No water observed

TP-2

Depth	Horizon	Color	Texture
0-30	FILL		
30-98	C	10YR5/2	Loamy Sand

Mottles @ 32"
No water observed

TP-3

Depth	Horizon	Color	Texture
0-40	FILL		
40-60	C	10YR5/2	Loamy Sand

Mottles @ 40"
No water observed
Refusal @ 60
Lots of boulders

TP-4

Depth	Horizon	Color	Texture
0-16	A	10YR3/2	Loamy Sand
16-26	B	10YR5/6	Loamy Sand
26-80	C	10YR6/2	Fine Loamy Sand

Mottles @ 42"
No water observed

CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN

February 26, 2026

Revision May 1, 2026

This plan has been prepared for the contractor to utilize in preparation of the Stormwater Pollution Prevention Plan (SWPPP) as required by the EPA National Pollutant Discharge Elimination System (NDPES). A SWPPP will be submitted to the Conservation Department at least fourteen (14) days prior to start of construction.

Good Housekeeping BMPs

Minimize the potential for contaminants to enter or runoff the site during construction activities. Fuel and other equipment-related fluids will be properly stored. The Contractor shall establish secure storage areas that collect any spillage to meet requirements of the City of Haverhill Fire Department regarding the storage of flammable materials. The Contractor shall complete and submit the plans to the Engineer.

General Requirements

The following presents a proactive approach to all of the best management practices, erosion and sedimentation controls, mitigation measures, and monitoring activities for this Project.

Compost Filter Sock

A compost filter sock is a type of contained compost filter berm. It is a mesh tube filled with composted material that is placed perpendicular to sheet-flow runoff to control erosion and retain sediment in disturbed areas. The filter sock can be used in place of a traditional sediment and erosion control tool such as a silt fence or straw bale barrier.

Compost filter socks are flexible and can be placed along the perimeter of a site, or at intervals along a slope, to capture and treat stormwater that runs off as sheet flow. Filter socks can also be used on pavement as inlet protection for storm drains and to slow water flow in small ditches. Filter socks used for erosion control are usually 12 inches in diameter. The smaller, 8 inch–diameter filter socks are commonly used for stormwater inlet protection. The outer shell of a compost filter sock is typically biodegradable and can remain on pervious surfaces post construction versus having to be removed as construction waste.

Temporary Stabilized Construction Vehicle Entrance/Exit

The purpose of stabilized entrances to a construction site is to minimize the amount of sediment leaving the area as mud and sediment attached to vehicles. Installing a pad of gravel over filter cloth where construction traffic leaves a site can help stabilize a construction entrance. As a vehicle drives over the pad, the pad removes mud and sediment from the wheels and reduces soil transport off the site. The filter cloth separates the gravel from the soil below, keeping the gravel from being ground into the soil. The fabric also reduces the amount of rutting caused by vehicle tires. It spreads the vehicle's weight over a soil area larger than the tire width.

Storm Drain Inlet Protection

Storm drain inlet protection measures prevent soil and debris from entering storm drain inlets. These measures will be implemented before the Site is disturbed by using silt sacks, compost filter socks, or staked bales in combination with silt fence. Storm drain inlet protection will be installed at all down gradient catch basins adjacent to the project site outside the protection of other erosion control barriers, all catch basins within the construction site, and at low points within the construction site that are connected to the storm drainage system.

Pavement Sweeping

Paved areas within the active construction site can be swept on a regular basis to remove larger sediment particles from construction activities. Pavement areas adjacent to the Site will be swept if dirt and debris is tracked from the construction site.

Temporary Seeding and Slope Stabilization

Seeding shall be used to temporarily stabilize areas that will not be brought to final grade for a period of more than 30 working days and to stabilize disturbed areas before final grading or in a season not suitable for

permanent seeding. Stabilization of open soil surfaces will be implemented within 14 days after grading or construction activities have temporarily or permanently ceased, unless there is sufficient snow cover to prohibit implementation.

Vegetative slope stabilization will be used to minimize erosion on slopes of 3:1 or flatter. Annual grasses, such as annual rye, will be used to ensure rapid germination and production of root mass. Permanent stabilization will be completed with the planting of perennial grasses or legumes. Establishment of temporary and permanent vegetative cover may be established by hydro-seeding or sodding. A suitable topsoil, good seedbed preparation, and adequate lime, fertilizer, and water will be provided for effective establishment of these vegetative stabilization methods. Root systems restrain the soils so that they are less apt to be dislodged and carried offsite by stormwater runoff or wind. Temporary seeding also reduces the problems associated with mud and dust from bare soil surfaces during construction. Mulch will also be used after permanent seeding to protect soil from the impact of falling rain and to increase the capacity of the soil to absorb water.

Spill Prevention and Control

A spill recovery kit shall be readily accessible at the facility at all times. Contact information for an emergency cleanup vendor shall be visible and apparent at the facility. All employees shall be briefed on clean-up response and procedures. In the event of petroleum or other deleterious substance spill, action will be taken by the Contractor to contain and remove the spill. The Contractor will comply with the relevant section(s) of the Oil Pollution Prevention Act, 40 CFR 112.7.

Responsibility

In the event of an emergency spill, the Contractor will be responsible for retaining the environmental Subcontractor. The selected environmental subcontractor will develop a Hazardous Materials Health and Safety Plan, which will be referenced when a spill or release is discovered, and the control of the spill or release is beyond the scope of the Spill Prevention Control and Countermeasure plan. The Contractor's Project Manager is responsible for giving the SSHO directions for initiating the Hazardous Materials Health and Safety Plan.

Alert and reporting procedures will become effective immediately upon observance and indication of a spill or discharge of oil or other substances on the project.

Reportable observations are:

1. Leaks or spills
2. Soils which are discolored or have an odor
3. Discharge of oil or other similar substances from drain pipes

The Engineer will be informed immediately of all substantial spills, releases, or other substance discharges. All telephone numbers for the Emergency Response agencies will be posted on site. The Contractor or its Subcontractors will implement control and countermeasures immediately.

Fuel and Oil Delivery Trucks

The equipment superintendent or designee will monitor all truck unloading procedures to verify all hoses are tight and do not leak, and if necessary, will tighten, adjust, or replace them to prevent a release of any kind. In the event of a major spill, alert and initial report procedures will be implemented, and an emergency response contractor will be called in to perform the cleanup.

Equipment

Motorized equipment that requires fuel and oil to operate will be inspected prior to the start of each work shift by the operator (in the field) to ensure there is no leakage of oil, fuel, or other material. Trucks will be inspected prior to use for potential leaks or drips. If a leak is found, repairs will be made immediately, and spillage will be cleaned up manually using sorbent material. Vehicles that are found to be leaking will be immediately taken out of service until repairs can be made.

Drum Storage

Drum storage, if any, will be located in a secure area within the Project limits away from environmental areas of concern. Petroleum liquids and other substances stored in drums will be kept in a drum container that consists of a drum rack and drip containment pan that is capable of containing 110% of the stored volume should the drum rupture.

Dust Control

Standard industry practices will be utilized at the project site to control dust generation including a water truck, sweeper, and stone at construction entrances. Dust control measures will be applied to disturbed and work areas as necessary. The Operator will be required to provide equipment to blanket disturbed areas with moisture or sweep, as necessary. Site housekeeping practices will be employed to remove dust and debris from paved and concrete surfaces.

Temporary Concrete Washout Area

The purpose of a designated concrete washout area is to prevent the discharge of cementitious materials, wash water, and high-pH slurry into the surrounding soils, drainage systems, and resource areas. Concrete washout water can be highly alkaline and contain suspended solids that may adversely impact water quality if not properly contained.

A temporary concrete washout area shall be established on-site in a clearly designated and signed location. The washout area shall consist of a leak-proof containment system, such as a prefabricated container or a pit lined with an impervious liner, and shall be located a safe distance from wetlands, drainage structures, and stormwater BMPs. The area shall be sized to accommodate anticipated washout volumes from concrete trucks and equipment.

Washout activities shall be confined exclusively to the designated area. The washout facility shall be inspected regularly and maintained to ensure adequate capacity and structural integrity. When the containment area approaches capacity, accumulated materials shall be removed and properly disposed of in accordance with applicable regulations. Upon completion of construction, the washout area shall be removed and the disturbed area stabilized.

OPERATIONS AND MAINTENANCE PLAN

February 26, 2026

Revised: May 4, 2026

This Long-Term Operations and Maintenance Program Plan has been prepared for the proposed redevelopment located at 890 North Broadway in Haverhill, MA. Upon a period beginning twelve months after the completion of the driveway, all structural BMPs shall be inspected twice annually, once in April and once in November. The inspection shall be performed as indicated below:

Street Sweeping

Street sweeping can be an effective method to reduce pollutant loading in runoff generated from pavement. Street sweeping shall be performed monthly (on average), with sweeping scheduled primarily in the spring and fall, by a high efficiency vacuum sweeper.

Snow Storage / Removal

Snow plowed from the proposed roadway will be placed or disposed of in accordance with the policy developed by DEP. Any snow that accumulates over the grates of each catch basin shall be removed to ensure that the drainage systems functions properly. Under no circumstances shall snow plowed or removed from the road be stockpiled within wetland resource areas or the 50 ft wetland buffer. Snow shall be stored on marked areas on the layout and materials plan.

Catch Basins

The sump/hooded catch basins will be inspected and/or cleaned at least four times per year and at the end of the foliage and snow removal seasons. Sediment shall be removed four times per year or whenever the depth of the deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin. Sediment shall be removed and disposed of with a truck-mounted vacuum unit or other appropriate apparatus. The sediment will be disposed of at an approved offsite location in accordance with all applicable local, state, and federal regulations.

Drainage Outfalls

The outlets of the storm water management system will be inspected biannually. Any evidence of erosion or other damage will be reported to the appropriate town representative and repaired as soon as possible. Any sediment should be removed from the outlet structures.

Sediment Basins

Sediments and associated pollutants are removed only when sediment forebays are actually cleaned out, so regular maintenance is essential. Frequently removing accumulated sediments will make it less likely that sediments will be re-suspended. At a minimum, inspect sediment forebays monthly and clean them out at least four times per year. Stabilize the floor and sidewalls of the sediment forebay before making it operational, otherwise the practice will discharge excess amounts of suspended sediments. When mowing grasses, keep the grass height no greater than 6 inches. Set mower blades no lower than 3 to 4 inches. Check for signs of rilling and gullying and repair as needed. After removing the sediment, replace any vegetation damaged during the clean-out by either reseeding or resodding. When reseeding, incorporate practices such as hydroseeding with a tackifier, blanket, or similar practice to ensure that no scour occurs in the forebay, while the seeds germinate and develop roots.

Infiltration Ponds

Infiltration basins are prone to clogging and failure, so it is imperative to develop and implement aggressive maintenance plans and schedules. Installing the required pretreatment BMPs will significantly reduce maintenance requirements for the basin. The Operation and Maintenance Plan required by Standard 9 must include inspections and preventive maintenance at least twice a year, and after every time drainage discharges through the high outlet orifice. The Plan must require inspecting the pretreatment BMPs in accordance with the minimal requirements specified for those practices and after every major storm event. A major storm event is defined as a storm that is equal to or greater than the 2-year, 24-hour storm.

Once the basin is in use, inspect it after every major storm for the first few months to ensure it is stabilized and functioning properly and if necessary take corrective action. Note how long water remains standing in the basin after a storm; standing water within the basin 48 to 72 hours after a storm indicates that the infiltration capacity may have been overestimated. If the ponding is due to clogging, immediately address the reasons for the clogging (such as upland sediment erosion, excessive compaction of soils, or low spots).

Thereafter, inspect the infiltration basin at least twice per year. Important items to check during the inspection include:

- Signs of differential settlement,
- Cracking,
- Erosion,
- Leakage in the embankments,
- Tree growth on the embankments,
- Condition of riprap,
- Sediment accumulation and
- The health of the turf.

At least twice a year, mow the buffer area, side slopes, and basin bottom. Remove grass clippings and accumulated organic matter to prevent an impervious organic mat from forming. Remove trash and debris at the same time. Use deep tilling to break up clogged surfaces, and revegetate immediately. Remove sediment from the basin as necessary, but wait until the floor of the basin is thoroughly dry. Use light equipment to remove the top layer so as to not compact the underlying soil. Deeply till the remaining soil, and revegetate as soon as possible. Inspect and clean pretreatment devices associated with basins at least twice a year, and ideally every other month.

Wet Ponds

Inspect wet basins at least once per year to ensure they are operating as designed. Inspect the outlet structure for evidence of clogging or excessive outflow releases. Potential problems to check include: subsidence, erosion, cracking or tree growth on the embankment, damage to the emergency spillway, sediment accumulation around the outlet, inadequacy of the inlet/outlet channel erosion control measures, changes in the condition of the pilot channel, erosion within the basin and banks, and the emergence of invasive species. Make any necessary repairs immediately. During inspections, note any changes to the wet basin or the contributing watershed area because these may affect basin performance. At least twice a year, mow the upper-stage, side slopes, embankment and emergency spillway. At this time, also check the sediment forebay for accumulated material, sediment, trash, and debris and remove it. Remove sediment from the basin as necessary, and at least once every 10 years. Providing an on-site sediment disposal area will reduce the overall sediment removal costs.

Barracuda Max Model S6 Maintenance

Periodic inspection is needed to determine the need for and frequency of maintenance. You should begin inspecting as soon as construction is complete and then on an annual basis. Typically, the system needs to be cleaned every 1-3 years. Excessive oils, fuels or sediments may reduce the maintenance cycle. Periodic inspection is important. To determine the sediment depth, the maintenance contractor should lower a stadia rod into the manhole until it contacts the top of the captured sediment and mark that spot on the rod. Then push the probe through to the bottom of the sump and mark that spot to determine sediment depth. Maintenance should occur when the sediment has reached the levels indicated in the Storage Capacity Chart.

Remove the manhole cover to provide access to the pollutant storage. Pollutants are stored in the sump, below the bowl assembly visible from the surface. Access this area through the 8” (200 mm), 10” (250 mm), 15” (375 mm) or 20” (500 mm) diameter access cylinder. Use a vacuum truck or other similar equipment to remove all water, debris, oils and sediment. Use a high-pressure hose to clean the manhole of all the remaining sediment and debris. Then, use the vacuum truck to remove the water. Fill the cleaned manhole with water until the level reaches the invert of the outlet pipe. Replace the manhole cover. Dispose of the polluted water, oils, sediment and trash at an approved facility.

Owner / Responsible Party: Sterling Golf Management, Inc.
212 Kendrick Street
Newton, MA 02458

Estimated Operations and Maintenance Budget
It is anticipated that the stormwater management system will require an annual budget of $5,000 to maintain.

X_____ Date:_____
Owner's Signature

890 North Broadway - Haverhill, MA

Proposed Peak Discharge Rates (Closed Drainage Design)

(10-YR STORM DESIGN)

PCB-1

Cover Type	Area (ac)	C Value	C*A
Impervious	0.25	0.90	0.23
Lawn/Grass	0.09	0.20	0.02
Total	**0.34**	N/A	**0.24**

Composite C= 0.71

Q (cfs)
1.31

PCB-2

Cover Type	Area (ac)	C Value	C*A
Impervious	0.90	0.90	0.81
Lawn/Grass	0.09	0.20	0.02
Total	**0.99**	N/A	**0.83**

Composite C= 0.84

Q (cfs)
4.46

PCB-3

Cover Type	Area (ac)	C Value	C*A
Impervious	0.17	0.90	0.15
Lawn/Grass	0.05	0.20	0.01
Total	**0.22**	N/A	**0.16**

Composite C= 0.74

Q (cfs)
0.88

PDMH-2

Cover Type	Area (ac)	C Value	C*A
Impervious	0.17	0.90	0.15
Lawn/Grass	0.05	0.20	0.01
Total	**0.22**	N/A	**0.16**

Composite C= 0.74

Q (cfs)
0.88

PDMH-1

Cover Type	Area (ac)	C Value	C*A
Impervious	1.32	0.90	1.19
Lawn/Grass	0.23	0.20	0.05
Total	**1.55**	N/A	**1.23**

Composite C= 0.80

Q (cfs)
6.66

EX. CB NORTH

Cover Type	Area (ac)	C Value	C*A
Impervious	0.09	0.90	0.08
Lawn/Grass	0.06	0.20	0.01
Total	**0.15**	N/A	**0.09**

Composite C= 0.62

Q (cfs)
0.50

EX. CB SOUTH

Cover Type	Area (ac)	C Value	C*A
Impervious	0.13	0.90	0.12
Lawn/Grass	0.00	0.20	0.00
Total	**0.13**	N/A	**0.12**

Composite C= 0.90

Q (cfs)
0.63

EX. DMH ON SIDEWALK

Cover Type	Area (ac)	C Value	C*A
Impervious	0.22	0.90	0.20
Lawn/Grass	0.06	0.20	0.01
Total	**0.28**	N/A	**0.21**

Composite C= 0.75

Q (cfs)
1.13

WQU-1

Cover Type	Area (ac)	C Value	C*A
Impervious	1.54	0.90	1.38
Lawn/Grass	0.29	0.20	0.06
Total	**1.83**	N/A	**1.44**

Composite C= 0.79

Q (cfs)
7.79

PCB-4

Cover Type	Area (ac)	C Value	C*A
Impervious	0.01	0.90	0.01
Lawn/Grass	0.00	0.20	0.00
Total	**0.01**	N/A	**0.01**

Composite C= ***0.90***

Q (cfs)
0.05

PDMH-4

Cover Type	Area (ac)	C Value	C*A
Impervious	0.11	0.90	0.10
Lawn/Grass	0.00	0.20	0.00
Total	**0.11**	N/A	**0.10**

Composite C= ***0.90***

Q (cfs)
0.53

PDMH-5

Cover Type	Area (ac)	C Value	C*A
Impervious	0.17	0.90	0.15
Lawn/Grass	0.00	0.20	0.00
Total	**0.17**	N/A	**0.15**

Composite C= ***0.90***

Q (cfs)
0.83

PDMH-6

Cover Type	Area (ac)	C Value	C*A
Impervious	0.23	0.90	0.21
Lawn/Grass	0.00	0.20	0.00
Total	**0.23**	N/A	**0.21**

Composite C= ***0.90***

Q (cfs)
1.12

Pipe Design Calculations

Location 890 North Broadway
Client Sterling Golf Management, Inc.
Subject Pipe Design Calculations

Proj. No. 24-10594
Date 5/1/2026
Comp. TJS
Check

Design Parameters
10 Year Storm
12 "Min. Pipe Size

Location in Massachusetts 1 (1-Boston, 2-Barnstable, 3-Worcester, 4-Springfield, 5-Pittsfield)
Manning's roughness coefficient 0.013

Rainfall Data is For Boston

LOCATION FROM DRAINAGE NO.	LOCATION TO DRAINAGE NO.	RAINFALL CONCENTRATION PERIOD IN MINUTES		COMBINED RUNOFF COEFF.	TRIBUTARY AREA IN ACRES		C x A		RAINFALL INTENSITY (i)	PEAK FLOW	PIPE								PROFILE				Qf/Qd
											SIZE	n VALUE	SLOPE	LENGTH	FULL CAPACITY	FULL VELOCITY	PEAK FLOW CONDITIONS		INVERT ELEVATION		RIM ELEVATION & DEPTH OF COVER		
		PIPE	TOTAL	C	INC	TOTAL	INC	TOTAL	IN/HR	CFS	IN		FT/FT	FT	CFS	FT/S	VELOCITY FT/S	d/D	UPPER END	LOWER END	UPPER RIM	DEPTH	
PCB-1	PDMH-1		5.00	0.71	0.340	0.340	0.24	0.24	5.40	1.30	12	0.013	0.010	23	3.56	4.5	4.1	0.41	198.30	198.07	201.30	1.80	0.36601037
PCB-2	PDMH-1		5.00	0.84	0.990	0.990	0.83	0.83	5.40	4.49	18	0.013	0.010	18	10.50	5.9	5.7	0.45	198.50	198.32	201.50	1.30	0.42765535
PCB-3	PDMH-2		5.00	0.74	0.220	0.220	0.16	0.16	5.40	0.88	12	0.013	0.010	241	3.56	4.5	3.7	0.33	203.17	200.76	207.45	3.08	0.24683715
PDMH-2	PDMH-1	1.08	6.08			0.220	0.00	0.16	5.20	0.85	12	0.013	0.010	156	3.56	4.5	3.7	0.33	200.76	199.20	208.00	6.04	0.23769503
PDMH-1	WQU-1	1.08	7.17			1.550	0.00	1.24	5.20	6.43	18	0.013	0.010	34	10.50	5.9	6.2	0.56	192.26	191.92	202.20	8.24	0.61197997
EX CB N	EX DMH		5.00	0.62	0.150	0.150	0.09	0.09	5.40	0.50	12	0.013	0.006	35	2.69	3.4	2.6	0.29	194.40	194.20	198.40	2.80	0.18653404
EX CB S	EX DMH		5.00	0.90	0.130	0.130	0.12	0.12	5.40	0.63	12	0.013	0.001	15	0.92	1.2	1.3	0.60	194.11	194.10	198.31	3.00	0.68704884
EX DMH	WQU-1	0.22	5.22			0.280	0.00	0.21	5.40	1.13	15	0.013	0.017	52	8.50	6.9	4.6	0.23	194.10	193.20	199.85	4.30	0.13348398
WQU-1	**PFES-1**	**0.19**	**7.26**			**1.830**	**0.00**	**1.45**	**5.20**	**7.52**	**24**	**0.013**	**0.005**	**145**	**16.05**	**5.1**	**5.0**	**0.48**	**191.83**	**191.10**	**200.21**	**6.18**	**0.46854342**
PCB-4	**PFES-5**		**5.00**	**0.90**	**0.010**	**0.010**	**0.01**	**0.01**	5.40	**0.05**	**12**	**0.013**	**0.050**	**35**	**7.96**	**10.1**	**#N/A**	**#N/A**	**194.75**	**193.00**	**207.20**	**11.25**	**0.00610258**
DMH-4	PDMH-5		5.00	0.90	0.110	0.110	0.10	0.10	5.40	0.53	12	0.013	0.050	90	7.95	10.1	5.6	0.17	204.78	200.30	208.80	2.82	0.06727808
PDMH-5	PDMH-6	0.27	5.27	0.90	0.060	0.170	0.05	0.15	5.40	0.83	12	0.013	0.051	104	8.03	10.2	6.5	0.21	200.34	195.05	207.00	5.46	0.1028576
PDMH-6	**PFES-2**	**0.27**	**5.53**	**0.90**	**0.060**	**0.230**	**0.05**	**0.21**	5.40	**1.12**	**12**	**0.013**	**0.050**	**44**	**7.96**	**10.1**	**7.1**	**0.25**	**195.20**	**193.00**	**206.00**	**9.60**	**0.14035939**

Project: 890 North Broadway - Haverhill, MA **Prepared By:** TJS
Client: Sterling Golf Management, Inc. **Date:** May 1, 2026
Project Number: 24-10594

Inlet Grate Capacity

$Q = C \times A \times (2gd)^{1/2}$

Q = inlet capacity (cfs)
C = orifice discharge coefficient = 0.6
A = orifice area (ft^2) = 3.03 ft^2 (Single Grate)
A = orifice area (ft^2) = 6.02 ft^2 (Double Grate)
d = characteristic depth (ft) = see below
g = 32.3 ft/sec^2

INLET GRATE CAPACITY - PROPOSED CATCH BASIN 1 (PCB-1)
(Single Grate)
Basin Inflow **1.31 CFS**

PCB-1 Calculations

Q = 10.32 PASS
d = 0.500 FT

INLET GRATE CAPACITY - PROPOSED CATCH BASIN 2 (PCB-2)
(Single Grate)
Basin Inflow **4.46 CFS**

PCB-2 Calculations

Q = 10.32 PASS
d = 0.500 FT

INLET GRATE CAPACITY - PROPOSED CATCH BASIN 3 (PCB-3)
(Single Grate)
Basin Inflow **0.88 CFS**

PCB-3 Calculations

Q = 2.98 PASS
d = 0.042 FT

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Project: 890 North Broadway - Haverhill, MA
Client: Sterling Golf Management, Inc.
Project Number: 24-10594

Prepared By: TJS
Date: May 1, 2026

WATER QUALITY FLOW CALCULATION

Q_1 = $(q_u)(A)(WQV)$

MassDEP Q Rate - Sept. 10, 2013 - Page 5

Q_1	=	peak flow rate associated with first 1-inch of runoff
q_u	=	unit peak discharge (csm/in)
A	=	impervious surface area (square mile)
WQV	=	water quality volume in watershed inches (1.0-in)

WQU-1

A = 1.54-AC = 2.23×10^{-3} mi^2
CN = 98 (impervious surface)
T_c = 5 minutes

Use T_c to find q_u → MassDEP Q Rate - Sept. 10, 2013 - Page 7

q_u = 795 csm/in

Q_1 = (795 csm/in) (2.23×10^{-3} mi^2) (1.0in) = **1.78 cfs**

PRODUCT SPECIFICATIONS

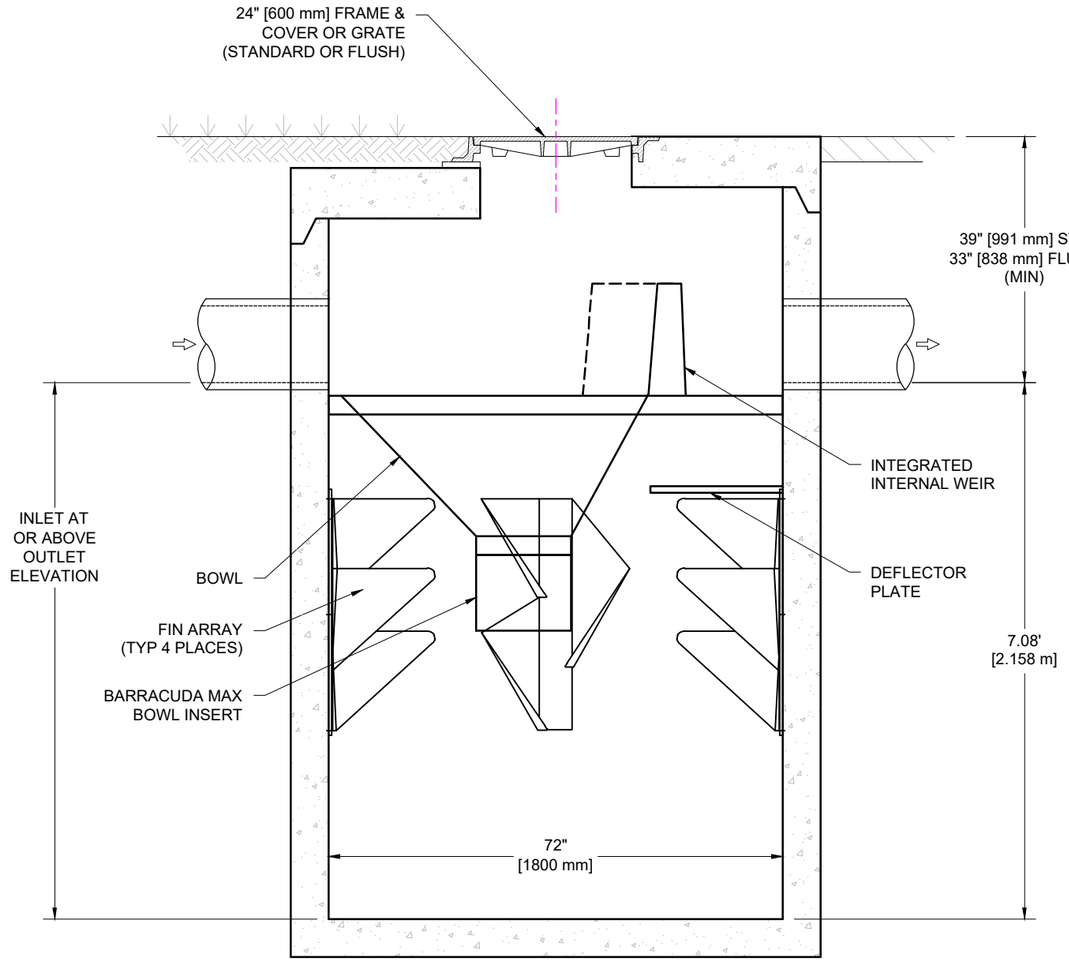
- THE STORMWATER TREATMENT UNIT SHALL BE AN INLINE UNIT CAPABLE OF CONVEYING 100% OF THE DESIGN PEAK FLOW. IF PEAK FLOW RATES EXCEED MAXIMUM HYDRAULIC RATE, THE UNIT SHALL BE INSTALLED OFFLINE.
- THE BARRACUDA UNIT SHALL BE DESIGNED TO REMOVE AT LEAST 80% OF THE SUSPENDED SOLIDS ON AN ANNUAL AGGREGATE REMOVAL BASIS. SAID REMOVAL SHALL BE BASED ON FULL-SCALE THIRD PARTY TESTING USING OK-110 MEDIA GRADATION OR EQUIVALENT AND 300 mg/L INFLUENT CONCENTRATION. SAID FULL SCALE TESTING SHALL HAVE INCLUDED SEDIMENT CAPTURE BASED ON ACTUAL TOTAL MASS COLLECTED BY THE STORMWATER TREATMENT UNIT.

  -OR -

  THE BARRACUDA UNIT SHALL BE DESIGNED TO REMOVE AT LEAST 50% OF TSS USING A MEDIA MIX WITH d_{50}=75 MICRON AND 200 MG/L INFLUENT CONCENTRATION.

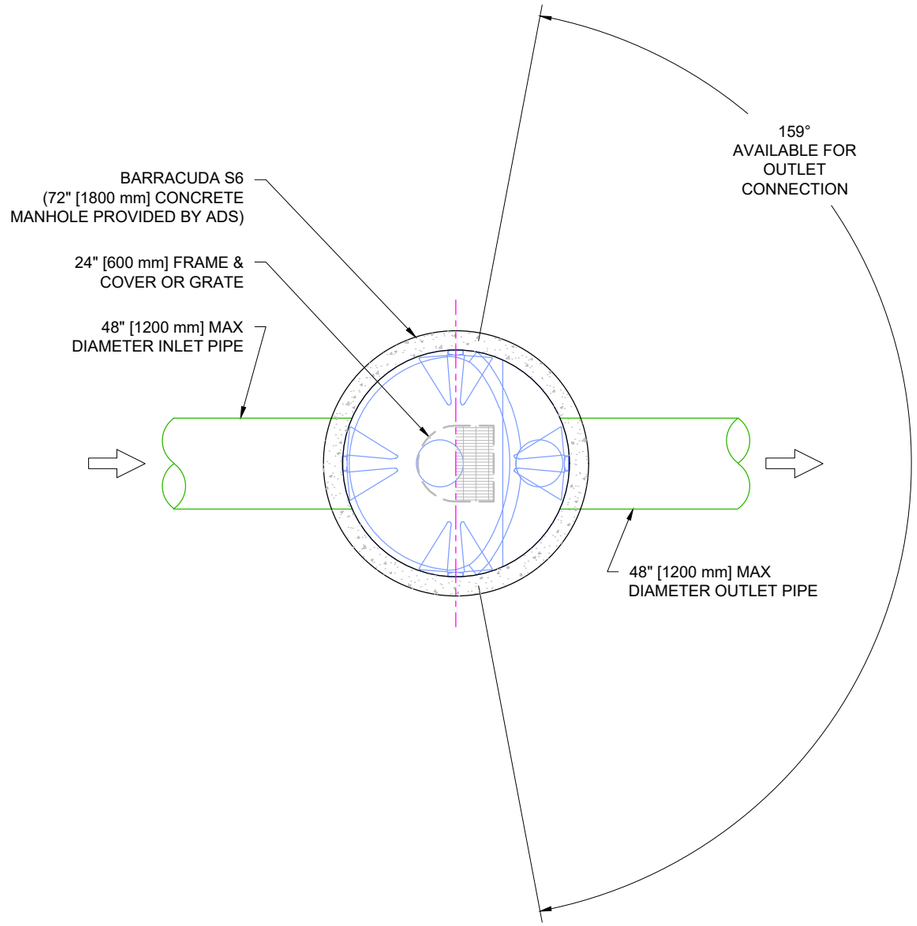
  -OR -

  THE BARRACUDA UNIT SHALL BE DESIGNED TO REMOVE AT LEAST 50% OF TSS PER PREVIOUS 2013 NJDEP/NJCAT HDS PROTOCOL.



SECTION VIEW A-A
NOT TO SCALE

BARRACUDA MAX S6		
	CFS	L/s
NJDEP (50% Removal)	3.40	96.3
OK-110 (80% Removal)	3.42	96.8



PLAN VIEW
NOT TO SCALE

NOTES:

- ENGINEER / CONTRACTOR TO CONFIRM PIPE MATERIALS AND APPLICABLE ADAPTERS
- CONTRACTOR IS RESPONSIBLE FOR MATERIAL AND LABOR TO BRING CASTINGS TO FINISHED GRADE
- CONTRACTOR TO MEASURE HEIGHT OF STRUCTURE TO ENSURE THAT DEPTH OF EXCAVATION IS CORRECT.
- UNIT SHALL CONFORM TO HS20-44 LOAD RATINGS.

BARRACUDA MAX S6

STANDARD DETAIL

DATE: 09/06/24 DRAWN: JLM

DRAWING #: 531-610 CHECKED: SMW

DATE	DRWN	CHKD	DESCRIPTION
04/02/25	JLM	AT	LID LEADER

Barracuda Max
Stormwater Separator

4640 TRUEMAN BLVD
HILLIARD, OH 43026

ADS

SHEET 1 OF 1

ILLICIT DISCHARGE COMPLIANCE STATEMENT

SITE ADDRESS:	890 NORTH BROADWAY, HAVERHILL, MASSACHUSETTS
OWNER:	STERLING GOLF MANAGEMENT, INC.
PLAN REFERENCE:	SITE DEVLEOPMENT PLANS FOR 890 NORTH BROADWAY PREPARED BY CIVIL DESIGN CONSULTANTS, INC.
DATE:	MAY 1, 2026

As required by Standard 10 of the Massachusetts Stormwater Standards, I, the undersigned, being the authorized owner/responsible party of the above referenced property do hereby certify that no illicit discharges exist on the site and that the stormwater management system, as shown on the above referenced plan, does not contain or permit any illicit discharges to enter the stormwater management system. Furthermore, discharges from interior building drains or plumbing within the buildings are prohibited. Illicit discharges do not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, and water used for street washing.

Further, I certify that the stormwater management system as shown on the referenced plan will be maintained in accordance with the conditions of the Long-Term Operations and Maintenance Program.

NAME:	JAY MILLER
SIGNED:	_____
DATE:	_____

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SECTION VI – Watershed Plans

Pre-Development Watershed Plan
Post-Development Watershed Plan

LEGEND - PROPOSED WATERSHED PLAN

EXISTING PROPERTY LINE	
WATERSHED BOUNDARY	
Tc FLOW PATH	
Tc FLOW PATH SEGMENT I.D.	• B
SOIL BOUNDRY	
SOIL DESIGNATION	

NOTES:

1. EXISTING CONDITIONS INFORMATION COMPILED FROM FROM AN ON THE GROUND SURVEY PERFORMED BY S.E. CUMMINGS & ASSOCIATES, INC. OF PLAISTOW, NH AS WELL AS RECORD DOCUMENTS AND SITE OBSERVATION.

2. SOILS INFORMATION GENERATED FROM THE NATURAL RESOURCES CONSERVATION SERVICES (NRCS) WEBSOILSURVEY.COM FOR ESSEX COUNTY MASSACHUSETTS, NORTHERN PART – VERSION 8, DATED AUGUST 11, 2008. THE FOLLOWING SOIL SUMMARY IS PROVIDED TO CORRESPOND WITH THE SOIL DESIGNATION PROVIDED ON THE PLAN.

SOIL	DESCRIPTION	HSG
70A	RIDGEBURY FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES	C
73A	WHITMAN LOAM, 0 TO 3 PERCENT SLOPES, EXTREMELY STONY	D
300B	MONTAUK FINE SANDY LOAM, 3 TO 8 PERCENT SLOPES	C
300C	MONTAUK FINE SANDY LOAM, 8 TO 15 PERCENT SLOPES	C
300D	MONTAUK FINE SANDY LOAM, 15 TO 25 PERCENT SLOPES	C
301C	MONTAUK FINE SANDY LOAM, 8 TO 15 PERCENT SLOPES, V. STONY	C
301D	MONTAUK FINE SANDY LOAM, 15 TO 25 PERCENT SLOPES, V. STONY	C
311B	WOODBRIDGE FINE SANDY LOAM, 0 TO 8 PERCENT SLOPES, V. STONY	C
310B	WOODBRIDGE FINE SANDY LOAM, 3 TO 8 PERCENT SLOPES	C

GRAPHIC SCALE

150 0 75 150 300 600

(IN FEET)

1 inch = 150 ft. HORIZONTAL

PROPOSED WATERSHED PLAN

PROJECT: TAX LOT 575-2-8 - CRYSTAL SPRINGS
NORTH BROADWAY
HAVERHILL, MASSACHUSETTS

SCALE: AS NOTED | DRAWN BY: JEH

DATE: MAY 10, 2009 | REVISED: 1. 10-14-09 | 2. | 3. | 4. | 5. | 6. | 7. | 8.

APPLICANT: MARONEY CONSTRUCTION
423 EAST BROADWAY
HAVERHILL, MA 01830

ENGINEERING SERVICES PROVIDED BY:
CIVIL DESIGN Consultants, Inc.
37 PLAISTOW ROAD, UNIT 7 / #235
PLAISTOW, NH 03865-2856
TEL: (603) 276-5369
FAX: (603) 382-1818

PREPARED BY: S.E.C. & ASSOCIATES, INC.
SURVEYING & ENGINEERING CONSULTANTS
P.O. BOX 1337 - PLAISTOW, NH 03865 ⊕ PHONE: (603)-382-5065
~ SERVING N.H. & MA. ~ FAX: (603)-382-5216

JOB NO. 08-1563

SHEET 2

LEGEND

PROPERTY LINE	
PROPOSED BUILDING	
PROPOSED CONTOUR	146
PROPOSED SPOT GRADE	161.00
PROPOSED SPOT GRADE (TW/BW)	TW:159.57 BW:155.67
PROPOSED DRAIN	
PROPOSED CATCH BASIN	
PROPOSED DRAIN MANHOLE	
PROPOSED RETAINING WALL	
PROPOSED WATERSHED BOUNDARY	
PROPOSED TC	
PROPOSED IMPERVIOUS SURFACE	
HYDROLOGIC SOILS GROUP A	
HYDROLOGIC SOILS GROUP B	
HYDROLOGIC SOILS GROUP C	
HYDROLOGIC SOILS GROUP D	

SOILS SUMMARY:

SYMBOL	DESCRIPTION	HSG
300B	MONTAUK FINE SL, 3–8%	C
300C	MONTAUK FINE SL, 8–15%	C
70A	RIDGEBURY FINE SL, 0–3%	D

HORIZONTAL SCALE

30 0 15 30 60 120

(IN FEET)

1"=30'

05/11/26	REV. PER PEER REVIEW COMMENTS
DATE	DESCRIPTION
REVISIONS	

OWNER / APPLICANT:

STERLING GOLF MANAGEMENT, INC.

212 KENDRICK STREET

NEWTON, MA 02458

PROJECT:

890 NORTH BROADWAY

HAVERHILL, MA 01832

DATE ISSUED:	FEBRUARY 26, 2026
PROJECT #:	24-10594
PREPARED BY:	MAC

ISSUED FOR REVIEW MAY 11, 2026

PROFESSIONAL ENGINEER FOR CIVIL DESIGN CONSULTANTS, INC.

CIVIL DESIGN CONSULTANTS, INC.

344 North Main Street | Andover - MA 01810

(978) 486-0920 | www.civildc.com

DRAWING TITLE:

PROPOSED WATERSHED PLAN

DRAWING #:

PWP