DRAINAGE MEMORANDUM

For

13B COMMONWEALTH AVE LLC

PROPOSED

MIXED-USE BUILDING

13b Commonwealth Avenue
Concord, Massachusetts
Middlesex County

Prepared by:

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August 26, 2020
#W181075

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I. EXECUTIVE SUMMARY

This memorandum examines the changes from the previous special permit granted for the project that included the proposed project and neighboring lot. The lot described as Map D09 Lot 2184-1-2 (Project Site), was designed as part of a larger development that included the lot described as Map D09 Lot 2185 (Abutting Lot). The stormwater management system for the Project Site is located on the Abutting Lot and was designed for a future condition that includes the development of the Project Site.

The proposed project includes the construction of a new three-story multi-use building along with modifications to the existing sidewalks, landscaping areas, and access drive. The changes to the previously approved site and stormwater management design due to the proposed project are detailed in the accompanying "Site Development Plans for Multi-Use Building" prepared by Bohler.

The existing conditions of the Project Site are described in further detail in **Section II** below. A summary of the comparisons for the approved and proposed design can be found in **Table 1.1, Table 1.2,** and **Table 1.3** below.

Table 1.1: Approved and Proposed Subcatchment P-1

Cover Type	CN	Overall Tributary Area P-1 (acres)	Approved Lot 2184-1-2 Areas (acres)	Proposed Lot 2184-1-2 Areas (acres)	New Overall Tributary Area P-1 (acres)	Change in Areas for P-1 (acres)
Roof	98	0.890	0.155	0.149	0.884	-0.006
Pavement	98	2.170	0.376	0.436	2.230	0.060
Surface Water	98	0.158	0.000	0.000	0.158	0.000
Woods	30	0.330	0.000	0.000	0.330	0.000
Grass	39	1.506	0.208	0.154	1.452	-0.054
Gravel	90	0.050	0.000	0.000	0.050	0.000
Total	-	5.104	0.739	0.739	5.104	0.000

Table 1.2: Approved and Proposed Curve Number Comparison

	Overall Tributary Area P-1	New Overall Tributary Area P-1
Weighted Curve Number	76.12	76.74
Change (%)	-	+0.82%

Table 1.3: Peak Flow Summary

	2-year Storm	10-year Storm	25-year Storm	100-year Storm
Approved Existing DP1	9.98	18.19	23.10	30.60
Approved Proposed DP1	9.47	17.75	22.68	30.39
Proposed DP1	9.75	18.07	22.99	30.52
Delta	-0.23	-0.12	-0.11	-0.08

**Flows are represented in cubic feet per second (cfs)*

II. CURRENT AND APPROVED SITE CONDITIONS

Current Site Description

The Project Site consists of approximately 0.74 acres of land and is located on the east side of Commonwealth Avenue in the Town of Concord, Massachusetts. An access drive off Commonwealth Avenue leads to the paved parking lot and the Abutting Lot. A sidewalk provides pedestrian access to the Project Site and the adjoining lots. A lawn area has been installed to accommodate a future building.

Currently Installed Collection and Conveyance

The drainage network consisting of underground pipe and deep-sump, hooded catch basins convey stormwater off site where it is treated by a proprietary stormwater treatment unit located on the Abutting Lot. This treatment unit was sized to include the building and pavement areas of an assumed future condition for the Project Site. This proprietary unit provides water quality treatment before discharging to Nashoba Brook.

Approved Overall Subcatchment

The Project Site is a portion of Subcatchment P-1 as described in the "Supplemental Drainage Report for Oaktree FX, LLC Proposed Mix Use Development" dated April 12, 2013 and prepared by Bohler Engineering. This overall subcatchment contains 5.104 acres of pavement, roof, open space lawn areas, gravel drives, woodland areas, and surface waters. The existing approved Project Site includes 0.74 acres of pavement, open space lawn areas, and roof. Subcatchment P-1 discharges to Nashoba Brook, described as Design Point #1 (DP1) in the Supplemental Drainage Report, after treatment by the Stormceptor unit. For additional information and graphical representation, refer to **Appendix B**.

III. PROPOSED SITE CONDITIONS

Proposed Development Description

The proposed development includes the construction of a new three-story mixed-use building. The first floor is dedicated to retail space with the upper two floors serving as apartment units. The existing paved parking area, sidewalks, and main access drive are to be modified to accommodate the new building, accessible routes, and other amenities. Associated service utilities have been extended to the building. The Project Site, including the proposed parking modifications, have been designed to match the existing drainage patterns currently collected by deep-sump, hooded catch basins. The catch basins capture and convey stormwater runoff, via an underground pipe system, to the Abutting Lot's proprietary treatment unit prior to discharge to Nashoba Brook.

Proposed Overall Subcatchment Modifications

The proposed development alters the previously approved Subcatchment P-1 as described in **Section II** above. For Subcatchment P-1, the site development will increase the impervious coverage by 0.054 acres and as a result, the weighted curve number (CN) increased from 76.12 to 76.74, a net change of 0.82%. This is due to the additional parking required for the apartments that was not a use described for the Project Site's originally approved building floorplan. A calculated time of concentration of 6.5 minutes has been applied to the proposed subcatchment P-1. The increase in peak discharge to DP1 from the approved conditions is minimal and does not exceed existing peak discharge rates. Refer to **Appendix B** for additional information.

IV. SUMMARY

In summary, the increases due to the proposed development are minimal and does not significantly alter tributary areas to the existing stormwater management system and proposed flows do not exceed the existing conditions originally designed to. A comparison of the existing approval and proposed project can be found in **Table 4.1**, **Table 4.2,** and **Table 4.3** below.

Table 4.1: Approved and Proposed Subcatchment P-1

Cover Type	CN	Overall Tributary Area P-1 (acres)	Approved Lot 2184-1-2 Areas (acres)	Proposed Lot 2184-1-2 Areas (acres)	New Overall Tributary Area P-1 (acres)	Change in Areas for P-1 (acres)
Roof	98	0.890	0.155	0.149	0.884	-0.006
Pavement	98	2.170	0.376	0.436	2.230	0.060
Surface Water	98	0.158	0.000	0.000	0.158	0.000
Woods	30	0.330	0.000	0.000	0.330	0.000
Grass	39	1.506	0.208	0.154	1.452	-0.054
Gravel	90	0.050	0.000	0.000	0.050	0.000
Total	-	5.104	0.739	0.739	5.104	0.000

Table 4.2: Approved and Proposed Curve Number Comparison

	Overall Tributary Area P-1	New Overall Tributary Area P-1
Weighted Curve Number	76.12	76.74
Change (%)	-	+0.82%

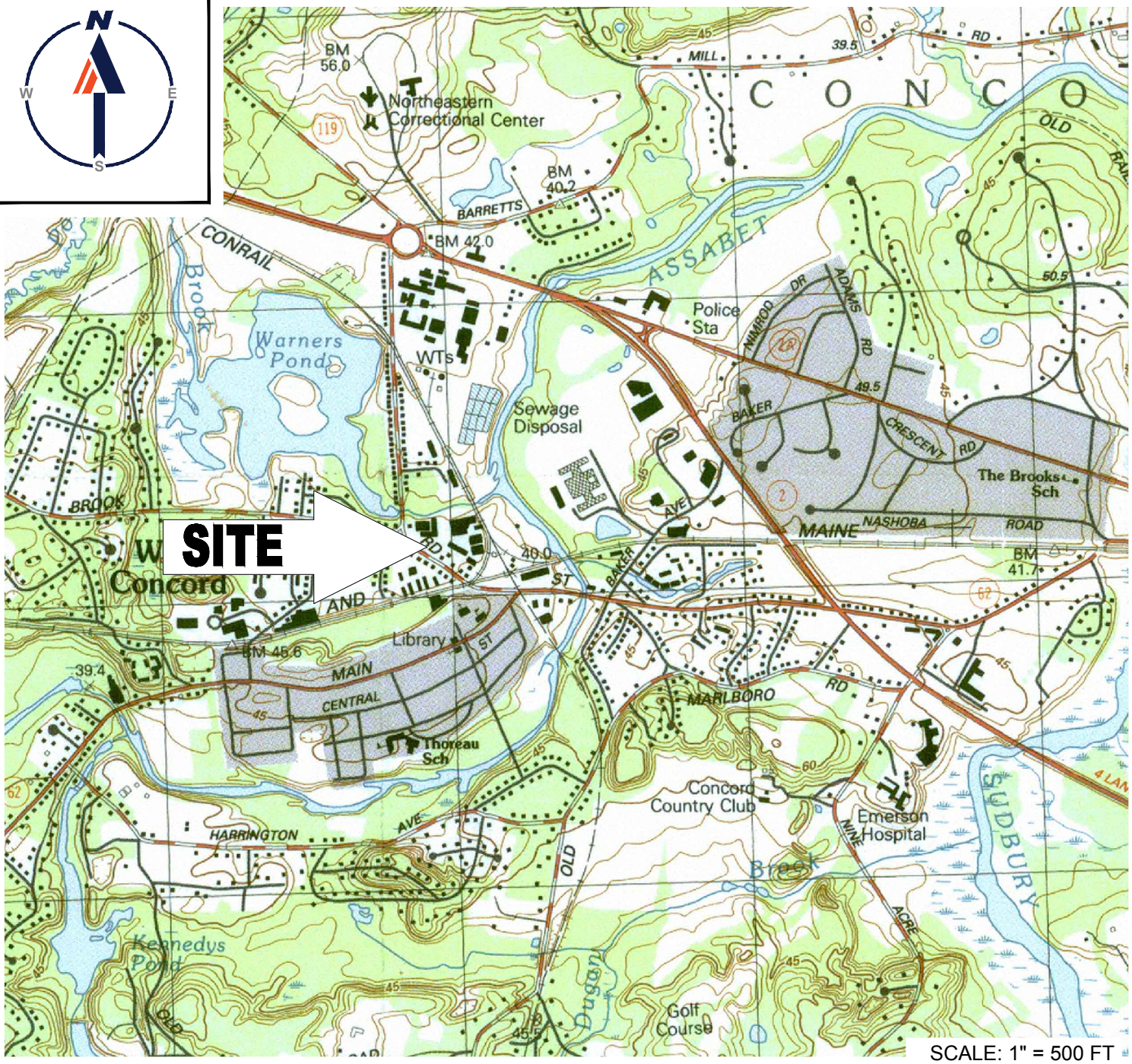
Table 4.3: Peak Flow Summary

	2-year Storm	10-year Storm	25-year Storm	100-year Storm
Approved Existing DP1	9.98	18.19	23.10	30.60
Approved Proposed DP1	9.47	17.75	22.68	30.39
Proposed DP1	9.75	18.07	22.99	30.52
Delta	-0.23	-0.12	-0.11	-0.08

**Flows are represented in cubic feet per second (cfs)*

APPENDIX A: PROJECT LOCATION MAPS

- *USGS MAP*



SCALE: 1" = 500 FT

USGS MAP
FOR
PROPOSED MIXED-USE BUILDING

LOCATION OF SITE
MAP #D09, LOT #2184-1-2
13B COMMONWEALTH AVENUE
TOWN OF CONCORD
MIDDLESEX COUNTY,
MASSACHUSETTS

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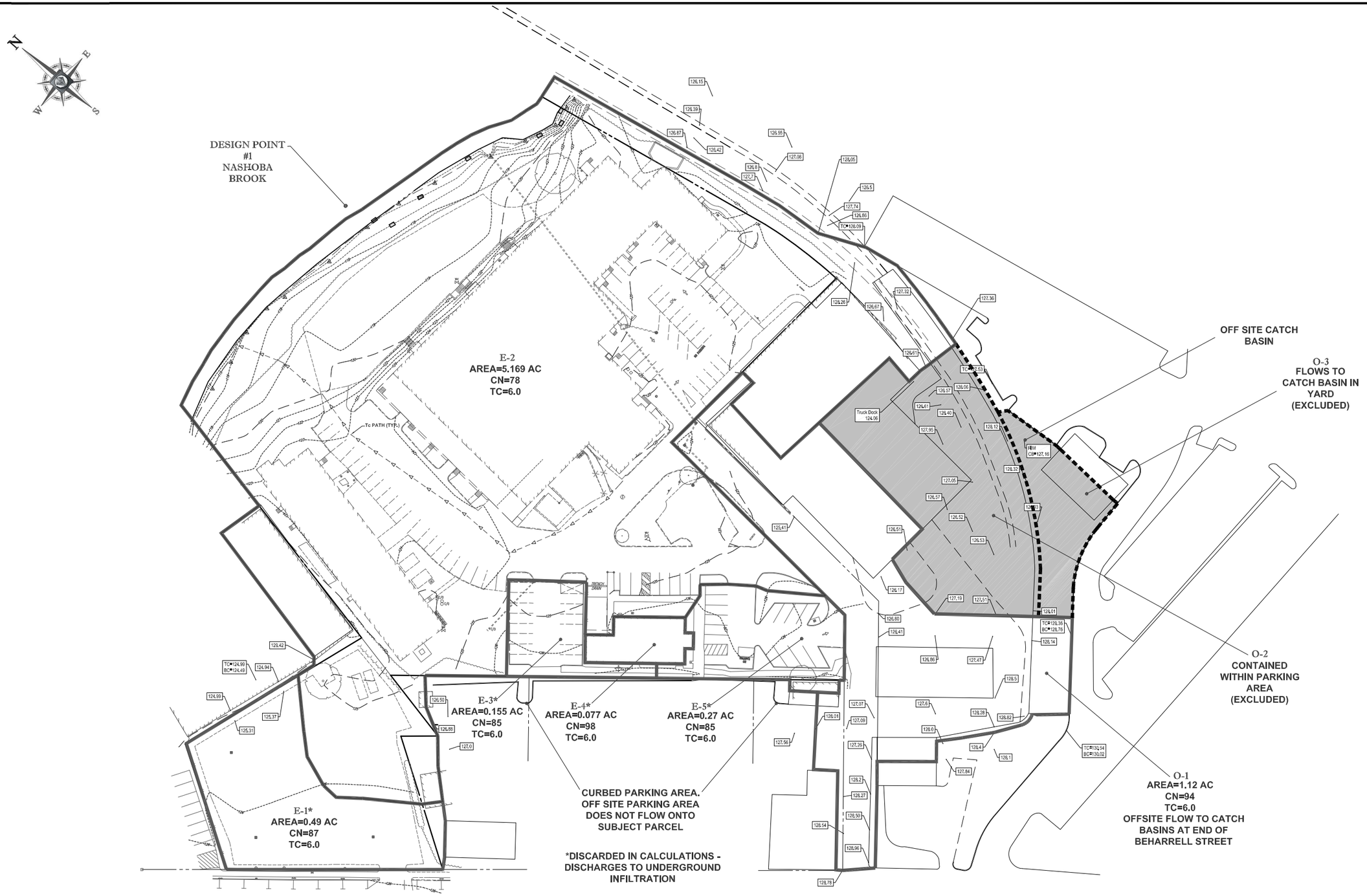
- PHILADELPHIA, PA
- PITTSBURGH, PA
- LEHIGH VALLEY, PA
- SOUTHEASTERN, PA
- REHOBOTH BEACH, DE
- BALTIMORE, MD
- SOUTHERN MARYLAND
- NORTHERN VIRGINIA
- CENTRAL VIRGINIA
- RALEIGH, NC
- WASHINGTON, DC
- CHARLOTTE, NC
- ATLANTA, GA
- TAMPA, FL
- SOUTH FLORIDA
- DALLAS, TX

APPENDIX B: EXISTING APPROVED COMPARISON

- *APPROVED EXISTING CONDITIONS TRIBUTARY MAP*
- *APPROVED EXISTING CONDITIONS HYDROCAD CALCULATIONS*
- *APPROVED PROPOSED CONDITIONS TRIBUTARY MAP*
- *APPROVED PROPOSED CONDITIONS HYDROCAD CALCULATIONS*
- *PROPOSED SITE CONDITIONS DRAINAGE MAP*
- *APPROVED LOT 2184-1-2 EXHIBIT*
- *PROPOSED SITE CONDITIONS HYDROCAD CALCULATIONS*

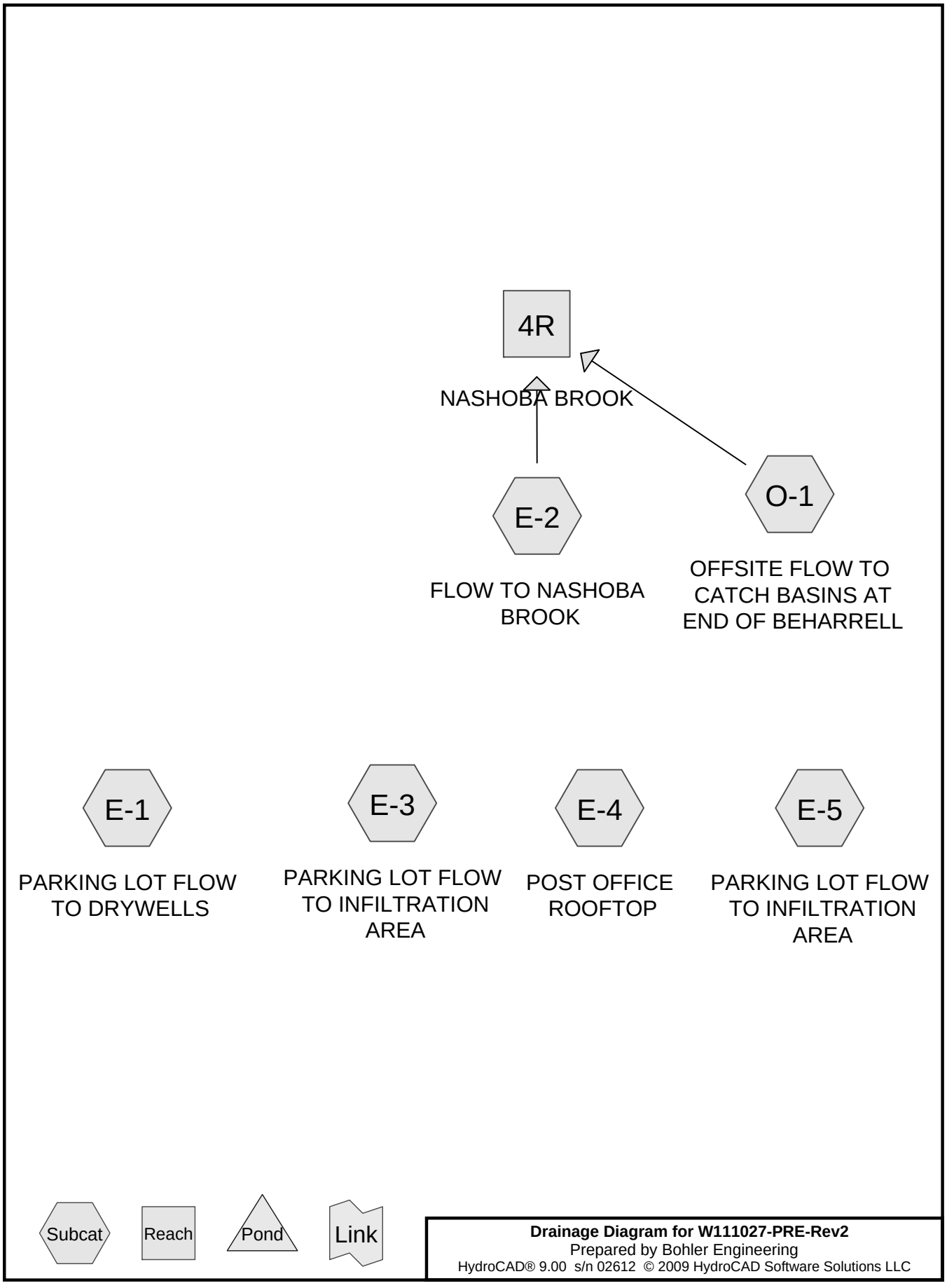


EXISTING DRAINAGE TRIBUTARY MAP

PREPARED BY

BOHLER ENGINEERING

NOT TO SCALE
DATE: APRIL 12, 2013



Drainage Diagram for W111027-PRE-Rev2
Prepared by Bohler Engineering

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.356	30	Woods, Good, HSG A (E-2)
1.529	39	>75% Grass cover, Good, HSG A (E-1, E-2, E-3, E-5, O-1)
0.426	90	Compacted Gravel/Deteriorated Pavement (E-2, O-1)
2.703	98	Paved parking, HSG A (E-1, E-2, E-3, E-5, O-1)
2.109	98	Roofs, HSG A (E-2, E-4, E-5, O-1)
0.158	98	Water Surface, HSG A (E-2)
7.281		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
6.855	HSG A	E-1, E-2, E-3, E-4, E-5, O-1
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.426	Other	E-2, O-1
7.281		**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: PARKING LOT FLOW Runoff Area=0.490 ac 81.63% Impervious Runoff Depth=1.83"
Tc=6.0 min CN=87 Runoff=1.03 cfs 0.075 af

Subcatchment E-2: FLOW TO NASHOBA Runoff Area=5.169 ac 61.15% Impervious Runoff Depth=1.20"
Flow Length=429' Tc=6.0 min CN=78 Runoff=6.98 cfs 0.517 af

Subcatchment E-3: PARKING LOT FLOW Runoff Area=0.155 ac 78.71% Impervious Runoff Depth=1.67"
Tc=6.0 min CN=85 Runoff=0.30 cfs 0.022 af

Subcatchment E-4: POST OFFICE Runoff Area=0.077 ac 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.23 cfs 0.018 af

Subcatchment E-5: PARKING LOT FLOW Runoff Area=0.270 ac 77.78% Impervious Runoff Depth=1.67"
Tc=6.0 min CN=85 Runoff=0.52 cfs 0.038 af

Subcatchment O-1: OFFSITE FLOW TO Runoff Area=1.120 ac 89.29% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=94 Runoff=3.01 cfs 0.228 af

Reach 4R: NASHOBA BROOK Inflow=9.98 cfs 0.746 af
Outflow=9.98 cfs 0.746 af

Total Runoff Area = 7.281 ac Runoff Volume = 0.898 af Average Runoff Depth = 1.48"
31.74% Pervious = 2.311 ac 68.26% Impervious = 4.970 ac

Summary for Subcatchment E-1: PARKING LOT FLOW TO DRYWELLS

Runoff = 1.03 cfs @ 12.09 hrs, Volume= 0.075 af, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.10"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.400	98	Paved parking, HSG A
0.490	87	Weighted Average
0.090		18.37% Pervious Area
0.400		81.63% Impervious Area

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

Summary for Subcatchment E-2: FLOW TO NASHOBA BROOK

Runoff = 6.98 cfs @ 12.10 hrs, Volume= 0.517 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.10"

	Area (ac)	CN	Description
	1.652	98	Roofs, HSG A
	1.351	98	Paved parking, HSG A
*	0.386	90	Compacted Gravel/Deteriorated Pavement
	0.158	98	Water Surface, HSG A
	0.356	30	Woods, Good, HSG A
	1.266	39	>75% Grass cover, Good, HSG A
	5.169	78	Weighted Average
	2.008		38.85% Pervious Area
	3.161		61.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	50	0.0150	0.78		**Sheet Flow,** n= 0.016 P2= 3.10"
2.0	292	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	47	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	40	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.2	429	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment E-3: PARKING LOT FLOW TO INFILTRATION AREA

Runoff = 0.30 cfs @ 12.09 hrs, Volume= 0.022 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.10"

Area (ac)	CN	Description
0.033	39	>75% Grass cover, Good, HSG A
0.122	98	Paved parking, HSG A
0.155	85	Weighted Average
0.033		21.29% Pervious Area
0.122		78.71% Impervious Area

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

Summary for Subcatchment E-4: POST OFFICE ROOFTOP

Runoff = 0.23 cfs @ 12.09 hrs, Volume= 0.018 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.10"

Area (ac)	CN	Description
0.077	98	Roofs, HSG A
0.077		100.00% Impervious Area

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

Summary for Subcatchment E-5: PARKING LOT FLOW TO INFILTRATION AREA

Runoff = 0.52 cfs @ 12.09 hrs, Volume= 0.038 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.10"

Area (ac)	CN	Description
0.200	98	Paved parking, HSG A
0.060	39	>75% Grass cover, Good, HSG A
0.010	98	Roofs, HSG A
0.270	85	Weighted Average
0.060		22.22% Pervious Area
0.210		77.78% Impervious Area

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

Summary for Subcatchment O-1: OFFSITE FLOW TO CATCH BASINS AT END OF BEHARRELL

Runoff = 3.01 cfs @ 12.09 hrs, Volume= 0.228 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.10"

	Area (ac)	CN	Description
	0.080	39	>75% Grass cover, Good, HSG A
*	0.040	90	Compacted Gravel/Deteriorated Pavement
	0.370	98	Roofs, HSG A
	0.630	98	Paved parking, HSG A
	1.120	94	Weighted Average
	0.120		10.71% Pervious Area
	1.000		89.29% Impervious Area

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

Summary for Reach 4R: NASHOBA BROOK

Inflow Area = 6.289 ac, 66.16% Impervious, Inflow Depth = 1.42" for 2 YR event
Inflow = 9.98 cfs @ 12.09 hrs, Volume= 0.746 af
Outflow = 9.98 cfs @ 12.09 hrs, Volume= 0.746 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: PARKING LOT FLOW Runoff Area=0.490 ac 81.63% Impervious Runoff Depth=3.10"
Tc=6.0 min CN=87 Runoff=1.72 cfs 0.127 af

Subcatchment E-2: FLOW TO NASHOBA Runoff Area=5.169 ac 61.15% Impervious Runoff Depth=2.29"
Flow Length=429' Tc=6.0 min CN=78 Runoff=13.61 cfs 0.988 af

Subcatchment E-3: PARKING LOT FLOW Runoff Area=0.155 ac 78.71% Impervious Runoff Depth=2.91"
Tc=6.0 min CN=85 Runoff=0.51 cfs 0.038 af

Subcatchment E-4: POST OFFICE Runoff Area=0.077 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=0.33 cfs 0.027 af

Subcatchment E-5: PARKING LOT FLOW Runoff Area=0.270 ac 77.78% Impervious Runoff Depth=2.91"
Tc=6.0 min CN=85 Runoff=0.90 cfs 0.065 af

Subcatchment O-1: OFFSITE FLOW TO Runoff Area=1.120 ac 89.29% Impervious Runoff Depth=3.82"
Tc=6.0 min CN=94 Runoff=4.58 cfs 0.356 af

Reach 4R: NASHOBA BROOK Inflow=18.19 cfs 1.344 af
Outflow=18.19 cfs 1.344 af

Total Runoff Area = 7.281 ac Runoff Volume = 1.601 af Average Runoff Depth = 2.64"
31.74% Pervious = 2.311 ac 68.26% Impervious = 4.970 ac

Summary for Subcatchment E-1: PARKING LOT FLOW TO DRYWELLS

Runoff = 1.72 cfs @ 12.09 hrs, Volume= 0.127 af, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.400	98	Paved parking, HSG A
0.490	87	Weighted Average
0.090		18.37% Pervious Area
0.400		81.63% Impervious Area

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

Summary for Subcatchment E-2: FLOW TO NASHOBA BROOK

Runoff = 13.61 cfs @ 12.09 hrs, Volume= 0.988 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

	Area (ac)	CN	Description
	1.652	98	Roofs, HSG A
	1.351	98	Paved parking, HSG A
*	0.386	90	Compacted Gravel/Deteriorated Pavement
	0.158	98	Water Surface, HSG A
	0.356	30	Woods, Good, HSG A
	1.266	39	>75% Grass cover, Good, HSG A
	5.169	78	Weighted Average
	2.008		38.85% Pervious Area
	3.161		61.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	50	0.0150	0.78		**Sheet Flow,** n= 0.016 P2= 3.10"
2.0	292	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	47	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	40	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.2	429	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment E-3: PARKING LOT FLOW TO INFILTRATION AREA

Runoff = 0.51 cfs @ 12.09 hrs, Volume= 0.038 af, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

Area (ac)	CN	Description
0.033	39	>75% Grass cover, Good, HSG A
0.122	98	Paved parking, HSG A
0.155	85	Weighted Average
0.033		21.29% Pervious Area
0.122		78.71% Impervious Area

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

Summary for Subcatchment E-4: POST OFFICE ROOFTOP

Runoff = 0.33 cfs @ 12.09 hrs, Volume= 0.027 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

Area (ac)	CN	Description
0.077	98	Roofs, HSG A
0.077		100.00% Impervious Area

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

Summary for Subcatchment E-5: PARKING LOT FLOW TO INFILTRATION AREA

Runoff = 0.90 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

Area (ac)	CN	Description
0.200	98	Paved parking, HSG A
0.060	39	>75% Grass cover, Good, HSG A
0.010	98	Roofs, HSG A
0.270	85	Weighted Average
0.060		22.22% Pervious Area
0.210		77.78% Impervious Area

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

Summary for Subcatchment O-1: OFFSITE FLOW TO CATCH BASINS AT END OF BEHARRELL

Runoff = 4.58 cfs @ 12.09 hrs, Volume= 0.356 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

	Area (ac)	CN	Description
	0.080	39	>75% Grass cover, Good, HSG A
*	0.040	90	Compacted Gravel/Deteriorated Pavement
	0.370	98	Roofs, HSG A
	0.630	98	Paved parking, HSG A
	1.120	94	Weighted Average
	0.120		10.71% Pervious Area
	1.000		89.29% Impervious Area

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

Summary for Reach 4R: NASHOBA BROOK

Inflow Area = 6.289 ac, 66.16% Impervious, Inflow Depth = 2.56" for 10 YR event
Inflow = 18.19 cfs @ 12.09 hrs, Volume= 1.344 af
Outflow = 18.19 cfs @ 12.09 hrs, Volume= 1.344 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: PARKING LOT FLOW Runoff Area=0.490 ac 81.63% Impervious Runoff Depth=3.85"
Tc=6.0 min CN=87 Runoff=2.12 cfs 0.157 af

Subcatchment E-2: FLOW TO NASHOBA Runoff Area=5.169 ac 61.15% Impervious Runoff Depth=2.97"
Flow Length=429' Tc=6.0 min CN=78 Runoff=17.63 cfs 1.279 af

Subcatchment E-3: PARKING LOT FLOW Runoff Area=0.155 ac 78.71% Impervious Runoff Depth=3.65"
Tc=6.0 min CN=85 Runoff=0.64 cfs 0.047 af

Subcatchment E-4: POST OFFICE Runoff Area=0.077 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=0.39 cfs 0.032 af

Subcatchment E-5: PARKING LOT FLOW Runoff Area=0.270 ac 77.78% Impervious Runoff Depth=3.65"
Tc=6.0 min CN=85 Runoff=1.11 cfs 0.082 af

Subcatchment O-1: OFFSITE FLOW TO Runoff Area=1.120 ac 89.29% Impervious Runoff Depth=4.60"
Tc=6.0 min CN=94 Runoff=5.47 cfs 0.430 af

Reach 4R: NASHOBA BROOK Inflow=23.10 cfs 1.708 af
Outflow=23.10 cfs 1.708 af

Total Runoff Area = 7.281 ac Runoff Volume = 2.027 af Average Runoff Depth = 3.34"
31.74% Pervious = 2.311 ac 68.26% Impervious = 4.970 ac

Summary for Subcatchment E-1: PARKING LOT FLOW TO DRYWELLS

Runoff = 2.12 cfs @ 12.09 hrs, Volume= 0.157 af, Depth= 3.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.30"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.400	98	Paved parking, HSG A
0.490	87	Weighted Average
0.090		18.37% Pervious Area
0.400		81.63% Impervious Area

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

Summary for Subcatchment E-2: FLOW TO NASHOBA BROOK

Runoff = 17.63 cfs @ 12.09 hrs, Volume= 1.279 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.30"

	Area (ac)	CN	Description
	1.652	98	Roofs, HSG A
	1.351	98	Paved parking, HSG A
*	0.386	90	Compacted Gravel/Deteriorated Pavement
	0.158	98	Water Surface, HSG A
	0.356	30	Woods, Good, HSG A
	1.266	39	>75% Grass cover, Good, HSG A
	5.169	78	Weighted Average
	2.008		38.85% Pervious Area
	3.161		61.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	50	0.0150	0.78		**Sheet Flow,** n= 0.016 P2= 3.10"
2.0	292	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	47	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	40	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.2	429	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment E-3: PARKING LOT FLOW TO INFILTRATION AREA

Runoff = 0.64 cfs @ 12.09 hrs, Volume= 0.047 af, Depth= 3.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.30"

Area (ac)	CN	Description
0.033	39	>75% Grass cover, Good, HSG A
0.122	98	Paved parking, HSG A
0.155	85	Weighted Average
0.033		21.29% Pervious Area
0.122		78.71% Impervious Area

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

Summary for Subcatchment E-4: POST OFFICE ROOFTOP

Runoff = 0.39 cfs @ 12.09 hrs, Volume= 0.032 af, Depth= 5.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.30"

Area (ac)	CN	Description
0.077	98	Roofs, HSG A
0.077		100.00% Impervious Area

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

Summary for Subcatchment E-5: PARKING LOT FLOW TO INFILTRATION AREA

Runoff = 1.11 cfs @ 12.09 hrs, Volume= 0.082 af, Depth= 3.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.30"

Area (ac)	CN	Description
0.200	98	Paved parking, HSG A
0.060	39	>75% Grass cover, Good, HSG A
0.010	98	Roofs, HSG A
0.270	85	Weighted Average
0.060		22.22% Pervious Area
0.210		77.78% Impervious Area

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

Summary for Subcatchment O-1: OFFSITE FLOW TO CATCH BASINS AT END OF BEHARRELL

Runoff = 5.47 cfs @ 12.09 hrs, Volume= 0.430 af, Depth= 4.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.30"

	Area (ac)	CN	Description
	0.080	39	>75% Grass cover, Good, HSG A
*	0.040	90	Compacted Gravel/Deteriorated Pavement
	0.370	98	Roofs, HSG A
	0.630	98	Paved parking, HSG A
	1.120	94	Weighted Average
	0.120		10.71% Pervious Area
	1.000		89.29% Impervious Area

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

Summary for Reach 4R: NASHOBA BROOK

Inflow Area = 6.289 ac, 66.16% Impervious, Inflow Depth = 3.26" for 25 YR event
Inflow = 23.10 cfs @ 12.09 hrs, Volume= 1.708 af
Outflow = 23.10 cfs @ 12.09 hrs, Volume= 1.708 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: PARKING LOT FLOW Runoff Area=0.490 ac 81.63% Impervious Runoff Depth=5.00"
Tc=6.0 min CN=87 Runoff=2.71 cfs 0.204 af

Subcatchment E-2: FLOW TO NASHOBA Runoff Area=5.169 ac 61.15% Impervious Runoff Depth=4.02"
Flow Length=429' Tc=6.0 min CN=78 Runoff=23.81 cfs 1.733 af

Subcatchment E-3: PARKING LOT FLOW Runoff Area=0.155 ac 78.71% Impervious Runoff Depth=4.78"
Tc=6.0 min CN=85 Runoff=0.83 cfs 0.062 af

Subcatchment E-4: POST OFFICE Runoff Area=0.077 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=0.48 cfs 0.040 af

Subcatchment E-5: PARKING LOT FLOW Runoff Area=0.270 ac 77.78% Impervious Runoff Depth=4.78"
Tc=6.0 min CN=85 Runoff=1.44 cfs 0.107 af

Subcatchment O-1: OFFSITE FLOW TO Runoff Area=1.120 ac 89.29% Impervious Runoff Depth=5.79"
Tc=6.0 min CN=94 Runoff=6.79 cfs 0.541 af

Reach 4R: NASHOBA BROOK Inflow=30.60 cfs 2.274 af
Outflow=30.60 cfs 2.274 af

Total Runoff Area = 7.281 ac Runoff Volume = 2.687 af Average Runoff Depth = 4.43"
31.74% Pervious = 2.311 ac 68.26% Impervious = 4.970 ac

Summary for Subcatchment E-1: PARKING LOT FLOW TO DRYWELLS

Runoff = 2.71 cfs @ 12.09 hrs, Volume= 0.204 af, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=6.50"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.400	98	Paved parking, HSG A
0.490	87	Weighted Average
0.090		18.37% Pervious Area
0.400		81.63% Impervious Area

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

Summary for Subcatchment E-2: FLOW TO NASHOBA BROOK

Runoff = 23.81 cfs @ 12.09 hrs, Volume= 1.733 af, Depth= 4.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=6.50"

	Area (ac)	CN	Description
	1.652	98	Roofs, HSG A
	1.351	98	Paved parking, HSG A
*	0.386	90	Compacted Gravel/Deteriorated Pavement
	0.158	98	Water Surface, HSG A
	0.356	30	Woods, Good, HSG A
	1.266	39	>75% Grass cover, Good, HSG A
	5.169	78	Weighted Average
	2.008		38.85% Pervious Area
	3.161		61.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	50	0.0150	0.78		**Sheet Flow,** n= 0.016 P2= 3.10"
2.0	292	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	47	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	40	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.2	429	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment E-3: PARKING LOT FLOW TO INFILTRATION AREA

Runoff = 0.83 cfs @ 12.09 hrs, Volume= 0.062 af, Depth= 4.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=6.50"

Area (ac)	CN	Description
0.033	39	>75% Grass cover, Good, HSG A
0.122	98	Paved parking, HSG A
0.155	85	Weighted Average
0.033		21.29% Pervious Area
0.122		78.71% Impervious Area

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

Summary for Subcatchment E-4: POST OFFICE ROOFTOP

Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.040 af, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=6.50"

Area (ac)	CN	Description
0.077	98	Roofs, HSG A
0.077		100.00% Impervious Area

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

Summary for Subcatchment E-5: PARKING LOT FLOW TO INFILTRATION AREA

Runoff = 1.44 cfs @ 12.09 hrs, Volume= 0.107 af, Depth= 4.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=6.50"

Area (ac)	CN	Description
0.200	98	Paved parking, HSG A
0.060	39	>75% Grass cover, Good, HSG A
0.010	98	Roofs, HSG A
0.270	85	Weighted Average
0.060		22.22% Pervious Area
0.210		77.78% Impervious Area

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

Summary for Subcatchment O-1: OFFSITE FLOW TO CATCH BASINS AT END OF BEHARRELL

Runoff = 6.79 cfs @ 12.09 hrs, Volume= 0.541 af, Depth= 5.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=6.50"

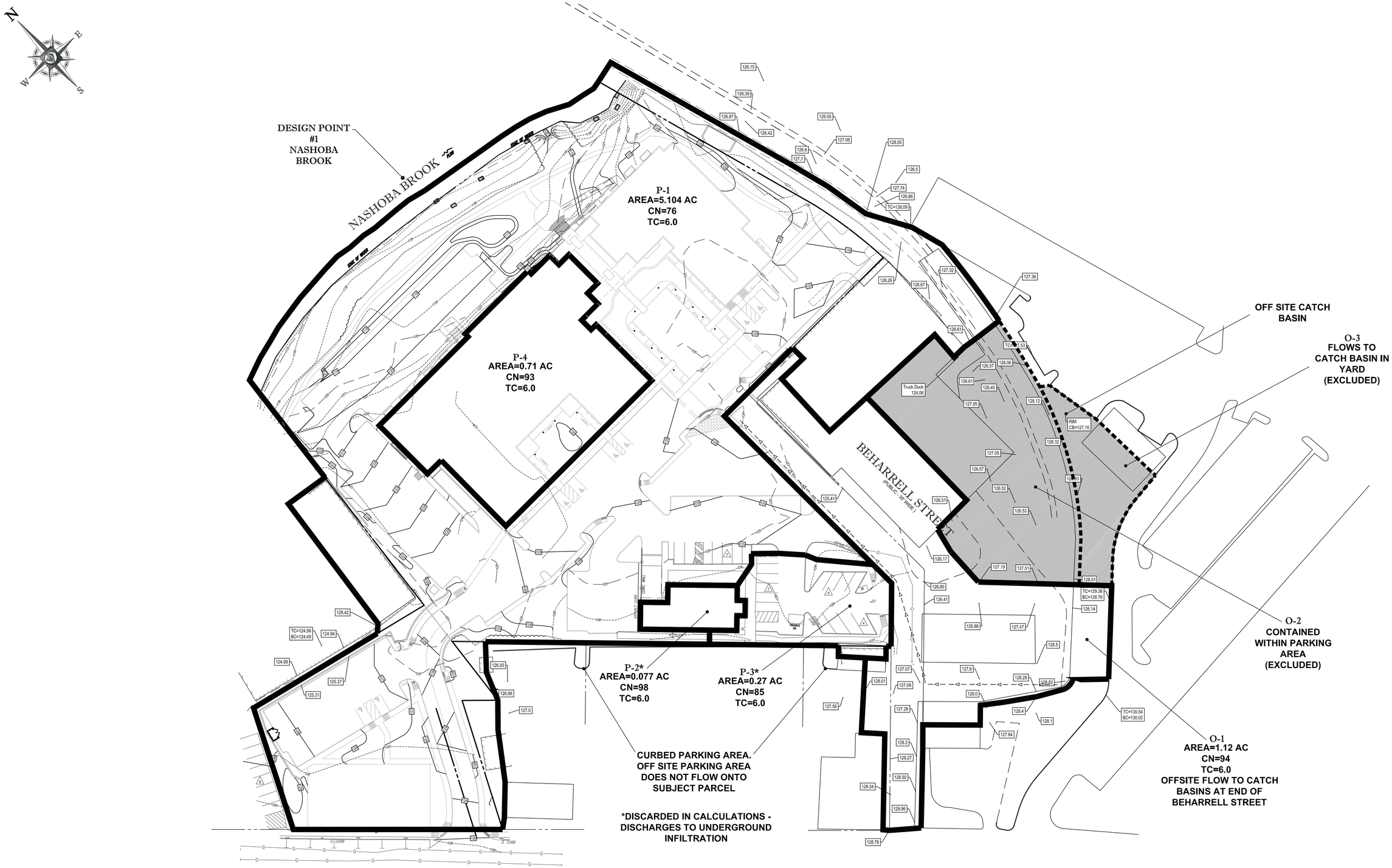
	Area (ac)	CN	Description
	0.080	39	>75% Grass cover, Good, HSG A
*	0.040	90	Compacted Gravel/Deteriorated Pavement
	0.370	98	Roofs, HSG A
	0.630	98	Paved parking, HSG A
	1.120	94	Weighted Average
	0.120		10.71% Pervious Area
	1.000		89.29% Impervious Area

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

Summary for Reach 4R: NASHOBA BROOK

Inflow Area = 6.289 ac, 66.16% Impervious, Inflow Depth = 4.34" for 100 YR event
Inflow = 30.60 cfs @ 12.09 hrs, Volume= 2.274 af
Outflow = 30.60 cfs @ 12.09 hrs, Volume= 2.274 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

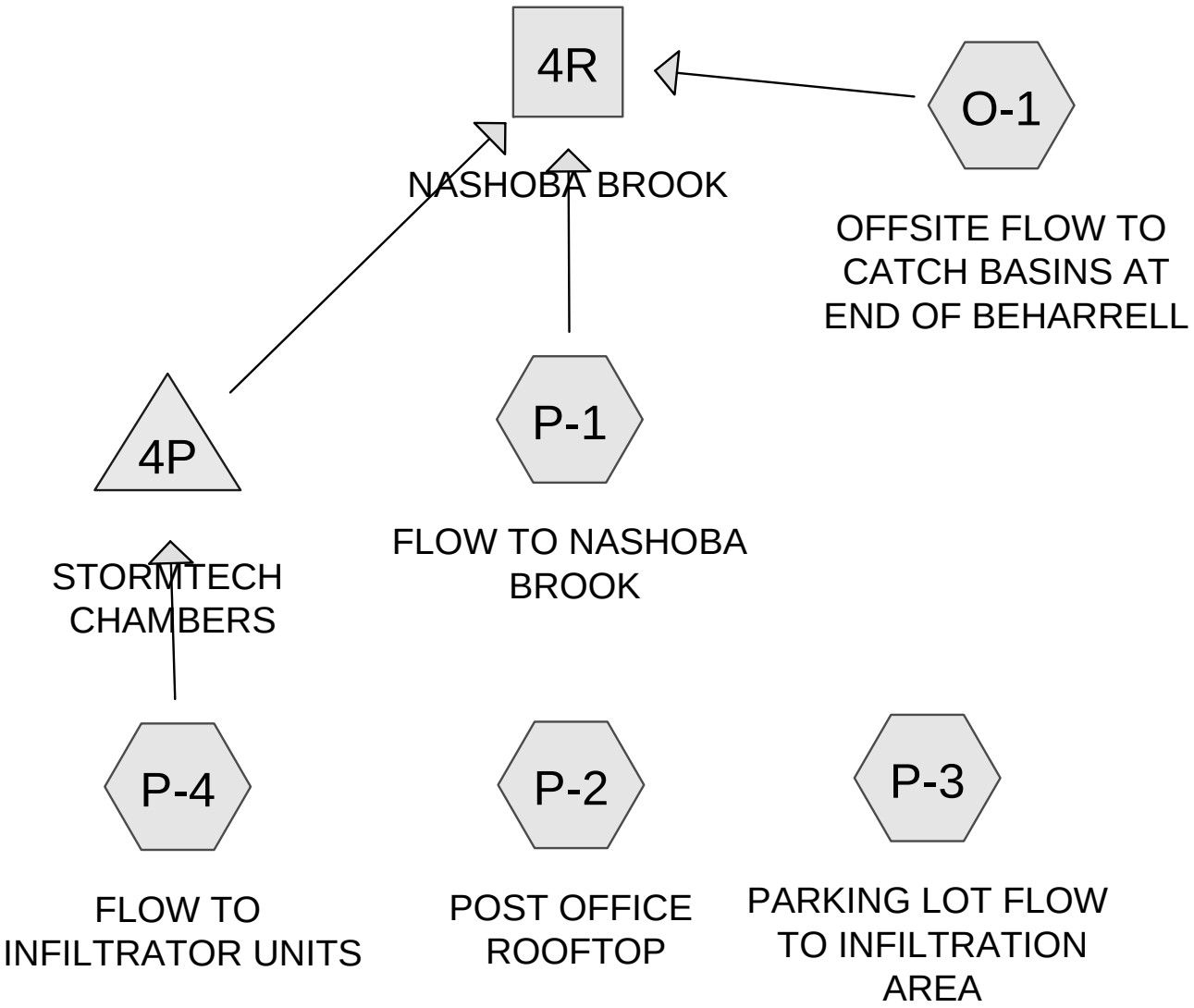


PROPOSED DRAINAGE TRIBUTARY MAP

PREPARED BY

BOHLER ENGINEERING

NOT TO SCALE
DATE: APRIL 12, 2013



Subcat Reach Pond Link

Drainage Diagram for W111027-POST-REV2
Prepared by Bohler Engineering

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.330	30	Woods, Good, HSG A (P-1)
1.706	39	>75% Grass cover, Good, HSG A (O-1, P-1, P-3, P-4)
0.090	90	Compacted Gravel/Deteriorated Pavement (O-1, P-1)
3.020	98	Paved parking, HSG A (O-1, P-1, P-3, P-4)
1.977	98	Roofs, HSG A (O-1, P-1, P-2, P-3, P-4)
0.158	98	Water Surface, HSG A (P-1)
7.281		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
7.191	HSG A	O-1, P-1, P-2, P-3, P-4
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.090	Other	O-1, P-1
7.281		**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment O-1: OFFSITE FLOW TO Runoff Area=1.120 ac 89.29% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=94 Runoff=3.01 cfs 0.228 af

Subcatchment P-1: FLOW TO NASHOBA Runoff Area=5.104 ac 63.05% Impervious Runoff Depth=1.08"
Tc=6.0 min CN=76 Runoff=6.13 cfs 0.461 af

Subcatchment P-2: POST OFFICE Runoff Area=0.077 ac 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.23 cfs 0.018 af

Subcatchment P-3: PARKING LOT FLOW Runoff Area=0.270 ac 77.78% Impervious Runoff Depth=1.67"
Tc=6.0 min CN=85 Runoff=0.52 cfs 0.038 af

Subcatchment P-4: FLOW TO Runoff Area=0.710 ac 91.55% Impervious Runoff Depth=2.35"
Tc=6.0 min CN=93 Runoff=1.86 cfs 0.139 af

Reach 4R: NASHOBA BROOK Inflow=9.47 cfs 0.716 af
Outflow=9.47 cfs 0.716 af

Pond 4P: STORMTECH CHAMBERS Peak Elev=122.01' Storage=1,076 cf Inflow=1.86 cfs 0.139 af
Discarded=0.30 cfs 0.113 af Primary=0.57 cfs 0.027 af Outflow=0.87 cfs 0.139 af

Total Runoff Area = 7.281 ac Runoff Volume = 0.884 af Average Runoff Depth = 1.46"
29.20% Pervious = 2.126 ac 70.80% Impervious = 5.155 ac

Summary for Subcatchment O-1: OFFSITE FLOW TO CATCH BASINS AT END OF BEHARRELL

Runoff = 3.01 cfs @ 12.09 hrs, Volume= 0.228 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.10"

	Area (ac)	CN	Description
	0.080	39	>75% Grass cover, Good, HSG A
*	0.040	90	Compacted Gravel/Deteriorated Pavement
	0.370	98	Roofs, HSG A
	0.630	98	Paved parking, HSG A
	1.120	94	Weighted Average
	0.120		10.71% Pervious Area
	1.000		89.29% Impervious Area

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

Summary for Subcatchment P-1: FLOW TO NASHOBA BROOK

Runoff = 6.13 cfs @ 12.10 hrs, Volume= 0.461 af, Depth= 1.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.10"

	Area (ac)	CN	Description
	0.890	98	Roofs, HSG A
	2.170	98	Paved parking, HSG A
	0.158	98	Water Surface, HSG A
	0.330	30	Woods, Good, HSG A
	1.506	39	>75% Grass cover, Good, HSG A
*	0.050	90	Compacted Gravel/Deteriorated Pavement
	5.104	76	Weighted Average
	1.886		36.95% Pervious Area
	3.218		63.05% Impervious Area

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

Summary for Subcatchment P-2: POST OFFICE ROOFTOP

Runoff = 0.23 cfs @ 12.09 hrs, Volume= 0.018 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.10"

Area (ac)	CN	Description
0.077	98	Roofs, HSG A
0.077		100.00% Impervious Area

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

Summary for Subcatchment P-3: PARKING LOT FLOW TO INFILTRATION AREA

Runoff = 0.52 cfs @ 12.09 hrs, Volume= 0.038 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.10"

Area (ac)	CN	Description
0.200	98	Paved parking, HSG A
0.060	39	>75% Grass cover, Good, HSG A
0.010	98	Roofs, HSG A
0.270	85	Weighted Average
0.060		22.22% Pervious Area
0.210		77.78% Impervious Area

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

Summary for Subcatchment P-4: FLOW TO INFILTRATOR UNITS

Runoff = 1.86 cfs @ 12.09 hrs, Volume= 0.139 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.10"

Area (ac)	CN	Description
0.020	98	Paved parking, HSG A
0.060	39	>75% Grass cover, Good, HSG A
0.630	98	Roofs, HSG A
0.710	93	Weighted Average
0.060		8.45% Pervious Area
0.650		91.55% Impervious Area

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

Summary for Reach 4R: NASHOBA BROOK

Inflow Area = 6.934 ac, 70.20% Impervious, Inflow Depth = 1.24" for 2 YR event
Inflow = 9.47 cfs @ 12.10 hrs, Volume= 0.716 af
Outflow = 9.47 cfs @ 12.10 hrs, Volume= 0.716 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond 4P: STORMTECH CHAMBERS

Inflow Area = 0.710 ac, 91.55% Impervious, Inflow Depth = 2.35" for 2 YR event
Inflow = 1.86 cfs @ 12.09 hrs, Volume= 0.139 af
Outflow = 0.87 cfs @ 12.27 hrs, Volume= 0.139 af, Atten= 53%, Lag= 10.6 min
Discarded = 0.30 cfs @ 11.75 hrs, Volume= 0.113 af
Primary = 0.57 cfs @ 12.27 hrs, Volume= 0.027 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 122.01' @ 12.27 hrs Surf.Area= 1,560 sf Storage= 1,076 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 10.3 min (804.0 - 793.8)

Volume	Invert	Avail.Storage	Storage Description
#1	120.90'	1,450 cf	**37.60'W x 41.50'L x 3.50'H Prismatoid** 5,461 cf Overall - 1,838 cf Embedded = 3,624 cf x 40.0% Voids
#2	121.40'	1,838 cf	**StormTech SC-740** x 40 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		3,287 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	120.90'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	121.40'	**12.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Outlet Invert= 120.00' S= 0.0359 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#3	Device 2	121.40'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	124.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.30 cfs @ 11.75 hrs HW=120.94' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=0.57 cfs @ 12.27 hrs HW=122.01' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Passes 0.57 cfs of 1.34 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.57 cfs @ 2.90 fps)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment O-1: OFFSITE FLOW TO Runoff Area=1.120 ac 89.29% Impervious Runoff Depth=3.82"
Tc=6.0 min CN=94 Runoff=4.58 cfs 0.356 af

Subcatchment P-1: FLOW TO NASHOBA Runoff Area=5.104 ac 63.05% Impervious Runoff Depth=2.13"
Tc=6.0 min CN=76 Runoff=12.45 cfs 0.906 af

Subcatchment P-2: POST OFFICE Runoff Area=0.077 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=0.33 cfs 0.027 af

Subcatchment P-3: PARKING LOT FLOW Runoff Area=0.270 ac 77.78% Impervious Runoff Depth=2.91"
Tc=6.0 min CN=85 Runoff=0.90 cfs 0.065 af

Subcatchment P-4: FLOW TO Runoff Area=0.710 ac 91.55% Impervious Runoff Depth=3.71"
Tc=6.0 min CN=93 Runoff=2.85 cfs 0.219 af

Reach 4R: NASHOBA BROOK Inflow=17.75 cfs 1.325 af
Outflow=17.75 cfs 1.325 af

Pond 4P: STORMTECH CHAMBERS Peak Elev=122.66' Storage=1,833 cf Inflow=2.85 cfs 0.219 af
Discarded=0.30 cfs 0.157 af Primary=0.95 cfs 0.063 af Outflow=1.25 cfs 0.219 af

Total Runoff Area = 7.281 ac Runoff Volume = 1.574 af Average Runoff Depth = 2.59"
29.20% Pervious = 2.126 ac 70.80% Impervious = 5.155 ac

Summary for Subcatchment O-1: OFFSITE FLOW TO CATCH BASINS AT END OF BEHARRELL

Runoff = 4.58 cfs @ 12.09 hrs, Volume= 0.356 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

	Area (ac)	CN	Description
	0.080	39	>75% Grass cover, Good, HSG A
*	0.040	90	Compacted Gravel/Deteriorated Pavement
	0.370	98	Roofs, HSG A
	0.630	98	Paved parking, HSG A
	1.120	94	Weighted Average
	0.120		10.71% Pervious Area
	1.000		89.29% Impervious Area

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

Summary for Subcatchment P-1: FLOW TO NASHOBA BROOK

Runoff = 12.45 cfs @ 12.09 hrs, Volume= 0.906 af, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

	Area (ac)	CN	Description
	0.890	98	Roofs, HSG A
	2.170	98	Paved parking, HSG A
	0.158	98	Water Surface, HSG A
	0.330	30	Woods, Good, HSG A
	1.506	39	>75% Grass cover, Good, HSG A
*	0.050	90	Compacted Gravel/Deteriorated Pavement
	5.104	76	Weighted Average
	1.886		36.95% Pervious Area
	3.218		63.05% Impervious Area

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

Summary for Subcatchment P-2: POST OFFICE ROOFTOP

Runoff = 0.33 cfs @ 12.09 hrs, Volume= 0.027 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

Area (ac)	CN	Description
0.077	98	Roofs, HSG A
0.077		100.00% Impervious Area

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

Summary for Subcatchment P-3: PARKING LOT FLOW TO INFILTRATION AREA

Runoff = 0.90 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

Area (ac)	CN	Description
0.200	98	Paved parking, HSG A
0.060	39	>75% Grass cover, Good, HSG A
0.010	98	Roofs, HSG A
0.270	85	Weighted Average
0.060		22.22% Pervious Area
0.210		77.78% Impervious Area

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

Summary for Subcatchment P-4: FLOW TO INFILTRATOR UNITS

Runoff = 2.85 cfs @ 12.09 hrs, Volume= 0.219 af, Depth= 3.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.50"

Area (ac)	CN	Description
0.020	98	Paved parking, HSG A
0.060	39	>75% Grass cover, Good, HSG A
0.630	98	Roofs, HSG A
0.710	93	Weighted Average
0.060		8.45% Pervious Area
0.650		91.55% Impervious Area

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

Summary for Reach 4R: NASHOBA BROOK

Inflow Area = 6.934 ac, 70.20% Impervious, Inflow Depth = 2.29" for 10 YR event
Inflow = 17.75 cfs @ 12.09 hrs, Volume= 1.325 af
Outflow = 17.75 cfs @ 12.09 hrs, Volume= 1.325 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond 4P: STORMTECH CHAMBERS

Inflow Area = 0.710 ac, 91.55% Impervious, Inflow Depth = 3.71" for 10 YR event
Inflow = 2.85 cfs @ 12.09 hrs, Volume= 0.219 af
Outflow = 1.25 cfs @ 12.28 hrs, Volume= 0.219 af, Atten= 56%, Lag= 11.6 min
Discarded = 0.30 cfs @ 11.65 hrs, Volume= 0.157 af
Primary = 0.95 cfs @ 12.28 hrs, Volume= 0.063 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 122.66' @ 12.28 hrs Surf.Area= 1,560 sf Storage= 1,833 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 12.0 min (793.5 - 781.5)

Volume	Invert	Avail.Storage	Storage Description
#1	120.90'	1,450 cf	**37.60'W x 41.50'L x 3.50'H Prismatoid** 5,461 cf Overall - 1,838 cf Embedded = 3,624 cf x 40.0% Voids
#2	121.40'	1,838 cf	**StormTech SC-740** x 40 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		3,287 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	120.90'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	121.40'	**12.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Outlet Invert= 120.00' S= 0.0359 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#3	Device 2	121.40'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	124.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.30 cfs @ 11.65 hrs HW=120.96' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=0.95 cfs @ 12.28 hrs HW=122.66' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Passes 0.95 cfs of 3.29 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.95 cfs @ 4.84 fps)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment O-1: OFFSITE FLOW TO Runoff Area=1.120 ac 89.29% Impervious Runoff Depth=4.60"
Tc=6.0 min CN=94 Runoff=5.47 cfs 0.430 af

Subcatchment P-1: FLOW TO NASHOBA Runoff Area=5.104 ac 63.05% Impervious Runoff Depth=2.78"
Tc=6.0 min CN=76 Runoff=16.34 cfs 1.184 af

Subcatchment P-2: POST OFFICE Runoff Area=0.077 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=0.39 cfs 0.032 af

Subcatchment P-3: PARKING LOT FLOW Runoff Area=0.270 ac 77.78% Impervious Runoff Depth=3.65"
Tc=6.0 min CN=85 Runoff=1.11 cfs 0.082 af

Subcatchment P-4: FLOW TO Runoff Area=0.710 ac 91.55% Impervious Runoff Depth=4.49"
Tc=6.0 min CN=93 Runoff=3.42 cfs 0.266 af

Reach 4R: NASHOBA BROOK Inflow=22.68 cfs 1.700 af
Outflow=22.68 cfs 1.700 af

Pond 4P: STORMTECH CHAMBERS Peak Elev=123.10' Storage=2,302 cf Inflow=3.42 cfs 0.266 af
Discarded=0.30 cfs 0.180 af Primary=1.14 cfs 0.086 af Outflow=1.44 cfs 0.266 af

Total Runoff Area = 7.281 ac Runoff Volume = 1.995 af Average Runoff Depth = 3.29"
29.20% Pervious = 2.126 ac 70.80% Impervious = 5.155 ac

Summary for Subcatchment O-1: OFFSITE FLOW TO CATCH BASINS AT END OF BEHARRELL

Runoff = 5.47 cfs @ 12.09 hrs, Volume= 0.430 af, Depth= 4.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.30"

	Area (ac)	CN	Description
	0.080	39	>75% Grass cover, Good, HSG A
*	0.040	90	Compacted Gravel/Deteriorated Pavement
	0.370	98	Roofs, HSG A
	0.630	98	Paved parking, HSG A
	1.120	94	Weighted Average
	0.120		10.71% Pervious Area
	1.000		89.29% Impervious Area

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

Summary for Subcatchment P-1: FLOW TO NASHOBA BROOK

Runoff = 16.34 cfs @ 12.09 hrs, Volume= 1.184 af, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.30"

	Area (ac)	CN	Description
	0.890	98	Roofs, HSG A
	2.170	98	Paved parking, HSG A
	0.158	98	Water Surface, HSG A
	0.330	30	Woods, Good, HSG A
	1.506	39	>75% Grass cover, Good, HSG A
*	0.050	90	Compacted Gravel/Deteriorated Pavement
	5.104	76	Weighted Average
	1.886		36.95% Pervious Area
	3.218		63.05% Impervious Area

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

Summary for Subcatchment P-2: POST OFFICE ROOFTOP

Runoff = 0.39 cfs @ 12.09 hrs, Volume= 0.032 af, Depth= 5.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.30"

Area (ac)	CN	Description
0.077	98	Roofs, HSG A
0.077		100.00% Impervious Area

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

Summary for Subcatchment P-3: PARKING LOT FLOW TO INFILTRATION AREA

Runoff = 1.11 cfs @ 12.09 hrs, Volume= 0.082 af, Depth= 3.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.30"

Area (ac)	CN	Description
0.200	98	Paved parking, HSG A
0.060	39	>75% Grass cover, Good, HSG A
0.010	98	Roofs, HSG A
0.270	85	Weighted Average
0.060		22.22% Pervious Area
0.210		77.78% Impervious Area

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

Summary for Subcatchment P-4: FLOW TO INFILTRATOR UNITS

Runoff = 3.42 cfs @ 12.09 hrs, Volume= 0.266 af, Depth= 4.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.30"

Area (ac)	CN	Description
0.020	98	Paved parking, HSG A
0.060	39	>75% Grass cover, Good, HSG A
0.630	98	Roofs, HSG A
0.710	93	Weighted Average
0.060		8.45% Pervious Area
0.650		91.55% Impervious Area

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

Summary for Reach 4R: NASHOBA BROOK

Inflow Area = 6.934 ac, 70.20% Impervious, Inflow Depth = 2.94" for 25 YR event
Inflow = 22.68 cfs @ 12.09 hrs, Volume= 1.700 af
Outflow = 22.68 cfs @ 12.09 hrs, Volume= 1.700 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond 4P: STORMTECH CHAMBERS

Inflow Area = 0.710 ac, 91.55% Impervious, Inflow Depth = 4.49" for 25 YR event
Inflow = 3.42 cfs @ 12.09 hrs, Volume= 0.266 af
Outflow = 1.44 cfs @ 12.29 hrs, Volume= 0.266 af, Atten= 58%, Lag= 12.4 min
Discarded = 0.30 cfs @ 11.50 hrs, Volume= 0.180 af
Primary = 1.14 cfs @ 12.29 hrs, Volume= 0.086 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 123.10' @ 12.29 hrs Surf.Area= 1,560 sf Storage= 2,302 cf

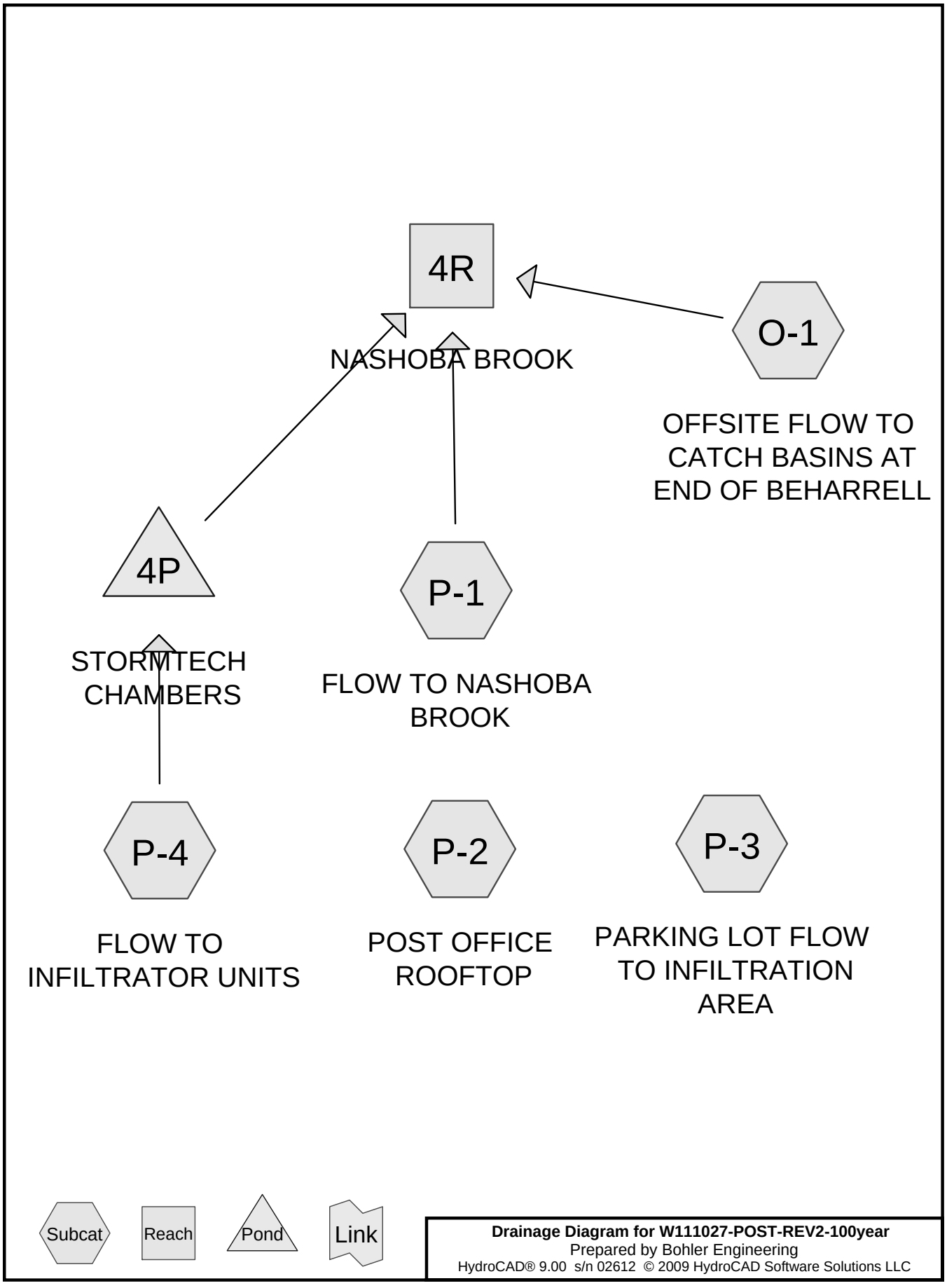
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 13.4 min (790.0 - 776.6)

Volume	Invert	Avail.Storage	Storage Description
#1	120.90'	1,450 cf	**37.60'W x 41.50'L x 3.50'H Prismatoid** 5,461 cf Overall - 1,838 cf Embedded = 3,624 cf x 40.0% Voids
#2	121.40'	1,838 cf	**StormTech SC-740** x 40 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		3,287 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	120.90'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	121.40'	**12.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Outlet Invert= 120.00' S= 0.0359 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#3	Device 2	121.40'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	124.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.30 cfs @ 11.50 hrs HW=120.94' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=1.14 cfs @ 12.29 hrs HW=123.10' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Passes 1.14 cfs of 4.14 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 1.14 cfs @ 5.79 fps)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)



Drainage Diagram for W111027-POST-REV2-100year
Prepared by Bohler Engineering

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.330	30	Woods, Good, HSG A (P-1)
1.706	39	>75% Grass cover, Good, HSG A (O-1, P-1, P-3, P-4)
0.090	90	Compacted Gravel/Deteriorated Pavement (O-1, P-1)
3.020	98	Paved parking, HSG A (O-1, P-1, P-3, P-4)
1.977	98	Roofs, HSG A (O-1, P-1, P-2, P-3, P-4)
0.158	98	Water Surface, HSG A (P-1)
7.281		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
7.191	HSG A	O-1, P-1, P-2, P-3, P-4
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.090	Other	O-1, P-1
7.281		**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment O-1: OFFSITE FLOW TO Runoff Area=1.120 ac 89.29% Impervious Runoff Depth=5.79"
Tc=6.0 min CN=94 Runoff=6.79 cfs 0.541 af

Subcatchment P-1: FLOW TO NASHOBA Runoff Area=5.104 ac 63.05% Impervious Runoff Depth=3.82"
Tc=6.0 min CN=76 Runoff=22.35 cfs 1.623 af

Subcatchment P-2: POST OFFICE Runoff Area=0.077 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=0.48 cfs 0.040 af

Subcatchment P-3: PARKING LOT FLOW Runoff Area=0.270 ac 77.78% Impervious Runoff Depth=4.78"
Tc=6.0 min CN=85 Runoff=1.44 cfs 0.107 af

Subcatchment P-4: FLOW TO Runoff Area=0.710 ac 91.55% Impervious Runoff Depth=5.68"
Tc=6.0 min CN=93 Runoff=4.26 cfs 0.336 af

Reach 4R: NASHOBA BROOK Inflow=30.39 cfs 2.499 af
Outflow=30.39 cfs 2.499 af

Pond 4P: STORMTECH CHAMBERS Peak Elev=124.23' Storage=3,182 cf Inflow=4.26 cfs 0.336 af
Outflow=2.96 cfs 0.335 af

Total Runoff Area = 7.281 ac Runoff Volume = 2.647 af Average Runoff Depth = 4.36"
29.20% Pervious = 2.126 ac 70.80% Impervious = 5.155 ac

Summary for Subcatchment O-1: OFFSITE FLOW TO CATCH BASINS AT END OF BEHARRELL

Runoff = 6.79 cfs @ 12.09 hrs, Volume= 0.541 af, Depth= 5.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=6.50"

	Area (ac)	CN	Description
	0.080	39	>75% Grass cover, Good, HSG A
*	0.040	90	Compacted Gravel/Deteriorated Pavement
	0.370	98	Roofs, HSG A
	0.630	98	Paved parking, HSG A
	1.120	94	Weighted Average
	0.120		10.71% Pervious Area
	1.000		89.29% Impervious Area

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

Summary for Subcatchment P-1: FLOW TO NASHOBA BROOK

Runoff = 22.35 cfs @ 12.09 hrs, Volume= 1.623 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=6.50"

	Area (ac)	CN	Description
	0.890	98	Roofs, HSG A
	2.170	98	Paved parking, HSG A
	0.158	98	Water Surface, HSG A
	0.330	30	Woods, Good, HSG A
	1.506	39	>75% Grass cover, Good, HSG A
*	0.050	90	Compacted Gravel/Deteriorated Pavement
	5.104	76	Weighted Average
	1.886		36.95% Pervious Area
	3.218		63.05% Impervious Area

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

Summary for Subcatchment P-2: POST OFFICE ROOFTOP

Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.040 af, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=6.50"

Area (ac)	CN	Description
0.077	98	Roofs, HSG A
0.077		100.00% Impervious Area

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

Summary for Subcatchment P-3: PARKING LOT FLOW TO INFILTRATION AREA

Runoff = 1.44 cfs @ 12.09 hrs, Volume= 0.107 af, Depth= 4.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=6.50"

Area (ac)	CN	Description
0.200	98	Paved parking, HSG A
0.060	39	>75% Grass cover, Good, HSG A
0.010	98	Roofs, HSG A
0.270	85	Weighted Average
0.060		22.22% Pervious Area
0.210		77.78% Impervious Area

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

Summary for Subcatchment P-4: FLOW TO INFILTRATOR UNITS

Runoff = 4.26 cfs @ 12.09 hrs, Volume= 0.336 af, Depth= 5.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=6.50"

Area (ac)	CN	Description
0.020	98	Paved parking, HSG A
0.060	39	>75% Grass cover, Good, HSG A
0.630	98	Roofs, HSG A
0.710	93	Weighted Average
0.060		8.45% Pervious Area
0.650		91.55% Impervious Area

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

Summary for Reach 4R: NASHOBA BROOK

Inflow Area = 6.934 ac, 70.20% Impervious, Inflow Depth = 4.32" for 100 YR event
Inflow = 30.39 cfs @ 12.09 hrs, Volume= 2.499 af
Outflow = 30.39 cfs @ 12.09 hrs, Volume= 2.499 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond 4P: STORMTECH CHAMBERS

Inflow Area = 0.710 ac, 91.55% Impervious, Inflow Depth = 5.68" for 100 YR event
Inflow = 4.26 cfs @ 12.09 hrs, Volume= 0.336 af
Outflow = 2.96 cfs @ 12.19 hrs, Volume= 0.335 af, Atten= 31%, Lag= 6.3 min
Primary = 2.96 cfs @ 12.19 hrs, Volume= 0.335 af

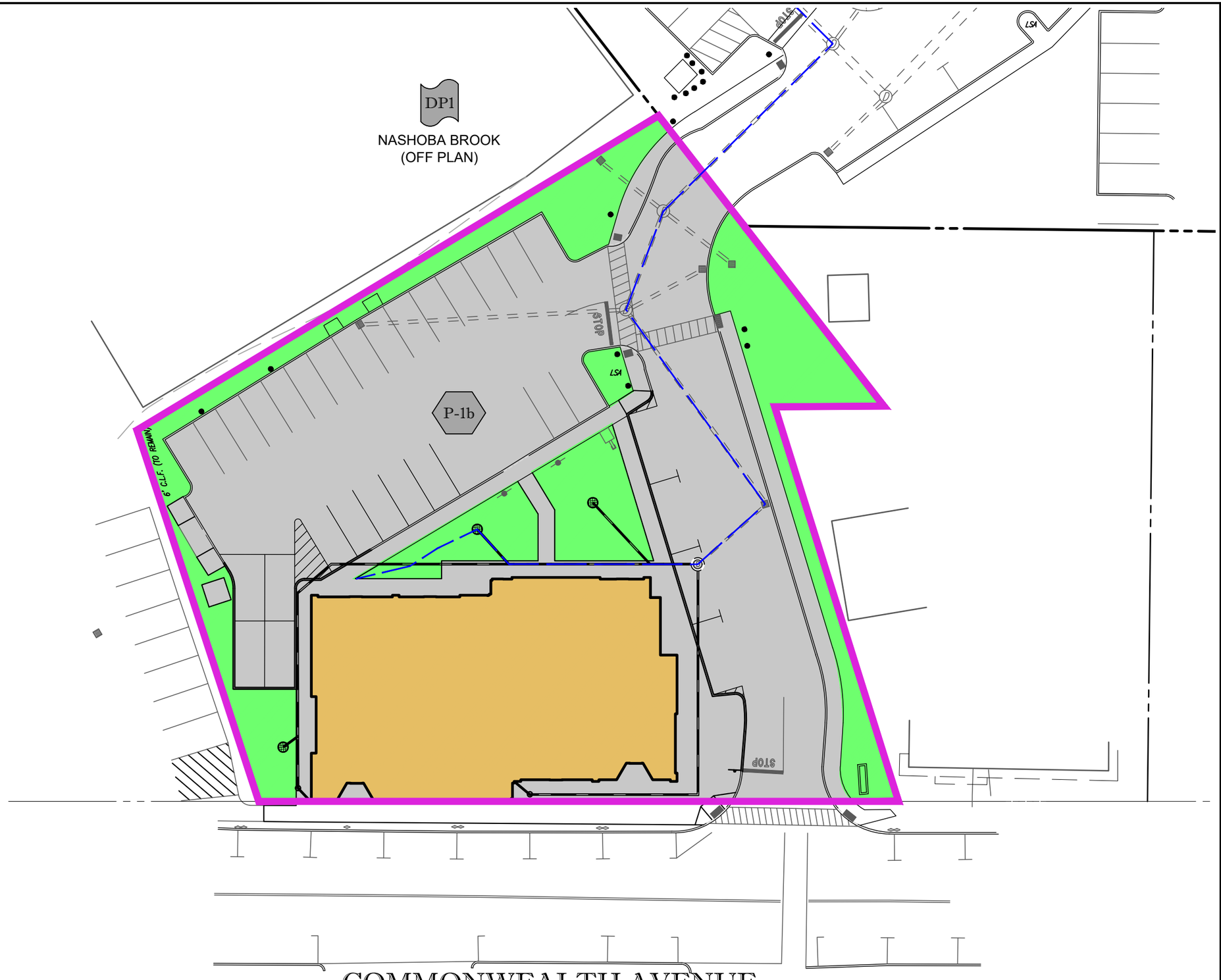
Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 121.39' Surf.Area= 1,560 sf Storage= 306 cf
Peak Elev= 124.23' @ 12.19 hrs Surf.Area= 1,560 sf Storage= 3,182 cf (2,876 cf above start)

Plug-Flow detention time= 54.8 min calculated for 0.328 af (98% of inflow)
Center-of-Mass det. time= 31.4 min (802.2 - 770.8)

Volume	Invert	Avail.Storage	Storage Description
#1	120.90'	1,450 cf	**37.60'W x 41.50'L x 3.50'H Prismatoid** 5,461 cf Overall - 1,838 cf Embedded = 3,624 cf x 40.0% Voids
#2	121.40'	1,838 cf	**StormTech SC-740** x 40 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		3,287 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	121.40'	**12.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Outlet Invert= 120.00' S= 0.0359 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	121.40'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	124.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=2.88 cfs @ 12.19 hrs HW=124.22' TW=121.39' (Fixed TW Elev= 121.39')
└─**1=Culvert** (Passes 2.88 cfs of 5.76 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.52 cfs @ 7.72 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 1.36 cfs @ 1.54 fps)



LEGEND

- OVERALL BOUNDARY
- SUBCATCHMENT BOUNDARY
- TIME OF CONCENTRATION
- HYDROLOGIC SOIL GROUP BOUNDARY
- CONCRETE/ PAVEMENT
- ROOF
- GRAVEL SURFACE
- LANDSCAPE/ LAWN
- LIGHT UNDERBRUSH/ SHRUBS
- DENSE WOODS
- WATER/ PONDING
- DP# — DESIGN POINT
- X#.# — SUBCATCHMENT
- X#.# — OUTLET CONTROL STRUCTURE OR POND
- X — HYDROLOGIC SOIL GROUP RATING
- XxX — NCRS SOIL MAP UNIT
- R#.# — REACH

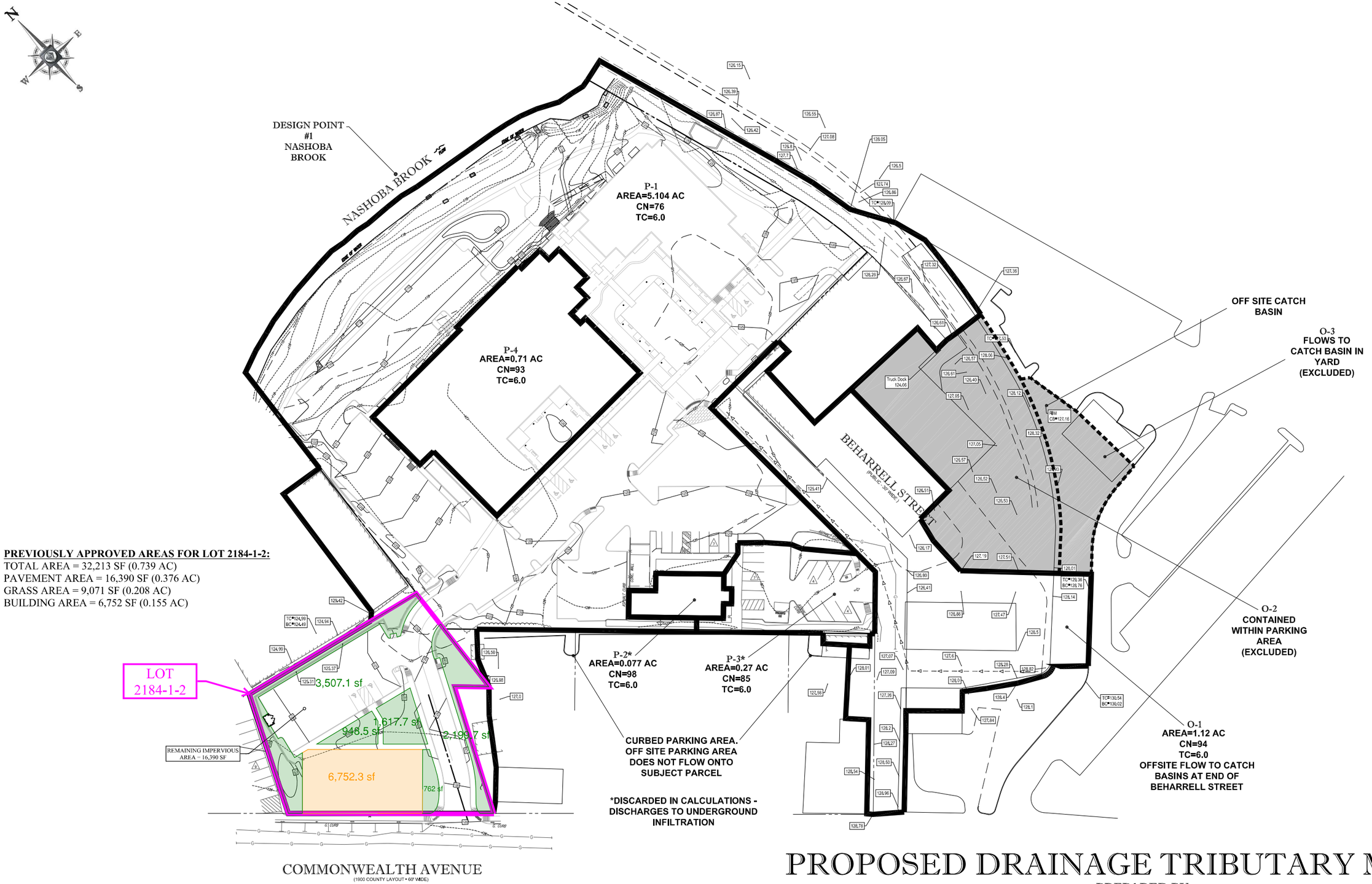
PROPOSED LOT 2184-1-2 DRAINAGE WATERSHED MAP

13B COMMONWEALTH AVENUE
CONCORD, MASSACHUSETTS

PREPARED BY

BOHLER

SCALE: 1"=30'
DATE: AUGUST 26, 2020



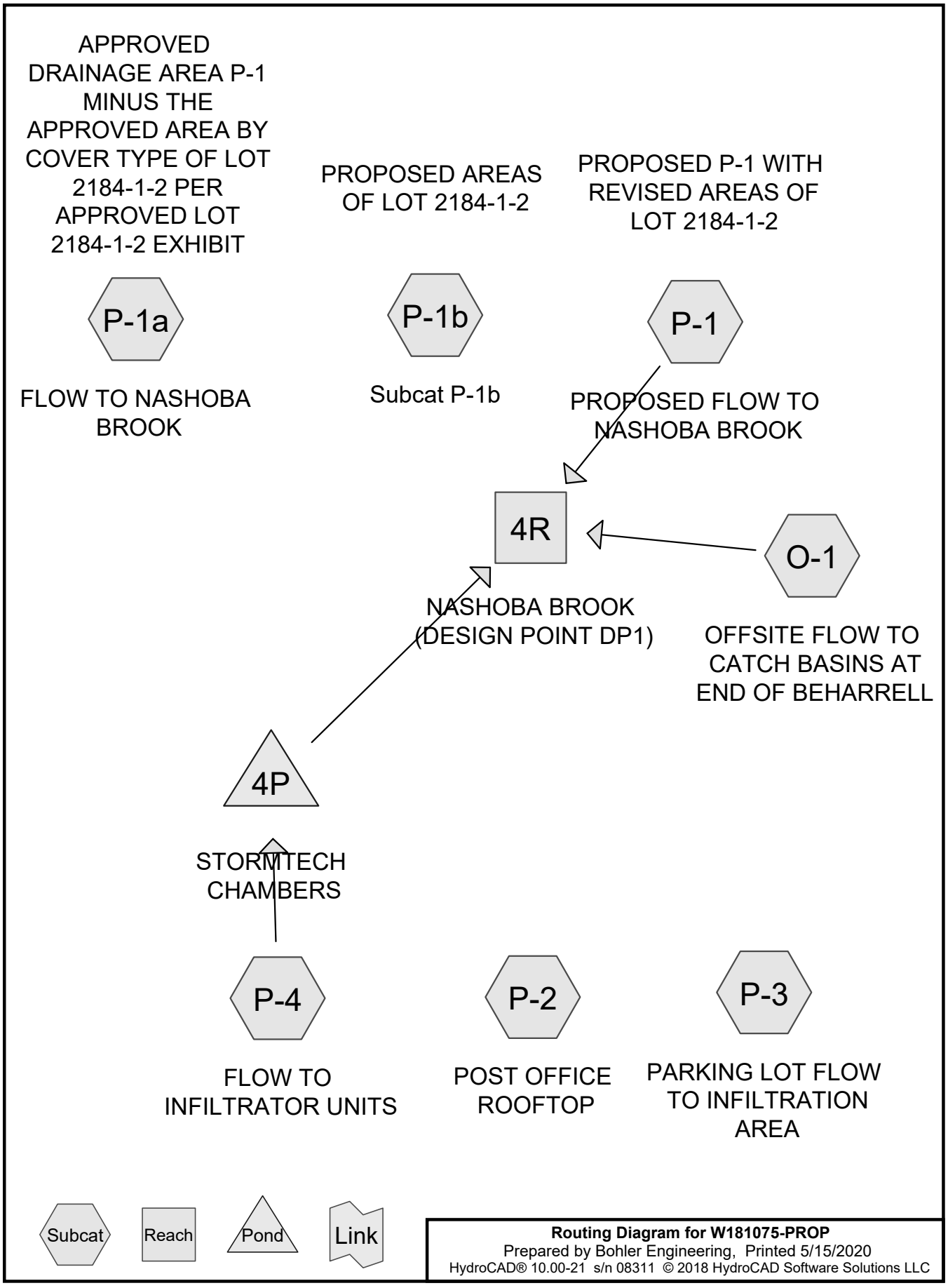
PREVIOUSLY APPROVED AREAS FOR LOT 2184-1-2:
TOTAL AREA = 32,213 SF (0.739 AC)
PAVEMENT AREA = 16,390 SF (0.376 AC)
GRASS AREA = 9,071 SF (0.208 AC)
BUILDING AREA = 6,752 SF (0.155 AC)

APPROVED LOT 2184-1-2 EXBIHIT
DATE: AUGUST 26, 2020

PROPOSED DRAINAGE TRIBUTARY MAP

PREPARED BY
BOHLER ENGINEERING

NOT TO SCALE
DATE: APRIL 12, 2013



Routing Diagram for W181075-PROP
Prepared by Bohler Engineering, Printed 5/15/2020

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 O-1: OFFSITE FLOW TO Runoff Area=1.120 ac 89.29% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=94 Runoff=3.01 cfs 0.228 af

Subcatchment P-1: PROPOSED FLOW TO Runoff Area=5.104 ac 64.13% Impervious Runoff Depth=1.14"
Flow Length=490' Tc=6.5 min CN=77 Runoff=6.41 cfs 0.485 af

Subcatchment P-1a: FLOW TO NASHOBA Runoff Area=4.364 ac 61.57% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=75 Runoff=4.92 cfs 0.373 af

Subcatchment P-1b: Subcat P-1b Runoff Area=0.739 ac 79.16% Impervious Runoff Depth=1.75"
Tc=0.0 min CN=86 Runoff=1.74 cfs 0.108 af

Subcatchment P-2: POST OFFICE Runoff Area=0.077 ac 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.23 cfs 0.018 af

Subcatchment P-3: PARKING LOT FLOW Runoff Area=0.270 ac 77.78% Impervious Runoff Depth=1.67"
Tc=6.0 min CN=85 Runoff=0.52 cfs 0.038 af

Subcatchment P-4: FLOW TO Runoff Area=0.710 ac 91.55% Impervious Runoff Depth=2.35"
Tc=6.0 min CN=93 Runoff=1.86 cfs 0.139 af

Reach 4R: NASHOBA BROOK (DESIGN POINT DP1) Inflow=9.75 cfs 0.740 af
Outflow=9.75 cfs 0.740 af

Pond 4P: STORMTECH CHAMBERS Peak Elev=122.01' Storage=1,076 cf Inflow=1.86 cfs 0.139 af
Discarded=0.30 cfs 0.113 af Primary=0.57 cfs 0.027 af Outflow=0.87 cfs 0.139 af

Total Runoff Area = 12.384 ac Runoff Volume = 1.390 af Average Runoff Depth = 1.35"
31.51% Pervious = 3.902 ac 68.49% Impervious = 8.482 ac

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 O-1: OFFSITE FLOW TO Runoff Area=1.120 ac 89.29% Impervious Runoff Depth=3.82"
Tc=6.0 min CN=94 Runoff=4.58 cfs 0.356 af

Subcatchment P-1: PROPOSED FLOW TO Runoff Area=5.104 ac 64.13% Impervious Runoff Depth=2.21"
Flow Length=490' Tc=6.5 min CN=77 Runoff=12.78 cfs 0.940 af

Subcatchment P-1a: FLOW TO NASHOBA Runoff Area=4.364 ac 61.57% Impervious Runoff Depth=2.05"
Tc=6.0 min CN=75 Runoff=10.22 cfs 0.746 af

Subcatchment P-1b: Subcat P-1b Runoff Area=0.739 ac 79.16% Impervious Runoff Depth=3.00"
Tc=0.0 min CN=86 Runoff=2.96 cfs 0.185 af

Subcatchment P-2: POST OFFICE Runoff Area=0.077 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=0.33 cfs 0.027 af

Subcatchment P-3: PARKING LOT FLOW Runoff Area=0.270 ac 77.78% Impervious Runoff Depth=2.91"
Tc=6.0 min CN=85 Runoff=0.90 cfs 0.065 af

Subcatchment P-4: FLOW TO Runoff Area=0.710 ac 91.55% Impervious Runoff Depth=3.71"
Tc=6.0 min CN=93 Runoff=2.85 cfs 0.219 af

Reach 4R: NASHOBA BROOK (DESIGN POINT DP1) Inflow=18.07 cfs 1.359 af
Outflow=18.07 cfs 1.359 af

Pond 4P: STORMTECH CHAMBERS Peak Elev=122.66' Storage=1,833 cf Inflow=2.85 cfs 0.219 af
Discarded=0.30 cfs 0.157 af Primary=0.95 cfs 0.063 af Outflow=1.25 cfs 0.219 af

Total Runoff Area = 12.384 ac Runoff Volume = 2.539 af Average Runoff Depth = 2.46"
31.51% Pervious = 3.902 ac 68.49% Impervious = 8.482 ac

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 O-1: OFFSITE FLOW TO Runoff Area=1.120 ac 89.29% Impervious Runoff Depth=4.60"
Tc=6.0 min CN=94 Runoff=5.47 cfs 0.430 af

Subcatchment P-1: PROPOSED FLOW TO Runoff Area=5.104 ac 64.13% Impervious Runoff Depth=2.88"
Flow Length=490' Tc=6.5 min CN=77 Runoff=16.66 cfs 1.223 af

Subcatchment P-1a: FLOW TO NASHOBA Runoff Area=4.364 ac 61.57% Impervious Runoff Depth=2.69"
Tc=6.0 min CN=75 Runoff=13.51 cfs 0.980 af

Subcatchment P-1b: Subcat P-1b Runoff Area=0.739 ac 79.16% Impervious Runoff Depth=3.75"
Tc=0.0 min CN=86 Runoff=3.66 cfs 0.231 af

Subcatchment P-2: POST OFFICE Runoff Area=0.077 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=0.39 cfs 0.032 af

Subcatchment P-3: PARKING LOT FLOW Runoff Area=0.270 ac 77.78% Impervious Runoff Depth=3.65"
Tc=6.0 min CN=85 Runoff=1.11 cfs 0.082 af

Subcatchment P-4: FLOW TO Runoff Area=0.710 ac 91.55% Impervious Runoff Depth=4.49"
Tc=6.0 min CN=93 Runoff=3.42 cfs 0.266 af

Reach 4R: NASHOBA BROOK (DESIGN POINT DP1) Inflow=22.99 cfs 1.739 af
Outflow=22.99 cfs 1.739 af

Pond 4P: STORMTECH CHAMBERS Peak Elev=123.10' Storage=2,302 cf Inflow=3.42 cfs 0.266 af
Discarded=0.30 cfs 0.180 af Primary=1.14 cfs 0.086 af Outflow=1.44 cfs 0.266 af

Total Runoff Area = 12.384 ac Runoff Volume = 3.244 af Average Runoff Depth = 3.14"
31.51% Pervious = 3.902 ac 68.49% Impervious = 8.482 ac

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 O-1: OFFSITE FLOW TO Runoff Area=1.120 ac 89.29% Impervious Runoff Depth=5.79"
Tc=6.0 min CN=94 Runoff=6.79 cfs 0.541 af

Subcatchment P-1: PROPOSED FLOW TO Runoff Area=5.104 ac 64.13% Impervious Runoff Depth=3.92"
Flow Length=490' Tc=6.5 min CN=77 Runoff=22.65 cfs 1.667 af

Subcatchment P-1a: FLOW TO NASHOBA Runoff Area=4.364 ac 61.57% Impervious Runoff Depth=3.71"
Tc=6.0 min CN=75 Runoff=18.61 cfs 1.350 af

Subcatchment P-1b: Subcat P-1b Runoff Area=0.739 ac 79.16% Impervious Runoff Depth=4.89"
Tc=0.0 min CN=86 Runoff=4.72 cfs 0.301 af

Subcatchment P-2: POST OFFICE Runoff Area=0.077 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=0.48 cfs 0.040 af

Subcatchment P-3: PARKING LOT FLOW Runoff Area=0.270 ac 77.78% Impervious Runoff Depth=4.78"
Tc=6.0 min CN=85 Runoff=1.44 cfs 0.107 af

Subcatchment P-4: FLOW TO Runoff Area=0.710 ac 91.55% Impervious Runoff Depth=5.68"
Tc=6.0 min CN=93 Runoff=4.26 cfs 0.336 af

Reach 4R: NASHOBA BROOK (DESIGN POINT DP1) Inflow=30.52 cfs 2.331 af
Outflow=30.52 cfs 2.331 af

Pond 4P: STORMTECH CHAMBERS Peak Elev=123.98' Storage=3,027 cf Inflow=4.26 cfs 0.336 af
Discarded=0.30 cfs 0.213 af Primary=1.44 cfs 0.124 af Outflow=1.74 cfs 0.336 af

Total Runoff Area = 12.384 ac Runoff Volume = 4.342 af Average Runoff Depth = 4.21"
31.51% Pervious = 3.902 ac 68.49% Impervious = 8.482 ac