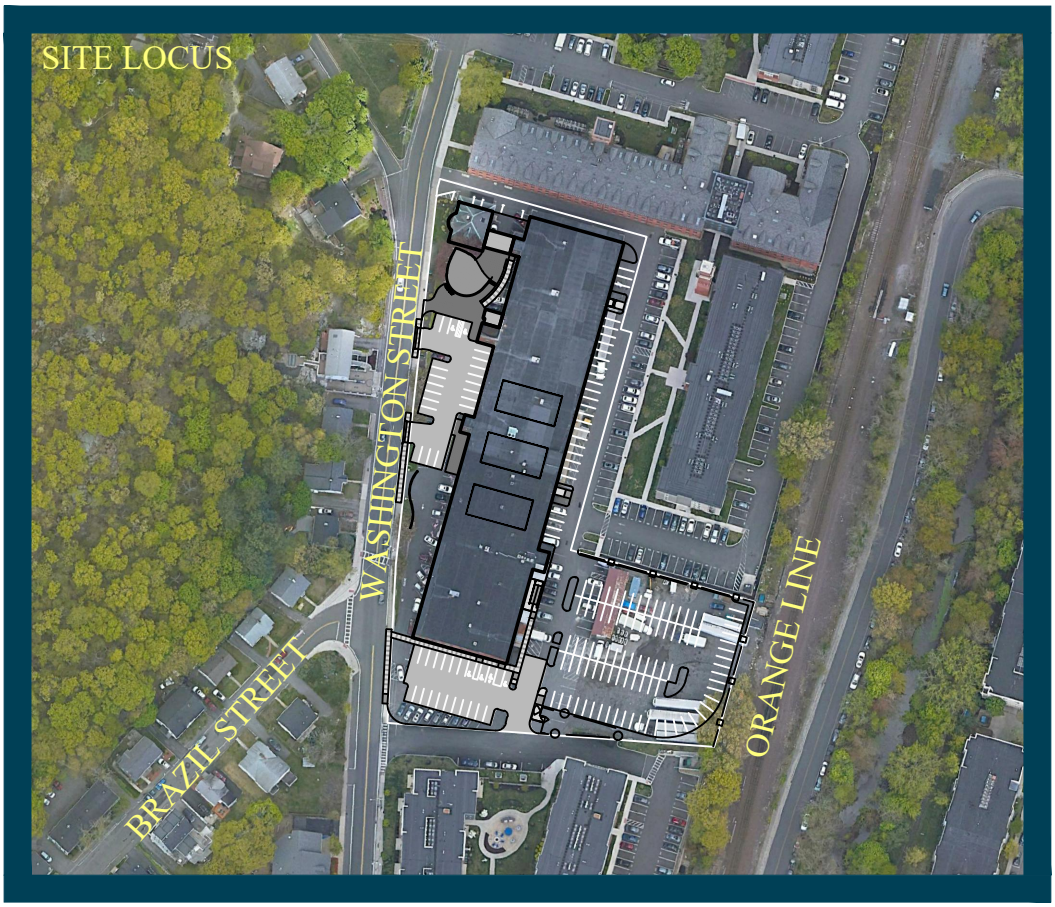
ALLEN & MAJOR ASSOCIATES, INC.



OAK GROVE MILL

99 WASHINGTON STREET
MELROSE, MA

DRAINAGE SUMMARY

DATE PREPARED: NOVEMBER 25, 2019
REVISED: FEBRUARY 27, 2020

CLIENT:
OAK GROVE MILL, LLC
ONE MARINA PARK DRIVE
SUITE 1500
BOSTON, MA 02210

PREPARED BY:
ALLEN & MAJOR ASSOCIATES, INC.
100 COMMERCE WAY, SUITE 5
WOBURN, MA 01801

A&M PROJECT NO. : 2674-01A

ALLEN & MAJOR ASSOCIATES, INC.

November 25, 2019
REVISED: February 27, 2020

Denise M. Gaffey
Director and City Planner
562 Main Street, 2nd Floor
Melrose, MA 02176

RE: Drainage Summary Letter
99 Washington Street
Melrose, MA

Dear Ms. Gaffey,

On behalf of our Client, Oak Grove Mill, LLC, Allen & Major Associates (A&M) is pleased to provide this letter in support of the Site Plan application for the multi-family project at 99 Washington Street. This letter will summarize the changes to the stormwater management system which are proposed as part of the redevelopment efforts.

Existing Conditions

The Site is located on the eastern side of Washington Street between the intersections with Pleasant Street, to the north, and Brazil Street to the South. It is comprised of a single property, identified by the City Assessor's office as Parcel B2 0 16-18. The Site is predominantly covered by paved parking and roof top with a small portion of the easterly side of the Site covered by compacted reclaimed asphalt product.

Elevations onsite range from approximately El 48 at the northwesterly property corner, to approximately El 42 at a low point catch basin near the southeasterly side of the Site. Stormwater sheet flows over the paved parking lot to onsite catch basins which discharge to existing stormwater management infrastructure on the neighboring parcels. Stormwater from the roof discharges to the ground surface and sheet flows to catch basins on Site. A review of the NRCS soil report for Middlesex County indicates that the soil onsite is considered Urban Land. A copy of the Existing Watershed Plan is included herewith.

Proposed Conditions

The project, which proposes the addition to and renovation of the existing buildings, to accommodate a multi-family development, will revise the parking alignment and make improvements to the utilities and stormwater management systems. A total of 174 parking spaces are proposed onsite. The proposed work will result in approximately 18,014 square feet of impervious material being replaced with landscaping. Additionally, the project will replace approximately 19,369 square feet of pavement with pervious pavement and permeable pavers. A copy of the Proposed Watershed Plan is included herewith.

Runoff flows were estimated for both pre and post development conditions using HydroCAD 10.00 software, at two specific "Study Points" (SP-1 and SP-2). Study Point 1 is a drain manhole towards the southeasterly corner of the Site, but on the 37 Washington Street property. Stormwater from the portion of the Site west and south of the existing building is directed to this manhole through various roof leaders, underdrains, and catch basins. Study Point 2 is the stormwater management system on the abutting property to the east. In the proposed condition, stormwater from the portion of the Site which is east of the existing building will be directed to the Study Point 2 in a manner consistent with the existing conditions. Both stormwater management systems on the 37 Washington and Stone Place properties were designed and constructed to manage stormwater from the Site.

The table below shows that the project causes a reduction in the peak rate of runoff and volume of stormwater leaving the site at SP-1 and SP-2, a benefit to the stormwater management systems on the neighboring properties. Copies of the HydroCAD worksheets are included herewith.

STUDY POINT #1 (on-site flow west to 37 Washington)								
	2-Year		10-Year		25-Year		100-Year	
	Rate (cfs)	Volume (cf)	Rate (cfs)	Volume (cf)	Rate (cfs)	Volume (cf)	Rate (cfs)	Volume (cf)
Existing Flow	5.97	19,170	9.25	30,504	11.81	39,433	17.01	57,739
Proposed Flow	3.57	11,691	5.53	18,587	7.05	24,755	10.34	38,989
Change	**-2.40**	**-7,479**	**-3.72**	**-11,917**	**-4.76**	**-14,678**	**-6.67**	**-18,750**

STUDY POINT #2 (on-site flow east to abutter)								
	2-Year		10-Year		25-Year		100-Year	
	Rate (cfs)	Volume (cf)	Rate (cfs)	Volume (cf)	Rate (cfs)	Volume (cf)	Rate (cfs)	Volume (cf)
Existing Flow	4.16	13,621	6.39	21,407	8.13	27,530	11.68	40,070
Proposed Flow	3.84	12,400	5.96	19,702	7.60	25,456	10.96	37,255
Change	**-0.32**	**-1,221**	**-0.43**	**-1,705**	**-0.53**	**-2,074**	**-0.72**	**-2,815**

MA DEP STORMWATER PERFORMANCE STANDARDS

The MA DEP Stormwater Management Policy was developed to improve water quality by implementing performance standards for stormwater management. The following section outlines how the proposed Stormwater Management System meets the standards set forth by the Policy.

BMP's implemented in the design include:

Catch Basins with outlet hoods and sumps
Pervious Pavement and pervious pavers
Stormceptor 450i Hydrodynamic separators for TSS removal
Specific maintenance schedule

Stormwater Best Management Practices have been incorporated into the design of the Project to mitigate the anticipated pollutant loading. An Operations & Maintenance Plan has been developed for the Project, which addresses the long-term maintenance requirements of the proposed system.

Temporary erosion and sedimentation controls will be incorporated into the construction phase of the Project. These temporary controls may include tubular barrier and/or silt fence barriers, inlet sediment traps, diversion channels, slope stabilization and stabilized construction entrances.

The MADEP has established ten (10) Stormwater Management Standards. A project that meets or exceeds the standards is presumed to satisfy the regulatory requirements regarding stormwater management. The calculations in Sections 2 and 3 that follow, demonstrate that the proposed stormwater management system is in compliance with the performance standards (*in italics*) as outlined in the MA DEP Stormwater Management Handbook as follows:

1. *No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

The proposed development will not discharge any untreated stormwater directly to wetlands or waters of the Commonwealth. All proposed discharges will be treated for water quality and the rate of runoff will not be increased over existing conditions. All discharge locations have been designed to prevent erosion in wetlands.

2. *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.*

   The proposed development has been designed such that the post-development peak discharge rates do not exceed the pre-development peak discharge rates. A summary of the existing and proposed discharge rates is included within this document.

3. *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.*

   The existing annual recharge for the Site will be approximated in the developed condition. Two pervious pavement systems are provided in the design and will be used to meet this requirement. Only the volume below the underdrain is included in the proposed recharge volume.

   The NRCS Custom Soil Resource Report for Middlesex County indicates the entire site is comprised of Urban Land which does not provide a Hydrologic Soil Group. Historic observations indicate that the soils onsite are typically silty. We therefore assumed the entire site to be a Type C soil.

   IS-1:
   Proposed impervious area (entire site) = 115,055± square feet

   Recharge Volume (Rv) = (F) x (Impervious Area)
   Where:
   Rv = Required Recharge Volume, expressed in cubic feet
   F = Target Depth Factor associated with each Hydrologic Soil Group
   Imp. Area = proposed pavement, sidewalk, rooftop in square feet

   Recharge Volume (Rv) = (0.25 inches)*(1/12 inches/ft)*(115,055 square feet)
   =2,397 cubic feet

   Recharge Provided: Pervious Pavement Storage Volume = 3,196 cubic feet (below underdrains)

   3,196 ft^3 provided > 2,397 ft^3 required OK

4. *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:*

   a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;

   b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and

   c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

The proposed stormwater management system has been designed such that for each study point, the 80% TSS removal standard has been met. Standard #4 is met when structural stormwater best management practices are sized to capture and treat the required water quality volume and pretreatment is provided in accordance with the

Massachusetts Stormwater Handbook. Standard #4 also requires that suitable source control measures are identified in the Long-Term Pollution Prevention Plan.

The water quality volume for the proposed development is captured and treated using deep sump catch basins, Stormceptor 450i proprietary separation devices, and the pervious pavement systems. The TSS removal efficiencies are based on the values assigned in the TSS Removal Efficiencies for Best Management Practices table provided in the Massachusetts Stormwater Handbook. TSS removal calculations for the two treatment trains are provided in the Appendix of this Report.

5. *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.*

The site is not classified as land use with higher potential pollutant load (LUHPPL) and therefore this standard does not apply.

6. *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.*

The project site does not discharge stormwater within a Zone II or Interim Wellhead Protection Area or near a critical area. Critical Areas are Outstanding Resource Waters as designated in 314 CMR 4.00, Special Resource Waters as designated in 314 CMR 4.00, recharge areas for public water supplies as defined in 310 CMR 22.02, bathing beaches as defined in 105 CMR 445.000, cold-water fisheries as defined in 314 CMR 9.02 and 310 CMR 10.04, and shellfish growing areas as defined in 314 CMR 9.02 and 310 CMR 10.04.

7. *A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

The proposed project will reduce the amount of impervious area on site and is therefore considered a re-development project under the Stormwater Management Handbook guidelines. The project will comply with the standards outlined above to the maximum extent practicable.

8. *A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

A plan to control construction-related impacts, including erosion, sedimentation and other pollutant sources during construction and land disturbance activities has been developed. A detailed Site Preparation Plan is included in the Site Development Plan set.

9. *A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.*

A Long-Term Operation & Maintenance (O&M) Plan has been developed for the proposed stormwater management system and is included in the appendix of this document.

10. *All illicit discharges to the stormwater management system are prohibited.*

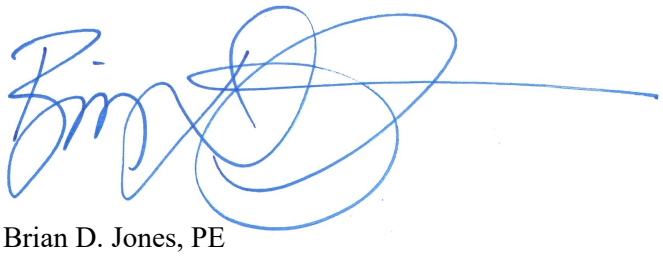
There are no expected illicit discharges to the stormwater management system. An illicit Discharge Compliance Statement is included in the Appendix of this report.

Summary

As shown in the table above, the proposed development will have a positive impact on the stormwater management systems by reducing the rate and volume of stormwater runoff from the Site.

Very truly yours,

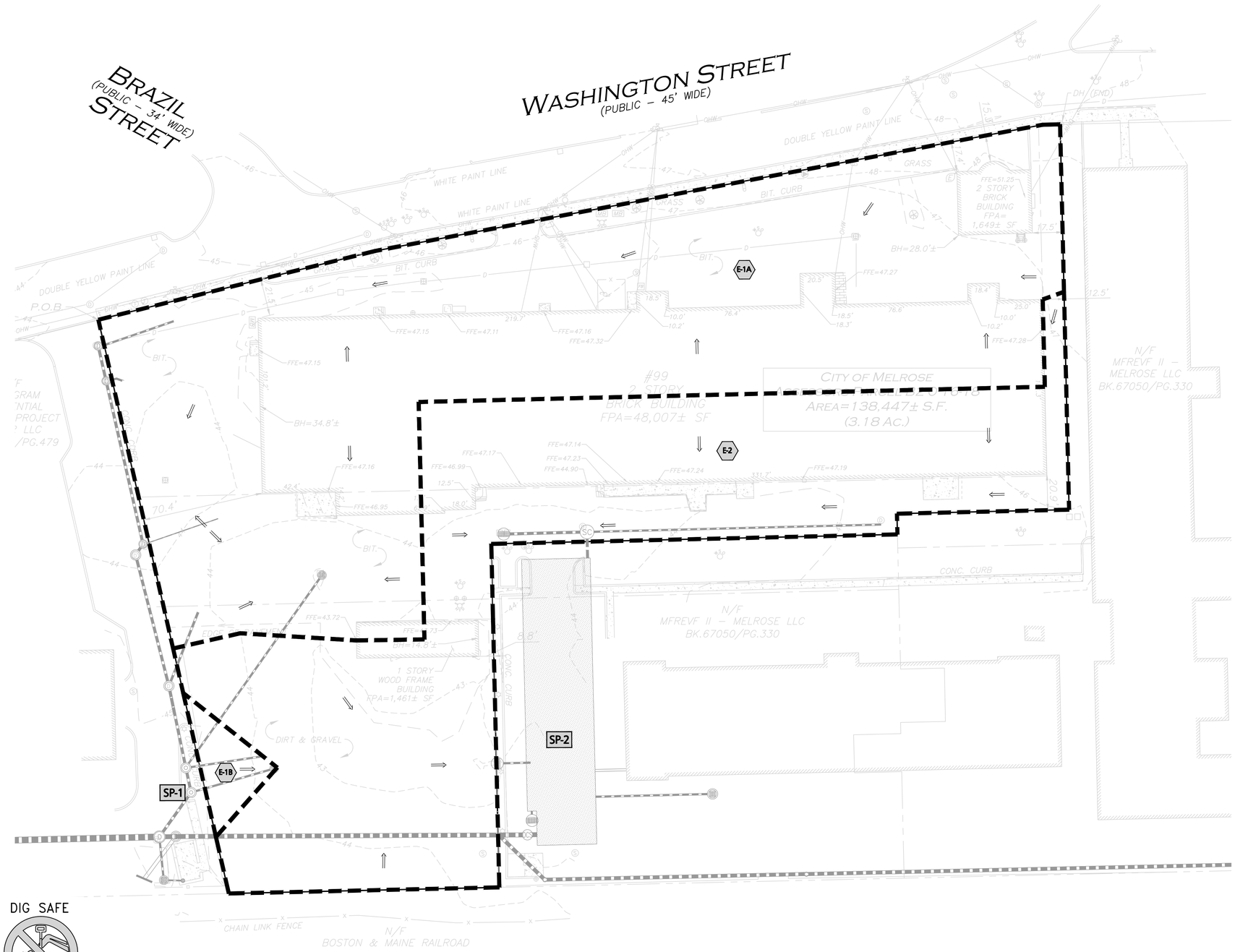
ALLEN & MAJOR ASSOCIATES, INC.



Brian D. Jones, PE
Senior Project Manager

Attachments:

1. Existing Watershed Plan
2. Proposed Watershed Plan
3. Predevelopment HydroCAD Calculations
4. Post development HydroCAD Calculations
5. Extreme Precipitation Tables
6. NRCS Soil Report
7. Operation and Maintenance Plan
8. TSS Removal Calculations



LEGEND

SUBCATCHMENT BOUNDARY	
SUBCATCHMENT LABEL	E-1
FLOW DIRECTION	⟹

DIG SAFE

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1-888-DIG-SAFE
1-888-344-7233

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

REV	DATE	DESCRIPTION
1	02-27-2020	REVISED PER CITY COMMENTS

APPLICANT\OWNER:
OAK GROVE MILL, LLC
ONE MARINA PARK DRIVE
SUITE 1500
BOSTON, MA 02210

PROJECT:

99 WASHINGTON STREET
MELROSE, MA

PROJECT NO.	2674-01A	DATE:	10-03-19
SCALE:	1" = 30'	DWG. NAME:	C2674-01A
DESIGNED BY:	SM	CHECKED BY:	BDJ

PREPARED BY:
ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ◆ land surveying
environmental consulting ◆ landscape architecture
www.allenmajor.com
100 COMMERCE WAY, SUITE 5
WOBURN MA 01801
TEL: (781) 935-6889
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WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

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DRAWING TITLE:
EXISTING WATERSHED PLAN

SHEET No.
EWS-1

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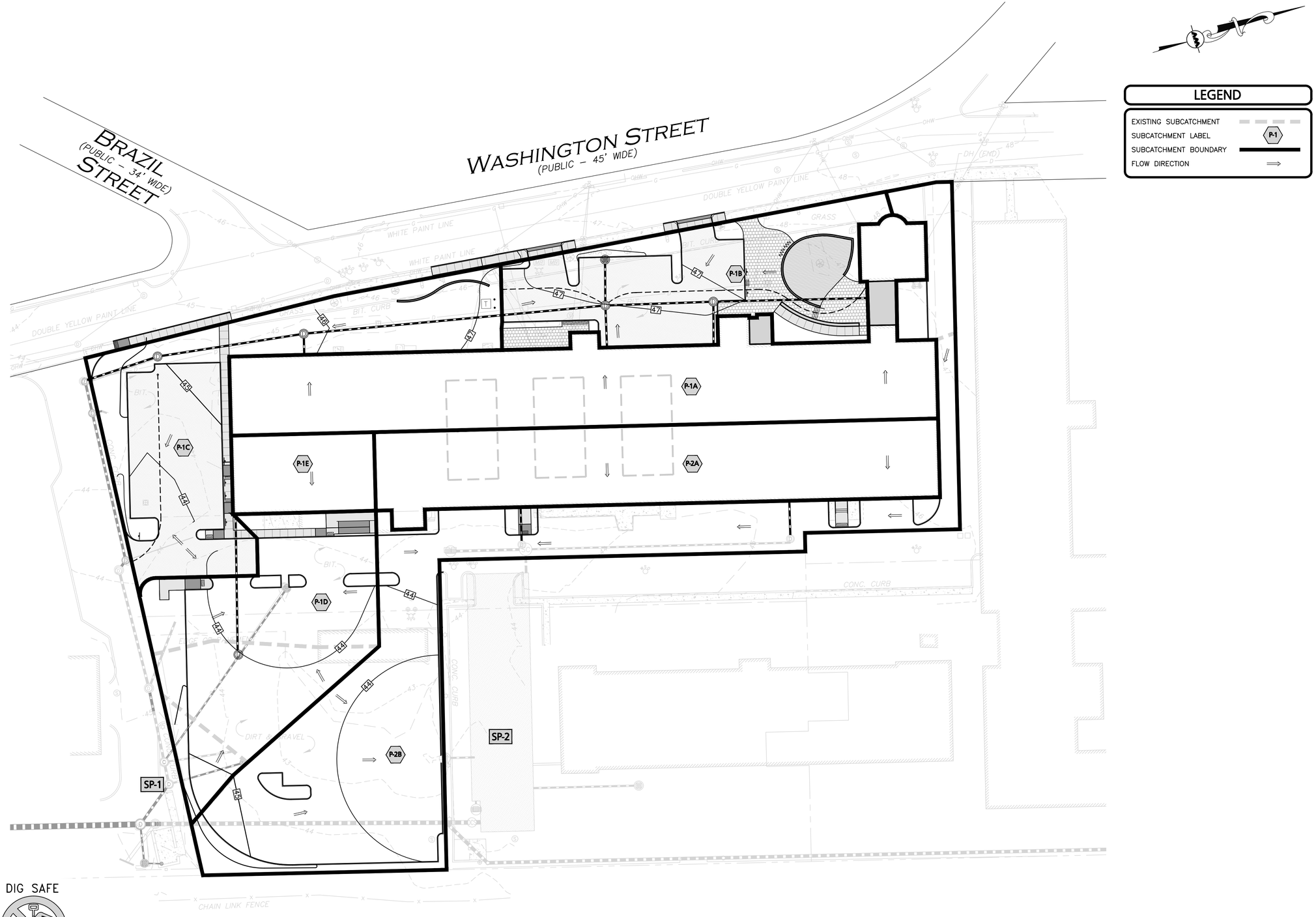

LEGEND

EXISTING SUBCATCHMENT	
SUBCATCHMENT LABEL	P-1
SUBCATCHMENT BOUNDARY	
FLOW DIRECTION	

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1-888-344-7233

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

REV	DATE	DESCRIPTION
1	02-27-2020	REVISED PER CITY COMMENTS

APPLICANT\OWNER:
OAK GROVE MILL, LLC
ONE MARINA PARK DRIVE
SUITE 1500
BOSTON, MA 02210

PROJECT:
99 WASHINGTON STREET
MELROSE, MA

PROJECT NO.	2674-01A	DATE:	11-21-19
SCALE:	1" = 30'	DWG. NAME:	C2674-01A
DESIGNED BY:	SM	CHECKED BY:	BDJ

PREPARED BY:

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DRAWING TITLE:
PROPOSED WATERSHED PLAN

SHEET No.
PWS-1

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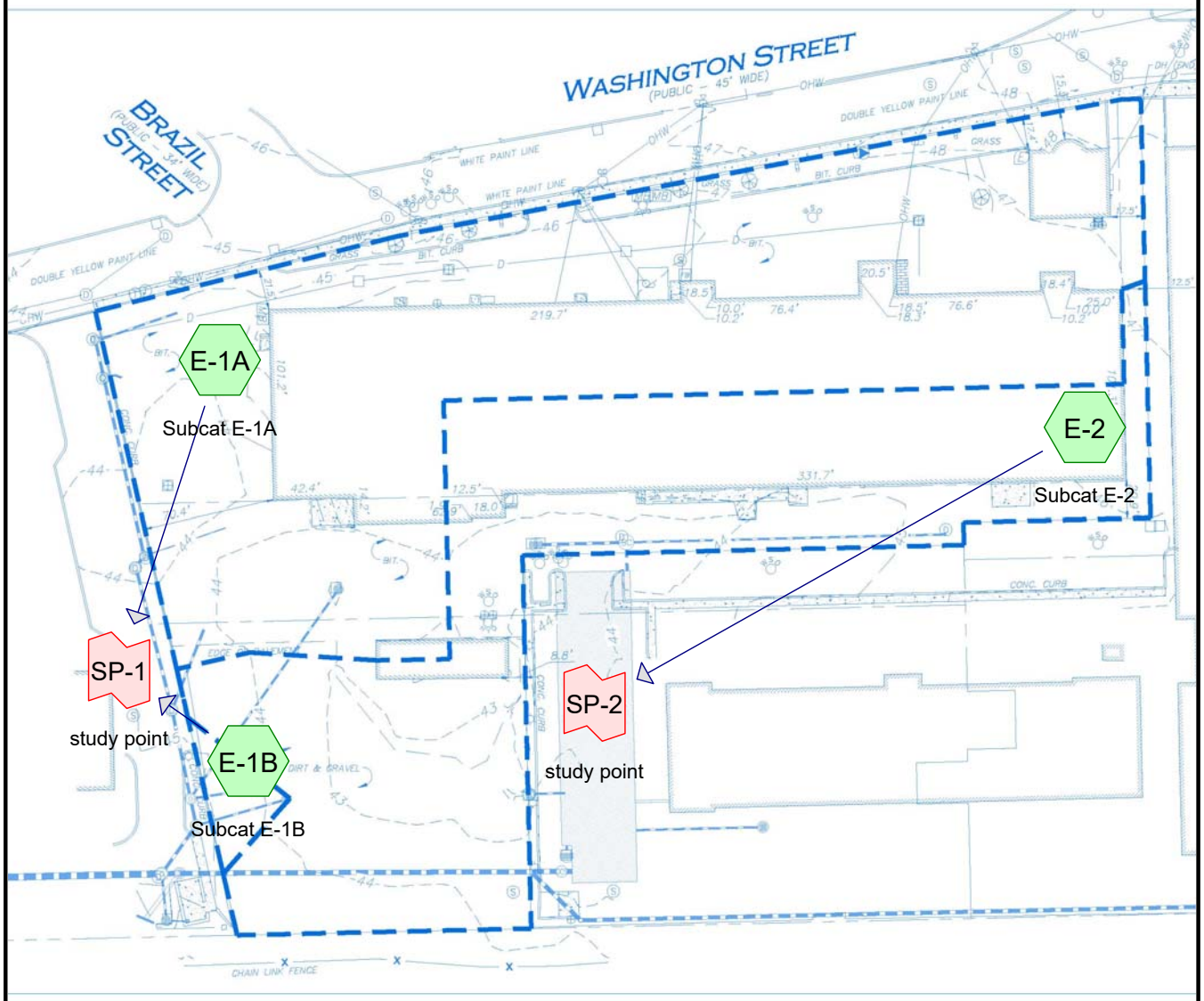


Subcat Reach Pond Link

Routing Diagram for 2674-01A_Existing-Conditions
Prepared by Allen & Major Associates, Inc., Printed 2/27/2020
HydroCAD® 10.00-24 s/n 02947 © 2018 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
5,378	74	>75% Grass cover, Good, HSG C (E-1A, E-2)
21,771	96	Gravel surface, HSG C (E-1A, E-1B, E-2)
61,830	98	Paved parking, HSG C (E-1A, E-2)
49,468	98	Roofs, HSG C (E-1A, E-2)
138,447	**97**	**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	0	5,378	0	0	5,378	>75% Grass cover, Good	
0	0	21,771	0	0	21,771	Gravel surface	
0	0	61,830	0	0	61,830	Paved parking	
0	0	49,468	0	0	49,468	Roofs	
0	**0**	**138,447**	**0**	**0**	**138,447**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
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 E-1A: Subcat E-1A Runoff Area=80,339 sf 92.47% Impervious Runoff Depth=2.80"
Tc=5.0 min CN=96 Runoff=5.83 cfs 18,735 cf

Subcatchment E-1B: Subcat E-1B Runoff Area=1,864 sf 0.00% Impervious Runoff Depth=2.80"
Tc=5.0 min CN=96 Runoff=0.14 cfs 435 cf

Subcatchment E-2: Subcat E-2 Runoff Area=56,244 sf 65.80% Impervious Runoff Depth=2.91"
Tc=5.0 min CN=97 Runoff=4.16 cfs 13,621 cf

Link SP-1: study point Inflow=5.97 cfs 19,170 cf
Primary=5.97 cfs 19,170 cf

Link SP-2: study point Inflow=4.16 cfs 13,621 cf
Primary=4.16 cfs 13,621 cf

Total Runoff Area = 138,447 sf Runoff Volume = 32,791 cf Average Runoff Depth = 2.84"
19.61% Pervious = 27,149 sf 80.39% Impervious = 111,298 sf

Summary for Subcatchment E-1A: Subcat E-1A

Runoff = 5.83 cfs @ 12.07 hrs, Volume= 18,735 cf, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
44,658	98	Paved parking, HSG C
29,629	98	Roofs, HSG C
678	96	Gravel surface, HSG C
5,374	74	>75% Grass cover, Good, HSG C
80,339	96	Weighted Average
6,052		7.53% Pervious Area
74,287		92.47% Impervious Area

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

Summary for Subcatchment E-1B: Subcat E-1B

Runoff = 0.14 cfs @ 12.07 hrs, Volume= 435 cf, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
1,864	96	Gravel surface, HSG C
1,864		100.00% Pervious Area

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

Summary for Subcatchment E-2: Subcat E-2

Runoff = 4.16 cfs @ 12.07 hrs, Volume= 13,621 cf, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
19,839	98	Roofs, HSG C
19,229	96	Gravel surface, HSG C
4	74	>75% Grass cover, Good, HSG C
17,171	98	Paved parking, HSG C
56,244	97	Weighted Average
19,233		34.20% Pervious Area
37,011		65.80% Impervious Area

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

Summary for Link SP-1: study point

Inflow Area = 82,203 sf, 90.37% Impervious, Inflow Depth = 2.80" for 2-Year event
Inflow = 5.97 cfs @ 12.07 hrs, Volume= 19,170 cf
Primary = 5.97 cfs @ 12.07 hrs, Volume= 19,170 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SP-2: study point

Inflow Area = 56,244 sf, 65.80% Impervious, Inflow Depth = 2.91" for 2-Year event
Inflow = 4.16 cfs @ 12.07 hrs, Volume= 13,621 cf
Primary = 4.16 cfs @ 12.07 hrs, Volume= 13,621 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
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 E-1A: Subcat E-1A Runoff Area=80,339 sf 92.47% Impervious Runoff Depth=4.45"
Tc=5.0 min CN=96 Runoff=9.04 cfs 29,813 cf

Subcatchment E-1B: Subcat E-1B Runoff Area=1,864 sf 0.00% Impervious Runoff Depth=4.45"
Tc=5.0 min CN=96 Runoff=0.21 cfs 692 cf

Subcatchment E-2: Subcat E-2 Runoff Area=56,244 sf 65.80% Impervious Runoff Depth=4.57"
Tc=5.0 min CN=97 Runoff=6.39 cfs 21,407 cf

Link SP-1: study point Inflow=9.25 cfs 30,504 cf
Primary=9.25 cfs 30,504 cf

Link SP-2: study point Inflow=6.39 cfs 21,407 cf
Primary=6.39 cfs 21,407 cf

Total Runoff Area = 138,447 sf Runoff Volume = 51,912 cf Average Runoff Depth = 4.50"
19.61% Pervious = 27,149 sf 80.39% Impervious = 111,298 sf

Summary for Subcatchment E-1A: Subcat E-1A

Runoff = 9.04 cfs @ 12.07 hrs, Volume= 29,813 cf, Depth= 4.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.92"

Area (sf)	CN	Description
44,658	98	Paved parking, HSG C
29,629	98	Roofs, HSG C
678	96	Gravel surface, HSG C
5,374	74	>75% Grass cover, Good, HSG C
80,339	96	Weighted Average
6,052		7.53% Pervious Area
74,287		92.47% Impervious Area

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

Summary for Subcatchment E-1B: Subcat E-1B

Runoff = 0.21 cfs @ 12.07 hrs, Volume= 692 cf, Depth= 4.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.92"

Area (sf)	CN	Description
1,864	96	Gravel surface, HSG C
1,864		100.00% Pervious Area

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

Summary for Subcatchment E-2: Subcat E-2

Runoff = 6.39 cfs @ 12.07 hrs, Volume= 21,407 cf, Depth= 4.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.92"

Area (sf)	CN	Description
19,839	98	Roofs, HSG C
19,229	96	Gravel surface, HSG C
4	74	>75% Grass cover, Good, HSG C
17,171	98	Paved parking, HSG C
56,244	97	Weighted Average
19,233		34.20% Pervious Area
37,011		65.80% Impervious Area

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

Summary for Link SP-1: study point

Inflow Area = 82,203 sf, 90.37% Impervious, Inflow Depth = 4.45" for 10-Year event
Inflow = 9.25 cfs @ 12.07 hrs, Volume= 30,504 cf
Primary = 9.25 cfs @ 12.07 hrs, Volume= 30,504 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SP-2: study point

Inflow Area = 56,244 sf, 65.80% Impervious, Inflow Depth = 4.57" for 10-Year event
Inflow = 6.39 cfs @ 12.07 hrs, Volume= 21,407 cf
Primary = 6.39 cfs @ 12.07 hrs, Volume= 21,407 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
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 E-1A: Subcat E-1A Runoff Area=80,339 sf 92.47% Impervious Runoff Depth=5.76"
Tc=5.0 min CN=96 Runoff=11.54 cfs 38,539 cf

Subcatchment E-1B: Subcat E-1B Runoff Area=1,864 sf 0.00% Impervious Runoff Depth=5.76"
Tc=5.0 min CN=96 Runoff=0.27 cfs 894 cf

Subcatchment E-2: Subcat E-2 Runoff Area=56,244 sf 65.80% Impervious Runoff Depth=5.87"
Tc=5.0 min CN=97 Runoff=8.13 cfs 27,530 cf

Link SP-1: study point Inflow=11.81 cfs 39,433 cf
Primary=11.81 cfs 39,433 cf

Link SP-2: study point Inflow=8.13 cfs 27,530 cf
Primary=8.13 cfs 27,530 cf

Total Runoff Area = 138,447 sf Runoff Volume = 66,963 cf Average Runoff Depth = 5.80"
19.61% Pervious = 27,149 sf 80.39% Impervious = 111,298 sf

Summary for Subcatchment E-1A: Subcat E-1A

Runoff = 11.54 cfs @ 12.07 hrs, Volume= 38,539 cf, Depth= 5.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
44,658	98	Paved parking, HSG C
29,629	98	Roofs, HSG C
678	96	Gravel surface, HSG C
5,374	74	>75% Grass cover, Good, HSG C
80,339	96	Weighted Average
6,052		7.53% Pervious Area
74,287		92.47% Impervious Area

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

Summary for Subcatchment E-1B: Subcat E-1B

Runoff = 0.27 cfs @ 12.07 hrs, Volume= 894 cf, Depth= 5.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
1,864	96	Gravel surface, HSG C
1,864		100.00% Pervious Area

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

Summary for Subcatchment E-2: Subcat E-2

Runoff = 8.13 cfs @ 12.07 hrs, Volume= 27,530 cf, Depth= 5.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
19,839	98	Roofs, HSG C
19,229	96	Gravel surface, HSG C
4	74	>75% Grass cover, Good, HSG C
17,171	98	Paved parking, HSG C
56,244	97	Weighted Average
19,233		34.20% Pervious Area
37,011		65.80% Impervious Area

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

Summary for Link SP-1: study point

Inflow Area = 82,203 sf, 90.37% Impervious, Inflow Depth = 5.76" for 25-Year event
Inflow = 11.81 cfs @ 12.07 hrs, Volume= 39,433 cf
Primary = 11.81 cfs @ 12.07 hrs, Volume= 39,433 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SP-2: study point

Inflow Area = 56,244 sf, 65.80% Impervious, Inflow Depth = 5.87" for 25-Year event
Inflow = 8.13 cfs @ 12.07 hrs, Volume= 27,530 cf
Primary = 8.13 cfs @ 12.07 hrs, Volume= 27,530 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
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 E-1A: Subcat E-1A Runoff Area=80,339 sf 92.47% Impervious Runoff Depth=8.43"
Tc=5.0 min CN=96 Runoff=16.62 cfs 56,430 cf

Subcatchment E-1B: Subcat E-1B Runoff Area=1,864 sf 0.00% Impervious Runoff Depth=8.43"
Tc=5.0 min CN=96 Runoff=0.39 cfs 1,309 cf

Subcatchment E-2: Subcat E-2 Runoff Area=56,244 sf 65.80% Impervious Runoff Depth=8.55"
Tc=5.0 min CN=97 Runoff=11.68 cfs 40,070 cf

Link SP-1: study point Inflow=17.01 cfs 57,739 cf
Primary=17.01 cfs 57,739 cf

Link SP-2: study point Inflow=11.68 cfs 40,070 cf
Primary=11.68 cfs 40,070 cf

Total Runoff Area = 138,447 sf Runoff Volume = 97,810 cf Average Runoff Depth = 8.48"
19.61% Pervious = 27,149 sf 80.39% Impervious = 111,298 sf

Summary for Subcatchment E-1A: Subcat E-1A

Runoff = 16.62 cfs @ 12.07 hrs, Volume= 56,430 cf, Depth= 8.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.91"

Area (sf)	CN	Description
44,658	98	Paved parking, HSG C
29,629	98	Roofs, HSG C
678	96	Gravel surface, HSG C
5,374	74	>75% Grass cover, Good, HSG C
80,339	96	Weighted Average
6,052		7.53% Pervious Area
74,287		92.47% Impervious Area

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

Summary for Subcatchment E-1B: Subcat E-1B

Runoff = 0.39 cfs @ 12.07 hrs, Volume= 1,309 cf, Depth= 8.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.91"

Area (sf)	CN	Description
1,864	96	Gravel surface, HSG C
1,864		100.00% Pervious Area

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

Summary for Subcatchment E-2: Subcat E-2

Runoff = 11.68 cfs @ 12.07 hrs, Volume= 40,070 cf, Depth= 8.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.91"

Area (sf)	CN	Description
19,839	98	Roofs, HSG C
19,229	96	Gravel surface, HSG C
4	74	>75% Grass cover, Good, HSG C
17,171	98	Paved parking, HSG C
56,244	97	Weighted Average
19,233		34.20% Pervious Area
37,011		65.80% Impervious Area

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

Summary for Link SP-1: study point

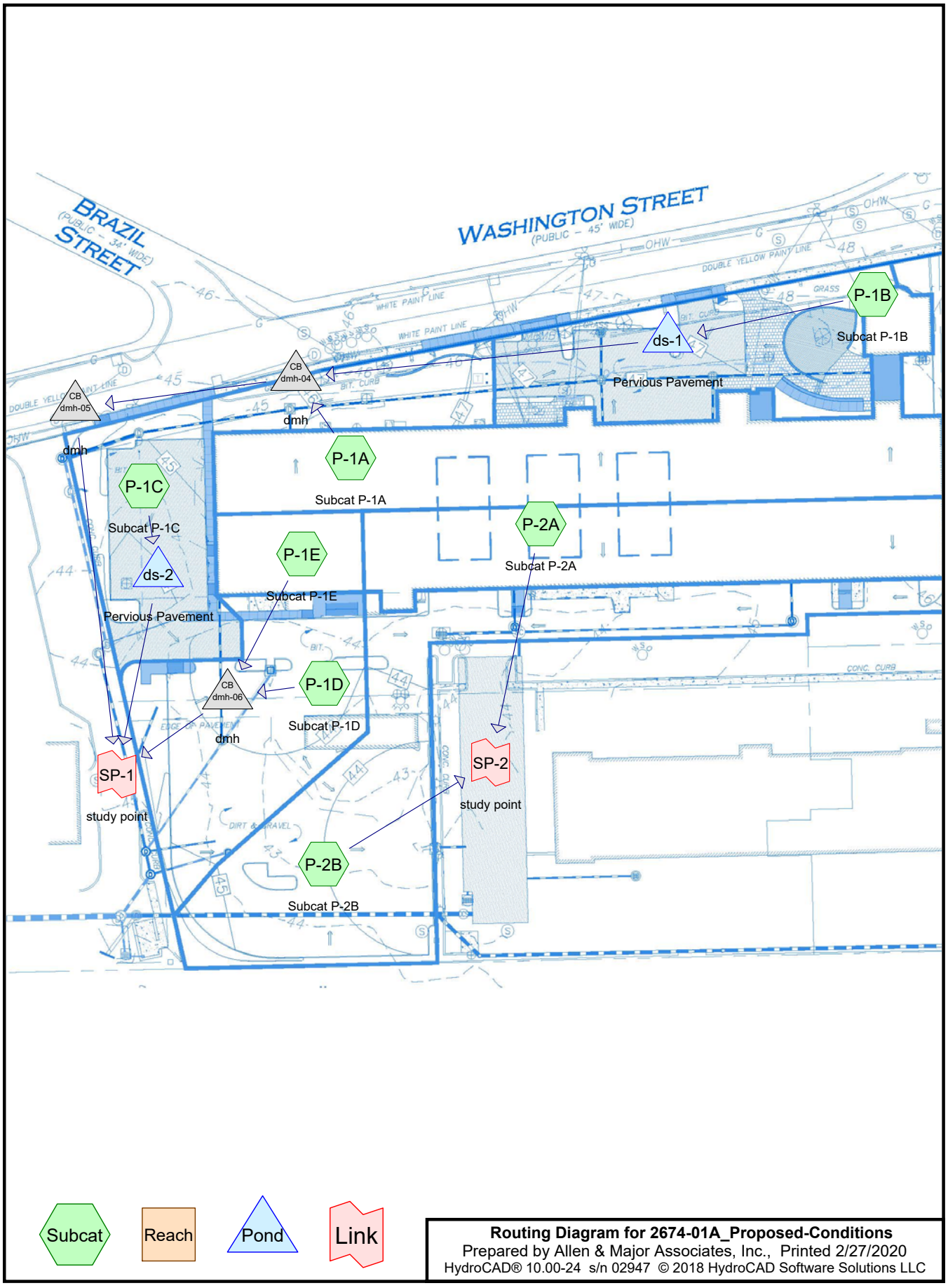
Inflow Area = 82,203 sf, 90.37% Impervious, Inflow Depth = 8.43" for 100-Year event
Inflow = 17.01 cfs @ 12.07 hrs, Volume= 57,739 cf
Primary = 17.01 cfs @ 12.07 hrs, Volume= 57,739 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SP-2: study point

Inflow Area = 56,244 sf, 65.80% Impervious, Inflow Depth = 8.55" for 100-Year event
Inflow = 11.68 cfs @ 12.07 hrs, Volume= 40,070 cf
Primary = 11.68 cfs @ 12.07 hrs, Volume= 40,070 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



Routing Diagram for 2674-01A_Proposed-Conditions
Prepared by Allen & Major Associates, Inc., Printed 2/27/2020
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
23,391	74	>75% Grass cover, Good, HSG C (P-1B, P-1C, P-1D, P-2B)
65,461	98	Paved parking, HSG C (P-1B, P-1C, P-1D, P-2B)
49,594	98	Roofs, HSG C (P-1A, P-1E, P-2A)
138,447	**94**	**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	0	23,391	0	0	23,391	>75% Grass cover, Good	
0	0	65,461	0	0	65,461	Paved parking	
0	0	49,594	0	0	49,594	Roofs	
0	**0**	**138,447**	**0**	**0**	**138,447**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	dmh-04	41.52	41.04	95.0	0.0051	0.013	12.0	0.0	0.0
2	dmh-05	40.94	40.69	50.0	0.0050	0.013	12.0	0.0	0.0
3	dmh-06	38.74	37.54	84.0	0.0143	0.013	12.0	0.0	0.0
4	ds-1	42.59	41.62	195.0	0.0050	0.013	12.0	0.0	0.0
5	ds-2	41.38	40.27	10.0	0.1110	0.013	4.0	0.0	0.0

Notes Listing (all nodes)

Line#	Node Number	Notes
1	ds-1	assumed exfiltration rate and groundwater elevation based on boring HA15-B5 by Haley & Aldrich, Inc.
2	ds-2	assumed exfiltration rate and groundwater elevation based on boring HA15-B5 by Haley & Aldrich, Inc.

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
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 P-1A: Subcat P-1A Runoff Area=26,309 sf 100.00% Impervious Runoff Depth=3.02"
Tc=5.0 min CN=98 Runoff=1.97 cfs 6,615 cf

Subcatchment P-1B: Subcat P-1B Runoff Area=16,799 sf 69.69% Impervious Runoff Depth=2.31"
Tc=5.0 min CN=91 Runoff=1.06 cfs 3,227 cf

Subcatchment P-1C: Subcat P-1C Runoff Area=19,608 sf 48.17% Impervious Runoff Depth=1.88"
Tc=5.0 min CN=86 Runoff=1.03 cfs 3,070 cf

Subcatchment P-1D: Subcat P-1D Runoff Area=18,076 sf 81.48% Impervious Runoff Depth=2.59"
Tc=5.0 min CN=94 Runoff=1.25 cfs 3,905 cf

Subcatchment P-1E: Subcat P-1E Runoff Area=4,655 sf 100.00% Impervious Runoff Depth=3.02"
Tc=5.0 min CN=98 Runoff=0.35 cfs 1,170 cf

Subcatchment P-2A: Subcat P-2A Runoff Area=18,631 sf 100.00% Impervious Runoff Depth=3.02"
Tc=5.0 min CN=98 Runoff=1.40 cfs 4,685 cf

Subcatchment P-2B: Subcat P-2B Runoff Area=34,369 sf 86.07% Impervious Runoff Depth=2.69"
Tc=5.0 min CN=95 Runoff=2.44 cfs 7,715 cf

Pond dmh-04: dmh Peak Elev=42.49' Inflow=1.97 cfs 6,615 cf
12.0" Round Culvert n=0.013 L=95.0' S=0.0051 '/' Outflow=1.97 cfs 6,615 cf

Pond dmh-05: dmh Peak Elev=41.87' Inflow=1.97 cfs 6,615 cf
12.0" Round Culvert n=0.013 L=50.0' S=0.0050 '/' Outflow=1.97 cfs 6,615 cf

Pond dmh-06: dmh Peak Elev=39.42' Inflow=1.60 cfs 5,075 cf
12.0" Round Culvert n=0.013 L=84.0' S=0.0143 '/' Outflow=1.60 cfs 5,075 cf

Pond ds-1: Pervious Pavement Peak Elev=43.81' Storage=676 cf Inflow=1.06 cfs 3,227 cf
Discarded=0.27 cfs 3,227 cf Primary=0.00 cfs 0 cf Outflow=0.27 cfs 3,227 cf

Pond ds-2: Pervious Pavement Peak Elev=41.17' Storage=777 cf Inflow=1.03 cfs 3,070 cf
Discarded=0.21 cfs 3,070 cf Primary=0.00 cfs 0 cf Outflow=0.21 cfs 3,070 cf

Link SP-1: study point Inflow=3.57 cfs 11,691 cf
Primary=3.57 cfs 11,691 cf

Link SP-2: study point Inflow=3.84 cfs 12,400 cf
Primary=3.84 cfs 12,400 cf

Total Runoff Area = 138,447 sf Runoff Volume = 30,387 cf Average Runoff Depth = 2.63"
16.90% Pervious = 23,391 sf 83.10% Impervious = 115,055 sf

Summary for Subcatchment P-1A: Subcat P-1A

Runoff = 1.97 cfs @ 12.07 hrs, Volume= 6,615 cf, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
26,309	98	Roofs, HSG C
26,309		100.00% Impervious Area

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

Summary for Subcatchment P-1B: Subcat P-1B

Runoff = 1.06 cfs @ 12.07 hrs, Volume= 3,227 cf, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
5,092	74	>75% Grass cover, Good, HSG C
11,708	98	Paved parking, HSG C
16,799	91	Weighted Average
5,092		30.31% Pervious Area
11,708		69.69% Impervious Area

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

Summary for Subcatchment P-1C: Subcat P-1C

Runoff = 1.03 cfs @ 12.07 hrs, Volume= 3,070 cf, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
10,163	74	>75% Grass cover, Good, HSG C
9,446	98	Paved parking, HSG C
19,608	86	Weighted Average
10,163		51.83% Pervious Area
9,446		48.17% Impervious Area

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

Summary for Subcatchment P-1D: Subcat P-1D

Runoff = 1.25 cfs @ 12.07 hrs, Volume= 3,905 cf, Depth= 2.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
14,728	98	Paved parking, HSG C
3,348	74	>75% Grass cover, Good, HSG C
18,076	94	Weighted Average
3,348		18.52% Pervious Area
14,728		81.48% Impervious Area

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

Summary for Subcatchment P-1E: Subcat P-1E

Runoff = 0.35 cfs @ 12.07 hrs, Volume= 1,170 cf, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
4,655	98	Roofs, HSG C
4,655		100.00% Impervious Area

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

Summary for Subcatchment P-2A: Subcat P-2A

Runoff = 1.40 cfs @ 12.07 hrs, Volume= 4,685 cf, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
18,631	98	Roofs, HSG C
18,631		100.00% Impervious Area

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

Summary for Subcatchment P-2B: Subcat P-2B

Runoff = 2.44 cfs @ 12.07 hrs, Volume= 7,715 cf, Depth= 2.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
4,789	74	>75% Grass cover, Good, HSG C
29,580	98	Paved parking, HSG C
34,369	95	Weighted Average
4,789		13.93% Pervious Area
29,580		86.07% Impervious Area

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

Summary for Pond dmh-04: dmh

Inflow Area = 43,108 sf, 88.19% Impervious, Inflow Depth = 1.84" for 2-Year event
Inflow = 1.97 cfs @ 12.07 hrs, Volume= 6,615 cf
Outflow = 1.97 cfs @ 12.07 hrs, Volume= 6,615 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.97 cfs @ 12.07 hrs, Volume= 6,615 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 42.49' @ 12.07 hrs
Flood Elev= 45.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	41.52'	**12.0" Round Culvert** L= 95.0' Ke= 0.500 Inlet / Outlet Invert= 41.52' / 41.04' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.97 cfs @ 12.07 hrs HW=42.49' TW=41.87' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 1.97 cfs @ 3.22 fps)

Summary for Pond dmh-05: dmh

Inflow Area = 43,108 sf, 88.19% Impervious, Inflow Depth = 1.84" for 2-Year event
Inflow = 1.97 cfs @ 12.07 hrs, Volume= 6,615 cf
Outflow = 1.97 cfs @ 12.07 hrs, Volume= 6,615 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.97 cfs @ 12.07 hrs, Volume= 6,615 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 41.87' @ 12.07 hrs
Flood Elev= 45.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	40.94'	**12.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 40.94' / 40.69' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.97 cfs @ 12.07 hrs HW=41.87' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.97 cfs @ 3.36 fps)

Summary for Pond dmh-06: dmh

Inflow Area = 22,731 sf, 85.27% Impervious, Inflow Depth = 2.68" for 2-Year event
Inflow = 1.60 cfs @ 12.07 hrs, Volume= 5,075 cf
Outflow = 1.60 cfs @ 12.07 hrs, Volume= 5,075 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.60 cfs @ 12.07 hrs, Volume= 5,075 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 39.42' @ 12.07 hrs
Flood Elev= 44.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	38.74'	**12.0" Round Culvert** L= 84.0' Ke= 0.500 Inlet / Outlet Invert= 38.74' / 37.54' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.60 cfs @ 12.07 hrs HW=39.42' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.60 cfs @ 2.81 fps)

Summary for Pond ds-1: Pervious Pavement

assumed exfiltration rate and groundwater elevation based on boring HA15-B5 by Haley & Aldrich, Inc.

Inflow Area = 16,799 sf, 69.69% Impervious, Inflow Depth = 2.31" for 2-Year event
Inflow = 1.06 cfs @ 12.07 hrs, Volume= 3,227 cf
Outflow = 0.27 cfs @ 12.44 hrs, Volume= 3,227 cf, Atten= 75%, Lag= 22.2 min
Discarded = 0.27 cfs @ 12.44 hrs, Volume= 3,227 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 43.81' @ 12.44 hrs Surf.Area= 11,123 sf Storage= 676 cf
Flood Elev= 45.97' Surf.Area= 11,123 sf Storage= 8,589 cf

Plug-Flow detention time= 14.0 min calculated for 3,227 cf (100% of inflow)
Center-of-Mass det. time= 14.0 min (815.0 - 801.0)

Volume	Invert	Avail.Storage	Storage Description
#1	43.63'	8,589 cf	**stone voids (Irregular)** Listed below (Recalc) 26,028 cf Overall x 33.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
43.63	11,123	899.0	0	0	11,123
45.97	11,123	899.0	26,028	26,028	13,227

Device	Routing	Invert	Outlet Devices
#1	Discarded	43.63'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 38.60' Phase-In= 0.01'
#2	Device 3	44.13'	**4.0" Vert. Underdrain X 2.00** C= 0.600
#3	Primary	42.59'	**12.0" Round Culvert** L= 195.0' Ke= 0.500 Inlet / Outlet Invert= 42.59' / 41.62' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.27 cfs @ 12.44 hrs HW=43.81' (Free Discharge)
└**1=Exfiltration** (Controls 0.27 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=43.63' TW=41.52' (Dynamic Tailwater)
└**3=Culvert** (Passes 0.00 cfs of 2.34 cfs potential flow)
└**2=Underdrain** (Controls 0.00 cfs)

Summary for Pond ds-2: Pervious Pavement

assumed exfiltration rate and groundwater elevation based on boring HA15-B5 by Haley & Aldrich, Inc.

Inflow Area = 19,608 sf, 48.17% Impervious, Inflow Depth = 1.88" for 2-Year event
Inflow = 1.03 cfs @ 12.07 hrs, Volume= 3,070 cf
Outflow = 0.21 cfs @ 12.50 hrs, Volume= 3,070 cf, Atten= 79%, Lag= 25.7 min
Discarded = 0.21 cfs @ 12.50 hrs, Volume= 3,070 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 41.17' @ 12.50 hrs Surf.Area= 8,246 sf Storage= 777 cf
Flood Elev= 43.22' Surf.Area= 8,246 sf Storage= 6,368 cf

Plug-Flow detention time= 22.5 min calculated for 3,069 cf (100% of inflow)
Center-of-Mass det. time= 22.5 min (843.4 - 820.9)

Volume	Invert	Avail.Storage	Storage Description
#1	40.88'	6,368 cf	**stone voids (Irregular)**Listed below (Recalc) 19,296 cf Overall x 33.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
40.88	8,246	532.0	0	0	8,246
43.22	8,246	532.0	19,296	19,296	9,491

Device	Routing	Invert	Outlet Devices
#1	Discarded	40.88'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 38.60' Phase-In= 0.01'
#2	Device 3	41.38'	**4.0" Vert. Underdrain** C= 0.600
#3	Primary	41.38'	**4.0" Round Culvert** L= 10.0' Ke= 0.500

Inlet / Outlet Invert= 41.38' / 40.27' S= 0.1110 '/' Cc= 0.900
n= 0.013 Cast iron, coated, Flow Area= 0.09 sf

Discarded OutFlow Max=0.21 cfs @ 12.50 hrs HW=41.17' (Free Discharge)
└**1=Exfiltration** (Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=40.88' TW=0.00' (Dynamic Tailwater)
└**3=Culvert** (Controls 0.00 cfs)
└**2=Underdrain** (Controls 0.00 cfs)

Summary for Link SP-1: study point

Inflow Area = 85,448 sf, 78.23% Impervious, Inflow Depth = 1.64" for 2-Year event
Inflow = 3.57 cfs @ 12.07 hrs, Volume= 11,691 cf
Primary = 3.57 cfs @ 12.07 hrs, Volume= 11,691 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SP-2: study point

Inflow Area = 52,999 sf, 90.96% Impervious, Inflow Depth = 2.81" for 2-Year event
Inflow = 3.84 cfs @ 12.07 hrs, Volume= 12,400 cf
Primary = 3.84 cfs @ 12.07 hrs, Volume= 12,400 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
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 P-1A: Subcat P-1A Runoff Area=26,309 sf 100.00% Impervious Runoff Depth=4.68"
Tc=5.0 min CN=98 Runoff=3.01 cfs 10,268 cf

Subcatchment P-1B: Subcat P-1B Runoff Area=16,799 sf 69.69% Impervious Runoff Depth=3.90"
Tc=5.0 min CN=91 Runoff=1.75 cfs 5,466 cf

Subcatchment P-1C: Subcat P-1C Runoff Area=19,608 sf 48.17% Impervious Runoff Depth=3.39"
Tc=5.0 min CN=86 Runoff=1.83 cfs 5,543 cf

Subcatchment P-1D: Subcat P-1D Runoff Area=18,076 sf 81.48% Impervious Runoff Depth=4.23"
Tc=5.0 min CN=94 Runoff=1.98 cfs 6,370 cf

Subcatchment P-1E: Subcat P-1E Runoff Area=4,655 sf 100.00% Impervious Runoff Depth=4.68"
Tc=5.0 min CN=98 Runoff=0.53 cfs 1,817 cf

Subcatchment P-2A: Subcat P-2A Runoff Area=18,631 sf 100.00% Impervious Runoff Depth=4.68"
Tc=5.0 min CN=98 Runoff=2.13 cfs 7,271 cf

Subcatchment P-2B: Subcat P-2B Runoff Area=34,369 sf 86.07% Impervious Runoff Depth=4.34"
Tc=5.0 min CN=95 Runoff=3.82 cfs 12,431 cf

Pond dmh-04: dmh Peak Elev=43.41' Inflow=3.01 cfs 10,268 cf
12.0" Round Culvert n=0.013 L=95.0' S=0.0051 '/' Outflow=3.01 cfs 10,268 cf

Pond dmh-05: dmh Peak Elev=42.39' Inflow=3.01 cfs 10,268 cf
12.0" Round Culvert n=0.013 L=50.0' S=0.0050 '/' Outflow=3.01 cfs 10,268 cf

Pond dmh-06: dmh Peak Elev=39.68' Inflow=2.52 cfs 8,187 cf
12.0" Round Culvert n=0.013 L=84.0' S=0.0143 '/' Outflow=2.52 cfs 8,187 cf

Pond ds-1: Pervious Pavement Peak Elev=44.06' Storage=1,570 cf Inflow=1.75 cfs 5,466 cf
Discarded=0.28 cfs 5,466 cf Primary=0.00 cfs 0 cf Outflow=0.28 cfs 5,466 cf

Pond ds-2: Pervious Pavement Peak Elev=41.54' Storage=1,786 cf Inflow=1.83 cfs 5,543 cf
Discarded=0.25 cfs 5,411 cf Primary=0.05 cfs 132 cf Outflow=0.30 cfs 5,543 cf

Link SP-1: study point Inflow=5.53 cfs 18,587 cf
Primary=5.53 cfs 18,587 cf

Link SP-2: study point Inflow=5.96 cfs 19,702 cf
Primary=5.96 cfs 19,702 cf

Total Runoff Area = 138,447 sf Runoff Volume = 49,166 cf Average Runoff Depth = 4.26"
16.90% Pervious = 23,391 sf 83.10% Impervious = 115,055 sf

Summary for Subcatchment P-1A: Subcat P-1A

Runoff = 3.01 cfs @ 12.07 hrs, Volume= 10,268 cf, Depth= 4.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.92"

Area (sf)	CN	Description
26,309	98	Roofs, HSG C
26,309		100.00% Impervious Area

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

Summary for Subcatchment P-1B: Subcat P-1B

Runoff = 1.75 cfs @ 12.07 hrs, Volume= 5,466 cf, Depth= 3.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.92"

Area (sf)	CN	Description
5,092	74	>75% Grass cover, Good, HSG C
11,708	98	Paved parking, HSG C
16,799	91	Weighted Average
5,092		30.31% Pervious Area
11,708		69.69% Impervious Area

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

Summary for Subcatchment P-1C: Subcat P-1C

Runoff = 1.83 cfs @ 12.07 hrs, Volume= 5,543 cf, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.92"

Area (sf)	CN	Description
10,163	74	>75% Grass cover, Good, HSG C
9,446	98	Paved parking, HSG C
19,608	86	Weighted Average
10,163		51.83% Pervious Area
9,446		48.17% Impervious Area

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

Summary for Subcatchment P-1D: Subcat P-1D

Runoff = 1.98 cfs @ 12.07 hrs, Volume= 6,370 cf, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.92"

Area (sf)	CN	Description
14,728	98	Paved parking, HSG C
3,348	74	>75% Grass cover, Good, HSG C
18,076	94	Weighted Average
3,348		18.52% Pervious Area
14,728		81.48% Impervious Area

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

Summary for Subcatchment P-1E: Subcat P-1E

Runoff = 0.53 cfs @ 12.07 hrs, Volume= 1,817 cf, Depth= 4.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.92"

Area (sf)	CN	Description
4,655	98	Roofs, HSG C
4,655		100.00% Impervious Area

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

Summary for Subcatchment P-2A: Subcat P-2A

Runoff = 2.13 cfs @ 12.07 hrs, Volume= 7,271 cf, Depth= 4.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.92"

Area (sf)	CN	Description
18,631	98	Roofs, HSG C
18,631		100.00% Impervious Area

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

Summary for Subcatchment P-2B: Subcat P-2B

Runoff = 3.82 cfs @ 12.07 hrs, Volume= 12,431 cf, Depth= 4.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.92"

Area (sf)	CN	Description
4,789	74	>75% Grass cover, Good, HSG C
29,580	98	Paved parking, HSG C
34,369	95	Weighted Average
4,789		13.93% Pervious Area
29,580		86.07% Impervious Area

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

Summary for Pond dmh-04: dmh

Inflow Area = 43,108 sf, 88.19% Impervious, Inflow Depth = 2.86" for 10-Year event
Inflow = 3.01 cfs @ 12.07 hrs, Volume= 10,268 cf
Outflow = 3.01 cfs @ 12.07 hrs, Volume= 10,268 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.01 cfs @ 12.07 hrs, Volume= 10,268 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 43.41' @ 12.07 hrs
Flood Elev= 45.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	41.52'	**12.0" Round Culvert** L= 95.0' Ke= 0.500 Inlet / Outlet Invert= 41.52' / 41.04' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.01 cfs @ 12.07 hrs HW=43.41' TW=42.39' (Dynamic Tailwater)
1=Culvert (Outlet Controls 3.01 cfs @ 3.83 fps)

Summary for Pond dmh-05: dmh

Inflow Area = 43,108 sf, 88.19% Impervious, Inflow Depth = 2.86" for 10-Year event
Inflow = 3.01 cfs @ 12.07 hrs, Volume= 10,268 cf
Outflow = 3.01 cfs @ 12.07 hrs, Volume= 10,268 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.01 cfs @ 12.07 hrs, Volume= 10,268 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 42.39' @ 12.07 hrs
Flood Elev= 45.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	40.94'	**12.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 40.94' / 40.69' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.01 cfs @ 12.07 hrs HW=42.39' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 3.01 cfs @ 3.83 fps)

Summary for Pond dmh-06: dmh

Inflow Area = 22,731 sf, 85.27% Impervious, Inflow Depth = 4.32" for 10-Year event
Inflow = 2.52 cfs @ 12.07 hrs, Volume= 8,187 cf
Outflow = 2.52 cfs @ 12.07 hrs, Volume= 8,187 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.52 cfs @ 12.07 hrs, Volume= 8,187 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 39.68' @ 12.07 hrs
Flood Elev= 44.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	38.74'	**12.0" Round Culvert** L= 84.0' Ke= 0.500 Inlet / Outlet Invert= 38.74' / 37.54' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.52 cfs @ 12.07 hrs HW=39.68' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.52 cfs @ 3.29 fps)

Summary for Pond ds-1: Pervious Pavement

assumed exfiltration rate and groundwater elevation based on boring HA15-B5 by Haley & Aldrich, Inc.

Inflow Area = 16,799 sf, 69.69% Impervious, Inflow Depth = 3.90" for 10-Year event
Inflow = 1.75 cfs @ 12.07 hrs, Volume= 5,466 cf
Outflow = 0.28 cfs @ 12.54 hrs, Volume= 5,466 cf, Atten= 84%, Lag= 28.0 min
Discarded = 0.28 cfs @ 12.54 hrs, Volume= 5,466 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 44.06' @ 12.54 hrs Surf.Area= 11,123 sf Storage= 1,570 cf
Flood Elev= 45.97' Surf.Area= 11,123 sf Storage= 8,589 cf

Plug-Flow detention time= 35.1 min calculated for 5,465 cf (100% of inflow)
Center-of-Mass det. time= 35.1 min (821.5 - 786.4)

Volume	Invert	Avail.Storage	Storage Description
#1	43.63'	8,589 cf	**stone voids (Irregular)**Listed below (Recalc) 26,028 cf Overall x 33.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
43.63	11,123	899.0	0	0	11,123
45.97	11,123	899.0	26,028	26,028	13,227

Device	Routing	Invert	Outlet Devices
#1	Discarded	43.63'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 38.60' Phase-In= 0.01'
#2	Device 3	44.13'	**4.0" Vert. Underdrain X 2.00** C= 0.600
#3	Primary	42.59'	**12.0" Round Culvert** L= 195.0' Ke= 0.500 Inlet / Outlet Invert= 42.59' / 41.62' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.28 cfs @ 12.54 hrs HW=44.06' (Free Discharge)
└**1=Exfiltration** (Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=43.63' TW=41.52' (Dynamic Tailwater)
└**3=Culvert** (Passes 0.00 cfs of 2.34 cfs potential flow)
└**2=Underdrain** (Controls 0.00 cfs)

Summary for Pond ds-2: Pervious Pavement

assumed exfiltration rate and groundwater elevation based on boring HA15-B5 by Haley & Aldrich, Inc.

Inflow Area = 19,608 sf, 48.17% Impervious, Inflow Depth = 3.39" for 10-Year event
Inflow = 1.83 cfs @ 12.07 hrs, Volume= 5,543 cf
Outflow = 0.30 cfs @ 12.54 hrs, Volume= 5,543 cf, Atten= 84%, Lag= 28.1 min
Discarded = 0.25 cfs @ 12.54 hrs, Volume= 5,411 cf
Primary = 0.05 cfs @ 12.54 hrs, Volume= 132 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 41.54' @ 12.54 hrs Surf.Area= 8,246 sf Storage= 1,786 cf
Flood Elev= 43.22' Surf.Area= 8,246 sf Storage= 6,368 cf

Plug-Flow detention time= 51.0 min calculated for 5,543 cf (100% of inflow)
Center-of-Mass det. time= 51.0 min (855.2 - 804.1)

Volume	Invert	Avail.Storage	Storage Description
#1	40.88'	6,368 cf	**stone voids (Irregular)**Listed below (Recalc) 19,296 cf Overall x 33.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
40.88	8,246	532.0	0	0	8,246
43.22	8,246	532.0	19,296	19,296	9,491

Device	Routing	Invert	Outlet Devices
#1	Discarded	40.88'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 38.60' Phase-In= 0.01'
#2	Device 3	41.38'	**4.0" Vert. Underdrain** C= 0.600
#3	Primary	41.38'	**4.0" Round Culvert** L= 10.0' Ke= 0.500

Inlet / Outlet Invert= 41.38' / 40.27' S= 0.1110 '/' Cc= 0.900
n= 0.013 Cast iron, coated, Flow Area= 0.09 sf

Discarded OutFlow Max=0.25 cfs @ 12.54 hrs HW=41.54' (Free Discharge)
└**1=Exfiltration** (Controls 0.25 cfs)

Primary OutFlow Max=0.05 cfs @ 12.54 hrs HW=41.54' TW=0.00' (Dynamic Tailwater)
└**3=Culvert** (Controls 0.05 cfs)
└**2=Underdrain** (Orifice Controls 0.05 cfs @ 1.35 fps)

Summary for Link SP-1: study point

Inflow Area = 85,448 sf, 78.23% Impervious, Inflow Depth = 2.61" for 10-Year event
Inflow = 5.53 cfs @ 12.07 hrs, Volume= 18,587 cf
Primary = 5.53 cfs @ 12.07 hrs, Volume= 18,587 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SP-2: study point

Inflow Area = 52,999 sf, 90.96% Impervious, Inflow Depth = 4.46" for 10-Year event
Inflow = 5.96 cfs @ 12.07 hrs, Volume= 19,702 cf
Primary = 5.96 cfs @ 12.07 hrs, Volume= 19,702 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
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 P-1A: Subcat P-1A Runoff Area=26,309 sf 100.00% Impervious Runoff Depth=5.99"
Tc=5.0 min CN=98 Runoff=3.82 cfs 13,136 cf

Subcatchment P-1B: Subcat P-1B Runoff Area=16,799 sf 69.69% Impervious Runoff Depth=5.18"
Tc=5.0 min CN=91 Runoff=2.29 cfs 7,255 cf

Subcatchment P-1C: Subcat P-1C Runoff Area=19,608 sf 48.17% Impervious Runoff Depth=4.63"
Tc=5.0 min CN=86 Runoff=2.47 cfs 7,563 cf

Subcatchment P-1D: Subcat P-1D Runoff Area=18,076 sf 81.48% Impervious Runoff Depth=5.52"
Tc=5.0 min CN=94 Runoff=2.55 cfs 8,322 cf

Subcatchment P-1E: Subcat P-1E Runoff Area=4,655 sf 100.00% Impervious Runoff Depth=5.99"
Tc=5.0 min CN=98 Runoff=0.68 cfs 2,324 cf

Subcatchment P-2A: Subcat P-2A Runoff Area=18,631 sf 100.00% Impervious Runoff Depth=5.99"
Tc=5.0 min CN=98 Runoff=2.71 cfs 9,302 cf

Subcatchment P-2B: Subcat P-2B Runoff Area=34,369 sf 86.07% Impervious Runoff Depth=5.64"
Tc=5.0 min CN=95 Runoff=4.90 cfs 16,153 cf

Pond dmh-04: dmh Peak Elev=44.47' Inflow=3.82 cfs 13,278 cf
12.0" Round Culvert n=0.013 L=95.0' S=0.0051 '/' Outflow=3.82 cfs 13,278 cf

Pond dmh-05: dmh Peak Elev=42.82' Inflow=3.82 cfs 13,278 cf
12.0" Round Culvert n=0.013 L=50.0' S=0.0050 '/' Outflow=3.82 cfs 13,278 cf

Pond dmh-06: dmh Peak Elev=39.97' Inflow=3.23 cfs 10,646 cf
12.0" Round Culvert n=0.013 L=84.0' S=0.0143 '/' Outflow=3.23 cfs 10,646 cf

Pond ds-1: Pervious Pavement Peak Elev=44.25' Storage=2,269 cf Inflow=2.29 cfs 7,255 cf
Discarded=0.29 cfs 7,114 cf Primary=0.06 cfs 142 cf Outflow=0.35 cfs 7,255 cf

Pond ds-2: Pervious Pavement Peak Elev=41.78' Storage=2,460 cf Inflow=2.47 cfs 7,563 cf
Discarded=0.27 cfs 6,732 cf Primary=0.20 cfs 831 cf Outflow=0.47 cfs 7,563 cf

Link SP-1: study point Inflow=7.05 cfs 24,755 cf
Primary=7.05 cfs 24,755 cf

Link SP-2: study point Inflow=7.60 cfs 25,456 cf
Primary=7.60 cfs 25,456 cf

Total Runoff Area = 138,447 sf Runoff Volume = 64,056 cf Average Runoff Depth = 5.55"
16.90% Pervious = 23,391 sf 83.10% Impervious = 115,055 sf

Summary for Subcatchment P-1A: Subcat P-1A

Runoff = 3.82 cfs @ 12.07 hrs, Volume= 13,136 cf, Depth= 5.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
26,309	98	Roofs, HSG C
26,309		100.00% Impervious Area

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

Summary for Subcatchment P-1B: Subcat P-1B

Runoff = 2.29 cfs @ 12.07 hrs, Volume= 7,255 cf, Depth= 5.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
5,092	74	>75% Grass cover, Good, HSG C
11,708	98	Paved parking, HSG C
16,799	91	Weighted Average
5,092		30.31% Pervious Area
11,708		69.69% Impervious Area

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

Summary for Subcatchment P-1C: Subcat P-1C

Runoff = 2.47 cfs @ 12.07 hrs, Volume= 7,563 cf, Depth= 4.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
10,163	74	>75% Grass cover, Good, HSG C
9,446	98	Paved parking, HSG C
19,608	86	Weighted Average
10,163		51.83% Pervious Area
9,446		48.17% Impervious Area

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

Summary for Subcatchment P-1D: Subcat P-1D

Runoff = 2.55 cfs @ 12.07 hrs, Volume= 8,322 cf, Depth= 5.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
14,728	98	Paved parking, HSG C
3,348	74	>75% Grass cover, Good, HSG C
18,076	94	Weighted Average
3,348		18.52% Pervious Area
14,728		81.48% Impervious Area

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

Summary for Subcatchment P-1E: Subcat P-1E

Runoff = 0.68 cfs @ 12.07 hrs, Volume= 2,324 cf, Depth= 5.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
4,655	98	Roofs, HSG C
4,655		100.00% Impervious Area

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

Summary for Subcatchment P-2A: Subcat P-2A

Runoff = 2.71 cfs @ 12.07 hrs, Volume= 9,302 cf, Depth= 5.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
18,631	98	Roofs, HSG C
18,631		100.00% Impervious Area

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

Summary for Subcatchment P-2B: Subcat P-2B

Runoff = 4.90 cfs @ 12.07 hrs, Volume= 16,153 cf, Depth= 5.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.23"

Area (sf)	CN	Description
4,789	74	>75% Grass cover, Good, HSG C
29,580	98	Paved parking, HSG C
34,369	95	Weighted Average
4,789		13.93% Pervious Area
29,580		86.07% Impervious Area

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

Summary for Pond dmh-04: dmh

[80] Warning: Exceeded Pond ds-1 by 0.53' @ 12.07 hrs (0.35 cfs 40 cf)

Inflow Area = 43,108 sf, 88.19% Impervious, Inflow Depth = 3.70" for 25-Year event
Inflow = 3.82 cfs @ 12.07 hrs, Volume= 13,278 cf
Outflow = 3.82 cfs @ 12.07 hrs, Volume= 13,278 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.82 cfs @ 12.07 hrs, Volume= 13,278 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 44.47' @ 12.07 hrs
Flood Elev= 45.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	41.52'	**12.0" Round Culvert** L= 95.0' Ke= 0.500 Inlet / Outlet Invert= 41.52' / 41.04' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.82 cfs @ 12.07 hrs HW=44.47' TW=42.82' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 3.82 cfs @ 4.87 fps)

Summary for Pond dmh-05: dmh

Inflow Area = 43,108 sf, 88.19% Impervious, Inflow Depth = 3.70" for 25-Year event
Inflow = 3.82 cfs @ 12.07 hrs, Volume= 13,278 cf
Outflow = 3.82 cfs @ 12.07 hrs, Volume= 13,278 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.82 cfs @ 12.07 hrs, Volume= 13,278 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 42.82' @ 12.07 hrs
Flood Elev= 45.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	40.94'	**12.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 40.94' / 40.69' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.82 cfs @ 12.07 hrs HW=42.82' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 3.82 cfs @ 4.87 fps)

Summary for Pond dmh-06: dmh

Inflow Area = 22,731 sf, 85.27% Impervious, Inflow Depth = 5.62" for 25-Year event
Inflow = 3.23 cfs @ 12.07 hrs, Volume= 10,646 cf
Outflow = 3.23 cfs @ 12.07 hrs, Volume= 10,646 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.23 cfs @ 12.07 hrs, Volume= 10,646 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 39.97' @ 12.07 hrs
Flood Elev= 44.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	38.74'	**12.0" Round Culvert** L= 84.0' Ke= 0.500 Inlet / Outlet Invert= 38.74' / 37.54' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.23 cfs @ 12.07 hrs HW=39.97' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.23 cfs @ 4.11 fps)

Summary for Pond ds-1: Pervious Pavement

assumed exfiltration rate and groundwater elevation based on boring HA15-B5 by Haley & Aldrich, Inc.

Inflow Area = 16,799 sf, 69.69% Impervious, Inflow Depth = 5.18" for 25-Year event
Inflow = 2.29 cfs @ 12.07 hrs, Volume= 7,255 cf
Outflow = 0.35 cfs @ 12.54 hrs, Volume= 7,255 cf, Atten= 85%, Lag= 28.2 min
Discarded = 0.29 cfs @ 12.54 hrs, Volume= 7,114 cf
Primary = 0.06 cfs @ 12.54 hrs, Volume= 142 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 44.25' @ 12.54 hrs Surf.Area= 11,123 sf Storage= 2,269 cf
Flood Elev= 45.97' Surf.Area= 11,123 sf Storage= 8,589 cf

Plug-Flow detention time= 50.2 min calculated for 7,255 cf (100% of inflow)
Center-of-Mass det. time= 50.2 min (829.2 - 779.0)

Volume	Invert	Avail.Storage	Storage Description
#1	43.63'	8,589 cf	**stone voids (Irregular)**Listed below (Recalc) 26,028 cf Overall x 33.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
43.63	11,123	899.0	0	0	11,123
45.97	11,123	899.0	26,028	26,028	13,227

Device	Routing	Invert	Outlet Devices
#1	Discarded	43.63'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 38.60' Phase-In= 0.01'
#2	Device 3	44.13'	**4.0" Vert. Underdrain X 2.00** C= 0.600
#3	Primary	42.59'	**12.0" Round Culvert** L= 195.0' Ke= 0.500 Inlet / Outlet Invert= 42.59' / 41.62' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.29 cfs @ 12.54 hrs HW=44.25' (Free Discharge)
└**1=Exfiltration** (Controls 0.29 cfs)

Primary OutFlow Max=0.06 cfs @ 12.54 hrs HW=44.25' TW=41.99' (Dynamic Tailwater)
└**3=Culvert** (Passes 0.06 cfs of 2.91 cfs potential flow)
└**2=Underdrain** (Orifice Controls 0.06 cfs @ 1.17 fps)

Summary for Pond ds-2: Pervious Pavement

assumed exfiltration rate and groundwater elevation based on boring HA15-B5 by Haley & Aldrich, Inc.

Inflow Area = 19,608 sf, 48.17% Impervious, Inflow Depth = 4.63" for 25-Year event
Inflow = 2.47 cfs @ 12.07 hrs, Volume= 7,563 cf
Outflow = 0.47 cfs @ 12.51 hrs, Volume= 7,563 cf, Atten= 81%, Lag= 26.0 min
Discarded = 0.27 cfs @ 12.51 hrs, Volume= 6,732 cf
Primary = 0.20 cfs @ 12.51 hrs, Volume= 831 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 41.78' @ 12.51 hrs Surf.Area= 8,246 sf Storage= 2,460 cf
Flood Elev= 43.22' Surf.Area= 8,246 sf Storage= 6,368 cf

Plug-Flow detention time= 55.8 min calculated for 7,563 cf (100% of inflow)
Center-of-Mass det. time= 55.8 min (851.2 - 795.4)

Volume	Invert	Avail.Storage	Storage Description
#1	40.88'	6,368 cf	**stone voids (Irregular)**Listed below (Recalc) 19,296 cf Overall x 33.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
40.88	8,246	532.0	0	0	8,246
43.22	8,246	532.0	19,296	19,296	9,491

Device	Routing	Invert	Outlet Devices
#1	Discarded	40.88'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 38.60' Phase-In= 0.01'
#2	Device 3	41.38'	**4.0" Vert. Underdrain** C= 0.600
#3	Primary	41.38'	**4.0" Round Culvert** L= 10.0' Ke= 0.500

Inlet / Outlet Invert= 41.38' / 40.27' S= 0.1110 '/' Cc= 0.900
n= 0.013 Cast iron, coated, Flow Area= 0.09 sf

Discarded OutFlow Max=0.27 cfs @ 12.51 hrs HW=41.78' (Free Discharge)
└**1=Exfiltration** (Controls 0.27 cfs)

Primary OutFlow Max=0.20 cfs @ 12.51 hrs HW=41.78' TW=0.00' (Dynamic Tailwater)
└**3=Culvert** (Controls 0.20 cfs)
└**2=Underdrain** (Orifice Controls 0.20 cfs @ 2.35 fps)

Summary for Link SP-1: study point

Inflow Area = 85,448 sf, 78.23% Impervious, Inflow Depth = 3.48" for 25-Year event
Inflow = 7.05 cfs @ 12.07 hrs, Volume= 24,755 cf
Primary = 7.05 cfs @ 12.07 hrs, Volume= 24,755 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SP-2: study point

Inflow Area = 52,999 sf, 90.96% Impervious, Inflow Depth = 5.76" for 25-Year event
Inflow = 7.60 cfs @ 12.07 hrs, Volume= 25,456 cf
Primary = 7.60 cfs @ 12.07 hrs, Volume= 25,456 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
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 P-1A: Subcat P-1A Runoff Area=26,309 sf 100.00% Impervious Runoff Depth=8.67"
Tc=5.0 min CN=98 Runoff=5.48 cfs 19,008 cf

Subcatchment P-1B: Subcat P-1B Runoff Area=16,799 sf 69.69% Impervious Runoff Depth=7.82"
Tc=5.0 min CN=91 Runoff=3.38 cfs 10,953 cf

Subcatchment P-1C: Subcat P-1C Runoff Area=19,608 sf 48.17% Impervious Runoff Depth=7.22"
Tc=5.0 min CN=86 Runoff=3.76 cfs 11,791 cf

Subcatchment P-1D: Subcat P-1D Runoff Area=18,076 sf 81.48% Impervious Runoff Depth=8.19"
Tc=5.0 min CN=94 Runoff=3.71 cfs 12,333 cf

Subcatchment P-1E: Subcat P-1E Runoff Area=4,655 sf 100.00% Impervious Runoff Depth=8.67"
Tc=5.0 min CN=98 Runoff=0.97 cfs 3,363 cf

Subcatchment P-2A: Subcat P-2A Runoff Area=18,631 sf 100.00% Impervious Runoff Depth=8.67"
Tc=5.0 min CN=98 Runoff=3.88 cfs 13,460 cf

Subcatchment P-2B: Subcat P-2B Runoff Area=34,369 sf 86.07% Impervious Runoff Depth=8.31"
Tc=5.0 min CN=95 Runoff=7.08 cfs 23,795 cf

Pond dmh-04: dmh Peak Elev=47.39' Inflow=5.48 cfs 20,616 cf
12.0" Round Culvert n=0.013 L=95.0' S=0.0051 '/' Outflow=5.48 cfs 20,616 cf

Pond dmh-05: dmh Peak Elev=44.01' Inflow=5.48 cfs 20,616 cf
12.0" Round Culvert n=0.013 L=50.0' S=0.0050 '/' Outflow=5.48 cfs 20,616 cf

Pond dmh-06: dmh Peak Elev=40.82' Inflow=4.67 cfs 15,696 cf
12.0" Round Culvert n=0.013 L=84.0' S=0.0143 '/' Outflow=4.67 cfs 15,696 cf

Pond ds-1: Pervious Pavement Peak Elev=44.55' Storage=3,390 cf Inflow=3.38 cfs 10,953 cf
Discarded=0.30 cfs 9,345 cf Primary=0.43 cfs 1,608 cf Outflow=0.73 cfs 10,953 cf

Pond ds-2: Pervious Pavement Peak Elev=42.37' Storage=4,055 cf Inflow=3.76 cfs 11,791 cf
Discarded=0.32 cfs 9,114 cf Primary=0.38 cfs 2,677 cf Outflow=0.70 cfs 11,791 cf

Link SP-1: study point Inflow=10.34 cfs 38,989 cf
Primary=10.34 cfs 38,989 cf

Link SP-2: study point Inflow=10.96 cfs 37,255 cf
Primary=10.96 cfs 37,255 cf

Total Runoff Area = 138,447 sf Runoff Volume = 94,703 cf Average Runoff Depth = 8.21"
16.90% Pervious = 23,391 sf 83.10% Impervious = 115,055 sf

Summary for Subcatchment P-1A: Subcat P-1A

Runoff = 5.48 cfs @ 12.07 hrs, Volume= 19,008 cf, Depth= 8.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.91"

Area (sf)	CN	Description
26,309	98	Roofs, HSG C
26,309		100.00% Impervious Area

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

Summary for Subcatchment P-1B: Subcat P-1B

Runoff = 3.38 cfs @ 12.07 hrs, Volume= 10,953 cf, Depth= 7.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.91"

Area (sf)	CN	Description
5,092	74	>75% Grass cover, Good, HSG C
11,708	98	Paved parking, HSG C
16,799	91	Weighted Average
5,092		30.31% Pervious Area
11,708		69.69% Impervious Area

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

Summary for Subcatchment P-1C: Subcat P-1C

Runoff = 3.76 cfs @ 12.07 hrs, Volume= 11,791 cf, Depth= 7.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.91"

Area (sf)	CN	Description
10,163	74	>75% Grass cover, Good, HSG C
9,446	98	Paved parking, HSG C
19,608	86	Weighted Average
10,163		51.83% Pervious Area
9,446		48.17% Impervious Area

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

Summary for Subcatchment P-1D: Subcat P-1D

Runoff = 3.71 cfs @ 12.07 hrs, Volume= 12,333 cf, Depth= 8.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.91"

Area (sf)	CN	Description
14,728	98	Paved parking, HSG C
3,348	74	>75% Grass cover, Good, HSG C
18,076	94	Weighted Average
3,348		18.52% Pervious Area
14,728		81.48% Impervious Area

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

Summary for Subcatchment P-1E: Subcat P-1E

Runoff = 0.97 cfs @ 12.07 hrs, Volume= 3,363 cf, Depth= 8.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.91"

Area (sf)	CN	Description
4,655	98	Roofs, HSG C
4,655		100.00% Impervious Area

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

Summary for Subcatchment P-2A: Subcat P-2A

Runoff = 3.88 cfs @ 12.07 hrs, Volume= 13,460 cf, Depth= 8.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.91"

Area (sf)	CN	Description
18,631	98	Roofs, HSG C
18,631		100.00% Impervious Area

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

Summary for Subcatchment P-2B: Subcat P-2B

Runoff = 7.08 cfs @ 12.07 hrs, Volume= 23,795 cf, Depth= 8.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.91"

Area (sf)	CN	Description
4,789	74	>75% Grass cover, Good, HSG C
29,580	98	Paved parking, HSG C
34,369	95	Weighted Average
4,789		13.93% Pervious Area
29,580		86.07% Impervious Area

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

Summary for Pond dmh-04: dmh

[58] Hint: Peaked 1.49' above defined flood level
[80] Warning: Exceeded Pond ds-1 by 3.23' @ 12.07 hrs (1.48 cfs 567 cf)

Inflow Area = 43,108 sf, 88.19% Impervious, Inflow Depth = 5.74" for 100-Year event
Inflow = 5.48 cfs @ 12.07 hrs, Volume= 20,616 cf
Outflow = 5.48 cfs @ 12.07 hrs, Volume= 20,616 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.48 cfs @ 12.07 hrs, Volume= 20,616 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 47.39' @ 12.07 hrs
Flood Elev= 45.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	41.52'	**12.0" Round Culvert** L= 95.0' Ke= 0.500 Inlet / Outlet Invert= 41.52' / 41.04' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=5.48 cfs @ 12.07 hrs HW=47.39' TW=44.01' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 5.48 cfs @ 6.97 fps)

Summary for Pond dmh-05: dmh

Inflow Area = 43,108 sf, 88.19% Impervious, Inflow Depth = 5.74" for 100-Year event
Inflow = 5.48 cfs @ 12.07 hrs, Volume= 20,616 cf
Outflow = 5.48 cfs @ 12.07 hrs, Volume= 20,616 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.48 cfs @ 12.07 hrs, Volume= 20,616 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 44.01' @ 12.07 hrs
Flood Elev= 45.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	40.94'	**12.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 40.94' / 40.69' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=5.48 cfs @ 12.07 hrs HW=44.01' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 5.48 cfs @ 6.97 fps)

Summary for Pond dmh-06: dmh

Inflow Area = 22,731 sf, 85.27% Impervious, Inflow Depth = 8.29" for 100-Year event
Inflow = 4.67 cfs @ 12.07 hrs, Volume= 15,696 cf
Outflow = 4.67 cfs @ 12.07 hrs, Volume= 15,696 cf, Atten= 0%, Lag= 0.0 min
Primary = 4.67 cfs @ 12.07 hrs, Volume= 15,696 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 40.82' @ 12.07 hrs
Flood Elev= 44.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	38.74'	**12.0" Round Culvert** L= 84.0' Ke= 0.500 Inlet / Outlet Invert= 38.74' / 37.54' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=4.67 cfs @ 12.07 hrs HW=40.82' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 4.67 cfs @ 5.95 fps)

Summary for Pond ds-1: Pervious Pavement

assumed exfiltration rate and groundwater elevation based on boring HA15-B5 by Haley & Aldrich, Inc.

Inflow Area = 16,799 sf, 69.69% Impervious, Inflow Depth = 7.82" for 100-Year event
Inflow = 3.38 cfs @ 12.07 hrs, Volume= 10,953 cf
Outflow = 0.73 cfs @ 12.47 hrs, Volume= 10,953 cf, Atten= 78%, Lag= 23.8 min
Discarded = 0.30 cfs @ 12.47 hrs, Volume= 9,345 cf
Primary = 0.43 cfs @ 12.47 hrs, Volume= 1,608 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 44.55' @ 12.47 hrs Surf.Area= 11,123 sf Storage= 3,390 cf
Flood Elev= 45.97' Surf.Area= 11,123 sf Storage= 8,589 cf

Plug-Flow detention time= 53.8 min calculated for 10,953 cf (100% of inflow)
Center-of-Mass det. time= 53.8 min (822.5 - 768.7)

Volume	Invert	Avail.Storage	Storage Description
#1	43.63'	8,589 cf	**stone voids (Irregular)**Listed below (Recalc) 26,028 cf Overall x 33.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
43.63	11,123	899.0	0	0	11,123
45.97	11,123	899.0	26,028	26,028	13,227

Device	Routing	Invert	Outlet Devices
#1	Discarded	43.63'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 38.60' Phase-In= 0.01'
#2	Device 3	44.13'	**4.0" Vert. Underdrain X 2.00** C= 0.600
#3	Primary	42.59'	**12.0" Round Culvert** L= 195.0' Ke= 0.500 Inlet / Outlet Invert= 42.59' / 41.62' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.30 cfs @ 12.47 hrs HW=44.55' (Free Discharge)
└**1=Exfiltration** (Controls 0.30 cfs)

Primary OutFlow Max=0.43 cfs @ 12.47 hrs HW=44.55' TW=42.35' (Dynamic Tailwater)
└**3=Culvert** (Passes 0.43 cfs of 3.17 cfs potential flow)
└**2=Underdrain** (Orifice Controls 0.43 cfs @ 2.44 fps)

Summary for Pond ds-2: Pervious Pavement

assumed exfiltration rate and groundwater elevation based on boring HA15-B5 by Haley & Aldrich, Inc.

Inflow Area = 19,608 sf, 48.17% Impervious, Inflow Depth = 7.22" for 100-Year event
Inflow = 3.76 cfs @ 12.07 hrs, Volume= 11,791 cf
Outflow = 0.70 cfs @ 12.51 hrs, Volume= 11,791 cf, Atten= 81%, Lag= 26.1 min
Discarded = 0.32 cfs @ 12.51 hrs, Volume= 9,114 cf
Primary = 0.38 cfs @ 12.51 hrs, Volume= 2,677 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 42.37' @ 12.51 hrs Surf.Area= 8,246 sf Storage= 4,055 cf
Flood Elev= 43.22' Surf.Area= 8,246 sf Storage= 6,368 cf

Plug-Flow detention time= 63.5 min calculated for 11,790 cf (100% of inflow)
Center-of-Mass det. time= 63.5 min (846.8 - 783.3)

Volume	Invert	Avail.Storage	Storage Description
#1	40.88'	6,368 cf	**stone voids (Irregular)**Listed below (Recalc) 19,296 cf Overall x 33.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
40.88	8,246	532.0	0	0	8,246
43.22	8,246	532.0	19,296	19,296	9,491

Device	Routing	Invert	Outlet Devices
#1	Discarded	40.88'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 38.60' Phase-In= 0.01'
#2	Device 3	41.38'	**4.0" Vert. Underdrain** C= 0.600
#3	Primary	41.38'	**4.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 41.38' / 40.27' S= 0.1110 '/' Cc= 0.900 n= 0.013 Cast iron, coated, Flow Area= 0.09 sf

Discarded OutFlow Max=0.32 cfs @ 12.51 hrs HW=42.37' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.32 cfs)

Primary OutFlow Max=0.38 cfs @ 12.51 hrs HW=42.37' TW=0.00' (Dynamic Tailwater)
↑—**3=Culvert** (Controls 0.38 cfs)
↑—**2=Underdrain** (Orifice Controls 0.38 cfs @ 4.37 fps)

Summary for Link SP-1: study point

Inflow Area = 85,448 sf, 78.23% Impervious, Inflow Depth = 5.48" for 100-Year event
Inflow = 10.34 cfs @ 12.07 hrs, Volume= 38,989 cf
Primary = 10.34 cfs @ 12.07 hrs, Volume= 38,989 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SP-2: study point

Inflow Area = 52,999 sf, 90.96% Impervious, Inflow Depth = 8.44" for 100-Year event
Inflow = 10.96 cfs @ 12.07 hrs, Volume= 37,255 cf
Primary = 10.96 cfs @ 12.07 hrs, Volume= 37,255 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Stage-Area-Storage for Pond ds-1: Pervious Pavement

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
43.63	**11,123**	0	44.16	11,123	1,945
43.64	11,123	37	44.17	11,123	1,982
43.65	11,123	73	44.18	11,123	2,019
43.66	11,123	110	44.19	11,123	2,056
43.67	11,123	147	44.20	11,123	2,092
43.68	11,123	184	44.21	11,123	2,129
43.69	11,123	220	44.22	11,123	2,166
43.70	11,123	257	44.23	11,123	2,202
43.71	11,123	294	44.24	11,123	2,239
43.72	11,123	330	44.25	11,123	2,276
43.73	11,123	367	44.26	11,123	2,312
43.74	11,123	404	44.27	11,123	2,349
43.75	11,123	440	44.28	11,123	2,386
43.76	11,123	477	44.29	11,123	2,423
43.77	11,123	514	44.30	11,123	2,459
43.78	11,123	551	44.31	11,123	2,496
43.79	11,123	587	44.32	11,123	2,533
43.80	11,123	624	44.33	11,123	2,569
43.81	11,123	661	44.34	11,123	2,606
43.82	11,123	697	44.35	11,123	2,643
43.83	11,123	734	44.36	11,123	2,680
43.84	11,123	771	44.37	11,123	2,716
43.85	11,123	808	44.38	11,123	2,753
43.86	11,123	844	44.39	11,123	2,790
43.87	11,123	881	44.40	11,123	2,826
43.88	11,123	918	44.41	11,123	2,863
43.89	11,123	954	44.42	11,123	2,900
43.90	11,123	991	44.43	11,123	2,936
43.91	11,123	1,028	44.44	11,123	2,973
43.92	11,123	1,064	44.45	11,123	3,010
43.93	11,123	1,101	44.46	11,123	3,047
43.94	11,123	1,138	44.47	11,123	3,083
43.95	11,123	1,175	44.48	11,123	3,120
43.96	11,123	1,211	44.49	11,123	3,157
43.97	11,123	1,248	44.50	11,123	3,193
43.98	11,123	1,285	44.51	11,123	3,230
43.99	11,123	1,321	44.52	11,123	3,267
44.00	11,123	1,358	44.53	11,123	3,304
44.01	11,123	1,395	44.54	11,123	3,340
44.02	11,123	1,432	44.55	11,123	3,377
44.03	11,123	1,468	44.56	11,123	3,414
44.04	11,123	1,505	44.57	11,123	3,450
44.05	11,123	1,542	44.58	11,123	3,487
44.06	11,123	1,578	44.59	11,123	3,524
44.07	11,123	1,615	44.60	11,123	3,560
44.08	11,123	1,652	44.61	11,123	3,597
44.09	11,123	1,688	44.62	11,123	3,634
44.10	11,123	1,725	44.63	11,123	3,671
44.11	11,123	1,762	44.64	11,123	3,707
44.12	11,123	1,799	44.65	11,123	3,744
44.13	11,123	1,835	44.66	11,123	3,781
44.14	11,123	1,872	44.67	11,123	3,817
44.15	11,123	1,909	44.68	11,123	3,854

Stage-Area-Storage for Pond ds-2: Pervious Pavement

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
40.88	**8,246**	0	41.41	8,246	1,442
40.89	8,246	27	41.42	8,246	1,469
40.90	8,246	54	41.43	8,246	1,497
40.91	8,246	82	41.44	8,246	1,524
40.92	8,246	109	41.45	8,246	1,551
40.93	8,246	136	41.46	8,246	1,578
40.94	8,246	163	41.47	8,246	1,605
40.95	8,246	190	41.48	8,246	1,633
40.96	8,246	218	41.49	8,246	1,660
40.97	8,246	245	41.50	8,246	1,687
40.98	8,246	272	41.51	8,246	1,714
40.99	8,246	299	41.52	8,246	1,742
41.00	8,246	327	41.53	8,246	1,769
41.01	8,246	354	41.54	8,246	1,796
41.02	8,246	381	41.55	8,246	1,823
41.03	8,246	408	41.56	8,246	1,850
41.04	8,246	435	41.57	8,246	1,878
41.05	8,246	463	41.58	8,246	1,905
41.06	8,246	490	41.59	8,246	1,932
41.07	8,246	517	41.60	8,246	1,959
41.08	8,246	544	41.61	8,246	1,986
41.09	8,246	571	41.62	8,246	2,014
41.10	8,246	599	41.63	8,246	2,041
41.11	8,246	626	41.64	8,246	2,068
41.12	8,246	653	41.65	8,246	2,095
41.13	8,246	680	41.66	8,246	2,123
41.14	8,246	708	41.67	8,246	2,150
41.15	8,246	735	41.68	8,246	2,177
41.16	8,246	762	41.69	8,246	2,204
41.17	8,246	789	41.70	8,246	2,231
41.18	8,246	816	41.71	8,246	2,259
41.19	8,246	844	41.72	8,246	2,286
41.20	8,246	871	41.73	8,246	2,313
41.21	8,246	898	41.74	8,246	2,340
41.22	8,246	925	41.75	8,246	2,367
41.23	8,246	952	41.76	8,246	2,395
41.24	8,246	980	41.77	8,246	2,422
41.25	8,246	1,007	41.78	8,246	2,449
41.26	8,246	1,034	41.79	8,246	2,476
41.27	8,246	1,061	41.80	8,246	2,503
41.28	8,246	1,088	41.81	8,246	2,531
41.29	8,246	1,116	41.82	8,246	2,558
41.30	8,246	1,143	41.83	8,246	2,585
41.31	8,246	1,170	41.84	8,246	2,612
41.32	8,246	1,197	41.85	8,246	2,640
41.33	8,246	1,225	41.86	8,246	2,667
41.34	8,246	1,252	41.87	8,246	2,694
41.35	8,246	1,279	41.88	8,246	2,721
41.36	8,246	1,306	41.89	8,246	2,748
41.37	8,246	1,333	41.90	8,246	2,776
41.38	8,246	1,361	41.91	8,246	2,803
41.39	8,246	1,388	41.92	8,246	2,830
41.40	8,246	1,415	41.93	8,246	2,857

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	Massachusetts
Location	
Longitude	71.072 degrees West
Latitude	42.443 degrees North
Elevation	0 feet
Date/Time	Tue, 24 Sep 2019 10:07:12 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.69	0.86	1.09	**1yr**	0.75	1.03	1.27	1.63	2.09	2.71	2.98	**1yr**	2.40	2.87	3.29	4.00	4.67	**1yr**
2yr	0.35	0.53	0.67	0.88	1.10	1.39	**2yr**	0.95	1.27	1.62	2.04	2.57	3.25	3.61	**2yr**	2.88	3.47	3.97	4.72	5.37	**2yr**
5yr	0.41	0.64	0.80	1.08	1.38	1.76	**5yr**	1.19	1.60	2.04	2.59	3.26	4.12	4.58	**5yr**	3.64	4.40	5.02	5.99	6.72	**5yr**
10yr	0.46	0.73	0.92	1.25	1.62	2.09	**10yr**	1.40	1.90	2.45	3.10	3.91	4.92	5.48	**10yr**	4.35	5.27	6.00	7.16	7.96	**10yr**
25yr	0.55	0.87	1.11	1.53	2.02	2.63	**25yr**	1.75	2.40	3.09	3.93	4.96	6.23	6.97	**25yr**	5.51	6.70	7.59	9.09	9.97	**25yr**
50yr	0.61	0.99	1.27	1.78	2.40	3.15	**50yr**	2.07	2.85	3.71	4.73	5.96	7.45	8.36	**50yr**	6.59	8.04	9.08	10.89	11.83	**50yr**
100yr	0.71	1.15	1.48	2.09	2.84	3.75	**100yr**	2.45	3.40	4.43	5.65	7.13	8.91	10.04	**100yr**	7.89	9.65	10.86	13.05	14.04	**100yr**
200yr	0.80	1.31	1.70	2.44	3.36	4.48	**200yr**	2.90	4.05	5.30	6.78	8.55	10.67	12.06	**200yr**	9.44	11.59	13.00	15.64	16.67	**200yr**
500yr	0.97	1.59	2.07	3.01	4.22	5.66	**500yr**	3.64	5.11	6.72	8.61	10.86	13.54	15.37	**500yr**	11.98	14.78	16.50	19.89	20.94	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.25	0.38	0.47	0.63	0.78	0.86	**1yr**	0.67	0.85	1.16	1.42	1.76	2.41	2.44	**1yr**	2.13	2.34	2.94	3.52	3.85	**1yr**
2yr	0.33	0.51	0.63	0.85	1.05	1.25	**2yr**	0.91	1.23	1.44	1.91	2.47	3.15	3.48	**2yr**	2.79	3.35	3.83	4.56	5.20	**2yr**
5yr	0.39	0.60	0.74	1.02	1.29	1.51	**5yr**	1.12	1.47	1.72	2.23	2.86	3.79	4.15	**5yr**	3.35	3.99	4.60	5.49	6.21	**5yr**
10yr	0.43	0.66	0.82	1.15	1.48	1.73	**10yr**	1.28	1.69	1.97	2.51	3.21	4.34	4.84	**10yr**	3.84	4.66	5.29	6.29	7.07	**10yr**
25yr	0.50	0.75	0.94	1.34	1.76	2.06	**25yr**	1.52	2.02	2.34	2.93	3.73	5.18	5.86	**25yr**	4.59	5.63	6.35	7.49	8.40	**25yr**
50yr	0.55	0.84	1.04	1.50	2.02	2.37	**50yr**	1.74	2.32	2.66	3.30	4.19	5.89	6.76	**50yr**	5.22	6.50	7.27	8.55	9.55	**50yr**
100yr	0.62	0.93	1.17	1.69	2.31	2.70	**100yr**	2.00	2.64	3.03	3.73	4.70	6.75	7.83	**100yr**	5.97	7.53	8.35	9.71	10.85	**100yr**
200yr	0.69	1.04	1.32	1.91	2.67	3.10	**200yr**	2.30	3.03	3.45	4.20	5.28	7.68	9.09	**200yr**	6.80	8.74	9.59	11.00	12.32	**200yr**
500yr	0.81	1.21	1.55	2.25	3.20	3.71	**500yr**	2.77	3.62	4.09	4.93	6.16	9.13	11.08	**500yr**	8.08	10.66	11.51	12.95	14.54	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.31	0.47	0.57	0.77	0.95	1.11	**1yr**	0.82	1.09	1.30	1.74	2.23	2.88	3.21	**1yr**	2.55	3.08	3.55	4.36	5.06	**1yr**
2yr	0.36	0.55	0.68	0.92	1.14	1.35	**2yr**	0.98	1.32	1.56	2.05	2.66	3.40	3.77	**2yr**	3.01	3.63	4.12	4.93	5.56	**2yr**
5yr	0.45	0.69	0.86	1.17	1.49	1.77	**5yr**	1.29	1.73	2.05	2.65	3.38	4.49	5.04	**5yr**	3.97	4.85	5.48	6.49	7.26	**5yr**
10yr	0.55	0.84	1.04	1.45	1.88	2.17	**10yr**	1.62	2.12	2.52	3.21	4.06	5.57	6.27	**10yr**	4.93	6.03	6.78	8.02	8.90	**10yr**
25yr	0.71	1.08	1.34	1.92	2.52	2.85	**25yr**	2.18	2.79	3.34	4.16	5.17	7.40	8.41	**25yr**	6.55	8.08	9.02	10.67	11.68	**25yr**
50yr	0.86	1.31	1.63	2.34	3.15	3.52	**50yr**	2.72	3.44	4.12	5.05	6.23	9.20	10.48	**50yr**	8.15	10.08	11.20	13.25	14.36	**50yr**
100yr	1.05	1.59	2.00	2.88	3.95	4.34	**100yr**	3.41	4.24	5.11	6.15	7.49	11.44	13.08	**100yr**	10.12	12.58	13.91	16.50	17.68	**100yr**
200yr	1.28	1.93	2.45	3.55	4.95	5.35	**200yr**	4.27	5.23	6.33	7.47	8.99	14.22	16.32	**200yr**	12.58	15.69	17.28	20.55	21.80	**200yr**
500yr	1.68	2.50	3.22	4.67	6.64	7.05	**500yr**	5.73	6.89	8.43	9.67	11.48	18.98	21.86	**500yr**	16.80	21.02	23.02	27.51	28.80	**500yr**

Powered by ACIS Northeast Regional Climate Center

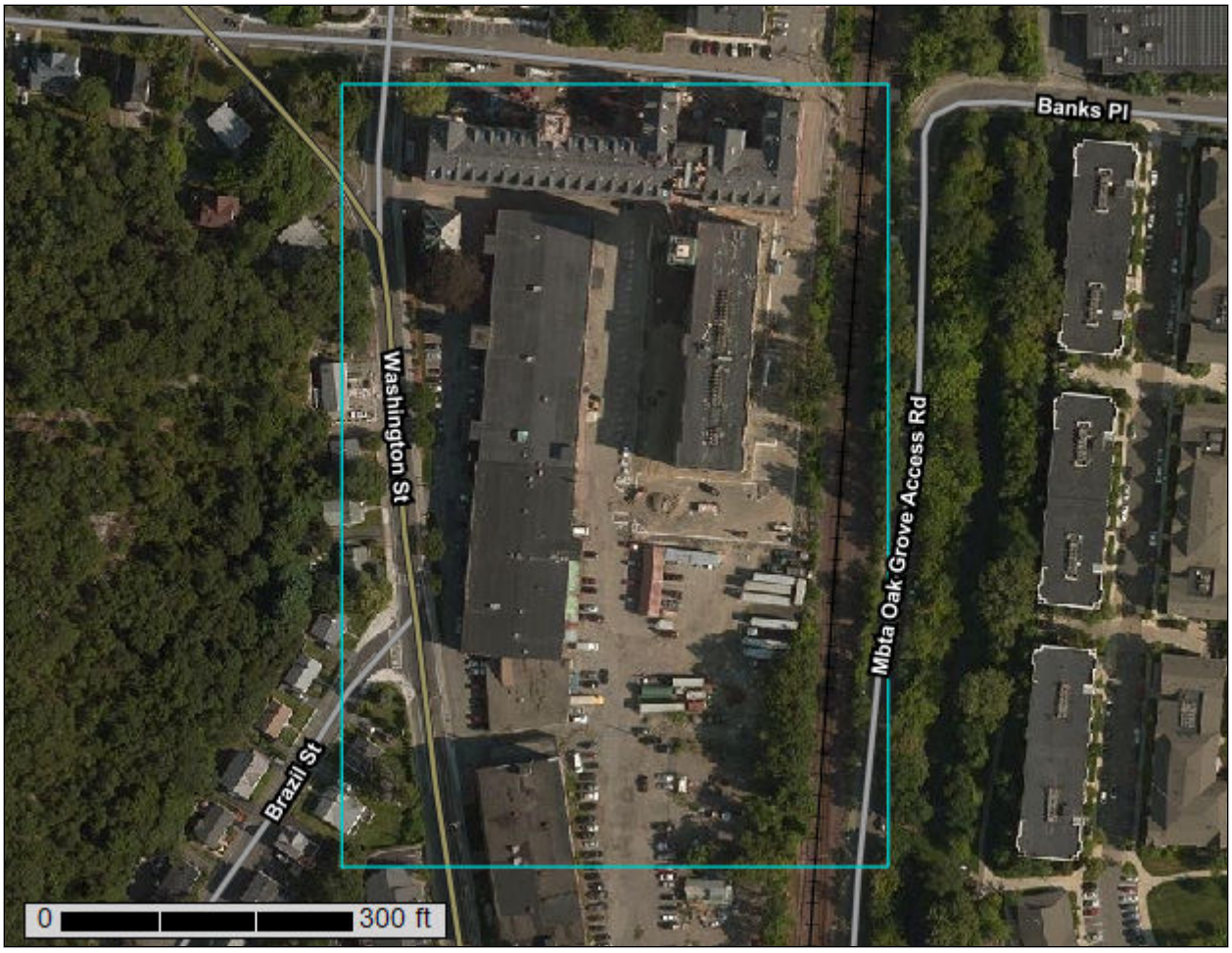
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Middlesex County, Massachusetts



September 24, 2019

Preface

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

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

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

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

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

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

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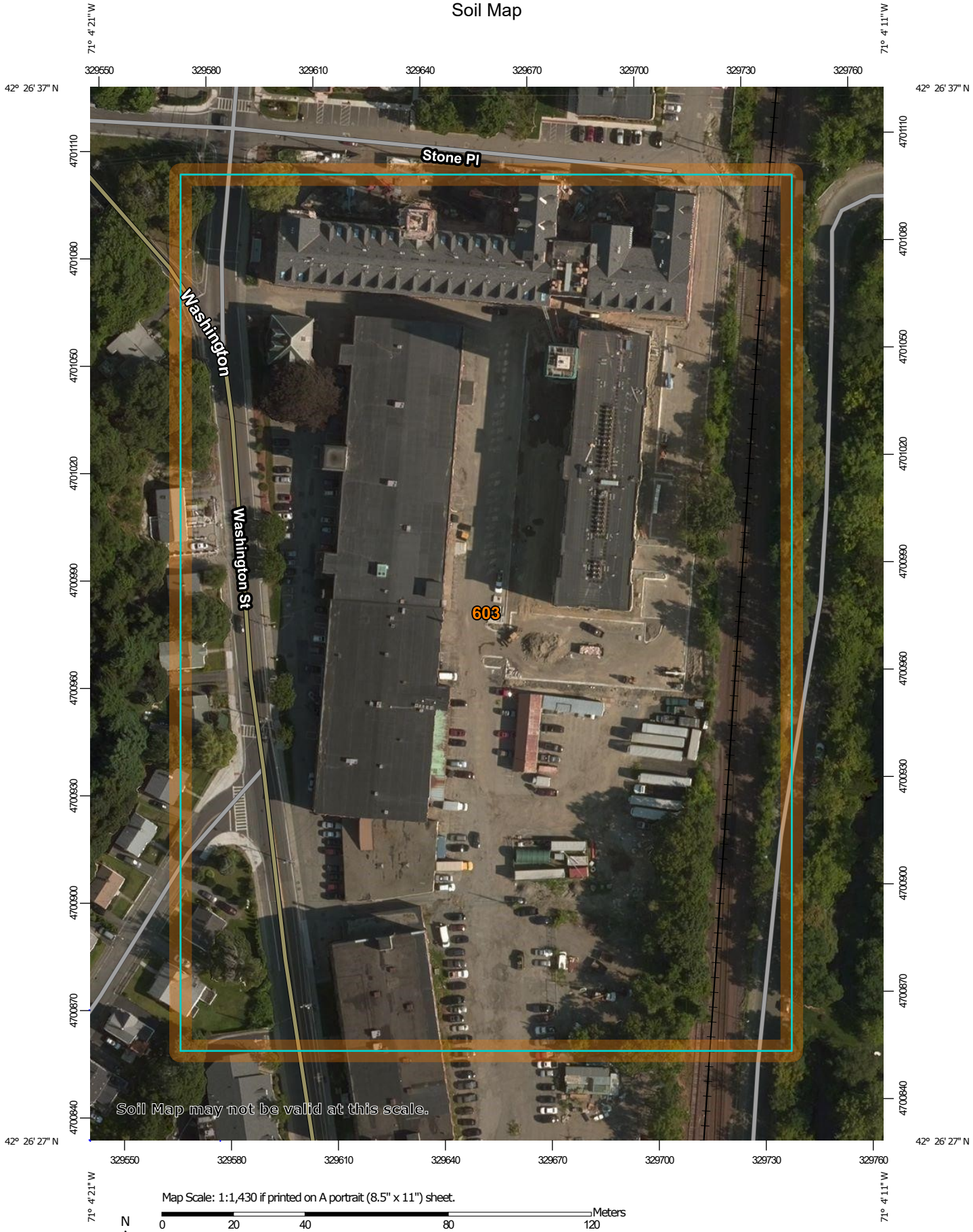
Contents

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:1,430 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 18, Sep 7, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 10, 2014—Aug 25, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
603	Urban land, wet substratum	10.4	100.0%
Totals for Area of Interest		**10.4**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

Middlesex County, Massachusetts

603—Urban land, wet substratum

Map Unit Setting

National map unit symbol: 9951
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land over alluvium and/or marine deposits

Minor Components

Udorthents, loamy

Percent of map unit: 10 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Operation & Maintenance Plan

INTRODUCTION

In accordance with the standards set forth by the Stormwater Management Policy issued by the Department of Environmental Protection (DEP), Allen & Major Associates, Inc. has prepared the following Operation & Maintenance Plan for the proposed parking expansion at 99 Washington Street, Melrose, Massachusetts.

The plan is divided into three major sections. The first section describes construction-related erosion and sedimentation controls (Construction Period). The second section describes the long-term pollution prevention measures (Long Term Pollution Prevention Plan). The third section is a post-construction operation and maintenance plan designed to address the long-term maintenance needs of the stormwater management system (Long Term Maintenance Plan).

NOTIFICATION PROCEDURES FOR CHANGE OF RESPONSIBILITY FOR O&M

The Stormwater Management System (SMS) for the Project is owned by Oak Grove Mill, LLC (Owner). The Owner shall be legally responsible for the long-term operation and maintenance of this SMS as outlined in this Operation & Maintenance (O&M) Plan. Should ownership of the SMS change, the Owner will continue to be responsible until the succeeding owner shall notify the City that the succeeding owner has assumed such responsibility. Upon subsequent transfers, the responsibility shall continue to be that of transferring owner until the transferee owner notifies the City of its assumption of responsibility.

In the event the SMS will serve multiple lots/owners, such as the subdivision of the existing parcel or creation of lease areas, the owner(s) shall establish an association on other legally enforceable arrangements under which the association or a single party shall have legal responsibility for the operation and maintenance of the entire SMS. The legal instrument creating such responsibility shall be recorded with the Registry of Deeds and promptly following its recording, a copy thereof shall be furnished to the Commission.

CONTACT INFORMATION

Stormwater Management System Owner:

Oak Grove Mill, LLC
c/o Eastern Real Estate LLC
One Marina Park Drive, Suite 1500
Boston, MA 02210
Phone: 617-274-5660

Emergency Contact Information:

- Oak Grove Mill, LLC (Owner/Operator) — Phone (617) 274-5660
- Allen & Major Associates, Inc. (Site Civil Engineer) — Phone (781) 935-6889
- Melrose Public Works — Phone (781) 665-0142
- Melrose Conservation Commission — Phone (781) 979-4312
- Melrose Fire Department (non-emergency line) — Phone (781) 665-0500

CONSTRUCTION PERIOD

1. Contact the Melrose Engineering Division at least fourteen (14) days prior to start of construction to schedule a pre-construction meeting.

2. Install the tubular barriers and construction fencing as shown on the Site Preparation Plan.

3. Install the construction entrance at the location shown on the Site Preparation Plan.

4. Site access shall be achieved only from the designated construction entrance.

5. Stockpiles shall be stabilized with erosion control matting or temporary seeding whenever practicable.

6. Install silt sacks and tubular barriers around each drain inlet as soon as practicable.

7. Install stone check dams at locations shown on the Site Preparation Plan or as required to control runoff as soon as practicable.

8. Install erosion control fabric on all vegetated slopes as shown on the Site Preparation Plan as soon as practicable.

9. All erosion control measures shall be inspected weekly and after every rainfall event half-inch or greater.

10. All erosion control measures shall be maintained, repaired or replaced as required or at the direction of the Owner's engineer, the City Engineer or the City Conservation Agent.

11. Sediment accumulation up-gradient of the tubular barriers greater than 6" in depth shall be removed and disposed of in accordance with all applicable regulations.

12. If it appears that sediment is exiting the site, immediate action shall be taken to stop the sediment from exiting the site. Silt sacks shall then be installed in all off-site catch basins adjacent to the Site and the on-site erosion and sediment control measures shall be modified to prevent any future sediment from exiting the site.

13. The contractor shall comply with all the General and Erosion Notes as shown on the Site Development Plans and Specifications.

14. The stabilized construction entrances shall be inspected weekly by the contractor. The entrances shall be maintained by adding additional clean, angular, durable stone to remove the soil from the construction vehicle's tires when exiting the site. If soil is still leaving the site via the construction vehicle tires, adjacent roadways shall be kept clean by street sweeping.

15. Dust pollution shall be controlled using on-site water trucks and or an approved soil stabilization product.

LONG TERM POLLUTION PREVENTION PLAN

Standard #4 of the MA DEP Stormwater Management Handbook requires that a Long-Term Pollution Prevention Plan (LTPPP) be prepared and incorporated as part of the Operation and Maintenance of the Stormwater Management System. The purpose of the LTPPP is to identify potential sources of pollution that may affect the quality of stormwater discharges, and to describe the implementation of practices to reduce the pollutants in stormwater discharges. The following items describe the source control and proper procedures for the LTPPP.

o HOUSEKEEPING

The proposed site development has been designed to maintain a high level of water quality treatment for all stormwater discharge generated on the Site. An Operation & Maintenance (O&M) plan has been prepared and is included in this section of the report. The Owner (or its designee) is responsible for adherence to the O&M plan is a strict and complete manner.

o STORING OF MATERIALS AND WASTE PRODUCTS

There are no proposed exterior (un-covered) storage areas. The trash and waste program for the site includes interior trash rooms and interior compactor. There will be a trash contractor used to pick up the waste material in the compactor. The stormwater drainage system has water quality inlets designed to capture trash and debris.

o VEHICLE WASHING

Outdoor vehicle washing has the potential to result in high loads of nutrients, metals, and hydrocarbons during dry weather conditions, as the detergent-rich water used to wash the grime off the vehicle enters the stormwater drainage system. The proposed Project does not include any designated vehicle washing areas, nor is it expected that any vehicle washing will take place on-site.

o SPILL PREVENTION AND RESPONSE

Sources of potential spill hazards include vehicle fluids, liquid fuels, pesticides, paints, solvents, and liquid cleaning products. The majority of the spill hazards would likely occur within the building and would not enter the stormwater drainage system. However, there are spill hazards from vehicle fluids or liquid fuels located outside of the buildings. These exterior spill hazards have the potential to enter the stormwater drainage system and are to be addressed as follows:

1. Spill Hazards of pesticides, paints, and solvents shall be remediated using the Manufacturers' recommended spill cleanup protocol.
2. Vehicle fluids and liquid fuel spill shall be remediated according to the local and state regulations governing fuel spills.
3. The owner shall have the following equipment and materials on hand to address a spill clean-up: brooms, dust pans, mops, rags, gloves, absorptive material, sand, sawdust, plastic and metal trash containers.
4. The owner shall have trained personnel on site to identify the spill, utilize the onsite spill cleanup materials to immediately contain the spill, and contact the appropriate authorities for further cleanup if necessary. See Item #6.
5. All spills shall be cleaned up immediately after discovery.

6. **Spills of toxic or hazardous material shall be reported, regardless of size, to the Massachusetts Department of Environmental Protection at 888-304-1133 and the local Fire Department. Additional resources for spill cleanup include Clean Harbors at Phone (800) 645-8265.**

o Should a spill occur, the pollution prevention plan will be adjusted by the owner to include measures to prevent another spill of a similar nature. A description of the spill, along with the causes and cleanup measures will be included in the updated pollution prevention plan.

MAINTENANCE OF LAWNS, GARDENS AND OTHER LANDSCAPED AREAS

It should be recognized that this is a general guideline towards achieving high quality and well groomed landscaped areas. The grounds staff / landscape contractor must recognize the shortcomings of a general maintenance plan such as this, and modify and/or augment it based on weekly, monthly, and yearly observations. In order to assure the highest quality conditions, the staff must also recognize and appreciate the need to be aware of the constantly changing conditions of the landscaping and be able to respond to them on a proactive basis.

- **Fertilizer**

Maintenance practices should be aimed at reducing environmental, mechanical and pest stresses to promote healthy and vigorous growth. When necessary, pest outbreaks should be treated with the most sensitive control measure available. Synthetic chemical controls should be used only as a last resort to organic and biological control methods. Fertilizer, synthetic chemical controls and pest management applications (when necessary) shall be performed only by licensed applicators in accordance with the manufacturer's label instructions when environmental conditions are conducive to controlled product application.

Only slow-release organic fertilizers should be used in the planting and mulch areas to limit the amount of nutrients that could enter downstream resource areas. Fertilization of the planting and mulch areas will be performed within manufacturers labeling instructions and shall not exceed an NPK ration of 1:1:1 (i.e. Triple 10 fertilizer mix), considered a low nitrogen mixture. Fertilizers approved for the use under this O&M Plan are as follows:

Type:	LESCO® 28-0-12 (Lawn Fertilizer)
	MERIT® 0.2 Plus Turf Fertilizer
	MOMENTUM™ Force Weed & Feed

- **Suggested Aeration Program**

In-season aeration of lawn areas is good cultural practice, and is recommended whenever feasible. It should be accomplished with a solid thin tine aeration method to reduce disruption to the use of the area. The depth of solid tine aeration is similar to core type, but should be performed when the soil is somewhat drier for a greater overall effect.

Depending on the intensity of use, it can be expected that all landscaped lawn areas will need aeration to reduce compaction at least once per year. The first operation should occur in late May following the spring season. Methods of reducing compaction will vary based on the nature of the compaction. Compaction on newly established landscaped areas is generally limited to the top 2-3" and can be alleviated using hollow core or thin tine aeration methods.

The spring aeration should consist of two passes at opposite directions with 1/4" hollow core tines penetrating 3-5" into the soil profile. Aeration should occur when the soil is moist but not saturated. The soil cores should be shattered in place and dragged or swept back into the turf to control thatch. If desired the cores may also be removed and the area top-dressed with sand or sandy loam. If the area drains on average too slowly, the topdressing should contain a higher percentage of sand. If it is draining on average too quickly, the top dressing should contain a higher percentage of soil and organic matter.

- **Landscape Maintenance Program Practices:**
  - **Lawn**
    1. Mow a minimum of once a week in spring, to a height of 2" to 2 1/2" high. Mowing should be frequent enough so that no more than 1/3 of grass blade is removed at each mowing. The top growth supports the roots; the shorter the grass is cut, the less the roots will grow. Short cutting also dries out the soil and encourages weeds to germinate.
    2. Mow approximately once every two weeks from July 1st to August 15th depending on lawn growth.
    3. Mow on a ten-day cycle in fall, when growth is stimulated by cooler nights and increased moisture.
    4. Do not remove grass clippings after mowing.
    5. Keep mower blades sharp to prevent ragged cuts on grass leaves, which cause a brownish appearance and increase the chance for disease to enter a leaf.
  - **Shrubs**
    1. Mulch not more than 3" depth with shredded pine or fir bark.
    2. Hand prune annually, immediately after blooming, to remove 1/3 of the above-ground biomass (older stems). Stem removals to occur within 6" of the ground to open up shrub and maintain two-year wood (the blooming wood).
    3. Hand prune evergreen shrubs only as needed to remove dead and damaged wood and to maintain the naturalistic form of the shrub. Never mechanically shear evergreen shrubs.
  - **Trees**
    1. Provide aftercare for new tree plantings for the first three years.
    2. Do not fertilize trees, it artificially stimulates them (unless tree health warrants).
    3. Water once a week for the first year; twice a month the second, once a month the third year.
    4. Prune trees on a four-year cycle.
  - **Invasive Species**
    1. Inform the Conservation Commission Agent prior to the removal of invasive species proposed either through hand work or through chemical removal.

o **STORAGE AND USE OF HERBICIDES AND PESTICIDES**

Integrated Pest Management is the combination of all methods (of pest control) which may prevent, reduce, suppress, eliminate, or repel an insect population. The main requirements necessary to support any pest population are food, shelter and water, and any upset of the balance of these will assist in controlling a pest population. Scientific pest management is the knowledgeable use of all pest control methods (sanitation, mechanical, chemical) to benefit mankind's health, welfare, comfort, property and food.

A Pest Management Professional (PMP) will be retained who is licensed with the Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Department of Agricultural Resources.

The site manager will be provided with approved bulletin before entering into or renewing an agreement to apply pesticides for the control of indoor or structural pests. 333 CMR 13.08.

Before beginning each application, the applicator must inform the conservation commission and post a state and local approved notice on all of the entrances to the treated room or area. The applicator must leave such notices posted after the application. The notice will be posted at conspicuous point(s) of access to the area treated. The location and number of signs will be determined by the configuration of the area to be treated based on the applicator's best judgment. It is intended to give sufficient notice that no one comes into an area being treated unaware that the applicator is working and pesticides are being applied. However, if the contracting entity does not want the signs posted, he/she may sign a Department approved waiver indicating this.

The applicator or employer will provide to any person upon their request the following information on previously conducted applications:

1. Name and phone number of pest control company
2. Date and time of the application;
3. Name and license number of the applicator
4. Target pests
5. Name and EPA Registration Number of pesticide products applied

The notification must be made in writing. The intent is so that individuals, who wish to avoid exposure or want to avoid encountering the applicator, can make necessary arrangements. Applicators are required by law to follow all directions on the pesticide label and must take all steps necessary to avoid applications with people present in a room or area to be treated. Individuals occupying a room or area to be treated at the time of application shall be informed of the procedure. Whenever possible, the applicator should not apply pesticides with anyone present. That may mean treating other areas and returning when occupants have left, asking people to leave the area while the work is being done, or treating before or after people occupy the room. If people do not leave, the applicator must make it clear that he is there to apply pesticides. The applicator will be prepared to provide whatever information possible about the pesticides and techniques used.

- **PET WASTE MANAGEMENT**

The City of Melrose has regulations regarding the care of pets within public areas. The City has a leash law and a pet waste law that requires pet owners to remove pet waste from public areas. The owner's landscape crew (or designee) shall remove any obvious pet waste that has been left behind by pet owners within the project area. The pet waste shall be disposed of in accordance with local and state regulations.

- **OPERATIONS AND MANAGEMENT OF SEPTIC SYSTEMS**

There are no proposed septic systems within the limits of the project. The sanitary sewer is proposed to connect to the existing sewer line, which runs through Washington Street.

- **MANAGEMENT OF DEICING CHEMICALS AND SNOW**

  Snow will be stockpiled on site in designated areas shown on the Layout & Materials Plan until the space is exceeded. Once the designated areas shown on the plan are full, the accumulated snow will be removed and disposed of off-site. In the case of storm events in which snowfall is at least 12 inches, stockpiled snow will be removed and disposed off-site as soon as is practicable. In the case of smaller storm events, snow will remain in the snow storage areas shown on the plan, until the storage is exceeded at which time the accumulated snow will be removed and disposed of off-site. It will be the responsibility of the snow removal contractor to properly dispose of transported snow according to Massachusetts DEP, Bureau of Resource Protection – Snow Disposal Guideline #BWR G2015-01, governing the proper disposal of snow. It will be the responsibility of the snow removal contractor to follow these guidelines and all applicable laws and regulations.

  The owner's maintenance staff (or its designee), or an outside snow removal contractor will be responsible for the clearing of the sidewalk and building entrances. The owner may be required to use a de-icing agent such as potassium chloride to maintain a safe walking surface. The de-icing agent for the walkways and building entrances will be kept within the storage rooms located within the building. De-icing agents will not be stored outside. The use of de-icing chemicals (such as sodium chloride, potassium chloride, calcium chloride or any other chemicals) are to be limited to the amount necessary to maintain public safety. The owner, owner's designee, or contractor shall be responsible to follow this requirement.

- **LONG TERM MAINTENANCE PLAN – FACILITIES DESCRIPTION**

The following is a description of the stormwater management system for the project site.

- **STORMWATER COLLECTION SYSTEM – ON SITE**

  The stormwater collection system is a series of inlets located at low points within the limits of the paved and unpaved areas. All of the proposed catch basins incorporate a hooded outlet and flow to existing stormwater infrastructure on neighboring properties.

- **PROPRIETARY SEPARATORS**

  The water quality units used on site are Stormceptor STC units. The units use a swirl chamber and baffle system to provide TSS removal. The maintenance needs of the separators are described further in the sections following.

- **PERVIOUS PAVEMENT**

  There are two pervious pavement systems within the proposed development. Copies of the maintenance requirements are included in the following sections.

INSPECTION AND MAINTENANCE FREQUENCY AND CORRECTIVE MEASURES

In accordance with MA DEP Stormwater Handbook: Volume 2, Chapter 2; the following areas, facilities, and measures will be inspected and the identified deficiencies will be corrected. Clean-out must include the removal and legal disposal of any accumulated sediments, trash, and debris. In any and all cases, operations, inspections, and maintenance activities shall utilize best practical measures to avoid and minimize impacts to wetland resource areas outside the foot print of the SMS.

Structural Pretreatment BMPs: Regular maintenance of these BMPs is especially critical because they typically receive the highest concentration of suspended solids during the first flush of a storm event.

Deep Sump Catch Basins:
Inspect all on-site catch basins two times per year (specifically after foliage and snow season) to ensure that the catch basins are working in their intended fashion and that they are free of debris. Structures will be skimmed of floatable debris at each inspection and sediment will be removed when or before sump is determined to be 50% full. If the basin outlet is designed with a hood to trap floatable materials (i.e. Snout), check to ensure watertight seal is working.

Proprietary Separators will be maintained in strict accordance with manufacturers recommend schedule and practices but at a minimum be inspected yearly and cleaned out when sediment levels reach a depth of 8 inches. Available manufacturer specific O&M plans attached as Appendix.

Other BMPs and Accessories:

Vegetated Areas:
Inspect slopes and embankments early in the growing season to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

Pervious Pavement, Roadways and Parking Surfaces:
Clear accumulations of winter sand in parking lots and along roadways at least two times per year, primarily in the spring and fall. Special attention to sweeping should be provided in March or April, before spring rains wash away residual sand from winter applications. Accumulations on pavement shall be removed using either a High Efficiency Vacuum Sweeper or a Regenerative Air Sweeper.

SUPPLEMENTAL INFORMATION (See following pages)

OPERATION & MAINTENANCE SCHEDULE & CHECKLIST
PERVIOUS PAVEMENT MAINTENANCE
STORMCEPTOR® STC OWNER'S MANUAL

OPERATION & MAINTENANCE PLAN SCHEDULE

Project: Oak Grove Mill
Address: 99 Washington Street
Melrose, Massachusetts

Party Responsible for O & M Plan: Oak Grove Mill, LLC

Address: One Marina Park Drive, Suite 1500
Boston, MA 02210
Phone: 617-274-5660

Date: _____
Revised _____

Structure or Task	Maintenance Activity	Schedule/Notes	Annual Maintenance Cost (% of construction cost)	Inspection Performed	
				Date:	By:
Street Sweeping	Sweep paved areas using either a High Efficiency Vacuum Sweeper or a Regenerative Air Sweeper.	Sweep paved areas as needed, but not less than two times annually. Sweeping should occur primarily in the Spring and Fall.			
		Submit information that confirms that all street sweepings have been disposed in accordance with state and local requirements			
Deep Sump Catch Basins(s)	Clam shell or vacuum sumps	Inspect two times annually. Clean when sediment is 6" deep, but never allow sediment to exceed 60% of sump volume.			
		Submit information that confirms that all catch basin sediments have been disposed in accordance with state and local requirements			
Water Quality Structures	Inspect frames and covers. Empty Sediment storage chamber using vacuum truck	Inspect annually. Clean when sediment is 8" Deep.			
		Submit information that confirms that all water quality inlets sediments have been disposed in accordance with state and local requirements			
Mosquito Control	CB management targeted larviciding treatment to CB's and all storm drains to control mosquitoes in their aquatic stages.	Surveillance is a non chemical inspection method that involves classification of mosquito breeding sites, larval presents, and survey.			
Snow Storage	Snow will be stockpiled on site in designated areas shown on the Layout & Materials Plan until the space is exceeded. Once the designated areas shown on the Layout & Materials Plan are full, the accumulated snow will be removed and disposed of off-site. In the case of storm events in which snowfall is at least 12 inches, stockpiled snow will be removed and disposed off-site as soon as is practicable. Debris shall be cleared from the site and properly disposed of at the end of the snow season, but shall be cleared no later than May 15.	Avoid dumping snow removal over catch basins			

PERVIOUS PAVEMENT - DESCRIPTION

From the bottom up, the pervious pavement structure consists of:

- An un-compacted level subgrade.
- A stone recharge bed consisting of clean, ¾" crushed stone. This course is considered the "reservoir course" and is a structural layer that also temporarily stores stormwater as it infiltrates in the soil below.
- A filter blanket comprised of pea-stone. The filter blanket prevents the filter course from migrating into the reservoir course.
- A filter course comprised of sand and gravel. The purpose of the filter course is to provide water quality treatment prior to recharge.
- A choker course comprised of ¾" crushed stone. The purpose of the choker course is to stabilize the surface for the paving equipment.
- Pervious pavement – an open-graded asphalt surface with interconnected voids that allow stormwater to flow through the pavement into the reservoir course.

PERVIOUS PAVEMENT - MAINTENANCE

Pervious pavement shall not be seal-coated. In addition, sand must not be used for the control of snow and ice. All pervious pavements should be inspected several times in the first few months after construction and at least quarterly thereafter. Pavement inspections should include, but not be limited to, checking for cracks, surface unraveling (individual aggregate particles dislodging from the surface), unevenness, heaving, and settlement (particularly at boundaries. Inspections should be conducted during and after large storms (2" of rainfall in a 24-hour period) to check for surface ponding that might indicate possible clogging. To prevent clogging of pervious pavements, the areas shall be vacuum swept at least twice per year. Snow plowing shall be conducted using a plastic, rubber, or composite plow blade. Steel-edged plow blades increase the likelihood of surface unraveling.

CONTECH®
ENGINEERED SOLUTIONS

Stormceptor® STC
Owner's Manual

Stormceptor® STC

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For patent information, go to www.ContechES.com/ip.

Your selection of a Stormceptor® means that you have chosen the most recognized and efficient stormwater oil/sediment separator available for protecting the environment. Stormceptor is a pollution control device often referred to as a "Hydrodynamic Separator (HDS)" or an "Oil Grit Separator (OGS)", engineered to remove and retain pollutants from stormwater runoff to protect our lakes, rivers and streams from the harmful effects of non-point source pollution.

1 – Stormceptor Overview

Stormceptor is a patented stormwater quality structure most often utilized as a treatment component of the underground storm drain network for stormwater pollution prevention. Stormceptor is designed to remove sediment, total suspended solids (TSS), other pollutants attached to sediment, hydrocarbons and free oil from stormwater runoff. Collectively the Stormceptor provides spill protection and prevents non-point source pollution from entering downstream waterways.

Key benefits of Stormceptor include:

- Removes sediment, suspended solids, debris, nutrients, heavy metals, and hydrocarbons (oil and grease) from runoff and snowmelt.
- Will not scour or re-suspend trapped pollutants.
- Provides sediment and oil storage.
- Provides spill control for accidents, commercial and industrial developments.
- Easy to inspect and maintain (vacuum truck).
- "STORMCEPTOR" is clearly marked on the access cover (excluding inlet designs).
- Relatively small footprint.
- 3rd Party tested and independently verified.
- Dedicated team of experts available to provide support.

Model Types:

- STC (Standard)
- EOS (Extended Oil Storage)
- OSR (Oil and Sand Removal)
- MAX (Custom designed unit, specific to site)

Configuration Types:

- Inlet unit (accommodates inlet flow entry, and multi-pipe entry)
- In-Line (accommodates multi-pipe entry)
- Submerged Unit (accommodates the site's tailwater conditions)
- Series Unit (combines treatment in two systems)

PLEASE MAINTAIN YOUR STORMCEPTOR

To ensure long-term environmental protection through continued performance as originally designed for your site, Stormceptor must be maintained, as any stormwater treatment practice does. The need for maintenance is determined through inspection of the Stormceptor. Procedures for inspection are provided within this document. Maintenance of the Stormceptor is performed from the surface via vacuum truck.

If you require information about Stormceptor, or assistance in finding resources to facilitate inspections or maintenance of your Stormceptor please call Contech at 1-800-338-1122.

2 – Stormceptor Operation and Components

Stormceptor is a flexibly designed underground stormwater quality treatment device that is unparalleled in its effectiveness for pollutant capture and retention using patented flow separation technology. Stormceptor creates a non-turbulent treatment environment below the insert platform within the system. The insert diverts water into the lower chamber, allowing free oils and debris to rise, and sediment to settle under relatively low velocity conditions. These pollutants are trapped and stored below the insert and protected from large runoff events for later removal during the maintenance procedure.

With thousands of units operating worldwide, Stormceptor delivers reliable protection every day, in every storm. The patented Stormceptor design prohibits the scour and release of captured pollutants, ensuring superior water quality treatment and protection during even the most extreme storm events. Stormceptor's proven performance is backed by the longest record of lab and field verification in the industry.

Stormceptor Schematic and Component Functions

Below are schematics of two common Stormceptor configurations with key components identified and their functions briefly described.

- **Manhole access cover** – provides access to the subsurface components
- **Precast reinforced concrete structure** – provides the vessel's watertight structural support
- **Fiberglass insert** – separates vessel into upper and lower chambers
- **Weir** – directs incoming stormwater and oil spills into the lower chamber
- **Orifice plate** – prevents scour of accumulated pollutants
- **Inlet drop tee** – conveys stormwater into the lower chamber
- **Fiberglass skirt** – provides double-wall containment of hydrocarbons
- **Outlet riser pipe** – conveys treated water to the upper chamber; primary vacuum line access port for sediment removal
- **Oil inspection port** – primary access for measuring oil depth and oil removal
- **Safety grate** – safety measure to cover riser pipe in the event of manned entry into vessel

Figure 1.

Inline Stormceptor

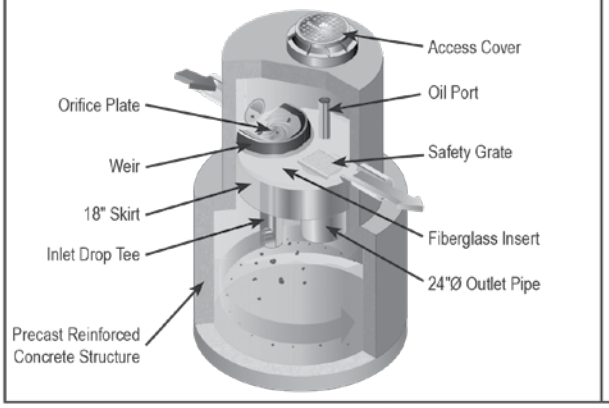
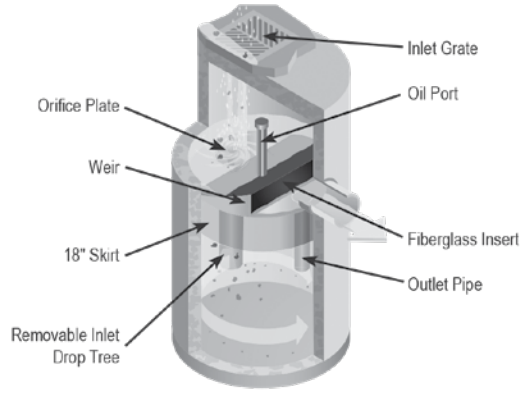


Figure 2.

Inlet Stormceptor



3 – Stormceptor Identification

Stormceptor is available in both precast concrete and fiberglass vessels, with precast concrete often being the dominant material of construction.

In the Stormceptor, a patented, engineered fiberglass insert separates the structure into an upper chamber and lower chamber. The lower chamber will remain full of water, as this is where the pollutants are sequestered for later removal. Multiple Stormceptor model (STC, OSR, EOS and MAX) configurations exist, each to be inspected and maintained in a similar fashion.

Each unit is easily identifiable as a Stormceptor by the trade name "Stormceptor" embossed on each access cover at the surface. To determine the location of "inlet" Stormceptor units with horizontal catch basin inlet, look down into the grate as the Stormceptor insert will be visible. The name "Stormceptor" is not embossed on inlet models due to the variability of inlet grates used/approved across North America.

Once the location of the Stormceptor is determined, the model number may be identified by comparing the measured depth from the fiberglass insert level at the outlet pipe's invert (water level) to the bottom of the tank using Table 1.

In addition, starting in 1996 a metal serial number tag containing the model number has been affixed to the inside of the unit, on the fiberglass insert. If the unit does not have a serial number, or if there is any uncertainty regarding the size of the unit using depth measurements, please contact your local Contech Representative for assistance.

Sizes/Models

Typical general dimensions and capacities of the standard precast STC, EOS and OSR Stormceptor models are provided in Tables 1 and 2. Typical rim to invert measurements are provided later in this document. The total depth for cleaning will be the sum of the depth from outlet pipe invert (generally the water level) to rim (grade) and the depth from outlet pipe invert to the precast bottom of the unit. Note that depths and capacities may vary slightly between regions.

Table 1. Stormceptor Dimensions - Insert to Base of Structure

STC Model	Insert to Base (in.)
450	60
900	55
1200	71
1800	105
2400	94
3600	134
4800	128
6000	150
7200	134
11000*	128
13000*	150
16000*	134

Notes:

1. Depth Below Pipe Inlet Invert to the Inside Top Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.

**Consist of two chamber structures in series.*

Table 2. Storage Capacities

STC Model	Hydrocarbon Storage Capacity (gal)	Sediment Capacity (ft^3)
450	86	46
900	251	89
1200	251	127
1800	251	207
2400	840	205
3600	840	373
4800	909	543
6000	909	687
7200	1059	839
11000*	2797	1089
13000*	2797	1374
16000*	3055	1677

Notes:

1. Hydrocarbon and Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.

**Consist of two chamber structures in series*

4 – Stormceptor Inspection and Maintenance

Regular inspection and maintenance is a proven, cost-effective way to maximize water resource protection for all stormwater pollution control practices, and is required to insure proper functioning of the Stormceptor. Both inspection and maintenance of the Stormceptor is easily performed from the surface. Stormceptor's patented technology has no moving parts, simplifying the inspection and maintenance process.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess the sediment accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

When is maintenance cleaning needed?

- For optimum performance, the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, which is approximately 15% of the unit's total storage capacity (see Table 3). The frequency should be adjusted based on historical inspection results due to variable site pollutant loading.
- Sediment removal is easier when removed on a regular basis at or prior to the recommended maintenance sediment depths, as sediment build-up can compact making removal more difficult.
- The unit should be cleaned out immediately after an oil, fuel or chemical spill.

What conditions can compromise Stormceptor performance?

- If construction sediment and debris is not removed prior to activating the Stormceptor unit, maintenance frequency may be reduced.
- If the system is not maintained regularly and fills with sediment and debris beyond the capacity as indicated in Table 2, pollutant removal efficiency may be reduced.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured.
- If debris clogs the inlet of the system, removal efficiency of sediment and hydrocarbons may be reduced.
- If a downstream blockage occurs, a backwater condition may occur for the Stormceptor and removal efficiency of sediment and hydrocarbons may be reduced.

What training is required?

The Stormceptor is to be inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins.

For typical inspection and maintenance activities, no specific supplemental training is required

Recommended Stormceptor Inspection Procedure:

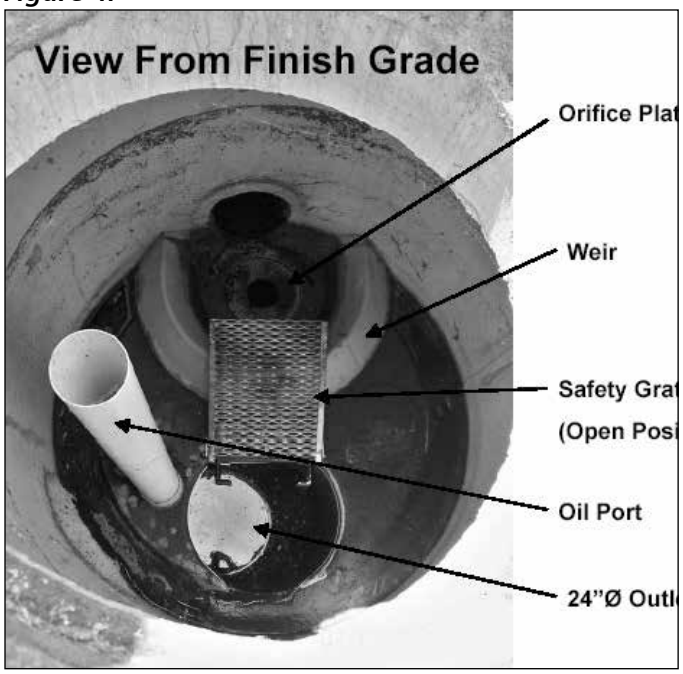
- Stormceptor is to be inspected from grade through a standard surface manhole access cover.
- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick.
- Oil depth is measured through the oil inspection port, either a 4-inch or 6-inch diameter port.
- Sediment depth can be measured through the oil inspection port or the 24-inch diameter outlet riser pipe.
- Inspections also involve a visual inspection of the internal components of the system.

What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, hoist and safety harness for specially trained personnel if confined space entry is required

Figure 3.

Figure 4.



Recommended Stormceptor Maintenance Procedure

Maintenance of Stormceptor is performed using a vacuum truck. No entry into the unit is required for maintenance. DO NOT ENTER THE STORMCEPTOR CHAMBER unless you have the proper personal safety equipment, have been trained and are qualified to enter a confined space, as identified by local Occupational Safety and Health Regulations (e.g. 29 CFR 1910.146). Without the proper equipment, training and permit, entry into confined spaces can result in serious bodily harm and potentially death. Consult local and/or state regulations to determine the requirements for confined space entry. Be aware, and take precaution that the Stormceptor fiberglass insert may be slippery. In addition, be aware that some units do not have a safety grate to cover the outlet riser pipe that leads to the submerged, lower chamber.

- Ideally maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is to be maintained through a standard surface manhole access cover.
- Insert the oil dipstick into the oil inspection port. If oil is present, pump off the oil layer into separate containment using a small pump and tubing.
- Maintenance cleaning of accumulated sediment is performed with a vacuum truck.
  - » For 6-ft diameter models and larger, the vacuum hose is inserted into the lower chamber via the 24-inch outlet riser pipe (See Fig. 5).
  - » For 4-ft diameter model, the removable drop tee is lifted out, and the vacuum hose is inserted into the lower chamber via the 12-inch drop tee hole (See Fig. 6).

Figure 5.

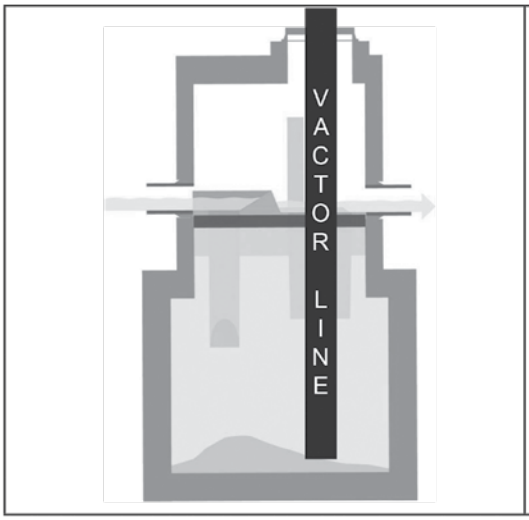
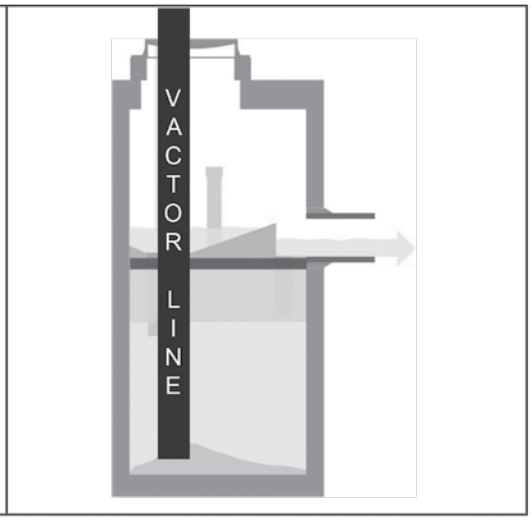


Figure 6.



- Using the vacuum hose, decant the water from the lower chamber into a separate containment tank or to the sanitary sewer, if permitted by the local regulating authority.
- Remove the sediment sludge from the bottom of the unit using the vacuum hose. For large Stormceptor units, a flexible hose is often connected to the primary vacuum line for ease of movement in the lower chamber.
- Units that have not been maintained regularly, have surpassed the maximum recommended sediment capacity, or contain damaged components may require manned entry by trained personnel using safe and proper confined space entry procedures.

What is required for proper disposal?

The requirements for the disposal of material removed from Stormceptor units are similar to that of any other stormwater treatment Best Management Practices (BMP). Local guidelines should be consulted prior to disposal of the separator contents. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste. This could be site and pollutant dependent. In some cases, approval from the disposal facility operator/agency may be required.

What about oil spills?

Stormceptor is often implemented in areas where there is high potential for oil, fuel or other hydrocarbon or chemical spills. Stormceptor units should be cleaned immediately after a spill occurs by a licensed liquid waste hauler. You should also notify the appropriate regulatory agencies as required in the event of a spill.

What if I see an oil rainbow or sheen at the Stormceptor outlet?

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a hydrocarbon rainbow or sheen can be seen at very small oil concentrations (< 10 ppm). Stormceptor is effective at removing 95% of free oil, and the appearance of a sheen at the outlet with high influent oil concentrations does not mean unit is not working to this level of removal. In addition, if the influent oil is emulsified, the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified or dissolved oil conditions.

What factors affect the costs involved with inspection/maintenance?

The Vacuum Service Industry for stormwater drainage and sewer systems is a well-established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean Stormceptor units will vary. Inspection and maintenance costs are most often based on unit size, the number of units on a site, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations.

What factors predict maintenance frequency?

Maintenance frequency will vary with the amount of pollution on your site (number of hydrocarbon spills, amount of sediment, site activity and use, etc.). It is recommended that the frequency of maintenance be increased or reduced based on local conditions. If the sediment load is high from an unstable site or sediment loads transported from upstream catchments, maintenance may be required semi-annually. Conversely once a site has stabilized, maintenance may be required less frequently (for example: two to seven year, site and situation dependent). Maintenance should be performed immediately after an oil spill or once the sediment depth in Stormceptor reaches the value specified in Table 3 based on the unit size.

Table 3. Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment Depth (in)
450	8
900	8
1200	10
1800	15
2400	12
3600	17
4800	15
6000	18
7200	15
11000*	17
13000*	20
16000*	17

Notes:

1. The values above are for typical standard units.

** Per structure.*

Replacement parts

Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. Therefore, inspection and maintenance activities are generally focused on pollutant removal. However, if replacements parts are necessary, they may be purchased by contacting your local Contech Representative or call 800-338-1122.

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Stormceptor's long and effective service life.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: _____

Allowable Sediment Depth: _____

Serial Number: _____

Installation Date: _____

Location Description of Unit: _____

Other Comments: _____

5 – Contact Information

Questions regarding the Stormceptor can be addressed by contacting your local Contech representative or by calling 800-338-1122.

SUPPORT

- Drawings and specifications are available at www.ContechES.com.
- Site-specific design support is available from our engineers.

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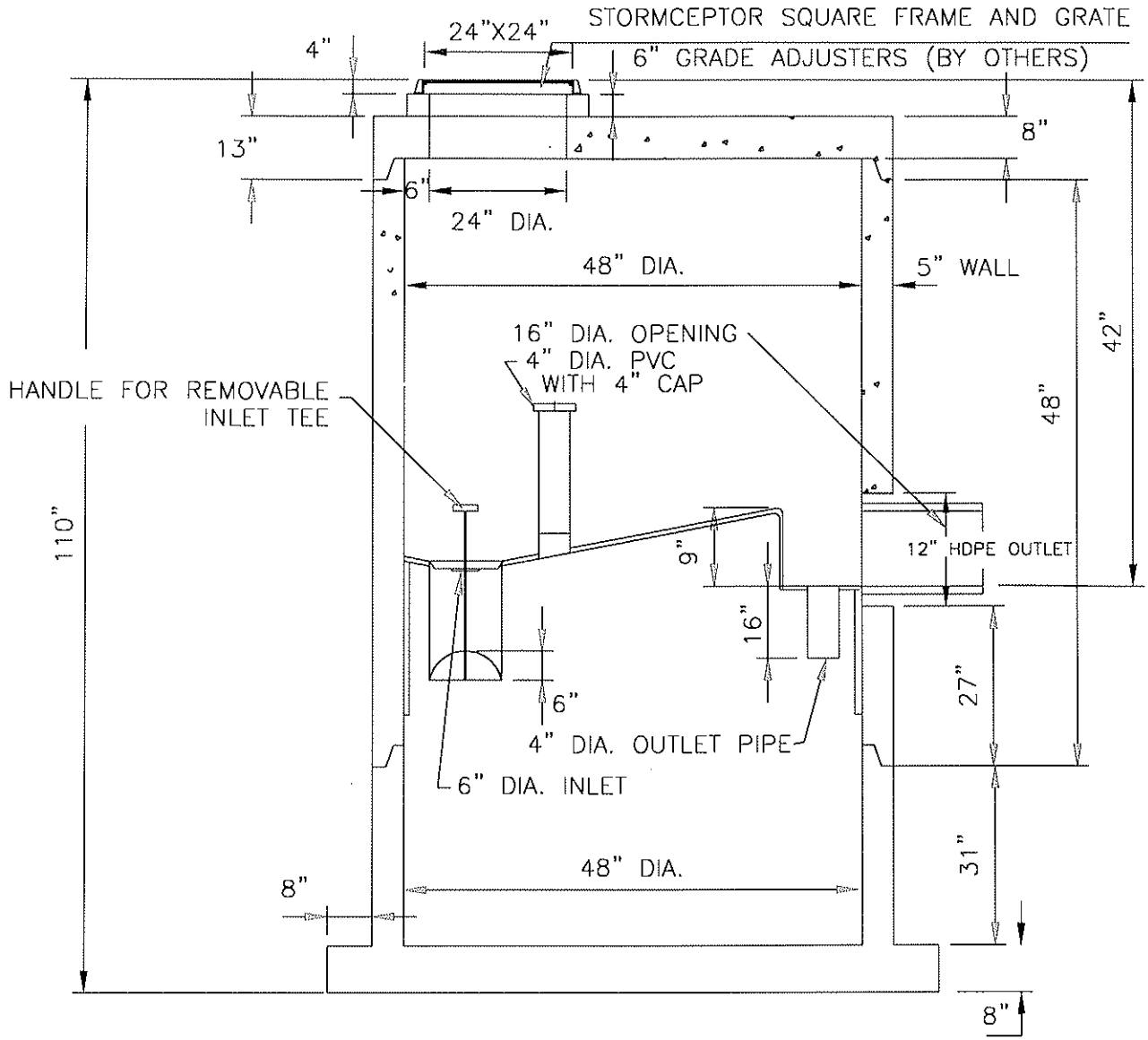


NOTES:

- RISER SECTION AND BASE SECTION WOULD HAVE TWO EQUALLY SPACED LIFT ANCHORS AT 12" FROM SPIGOT END SHOULDER.
- CONCRETE HAVE A MINIMUM 4000 P.S.I. COMPRESSIVE STRENGTH AT 28 DAYS.
- PRECAST STRUCTURES CONFORM TO ASTM C-478.
- REINFORCING CONFORM TO ASTM A-185.
- PRECAST CONCRETE STORMCEPTOR LOAD RATED FOR HS-20 HIGHWAY LOADS.

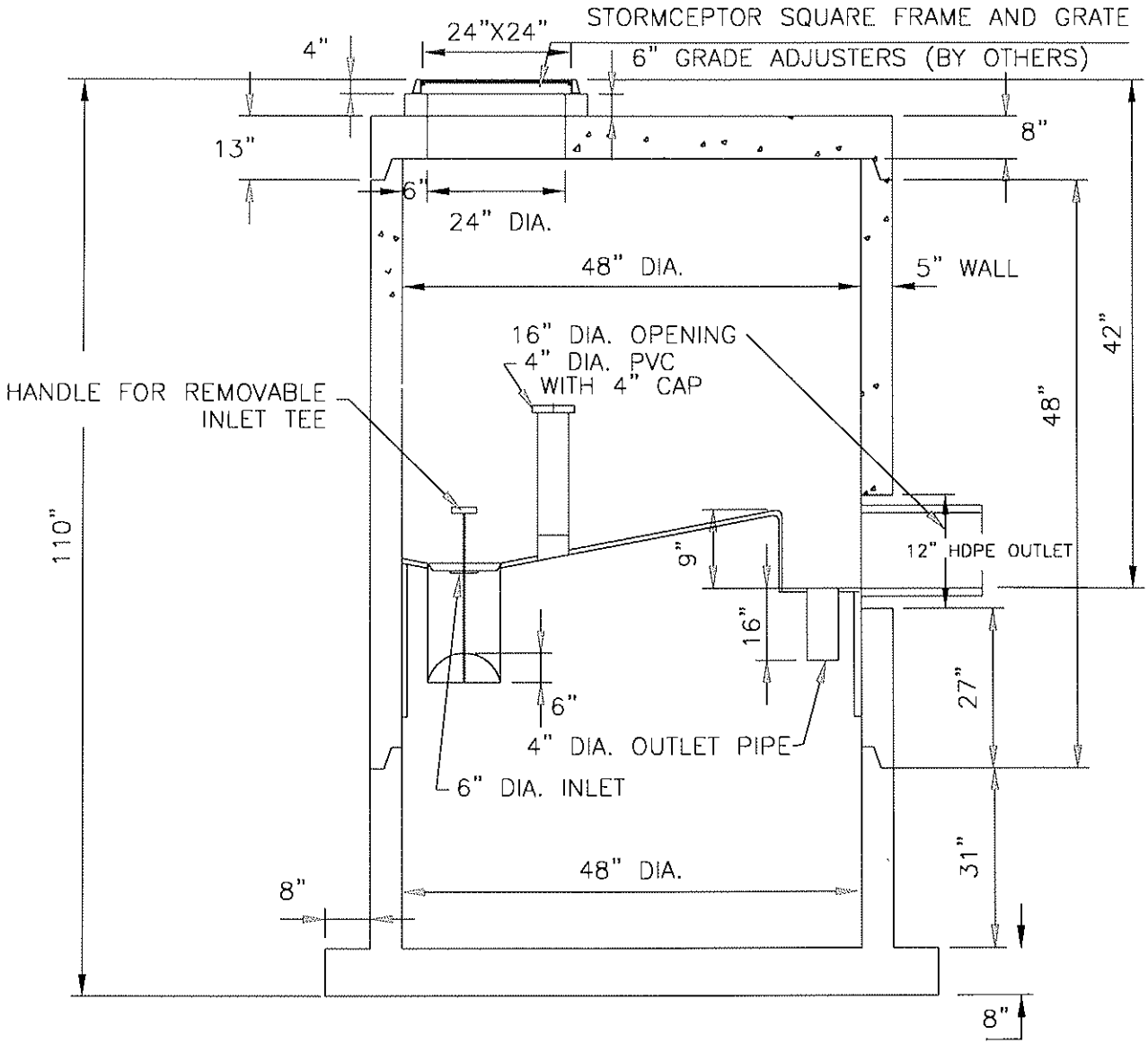
RINKER MATERIALS CONCRETE PIPE DIVISION

69 NECK ROAD
WESTFIELD, MA 01085

SCALE : N/A	APPROVED BY	DRAWN BY : G.Y.
DATE : 12-3-2015		

STORMCEPTOR STC-450 (CB5). D.A. BOSWORTH CO., INC. (EX-CB-A)

JOINT DETAIL	DRAWING NUMBER 450DABC5	REV. 1



NOTES:

- RISER SECTION AND BASE SECTION WOULD HAVE TWO EQUALLY SPACED LIFT ANCHORS AT 12" FROM SPIGOT END SHOULDER.
- CONCRETE HAVE A MINIMUM 4000 P.S.I. COMPRESSIVE STRENGTH AT 28 DAYS.
- PRECAST STRUCTURES CONFORM TO ASTM C-478.
- REINFORCING CONFORM TO ASTM A-185.
- PRECAST CONCRETE STORMCEPTOR LOAD RATED FOR HS-20 HIGHWAY LOADS.

RINKER MATERIALS CONCRETE PIPE DIVISION

69 NECK ROAD
WESTFIELD, MA 01085

SCALE : N/A	APPROVED BY	DRAWN BY : G.Y.
DATE : 12-3-2015		

STORMCEPTOR STC-450 (CB6). D.A. BOSWORTH CO., INC. (EX-CB-B)

JOINT DETAIL	DRAWING NUMBER 450DABC6	REV. 1

ALLEN & MAJOR ASSOCIATES, INC.

Project No.	2674-01A	**Sheet**	1 of 2
Project Description	Oak Grove Mill		
	99 Washington Street, Melrose, MA		
Calculated By	SM	**Date**	02/28/20
Checked By	BDJ	**Date**	

The following calculations provide the TSS removal rate for pervious pavement.

Stormwater Management BMP	TSS Removal rate
Parking Lot Sweeping	5 %
Pervious Pavement	80 %

Average Annual Load	=	1.0	
Parking Lot Sweeping	=	5.0	% Removal Rate
		95.0	% TSS Load Remains

TSS Load Remaining	=	95.0	%
Pervious Pavement	=	80.0	% Removal Rate
		19.0	% TSS Load Remains

Percentage of TSS Remaining	-	Initial TSS Load	=	Final TSS Removal Rate
100.00	-	19.0	=	81.0 %

For this drainage area, this system as designed will remove an estimated
81.0 % of the annual TSS load and therefore will meet the TSS removal standard.

ALLEN & MAJOR ASSOCIATES, INC.

Project No.	2674-01A	**Sheet**	2 of 2
Project Description	Oak Grove Mill		
	99 Washington Street, Melrose, MA		
Calculated By	SM	**Date**	02/28/20
Checked By	BDJ	**Date**	

The following calculations provide the TSS removal rate for the paved parking lot.

Stormwater Management BMP	TSS Removal rate
Parking Lot Sweeping	5 %
Stormceptor Propritary Device	91 %

Average Annual Load	=	1.0	
Parking Lot Sweeping	=	5.0	% Removal Rate
		95.0	% TSS Load Remains

TSS Load Remaining	=	95.0	%
Stormceptor Propritary Device	=	91.0	% Removal Rate
		8.6	% TSS Load Remains

Percentage of TSS Remaining	-	Initial TSS Load	=	Final TSS Removal Rate
100.00	-	8.6	=	91.5 %

For this drainage area, this system as designed will remove an estimated
91.5 % of the annual TSS load and therefore will meet the TSS removal standard.

Brief Stormceptor Sizing Report - Ex CB A

Project Information & Location			
Project Name	99 Washington Street	**Project Number**	641967
City	Melrose	**State/ Province**	Massachusetts
Country	United States of America	**Date**	3/2/2020
Designer Information		**EOR Information (optional)**	
Name	David Adams	**Name**	
Company	Contech	**Company**	Allen & Major
Phone #	207-885-6191	**Phone #**	
Email	dadams@conteches.com	**Email**	

Stormwater Treatment Recommendation
The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Ex CB A
Target TSS Removal (%)	80
TSS Removal (%) Provided	91
Recommended Stormceptor Model	STC 450i

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	91
STC 900	95
STC 1200	95
STC 1800	96
STC 2400	97
STC 3600	97
STC 4800	98
STC 6000	98
STC 7200	99
STC 11000	99
STC 13000	99
STC 16000	99

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Sizing Details

Drainage Area

Total Area (acres)	0.40
Imperviousness %	81.5

Rainfall

Station Name	BOSTON WSFO AP
State/Province	Massachusetts
Station ID #	0770
Years of Records	58
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective

TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage

Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion

Max. Flow to Stormceptor (cfs)	0.00000

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

OK-110

Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Brief Stormceptor Sizing Report - Ex CB B

Project Information & Location			
Project Name	99 Washington Street	**Project Number**	641967
City	Melrose	**State/ Province**	Massachusetts
Country	United States of America	**Date**	3/2/2020
Designer Information		**EOR Information (optional)**	
Name	David Adams	**Name**	
Company	Contech	**Company**	Allen & Major
Phone #	207-885-6191	**Phone #**	
Email	dadams@conteches.com	**Email**	

Stormwater Treatment Recommendation
The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Ex CB B
Target TSS Removal (%)	80
TSS Removal (%) Provided	99
Recommended Stormceptor Model	STC 450i

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	99
STC 900	100
STC 1200	100
STC 1800	100
STC 2400	100
STC 3600	100
STC 4800	100
STC 6000	100
STC 7200	100
STC 11000	100
STC 13000	100
STC 16000	100

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A QUIKRETE® COMPANY

Sizing Details

Drainage Area	
Total Area (acres)	0.01
Imperviousness %	100.0

Rainfall	
Station Name	BOSTON WSFO AP
State/Province	Massachusetts
Station ID #	0770
Years of Records	58
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

OK-110		
Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX