DRAINAGE REPORT

For

CAPITAL GROUP
PROPERTIES

PROPOSED

Maynard Crossing

129 Parker Street
Maynard, Massachusetts
Middlesex County

Prepared by:

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TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

This report examines the changes in drainage that can be expected as the result of the redevelopment of approximately 58 acres located at 129 Parker Street in Maynard, previously used by the Digital Equipment Corporation, into a multi-use site consisting of supermarket and retail space, restaurants, multi-family residential apartment buildings, and a senior independent living building.

This report addresses a comparative analysis of the pre- and post-development site runoff conditions. Additionally, this report provides calculations documenting the design of the proposed stormwater conveyance/management system as illustrated within the accompanying Site Development Plans prepared by Bohler Engineering. The project will also provide erosion and sedimentation controls during the demolition and construction periods, as well as long term stabilization of the site.

For the purposes of this analysis the pre- and post-development drainage conditions were analyzed at a "design point" where stormwater runoff currently drains to under existing conditions. This design point is described in further detail in Section 2 below. A comparison of the pre and post development 2, 10, 25, and 100 year storms is included in Table 1.1 below.

Table 1.1 – Comparison of Runoff Rates to Design Points (CFS)

Point of Analysis	2-Year Storm			10-Year Storm			25-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP-1: To existing wetlands	46.01	40.39	-5.62	94.91	88.22	-6.69	126.23	111.93	-14.30	175.85	133.39	-42.46

CFS = Cubic feet per second

As outlined in the table above, the proposed stormwater management system as designed will provide a decrease in peak rates of runoff from the proposed facility for the 2-, 10-, 25- and 100-year storm events. Additionally, the project meets, or exceeds the MADEP Stormwater Management Standards as applicable for redevelopment and described further herein.

II. EXISTING SITE CONDITIONS

The site consists of approximately 58 acres of land located along the westerly side of Parker Street in the Town of Maynard, Massachusetts. The site was formerly the home of Digital Equipment Corporation and consists of paved parking areas, lawn areas, one remaining 50,000 square foot building and undeveloped areas of forest and wetlands. All of the other buildings formerly at the site have been demolished although they are included for the purposes of establishing an existing conditions model for this drainage analysis.

The majority of the soils at the site are mapped by the Natural Resource Conservation Service (NRCS) as urban land. Surrounding areas are mapped as Windsor, Merrimac, and Hinckley, soils, all categorized as Hydrologic Soil Group (HSG) "A". Based upon on-site geotechnical testing performed in December 2016 which indicated the presence of sandy soils, the entire site has been categorized as HSG "A" for the purposes of this analysis. Refer to Appendix A for soil testing information.

The existing development is located in the central and eastern portions of the site, while the west side of the site is undeveloped and contains wetlands. Please refer to the Pre-Development Drainage Area Map in Appendix B. The developed portion of the site generally drains to an existing pond located in the center of the site. Runoff drains to the pond either by overland flow or through the existing storm sewer system. The existing pond discharges water to the existing wetland system via an outlet control structure and underground pipe network.

Two off-site areas drain into the site and are conveyed by a swale to the pond. The first area is the Parker Street drainage area, generally north of the pond. The pipe entering the site from Parker Street to the north is fifteen (15) inches in diameter. For the purposes of this analysis, it was presumed that the flow from this area is constricted to the maximum flow that can be conveyed by the pipe which is approximately 5.3 cubic feet per second (CFS). The second off-site area is the Vose Hill area south of the site that drains primarily by overland flow to the southeast corner of the site and then into the same swale that Parker Street drains into and then discharges to the pond. The off-site area is approximately 13.8 acres consisting of ¼ acre residential lots, paved roads, woods, and grassed areas with a curve number (CN) of 78 and time of concentration of approximately 13.4 minutes.

For the purposes of this analysis, the pre- and post-development drainage conditions were analyzed at the existing wetland system "design point". This system takes flow from an existing 72-inch diameter pipe outfall southwest of the developed portion of the site near the southern property line. In addition, the majority of the runoff from the site and off-site areas flows to this point and then to the wetlands in the west portion of the site.

III. PROPOSED SITE CONDITIONS

The proposed project consists of the construction of approximately 295,000 square feet of commercial building space, a 143-suite independent living facility, and a 172-unit apartment building complex including car garages and a clubhouse. Also to be constructed are paved parking areas, landscaping, associated utilities, and a new stormwater management system. The site, including the proposed parking areas, has been designed to drain to deep sump hooded catch basins. The catch basins will capture and convey stormwater runoff via an underground pipe system to the central lined pond. The central lined pond has been designed in accordance with the MassDEP Stormwater Handbook criteria, and will provide water quality treatment. Pretreatment of stormwater runoff to the central lined basin will also be provided by deep sump hooded catch basins, two hydrodynamic water quality units for portions of the contributing drainage area, and two (2) forebays. An open (surface) infiltration basin with forebays is proposed that will accept runoff from rooftops and adjacent paved parking areas. Rooftop runoff from six (6) of the buildings will be directed to the open and underground infiltration basins to meet DEP groundwater recharge requirements. Paved areas in the southern part of the project will be directed to underground infiltration basins for additional water quality treatment. A rain garden is also proposed in the northwest part of the site. Refer to Standard 4 under section V of this report for a more detailed description of the water quality treatments and Appendix F for additional calculations.

The proposed drainage system has been designed to remove 92% of Total Suspended Solids (TSS), exceeding the minimum rate of 80% required by the Massachusetts DEP Stormwater Handbook. The project has been designed to maintain existing drainage watersheds to the greatest extent possible, with the same Design Point described in Section 2 above. Refer to the watershed maps in the appendices of the report for a graphical representation of the proposed drainage areas.

The contributing drainage area was subdivided into thirteen (13) separate sub catchments for the proposed conditions as described below.

Area P1 is the majority of the developed project site both north and south of the central pond which drains to the pond. The total drainage area is approximately 33.8 acres with a CN of 84 and time of concentration of 10.8 minutes.

Area P2 is the 0.8 acre area in the southwest corner of the site in the vicinity of the existing pipe outfall outside the proposed area of development that will remain as woods. The CN for this area is 30 and time of concentration is 6.0 minutes.

Area P3 is the 3.6 acre parking area in the southwest corner of the site at the proposed apartment buildings that will drain directly to the area of the existing pipe outfall at Design Point #1. The area contains a portion of an apartment building roof, paved parking areas, lawn areas, and an underground detention basin. The CN for this area is 81 and time of concentration is 6.0 minutes.

Area P4 is 12.9 acres of off-site area in the Vose Hill area to the southeast of the site consisting of ¼ acre residential lots, paved roads, woods, and grassed areas with a CN of 79 and a time of concentration of 13.4 minutes.

Area P5 is the 1.9 acre area in the southwest corner draining west to the wetlands that will contain a proposed turtle habitat area. The remaining portions will remain woodland. The CN for this area is 30 and time of concentration is 6.0 minutes.

Area P6 is the 3.6 acre area in the mid-west part of the site draining to the open basin. This area consists of lawn area, the basin surface, and paved parking areas, and has a CN of 74 and time of concentration is 6.0 minutes.

The remaining seven subareas are roof areas denoted in the hydrologic model and nodes R1, R2, R3A, R3B, R4, and R5, R6, all with a CN of 98 and time of concentration of 6.0 minutes. The areas of each roof are listed below:

Roof #	Area (Ac.)
R1	1.18
R2	1.28
R3A	0.57
R3B	0.43
R4A	0.87
R4B	0.69
R5	1.58
R6	0.80

Refer to the Drainage Area Maps in the appendices of this report for a graphical representation of the proposed drainage areas.

The best management practices (BMPs) incorporated into the proposed stormwater management system have been designed to meet the total suspended solid (TSS) removal requirements as set forth in the Massachusetts Department of Environmental Protection Stormwater Handbook standards. In addition, a Stormwater Operation and Maintenance (O&M) Plan has been developed which includes scheduled pavement sweepings, and periodic inspections of stormwater management structures (i.e catch basins and infiltration basins).

Storm Sewer System

Deep sump hooded catch basins are proposed to collect and route runoff from the paved parking areas to the existing surface basins and underground water quality infiltration basins. Pipes have been designed for the 50-year storm using Storm Sewers by Hydraflow software. Pipe sizing information is included in Appendix F.

IV. METHODOLOGY

Peak Flow Calculations

Methodology utilized to design the proposed stormwater management system includes compliance with the guidelines set forth in the latest edition of the Massachusetts DEP Stormwater Handbook. The pre- and post-development runoff rates being discharged from the site were computed using the HydroCAD computer program. The drainage area and outlet information were entered into the program, which routes storm flows based on NRCS TR-20 and TR-55 methods. The other components of the model were determined following standard NRCS procedures for Curve Numbers (CNs) and times of concentrations documented in the appendices of this report. The following rainfall data based on Technical Paper-40, was utilized in the calculations:

Table 4.1 – Rainfall Intensities*

Frequency	2 year	10 year	25 year	100 year
Rainfall (inches)	3.10	4.50	5.30	6.50

*Values derived from Hydrology Handbook for Conservation Commissioners prepared by Mass DEP (TP-40 Maps)

The proposed stormwater management as designed will provide a decrease in peak rates of runoff from the proposed facility for the 2-, 10-, 25- and 100-year design storm events. Additionally, the proposed project meets, or exceeds, the MADEP Stormwater Management standards. Compliance with these standards is described further below:

V. STORMWATER MANAGEMENT STANDARDS

Standard #1: No New Untreated Discharges:

The project has been designed so that proposed impervious areas shall be collected and passed through the proposed drainage system for treatment.

Standard 2: Peak Rate Attenuation

As outlined in Table 1.1, the development of the site and the proposed stormwater management system, have been designed so that post-development peak rates of runoff are below pre-development conditions for the 2-, 10-, 25- and 100-year storm events at the Design Point.

Standard 3: Recharge

Rooftop runoff from several rooftops and paved areas in the south part of the project will be collected and diverted to infiltration basins to provide groundwater recharge. The project as proposed will involve the creation of approximately nine (9) acres of new impervious area and is required to infiltrate 19,515 cubic feet of stormwater as defined in Stormwater Standard 3, and calculated in Appendix F. The proposed infiltration basins will provide over 57,000 cubic feet of volume below the lowest outlet for groundwater recharge, which is nearly three times the required volume. In addition, approximately 1,250 linear feet of 12 and 15 inch diameter pipe surrounded by crushed stone will provide an additional storage volume of 4,100 cubic feet (0.09 ac-ft) that is not included in the recharge calculations. Recharge calculations are included in Appendix F of this Report.

The DEP Stormwater Standards require that the infiltration BMP drains completely within 72 hours of the end of the storm event. Calculations showing that the proposed subsurface infiltration basins will drain within 72 hours are included in Appendix F of this report. The main central surface basin is proposed to be reconstructed with an impervious liner in the bottom and sidewalls and will continually hold water, the same as under existing conditions.

A groundwater mounding analysis for the basins providing peak rate attenuation has been provided in Appendix F of this report. The analysis shows that the groundwater mound will have no effect on the proposed system.

Standard #4 Water Quality:

It should be noted that the only water quality treatment provided under existing conditions comes from the central pond, and only approximately half of the existing impervious area (approximately 13 acres) drains to the pond. The other half drains untreated to the wetlands to the south. The proposed project

will provide water quality treatment for all of the proposed impervious areas, will provide a 92% Total Suspended Solids removal rate, and is a substantial improvement over existing conditions.

Water quality treatment will be provided via hooded, deep sump catch basins, a wet basin with forebays, a rain garden, hydrodynamic separation water quality units, subsurface infiltration basins, and an open infiltration basin with forebays. TSS removal and water quality calculations are included in Appendix F of this report. As a redevelopment, the project is required to provide water quality treatments to the maximum extent practicable. Calculations are provided in Appendix F demonstrating that the project provides adequate water quality treatment for an equivalent of 0.87 inches of rainfall.

The infiltration basins, raingarden, infiltration basin #3, and the underground water quality infiltration basins are all sized to treat the water quality volume for one (1) inch of runoff. The wet basin provides a permanent pool volume equivalent to 0.79 inches. It is notable that this number is conservative as much of the upstream flow receives pretreatment prior to reaching the wet basin.

Standard #5 Land Uses with Higher Potential Pollutant Loads

The proposed project involves "Land Uses with Higher Potential Pollutant Loads". The drainage system has been designed accordingly and a Long Term Pollution Prevention Plan has been developed and is included in Appendix H.

Standard 6: Critical Areas

The project is located within a Zone II to an existing drinking water well proximate to the site. Accordingly, the drainage system has been designed to provide water quality treatment to the standards noted above.

Standard 7: Redevelopment

The Project consists of a redevelopment as defined under Standard 7 and has been designed in accordance with all ten standards as may be applicable to redevelopment and as noted herein.

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

The proposed project will provide construction period erosion and sedimentation controls as indicated within the site plan set provided for this project. This includes a proposed construction entrance, protection for stormwater inlets, protection around temporary material stock piles and various other techniques as outlined on the erosion and sediment control sheets. Additionally, the project is required to file a Notice of Intent with the US EPA and implement a Stormwater Pollution Prevention Plan (SWPPP) during the construction period. The SWPPP will be prepared prior to the start of construction and will be implemented by the site contractor under the guidance and responsibility of the project's proponent.

Standard 9: Operation and Maintenance (O&M) Plan

An Operation and Maintenance (O&M) Plan for this site has been prepared and is included within this report. The O&M Plan outlines procedures and time tables for the long term operation and maintenance of the proposed site stormwater management system, including initial inspections upon completion of construction, and periodic monitoring of the system components, in accordance with established practices and the manufacturer's recommendations. The O&M Plan includes a list of responsible parties for inspections and maintenance.

Standard 10: Prohibition of Illicit Discharges

The proposed stormwater system will only convey allowable non-stormwater discharges (firefighting waters, irrigation, air conditioning condensates, etc.) and will not contain any illicit discharges from prohibited sources. An Illicit Discharge Statement is included in Appendix G of this report.

VI. SUMMARY

In summary, the proposed stormwater management system illustrated on the drawings prepared by Bohler Engineering results in a reduction in peak rates of runoff from the subject site when compared to pre-development conditions for the 2-, 10-, 25- and 100-year storm frequencies. Under existing conditions, over 13 acres of impervious area drains untreated to the stream and wetlands in the southwest part of the property. The proposed water quality BMPs will treat nearly 100% of the

proposed impervious area, resulting in a TSS removal rate of 92%. The pre-development versus post-development peak discharge rates comparisons are contained in Table 6.1 below:

Table 6.1 – Comparison of Runoff Rates to Design Points (CFS)

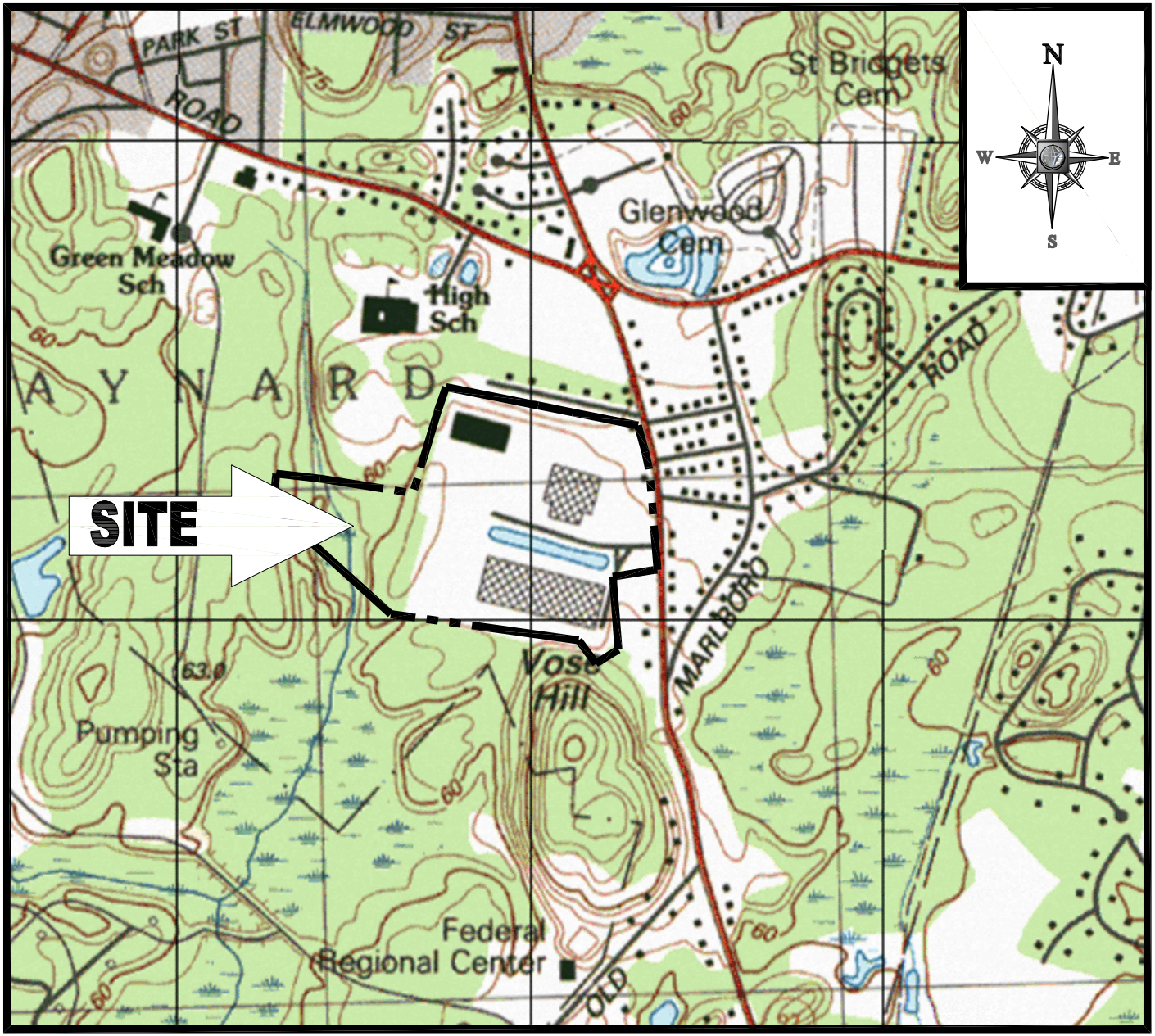
Point of Analysis	2-Year Storm			10-Year Storm			25-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP-1: To existing wetlands	46.01	40.39	-5.62	94.91	88.22	-6.69	126.23	111.93	-14.30	175.85	133.39	-42.46

CFS = Cubic feet per second

As described herein, the project will include a new stormwater management system that will provide stormwater treatment for the proposed project and will be a substantial improvement over existing conditions.

APPENDIX A – PROJECT MAPS AND SOIL DATA

- USGS Map
- NRCS Soils Maps
- Soil Testing Logs



LOCATION MAP

SCALE: 1"=1000'
PLAN REFERENCE: MAYNARD MASSACHUSETTS USGS QUADRANGLE


71° 27' 20" W
71° 26' 30" W
42° 25' 30" N
42° 24' 41" N
298000
298100
298200
298300
298400
298500
298600
298700
298800
298900
299000
299100
4699800
4699700
4699600
4699500
4699400
4699300
4699200
4699100
4699000
4698900
4698800
4698700
4698600
4698500
4698400
Great Rd
Walker St
117
Field St
South St
Old Marlboro Rd
Parker St
SLP
626B
254A
53A
1
253B
602
654
254B
320B
71B
253D
52A
256B
255A
307D
307E
223A
307B
51A
Warning: Soil Map may not be valid at this scale.
Map Scale: 1:7,370 if printed on A portrait (8.5" x 11") sheet.
Meters
0
100
200
400
600
Feet
0
350
700
1400
2100
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

Map Unit Legend

Middlesex County, Massachusetts (MA017)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
1	Water	1.6	0.6%
51A	Swansea muck, 0 to 1 percent slopes	1.4	0.5%
52A	Freetown muck, 0 to 1 percent slopes	28.1	10.9%
53A	Freetown muck, ponded, 0 to 1 percent slopes	12.4	4.8%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	1.3	0.5%
223A	Scio very fine sandy loam, 0 to 3 percent slopes	2.3	0.9%
253B	Hinckley loamy sand, 3 to 8 percent slopes	1.3	0.5%
253D	Hinckley loamy sand, 15 to 25 percent slopes	4.9	1.9%
254A	Merrimac fine sandy loam, 0 to 3 percent slopes	2.8	1.1%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	23.4	9.1%
255A	Windsor loamy sand, 0 to 3 percent slopes	19.3	7.5%
256B	Deerfield loamy sand, 3 to 8 percent slopes	18.9	7.4%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	3.7	1.4%
307D	Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony	13.8	5.4%
307E	Paxton fine sandy loam, 25 to 35 percent slopes, extremely stony	5.6	2.2%
320B	Birchwood fine sandy loam, 3 to 8 percent slopes	6.1	2.4%
602	Urban land	56.6	22.0%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	40.4	15.7%
654	Udorthents, loamy	13.2	5.1%
Totals for Area of Interest		**257.2**	**100.0%**

SKETCH SHOWING
PROPOSED SOIL TEST PIT LOCATIONS
129 PARKER STREET
MAYNARD, MA
DECEMBER 21, 2016 & APRIL 7, 2017

APPROX. LOCATION OF PROPOSED UNDERGROUND INFILTRATION BASIN

APPROX. LOCATION OF PROPOSED AT-GRADE INFILTRATION BASIN

APPROX. LOCATION OF PROPOSED UNDERGROUND INFILTRATION BASIN

EXISTING BUILDING

LOT 68
45.67± ACRES

LOT 62
12.49± ACRES

EXISTING SHED

EXISTING ONE STORY BUILDING

TP-1
TP-2
TP-3
TP-3A
TP-4
TP-5
TP-6
TP-7
TP-8
TP-9
TP-10
TP-11
TP-12
TP-13
TP-14
TP-15

PARKER STREET (ROUTE 27)
SOUTH STREET
B STREET
FIELD STREET

N/F TOWN OF MAYNARD HIGH SCHOOL DEED BOOK 4891M, PAGE 227 MAP 24 PARCEL 12

N/F TOWN OF MAYNARD DEED BOOK 12780 PAGE 137 MAP 31 PARCEL 12

N/F ROBERT G. MOLLOY DEED BOOK 37896 PAGE 298 MAP 25 PARCEL 112

N/F SETH & PATRICIA FRIEDMAN DEED BOOK 33741 PAGE 477 MAP 25 PARCEL 111

N/F ALAN G. & MELISSA G. RINGUETTE DEED BOOK 40674 PAGE 548 MAP 25 PARCEL 100

N/F SILVER HILL ROAD 2013 REALTY TRUST DEED BOOK 63042 PAGE 374 MAP 25 PARCEL 99

N/F JOHN J. III, & ELIZABETH A. CAFARELLA DEED BOOK 34559 PAGE 2 MAP 29 PARCEL 31

N/F FRITZ & JOSETTE VERNET DEED BOOK 39292 PAGE 532 MAP 29 PARCEL 29

N/F LIM & LECK NGOUANE DEED BOOK 16057 PAGE 136 MAP 29 PARCEL 28

N/F FRANK J. SCACCIOTTI DEED BOOK 65079 PAGE 504 MAP 29 PARCEL 27

N/F ANTONIO C. HIPOLITO, JR. DEED BOOK 43803 PAGE 579 MAP 29 PARCEL 26

N/F LEXVEST PARKER LLC LAND COURT DEED BOOK 1430 PAGE 87 MAP 29 PARCEL 2

N/F TOWN OF MAYNARD DEED BOOK 13642 PAGE 201 MAP 28 PARCEL 1

N/F PAMELA BRAGG DEED BOOK 27902 PAGE 231

N/F ANDREW BAXTER DEED BOOK 40699 PAGE 595 MAP 29 PARCEL 43

N/F PETER F. JR. & STACEY A. FALZONE DEED BOOK 23242 PAGE 536 MAP 29 PARCEL 42

N/F MICHAEL J. & JEANNINE

WETLAND

1" = 60'

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-1
Applicant/owner:	Capital Group Properties				
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º	
LOCATION: (Refer to sketch attached)	Within Southwest Wooded Area				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:	Jeff Black, VHB				
Land Use:	Former office park		Landform:		
Vegetation:	Pines		Slope:	5% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☒ Y ☐ N	

Distance From:			
Open Water Bodies:	550+/- ft.	Possible Wet Area:	175 +/- ft.
Drinking Water Well:	>100 ft.	Drainageway:	350’ +/- ft.
Property Line:	340’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-6”	A/O	SL	10YR 3/2	
6”-18”	B	SL	10YR 6/6	
18”-36”	C	LS	10 YR 7/3	Angular Boulders

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	36” (slopes to 60” toward BVW)
Depth to Groundwater:	Standing Water in Hole:	None	
	Weeping From Pit Face:	None	
	Estimated Seasonal High Groundwater:		None to 36”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:					
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							
Notes:							

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-2
Applicant/owner:	Capital Group Properties				
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º	
LOCATION: (Refer to sketch attached)	Within Southwest Wooded Area				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:	Jeff Black, VHB				
Land Use:	Former office park		Landform:		
Vegetation:	Pines		Slope:	5% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☒ Y ☐ N	

Distance From:			
Open Water Bodies:	473 +/- ft.	Possible Wet Area:	234 +/- ft.
Drinking Water Well:	>100 ft.	Drainageway:	262’ +/- ft.
Property Line:	220’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-6”	A/O	SL	10YR 3/2	
6”-20”	B	SL	10YR 6/6	
20”-120”	C	LS	10 YR 7/2	Angular Boulders, Fractured Rock, pockets of silt loam

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	Below 120”
Depth to Groundwater:	Standing Water in Hole:	None	
	Weeping From Pit Face:	None	
	Estimated Seasonal High Groundwater:		Below 120”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:					
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-3
Applicant/owner:	Capital Group Properties				
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º	
LOCATION: (Refer to sketch attached)	Within Southwest Wooded Area				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:	Jeff Black, VHB				
Land Use:	Former office park		Landform:		
Vegetation:	Pines		Slope:	5% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☒ Y ☐ N	

Distance From:			
Open Water Bodies:	400 +/- ft.	Possible Wet Area:	150 +/- ft.
Drinking Water Well:	>100 ft.	Drainageway:	150’ +/- ft.
Property Line:	200’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-6”	A/O	SL	10YR 3/2	
6”-20”	B	SL	10YR 6/6	
20”-72”	C1	Sand	10 YR 7/2	Coarse sand with variegated color
72”-120”	C2	Sand	10YR 6/3	Medium sand, angular cobbles

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	Below 120”
Depth to Groundwater:	Standing Water in Hole:	None	
	Weeping From Pit Face:	None	
	Estimated Seasonal High Groundwater:		120”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:		Based on adjacent test holes			
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:					
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	

Site Location or lot #	129 Parker Street – Maynard, MA			DEEP HOLE # TP-3A
Applicant/owner:	Capital Group Properties			
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º
LOCATION: (Refer to sketch attached)	Within Southwest Wooded Area			
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)			
WITNESSED BY:	Jeff Black, VHB			
Land Use:	Former office park	Landform:		
Vegetation:	Pines	Slope:	5% +/-	
Stone Walls:	☐ Y ☒ N	Surface Stones:	☒ Y ☐ N	

Distance From:			
Open Water Bodies:	470 +/- ft.	Possible Wet Area:	120 +/- ft.
Drinking Water Well:	>100 ft.	Drainageway:	120’ +/- ft.
Property Line:	120’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-6”	A/O	SL	10YR 3/2	
6”-24”	B	SL	10YR 6/6	
24”-60”	C	LS	10 YR 7/2	Angular cobbles

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	60”
Depth to Groundwater:	Standing Water in Hole:	None	
	Weeping From Pit Face:	None	
	Estimated Seasonal High Groundwater:		None to 60”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:					
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	

Site Location or lot #	129 Parker Street – Maynard, MA			DEEP HOLE # TP-4
Applicant/owner:	Capital Group Properties			
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º
LOCATION: (Refer to sketch attached)	Westerly parking area (within gravel patch)			
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)			
WITNESSED BY:	Jeff Black, VHB			

Land Use:	Former office park	Landform:	Filled wetland
Vegetation:	N/A	Slope:	3% +/-
Stone Walls:	☐ Y ☒ N	Surface Stones:	☐ Y ☒ N

Distance From:			
Open Water Bodies:	215 +/- ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	425’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-72”	Fill	Mixed fill	N/A	Mixed fill & boulders
72”-120”	C	Silty Sand	10YR 7/2	Very fine silty sand

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	66”	
	Weeping From Pit Face:	36”	
	Estimated Seasonal High Groundwater:		36”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:			36”		
		Depth to soil mottles, description:					
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-5
Applicant/owner:	Capital Group Properties				
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º	
LOCATION: (Refer to sketch attached)	Southerly parking area				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:	Jeff Black, VHB				
Land Use:	Former office park		Landform:	Outwash plain	
Vegetation:	N/A		Slope:	3% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance From:			
Open Water Bodies:	368 +/- ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	215’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-12”	Pavement	N/A	N/A	Pavement / frozen base material
12”-36”	Fill	N/A	N/A	Coarse clean sandy fill
36”-120”	C	Sand	10YR 7/2	Natural sand

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	96”	
	Weeping From Pit Face:	84”	
	Estimated Seasonal High Groundwater:		60”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:			60” distinct, many		
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-6
Applicant/owner:	Capital Group Properties				
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º	
LOCATION: (Refer to sketch attached)	Southerly parking area				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:	Jeff Black, VHB				
Land Use:	Former office park		Landform:	Outwash plain	
Vegetation:	N/A		Slope:	3% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance From:			
Open Water Bodies:	368 +/- ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	215’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-10”	Pavement	N/A	N/A	Pavement / frozen base material
10”-84”	C	Sand	10YR 7/3	Medium-coarse sand (natural)
				Possible ledge @ 36” (easterly side of hole)

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	36” (east side of hole)
Depth to Groundwater:	Standing Water in Hole:	72”	
	Weeping From Pit Face:	66”	
	Estimated Seasonal High Groundwater:		60”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:			60” distinct, many		
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-7
Applicant/owner:	Capital Group Properties				
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º	
LOCATION: (Refer to sketch attached)	Within former building footprint				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:	Jeff Black, VHB				
Land Use:	Former office park		Landform:	Possible filled wetland	
Vegetation:	Brush		Slope:	< 1%	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance From:			
Open Water Bodies:	100 +/- ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	295’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-96”	Fill	Fill	N/A	Mixed clean sandy fill
96”-120”	C	Silt Loam	Gley1 7/5G	Very firm

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	110”	
	Weeping From Pit Face:	96”	
	Estimated Seasonal High Groundwater:		60”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:					
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-8
Applicant/owner:	Capital Group Properties				
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º	
LOCATION: (Refer to sketch attached)	Within former building footprint				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:	Jeff Black, VHB				
Land Use:	Former office park		Landform:	Possible filled wetland	
Vegetation:	Brush		Slope:	< 1%	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance From:			
Open Water Bodies:	100 +/- ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	295’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-96”	Fill	Fill	N/A	Mixed clean sandy fill
96”-120”	C	Silt Loam	Gley1 7/5G	Very firm

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	110”	
	Weeping From Pit Face:	96”	
	Estimated Seasonal High Groundwater:		60”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:					
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-9
Applicant/owner:	Capital Group Properties				
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º	
LOCATION: (Refer to sketch attached)	Westerly parking area				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:	Jeff Black, VHB				
Land Use:	Former office park		Landform:	Outwash Plain	
Vegetation:	N/A		Slope:	1% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance From:			
Open Water Bodies:	360 +/- ft.	Possible Wet Area:	200 ft. +/-
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	180’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-12”	Pavement	N/A	N/A	Pavement / base material
12”-72”	C1	Coarse Sand	10YR 7/2	
72”-132”	C2	Medium Sand	10YR 7/3	

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	108”	
	Weeping From Pit Face:	108”	
	Estimated Seasonal High Groundwater:		84”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:			84”, distinct, common		
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							
Notes:							

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-10
Applicant/owner:	Capital Group Properties				
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º	
LOCATION: (Refer to sketch attached)	Westerly parking area				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:	Jeff Black, VHB				
Land Use:	Former office park		Landform:	Outwash Plain	
Vegetation:	N/A		Slope:	1% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance From:			
Open Water Bodies:	460 +/- ft.	Possible Wet Area:	187 ft. +/-
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	162’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-10”	Pavement	N/A	N/A	Pavement / base material
10”-96”	C	Sand	10YR 7/2	Coarse-medium sand with variegated color bands

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	84”	
	Weeping From Pit Face:	84”	
	Estimated Seasonal High Groundwater:		60”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:			60”, prominent, many		
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							
Notes:							

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-11
Applicant/owner:	Capital Group Properties				
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º	
LOCATION: (Refer to sketch attached)	Central parking area, SE of existing building				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:	Jeff Black, VHB				
Land Use:	Former office park		Landform:	Outwash Plain	
Vegetation:	N/A		Slope:	1% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance From:			
Open Water Bodies:	265 +/- ft.	Possible Wet Area:	550 ft. +/-
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	525’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-10”	Pavement	N/A	N/A	Pavement / base material
10”-84”	C	Sand	10YR 7/2	Coarse-medium sand with variegated color bands

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	77”	
	Weeping From Pit Face:	77”	
	Estimated Seasonal High Groundwater:		60”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:			60”, prominent, many		
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-12
Applicant/owner:	Capital Group Properties				
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º	
LOCATION: (Refer to sketch attached)	Within former building footprint				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:	Jeff Black, VHB				
Land Use:	Former office park		Landform:	Outwash Plain	
Vegetation:	N/A		Slope:	1% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance From:			
Open Water Bodies:	285+/- ft.	Possible Wet Area:	>500 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	445’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-12”	Fill	N/A	N/A	Crushed stone
12”-84”	C	Sand	10YR 7/2	Coarse sand, variegated color

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	77”	
	Weeping From Pit Face:	77”	
	Estimated Seasonal High Groundwater:		60”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:			60”, distinct, many		
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-13
Applicant/owner:	Capital Group Properties				
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º	
LOCATION: (Refer to sketch attached)		Easterly parking area			
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:	Jeff Black, VHB				
Land Use:	Former office park		Landform:	Outwash Plain	
Vegetation:	N/A		Slope:	1% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance From:			
Open Water Bodies:	285+/- ft.	Possible Wet Area:	>500 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	205’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-6”	Pavement	N/A	N/A	Pavement / base material
6”-96”	C	Sand	10YR 7/2	Coarse sand with variegated color bands

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	80”	
	Weeping From Pit Face:	72”	
	Estimated Seasonal High Groundwater:		60”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:			60”, prominent, many		
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-14
Applicant/owner:	Capital Group Properties				
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º	
LOCATION: (Refer to sketch attached)	Central parking area, east of existing building				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:	Jeff Black, VHB				
Land Use:	Former office park		Landform:	Outwash Plain	
Vegetation:	N/A		Slope:	1% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance From:			
Open Water Bodies:	515+/- ft.	Possible Wet Area:	>500 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	205’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-8”	Pavement	N/A	N/A	Pavement / base material
8”-80”	C	Sand	10YR 7/2	Coarse-medium sand with variegated color bands

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	77”	
	Weeping From Pit Face:	77”	
	Estimated Seasonal High Groundwater:		60”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:			60”, prominent, many		
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-15
Applicant/owner:	Capital Group Properties				
DATE:	12/21/16	WEATHER:	Sunny / cold	TEMP: 30 º	
LOCATION: (Refer to sketch attached)	Within field near site entrance				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:	Jeff Black, VHB				
Land Use:	Former office park		Landform:	Outwash Plain	
Vegetation:	N/A		Slope:	1% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance From:			
Open Water Bodies:	185+/- ft.	Possible Wet Area:	>168 ft. +/-
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	120’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-12”	Ap	SL	10YR 3/2	
12”-30”	B	SL	10YR 6/6	
30”-120”	C	Sand	10YR 7/2	Medium-coarse sand

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	96”	
	Weeping From Pit Face:	88”	
	Estimated Seasonal High Groundwater:		77”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:			77”, distinct, many		
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-16
Applicant/owner:	Capital Group Properties				
DATE:	04/20/2017	WEATHER:	Partly sunny	TEMP: 50 º	
LOCATION: (Refer to sketch attached)	Along edge Southwest Wooded Area near stump dump				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:					
Land Use:	Former office park		Landform:		
Vegetation:	Pines		Slope:	5% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☒ Y ☐ N	

Distance from:			
Open Water Bodies:	400 +/- ft.	Possible Wet Area:	100’ +
Drinking Water Well:	>100 ft.	Drainageway:	150’ +/- ft
Property Line:	200’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-12”	A	SL	10YR 3/2	
12”-18”	B	SL	10YR 6/6	
18”-96”	C	Sand	10 YR 7/4	Sand & Gravel with large angular fractured rock

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	96”
Depth to Groundwater:	Standing Water in Hole:	None	
	Weeping from Pit Face:	None	
	Estimated Seasonal High Groundwater:		96”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:					
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	No water present. Variegated color patches likely due to localized textural changes.

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-17
Applicant/owner:	Capital Group Properties				
DATE:	04/20/2017	WEATHER:	Partly sunny	TEMP: 50 º	
LOCATION: (Refer to sketch attached)	Along edge Southwest Wooded Area near stump dump				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:					
Land Use:	Former office park		Landform:		
Vegetation:	Pines		Slope:	5% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☒ Y ☐ N	

Distance from:			
Open Water Bodies:	400 +/- ft.	Possible Wet Area:	100’ +
Drinking Water Well:	>100 ft.	Drainageway:	150’ +/- ft
Property Line:	200’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-12”	A	SL	10YR 3/2	
12”-18”	B	SL	10YR 6/6	
18”-120”	C	Sand	10 YR 7/4	Sand and cobbles with small pockets of silt loam; dry bottom of hole

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None to 120”
Depth to Groundwater:	Standing Water in Hole:	None	
	Weeping from Pit Face:	None	
	Estimated Seasonal High Groundwater:		Below 120”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:					
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	No water present. Variegated color within silt loam patches only.

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-18
Applicant/owner:	Capital Group Properties				
DATE:	04/20/2017	WEATHER:	Partly sunny	TEMP: 50 º	
LOCATION: (Refer to sketch attached)	Along edge Southwest Wooded Area near stump dump				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:					
Land Use:	Former office park		Landform:		
Vegetation:	Pines		Slope:	5% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☒ Y ☐ N	

Distance from:			
Open Water Bodies:	400 +/- ft.	Possible Wet Area:	100’ +
Drinking Water Well:	>100 ft.	Drainageway:	150’ +/- ft
Property Line:	200’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-12”	A	SL	10YR 3/2	
12”-18”	B	SL	10YR 6/6	
18”-80”	C	Sand	10 YR 7/4	Sand and cobbles with angular rock / boulders

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	80”
Depth to Groundwater:	Standing Water in Hole:	None	
	Weeping from Pit Face:	None	
	Estimated Seasonal High Groundwater:		80”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:					
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	No water present.

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-19
Applicant/owner:	Capital Group Properties				
DATE:	04/20/2017	WEATHER:	Partly Sunny	TEMP: 50 º	
LOCATION: (Refer to sketch attached)	In pavement area				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:					
Land Use:	Former office park		Landform:	Outwash Plain	
Vegetation:	N/A		Slope:	1% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance from:			
Open Water Bodies:	360 +/- ft.	Possible Wet Area:	200 ft. +
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	180’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-12”	Pavement	N/A	N/A	Pavement & base material
12”-96”	C	Coarse Sand	10YR 7/3	Loose, saturated below 72”

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	84”	
	Weeping from Pit Face:	84”	
	Estimated Seasonal High Groundwater:		72”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:			72”, distinct, common		
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes:	

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-20
Applicant/owner:	Capital Group Properties				
DATE:	04/20/2017	WEATHER:	Partly Sunny	TEMP: 50 º	
LOCATION: (Refer to sketch attached)	In pavement area				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:					
Land Use:	Former office park		Landform:	Outwash Plain	
Vegetation:	N/A		Slope:	1% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance from:			
Open Water Bodies:	360 +/- ft.	Possible Wet Area:	200 ft. +
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	180’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-10”	Pavement	N/A	N/A	Pavement & base material
10”-96”	C	Coarse Sand	10YR 7/3	Loose, saturated below 70”

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	78”	
	Weeping from Pit Face:	78”	
	Estimated Seasonal High Groundwater:		70”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:			70”, distinct, common		
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							
Notes:							

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-21
Applicant/owner:	Capital Group Properties				
DATE:	04/20/2017	WEATHER:	Partly Sunny	TEMP: 50 º	
LOCATION: (Refer to sketch attached)	In pavement area				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:					
Land Use:	Former office park		Landform:	Outwash Plain	
Vegetation:	N/A		Slope:	1% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance from:			
Open Water Bodies:	360 +/- ft.	Possible Wet Area:	200 ft. +
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	180’ +/- ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-10”	Pavement	N/A	N/A	Pavement & base material
10”-120”	C	Fine Sand	10YR 7/2	Slightly firm, damp

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	96”	
	Weeping from Pit Face:	96”	
	Estimated Seasonal High Groundwater:		68”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:			68”, distinct, common		
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							
Notes:							

Site Location or lot #	129 Parker Street – Maynard, MA				DEEP HOLE # TP-22
Applicant/owner:	Capital Group Properties				
DATE:	04/20/2017	WEATHER:	Partly Sunny	TEMP: 50 º	
LOCATION: (Refer to sketch attached)	In landscaped island				
PERFORMED BY:	Marc N. Belanger, PE (MassDEP SE #123)				
WITNESSED BY:					
Land Use:	Former office park		Landform:	Outwash Plain	
Vegetation:	N/A		Slope:	1% +/-	
Stone Walls:	☐ Y ☒ N		Surface Stones:	☐ Y ☒ N	

Distance from:			
Open Water Bodies:	360 +/- ft.	Possible Wet Area:	200 ft. +
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	180’ +/- ft.	Other:	

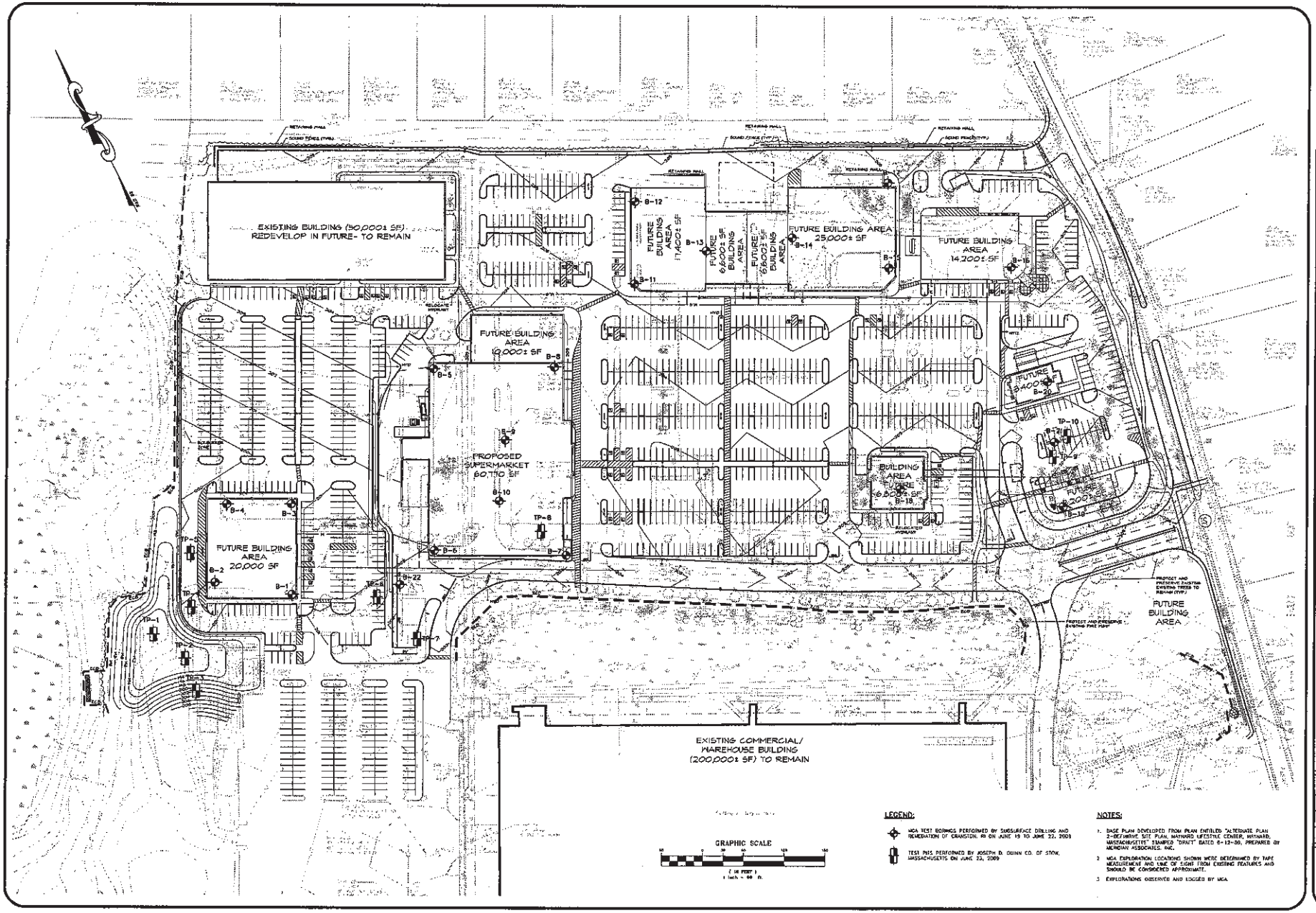
DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0”-12”	A	Sandy Loam	10YR 3/2	
12”-18”	B	Sandy Loam	10YR 6/8	
18”-120”	C	Medium Sand	10YR 7/3	

Parent Material (geologic):	Glacial Outwash	Depth to Bedrock:	None
Depth to Groundwater:	Standing Water in Hole:	100”	
	Weeping from Pit Face:	100”	
	Estimated Seasonal High Groundwater:		68”

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:		Depth observed standing in obs. hole:					
		Depth to weeping from side of obs. hole:					
		Depth to soil mottles, description:			68”, distinct, common		
		Groundwater adjustment:					
Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							
Notes:							



REVISIONS

WAYNE A. MCARDLE CIVIL NO. 41835

DRAWN BY: WAM

DESIGNED BY: WAM

CHECKED BY:

McArdle Gannon Associates, Inc.
Engineers & Consultants
1125 Main Street
Hanover, MA 02339
781.982.2881 phone
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EXPLORATION LOCATION PLAN

MAYNARD LIFESTYLE CENTER
129 PARKER STREET - MAYNARD, MA

JULY 2, 2009

SCALE: 1"=60'

JOB NO. W0172

LATEST REVISIONS

FIG. No. 2

SHEET 1 OF 1

McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-1

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 204'±
DATE START : 6-19-2009
END : 6-19-2009
DRILLER : Phil Thornsbury
ENGINEER : W. McArdle, PE

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HSA	Split Spoon	---
6-19-09	0900	10'	10'	11.5'	Size I.D.	4-1/4"	1-3/8"	---
					Hammer Wt.	---	140#	----
					Hammer Fall	---	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0			1 4	S-1	0.0 1.0	5	203.0	-TOPSOIL-
			6 9	S-1A	1.0 2.0	7	1.0	Orange-brown, fine to medium SAND, some (-) Silt, trace (-) Roots.
4								-FINE SAND-
			7 10 10 12	S-2	5.0 7.0	11		Medium dense, beige, SILT and fine SAND. (Mottles observed in sample)
8							196.0	
							8.0	[Strata change noted with augers at 8 feet]
			54 66 120	S-3	10.0 11.5	9		Very dense, wet, beige, fine to medium SAND, some (+) fine to coarse Gravel, some (-) Silt. (Weathered rock observed in tip of split spoon.)
12								-GLACIAL TILL-
							191.0	
							13.0	AUGER REFUSAL AT 13 FEET.
16								
20								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-1

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Engineers & Consultants

TEST BORING LOG

BORING B-2

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 214'±
DATE START : 6-19-2009
END : 6-19-2009
DRILLER : Phil Thornsbury
ENGINEER : W. McArdle, PE

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HSA	Split Spoon	---
6-19-09	1000	NE (1)	out		Size I.D.	4-1/4"	1-3/8"	---
					Hammer Wt.	---	140#	----
					Hammer Fall	---	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0			1 2	S-1	0.0 1.0	10		
			7 10	S-1A	1.0 2.0	2		Dark brown, fine to medium SAND, some Silt, trace fine Gravel.
			17 20	S-2	2.0 4.0	20		Dense, gray-brown, fine to medium SAND, little (+) Silt, trace fine Gravel.
4			18 16					
			20 17	S-3	5.0 7.0	14		Dense, dark brown, fine to medium SAND, some (+) Silt, trace fine Gravel.
			16 17					
8								-TOPSOIL FILL-
			13 20	S-4	10.0 12.0	11		Dense, dark brown, fine to medium SAND, some Silt, little (+) fine to coarse Gravel.
12			24 16				202.0 12.0	[Strata change noted with augers at 12 feet]
								-GLACIAL TILL-
			120/3"	S-5	15.0 15.3	2	198.0	Beige, fine to medium SAND, some (-) fine to coarse Gravel, little Silt.
16							16.0	AUGER REFUSAL AT 16 FEET.
								(1) NE = NOT ENCOUNTERED
20								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-2

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McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-3

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 203'±
DATE START : 6-19-2009
END : 6-19-2009
DRILLER : Brad Haase
ENGINEER : W. McArdle, PE

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HSA	Split Spoon	---
6-19-09	1000	6.5'	5'	7'	Size I.D.	4-1/4"	1-3/8"	---
					Hammer Wt.	---	140#	----
					Hammer Fall	---	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							202.8	
			8	S-1	0.5	7	0.3	-ASPHALT-
			8		1.5		201.5	Brown, fine to medium SAND, little (+) fine to coarse Gravel, trace (+) Silt.
			15	S-1A	1.5	6	1.5	-GRANULAR FILL-
			17		2.5			Tan, fine to coarse SAND, trace Silt.
			25	S-2	2.5	16		Dense, tan, fine to medium SAND, trace (+) Silt.
			20		4.5			
4			21					
			15					
			11	S-3	5.0	13		Medium dense, wet, fine to medium SAND, some Silt. (Mottling observed in split spoon)
			8		7.0			
			6					
8			6					-SAND & SILT-
			6	S-4	10.0	16		Medium dense, beige, SILT, little (+) fine Sand.
			6		12.0			
			11					
12			8					
			5	S-5	15.0	9		Beige, fine SAND and SILT.
			17		16.0		187.0	
16			24	S-5A	16.0	6	16.0	Beige-tan, fine to coarse SAND and fine to coarse GRAVEL, some (-) Silt. (weathered)
			26		17.0			
								-GLACIAL TILL-
20			12	S-6	20.0	10		Very dense, beige-tan, fine to coarse SAND and fine to coarse GRAVEL, some (-) Silt. (weathered)
			36		22.0			
			20					
			16				181.0	
							22.0	BOTTOM OF BORING AT 22 FEET.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-3

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Engineers & Consultants

TEST BORING LOG

BORING B-4

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 203'±
DATE START : 6-19-2009
END : 6-19-2009
DRILLER : Brad Haase
ENGINEER : W. McArdle, PE

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HSA	Split Spoon	---
6-19-09	1100	9'	10'	10'	Size I.D.	4-1/4"	1-3/8"	---
					Hammer Wt.	---	140#	----
					Hammer Fall	---	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							202.7	-ASPHALT-
			8 12 20 14	S-1	0.5 2.5	12	0.3	Brown, fine to medium SAND, little (+) Silt, little fine to coarse Gravel. -GRANULAR FILL-
							200.5	
			20 20 14 14	S-2	2.5 4.5	16	2.5	Dense, tan, fine to medium SAND, trace Silt.
4								
			11 9 10 11	S-3	5.0 7.0	15		Medium dense, beige, fine SAND and SILT.
8								-SAND & SILT-
			18 20	S-4	10.0 11.0	10		Tan-beige, fine SAND, some (+) Silt.
			100/5"	S-4A	11.0 11.4	3	192.0 11.0	Tan, fine to coarse SAND, some (+) fine to coarse Gravel, little (+) Silt. -GLACIAL TILL-
12								
							189.0 14.0	AUGER REFUSAL AT 14 FEET.
16								
20								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-4

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TEST BORING LOG

BORING B-5

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 2
LOCATION N : See Plan
E :
ELEVATION : 204'±
DATE START : 6-19-2009
END : 6-19-2009
DRILLER : Phil Thornsbury
ENGINEER : W. McArdle, PE

GROUNDWATER		DEPTH (ft) OF:		
Date	Time	Water	Casing	Hole
6-19-09	1330	8.1'	10'	10'

EQUIPMENT	CASING	SAMPLER	CORE
Type	HSA	Split Spoon	---
Size I.D.	4-1/4"	1-3/8"	---
Hammer Wt.	---	140#	----
Hammer Fall	---	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0			1	S-1	0.0	6	203.5	-TOPSOIL-
			3	S-1A	0.5	0	0.5	[No Recovery]
			4		0.5			
			7		2.0			Brown, fine to medium SAND, little Silt.
			14	S-2	2.0	12	201.0	-GRANULAR FILL-
			20	S-2A	3.0	8	3.0	Tan, fine to coarse SAND, some fine to coarse Gravel, trace (+) Silt.
4			18		3.0			
			20		4.0			
			14	S-3	5.0	9		Dense, tan, fine to coarse SAND, some fine to coarse Gravel, trace Silt.
			16		7.0			
			17					
8			14					
			5	S-4	10.0	7		Medium dense, tan, fine to coarse SAND, little (+) fine to coarse Gravel, trace Silt.
			6		12.0			
12			7					-SAND-
			6					
			3	S-5	15.0	10		Medium dense, tan, fine to medium SAND, trace Silt.
16			5		17.0			
			7					
			10					
20			8	S-6	20.0	11		Medium dense, tan-reddish brown, fine to medium SAND, little (+) Silt, little fine Gravel.
			10		22.0			
			11					
			10					

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-5

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McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-5
PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA **CLIENT:** Site Management Group		**MGA NO. : W0172** **SHEET NO. : 2 of 2**

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
24							179.0	
			4 5 5 6	S-7	25.0 27.0	8	25.0	Loose to medium dense, gray, fine SAND and SILT.
28								-SAND & SILT-
			3 5 6 6	S-8	30.0 32.0	5	172.0	Medium dense, gray, fine SAND and SILT.
32							32.0	BOTTOM OF BORING AT 32 FEET.
36								
40								
44								
48								
52								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-5

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McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-6

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 2
LOCATION N : See Plan
E :
ELEVATION : 203'±
DATE START : 6-19-2009
END : 6-19-2009
DRILLER : Phil Thornsbury
ENGINEER : W. McArdle, PE

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-19-09	1500				Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recov-ery (in)	Elev-ation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							202.5	
			3	S-1	0.5	12	0.5	-ASPHALT-
			8		2.5			Medium dense, brown-gray, fine to medium SAND, little (+) fine Gravel, little (+) Silt.
			12					
			14					
			30	S-2	2.5	5		Very dense, brown-tan, fine to medium SAND, little (+) Silt, little fine to coarse Gravel.
			86		4.5			
4			50					
			45					-GRANULAR FILL-
			20	S-3	5.0	10		Tan-brown, fine to medium SAND, some (-) Silt, little (-) fine Gravel.
			30		6.0		197.0	
			18	S-3A	6.0	4	6.0	Orange-tan, fine to medium SAND, little fine Gravel, little Silt.
			19		7.0			
8								
			18	S-4	9.0	10		Dense, orange-brown, fine to coarse SAND, some (-) fine to coarse Gravel, trace (+) Silt.
			16		11.0			
			14					
			18					
12								-SAND-
			7	S-5	14.0	8		Medium dense, orange-brown, fine SAND, little Silt, little (-) fine Gravel.
			11		16.0			
			11					
16			11					
			6	S-6	19.0	6		Medium dense, beige-tan, fine to medium SAND, little Silt, trace fine Gravel.
			9		21.0			
20			10					
			11					

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-6

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McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-6
PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA **CLIENT:** Site Management Group		**MGA NO. : W0172** **SHEET NO. : 2 of 2**

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
24			5 7 9 12	S-7	24.0 26.0	7	179.0 24.0	Medium dense, tan, fine SAND and SILT.
28								-SAND & SILT-
			4 5 6 6	S-8	29.0 31.0	12	172.0 31.0	Medium dense, gray, fine SAND and SILT. BOTTOM OF BORING AT 31 FEET.
32								
36								
40								
44								
48								
52								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-6

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McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST BORING LOG

BORING B-7

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 2
LOCATION N : See Plan
E :
ELEVATION : 202'±
DATE START : 6-22-2009
END : 6-22-2009
DRILLER : Phil Thornsbury
ENGINEER : Sherry Holmes

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-22-09	0830	7'	9'	9'	Size I.D.	4"	1-3/8"	---
6-22-09	1000	7.5'	out		Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							201.7	
			14	S-1	0.5	8	0.3	-ASPHALT-
			21		2.5			Dense to very dense, brown, fine to medium SAND, little fine to coarse Gravel, little Silt.
			29					-GRANULAR FILL-
			31				199.5	
			39	S-2	2.5	18	2.5	Very dense, tan, fine to coarse SAND, little fine to coarse Gravel, trace Silt.
			49		4.0			
4			42					Dense, tan, fine to medium SAND, trace Silt.
			26	S-3	4.0	18		
			16		6.0			-SAND-
			16					
			14					
8							194.0	
							8.0	
			4	S-4	9.0	18		Medium dense, beige, fine SAND, some Silt.
			10		11.0			
			14					
			16					
12								-SAND & SILT-
			4	S-5	14.0	16		Loose, beige, fine SAND, some Silt.
			4		16.0			
			3					
16			2					
			3	S-6	19.0	14		Loose, beige, fine SAND, some Silt.
			3		21.0			
20			4					
			4					

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-7

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McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-7
PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA **CLIENT:** Site Management Group		**MGA NO. : W0172** **SHEET NO. : 2 of 2**

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
24			3 5 5 5	S-7	24.0 26.0	12		Loose to medium dense, beige, fine SAND and SILT.
28								-SAND & SILT-
			4 8 7 7	S-8	29.0 31.0	9		Medium dense, beige, fine SAND, little Silt.
							171.0 31.0	BOTTOM OF BORING AT 31 FEET.
32								
36								
40								
44								
48								
52								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-7

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McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST BORING LOG

BORING B-8

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 2
LOCATION N : See Plan
E :
ELEVATION : 202'±
DATE START : 6-22-2009
END : 6-23-2009
DRILLER : Phil Thornsbury
ENGINEER : Sherry Holmes

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	—
6-22-09	1600	8'	out		Size I.D.	4"	1-3/8"	—
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							201.8	
			26	S-1	0.5	10	0.3	-ASPHALT-
			17		2.0			Dense, brown, fine to medium SAND, little fine to coarse Gravel, little Silt.
			16				200.0	-GRANULAR FILL-
			12	S-2	2.0	20	2.0	Medium dense, tan, fine to medium SAND, trace Silt.
			8		4.0			
			10					
4			20					
			20	S-3	4.0	14		Dense, beige, fine SAND, little Silt.
			24		6.0			
			26					
			20					
8								
			3	S-4	9.0	9		Loose, tan, fine to coarse SAND, trace fine to coarse Gravel, trace Silt.
			3		11.0			
			4					
			5					
12								-SAND-
			2	S-5	14.0	3		Loose, beige, fine SAND, little Silt.
			2		16.0			
			4					
16			3					
			5	S-6	19.0	3		Loose to medium dense, beige, fine to medium SAND, little fine Gravel, trace Silt.
			4		21.0			
20			6					
			5					

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-8

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McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-8
PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA **CLIENT:** Site Management Group		**MGA NO. : W0172** **SHEET NO. : 2 of 2**

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
24			3 4 6 5	S-7	24.0 26.0	9		Loose to medium dense, beige, fine SAND, little Silt.
28								-SAND-
			5 7 8 8	S-8	29.0 31.0	9		Medium dense, gray, fine SAND, little Silt.
							171.0 31.0	BOTTOM OF BORING AT 31 FEET.
32								
36								
40								
44								
48								
52								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-8

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McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST BORING LOG

BORING B-9

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-22-09	1245	5.5'	4'	6'	Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

MGA NO. : W0172
SHEET NO. : 1 of 2
LOCATION N : See Plan
E :
ELEVATION : 202'±
DATE START : 6-22-2009
END : 6-22-2009
DRILLER : Phil Thornsbury
ENGINEER : Sherry Holmes

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recov-ery (in)	Elev-ation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							201.7	
			12	S-1	0.5	9	0.3	-ASPHALT-
			14		2.0			Medium dense to dense, brown, fine to coarse SAND, little fine to coarse Gravel, trace Silt.
			16				200.0	-GRANULAR FILL-
			22	S-2	2.0	18	2.0	Dense, tan, fine to coarse SAND, trace fine to coarse Gravel, trace Silt.
			24		4.0			
			21					
4			26					Medium dense, tan, fine to medium SAND, trace Silt.
			11	S-3	4.0	14		
			12		6.0			
			8					
			7					
8								
			1	S-4	9.0	12		Very loose to loose, beige, fine to medium SAND, trace Silt.
			2		11.0			
			2					
			2					
12								-SAND-
			1	S-5	14.0	14		Loose, beige, fine SAND, trace Silt.
			2		16.0			
			3					
16			2					
				S-6	19.0	14		Loose, beige, fine SAND, little Silt.
			2		21.0			
20			2					
			3					
			4					

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-9

McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-9
PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA **CLIENT:** Site Management Group		**MGA NO. : W0172** **SHEET NO. : 2 of 2**

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
24			2 2 6 10	S-7	24.0 26.0	11		Loose, beige, fine to medium SAND, trace Silt.
28								-SAND-
			3 5 6 6	S-8	29.0 31.0	14		Medium dense, gray, fine SAND, little Silt.
							171.0 31.0	BOTTOM OF BORING AT 31 FEET.
32								
36								
40								
44								
48								
52								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-9

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McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST BORING LOG

BORING B-10

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 2
LOCATION N : See Plan
E :
ELEVATION : 202'±
DATE START : 6-22-2009
END : 6-22-2009
DRILLER : Phil Thornsbury
ENGINEER : Sherry Holmes

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-22-09	1400	5'	4'	6'	Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							201.7	
			10	S-1	0.5	10	0.3	-ASPHALT-
			11		2.0			Medium dense, brown, fine to coarse SAND, little fine to coarse Gravel, trace Silt.
			12				200.0	
			26	S-2	2.0	18	2.0	-GRANULAR FILL-
			22		4.0			Dense, tan, fine to coarse SAND, trace fine to coarse Gravel, trace Silt.
			24					
4			22					
			14	S-3	4.0	16		Medium dense, tan, fine to medium SAND, trace Silt.
			10		6.0			
			10					
			9					
8								
			3	S-4	9.0	4		Loose, tan, fine to coarse SAND, trace Silt, trace fine Gravel.
			4		11.0			
			4					
			4					
12								
								-SAND-
			2	S-5	14.0	10		Loose, beige, fine to coarse SAND, little fine to coarse Gravel, trace Silt.
			3		16.0			
			4					
16			5					
			3	S-6	19.0	18		Loose, beige, fine SAND, little Silt.
20			4		21.0			
			3					
			2					

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-10

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McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-10
PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA **CLIENT:** Site Management Group		**MGA NO. : W0172** **SHEET NO. : 2 of 2**

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
24			2 4 6 7	S-7	24.0 26.0	11		Loose to medium dense, beige, fine SAND, little Silt.
28								-SAND-
			7 6 7 7	S-8	29.0 31.0	12	171.0 31.0	Medium dense, gray to reddish-brown, fine SAND, little Silt. BOTTOM OF BORING AT 31 FEET.
32								
36								
40								
44								
48								
52								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-10

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McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST BORING LOG

BORING B-11

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 203'±
DATE START : 6-19-2009
END : 6-19-2009
DRILLER : Brad Haase
ENGINEER : W. McArdle, PE

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-19-09	1330	4.5'	out		Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							202.7	
			8	S-1	0.5	6	0.3	-ASPHALT-
			12		1.5		201.5	Brown, fine to medium SAND, some (-) fine to coarse Gravel, little (-) Silt.
			16	S-1A	1.5	7	1.5	-GRANULAR FILL-
			20	S-2	2.5	16		Tan, fine to coarse SAND, some (+) fine to coarse Gravel, trace Silt.
			18		2.5			Dense, tan, fine to coarse SAND, some (+) fine to coarse Gravel, trace Silt.
4			18		4.5			
			16					
			11					
			3	S-3	5.0	12		Loose, wet, tan-beige, fine to coarse SAND, little fine to coarse Gravel, trace (-) Silt.
			4		7.0			
			4					
			5					
8								-SAND & GRAVEL-
			5	S-4	10.0	14		Medium dense, beige-tan, fine to coarse SAND, some (-) fine to coarse Gravel, trace (-) Silt.
			7		12.0			
			8					
12			6					
			8	S-5	14.0	5		Medium dense, beige, fine to coarse SAND, little (+) fine Gravel, trace (-) Silt.
			5		16.0			
			6					
16			6					
			7	S-6	19.0	2		Medium dense, beige, fine to coarse SAND and fine to coarse GRAVEL, trace (-) Silt.
			7		21.0			
20			9					
			8				182.0	
							21.0	BOTTOM OF BORING AT 21 FEET.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-11

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TEST BORING LOG

BORING B-12

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 204'±
DATE START : 6-19-2009
END : 6-22-2009
DRILLER : Brad Haase
ENGINEER : WAM/SLH

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-22-09	0840	4.5'	4'	6'	Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							203.8	-ASPHALT-
			19 13 19 19	S-1	0.5 2.5	12	0.3	Dense, brown-tan, fine to medium SAND, little (+) fine to coarse Gravel, little (-) Silt.
							201.5	-GRANULAR FILL-
			15 17 14 10	S-2	2.5 4.5	13	2.5	Dense, tan, fine to coarse SAND, some (-) fine to coarse Gravel, trace (-) Silt.
4								
			5 6 5 5	S-3	4.5 6.5	14		Medium dense, tan, fine to coarse SAND, trace Silt.
8								
			5 4 4 5	S-4	9.0 11.0	16		Loose, tan, fine to medium SAND, trace Silt.
12								-SAND-
			5 5 2 2	S-5	14.0 16.0	24		Loose, tan, fine to coarse SAND, trace Silt, trace (-) fine Gravel.
16								
			3 9 11 11	S-6	19.0 21.0	8		Medium dense, tan to orange-brown, fine to coarse SAND, trace Silt.
20							183.0	
							21.0	BOTTOM OF BORING AT 21 FEET.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-12

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TEST BORING LOG

BORING B-13

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-22-09	1030	5'	4.5'	6.5'	Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 203'±
DATE START : 6-22-2009
END : 6-22-2009
DRILLER : Brad Haase
ENGINEER : Sherry Holmes

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							202.7	-ASPHALT-
			13 21 38 40	S-1	0.5 2.5	8	0.3 200.5	Very dense, brown, fine to coarse SAND, little fine to coarse Gravel, little Silt. -GRANULAR FILL-
4			35 22 27 17	S-2	2.5 4.5	8	2.5	Dense, tan, fine to coarse SAND, little fine to coarse Gravel, trace Silt.
			9 11 12 10	S-3	4.5 6.5	18		Medium dense, tan, fine to coarse SAND, little fine to coarse Gravel, trace Silt.
8								
			4 4 5 4	S-4	9.0 11.0	8		Loose, tan, fine to medium SAND, trace Silt.
12								-SAND-
			2 1 2 1	S-5	14.0 16.0	8		Very loose, beige, fine to medium SAND, trace Silt.
16								
20			4 4 7 8	S-6	19.0 21.0	3		Medium dense, beige, fine to medium SAND, trace Silt.
							182.0 21.0	BOTTOM OF BORING AT 21 FEET.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-13

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TEST BORING LOG

BORING B-14

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-22-09	1145	3'	0'	4.5'	Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 202'±
DATE START : 6-22-2009
END : 6-22-2009
DRILLER : Brad Haase
ENGINEER : Sherry Holmes

Depth In Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							201.7	-ASPHALT-
			16 11 11 12	S-1	0.5 2.5	10	0.3	Medium dense, tan, fine to medium SAND, trace Silt.
			15 15 10 10	S-2	2.5 4.5	12		Medium dense, tan, fine to coarse SAND, little fine to coarse Gravel, trace Silt.
4			3 3 3 5	S-3	4.5 6.5	16		Loose, tan, fine to coarse SAND, trace fine to coarse Gravel, trace Silt.
8			6 5 4 5	S-4	9.0 11.0	10		Loose, beige, fine to coarse SAND, trace fine Gravel, trace Silt.
12								-SAND-
			2 2 2 3	S-5	14.0 16.0	14		Very loose to loose, beige, fine to coarse SAND, trace Silt.
16								
20			8 5 6 9	S-6	19.0 21.0	12		Medium dense, tan, fine to coarse SAND, little fine to coarse Gravel, trace Silt.
							181.0	
							21.0	BOTTOM OF BORING AT 21 FEET.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-14

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TEST BORING LOG

BORING B-15

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 203'±
DATE START : 6-22-2009
END : 6-22-2009
DRILLER : Brad Haase
ENGINEER : Sherry Holmes

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-22-09	1330	4'	4'	6'	Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0			1 4	S-1	0.0 1.0	8	202.0	-TOPSOIL-
			7 9	S-1A	1.0 2.0	8	1.0	Orange-brown, fine to medium SAND, trace Silt.
			18 16	S-2	2.0 4.0	10		Dense, tan, fine to medium SAND, trace Silt.
4			16 16	S-3	4.0 6.0	12		Medium dense, tan, fine to coarse SAND, trace Silt.
			4 6 6 7					
8			4 5 6 6	S-4	9.0 11.0	10		Medium dense, tan, fine to coarse SAND, trace fine Gravel, trace Silt.
12								-SAND-
			2 4 3 4	S-5	14.0 16.0	12		Loose, beige, fine SAND, little Silt.
16								
20			3 5 9 8	S-6	19.0 21.0	14		Medium dense, beige, fine SAND, little Silt.
							182.0 21.0	BOTTOM OF BORING AT 21 FEET.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-15

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TEST BORING LOG

BORING B-16

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 208'±
DATE START : 6-22-2009
END : 6-22-2009
DRILLER : Brad Haase
ENGINEER : Sherry Holmes

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
					Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0			2 3 3 6	S-1	0.0 2.0	12	207.0 1.0	-TOPSOIL- Tan, fine to coarse SAND, trace Silt.
			9 11 13 13	S-2	2.0 4.0	11		Medium dense, tan, fine to coarse SAND, trace Silt.
4			9 11 12 12	S-3	4.0 6.0	14		Medium dense, tan, fine to coarse SAND, trace Silt.
8								-SAND-
			7 6 9 9	S-4	9.0 11.0	16		Medium dense, tan, fine to coarse SAND, trace Silt.
12								
			10 7 6 7	S-5	14.0 16.0	10		Medium dense, beige, fine to medium SAND, trace Silt.
16							192.0 16.0	BOTTOM OF BORING AT 16 FEET.
20								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-16

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TEST BORING LOG

BORING B-17

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 210'±
DATE START : 6-23-2009
END : 6-23-2009
DRILLER : Phil Thornsbury
ENGINEER : Sherry Holmes

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-23-09	1000	10'	out		Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							209.8	-ASPHALT-
			8 7 10	S-1	0.5 2.0	6	0.3 208.0	Medium dense, brown, fine to medium SAND, little fine to coarse Gravel, little Silt.
			14 15 19 14	S-2	2.0 4.0	16	2.0	-GRANULAR FILL- Dense, tan, fine to coarse SAND, some fine to coarse Gravel, trace (-) Silt.
4			11 12 9 11	S-3	4.0 6.0	14		Medium dense, tan, fine to coarse SAND, little fine Gravel, trace Silt.
8			3 7 4 4	S-4	9.0 11.0	6		Medium dense, tan, fine to coarse SAND, trace fine Gravel, trace Silt.
12								-SAND-
16			4 4 4 4	S-5	14.0 16.0	3		Loose, tan, fine to coarse SAND, trace Silt.
20			2 5 3 3	S-6	19.0 21.0	1	189.0 21.0	Loose, beige, fine to medium SAND, trace Silt. BOTTOM OF BORING 21 FEET.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-17

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TEST BORING LOG

BORING B-18

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-23-09	1030	3.5'	0'	4'	Size I.D.	4"	1-3/8"	—
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 202'±
DATE START : 6-23-2009
END : 6-23-2009
DRILLER : Phil Thornsbury
ENGINEER : Sherry Holmes

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0			1 2	S-1	0.0 2.0	10	201.0	-TOPSOIL-
			4 6	S-1A	1.0 2.0	4	1.0	Beige, fine SAND, little Silt.
			7 7 7 8	S-2	2.0 4.0	12		Medium dense, tan, fine to medium SAND, trace Silt, trace (-) fine Gravel.
4			8 9 11 9	S-3	4.0 6.0	12		Medium dense, tan, fine to coarse SAND, trace fine to coarse Gravel, trace Silt.
								-SAND-
8							193.0	
			3 5 4 4	S-4	9.0 11.0	10	9.0	Loose, beige, fine SAND, some Silt.
12								-SAND & SILT-
			3 4 4 4	S-5	14.0 16.0	8		Loose, beige, fine SAND and SILT.
16							186.0 16.0	BOTTOM OF BORING AT 16 FEET.
20								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-18

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TEST BORING LOG

BORING B-19

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 203'±
DATE START : 6-23-2009
END : 6-23-2009
DRILLER : Phil Thornsbury
ENGINEER : Sherry Holmes

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-23-09	1200	9'	9'	11'	Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0			1 1	S-1	0.0 1.0	12	202.0	-TOPSOIL-
			5 7	S-1A	1.0 2.0	4	1.0	Brown, fine to medium SAND, little Silt, little fine Gravel.
			8 8 8	S-2	2.0 4.0	18		Medium dense, gray to dark gray, fine SAND, little Silt, trace fine Gravel, trace Organics.
4			8					
			7 7 7	S-3	4.0 6.0	12		Medium dense, gray to dark gray, fine SAND, little Silt, trace fine Gravel, trace Organics.
			9					[Drove casing from 4 to 9 feet. Pulled casing out of hole. Soil inside casing consisted of fill similar to S-2 & S-3.]
8								-GRANULAR FILL-
			2 4 4 4	S-4	9.0 11.0	10	193.5 9.5	Loose, gray, fine SAND, some Silt.
12								-SAND & SILT-
			8 9 7 5	S-5	14.0 16.0	15		Medium dense, gray, fine SAND, little Silt.
16							187.0 16.0	BOTTOM OF BORING AT 16 FEET.
20								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-19

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TEST BORING LOG

BORING B-20

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 205'±
DATE START : 6-23-2009
END : 6-23-2009
DRILLER : Phil Thornsbury
ENGINEER : Sherry Holmes

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-23-09	1400	5.5'	9'	11'	Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0			1 3	S-1	0.0 1.0	10	204.0	-TOPSOIL-
			8 12	S-1A	1.0 2.0	2	1.0	Tan, fine to medium SAND, little fine Gravel, trace Silt.
			10 11 12 14	S-2	2.0 4.0	20		Medium dense, tan, fine to medium SAND, trace fine Gravel, trace Silt.
4			10 9 9 8	S-3	4.0 6.0	16		Medium dense, tan, fine to coarse SAND, trace Silt. (1/2" thick layer of fine SAND, little Silt)
8								-SAND-
			1 1 1 1	S-4	9.0 11.0	20		Very loose, tan, fine to medium SAND, trace Silt.
12								
			2 3 2 4	S-5	14.0 16.0	12		Loose, tan, fine to medium SAND, little Silt, trace (-) fine Gravel.
16							189.0 16.0	BOTTOM OF BORING AT 16 FEET.
20								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-20

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McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST BORING LOG

BORING B-21

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 204'±
DATE START : 6-23-2009
END : 6-23-2009
DRILLER : Phil Thornsbury
ENGINEER : Sherry Holmes

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-23-09	1500	4'	9'	11'	Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS	Well Schematic
0							204.0		
			1 3	S-1	0.0 1.0	11	0.0	-TOPSOIL-	
			7 9	S-1A	1.0 2.0	5	203.0 1.0	Brown, fine to medium SAND, little Silt, trace fine to coarse Gravel.	
			10 17	S-2	2.0 4.0	8	202.0 2.0	-GRANULAR FILL- Medium dense, tan, fine to medium SAND, trace fine to coarse Gravel, trace Silt.	
4			11 7	S-3	4.0 6.0	14		Medium dense, tan, fine to coarse SAND, trace fine to coarse Gravel, trace Silt.	
			10 9 7					-SAND-	
8									
			1 3	S-4	9.0 11.0	22		Loose, tan, fine to medium SAND, trace Silt.	
			3 5				193.0 11.0	BOTTOM OF BORING AT 11 FEET.	
12									
16									
20									

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Overburden:
Rock:
Samples:

BORING B-21

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McArdle Gannon Associates, Inc.
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TEST BORING LOG

BORING B-22

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 203'±
DATE START : 6-23-2009
END : 6-23-2009
DRILLER : Phil Thornsbury
ENGINEER : Sherry Holmes

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
6-23-09	1700	8'	out		Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS	Well Schematic
							203.0		
0			1	S-1	0.0	8	0.0	-TOPSOIL-	
			3		1.0		202.0		
			5	S-1A	1.0	8	1.0	Tan, fine to medium SAND, trace fine Gravel, trace Silt.	
			9		2.0			-GRANULAR FILL-	
			10	S-2	2.0	10		Tan, fine to medium SAND, trace Silt.	
			20	S-2A	3.0	10	200.0		
			24		3.0		3.0	Tan, fine to coarse SAND, trace fine Gravel, trace Silt.	
4			22	S-3	4.0	16		Medium dense, tan, fine to medium SAND, little (-) Silt.	
			11		4.0				
			10		6.0			-SAND-	
			7						
			6						
8									
			2	S-4	9.0	13		Loose, beige, fine to medium SAND, little (-) Silt.	
			2		11.0				
			3						
			4						
12									
			2	S-5	14.0	0		[No Recovery]	
			3		16.0				
			3						
			5				187.0		
16							16.0	BOTTOM OF BORING AT 16 FEET.	
20									

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Overburden:
Rock:
Samples:

BORING B-22

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KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	Topsoil
	Sand
	Glacial Till
	Topsoil Fill
	Asphalt
	Granular Fill
	Sand & Silt
	Sand and Gravel
Soil Samplers	
	Split Spoon
Monitor Well Details	
	pipe riser
	assorted cuttings

Symbol	Description
	bentonite pellets
	silica sand, blank PVC
	slotted pipe w/ sand
	end of well installation

Notes:

1. Test borings performed by Subsurface Drilling & Remediation, Inc. on June 19, 22, and 23, 2009 using a truck-mounted drilling rig.

2. Test boring elevations estimated from ground surface contours shown on plans entitled "Grading, Drainage, & Utility Plan 1 & 2," prepared by Meridian Associates, Inc., dated May 8, 2009 and should be considered approximate.

3. Test borings observed and logged by MGA.

McArdle Gannon Associates, Inc. Engineers & Consultants	TEST PIT LOG	TEST PIT NO. TP-3

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Joseph D. Quinn Co.

EQUIPMENT: Link-Belt 2800 Tracked Excavator

OPERATOR: Joe Quinn

GROUNDWATER			
Date	Time	Depth (ft.)	Notes
6-23-09	1130	NE	Not Encountered

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 214'±
DATE START : 6-23-2009
END : 6-23-2009
ENGINEER : W. McArdle, PE

Depth In Feet	Strata Change	Sample Number/ Type	Sample Depth Range (ft)	Elev-ation/ Depth (ft)	SOIL DESCRIPTION (BURMISTER INDENTIFICATION)	NOTES
0					Dark brown, fine to medium SAND and SILT, little fine to coarse Gravel, trace Roots. -TOPSOIL FILL-	
				211.0		
3				3.0	Orange-brown, fine to medium SAND, some (+) Silt, little fine to coarse Gravel, trace (-) Roots. -SUBSOIL-	
				210.0 4.0		
				209.0 5.0	Tan, fine to coarse SAND, some (-) fine to coarse Gravel, little (+) Silt. -GLACIAL TILL-	
6					BUCKET REFUSAL AT 5 FEET.	
9						
12						
15						
18						

TEST PIT DIMENSIONS	BOULDERS	SAMPLE IDENTIFICATION	SUMMARY
Width: 4' (E/W) Feet Length: 12' (N/S) Feet	6" to 18" Diameter= 14 18" to 36" Diameter= 1 Over 36" Diameter= 0 (number)	- B - Bag - J - Jar - P - Percolation Test	Overburden: Rock: Samples: **TEST PIT NO. TP-3**

McArdle Gannon Associates, Inc. Engineers & Consultants	TEST PIT LOG	TEST PIT NO. TP-4

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Joseph D. Quinn Co.

EQUIPMENT: Link-Belt 2800 Tracked Excavator

OPERATOR: Joe Quinn

GROUNDWATER			
Date	Time	Depth (ft.)	Notes
6-23-09	1200	NE	Not Encountered

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 214'±
DATE START : 6-23-2009
END : 6-23-2009
ENGINEER : W. McArdle, PE

Depth in Feet	Strata Change	Sample Number/ Type	Sample Depth Range (ft)	Elev-ation/ Depth (ft)	SOIL DESCRIPTION (BURMISTER INDENTIFICATION)	NOTES
0					Dark brown, fine to medium SAND and SILT, some (-) fine to coarse Gravel.	
3					-TOPSOIL FILL-	
6						
9					Dark brown to brown, fine to medium SAND, some Silt, little fine to coarse Gravel.	
				202.5		
12				11.5	Orange-brown, fine to medium SAND, some (-) Silt, little fine to coarse Gravel, trace (-) Roots.	
				202.0	-SUBSOIL-	
				12.0		
				201.0	Tan, fine to coarse SAND, some (-) fine to coarse Gravel, little (+) Silt.	
				13.0	-GLACIAL TILL-	
15					BUCKET REFUSAL AT 13 FEET.	
18						

TEST PIT DIMENSIONS	BOULDERS	SAMPLE IDENTIFICATION	SUMMARY
Width: 6' (E/W) Feet	6" to 18" Diameter= 6	B - Bag	Overburden:
Length: 14' (N/S) Feet	18" to 36" Diameter= 0	J - Jar	Rock:
	Over 36" Diameter= 0 (number)	P - Percolation Test	Samples:
			TEST PIT NO. TP-4

McArdle Gannon Associates, Inc. Engineers & Consultants	TEST PIT LOG	TEST PIT NO. TP-5

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Joseph D. Quinn Co.

EQUIPMENT: Link-Belt 2800 Tracked Excavator

OPERATOR: Joe Quinn

GROUNDWATER

Date	Time	Depth (ft.)	Notes
6-23-09	1230	NE	Not Encountered

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 214'±
DATE START : 6-23-2009
END : 6-23-2009
ENGINEER : W. McArdle, PE

Depth in Feet	Strata Change	Sample Number/ Type	Sample Depth Range (ft)	Elev-ation/ Depth (ft)	SOIL DESCRIPTION (BURMISTER INDENTIFICATION)	NOTES
0					Dark brown, fine to medium SAND and SILT, little (-) fine to coarse Gravel.	
3					-TOPSOIL FILL-	
6						
9					Dark brown, fine to medium SAND and SILT, little fine to coarse Gravel.	
12						
				200.0		
				14.0	Tan-beige, fine to medium SAND, little (-) Silt.	
15				199.0	-SAND-	
				15.0	BOTTOM OF TEST PIT AT 15 FEET.	
18						

TEST PIT DIMENSIONS	BOULDERS	SAMPLE IDENTIFICATION	SUMMARY
Width: 6' (E/W) Feet	6" to 18" Diameter= 6	☒ - B - Bag	Overburden:
Length: 14' (N/S) Feet	18" to 36" Diameter= 0	◪ - J - Jar	Rock:
	Over 36" Diameter= 0 (number)	◪ - P - Percolation Test	Samples:
			TEST PIT NO. TP-5

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McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST PIT LOG

TEST PIT NO. TP-8

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: Site Management Group
CONTRACTOR: Joseph D. Quinn Co.

EQUIPMENT: Link-Belt 2800 Tracked Excavator

OPERATOR: Joe Quinn

GROUNDWATER			
Date	Time	Depth (ft.)	Notes
6-23-09	1400	NE	Not Encountered

MGA NO. : W0172
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 203'±
DATE START : 6-23-2009
END : 6-23-2009
ENGINEER : W. McArdle, PE

Depth in Feet	Strata Change	Sample Number/ Type	Sample Depth Range (ft)	Elev-ation/ Depth (ft)	SOIL DESCRIPTION (BURMISTER INDENTIFICATION)	NOTES
0				202.1	-TOPSOIL-	
		S-1	0.9 3.5	0.9	Brown-tan, fine to medium SAND, little (-) fine to coarse Gravel, little (+) Silt. -GRANULAR FILL-	(1)
3				199.5		
				3.5 198.5	Beige-tan, fine to medium SAND, little fine to coarse Gravel, trace Silt. -SAND-	
				4.5	BOTTOM OF TEST PIT AT 4.5 FEET.	
6					(1) BULK SAMPLE OF FILL OBTAINED FOR LABORATORY TESTING.	
9						
12						
15						
18						

TEST PIT DIMENSIONS	BOULDERS	SAMPLE IDENTIFICATION	SUMMARY
Width: 4' (N/S) Feet Length: 7' (E/W) Feet	6" to 18" Diameter= 0 18" to 36" Diameter= 0 Over 36" Diameter= 0 (number)	- B - Bag - J - Jar - P - Percolation Test	**Overburden:** **Rock:** **Samples:** **TEST PIT NO. TP-8**

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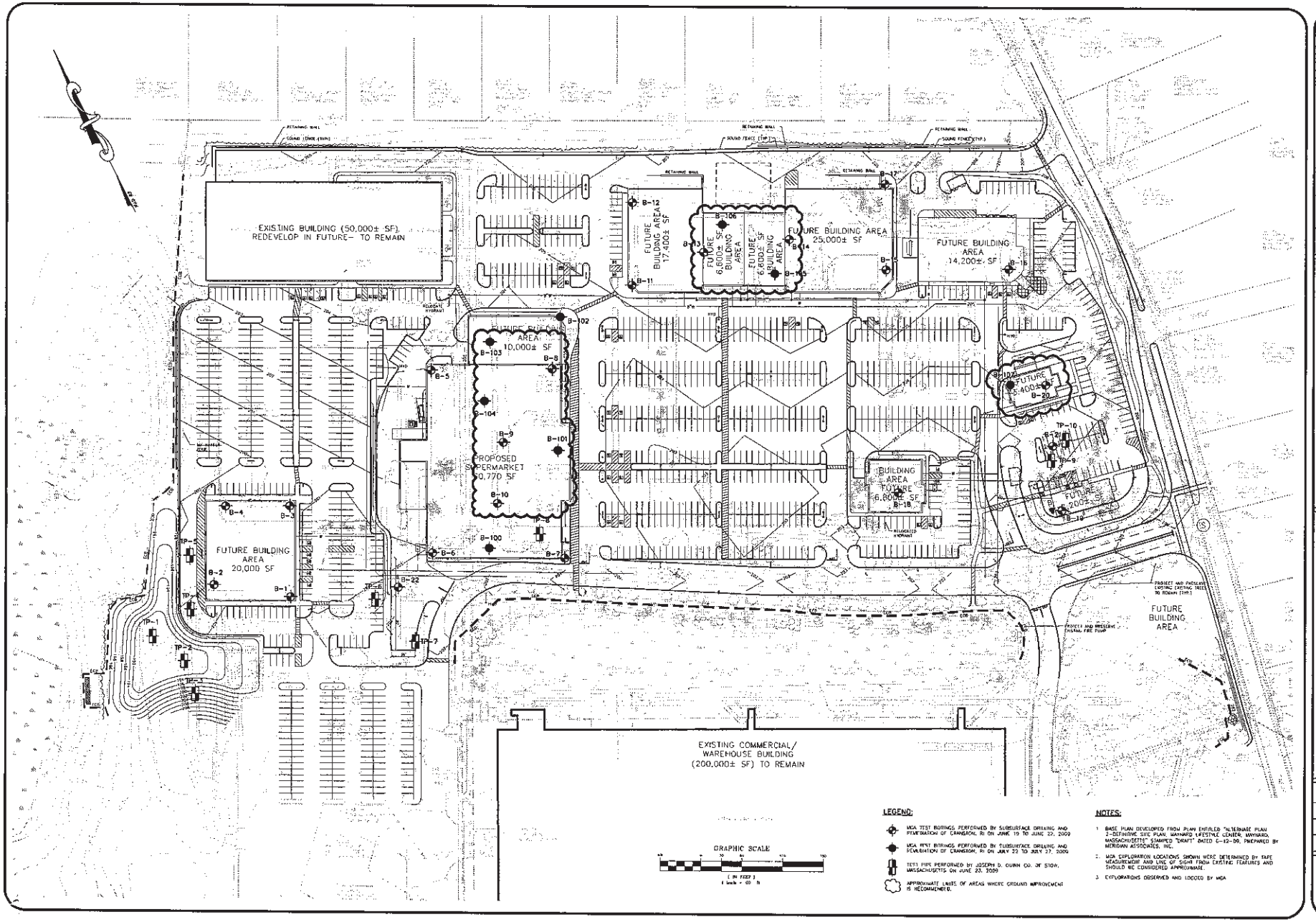

REVISIONS

WAYNE A. MCARDLE CIVIL NO. 41835 REGISTERED PROFESSIONAL ENGINEER

DRAWN BY: WAM

DESIGNED BY: WAM

CHECKED BY:

McArdle Gannon Associates, Inc.
Engineers & Consultants
1125 Main Street
Hanover, MA 02339
781.982.2881 phone
781.735.0418 fax

EXPLORATION LOCATION PLAN

MAYNARD LIFESTYLE CENTER

129 PARKER STREET - MAYNARD, MA

AUGUST 3, 2009

SCALE: 1"=60'

JOB NO. W0172.01

LATEST REVISIONS

FIG. No. 1

SHEET 1 OF 1

McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST BORING LOG

BORING B-100

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: 129 Parker Street LLC
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172.01
SHEET NO. : 1 of 2
LOCATION N : See Plan
E :
ELEVATION : 202'±
DATE START : 7/22/09
END : 7/23/09
DRILLER : Phil Thornsbury
ENGINEER : W. McArdle, P.E.

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
7/23/09	0700	6.8'	24'	26'	Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recov-ery (in)	Elev-ation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							201.2	-ASPHALT-
			17 15 21 25	S-1	1.0 3.0	18	0.8	Dense, brown-tan, fine to medium SAND, some (-) fine to coarse Gravel, little (-) Silt. -FILL-
							199.0	
4			29 30 36 30	S-2	4.0 6.0	20	3.0	Very dense, moist, beige, fine SAND, some (+) Silt.
8			8 9 8 13	S-3	9.0 11.0	11		Medium dense, wet, tan, fine to coarse SAND, trace Silt.
12								-SAND-
			4 6 6 8	S-4	14.0 16.0	12		Medium dense, tan, fine to coarse SAND, little fine Gravel, trace Silt.
16								
20			5 4 5 5	S-5	19.0 21.0	9		Loose, beige, fine to medium SAND, trace Silt.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-100

McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-100
PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA **CLIENT:** 129 Parker Street LLC		**MGA NO. : W0172.01** **SHEET NO. : 2 of 2**

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
24			3 5 6 6	S-6	24.0 26.0	12		Medium dense, beige, fine SAND, little Silt.
28								-SAND-
			4 7 5 5	S-7	29.0 31.0	12		Medium dense, beige-gray, fine SAND, some (-) Silt.
							171.0 31.0	BOTTOM OF BORING AT 31 FEET.
32								
36								
40								
44								
48								
52								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-100

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Engineers & Consultants

TEST BORING LOG

BORING B-101

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: 129 Parker Street LLC
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172.01
SHEET NO. : 1 of 3
LOCATION N : See Plan
E :
ELEVATION : 203'±
DATE START : 7/22/09
END : 7/22/09
DRILLER : Phil Thornsbury
ENGINEER : W. McArdle, P.E.

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
7/22/09	0840	7.1'	out		Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							202.7	-ASPHALT-
			18 16 15 12	S-1	0.5 2.5	10	0.3	Dense, tan, fine to medium SAND, little fine Gravel, trace (+) Silt. -FILL-
							200.0 3.0	
4			14 18 15 13	S-2	4.0 6.0	16		Dense, beige-tan, fine to coarse SAND, little (+) fine to coarse Gravel, trace Silt.
8			5 7 6 6	S-3	9.0 11.0	12		Medium dense, wet, beige, fine to medium SAND, some (-) Silt.
12								-SAND-
			2 3 3 2	S-4	14.0 16.0	14		Loose, beige, fine SAND, some Silt.
16								
20			4 4 3 4	S-5	19.0 21.0	17		Loose, beige, fine SAND and SILT.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-101

McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-101
PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA **CLIENT:** 129 Parker Street LLC		**MGA NO. :** W0172.01 **SHEET NO. :** 2 of 3

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
24			2 3 3 3	S-6	24.0 26.0	20		Loose, beige, fine SAND and SILT.
28								-SAND-
			4 3 4 3	S-7	29.0 31.0	18		Loose, beige, fine SAND, little (-) Silt.
32								
36			3 4 6 7	S-8	34.0 36.0	16		Loose to medium dense, gray, fine SAND, some Silt.
							166.0 37.0	
40			2 2 3 4	S-9	39.0 41.0	14		Loose, gray, Clayey SILT, some fine Sand.
44								-SILT-
			3 4 4 6	S-10	44.0 46.0	15		Loose, gray, CLAYEY SILT, little (-) fine Sand.
48								
52			4 6 4 3	S-11	49.0 51.0	16		Loose to medium dense, gray, SILT, some (+) fine Sand.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-101

McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-101
PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA **CLIENT:** 129 Parker Street LLC		**MGA NO. :** W0172.01 **SHEET NO. :** 3 of 3

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
			5 6 3 4	S-12	54.0 56.0	19		Loose, gray, SILT, little fine Sand.
56								-SILT-
60			6 7 4 3	S-13	59.0 61.0	18		Medium dense, gray, SILT, trace (+) fine Sand.
64			4 3 3 1	S-14	64.0 66.0	20		Loose, gray, SILT, trace fine Sand.
68							134.0	
			10 16 18 15	S-15	69.0 71.0	7	69.0	Dense, gray, fine to coarse GRAVEL and fine to coarse SAND, some Silt. -GLACIAL TILL-
72							130.0	[WATER LOSS FROM 72 TO 73 FEET]
							73.0	ROLLERBIT REFUSAL AT 73 FEET.
76								
80								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-101

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Engineers & Consultants

TEST BORING LOG

BORING B-102

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: 129 Parker Street LLC
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172.01
SHEET NO. : 1 of 2
LOCATION N : See Plan
E :
ELEVATION : 203'±
DATE START : 7/23/09
END : 7/23/09
DRILLER : Phil Thornsbury
ENGINEER : W. McArdle, P.E.

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
7/23/09	1500	6.3'	out		Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							202.7	-ASPHALT-
			6 11 18 20	S-1	0.5 2.5	16	0.3	Dense, brown, fine to medium SAND, little (+) fine to coarse Gravel, little (-) Silt. -FILL-
							200.0 3.0	
4			23 28 30	S-2	4.0 5.5	14		Very dense, tan, fine to coarse SAND, little (+) fine to coarse Gravel, trace (-) Silt.
8			4 6 8 8	S-3	9.0 11.0	4		Medium dense, wet, tan, fine to coarse SAND, some (-) fine to coarse Gravel, trace (-) Silt.
12								-SAND-
			4 5 5 6	S-4	14.0 16.0	6		Loose to medium dense, tan, fine to coarse SAND, little fine Gravel, trace (-) Silt.
16								
20			8 8 12 8	S-5	19.0 21.0	5		Medium dense, tan, fine to coarse SAND, little (-) fine Gravel, trace (-) Silt.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-102

McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST BORING LOG

BORING B-102

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: 129 Parker Street LLC

MGA NO. : W0172.01
SHEET NO. : 2 of 2

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
24			4 5 5 6	S-6	24.0 26.0	13		Loose to medium dense, gray, fine SAND, little (+) Silt.
28								-SAND-
			4 5 7 6	S-7	29.0 31.0	12		Medium dense, gray, fine SAND, little (+) Silt.
32								
36			3 5 6 7	S-8	34.0 36.0	10		Medium dense, gray, fine SAND, some Silt.
							167.0 36.0	
40			3 4 4 4	S-9	39.0 41.0	14		Loose, gray, SILT, some fine Sand. -SILT-
							162.0 41.0	BOTTOM OF BORING AT 41 FEET.
44								
48								
52								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-102

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McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST BORING LOG

BORING B-103

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: 129 Parker Street LLC
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172.01
SHEET NO. : 1 of 2
LOCATION N : See Plan
E :
ELEVATION : 202'±
DATE START : 7/23/09
END : 7/23/09
DRILLER : Phil Thornsbury
ENGINEER : W. McArdle, P.E.

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
7/23/09	1300	5.0'	out		Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							201.6	-ASPHALT-
			2	S-1	0.5	10	0.4	Brown-tan, fine to medium SAND, some (-) fine to coarse Gravel, little (-) Silt.
			9		1.5		200.5	-FILL-
			14	S-1A	1.5	6	1.5	Tan, fine to coarse SAND, little (-) fine Gravel, trace (-) Silt.
			18		2.5			
4			5	S-2	4.0	20		Medium dense, wet, fine to medium SAND, trace fine Gravel, trace Silt.
			8		6.0			
			5					
			4					
8			3	S-3	9.0	12		Loose, beige, fine to medium SAND, trace Silt.
			3		11.0			
			3					
			3					
12								-SAND-
			3	S-4	14.0	19		Loose, beige, fine to coarse SAND, trace Silt.
			3		16.0			
			3					
16			3					
			3	S-5	19.0	14		Loose to medium dense, beige, fine SAND, little Silt.
20			4		21.0			
			6					
			7					

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-103

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McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-103
PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA **CLIENT:** 129 Parker Street LLC		**MGA NO. :** W0172.01 **SHEET NO. :** 2 of 2

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
24			4 5 8 9	S-6	24.0 26.0	14		Medium dense, beige, fine SAND, little (-) Silt.
28								-SAND-
			3 5 6 6	S-7	29.0 31.0	16	171.0 31.0	Medium dense, gray, fine SAND, some (-) Silt. BOTTOM OF BORING AT 31 FEET.
32								
36								
40								
44								
48								
52								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-103

McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST BORING LOG

BORING B-104

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: 129 Parker Street LLC
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172.01
SHEET NO. : 1 of 2
LOCATION N : See Plan
E :
ELEVATION : 202'±
DATE START : 7/23/09
END : 7/23/09
DRILLER : Phil Thornsbury
ENGINEER : W. McArdle, P.E.

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
7/23/09	1230	5.3'	out		Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							201.7	-ASPHALT-
			6 7 10 12	S-1	0.5 2.5	15	0.3	Medium dense, brown, fine to medium SAND, little (+) fine to coarse Gravel, little (-) Silt.
							199.5	-FILL-
							2.5	
4			6 9 10 8	S-2	4.0 6.0	16		Medium dense, wet, tan, fine to coarse SAND, some fine to coarse Gravel, trace Silt.
8			2 3 2 2	S-3	9.0 11.0	9		Loose, beige, fine to medium SAND, trace (+) Silt.
12								-SAND-
			3 3 3 4	S-4	14.0 16.0	8		Loose, beige, fine to medium SAND, trace fine gravel, trace (-) Silt.
16								
20			3 6 9 9	S-5	19.0 21.0	9		Medium dense, beige, fine to medium SAND, little (+) fine Gravel, trace (+) Silt.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-104

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TEST BORING LOG | **BORING B-104**

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: 129 Parker Street LLC

MGA NO. : W0172.01
SHEET NO. : 2 of 2

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
24			3 5 6 6	S-6	24.0 26.0	10		Medium dense, gray, fine SAND, little Silt, trace (-) fine Gravel.
								-SAND-
28			4 5 5 5	S-7	29.0 31.0	13		Loose to medium dense, gray, fine SAND, some (+) Silt.
32							170.0 32.0	
			3 3 3 4	S-8	34.0 36.0	18		Loose, gray, fine SAND and SILT.
36								-SILT-
40			4 5 5 4	S-9	39.0 41.0	13		Loose to medium dense, gray, SILT, some fine Sand.
							161.0 41.0	BOTTOM OF BORING AT 41 FEET.
44								
48								
52								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-104

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TEST BORING LOG

BORING B-105

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: 129 Parker Street LLC
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172.01
SHEET NO. : 1 of 2
LOCATION N : See Plan
E :
ELEVATION : 202'±
DATE START : 7/24/09
END : 7/24/09
DRILLER : Phil Thornsbury
ENGINEER : W. McArdle, P.E.

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
					Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							201.6	
			12	S-1	0.5	12	0.4	-ASPHALT-
			10		2.5			Medium dense, brown-tan, fine to medium SAND, little fine Gravel, trace (+) Silt.
			6				199.5	-FILL-
			6				2.5	
4			3	S-2	4.0	14		Medium dense, wet, tan, fine to coarse SAND, little (-) fine Gravel, trace (-) Silt.
			5		6.0			
			8					
			8					
8								
			5	S-3	9.0	10		Medium dense, tan, fine to coarse SAND, little fine to coarse Gravel, trace (-) Silt.
			6		11.0			
			6					
			6					
12								-SAND-
			2	S-4	14.0	6		Loose, beige, fine to coarse SAND, little (-) fine Gravel, trace (-) Silt.
			2		16.0			
			3					
16			3					
			3	S-5	19.0	7		Loose, beige, fine to coarse SAND, trace fine Gravel, trace (-) Silt.
20			3		21.0			
			3					
			6					

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-105

McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST BORING LOG | **BORING B-105**

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: 129 Parker Street LLC

MGA NO. : W0172.01
SHEET NO. : 2 of 2

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
24			5 4 6 6	S-6	24.0 26.0	10		Loose to medium dense, gray, fine SAND, little (-) Silt.
28			3 3 4 6	S-7	29.0 31.0	12		Loose, gray, fine to medium SAND, little (-) Silt.
32								-SAND-
36			2 4 4 6	S-8	34.0 36.0	14		Loose, gray, fine SAND, little (+) Silt.
40			4 4 4 5	S-9	39.0 41.0	13		Loose, gray, fine SAND, little (+) Silt.
							160.0 42.0	
44			3 4 5 6	S-10	44.0 46.0	14		Loose, gray, SILT, some (+) fine Sand.
48								-SILT-
			4 7 6 8	S-11	49.0 51.0	21		Medium dense, gray, CLAYEY SILT, trace (+) fine Sand.
							151.0 51.0	
52								BOTTOM OF BORING AT 51 FEET.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-105

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TEST BORING LOG

BORING B-106

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: 129 Parker Street LLC
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172.01
SHEET NO. : 1 of 2
LOCATION N : See Plan
E :
ELEVATION : 204'±
DATE START : 7/24/09
END : 7/24/09
DRILLER : Phil Thornsbury
ENGINEER : W. McArdle, P.E.

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
7/24/09	1115	5.2'	out		Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							203.5	-ASPHALT-
			9 16 18 24	S-1	0.5 2.5	8	0.5	Dense, brown, fine to coarse SAND, some fine to coarse Gravel, trace (+) Silt. -FILL-
							201.0	
4			12 10 9 8	S-2	4.0 6.0	14	3.0	Medium dense, beige, fine to coarse SAND, trace fine Gravel, trace (-) Silt.
8			4 4 3 4	S-3	9.0 11.0	4		Loose, wet, beige, fine to medium SAND, little (-) fine Gravel, trace Silt.
12								-SAND-
			2 3 2 2	S-4	14.0 16.0	15		Loose, beige, fine to medium SAND, trace Silt.
16								
20			1 2 3 5	S-5	19.0 21.0	12		Loose, beige, fine to medium SAND, trace Silt.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-106

McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-106
PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA **CLIENT:** 129 Parker Street LLC		**MGA NO. : W0172.01** **SHEET NO. : 2 of 2**

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
24			10 12 12 11	S-6	24.0 26.0	9		Medium dense, tan-beige, fine to medium SAND, some (+) Silt.
28								-SAND-
			5 6 6 6	S-7	29.0 31.0	11		Medium dense, gray, fine SAND, some (-) Silt.
32								
36			2 4 4 4	S-8	34.0 36.0	13	168.0 36.0	Loose, gray, fine SAND, some Silt.
								Loose, gray, fine SAND and SILT.
40			2 3 3 4	S-9	39.0 41.0	14		
44								-SILT-
			5 5 6 7	S-10	44.0 46.0	18		Medium dense, gray, SILT, little (-) fine Sand.
48								
			6 8 11 11	S-11	49.0 51.0	22	153.0 51.0	Medium dense, gray, CLAYEY SILT, trace (+) fine Sand.
52								BOTTOM OF BORING AT 51 FEET.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-106

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McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST BORING LOG

BORING B-107

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: 129 Parker Street LLC
CONTRACTOR: Subsurface Drilling & Remediation

MGA NO. : W0172.01
SHEET NO. : 1 of 4
LOCATION N : See Plan
E :
ELEVATION : 204'±
DATE START : 7/27/09
END : 7/27/09
DRILLER : Phil Thornsbury
ENGINEER : W. McArdle, P.E.

GROUNDWATER		DEPTH (ft) OF:			EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Hole	Type	HW	Split Spoon	---
7/27/09	0730	4.1'	out		Size I.D.	4"	1-3/8"	---
					Hammer Wt.	300#	140#	----
					Hammer Fall	24"	30"	----

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
0							203.7	-ASPHALT-
			7 9 14 15	S-1	0.5 2.5	16	0.3	Medium dense, tan-beige, fine to medium SAND, little (-) fine Gravel, little (-) Silt.
4			6 7 8 10	S-2	4.0 6.0	15		Medium dense, wet, tan, fine to coarse SAND, trace (-) Silt.
8			2 2 2 3	S-3	9.0 11.0	16		Loose, tan, fine to coarse SAND, trace fine Gravel, trace (-) Silt.
12								-SAND-
16			1 2 3 3	S-4	14.0 16.0	15		Loose, beige, fine SAND, little (-) Silt.
20			5 6 4 4	S-5	19.0 21.0	18		Loose to medium dense, beige, fine SAND and SILT.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION
- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY
Station:
Rock:
Samples:

BORING B-107

1125 Main Street, Hanover, MA 02339 | Telephone 781.982.2881 | Fax 781.735.0418 | mcardlegannon.com

McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-107
PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA **CLIENT:** 129 Parker Street LLC		**MGA NO. : W0172.01** **SHEET NO. : 2 of 4**

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
24			2 4 6 6	S-6	24.0 26.0	13		Loose to medium dense, beige, fine SAND, some (+) Silt.
28			3 4 5 5	S-7	29.0 31.0	15		Loose, gray, fine SAND, some (+) Silt. -SAND-
36			2 3 2 2	S-8	34.0 36.0	14		Loose, gray, SILT and fine SAND.
40			2 5 6 7	S-9	39.0 41.0	12		Meidum dense, gray, fine SAND, some Silt.
44			1 2 3 3	S-10	44.0 46.0	9	160.0 44.0	Loose, gray, fine SAND and SILT. -SILT-
48			3 3 3 3	S-11	49.0 51.0	16		Loose, gray, SILT, some (-) fine Sand.
52								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-107

McArdle Gannon Associates, Inc. Engineers & Consultants	TEST BORING LOG	BORING B-107
PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA **CLIENT:** 129 Parker Street LLC		**MGA NO. : W0172.01** **SHEET NO. : 3 of 4**

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
			2 2 3 5	S-12	54.0 56.0	21		Loose, gray, CLAYEY SILT, trace (+) fine Sand.
56								
			4 6 6 7	S-13	59.0 61.0	22		Medium dense, gray, CLAYEY SILT, little (-) fine Sand.
60								
								-SILT-
64			3 4 6 4	S-14	64.0 66.0	20		Loose to medium dense, gray, fine SAND and SILT.
68								
			5 5 8 9	S-15	69.0 71.0	20		Medium dense, gray, CLAYEY SILT, trace (+) fine Sand.
72								
			7 14 12 11	S-16	74.0 76.0	17		Medium dense, gray, SILT, some fine Sand.
76								
			8 8 8 9	S-17	79.0 81.0	16	123.0	Medium dense, gray, SILT, some fine Sand.

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-107

McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST BORING LOG

BORING B-107

PROJECT: Maynard Lifestyle Center, 129 Parker Street, Maynard, MA
CLIENT: 129 Parker Street LLC

MGA NO. : W0172.01
SHEET NO. : 4 of 4

Depth in Feet	Strata Change	Case BPF (Drill) (min/ft)	Sampler Blows Per 6" (RQD%)	Sample Number/ Type	Sample Depth Range (ft)	Sample Recovery (in)	Elevation/ Depth (ft)	FIELD CLASSIFICATION AND REMARKS
							81.0	BOTTOM OF BORING AT 81 FEET.
84								
88								
92								
96								
100								
104								
108								

BLOWS/FT.	DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

BLOWS/FT.	CONSISTENCY
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30+	Hard

SAMPLE IDENTIFICATION

- S - Split Spoon
- T - Thin Wall Tube
- U - Undisturbed Piston
- C - Diamond Core
- W - Wash Sample

SUMMARY

Station:
Rock:
Samples:

BORING B-107

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APPENDIX B – PRE DEVELOPMENT DRAINAGE AREA MAP

N
W
E
S

254B
654
71B
254B
52A
253D
253D
602
255A
307D
307E
307B
256B
SOUTH STREET
B STREET
PARKER STREET (RT. 27)
DETTLING ROAD
VOSE HILL ROAD
BRIGHAM STREET
EXISTING ONE STORY BUILDING (TO REMAIN)

PATH OF TIME OF CONCENTRATION

E-1
AREA=25.43 AC
CN= 75
TC= 13.9 MIN.

E-2
AREA=21.92 AC
CN= 75
TC= 13.9 MIN.

E-3
AREA=13.821 AC
CN= 78
TC= 13.4 MIN.

E-4
AREA=3.01 AC
CN= 30
TC= 7.5 MIN.

DP-1 X

LIMIT OF WATERSHED E-3 BASED UPON EXISTING TOWN OF MAYNARD GIS INFORMATION AND FIELD VISIT PERFORMED BY BOHLER ENGINEERING ON JANUARY 4, 2017

SOIL TYPE BOUNDARY (TYP.)

MATCHLINE (SEE INSET)

100 50 25 0 100
1"= 100'

WATERSHED C-3 INSET

MATCHLINE

E-3
AREA=13.821 AC
CN= 78
TC= 13.4 MIN.

LIMIT OF WATERSHED E-3 BASED UPON EXISTING TOWN OF MAYNARD GIS INFORMATION AND FIELD VISIT PERFORMED BY BOHLER ENGINEERING ON JANUARY 4, 2017

SOIL LEGEND

253D	HINCKLEY LOAMY SAND
254B	MERRIMAC FINE SANDY LOAM
255A	WINDSOR LOAMY SAND
256B	DEERFIELD LOAMY SAND
307B	PAXTON FINE SANDY LOAM
307D	PAXTON FINE SANDY LOAM
602	URBAN LAND

NOTES:
(1) SOIL LEGEND AND SOIL OUTLINES PER ONLINE USDA SOIL MAPPING

(2) BASED UPON SITE SOIL TESTING, THIS SITE CONTAINS SOILS OF HYDROLOGIC TYPE 'A'

BOHLER ENGINEERING
SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING
SITE PLANNING
LAND DEVELOPMENT DESIGN
PROGRAM MANAGEMENT
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL SERVICES
TRANSPORTATION SERVICES
◆ RALEIGH, NC
◆ CHARLOTTE, NC
◆ GREENVILLE, SC
◆ TAMPA, FL
◆ ATLANTA, GA
◆ FORT MYERS, FLORIDA
◆ DALLAS, TX
◆ LEHIGH VALLEY, PA
◆ HARRISBURG-MECHANICSBURG-READING, PA
◆ UPSTATE NEW YORK
◆ SCRANTON-WILKES BARRE, PA
◆ BOSTON, MA
◆ NEW YORK METRO
◆ BALTIMORE, MD
◆ NEW ENGLAND
◆ NEW YORK, NY
◆ CENTRAL MARYLAND
◆ NEW JERSEY
◆ PHILADELPHIA, PA
◆ NORTHERN VIRGINIA
◆ CENTRAL VIRGINIA

REVISIONS

REV	DATE	COMMENT	BY
1	03/21/17	REMOVE CARRIAGE BLDG. (SHEETS 8-12 ONLY)	CFD
2	05/23/17	REV. PER TOWN COMMENTS	CFD
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

PRELIMINARY

PROJECT No.:	W161189
DRAWN BY:	BLC/CFD
CHECKED BY:	NEM/JAK
DATE:	02/15/2017
SCALE:	AS NOTED
CAD I.D.:	W161189SS0 GRADING

PROJECT:
SITE DEVELOPMENT PLANS
FOR
CAPITAL GROUP PROPERTIES
MAYNARD CROSSING

LOCATION OF SITE
MAP #25 & LOTS #152 & 152-1
129 PARKER STREET (ROUTE 27)
TOWN OF MAYNARD
MIDDLESEX COUNTY
MASSACHUSETTS

BOHLER ENGINEERING
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
Fax: (508) 480-9080
www.BohlerEngineering.com

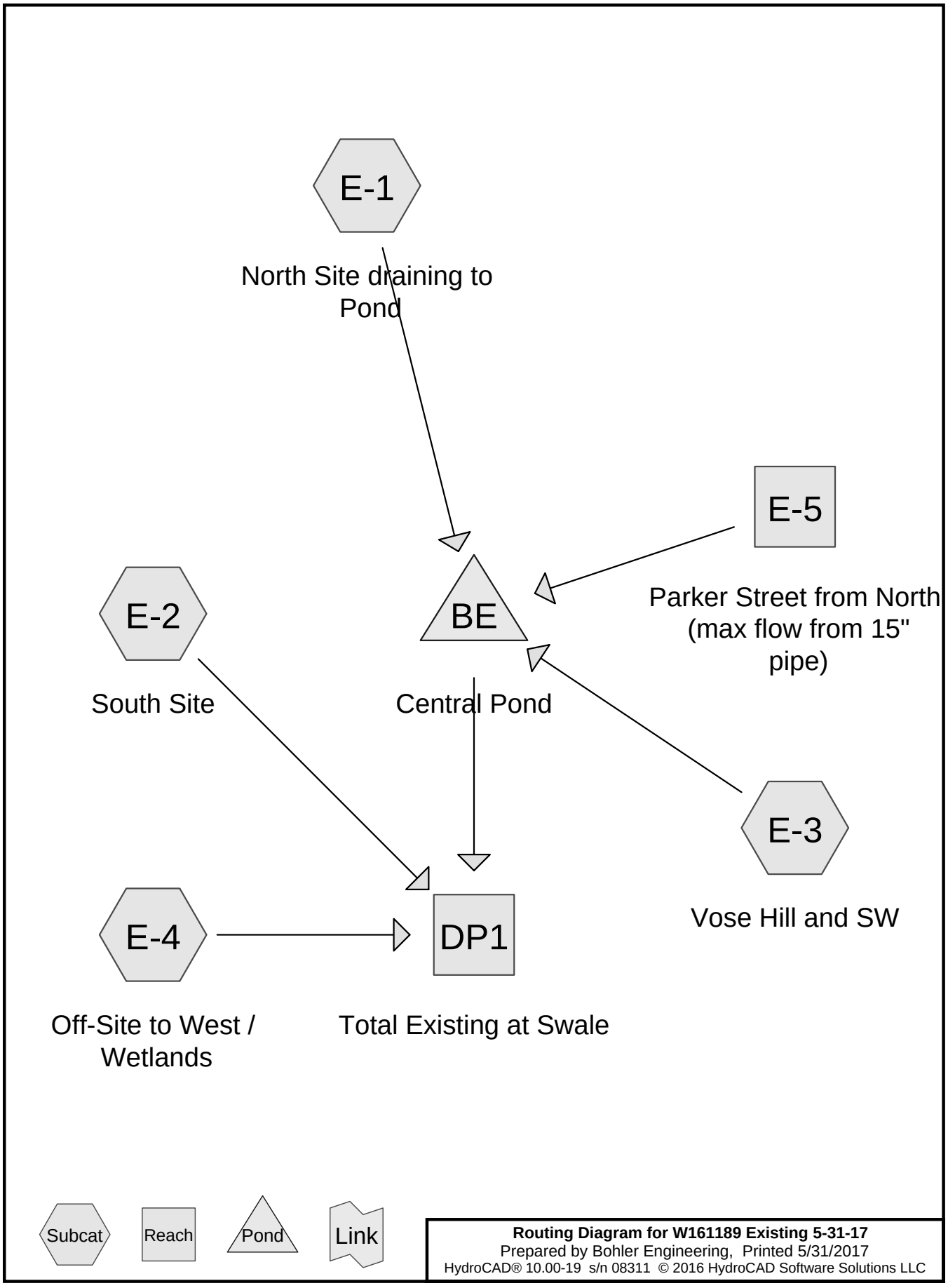
J.A. KUCICH
PROFESSIONAL ENGINEER
MASSACHUSETTS LICENSE No. 41539
CONNECTICUT LICENSE No. 26177
RHODE ISLAND LICENSE No. 9616
MAINE LICENSE No. 12553

SHEET TITLE:
EXISTING DRAINAGE AREA MAP

SHEET NUMBER:
E-1
OF 35

REV 2 - 05/23/2017

APPENDIX C – PRE DEVELOPMENT STORMWATER CALCULATIONS



Routing Diagram for W161189 Existing 5-31-17
Prepared by Bohler Engineering, Printed 5/31/2017

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

Subcatchment E-1: North Site draining to Runoff Area=25.429 ac 61.58% Impervious Runoff Depth=1.03"
Flow Length=285' Tc=13.9 min CN=75 Runoff=22.42 cfs 2.176 af

Subcatchment E-2: South Site Runoff Area=21.918 ac 62.77% Impervious Runoff Depth=1.03"
Flow Length=390' Tc=13.9 min CN=75 Runoff=19.33 cfs 1.875 af

Subcatchment E-3: Vose Hill and SW Runoff Area=13.821 ac 36.94% Impervious Runoff Depth=1.20"
Flow Length=910' Tc=13.4 min CN=78 Runoff=14.81 cfs 1.383 af

Subcatchment E-4: Off-Site to West / Runoff Area=3.011 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=205' Tc=7.5 min CN=30 Runoff=0.00 cfs 0.000 af

Reach DP1: Total Existing at Swale Inflow=46.01 cfs 20.137 af
Outflow=46.01 cfs 20.137 af

Reach E-5: Parker Street from North Avg. Flow Depth=1.02' Max Vel=4.96 fps Inflow=5.33 cfs 15.880 af
15.0" Round Pipe n=0.013 L=326.0' S=0.0068 '/' Capacity=5.34 cfs Outflow=5.33 cfs 15.849 af

Pond BE: Central Pond Peak Elev=194.93' Storage=73,562 cf Inflow=42.54 cfs 19.408 af
Outflow=30.84 cfs 18.262 af

Summary for Subcatchment E-1: North Site draining to Pond

Runoff = 22.42 cfs @ 12.21 hrs, Volume= 2.176 af, Depth= 1.03"

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

	Area (ac)	CN	Description
	0.890	61	1/4 acre lots, 38% imp, HSG A
	0.686	30	Woods, Good, HSG A
*	13.492	98	Impervious Areas
*	1.829	98	Water Surface
	8.532	39	>75% Grass cover, Good, HSG A
	25.429	75	Weighted Average
	9.770		38.42% Pervious Area
	15.659		61.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.6	125	0.0640	1.26		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	110	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0					**Direct Entry, Time in pipes**
13.9	285	Total			

Summary for Subcatchment E-2: South Site

Runoff = 19.33 cfs @ 12.21 hrs, Volume= 1.875 af, Depth= 1.03"

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

	Area (ac)	CN	Description
*	13.548	98	Impervious Area
	3.953	39	>75% Grass cover, Good, HSG A
	3.867	30	Woods, Good, HSG A
	0.550	83	1/4 acre lots, 38% imp, HSG C
	21.918	75	Weighted Average
	8.161		37.23% Pervious Area
	13.757		62.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, Woods at west edge of parking** Woods: Light underbrush n= 0.400 P2= 3.10"
0.6	50	0.0900	1.50		**Shallow Concentrated Flow, thru woods to parking** Woodland Kv= 5.0 fps
1.6	290	0.0210	2.94		**Shallow Concentrated Flow, Parking lot to CB** Paved Kv= 20.3 fps
1.0					**Direct Entry, Time in pipes**
13.9	390	Total			

Summary for Subcatchment E-3: Vose Hill and SW

Runoff = 14.81 cfs @ 12.20 hrs, Volume= 1.383 af, Depth= 1.20"

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

	Area (ac)	CN	Description
*	2.811	98	Impervious Area
	2.100	55	Woods, Good, HSG B
	1.035	61	>75% Grass cover, Good, HSG B
	1.837	70	Woods, Good, HSG C
	0.928	75	1/4 acre lots, 38% imp, HSG B
	5.110	83	1/4 acre lots, 38% imp, HSG C
	13.821	78	Weighted Average
	8.716		63.06% Pervious Area
	5.105		36.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.1	420	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.3	440	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.4	910	Total			

Summary for Subcatchment E-4: Off-Site to West / Wetlands

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

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

Area (ac)	CN	Description
3.011	30	Woods, Good, HSG A
3.011		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.4	155	0.1290	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	205	Total			

Summary for Reach DP1: Total Existing at Swale

Inflow Area = 64.179 ac, 53.79% Impervious, Inflow Depth > 3.77" for 2 yr event
Inflow = 46.01 cfs @ 12.30 hrs, Volume= 20.137 af
Outflow = 46.01 cfs @ 12.30 hrs, Volume= 20.137 af, Atten= 0%, Lag= 0.0 min

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

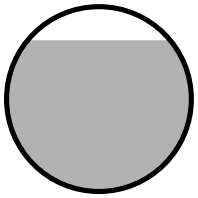
Summary for Reach E-5: Parker Street from North (max flow from 15" pipe)

Inflow	=	5.33 cfs @	0.00 hrs,	Volume=	15.880 af, Incl. 5.33 cfs Base Flow
Outflow	=	5.33 cfs @	0.70 hrs,	Volume=	15.849 af, Atten= 0%, Lag= 42.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.96 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 4.96 fps, Avg. Travel Time= 1.1 min

Peak Storage= 350 cf @ 0.65 hrs
Average Depth at Peak Storage= 1.02'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 5.34 cfs

15.0" Round Pipe
n= 0.013
Length= 326.0' Slope= 0.0068 '/' (50 Elevation Intervals)
Inlet Invert= 197.67', Outlet Invert= 195.44'



Summary for Pond BE: Central Pond

Inflow Area = 39.250 ac, 52.90% Impervious, Inflow Depth > 5.93" for 2 yr event
Inflow = 42.54 cfs @ 12.20 hrs, Volume= 19.408 af
Outflow = 30.84 cfs @ 12.40 hrs, Volume= 18.262 af, Atten= 27%, Lag= 11.5 min
Primary = 30.84 cfs @ 12.40 hrs, Volume= 18.262 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 192.20' Surf.Area= 0 sf Storage= 0 cf
Peak Elev= 194.93' @ 12.40 hrs Surf.Area= 81,185 sf Storage= 73,562 cf

Plug-Flow detention time= 129.0 min calculated for 18.237 af (94% of inflow)
Center-of-Mass det. time= 63.8 min (1,105.9 - 1,042.1)

Volume	Invert	Avail.Storage	Storage Description
#1	194.00'	249,863 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.00	77,820	0	0
195.00	81,457	79,639	79,639
196.00	85,136	83,297	162,935
197.00	88,719	86,928	249,863

Device	Routing	Invert	Outlet Devices
#1	Primary	188.40'	**48.0" Round Culvert** L= 114.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 188.40' / 187.00' S= 0.0123 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	194.50'	**144.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=30.81 cfs @ 12.40 hrs HW=194.93' (Free Discharge)
↑**1=Culvert** (Passes 30.81 cfs of 150.43 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 30.81 cfs @ 2.13 fps)

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

Subcatchment E-1: North Site draining to Runoff Area=25.429 ac 61.58% Impervious Runoff Depth=2.05"
Flow Length=285' Tc=13.9 min CN=75 Runoff=46.85 cfs 4.345 af

Subcatchment E-2: South Site Runoff Area=21.918 ac 62.77% Impervious Runoff Depth=2.05"
Flow Length=390' Tc=13.9 min CN=75 Runoff=40.38 cfs 3.745 af

Subcatchment E-3: Vose Hill and SW Runoff Area=13.821 ac 36.94% Impervious Runoff Depth=2.29"
Flow Length=910' Tc=13.4 min CN=78 Runoff=29.02 cfs 2.641 af

Subcatchment E-4: Off-Site to West / Runoff Area=3.011 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=205' Tc=7.5 min CN=30 Runoff=0.00 cfs 0.000 af

Reach DP1: Total Existing at Swale Inflow=94.91 cfs 25.434 af
Outflow=94.91 cfs 25.434 af

Reach E-5: Parker Street from North Avg. Flow Depth=1.02' Max Vel=4.96 fps Inflow=5.33 cfs 15.880 af
15.0" Round Pipe n=0.013 L=326.0' S=0.0068 '/' Capacity=5.34 cfs Outflow=5.33 cfs 15.849 af

Pond BE: Central Pond Peak Elev=195.17' Storage=93,664 cf Inflow=81.16 cfs 22.835 af
Outflow=61.18 cfs 21.689 af

Summary for Subcatchment E-1: North Site draining to Pond

Runoff = 46.85 cfs @ 12.20 hrs, Volume= 4.345 af, Depth= 2.05"

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

	Area (ac)	CN	Description
	0.890	61	1/4 acre lots, 38% imp, HSG A
	0.686	30	Woods, Good, HSG A
*	13.492	98	Impervious Areas
*	1.829	98	Water Surface
	8.532	39	>75% Grass cover, Good, HSG A
	25.429	75	Weighted Average
	9.770		38.42% Pervious Area
	15.659		61.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.6	125	0.0640	1.26		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	110	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0					**Direct Entry, Time in pipes**
13.9	285	Total			

Summary for Subcatchment E-2: South Site

Runoff = 40.38 cfs @ 12.20 hrs, Volume= 3.745 af, Depth= 2.05"

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

	Area (ac)	CN	Description
*	13.548	98	Impervious Area
	3.953	39	>75% Grass cover, Good, HSG A
	3.867	30	Woods, Good, HSG A
	0.550	83	1/4 acre lots, 38% imp, HSG C
	21.918	75	Weighted Average
	8.161		37.23% Pervious Area
	13.757		62.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, Woods at west edge of parking** Woods: Light underbrush n= 0.400 P2= 3.10"
0.6	50	0.0900	1.50		**Shallow Concentrated Flow, thru woods to parking** Woodland Kv= 5.0 fps
1.6	290	0.0210	2.94		**Shallow Concentrated Flow, Parking lot to CB** Paved Kv= 20.3 fps
1.0					**Direct Entry, Time in pipes**
13.9	390	Total			

Summary for Subcatchment E-3: Vose Hill and SW

Runoff = 29.02 cfs @ 12.19 hrs, Volume= 2.641 af, Depth= 2.29"

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

	Area (ac)	CN	Description
*	2.811	98	Impervious Area
	2.100	55	Woods, Good, HSG B
	1.035	61	>75% Grass cover, Good, HSG B
	1.837	70	Woods, Good, HSG C
	0.928	75	1/4 acre lots, 38% imp, HSG B
	5.110	83	1/4 acre lots, 38% imp, HSG C
	13.821	78	Weighted Average
	8.716		63.06% Pervious Area
	5.105		36.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.1	420	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.3	440	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.4	910	Total			

Summary for Subcatchment E-4: Off-Site to West / Wetlands

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

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

Area (ac)	CN	Description
3.011	30	Woods, Good, HSG A
3.011		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.4	155	0.1290	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	205	Total			

Summary for Reach DP1: Total Existing at Swale

Inflow Area = 64.179 ac, 53.79% Impervious, Inflow Depth > 4.76" for 10 yr event
Inflow = 94.91 cfs @ 12.27 hrs, Volume= 25.434 af
Outflow = 94.91 cfs @ 12.27 hrs, Volume= 25.434 af, Atten= 0%, Lag= 0.0 min

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

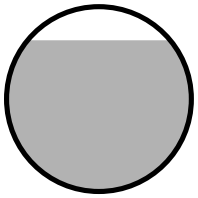
Summary for Reach E-5: Parker Street from North (max flow from 15" pipe)

Inflow	=	5.33 cfs @	0.00 hrs,	Volume=	15.880 af, Incl. 5.33 cfs Base Flow
Outflow	=	5.33 cfs @	0.70 hrs,	Volume=	15.849 af, Atten= 0%, Lag= 42.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.96 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 4.96 fps, Avg. Travel Time= 1.1 min

Peak Storage= 350 cf @ 0.65 hrs
Average Depth at Peak Storage= 1.02'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 5.34 cfs

15.0" Round Pipe
n= 0.013
Length= 326.0' Slope= 0.0068 '/' (50 Elevation Intervals)
Inlet Invert= 197.67', Outlet Invert= 195.44'



Summary for Pond BE: Central Pond

Inflow Area = 39.250 ac, 52.90% Impervious, Inflow Depth > 6.98" for 10 yr event
Inflow = 81.16 cfs @ 12.20 hrs, Volume= 22.835 af
Outflow = 61.18 cfs @ 12.34 hrs, Volume= 21.689 af, Atten= 25%, Lag= 8.9 min
Primary = 61.18 cfs @ 12.34 hrs, Volume= 21.689 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 192.20' Surf.Area= 0 sf Storage= 0 cf
Peak Elev= 195.17' @ 12.34 hrs Surf.Area= 82,088 sf Storage= 93,664 cf

Plug-Flow detention time= 111.0 min calculated for 21.659 af (95% of inflow)
Center-of-Mass det. time= 54.4 min (1,063.8 - 1,009.3)

Volume	Invert	Avail.Storage	Storage Description
#1	194.00'	249,863 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.00	77,820	0	0
195.00	81,457	79,639	79,639
196.00	85,136	83,297	162,935
197.00	88,719	86,928	249,863

Device	Routing	Invert	Outlet Devices
#1	Primary	188.40'	**48.0" Round Culvert** L= 114.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 188.40' / 187.00' S= 0.0123 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	194.50'	**144.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=61.08 cfs @ 12.34 hrs HW=195.17' (Free Discharge)
↑**1=Culvert** (Passes 61.08 cfs of 155.07 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 61.08 cfs @ 2.68 fps)

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

Subcatchment E-1: North Site draining to Runoff Area=25.429 ac 61.58% Impervious Runoff Depth=2.69"
Flow Length=285' Tc=13.9 min CN=75 Runoff=62.01 cfs 5.710 af

Subcatchment E-2: South Site Runoff Area=21.918 ac 62.77% Impervious Runoff Depth=2.69"
Flow Length=390' Tc=13.9 min CN=75 Runoff=53.45 cfs 4.922 af

Subcatchment E-3: Vose Hill and SW Runoff Area=13.821 ac 36.94% Impervious Runoff Depth=2.97"
Flow Length=910' Tc=13.4 min CN=78 Runoff=37.65 cfs 3.419 af

Subcatchment E-4: Off-Site to West / Runoff Area=3.011 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=205' Tc=7.5 min CN=30 Runoff=0.01 cfs 0.004 af

Reach DP1: Total Existing at Swale Inflow=126.23 cfs 28.758 af
Outflow=126.23 cfs 28.758 af

Reach E-5: Parker Street from North Avg. Flow Depth=1.02' Max Vel=4.96 fps Inflow=5.33 cfs 15.880 af
15.0" Round Pipe n=0.013 L=326.0' S=0.0068 '/' Capacity=5.34 cfs Outflow=5.33 cfs 15.849 af

Pond BE: Central Pond Peak Elev=195.31' Storage=104,870 cf Inflow=104.94 cfs 24.978 af
Outflow=80.70 cfs 23.832 af

Summary for Subcatchment E-1: North Site draining to Pond

Runoff = 62.01 cfs @ 12.20 hrs, Volume= 5.710 af, Depth= 2.69"

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

	Area (ac)	CN	Description
	0.890	61	1/4 acre lots, 38% imp, HSG A
	0.686	30	Woods, Good, HSG A
*	13.492	98	Impervious Areas
*	1.829	98	Water Surface
	8.532	39	>75% Grass cover, Good, HSG A
	25.429	75	Weighted Average
	9.770		38.42% Pervious Area
	15.659		61.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.6	125	0.0640	1.26		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	110	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0					**Direct Entry, Time in pipes**
13.9	285	Total			

Summary for Subcatchment E-2: South Site

Runoff = 53.45 cfs @ 12.20 hrs, Volume= 4.922 af, Depth= 2.69"

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

	Area (ac)	CN	Description
*	13.548	98	Impervious Area
	3.953	39	>75% Grass cover, Good, HSG A
	3.867	30	Woods, Good, HSG A
	0.550	83	1/4 acre lots, 38% imp, HSG C
	21.918	75	Weighted Average
	8.161		37.23% Pervious Area
	13.757		62.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, Woods at west edge of parking** Woods: Light underbrush n= 0.400 P2= 3.10"
0.6	50	0.0900	1.50		**Shallow Concentrated Flow, thru woods to parking** Woodland Kv= 5.0 fps
1.6	290	0.0210	2.94		**Shallow Concentrated Flow, Parking lot to CB** Paved Kv= 20.3 fps
1.0					**Direct Entry, Time in pipes**
13.9	390	Total			

Summary for Subcatchment E-3: Vose Hill and SW

Runoff = 37.65 cfs @ 12.19 hrs, Volume= 3.419 af, Depth= 2.97"

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

	Area (ac)	CN	Description
*	2.811	98	Impervious Area
	2.100	55	Woods, Good, HSG B
	1.035	61	>75% Grass cover, Good, HSG B
	1.837	70	Woods, Good, HSG C
	0.928	75	1/4 acre lots, 38% imp, HSG B
	5.110	83	1/4 acre lots, 38% imp, HSG C
	13.821	78	Weighted Average
	8.716		63.06% Pervious Area
	5.105		36.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.1	420	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.3	440	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.4	910	Total			

Summary for Subcatchment E-4: Off-Site to West / Wetlands

Runoff = 0.01 cfs @ 22.09 hrs, Volume= 0.004 af, Depth= 0.02"

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

Area (ac)	CN	Description
3.011	30	Woods, Good, HSG A
3.011		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.4	155	0.1290	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	205	Total			

Summary for Reach DP1: Total Existing at Swale

Inflow Area = 64.179 ac, 53.79% Impervious, Inflow Depth > 5.38" for 25 yr event
Inflow = 126.23 cfs @ 12.26 hrs, Volume= 28.758 af
Outflow = 126.23 cfs @ 12.26 hrs, Volume= 28.758 af, Atten= 0%, Lag= 0.0 min

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

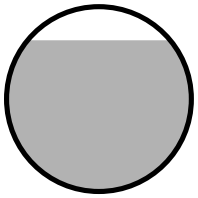
Summary for Reach E-5: Parker Street from North (max flow from 15" pipe)

Inflow	=	5.33 cfs @	0.00 hrs,	Volume=	15.880 af, Incl. 5.33 cfs Base Flow
Outflow	=	5.33 cfs @	0.70 hrs,	Volume=	15.849 af, Atten= 0%, Lag= 42.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.96 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 4.96 fps, Avg. Travel Time= 1.1 min

Peak Storage= 350 cf @ 0.65 hrs
Average Depth at Peak Storage= 1.02'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 5.34 cfs

15.0" Round Pipe
n= 0.013
Length= 326.0' Slope= 0.0068 '/' (50 Elevation Intervals)
Inlet Invert= 197.67', Outlet Invert= 195.44'



Summary for Pond BE: Central Pond

Inflow Area = 39.250 ac, 52.90% Impervious, Inflow Depth > 7.64" for 25 yr event
Inflow = 104.94 cfs @ 12.19 hrs, Volume= 24.978 af
Outflow = 80.70 cfs @ 12.33 hrs, Volume= 23.832 af, Atten= 23%, Lag= 7.9 min
Primary = 80.70 cfs @ 12.33 hrs, Volume= 23.832 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 192.20' Surf.Area= 0 sf Storage= 0 cf
Peak Elev= 195.31' @ 12.33 hrs Surf.Area= 82,589 sf Storage= 104,870 cf

Plug-Flow detention time= 102.4 min calculated for 23.832 af (95% of inflow)
Center-of-Mass det. time= 50.0 min (1,042.3 - 992.3)

Volume	Invert	Avail.Storage	Storage Description
#1	194.00'	249,863 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.00	77,820	0	0
195.00	81,457	79,639	79,639
196.00	85,136	83,297	162,935
197.00	88,719	86,928	249,863

Device	Routing	Invert	Outlet Devices
#1	Primary	188.40'	**48.0" Round Culvert** L= 114.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 188.40' / 187.00' S= 0.0123 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	194.50'	**144.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=80.37 cfs @ 12.33 hrs HW=195.31' (Free Discharge)
↑**1=Culvert** (Passes 80.37 cfs of 157.55 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 80.37 cfs @ 2.93 fps)

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

Subcatchment E-1: North Site draining to Runoff Area=25.429 ac 61.58% Impervious Runoff Depth=3.71"
Flow Length=285' Tc=13.9 min CN=75 Runoff=85.63 cfs 7.866 af

Subcatchment E-2: South Site Runoff Area=21.918 ac 62.77% Impervious Runoff Depth=3.71"
Flow Length=390' Tc=13.9 min CN=75 Runoff=73.81 cfs 6.780 af

Subcatchment E-3: Vose Hill and SW Runoff Area=13.821 ac 36.94% Impervious Runoff Depth=4.02"
Flow Length=910' Tc=13.4 min CN=78 Runoff=50.93 cfs 4.635 af

Subcatchment E-4: Off-Site to West / Runoff Area=3.011 ac 0.00% Impervious Runoff Depth=0.13"
Flow Length=205' Tc=7.5 min CN=30 Runoff=0.05 cfs 0.034 af

Reach DP1: Total Existing at Swale Inflow=175.85 cfs 34.018 af
Outflow=175.85 cfs 34.018 af

Reach E-5: Parker Street from North Avg. Flow Depth=1.02' Max Vel=4.96 fps Inflow=5.33 cfs 15.880 af
15.0" Round Pipe n=0.013 L=326.0' S=0.0068 '/' Capacity=5.34 cfs Outflow=5.33 cfs 15.849 af

Pond BE: Central Pond Peak Elev=195.51' Storage=121,250 cf Inflow=141.83 cfs 28.350 af
Outflow=112.03 cfs 27.204 af

Summary for Subcatchment E-1: North Site draining to Pond

Runoff = 85.63 cfs @ 12.20 hrs, Volume= 7.866 af, Depth= 3.71"

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

	Area (ac)	CN	Description
	0.890	61	1/4 acre lots, 38% imp, HSG A
	0.686	30	Woods, Good, HSG A
*	13.492	98	Impervious Areas
*	1.829	98	Water Surface
	8.532	39	>75% Grass cover, Good, HSG A
	25.429	75	Weighted Average
	9.770		38.42% Pervious Area
	15.659		61.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.6	125	0.0640	1.26		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	110	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0					**Direct Entry, Time in pipes**
13.9	285	Total			

Summary for Subcatchment E-2: South Site

Runoff = 73.81 cfs @ 12.20 hrs, Volume= 6.780 af, Depth= 3.71"

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

	Area (ac)	CN	Description
*	13.548	98	Impervious Area
	3.953	39	>75% Grass cover, Good, HSG A
	3.867	30	Woods, Good, HSG A
	0.550	83	1/4 acre lots, 38% imp, HSG C
	21.918	75	Weighted Average
	8.161		37.23% Pervious Area
	13.757		62.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, Woods at west edge of parking** Woods: Light underbrush n= 0.400 P2= 3.10"
0.6	50	0.0900	1.50		**Shallow Concentrated Flow, thru woods to parking** Woodland Kv= 5.0 fps
1.6	290	0.0210	2.94		**Shallow Concentrated Flow, Parking lot to CB** Paved Kv= 20.3 fps
1.0					**Direct Entry, Time in pipes**
13.9	390	Total			

Summary for Subcatchment E-3: Vose Hill and SW

Runoff = 50.93 cfs @ 12.19 hrs, Volume= 4.635 af, Depth= 4.02"

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

	Area (ac)	CN	Description
*	2.811	98	Impervious Area
	2.100	55	Woods, Good, HSG B
	1.035	61	>75% Grass cover, Good, HSG B
	1.837	70	Woods, Good, HSG C
	0.928	75	1/4 acre lots, 38% imp, HSG B
	5.110	83	1/4 acre lots, 38% imp, HSG C
	13.821	78	Weighted Average
	8.716		63.06% Pervious Area
	5.105		36.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.1	420	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.3	440	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.4	910	Total			

Summary for Subcatchment E-4: Off-Site to West / Wetlands

Runoff = 0.05 cfs @ 14.93 hrs, Volume= 0.034 af, Depth= 0.13"

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

Area (ac)	CN	Description
3.011	30	Woods, Good, HSG A
3.011		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.4	155	0.1290	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	205	Total			

Summary for Reach DP1: Total Existing at Swale

Inflow Area = 64.179 ac, 53.79% Impervious, Inflow Depth > 6.36" for 100 yr event
Inflow = 175.85 cfs @ 12.26 hrs, Volume= 34.018 af
Outflow = 175.85 cfs @ 12.26 hrs, Volume= 34.018 af, Atten= 0%, Lag= 0.0 min

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

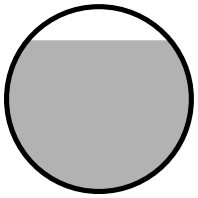
Summary for Reach E-5: Parker Street from North (max flow from 15" pipe)

Inflow	=	5.33 cfs @	0.00 hrs,	Volume=	15.880 af, Incl. 5.33 cfs Base Flow
Outflow	=	5.33 cfs @	0.70 hrs,	Volume=	15.849 af, Atten= 0%, Lag= 42.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.96 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 4.96 fps, Avg. Travel Time= 1.1 min

Peak Storage= 350 cf @ 0.65 hrs
Average Depth at Peak Storage= 1.02'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 5.34 cfs

15.0" Round Pipe
n= 0.013
Length= 326.0' Slope= 0.0068 '/' (50 Elevation Intervals)
Inlet Invert= 197.67', Outlet Invert= 195.44'



Summary for Pond BE: Central Pond

Inflow Area = 39.250 ac, 52.90% Impervious, Inflow Depth > 8.67" for 100 yr event
Inflow = 141.83 cfs @ 12.19 hrs, Volume= 28.350 af
Outflow = 112.03 cfs @ 12.31 hrs, Volume= 27.204 af, Atten= 21%, Lag= 7.2 min
Primary = 112.03 cfs @ 12.31 hrs, Volume= 27.204 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 192.20' Surf.Area= 0 sf Storage= 0 cf
Peak Elev= 195.51' @ 12.31 hrs Surf.Area= 83,315 sf Storage= 121,250 cf

Plug-Flow detention time= 91.4 min calculated for 27.204 af (96% of inflow)
Center-of-Mass det. time= 44.6 min (1,014.4 - 969.8)

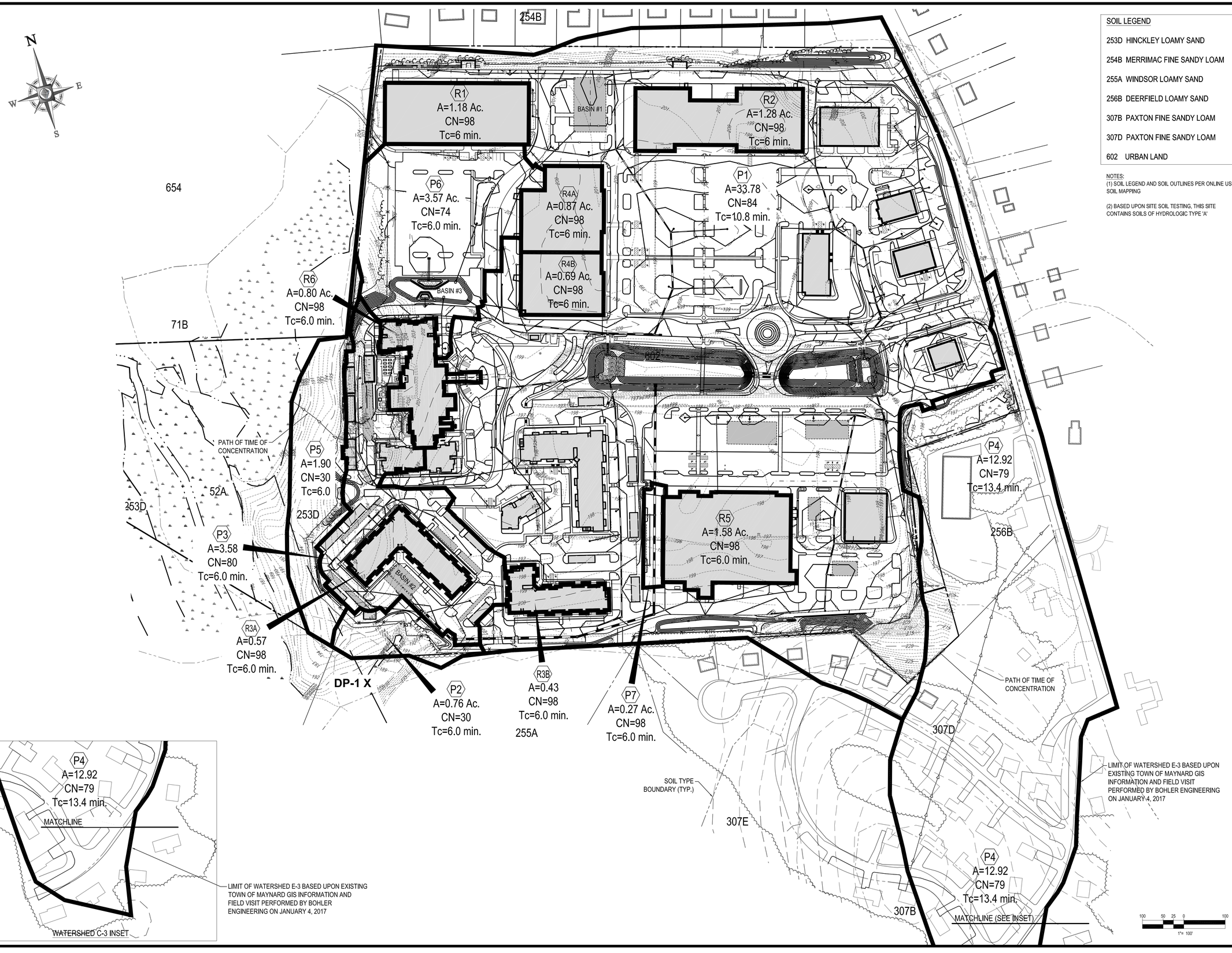
Volume	Invert	Avail.Storage	Storage Description
#1	194.00'	249,863 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.00	77,820	0	0
195.00	81,457	79,639	79,639
196.00	85,136	83,297	162,935
197.00	88,719	86,928	249,863

Device	Routing	Invert	Outlet Devices
#1	Primary	188.40'	**48.0" Round Culvert** L= 114.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 188.40' / 187.00' S= 0.0123 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	194.50'	**144.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=111.47 cfs @ 12.31 hrs HW=195.50' (Free Discharge)
↑**1=Culvert** (Passes 111.47 cfs of 161.10 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 111.47 cfs @ 3.27 fps)

APPENDIX D – POST DEVELOPMENT DRAINAGE AREA MAP



SOIL LEGEND	
253D	HINCKLEY LOAMY SAND
254B	MERRIMAC FINE SANDY LOAM
255A	WINDSOR LOAMY SAND
256B	DEERFIELD LOAMY SAND
307B	PAXTON FINE SANDY LOAM
307D	PAXTON FINE SANDY LOAM
602	URBAN LAND

NOTES:
(1) SOIL LEGEND AND SOIL OUTLINES PER ONLINE USDA SOIL MAPPING

(2) BASED UPON SITE SOIL TESTING, THIS SITE CONTAINS SOILS OF HYDROLOGIC TYPE 'A'

BOHLER ENGINEERING
SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING
SUSTAINABILITY
LANDSCAPE ARCHITECTURE
PERMITTING & DESIGN
PROGRAM MANAGEMENT
TRANSPORTATION SERVICES
UPSTATE NEW YORK
NEW ENGLAND
NEW YORK METRO
NEW JERSEY
LEHIGH VALLEY, PA
SCRANTON/NEPA, PA
BALTIMORE, MD
WASHINGTON, DC
PHILADELPHIA, PA
RALEIGH, NC
CHARLOTTE, NC
ATLANTA, GA
TAMPA, FL
ORLANDO, FLORIDA
AUSTIN, TX
DALLAS, TX
CENTRAL VIRGINIA
NORTHERN VIRGINIA

REVISIONS

REV	DATE	COMMENT	BY
1	03/21/17	REMOVE CARRIAGE BLDG. (SHEETS 8-12 ONLY)	CFD
2	06/02/17	REV. PER TOWN COMMENTS	CFD
3	06/15/17	DRAINAGE REVISIONS (SHEETS 13-16 ONLY)	GJZ
4	07/07/17	DRAINAGE REVISIONS (FULL SET)	AWP
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

PRELIMINARY

PROJECT No.:	W161189
DRAWN BY:	BLC/CFD
CHECKED BY:	NEM/JAK
DATE:	02/15/2017
SCALE:	AS NOTED
CAD I.D.:	W161189GRAD_STORM

PROJECT:
SITE DEVELOPMENT PLANS
FOR
CAPITAL GROUP PROPERTIES
MAYNARD CROSSING
LOCATION OF SITE
MAP #25 & LOTS #152 & 152-1
129 PARKER STREET (ROUTE 27)
TOWN OF MAYNARD
MIDDLESEX COUNTY
MASSACHUSETTS

BOHLER ENGINEERING
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
Fax: (508) 480-9080
www.BohlerEngineering.com

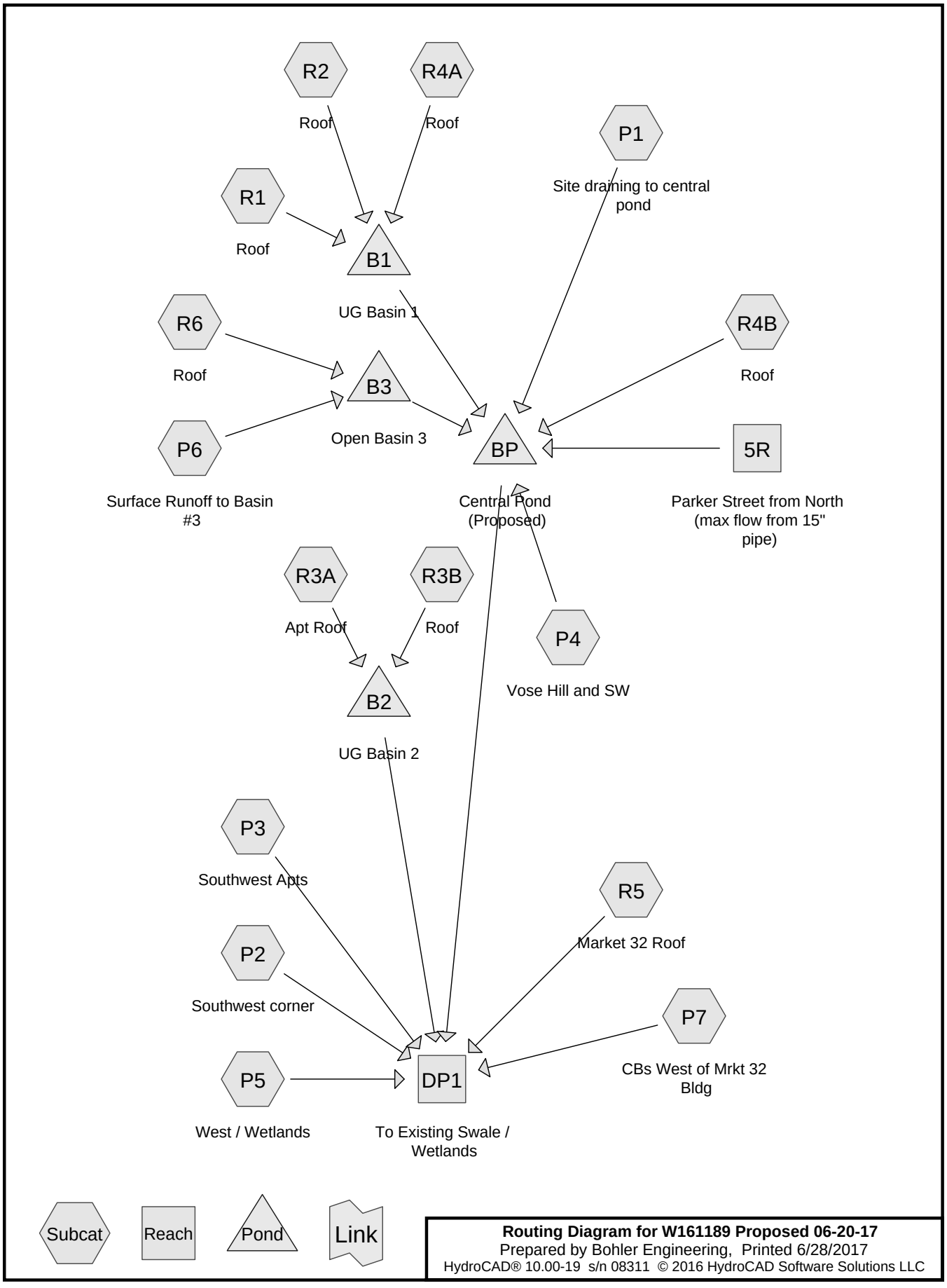
J.A. KUCICH
PROFESSIONAL ENGINEER
MASSACHUSETTS LICENSE No. 41530
CONNECTICUT LICENSE No. 26177
RHODE ISLAND LICENSE No. 9616
MAINE LICENSE No. 12553

SHEET TITLE:
PROPOSED DRAINAGE AREAS

SHEET NUMBER:
P-1
OF 39

REV 0 - 02/08/2017

APPENDIX E – POST DEVELOPMENT STORMWATER CALCULATIONS



Routing Diagram for W161189 Proposed 06-20-17
Prepared by Bohler Engineering, Printed 6/28/2017

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 P1: Site draining to central Runoff Area=33.782 ac 75.36% Impervious Runoff Depth=1.60"
Flow Length=100' Tc=10.8 min CN=84 Runoff=53.46 cfs 4.501 af

Subcatchment P2: Southwest corner Runoff Area=0.756 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment P3: Southwest Apts Runoff Area=3.583 ac 69.47% Impervious Runoff Depth=1.33"
Tc=6.0 min CN=80 Runoff=5.40 cfs 0.396 af

Subcatchment P4: Vose Hill and SW Runoff Area=12.923 ac 39.51% Impervious Runoff Depth=1.26"
Flow Length=910' Tc=13.4 min CN=79 Runoff=14.66 cfs 1.359 af

Subcatchment P5: West / Wetlands Runoff Area=1.899 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=155' Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment P6: Surface Runoff to Basin Runoff Area=3.567 ac 59.21% Impervious Runoff Depth=0.97"
Tc=6.0 min CN=74 Runoff=3.77 cfs 0.289 af

Subcatchment P7: CBs West of Mrkt 32 Runoff Area=0.270 ac 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.79 cfs 0.065 af

Subcatchment R1: Roof Runoff Area=1.183 ac 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=3.47 cfs 0.283 af

Subcatchment R2: Roof Runoff Area=1.284 ac 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=3.77 cfs 0.307 af

Subcatchment R3A: Apt Roof Runoff Area=0.565 ac 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=1.66 cfs 0.135 af

Subcatchment R3B: Roof Runoff Area=0.431 ac 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=1.27 cfs 0.103 af

Subcatchment R4A: Roof Runoff Area=0.869 ac 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=2.55 cfs 0.208 af

Subcatchment R4B: Roof Runoff Area=0.690 ac 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=2.03 cfs 0.165 af

Subcatchment R5: Market 32 Roof Runoff Area=1.578 ac 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=4.63 cfs 0.377 af

Subcatchment R6: Roof Runoff Area=0.799 ac 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=2.35 cfs 0.191 af

Reach 5R: Parker Street from North Avg. Flow Depth=1.20' Max Vel=4.96 fps Inflow=5.33 cfs 15.880 af
15.0" Round Pipe n=0.013 L=326.0' S=0.0068 '/' Capacity=5.34 cfs Outflow=5.72 cfs 15.872 af

Reach DP1: To Existing Swale / Wetlands Inflow=40.39 cfs 22.418 af
Outflow=40.39 cfs 22.418 af

Pond B1: UG Basin 1 Peak Elev=200.07' Storage=0.339 af Inflow=9.80 cfs 0.797 af
Discarded=0.57 cfs 0.798 af Primary=0.00 cfs 0.000 af Outflow=0.57 cfs 0.798 af

Pond B2: UG Basin 2 Peak Elev=196.54' Storage=0.103 af Inflow=2.92 cfs 0.238 af
Discarded=0.15 cfs 0.231 af Primary=0.12 cfs 0.007 af Outflow=0.26 cfs 0.238 af

Pond B3: Open Basin 3 Peak Elev=198.52' Storage=9,035 cf Inflow=6.10 cfs 0.480 af
Discarded=0.42 cfs 0.480 af Primary=0.00 cfs 0.000 af Outflow=0.42 cfs 0.480 af

Pond BP: Central Pond (Proposed) Peak Elev=195.45' Storage=172,211 cf Inflow=74.43 cfs 21.897 af
Outflow=37.20 cfs 21.574 af

Summary for Subcatchment P1: Site draining to central pond

Runoff = 53.46 cfs @ 12.16 hrs, Volume= 4.501 af, Depth= 1.60"

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

	Area (ac)	CN	Description
*	23.906	98	Impervious Areas
	6.271	39	>75% Grass cover, Good, HSG A
	0.113	61	>75% Grass cover, Good, HSG B
	1.047	30	Woods, Good, HSG A
	0.890	61	1/4 acre lots, 38% imp, HSG A
	0.550	83	1/4 acre lots, 38% imp, HSG C
*	1.005	98	Water Surfaces
	33.782	84	Weighted Average
	8.324		24.64% Pervious Area
	25.458		75.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.1	50	0.3300	8.62		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.8	100	Total			

Summary for Subcatchment P2: Southwest corner

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

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

Area (ac)	CN	Description
0.756	30	Woods, Good, HSG A
0.756		100.00% Pervious Area

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

Summary for Subcatchment P3: Southwest Apts

Runoff = 5.40 cfs @ 12.10 hrs, Volume= 0.396 af, Depth= 1.33"

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

	Area (ac)	CN	Description
*	2.489	98	Impervious Areas
	1.094	39	>75% Grass cover, Good, HSG A
	3.583	80	Weighted Average
	1.094		30.53% Pervious Area
	2.489		69.47% Impervious Area

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

Summary for Subcatchment P4: Vose Hill and SW

Runoff = 14.66 cfs @ 12.20 hrs, Volume= 1.359 af, Depth= 1.26"

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

	Area (ac)	CN	Description
*	2.811	98	Impervious Area - Vose Hill
	2.097	55	Woods, Good, HSG B
	0.140	61	>75% Grass cover, Good, HSG B
	1.837	70	Woods, Good, HSG C
	0.928	75	1/4 acre lots, 38% imp, HSG B
	5.110	83	1/4 acre lots, 38% imp, HSG C
	12.923	79	Weighted Average
	7.818		60.49% Pervious Area
	5.105		39.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.1	420	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.3	440	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.4	910	Total			

Summary for Subcatchment P5: West / Wetlands

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

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

Area (ac)	CN	Description
1.200	30	Brush, Good, HSG A
0.042	39	>75% Grass cover, Good, HSG A
0.657	30	Woods, Good, HSG A
1.899	30	Weighted Average
1.899		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
1.2	105	0.0857	1.46		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.8					**Direct Entry, To make min. allowed**
6.0	155	Total			

Summary for Subcatchment P6: Surface Runoff to Basin #3

Runoff = 3.77 cfs @ 12.10 hrs, Volume= 0.289 af, Depth= 0.97"

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

Area (ac)	CN	Description
1.455	39	>75% Grass cover, Good, HSG A
1.936	98	Paved parking, HSG C
0.176	98	Water Surface, HSG C
3.567	74	Weighted Average
1.455		40.79% Pervious Area
2.112		59.21% Impervious Area

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

Summary for Subcatchment P7: CBs West of Mrkt 32 Bldg

Runoff = 0.79 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 2.87"

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

	Area (ac)	CN	Description
*	0.270	98	Impervious Areas
	0.270		100.00% Impervious Area

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

Summary for Subcatchment R1: Roof

Runoff = 3.47 cfs @ 12.09 hrs, Volume= 0.283 af, Depth= 2.87"

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

	Area (ac)	CN	Description
*	1.183	98	Roofs
	1.183		100.00% Impervious Area

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

Summary for Subcatchment R2: Roof

Runoff = 3.77 cfs @ 12.09 hrs, Volume= 0.307 af, Depth= 2.87"

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

	Area (ac)	CN	Description
*	1.284	98	Roofs
	1.284		100.00% Impervious Area

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

Summary for Subcatchment R3A: Apt Roof

Runoff = 1.66 cfs @ 12.09 hrs, Volume= 0.135 af, Depth= 2.87"

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

	Area (ac)	CN	Description
*	0.565	98	Impervious Areas
	0.565		100.00% Impervious Area

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

Summary for Subcatchment R3B: Roof

Runoff = 1.27 cfs @ 12.09 hrs, Volume= 0.103 af, Depth= 2.87"

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

	Area (ac)	CN	Description
*	0.431	98	Impervious Areas
	0.431		100.00% Impervious Area

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

Summary for Subcatchment R4A: Roof

Runoff = 2.55 cfs @ 12.09 hrs, Volume= 0.208 af, Depth= 2.87"

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

	Area (ac)	CN	Description
*	0.869	98	Roofs
	0.869		100.00% Impervious Area

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

Summary for Subcatchment R4B: Roof

Runoff = 2.03 cfs @ 12.09 hrs, Volume= 0.165 af, Depth= 2.87"

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

	Area (ac)	CN	Description
*	0.690	98	Roofs
	0.690		100.00% Impervious Area

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

Summary for Subcatchment R5: Market 32 Roof

Runoff = 4.63 cfs @ 12.09 hrs, Volume= 0.377 af, Depth= 2.87"

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

	Area (ac)	CN	Description
*	1.578	98	Roofs
	1.578		100.00% Impervious Area

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

Summary for Subcatchment R6: Roof

Runoff = 2.35 cfs @ 12.09 hrs, Volume= 0.191 af, Depth= 2.87"

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

	Area (ac)	CN	Description
*	0.799	98	Roofs
	0.799		100.00% Impervious Area

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

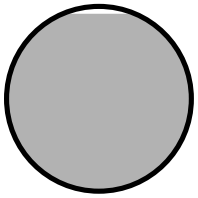
Summary for Reach 5R: Parker Street from North (max flow from 15" pipe)

Inflow = 5.33 cfs @ 0.00 hrs, Volume= 15.880 af, Incl. 5.33 cfs Base Flow
Outflow = 5.72 cfs @ 0.05 hrs, Volume= 15.872 af, Atten= 0%, Lag= 3.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.96 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 4.96 fps, Avg. Travel Time= 1.1 min

Peak Storage= 395 cf @ 0.05 hrs
Average Depth at Peak Storage= 1.20'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 5.34 cfs

15.0" Round Pipe
n= 0.013
Length= 326.0' Slope= 0.0068 '/' (50 Elevation Intervals)
Inlet Invert= 197.67', Outlet Invert= 195.44'



Summary for Reach DP1: To Existing Swale / Wetlands

Inflow Area = 64.179 ac, 66.74% Impervious, Inflow Depth > 4.19" for 2 yr event
Inflow = 40.39 cfs @ 12.43 hrs, Volume= 22.418 af
Outflow = 40.39 cfs @ 12.43 hrs, Volume= 22.418 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Summary for Pond B1: UG Basin 1

Inflow Area = 3.336 ac,100.00% Impervious, Inflow Depth = 2.87" for 2 yr event
Inflow = 9.80 cfs @ 12.09 hrs, Volume= 0.797 af
Outflow = 0.57 cfs @ 11.05 hrs, Volume= 0.798 af, Atten= 94%, Lag= 0.0 min
Discarded = 0.57 cfs @ 11.05 hrs, Volume= 0.798 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 200.07' @ 13.84 hrs Surf.Area= 0.234 ac Storage= 0.339 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 207.5 min (964.6 - 757.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	198.00'	0.207 af	**77.50'W x 131.78'L x 3.50'H Field A** 0.821 af Overall - 0.304 af Embedded = 0.517 af x 40.0% Voids
#2A	198.50'	0.304 af	**ADS_StormTech SC-740 +Cap** x 288 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 16 Rows of 18 Chambers
		0.510 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	196.60'	**24.0" Round Culvert** L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 196.60' / 196.35' S= 0.0104 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	200.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	198.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.57 cfs @ 11.05 hrs HW=198.04' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.57 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=198.00' TW=193.26' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.00 cfs of 7.86 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B2: UG Basin 2

Inflow Area = 0.996 ac,100.00% Impervious, Inflow Depth = 2.87" for 2 yr event
Inflow = 2.92 cfs @ 12.09 hrs, Volume= 0.238 af
Outflow = 0.26 cfs @ 12.97 hrs, Volume= 0.238 af, Atten= 91%, Lag= 53.3 min
Discarded = 0.15 cfs @ 10.70 hrs, Volume= 0.231 af
Primary = 0.12 cfs @ 12.97 hrs, Volume= 0.007 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 196.54' @ 12.97 hrs Surf.Area= 0.060 ac Storage= 0.103 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 245.6 min (1,002.7 - 757.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.00'	0.054 af	**34.75'W x 74.82'L x 3.50'H Field A** 0.209 af Overall - 0.074 af Embedded = 0.135 af x 40.0% Voids
#2A	194.50'	0.074 af	**ADS_StormTech SC-740 +Cap** x 70 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 7 Rows of 10 Chambers
		0.128 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	193.00'	**15.0" Round Culvert** L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 193.00' / 191.90' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	196.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	194.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.15 cfs @ 10.70 hrs HW=194.04' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.11 cfs @ 12.97 hrs HW=196.54' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.11 cfs of 10.09 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.11 cfs @ 0.67 fps)

Summary for Pond B3: Open Basin 3

Inflow Area = 4.366 ac, 66.67% Impervious, Inflow Depth = 1.32" for 2 yr event
Inflow = 6.10 cfs @ 12.10 hrs, Volume= 0.480 af
Outflow = 0.42 cfs @ 14.16 hrs, Volume= 0.480 af, Atten= 93%, Lag= 123.8 min
Discarded = 0.42 cfs @ 14.16 hrs, Volume= 0.480 af
Primary = 0.00 cfs @ 14.16 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 198.52' @ 14.16 hrs Surf.Area= 7,555 sf Storage= 9,035 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 231.1 min (1,052.7 - 821.5)

Volume	Invert	Avail.Storage	Storage Description
#1	197.00'	22,573 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
197.00	4,911	0	0
198.00	6,054	5,483	5,483
199.00	8,930	7,492	12,975
200.00	10,266	9,598	22,573

Device	Routing	Invert	Outlet Devices
#1	Primary	198.50'	**18.0" Round Culvert** L= 105.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 198.50' / 194.28' S= 0.0402 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	197.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.42 cfs @ 14.16 hrs HW=198.52' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=0.00 cfs @ 14.16 hrs HW=198.52' TW=194.17' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.00 cfs @ 0.63 fps)

Summary for Pond BP: Central Pond (Proposed)

Inflow Area = 55.097 ac, 68.06% Impervious, Inflow Depth > 4.77" for 2 yr event
Inflow = 74.43 cfs @ 12.16 hrs, Volume= 21.897 af
Outflow = 37.20 cfs @ 12.46 hrs, Volume= 21.574 af, Atten= 50%, Lag= 18.0 min
Primary = 37.20 cfs @ 12.46 hrs, Volume= 21.574 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 193.25' Surf.Area= 28,742 sf Storage= 94,216 cf
Peak Elev= 195.45' @ 12.46 hrs Surf.Area= 43,840 sf Storage= 172,211 cf (77,995 cf above start)

Plug-Flow detention time= 243.7 min calculated for 19.405 af (89% of inflow)
Center-of-Mass det. time= 23.3 min (1,037.0 - 1,013.7)

Volume	Invert	Avail.Storage	Storage Description
#1	189.00'	380,809 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	189.00'	4,320 cf	**60.0" Round Pipe Storage** x 2 L= 110.0'
		385,129 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
189.00	14,772	0	0
190.00	17,752	16,262	16,262
191.00	20,793	19,273	35,535
192.00	23,920	22,357	57,891
193.00	27,132	25,526	83,417
194.00	30,430	28,781	112,198
195.00	41,981	36,206	148,404
196.00	46,074	44,028	192,431
197.00	20,253	33,164	225,595
198.00	54,517	37,385	262,980
199.00	58,866	56,692	319,671
200.00	63,410	61,138	380,809

Device	Routing	Invert	Outlet Devices
#1	Primary	188.45'	**60.0" Round Culvert** L= 313.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 188.45' / 187.51' S= 0.0030 '/' Cc= 0.900 n= 0.013, Flow Area= 19.63 sf
#2	Device 1	195.15'	**24.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	193.25'	**5.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=37.14 cfs @ 12.46 hrs HW=195.45' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 37.14 cfs of 176.32 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 6.53 cfs @ 1.80 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Orifice Controls 30.61 cfs @ 6.38 fps)

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 P1: Site draining to central Runoff Area=33.782 ac 75.36% Impervious Runoff Depth=2.82"
Flow Length=100' Tc=10.8 min CN=84 Runoff=94.03 cfs 7.929 af

Subcatchment P2: Southwest corner Runoff Area=0.756 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment P3: Southwest Apts Runoff Area=3.583 ac 69.47% Impervious Runoff Depth=2.46"
Tc=6.0 min CN=80 Runoff=10.14 cfs 0.735 af

Subcatchment P4: Vose Hill and SW Runoff Area=12.923 ac 39.51% Impervious Runoff Depth=2.38"
Flow Length=910' Tc=13.4 min CN=79 Runoff=28.16 cfs 2.559 af

Subcatchment P5: West / Wetlands Runoff Area=1.899 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=155' Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment P6: Surface Runoff to Basin Runoff Area=3.567 ac 59.21% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=74 Runoff=8.02 cfs 0.586 af

Subcatchment P7: CBs West of Mrkt 32 Runoff Area=0.270 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=1.16 cfs 0.096 af

Subcatchment R1: Roof Runoff Area=1.183 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=5.08 cfs 0.420 af

Subcatchment R2: Roof Runoff Area=1.284 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=5.51 cfs 0.456 af

Subcatchment R3A: Apt Roof Runoff Area=0.565 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=2.43 cfs 0.201 af

Subcatchment R3B: Roof Runoff Area=0.431 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=1.85 cfs 0.153 af

Subcatchment R4A: Roof Runoff Area=0.869 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=3.73 cfs 0.309 af

Subcatchment R4B: Roof Runoff Area=0.690 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=2.96 cfs 0.245 af

Subcatchment R5: Market 32 Roof Runoff Area=1.578 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=6.77 cfs 0.561 af

Subcatchment R6: Roof Runoff Area=0.799 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=3.43 cfs 0.284 af

Reach 5R: Parker Street from North Avg. Flow Depth=1.20' Max Vel=4.96 fps Inflow=5.33 cfs 15.880 af
15.0" Round Pipe n=0.013 L=326.0' S=0.0068 '/' Capacity=5.34 cfs Outflow=5.72 cfs 15.872 af

Reach DP1: To Existing Swale / Wetlands Inflow=88.22 cfs 28.263 af
Outflow=88.22 cfs 28.263 af

Pond B1: UG Basin 1 Peak Elev=200.53' Storage=0.410 af Inflow=14.32 cfs 1.185 af
Discarded=0.57 cfs 0.939 af Primary=4.56 cfs 0.246 af Outflow=5.13 cfs 1.186 af

Pond B2: UG Basin 2 Peak Elev=196.85' Storage=0.112 af Inflow=4.28 cfs 0.354 af
Discarded=0.15 cfs 0.266 af Primary=2.60 cfs 0.089 af Outflow=2.75 cfs 0.354 af

Pond B3: Open Basin 3 Peak Elev=199.12' Storage=14,053 cf Inflow=11.43 cfs 0.870 af
Discarded=0.51 cfs 0.616 af Primary=2.31 cfs 0.255 af Outflow=2.82 cfs 0.871 af

Pond BP: Central Pond (Proposed) Peak Elev=196.34' Storage=211,068 cf Inflow=129.66 cfs 27.106 af
Outflow=79.95 cfs 26.782 af

Summary for Subcatchment P1: Site draining to central pond

Runoff = 94.03 cfs @ 12.15 hrs, Volume= 7.929 af, Depth= 2.82"

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

	Area (ac)	CN	Description
*	23.906	98	Impervious Areas
	6.271	39	>75% Grass cover, Good, HSG A
	0.113	61	>75% Grass cover, Good, HSG B
	1.047	30	Woods, Good, HSG A
	0.890	61	1/4 acre lots, 38% imp, HSG A
	0.550	83	1/4 acre lots, 38% imp, HSG C
*	1.005	98	Water Surfaces
	33.782	84	Weighted Average
	8.324		24.64% Pervious Area
	25.458		75.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.1	50	0.3300	8.62		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.8	100	Total			

Summary for Subcatchment P2: Southwest corner

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

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

Area (ac)	CN	Description
0.756	30	Woods, Good, HSG A
0.756		100.00% Pervious Area

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

Summary for Subcatchment P3: Southwest Apts

Runoff = 10.14 cfs @ 12.09 hrs, Volume= 0.735 af, Depth= 2.46"

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

	Area (ac)	CN	Description
*	2.489	98	Impervious Areas
	1.094	39	>75% Grass cover, Good, HSG A
	3.583	80	Weighted Average
	1.094		30.53% Pervious Area
	2.489		69.47% Impervious Area

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

Summary for Subcatchment P4: Vose Hill and SW

Runoff = 28.16 cfs @ 12.19 hrs, Volume= 2.559 af, Depth= 2.38"

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

	Area (ac)	CN	Description
*	2.811	98	Impervious Area - Vose Hill
	2.097	55	Woods, Good, HSG B
	0.140	61	>75% Grass cover, Good, HSG B
	1.837	70	Woods, Good, HSG C
	0.928	75	1/4 acre lots, 38% imp, HSG B
	5.110	83	1/4 acre lots, 38% imp, HSG C
	12.923	79	Weighted Average
	7.818		60.49% Pervious Area
	5.105		39.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.1	420	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.3	440	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.4	910	Total			

Summary for Subcatchment P5: West / Wetlands

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

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

Area (ac)	CN	Description
1.200	30	Brush, Good, HSG A
0.042	39	>75% Grass cover, Good, HSG A
0.657	30	Woods, Good, HSG A
1.899	30	Weighted Average
1.899		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
1.2	105	0.0857	1.46		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.8					**Direct Entry, To make min. allowed**
6.0	155	Total			

Summary for Subcatchment P6: Surface Runoff to Basin #3

Runoff = 8.02 cfs @ 12.10 hrs, Volume= 0.586 af, Depth= 1.97"

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

Area (ac)	CN	Description
1.455	39	>75% Grass cover, Good, HSG A
1.936	98	Paved parking, HSG C
0.176	98	Water Surface, HSG C
3.567	74	Weighted Average
1.455		40.79% Pervious Area
2.112		59.21% Impervious Area

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

Summary for Subcatchment P7: CBs West of Mrkt 32 Bldg

Runoff = 1.16 cfs @ 12.09 hrs, Volume= 0.096 af, Depth= 4.26"

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

	Area (ac)	CN	Description
*	0.270	98	Impervious Areas
	0.270		100.00% Impervious Area

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

Summary for Subcatchment R1: Roof

Runoff = 5.08 cfs @ 12.09 hrs, Volume= 0.420 af, Depth= 4.26"

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

	Area (ac)	CN	Description
*	1.183	98	Roofs
	1.183		100.00% Impervious Area

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

Summary for Subcatchment R2: Roof

Runoff = 5.51 cfs @ 12.09 hrs, Volume= 0.456 af, Depth= 4.26"

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

	Area (ac)	CN	Description
*	1.284	98	Roofs
	1.284		100.00% Impervious Area

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

Summary for Subcatchment R3A: Apt Roof

Runoff = 2.43 cfs @ 12.09 hrs, Volume= 0.201 af, Depth= 4.26"

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

	Area (ac)	CN	Description
*	0.565	98	Impervious Areas
	0.565		100.00% Impervious Area

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

Summary for Subcatchment R3B: Roof

Runoff = 1.85 cfs @ 12.09 hrs, Volume= 0.153 af, Depth= 4.26"

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

	Area (ac)	CN	Description
*	0.431	98	Impervious Areas
	0.431		100.00% Impervious Area

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

Summary for Subcatchment R4A: Roof

Runoff = 3.73 cfs @ 12.09 hrs, Volume= 0.309 af, Depth= 4.26"

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

	Area (ac)	CN	Description
*	0.869	98	Roofs
	0.869		100.00% Impervious Area

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

Summary for Subcatchment R4B: Roof

Runoff = 2.96 cfs @ 12.09 hrs, Volume= 0.245 af, Depth= 4.26"

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

	Area (ac)	CN	Description
*	0.690	98	Roofs
	0.690		100.00% Impervious Area

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

Summary for Subcatchment R5: Market 32 Roof

Runoff = 6.77 cfs @ 12.09 hrs, Volume= 0.561 af, Depth= 4.26"

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

	Area (ac)	CN	Description
*	1.578	98	Roofs
	1.578		100.00% Impervious Area

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

Summary for Subcatchment R6: Roof

Runoff = 3.43 cfs @ 12.09 hrs, Volume= 0.284 af, Depth= 4.26"

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

	Area (ac)	CN	Description
*	0.799	98	Roofs
	0.799		100.00% Impervious Area

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

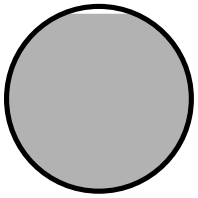
Summary for Reach 5R: Parker Street from North (max flow from 15" pipe)

Inflow = 5.33 cfs @ 0.00 hrs, Volume= 15.880 af, Incl. 5.33 cfs Base Flow
Outflow = 5.72 cfs @ 0.05 hrs, Volume= 15.872 af, Atten= 0%, Lag= 3.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.96 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 4.96 fps, Avg. Travel Time= 1.1 min

Peak Storage= 395 cf @ 0.05 hrs
Average Depth at Peak Storage= 1.20'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 5.34 cfs

15.0" Round Pipe
n= 0.013
Length= 326.0' Slope= 0.0068 '/' (50 Elevation Intervals)
Inlet Invert= 197.67', Outlet Invert= 195.44'



Summary for Reach DP1: To Existing Swale / Wetlands

Inflow Area = 64.179 ac, 66.74% Impervious, Inflow Depth > 5.28" for 10 yr event
Inflow = 88.22 cfs @ 12.33 hrs, Volume= 28.263 af
Outflow = 88.22 cfs @ 12.33 hrs, Volume= 28.263 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Summary for Pond B1: UG Basin 1

Inflow Area = 3.336 ac,100.00% Impervious, Inflow Depth = 4.26" for 10 yr event
Inflow = 14.32 cfs @ 12.09 hrs, Volume= 1.185 af
Outflow = 5.13 cfs @ 12.35 hrs, Volume= 1.186 af, Atten= 64%, Lag= 15.8 min
Discarded = 0.57 cfs @ 10.00 hrs, Volume= 0.939 af
Primary = 4.56 cfs @ 12.35 hrs, Volume= 0.246 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 200.53' @ 12.35 hrs Surf.Area= 0.234 ac Storage= 0.410 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 179.4 min (929.2 - 749.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	198.00'	0.207 af	**77.50'W x 131.78'L x 3.50'H Field A** 0.821 af Overall - 0.304 af Embedded = 0.517 af x 40.0% Voids
#2A	198.50'	0.304 af	**ADS_StormTech SC-740 +Cap** x 288 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 16 Rows of 18 Chambers
		0.510 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	196.60'	**24.0" Round Culvert** L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 196.60' / 196.35' S= 0.0104 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	200.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	198.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.57 cfs @ 10.00 hrs HW=198.04' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.57 cfs)

Primary OutFlow Max=4.56 cfs @ 12.35 hrs HW=200.53' TW=196.34' (Dynamic Tailwater)
└**1=Culvert** (Passes 4.56 cfs of 25.90 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 4.56 cfs @ 2.15 fps)

Summary for Pond B2: UG Basin 2

Inflow Area = 0.996 ac,100.00% Impervious, Inflow Depth = 4.26" for 10 yr event
Inflow = 4.28 cfs @ 12.09 hrs, Volume= 0.354 af
Outflow = 2.75 cfs @ 12.21 hrs, Volume= 0.354 af, Atten= 36%, Lag= 7.5 min
Discarded = 0.15 cfs @ 9.45 hrs, Volume= 0.266 af
Primary = 2.60 cfs @ 12.21 hrs, Volume= 0.089 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 196.85' @ 12.21 hrs Surf.Area= 0.060 ac Storage= 0.112 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 199.1 min (948.9 - 749.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.00'	0.054 af	**34.75'W x 74.82'L x 3.50'H Field A** 0.209 af Overall - 0.074 af Embedded = 0.135 af x 40.0% Voids
#2A	194.50'	0.074 af	**ADS_StormTech SC-740 +Cap** x 70 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 7 Rows of 10 Chambers
		0.128 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	193.00'	**15.0" Round Culvert** L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 193.00' / 191.90' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	196.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	194.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.15 cfs @ 9.45 hrs HW=194.04' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=2.46 cfs @ 12.21 hrs HW=196.83' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.46 cfs of 10.58 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 2.46 cfs @ 1.88 fps)

Summary for Pond B3: Open Basin 3

Inflow Area = 4.366 ac, 66.67% Impervious, Inflow Depth = 2.39" for 10 yr event
Inflow = 11.43 cfs @ 12.09 hrs, Volume= 0.870 af
Outflow = 2.82 cfs @ 12.50 hrs, Volume= 0.871 af, Atten= 75%, Lag= 24.5 min
Discarded = 0.51 cfs @ 12.50 hrs, Volume= 0.616 af
Primary = 2.31 cfs @ 12.50 hrs, Volume= 0.255 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 199.12' @ 12.50 hrs Surf.Area= 9,090 sf Storage= 14,053 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 188.3 min (1,000.7 - 812.4)

Volume	Invert	Avail.Storage	Storage Description
#1	197.00'	22,573 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
197.00	4,911	0	0
198.00	6,054	5,483	5,483
199.00	8,930	7,492	12,975
200.00	10,266	9,598	22,573

Device	Routing	Invert	Outlet Devices
#1	Primary	198.50'	**18.0" Round Culvert** L= 105.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 198.50' / 194.28' S= 0.0402 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	197.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.51 cfs @ 12.50 hrs HW=199.12' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.51 cfs)

Primary OutFlow Max=2.31 cfs @ 12.50 hrs HW=199.12' TW=196.23' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.31 cfs @ 3.35 fps)

Summary for Pond BP: Central Pond (Proposed)

Inflow Area = 55.097 ac, 68.06% Impervious, Inflow Depth > 5.90" for 10 yr event
Inflow = 129.66 cfs @ 12.16 hrs, Volume= 27.106 af
Outflow = 79.95 cfs @ 12.38 hrs, Volume= 26.782 af, Atten= 38%, Lag= 12.9 min
Primary = 79.95 cfs @ 12.38 hrs, Volume= 26.782 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 193.25' Surf.Area= 28,742 sf Storage= 94,216 cf
Peak Elev= 196.34' @ 12.38 hrs Surf.Area= 37,195 sf Storage= 211,068 cf (116,851 cf above start)

Plug-Flow detention time= 197.5 min calculated for 24.613 af (91% of inflow)
Center-of-Mass det. time= 23.2 min (995.8 - 972.6)

Volume	Invert	Avail.Storage	Storage Description
#1	189.00'	380,809 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	189.00'	4,320 cf	**60.0" Round Pipe Storage** x 2 L= 110.0'
		385,129 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
189.00	14,772	0	0
190.00	17,752	16,262	16,262
191.00	20,793	19,273	35,535
192.00	23,920	22,357	57,891
193.00	27,132	25,526	83,417
194.00	30,430	28,781	112,198
195.00	41,981	36,206	148,404
196.00	46,074	44,028	192,431
197.00	20,253	33,164	225,595
198.00	54,517	37,385	262,980
199.00	58,866	56,692	319,671
200.00	63,410	61,138	380,809

Device	Routing	Invert	Outlet Devices
#1	Primary	188.45'	**60.0" Round Culvert** L= 313.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 188.45' / 187.51' S= 0.0030 '/' Cc= 0.900 n= 0.013, Flow Area= 19.63 sf
#2	Device 1	195.15'	**24.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	193.25'	**5.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=79.82 cfs @ 12.38 hrs HW=196.34' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 79.82 cfs of 201.13 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 42.00 cfs @ 5.25 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Orifice Controls 37.82 cfs @ 7.88 fps)

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 P1: Site draining to central Runoff Area=33.782 ac 75.36% Impervious Runoff Depth=3.55"
Flow Length=100' Tc=10.8 min CN=84 Runoff=117.75 cfs 9.982 af

Subcatchment P2: Southwest corner Runoff Area=0.756 ac 0.00% Impervious Runoff Depth=0.02"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.001 af

Subcatchment P3: Southwest Apts Runoff Area=3.583 ac 69.47% Impervious Runoff Depth=3.16"
Tc=6.0 min CN=80 Runoff=12.97 cfs 0.942 af

Subcatchment P4: Vose Hill and SW Runoff Area=12.923 ac 39.51% Impervious Runoff Depth=3.06"
Flow Length=910' Tc=13.4 min CN=79 Runoff=36.31 cfs 3.297 af

Subcatchment P5: West / Wetlands Runoff Area=1.899 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=155' Tc=6.0 min CN=30 Runoff=0.00 cfs 0.003 af

Subcatchment P6: Surface Runoff to Basin Runoff Area=3.567 ac 59.21% Impervious Runoff Depth=2.61"
Tc=6.0 min CN=74 Runoff=10.66 cfs 0.775 af

Subcatchment P7: CBs West of Mrkt 32 Runoff Area=0.270 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=1.37 cfs 0.114 af

Subcatchment R1: Roof Runoff Area=1.183 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=5.99 cfs 0.499 af

Subcatchment R2: Roof Runoff Area=1.284 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=6.50 cfs 0.542 af

Subcatchment R3A: Apt Roof Runoff Area=0.565 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=2.86 cfs 0.238 af

Subcatchment R3B: Roof Runoff Area=0.431 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=2.18 cfs 0.182 af

Subcatchment R4A: Roof Runoff Area=0.869 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=4.40 cfs 0.367 af

Subcatchment R4B: Roof Runoff Area=0.690 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=3.50 cfs 0.291 af

Subcatchment R5: Market 32 Roof Runoff Area=1.578 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=7.99 cfs 0.666 af

Subcatchment R6: Roof Runoff Area=0.799 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=4.05 cfs 0.337 af

Reach 5R: Parker Street from North Avg. Flow Depth=1.20' Max Vel=4.96 fps Inflow=5.33 cfs 15.880 af
15.0" Round Pipe n=0.013 L=326.0' S=0.0068 '/' Capacity=5.34 cfs Outflow=5.72 cfs 15.872 af

Reach DP1: To Existing Swale / Wetlands Inflow=111.93 cfs 31.834 af
Outflow=111.93 cfs 31.834 af

Pond B1: UG Basin 1 Peak Elev=200.77' Storage=0.440 af Inflow=16.90 cfs 1.407 af
Discarded=0.57 cfs 1.000 af Primary=8.65 cfs 0.407 af Outflow=9.22 cfs 1.408 af

Pond B2: UG Basin 2 Peak Elev=196.99' Storage=0.116 af Inflow=5.05 cfs 0.420 af
Discarded=0.15 cfs 0.282 af Primary=4.36 cfs 0.139 af Outflow=4.50 cfs 0.420 af

Pond B3: Open Basin 3 Peak Elev=199.40' Storage=16,628 cf Inflow=14.70 cfs 1.112 af
Discarded=0.53 cfs 0.668 af Primary=4.45 cfs 0.444 af Outflow=4.97 cfs 1.112 af

Pond BP: Central Pond (Proposed) Peak Elev=197.35' Storage=239,232 cf Inflow=170.30 cfs 30.294 af
Outflow=101.85 cfs 29.970 af

Summary for Subcatchment P1: Site draining to central pond

Runoff = 117.75 cfs @ 12.15 hrs, Volume= 9.982 af, Depth= 3.55"

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

	Area (ac)	CN	Description
*	23.906	98	Impervious Areas
	6.271	39	>75% Grass cover, Good, HSG A
	0.113	61	>75% Grass cover, Good, HSG B
	1.047	30	Woods, Good, HSG A
	0.890	61	1/4 acre lots, 38% imp, HSG A
	0.550	83	1/4 acre lots, 38% imp, HSG C
*	1.005	98	Water Surfaces
	33.782	84	Weighted Average
	8.324		24.64% Pervious Area
	25.458		75.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.1	50	0.3300	8.62		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.8	100	Total			

Summary for Subcatchment P2: Southwest corner

Runoff = 0.00 cfs @ 22.04 hrs, Volume= 0.001 af, Depth= 0.02"

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

Area (ac)	CN	Description
0.756	30	Woods, Good, HSG A
0.756		100.00% Pervious Area

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

Summary for Subcatchment P3: Southwest Apts

Runoff = 12.97 cfs @ 12.09 hrs, Volume= 0.942 af, Depth= 3.16"

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

	Area (ac)	CN	Description
*	2.489	98	Impervious Areas
	1.094	39	>75% Grass cover, Good, HSG A
	3.583	80	Weighted Average
	1.094		30.53% Pervious Area
	2.489		69.47% Impervious Area

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

Summary for Subcatchment P4: Vose Hill and SW

Runoff = 36.31 cfs @ 12.19 hrs, Volume= 3.297 af, Depth= 3.06"

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

	Area (ac)	CN	Description
*	2.811	98	Impervious Area - Vose Hill
	2.097	55	Woods, Good, HSG B
	0.140	61	>75% Grass cover, Good, HSG B
	1.837	70	Woods, Good, HSG C
	0.928	75	1/4 acre lots, 38% imp, HSG B
	5.110	83	1/4 acre lots, 38% imp, HSG C
	12.923	79	Weighted Average
	7.818		60.49% Pervious Area
	5.105		39.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.1	420	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.3	440	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.4	910	Total			

Summary for Subcatchment P5: West / Wetlands

Runoff = 0.00 cfs @ 22.04 hrs, Volume= 0.003 af, Depth= 0.02"

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

Area (ac)	CN	Description
1.200	30	Brush, Good, HSG A
0.042	39	>75% Grass cover, Good, HSG A
0.657	30	Woods, Good, HSG A
1.899	30	Weighted Average
1.899		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
1.2	105	0.0857	1.46		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.8					**Direct Entry, To make min. allowed**
6.0	155	Total			

Summary for Subcatchment P6: Surface Runoff to Basin #3

Runoff = 10.66 cfs @ 12.09 hrs, Volume= 0.775 af, Depth= 2.61"

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

Area (ac)	CN	Description
1.455	39	>75% Grass cover, Good, HSG A
1.936	98	Paved parking, HSG C
0.176	98	Water Surface, HSG C
3.567	74	Weighted Average
1.455		40.79% Pervious Area
2.112		59.21% Impervious Area

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

Summary for Subcatchment P7: CBs West of Mrkt 32 Bldg

Runoff = 1.37 cfs @ 12.09 hrs, Volume= 0.114 af, Depth= 5.06"

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

	Area (ac)	CN	Description
*	0.270	98	Impervious Areas
	0.270		100.00% Impervious Area

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

Summary for Subcatchment R1: Roof

Runoff = 5.99 cfs @ 12.09 hrs, Volume= 0.499 af, Depth= 5.06"

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

	Area (ac)	CN	Description
*	1.183	98	Roofs
	1.183		100.00% Impervious Area

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

Summary for Subcatchment R2: Roof

Runoff = 6.50 cfs @ 12.09 hrs, Volume= 0.542 af, Depth= 5.06"

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

	Area (ac)	CN	Description
*	1.284	98	Roofs
	1.284		100.00% Impervious Area

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

Summary for Subcatchment R3A: Apt Roof

Runoff = 2.86 cfs @ 12.09 hrs, Volume= 0.238 af, Depth= 5.06"

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

	Area (ac)	CN	Description
*	0.565	98	Impervious Areas
	0.565		100.00% Impervious Area

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

Summary for Subcatchment R3B: Roof

Runoff = 2.18 cfs @ 12.09 hrs, Volume= 0.182 af, Depth= 5.06"

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

	Area (ac)	CN	Description
*	0.431	98	Impervious Areas
	0.431		100.00% Impervious Area

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

Summary for Subcatchment R4A: Roof

Runoff = 4.40 cfs @ 12.09 hrs, Volume= 0.367 af, Depth= 5.06"

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

	Area (ac)	CN	Description
*	0.869	98	Roofs
	0.869		100.00% Impervious Area

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

Summary for Subcatchment R4B: Roof

Runoff = 3.50 cfs @ 12.09 hrs, Volume= 0.291 af, Depth= 5.06"

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

	Area (ac)	CN	Description
*	0.690	98	Roofs
	0.690		100.00% Impervious Area

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

Summary for Subcatchment R5: Market 32 Roof

Runoff = 7.99 cfs @ 12.09 hrs, Volume= 0.666 af, Depth= 5.06"

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

	Area (ac)	CN	Description
*	1.578	98	Roofs
	1.578		100.00% Impervious Area

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

Summary for Subcatchment R6: Roof

Runoff = 4.05 cfs @ 12.09 hrs, Volume= 0.337 af, Depth= 5.06"

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

	Area (ac)	CN	Description
*	0.799	98	Roofs
	0.799		100.00% Impervious Area

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

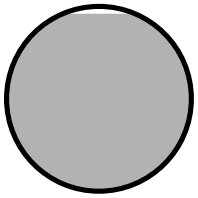
Summary for Reach 5R: Parker Street from North (max flow from 15" pipe)

Inflow = 5.33 cfs @ 0.00 hrs, Volume= 15.880 af, Incl. 5.33 cfs Base Flow
Outflow = 5.72 cfs @ 0.05 hrs, Volume= 15.872 af, Atten= 0%, Lag= 3.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.96 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 4.96 fps, Avg. Travel Time= 1.1 min

Peak Storage= 395 cf @ 0.05 hrs
Average Depth at Peak Storage= 1.20'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 5.34 cfs

15.0" Round Pipe
n= 0.013
Length= 326.0' Slope= 0.0068 '/' (50 Elevation Intervals)
Inlet Invert= 197.67', Outlet Invert= 195.44'



Summary for Reach DP1: To Existing Swale / Wetlands

Inflow Area = 64.179 ac, 66.74% Impervious, Inflow Depth > 5.95" for 25 yr event
Inflow = 111.93 cfs @ 12.33 hrs, Volume= 31.834 af
Outflow = 111.93 cfs @ 12.33 hrs, Volume= 31.834 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Summary for Pond B1: UG Basin 1

Inflow Area = 3.336 ac,100.00% Impervious, Inflow Depth = 5.06" for 25 yr event
Inflow = 16.90 cfs @ 12.09 hrs, Volume= 1.407 af
Outflow = 9.22 cfs @ 12.22 hrs, Volume= 1.408 af, Atten= 45%, Lag= 8.2 min
Discarded = 0.57 cfs @ 9.40 hrs, Volume= 1.000 af
Primary = 8.65 cfs @ 12.22 hrs, Volume= 0.407 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 200.77' @ 12.22 hrs Surf.Area= 0.234 ac Storage= 0.440 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 165.1 min (912.2 - 747.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	198.00'	0.207 af	**77.50'W x 131.78'L x 3.50'H Field A** 0.821 af Overall - 0.304 af Embedded = 0.517 af x 40.0% Voids
#2A	198.50'	0.304 af	**ADS_StormTech SC-740 +Cap** x 288 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 16 Rows of 18 Chambers
		0.510 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	196.60'	**24.0" Round Culvert** L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 196.60' / 196.35' S= 0.0104 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	200.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	198.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.57 cfs @ 9.40 hrs HW=198.04' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.57 cfs)

Primary OutFlow Max=8.38 cfs @ 12.22 hrs HW=200.75' TW=196.78' (Dynamic Tailwater)
└**1=Culvert** (Passes 8.38 cfs of 26.85 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 8.38 cfs @ 2.64 fps)

Summary for Pond B2: UG Basin 2

Inflow Area = 0.996 ac,100.00% Impervious, Inflow Depth = 5.06" for 25 yr event
Inflow = 5.05 cfs @ 12.09 hrs, Volume= 0.420 af
Outflow = 4.50 cfs @ 12.14 hrs, Volume= 0.420 af, Atten= 11%, Lag= 3.5 min
Discarded = 0.15 cfs @ 8.95 hrs, Volume= 0.282 af
Primary = 4.36 cfs @ 12.14 hrs, Volume= 0.139 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 196.99' @ 12.14 hrs Surf.Area= 0.060 ac Storage= 0.116 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 181.6 min (928.7 - 747.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.00'	0.054 af	**34.75'W x 74.82'L x 3.50'H Field A** 0.209 af Overall - 0.074 af Embedded = 0.135 af x 40.0% Voids
#2A	194.50'	0.074 af	**ADS_StormTech SC-740 +Cap** x 70 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 7 Rows of 10 Chambers
		0.128 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	193.00'	**15.0" Round Culvert** L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 193.00' / 191.90' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	196.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	194.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.15 cfs @ 8.95 hrs HW=194.04' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=4.26 cfs @ 12.14 hrs HW=196.98' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 4.26 cfs of 10.82 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 4.26 cfs @ 2.27 fps)

Summary for Pond B3: Open Basin 3

Inflow Area = 4.366 ac, 66.67% Impervious, Inflow Depth = 3.06" for 25 yr event
Inflow = 14.70 cfs @ 12.09 hrs, Volume= 1.112 af
Outflow = 4.97 cfs @ 12.41 hrs, Volume= 1.112 af, Atten= 66%, Lag= 18.8 min
Discarded = 0.53 cfs @ 12.41 hrs, Volume= 0.668 af
Primary = 4.45 cfs @ 12.41 hrs, Volume= 0.444 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 199.40' @ 12.41 hrs Surf.Area= 9,461 sf Storage= 16,628 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 165.6 min (973.7 - 808.1)

Volume	Invert	Avail.Storage	Storage Description
#1	197.00'	22,573 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
197.00	4,911	0	0
198.00	6,054	5,483	5,483
199.00	8,930	7,492	12,975
200.00	10,266	9,598	22,573

Device	Routing	Invert	Outlet Devices
#1	Primary	198.50'	**18.0" Round Culvert** L= 105.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 198.50' / 194.28' S= 0.0402 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	197.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.53 cfs @ 12.41 hrs HW=199.40' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.53 cfs)

Primary OutFlow Max=4.44 cfs @ 12.41 hrs HW=199.40' TW=197.33' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 4.44 cfs @ 4.03 fps)

Summary for Pond BP: Central Pond (Proposed)

Inflow Area = 55.097 ac, 68.06% Impervious, Inflow Depth > 6.60" for 25 yr event
Inflow = 170.30 cfs @ 12.16 hrs, Volume= 30.294 af
Outflow = 101.85 cfs @ 12.37 hrs, Volume= 29.970 af, Atten= 40%, Lag= 12.6 min
Primary = 101.85 cfs @ 12.37 hrs, Volume= 29.970 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 193.25' Surf.Area= 28,742 sf Storage= 94,216 cf
Peak Elev= 197.35' @ 12.37 hrs Surf.Area= 32,384 sf Storage= 239,232 cf (145,016 cf above start)

Plug-Flow detention time= 177.5 min calculated for 27.762 af (92% of inflow)
Center-of-Mass det. time= 23.2 min (976.5 - 953.3)

Volume	Invert	Avail.Storage	Storage Description
#1	189.00'	380,809 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	189.00'	4,320 cf	**60.0" Round Pipe Storage** x 2 L= 110.0'
		385,129 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
189.00	14,772	0	0
190.00	17,752	16,262	16,262
191.00	20,793	19,273	35,535
192.00	23,920	22,357	57,891
193.00	27,132	25,526	83,417
194.00	30,430	28,781	112,198
195.00	41,981	36,206	148,404
196.00	46,074	44,028	192,431
197.00	20,253	33,164	225,595
198.00	54,517	37,385	262,980
199.00	58,866	56,692	319,671
200.00	63,410	61,138	380,809

Device	Routing	Invert	Outlet Devices
#1	Primary	188.45'	**60.0" Round Culvert** L= 313.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 188.45' / 187.51' S= 0.0030 '/' Cc= 0.900 n= 0.013, Flow Area= 19.63 sf
#2	Device 1	195.15'	**24.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	193.25'	**5.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=101.65 cfs @ 12.37 hrs HW=197.34' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 101.65 cfs of 225.98 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 57.05 cfs @ 7.13 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Orifice Controls 44.60 cfs @ 9.29 fps)

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 P1: Site draining to central Runoff Area=33.782 ac 75.36% Impervious Runoff Depth=4.67"
Flow Length=100' Tc=10.8 min CN=84 Runoff=153.50 cfs 13.137 af

Subcatchment P2: Southwest corner Runoff Area=0.756 ac 0.00% Impervious Runoff Depth=0.13"
Tc=6.0 min CN=30 Runoff=0.01 cfs 0.008 af

Subcatchment P3: Southwest Apts Runoff Area=3.583 ac 69.47% Impervious Runoff Depth=4.24"
Tc=6.0 min CN=80 Runoff=17.30 cfs 1.265 af

Subcatchment P4: Vose Hill and SW Runoff Area=12.923 ac 39.51% Impervious Runoff Depth=4.13"
Flow Length=910' Tc=13.4 min CN=79 Runoff=48.80 cfs 4.447 af

Subcatchment P5: West / Wetlands Runoff Area=1.899 ac 0.00% Impervious Runoff Depth=0.13"
Flow Length=155' Tc=6.0 min CN=30 Runoff=0.03 cfs 0.021 af

Subcatchment P6: Surface Runoff to Basin Runoff Area=3.567 ac 59.21% Impervious Runoff Depth=3.61"
Tc=6.0 min CN=74 Runoff=14.80 cfs 1.073 af

Subcatchment P7: CBs West of Mrkt 32 Runoff Area=0.270 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=1.68 cfs 0.141 af

Subcatchment R1: Roof Runoff Area=1.183 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=7.36 cfs 0.617 af

Subcatchment R2: Roof Runoff Area=1.284 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=7.99 cfs 0.670 af

Subcatchment R3A: Apt Roof Runoff Area=0.565 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=3.52 cfs 0.295 af

Subcatchment R3B: Roof Runoff Area=0.431 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=2.68 cfs 0.225 af

Subcatchment R4A: Roof Runoff Area=0.869 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=5.41 cfs 0.453 af

Subcatchment R4B: Roof Runoff Area=0.690 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=4.29 cfs 0.360 af

Subcatchment R5: Market 32 Roof Runoff Area=1.578 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=9.82 cfs 0.823 af

Subcatchment R6: Roof Runoff Area=0.799 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=4.97 cfs 0.417 af

Reach 5R: Parker Street from North Avg. Flow Depth=1.20' Max Vel=4.96 fps Inflow=5.33 cfs 15.880 af
15.0" Round Pipe n=0.013 L=326.0' S=0.0068 '/' Capacity=5.34 cfs Outflow=5.72 cfs 15.872 af

Reach DP1: To Existing Swale / Wetlands Inflow=133.39 cfs 37.384 af
Outflow=133.39 cfs 37.384 af

Pond B1: UG Basin 1 Peak Elev=201.12' Storage=0.475 af Inflow=20.76 cfs 1.741 af
Discarded=0.57 cfs 1.080 af Primary=16.16 cfs 0.661 af Outflow=16.72 cfs 1.741 af

Pond B2: UG Basin 2 Peak Elev=197.10' Storage=0.118 af Inflow=6.20 cfs 0.520 af
Discarded=0.15 cfs 0.303 af Primary=5.91 cfs 0.217 af Outflow=6.06 cfs 0.520 af

Pond B3: Open Basin 3 Peak Elev=199.82' Storage=20,761 cf Inflow=19.76 cfs 1.490 af
Discarded=0.56 cfs 0.735 af Primary=7.48 cfs 0.756 af Outflow=8.04 cfs 1.490 af

Pond BP: Central Pond (Proposed) Peak Elev=198.43' Storage=291,419 cf Inflow=232.44 cfs 35.232 af
Outflow=120.75 cfs 34.908 af

Summary for Subcatchment P1: Site draining to central pond

Runoff = 153.50 cfs @ 12.15 hrs, Volume= 13.137 af, Depth= 4.67"

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

	Area (ac)	CN	Description
*	23.906	98	Impervious Areas
	6.271	39	>75% Grass cover, Good, HSG A
	0.113	61	>75% Grass cover, Good, HSG B
	1.047	30	Woods, Good, HSG A
	0.890	61	1/4 acre lots, 38% imp, HSG A
	0.550	83	1/4 acre lots, 38% imp, HSG C
*	1.005	98	Water Surfaces
	33.782	84	Weighted Average
	8.324		24.64% Pervious Area
	25.458		75.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.1	50	0.3300	8.62		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.8	100	Total			

Summary for Subcatchment P2: Southwest corner

Runoff = 0.01 cfs @ 14.91 hrs, Volume= 0.008 af, Depth= 0.13"

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

Area (ac)	CN	Description
0.756	30	Woods, Good, HSG A
0.756		100.00% Pervious Area

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

Summary for Subcatchment P3: Southwest Apts

Runoff = 17.30 cfs @ 12.09 hrs, Volume= 1.265 af, Depth= 4.24"

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

	Area (ac)	CN	Description
*	2.489	98	Impervious Areas
	1.094	39	>75% Grass cover, Good, HSG A
	3.583	80	Weighted Average
	1.094		30.53% Pervious Area
	2.489		69.47% Impervious Area

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

Summary for Subcatchment P4: Vose Hill and SW

Runoff = 48.80 cfs @ 12.19 hrs, Volume= 4.447 af, Depth= 4.13"

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

	Area (ac)	CN	Description
*	2.811	98	Impervious Area - Vose Hill
	2.097	55	Woods, Good, HSG B
	0.140	61	>75% Grass cover, Good, HSG B
	1.837	70	Woods, Good, HSG C
	0.928	75	1/4 acre lots, 38% imp, HSG B
	5.110	83	1/4 acre lots, 38% imp, HSG C
	12.923	79	Weighted Average
	7.818		60.49% Pervious Area
	5.105		39.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.1	420	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.3	440	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.4	910	Total			

Summary for Subcatchment P5: West / Wetlands

Runoff = 0.03 cfs @ 14.91 hrs, Volume= 0.021 af, Depth= 0.13"

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

Area (ac)	CN	Description
1.200	30	Brush, Good, HSG A
0.042	39	>75% Grass cover, Good, HSG A
0.657	30	Woods, Good, HSG A
1.899	30	Weighted Average
1.899		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
1.2	105	0.0857	1.46		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.8					**Direct Entry, To make min. allowed**
6.0	155	Total			

Summary for Subcatchment P6: Surface Runoff to Basin #3

Runoff = 14.80 cfs @ 12.09 hrs, Volume= 1.073 af, Depth= 3.61"

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

Area (ac)	CN	Description
1.455	39	>75% Grass cover, Good, HSG A
1.936	98	Paved parking, HSG C
0.176	98	Water Surface, HSG C
3.567	74	Weighted Average
1.455		40.79% Pervious Area
2.112		59.21% Impervious Area

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

Summary for Subcatchment P7: CBs West of Mrkt 32 Bldg

Runoff = 1.68 cfs @ 12.09 hrs, Volume= 0.141 af, Depth= 6.26"

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

	Area (ac)	CN	Description
*	0.270	98	Impervious Areas
	0.270		100.00% Impervious Area

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

Summary for Subcatchment R1: Roof

Runoff = 7.36 cfs @ 12.09 hrs, Volume= 0.617 af, Depth= 6.26"

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

	Area (ac)	CN	Description
*	1.183	98	Roofs
	1.183		100.00% Impervious Area

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

Summary for Subcatchment R2: Roof

Runoff = 7.99 cfs @ 12.09 hrs, Volume= 0.670 af, Depth= 6.26"

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

	Area (ac)	CN	Description
*	1.284	98	Roofs
	1.284		100.00% Impervious Area

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

Summary for Subcatchment R3A: Apt Roof

Runoff = 3.52 cfs @ 12.09 hrs, Volume= 0.295 af, Depth= 6.26"

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

	Area (ac)	CN	Description
*	0.565	98	Impervious Areas
	0.565		100.00% Impervious Area

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

Summary for Subcatchment R3B: Roof

Runoff = 2.68 cfs @ 12.09 hrs, Volume= 0.225 af, Depth= 6.26"

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

	Area (ac)	CN	Description
*	0.431	98	Impervious Areas
	0.431		100.00% Impervious Area

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

Summary for Subcatchment R4A: Roof

Runoff = 5.41 cfs @ 12.09 hrs, Volume= 0.453 af, Depth= 6.26"

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

	Area (ac)	CN	Description
*	0.869	98	Roofs
	0.869		100.00% Impervious Area

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

Summary for Subcatchment R4B: Roof

Runoff = 4.29 cfs @ 12.09 hrs, Volume= 0.360 af, Depth= 6.26"

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

	Area (ac)	CN	Description
*	0.690	98	Roofs
	0.690		100.00% Impervious Area

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

Summary for Subcatchment R5: Market 32 Roof

Runoff = 9.82 cfs @ 12.09 hrs, Volume= 0.823 af, Depth= 6.26"

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

	Area (ac)	CN	Description
*	1.578	98	Roofs
	1.578		100.00% Impervious Area

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

Summary for Subcatchment R6: Roof

Runoff = 4.97 cfs @ 12.09 hrs, Volume= 0.417 af, Depth= 6.26"

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

	Area (ac)	CN	Description
*	0.799	98	Roofs
	0.799		100.00% Impervious Area

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

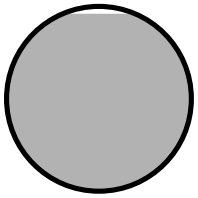
Summary for Reach 5R: Parker Street from North (max flow from 15" pipe)

Inflow = 5.33 cfs @ 0.00 hrs, Volume= 15.880 af, Incl. 5.33 cfs Base Flow
Outflow = 5.72 cfs @ 0.05 hrs, Volume= 15.872 af, Atten= 0%, Lag= 3.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 4.96 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 4.96 fps, Avg. Travel Time= 1.1 min

Peak Storage= 395 cf @ 0.05 hrs
Average Depth at Peak Storage= 1.20'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 5.34 cfs

15.0" Round Pipe
n= 0.013
Length= 326.0' Slope= 0.0068 '/' (50 Elevation Intervals)
Inlet Invert= 197.67', Outlet Invert= 195.44'



Summary for Reach DP1: To Existing Swale / Wetlands

Inflow Area = 64.179 ac, 66.74% Impervious, Inflow Depth > 6.99" for 100 yr event
Inflow = 133.39 cfs @ 12.31 hrs, Volume= 37.384 af
Outflow = 133.39 cfs @ 12.31 hrs, Volume= 37.384 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Summary for Pond B1: UG Basin 1

Inflow Area = 3.336 ac,100.00% Impervious, Inflow Depth = 6.26" for 100 yr event
Inflow = 20.76 cfs @ 12.09 hrs, Volume= 1.741 af
Outflow = 16.72 cfs @ 12.16 hrs, Volume= 1.741 af, Atten= 19%, Lag= 4.3 min
Discarded = 0.57 cfs @ 8.80 hrs, Volume= 1.080 af
Primary = 16.16 cfs @ 12.16 hrs, Volume= 0.661 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 201.12' @ 12.16 hrs Surf.Area= 0.234 ac Storage= 0.475 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 149.7 min (893.7 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	198.00'	0.207 af	**77.50'W x 131.78'L x 3.50'H Field A** 0.821 af Overall - 0.304 af Embedded = 0.517 af x 40.0% Voids
#2A	198.50'	0.304 af	**ADS_StormTech SC-740 +Cap** x 288 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 16 Rows of 18 Chambers
		0.510 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	196.60'	**24.0" Round Culvert** L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 196.60' / 196.35' S= 0.0104 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	200.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	198.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.57 cfs @ 8.80 hrs HW=198.04' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.57 cfs)

Primary OutFlow Max=15.83 cfs @ 12.16 hrs HW=201.11' TW=197.36' (Dynamic Tailwater)
└**1=Culvert** (Passes 15.83 cfs of 28.32 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 15.83 cfs @ 3.28 fps)

Summary for Pond B2: UG Basin 2

Inflow Area = 0.996 ac,100.00% Impervious, Inflow Depth = 6.26" for 100 yr event
Inflow = 6.20 cfs @ 12.09 hrs, Volume= 0.520 af
Outflow = 6.06 cfs @ 12.11 hrs, Volume= 0.520 af, Atten= 2%, Lag= 1.3 min
Discarded = 0.15 cfs @ 8.35 hrs, Volume= 0.303 af
Primary = 5.91 cfs @ 12.11 hrs, Volume= 0.217 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 197.10' @ 12.11 hrs Surf.Area= 0.060 ac Storage= 0.118 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 163.3 min (907.3 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.00'	0.054 af	**34.75'W x 74.82'L x 3.50'H Field A** 0.209 af Overall - 0.074 af Embedded = 0.135 af x 40.0% Voids
#2A	194.50'	0.074 af	**ADS_StormTech SC-740 +Cap** x 70 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 7 Rows of 10 Chambers
		0.128 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	193.00'	**15.0" Round Culvert** L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 193.00' / 191.90' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	196.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	194.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.15 cfs @ 8.35 hrs HW=194.04' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=5.81 cfs @ 12.11 hrs HW=197.09' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 5.81 cfs of 11.00 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 5.81 cfs @ 2.52 fps)

Summary for Pond B3: Open Basin 3

Inflow Area = 4.366 ac, 66.67% Impervious, Inflow Depth = 4.09" for 100 yr event
Inflow = 19.76 cfs @ 12.09 hrs, Volume= 1.490 af
Outflow = 8.04 cfs @ 12.24 hrs, Volume= 1.490 af, Atten= 59%, Lag= 8.9 min
Discarded = 0.56 cfs @ 12.35 hrs, Volume= 0.735 af
Primary = 7.48 cfs @ 12.24 hrs, Volume= 0.756 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 199.82' @ 12.35 hrs Surf.Area= 10,028 sf Storage= 20,761 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 142.7 min (945.2 - 802.5)

Volume	Invert	Avail.Storage	Storage Description
#1	197.00'	22,573 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
197.00	4,911	0	0
198.00	6,054	5,483	5,483
199.00	8,930	7,492	12,975
200.00	10,266	9,598	22,573

Device	Routing	Invert	Outlet Devices
#1	Primary	198.50'	**18.0" Round Culvert** L= 105.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 198.50' / 194.28' S= 0.0402 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	197.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.56 cfs @ 12.35 hrs HW=199.82' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.56 cfs)

Primary OutFlow Max=7.51 cfs @ 12.24 hrs HW=199.78' TW=198.06' (Dynamic Tailwater)
1=Culvert (Outlet Controls 7.51 cfs @ 6.28 fps)

Summary for Pond BP: Central Pond (Proposed)

Inflow Area = 55.097 ac, 68.06% Impervious, Inflow Depth > 7.67" for 100 yr event
Inflow = 232.44 cfs @ 12.16 hrs, Volume= 35.232 af
Outflow = 120.75 cfs @ 12.41 hrs, Volume= 34.908 af, Atten= 48%, Lag= 14.9 min
Primary = 120.75 cfs @ 12.41 hrs, Volume= 34.908 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 193.25' Surf.Area= 28,742 sf Storage= 94,216 cf
Peak Elev= 198.43' @ 12.41 hrs Surf.Area= 56,408 sf Storage= 291,419 cf (197,203 cf above start)

Plug-Flow detention time= 154.9 min calculated for 32.694 af (93% of inflow)
Center-of-Mass det. time= 23.6 min (953.1 - 929.4)

Volume	Invert	Avail.Storage	Storage Description
#1	189.00'	380,809 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	189.00'	4,320 cf	**60.0" Round Pipe Storage** x 2 L= 110.0'
		385,129 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
189.00	14,772	0	0
190.00	17,752	16,262	16,262
191.00	20,793	19,273	35,535
192.00	23,920	22,357	57,891
193.00	27,132	25,526	83,417
194.00	30,430	28,781	112,198
195.00	41,981	36,206	148,404
196.00	46,074	44,028	192,431
197.00	20,253	33,164	225,595
198.00	54,517	37,385	262,980
199.00	58,866	56,692	319,671
200.00	63,410	61,138	380,809

Device	Routing	Invert	Outlet Devices
#1	Primary	188.45'	**60.0" Round Culvert** L= 313.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 188.45' / 187.51' S= 0.0030 '/' Cc= 0.900 n= 0.013, Flow Area= 19.63 sf
#2	Device 1	195.15'	**24.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	193.25'	**5.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=120.71 cfs @ 12.41 hrs HW=198.43' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 120.71 cfs of 250.14 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 69.79 cfs @ 8.72 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Orifice Controls 50.92 cfs @ 10.61 fps)

APPENDIX F – STORMWATER MANAGEMENT CALCULATIONS

- RECHARGE VOLUME CALCULATIONS
- WATER QUALITY VOLUME CALCULATIONS
- PROPRIETARY UNIT SIZING
- TSS REMOVAL CALCULATIONS
- DRAWDOWN TIME CALCULATIONS
- PIPE SIZING CALCULATIONS
- GROUNDWATER MOUNDING ANALYSIS
- OUTLET PROTECTION SIZING

Maynard Crossing
129 Parker Street
Maynard, Massachusetts

MA DEP Standard 3: Recharge Volume Calculations

Required Recharge Volume - A Soils (0.6 in.)	
Existing Site Impervious Area (acres)	27.04
Proposed Site Impervious Area (Acres)	36
Proposed Increase in Site Impervious Area (Acres)	8.96
Proposed Increase in Site Impervious Area (SF)	390,298
Recharge Volume Required (CF)	**19,515**

Recharge Volume Adjustment Factor	
Impervious Area Directed to Infiltration BMP (Acres)	12.351
% of New Impervious Directed to Infiltration BMP*	138%
Adjustment Factor	1.0
Adjusted Total Recharge Volume Required (CF)	**19,515**
*Refers to percentage of newly created impervious surface	

Provided Recharge Volume*	
Basin #1 (CF)	14,985
Basin #2 (CF)	4,400
Basin #3 (CF)	8,869
Isolator basin #4	3,833
Isolator basin #5	305
Isolator basin #6	1,002
Isolator basin #7	1,220
Isolator basin #8	1,089
Isolator basin #9	784
Isolator basin #10	784
Isolator basin #11	1,002
Isolator basin #12	1,045
Isolator basin #13	6,991
Isolator basin #14	4,604
Isolator basin #15	2,945
Isolator basin #16	3,223
Total Recharge Volume Provided (CF)	**57,081**

*Volume provided below lowest outlet pipe in infiltration BMPs

Prepared By: Bohler Engineering
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

Stage-Area-Storage for Pond B1: UG Basin 1

Elevation (feet)	Surface (acres)	Storage (acre-feet)
198.00	**0.234**	0.000
198.05	0.234	0.005
198.10	0.234	0.009
198.15	0.234	0.014
198.20	0.234	0.019
198.25	0.234	0.023
198.30	0.234	0.028
198.35	0.234	0.033
198.40	0.234	0.038
198.45	0.234	0.042
198.50	0.234	0.047
198.55	0.234	0.057
198.60	0.234	0.067
198.65	0.234	0.077
198.70	0.234	0.087
198.75	0.234	0.096
198.80	0.234	0.106
198.85	0.234	0.116
198.90	0.234	0.126
198.95	0.234	0.136
199.00	0.234	0.145
199.05	0.234	0.155
199.10	0.234	0.164
199.15	0.234	0.174
199.20	0.234	0.184
199.25	0.234	0.193
199.30	0.234	0.202
199.35	0.234	0.212
199.40	0.234	0.221
199.45	0.234	0.230
199.50	0.234	0.239
199.55	0.234	0.249
199.60	0.234	0.258
199.65	0.234	0.267
199.70	0.234	0.275
199.75	0.234	0.284
199.80	0.234	0.293
199.85	0.234	0.302
199.90	0.234	0.310
199.95	0.234	0.319
200.00	0.234	0.327
200.05	0.234	0.336
200.10	0.234	0.344
200.15	0.234	0.352
200.20	0.234	0.360
200.25	0.234	0.368
200.30	0.234	0.376
200.35	0.234	0.383
200.40	0.234	0.391
200.45	0.234	0.398
200.50	0.234	0.405
200.55	0.234	0.412
200.60	0.234	0.419
200.65	0.234	0.426
200.70	0.234	0.432
200.75	0.234	0.438
200.80	0.234	0.444
200.85	0.234	0.449
200.90	0.234	0.454
200.95	0.234	0.459
201.00	0.234	0.464
201.05	0.234	0.468
201.10	0.234	0.473
201.15	0.234	0.478
201.20	0.234	0.482
201.25	0.234	0.487
201.30	0.234	0.492
201.35	0.234	0.496
201.40	0.234	0.501
201.45	0.234	0.506
201.50	0.234	**0.510**

14,985 cf of storage provided below outlet

Stage-Area-Storage for Pond B2: UG Basin 2

Elevation (feet)	Surface (acres)	Storage (acre-feet)
194.00	**0.060**	0.000
194.05	0.060	0.001
194.10	0.060	0.002
194.15	0.060	0.004
194.20	0.060	0.005
194.25	0.060	0.006
194.30	0.060	0.007
194.35	0.060	0.008
194.40	0.060	0.010
194.45	0.060	0.011
194.50	0.060	0.012
194.55	0.060	0.014
194.60	0.060	0.017
194.65	0.060	0.019
194.70	0.060	0.022
194.75	0.060	0.024
194.80	0.060	0.027
194.85	0.060	0.029
194.90	0.060	0.032
194.95	0.060	0.034
195.00	0.060	0.036
195.05	0.060	0.039
195.10	0.060	0.041
195.15	0.060	0.044
195.20	0.060	0.046
195.25	0.060	0.048
195.30	0.060	0.051
195.35	0.060	0.053
195.40	0.060	0.055
195.45	0.060	0.058
195.50	0.060	0.060
195.55	0.060	0.062
195.60	0.060	0.064
195.65	0.060	0.067
195.70	0.060	0.069
195.75	0.060	0.071
195.80	0.060	0.073
195.85	0.060	0.075
195.90	0.060	0.077
195.95	0.060	0.080
196.00	0.060	0.082
196.05	0.060	0.084
196.10	0.060	0.086
196.15	0.060	0.088
196.20	0.060	0.090
196.25	0.060	0.092
196.30	0.060	0.094
196.35	0.060	0.096
196.40	0.060	0.098
196.45	0.060	0.099
196.50	0.060	0.101
196.55	0.060	0.103
196.60	0.060	0.105
196.65	0.060	0.106
196.70	0.060	0.108
196.75	0.060	0.109
196.80	0.060	0.111
196.85	0.060	0.112
196.90	0.060	0.113
196.95	0.060	0.115
197.00	0.060	0.116
197.05	0.060	0.117
197.10	0.060	0.118
197.15	0.060	0.119
197.20	0.060	0.121
197.25	0.060	0.122
197.30	0.060	0.123
197.35	0.060	0.124
197.40	0.060	0.125
197.45	0.060	0.127
197.50	0.060	**0.128**

4,400 cf of storage provided below outlet

Stage-Area-Storage for Pond B3: Open Basin 3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
197.00	4,911	0
197.05	4,968	247
197.10	5,025	497
197.15	5,082	750
197.20	5,140	1,005
197.25	5,197	1,263
197.30	5,254	1,525
197.35	5,311	1,789
197.40	5,368	2,056
197.45	5,425	2,326
197.50	5,483	2,598
197.55	5,540	2,874
197.60	5,597	3,152
197.65	5,654	3,434
197.70	5,711	3,718
197.75	5,768	4,005
197.80	5,825	4,295
197.85	5,883	4,587
197.90	5,940	4,883
197.95	5,997	5,181
198.00	6,054	5,483
198.05	6,198	5,789
198.10	6,342	6,102
198.15	6,485	6,423
198.20	6,629	6,751
198.25	6,773	7,086
198.30	6,917	7,428
198.35	7,061	7,778
198.40	7,204	8,134
198.45	7,348	8,498
198.50	7,492	8,869
198.55	7,636	9,247
198.60	7,780	9,633
198.65	7,923	10,025
198.70	8,067	10,425
198.75	8,211	10,832
198.80	8,355	11,246
198.85	8,499	11,667
198.90	8,642	12,096
198.95	8,786	12,532
199.00	8,930	12,975
199.05	8,997	13,423
199.10	9,064	13,874
199.15	9,130	14,329
199.20	9,197	14,787
199.25	9,264	15,249
199.30	9,331	15,714
199.35	9,398	16,182
199.40	9,464	16,653
199.45	9,531	17,128
199.50	9,598	17,607
199.55	9,665	18,088
199.60	9,732	18,573
199.65	9,798	19,061
199.70	9,865	19,553
199.75	9,932	20,048
199.80	9,999	20,546
199.85	10,066	21,048
199.90	10,132	21,553
199.95	10,199	22,061
200.00	**10,266**	**22,573**

storage provided below outlet

Maynard Crossing
Equivalent Water Quality Rainfall Depth Calculation

Total Water Quality Volume Provided On Site	A	B	A x B
Stormwater BMP	Impervious Area Draining to BMP (Ac.)	WQV (In)	
CBs to wet basin (see below)	15.752	0.79	12.46
CBs to Water Quality Unit to wet basin	N/A, WQUs are pretreatment	1.00	0.00
Raingarden to Basin #3	0.45	1.00	0.45
CBs to forebays to Basin #3	1.46	1.00	1.46
CBs to Isolator Rows to Infiltration	7.18	1.00	7.18
Totals	24.84		21.55
Total Water Quality Volume Provided On Site	**0.87**	**in**	

Calculations exclude roof toop area
Calculation is a weighted average

Calculation of rainfall depth provided by wet basin		
WQV Required for CBs to Wet Basin=	57,180	cf
Permanent Pool Volume Provided=	90,449	cf
WQV provided in permanent pool (1/2 perm pool)	45,225	cf
Equivalent water quality rainfall provided in basin=	**0.79**	in

Maynard Crossing
129 Parker Street
Maynard, Massachusetts

Required Stormtech Infiltration Basin Sizing

Basin #	Impervious Area	Volume Required	Volume Provided
Infiltration basin #4	35,404	2,950	3,833
Infiltration basin #5	2,418	202	305
Infiltration basin #6	11,384	949	1,002
Infiltration basin #7	14,660	1,222	1,220
Infiltration basin #8	13,290	1,108	1,089
Infiltration basin #9	9,441	787	784
Infiltration basin #10	8,776	731	784
Infiltration basin #11	12,719	1,060	1,002
Infiltration basin #12	12,000	1,000	1,045
Infiltration basin #13	73,731	6,144	6,991
Infiltration basin #14	52,133	4,344	4,604
Infiltration basin #15	28,177	2,348	2,945
Infiltration basin #16	38,415	3,201	3,223
Total		7.18 Ac.	

Stage-Area-Storage for Pond 4: UG #4 for CBs 70-73

Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)
194.00	0.000	195.06	0.050	196.12	0.094
194.02	0.001	195.08	0.051	196.14	0.095
194.04	0.001	195.10	0.052	196.16	0.095
194.06	0.002	195.12	0.053	196.18	0.096
194.08	0.003	195.14	0.054	196.20	0.096
194.10	0.003	195.16	0.055	196.22	0.097
194.12	0.004	195.18	0.056	196.24	0.098
194.14	0.004	195.20	0.057	196.26	0.098
194.16	0.005	195.22	0.059	196.28	0.099
194.18	0.006	195.24	0.060	196.30	0.100
194.20	0.006	195.26	0.061	196.32	**0.100**
194.22	0.007	195.28	0.062		
194.24	0.008	195.30	0.063		
194.26	0.008	195.32	0.064		
194.28	0.009	195.34	0.065		
194.30	0.009	195.36	0.066		
194.32	0.010	195.38	0.067		
194.34	0.011	195.40	0.068		
194.36	0.011	195.42	0.069		
194.38	0.012	195.44	0.070		
194.40	0.013	195.46	0.071		
194.42	0.013	195.48	0.072		
194.44	0.014	195.50	0.072		
194.46	0.015	195.52	0.073		
194.48	0.015	195.54	0.074		
194.50	0.016	195.56	0.075		
194.52	0.017	195.58	0.076		
194.54	0.018	195.60	0.077		
194.56	0.020	195.62	0.077		
194.58	0.021	195.64	0.078		
194.60	0.022	195.66	0.079		
194.62	0.023	195.68	0.080		
194.64	0.025	195.70	0.080		
194.66	0.026	195.72	0.081		
194.68	0.027	195.74	0.082		
194.70	0.028	195.76	0.083		
194.72	0.030	195.78	0.083		
194.74	0.031	195.80	0.084		
194.76	0.032	195.82	0.084		
194.78	0.033	195.84	0.085		
194.80	0.034	195.86	0.086		
194.82	0.036	195.88	0.086		
194.84	0.037	195.90	0.087		
194.86	0.038	195.92	0.088		
194.88	0.039	195.94	0.088	Outlet Elev.	
194.90	0.040	195.96	0.089		
194.92	0.042	195.98	0.090		
194.94	0.043	196.00	0.090		
194.96	0.044	196.02	0.091		
194.98	0.045	196.04	0.091		
195.00	0.046	196.06	0.092		
195.02	0.047	196.08	0.093		
195.04	0.049	196.10	0.093		

Stage-Area-Storage for Pond 5: UG #5 for CB 88

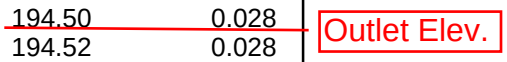
Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)	
194.00	0.000	195.06	0.003	196.12	0.007	
194.02	0.000	195.08	0.004	196.14	0.007	
194.04	0.000	195.10	0.004	196.16	0.007	
194.06	0.000	195.12	0.004	196.18	0.007	
194.08	0.000	195.14	0.004	196.20	0.007	
194.10	0.000	195.16	0.004	196.22	0.007	
194.12	0.000	195.18	0.004	196.24	0.007	
194.14	0.000	195.20	0.004	196.26	0.007	
194.16	0.000	195.22	0.004	196.28	0.007	
194.18	0.000	195.24	0.004	196.30	0.007	Outlet Elev.
194.20	0.000	195.26	0.004	196.32	**0.007**	
194.22	0.001	195.28	0.004			
194.24	0.001	195.30	0.004			
194.26	0.001	195.32	0.004			
194.28	0.001	195.34	0.005			
194.30	0.001	195.36	0.005			
194.32	0.001	195.38	0.005			
194.34	0.001	195.40	0.005			
194.36	0.001	195.42	0.005			
194.38	0.001	195.44	0.005			
194.40	0.001	195.46	0.005			
194.42	0.001	195.48	0.005			
194.44	0.001	195.50	0.005			
194.46	0.001	195.52	0.005			
194.48	0.001	195.54	0.005			
194.50	0.001	195.56	0.005			
194.52	0.001	195.58	0.005			
194.54	0.001	195.60	0.005			
194.56	0.001	195.62	0.005			
194.58	0.002	195.64	0.005			
194.60	0.002	195.66	0.006			
194.62	0.002	195.68	0.006			
194.64	0.002	195.70	0.006			
194.66	0.002	195.72	0.006			
194.68	0.002	195.74	0.006			
194.70	0.002	195.76	0.006			
194.72	0.002	195.78	0.006			
194.74	0.002	195.80	0.006			
194.76	0.002	195.82	0.006			
194.78	0.002	195.84	0.006			
194.80	0.002	195.86	0.006			
194.82	0.003	195.88	0.006			
194.84	0.003	195.90	0.006			
194.86	0.003	195.92	0.006			
194.88	0.003	195.94	0.006			
194.90	0.003	195.96	0.006			
194.92	0.003	195.98	0.006			
194.94	0.003	196.00	0.006			
194.96	0.003	196.02	0.006			
194.98	0.003	196.04	0.006			
195.00	0.003	196.06	0.007			
195.02	0.003	196.08	0.007			
195.04	0.003	196.10	0.007			

Stage-Area-Storage for Pond 6: UG #6 for CBs 74 & 75

Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)
194.00	0.000	195.06	0.016	196.12	0.030
194.02	0.000	195.08	0.016	196.14	0.030
194.04	0.000	195.10	0.016	196.16	0.030
194.06	0.001	195.12	0.017	196.18	0.030
194.08	0.001	195.14	0.017	196.20	0.031
194.10	0.001	195.16	0.017	196.22	0.031
194.12	0.001	195.18	0.018	196.24	0.031
194.14	0.001	195.20	0.018	196.26	0.031
194.16	0.002	195.22	0.018	196.28	0.031
194.18	0.002	195.24	0.019	196.30	0.032
194.20	0.002	195.26	0.019	196.32	**0.032**
194.22	0.002	195.28	0.019		
194.24	0.002	195.30	0.020		
194.26	0.003	195.32	0.020		
194.28	0.003	195.34	0.020		
194.30	0.003	195.36	0.021		
194.32	0.003	195.38	0.021		
194.34	0.004	195.40	0.021		
194.36	0.004	195.42	0.022		
194.38	0.004	195.44	0.022		
194.40	0.004	195.46	0.022		
194.42	0.004	195.48	0.022		
194.44	0.005	195.50	0.023	Outlet Elev.	
194.46	0.005	195.52	0.023		
194.48	0.005	195.54	0.023		
194.50	0.005	195.56	0.024		
194.52	0.006	195.58	0.024		
194.54	0.006	195.60	0.024		
194.56	0.006	195.62	0.024		
194.58	0.007	195.64	0.025		
194.60	0.007	195.66	0.025		
194.62	0.008	195.68	0.025		
194.64	0.008	195.70	0.025		
194.66	0.008	195.72	0.026		
194.68	0.009	195.74	0.026		
194.70	0.009	195.76	0.026		
194.72	0.009	195.78	0.026		
194.74	0.010	195.80	0.026		
194.76	0.010	195.82	0.027		
194.78	0.011	195.84	0.027		
194.80	0.011	195.86	0.027		
194.82	0.011	195.88	0.027		
194.84	0.012	195.90	0.027		
194.86	0.012	195.92	0.028		
194.88	0.012	195.94	0.028		
194.90	0.013	195.96	0.028		
194.92	0.013	195.98	0.028		
194.94	0.013	196.00	0.028		
194.96	0.014	196.02	0.029		
194.98	0.014	196.04	0.029		
195.00	0.015	196.06	0.029		
195.02	0.015	196.08	0.029		
195.04	0.015	196.10	0.030		

Stage-Area-Storage for Pond 7: UG #7 for CB 76

Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)
193.00	0.000	194.06	0.019	195.12	0.036
193.02	0.000	194.08	0.019	195.14	0.036
193.04	0.000	194.10	0.020	195.16	0.036
193.06	0.001	194.12	0.020	195.18	0.037
193.08	0.001	194.14	0.021	195.20	0.037
193.10	0.001	194.16	0.021	195.22	0.037
193.12	0.001	194.18	0.021	195.24	0.037
193.14	0.002	194.20	0.022	195.26	0.038
193.16	0.002	194.22	0.022	195.28	0.038
193.18	0.002	194.24	0.023	195.30	0.038
193.20	0.002	194.26	0.023	195.32	**0.038**
193.22	0.003	194.28	0.024		
193.24	0.003	194.30	0.024		
193.26	0.003	194.32	0.024		
193.28	0.003	194.34	0.025		
193.30	0.004	194.36	0.025		
193.32	0.004	194.38	0.025		
193.34	0.004	194.40	0.026		
193.36	0.004	194.42	0.026		
193.38	0.005	194.44	0.027		
193.40	0.005	194.46	0.027		
193.42	0.005	194.48	0.027		
193.44	0.005	194.50	0.028		
193.46	0.006	194.52	0.028		
193.48	0.006	194.54	0.028		
193.50	0.006	194.56	0.029		
193.52	0.007	194.58	0.029		
193.54	0.007	194.60	0.029		
193.56	0.008	194.62	0.030		
193.58	0.008	194.64	0.030		
193.60	0.009	194.66	0.030		
193.62	0.009	194.68	0.030		
193.64	0.009	194.70	0.031		
193.66	0.010	194.72	0.031		
193.68	0.010	194.74	0.031		
193.70	0.011	194.76	0.031		
193.72	0.011	194.78	0.032		
193.74	0.012	194.80	0.032		
193.76	0.012	194.82	0.032		
193.78	0.013	194.84	0.033		
193.80	0.013	194.86	0.033		
193.82	0.014	194.88	0.033		
193.84	0.014	194.90	0.033		
193.86	0.015	194.92	0.033		
193.88	0.015	194.94	0.034		
193.90	0.015	194.96	0.034		
193.92	0.016	194.98	0.034		
193.94	0.016	195.00	0.034		
193.96	0.017	195.02	0.035		
193.98	0.017	195.04	0.035		
194.00	0.018	195.06	0.035		
194.02	0.018	195.08	0.035		
194.04	0.019	195.10	0.036		

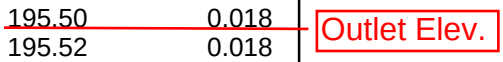


Stage-Area-Storage for Pond 8: UG #8 SC-310 for CB 77

Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)
193.00	0.000	194.06	0.017	195.12	0.032
193.02	0.000	194.08	0.018	195.14	0.033
193.04	0.000	194.10	0.018	195.16	0.033
193.06	0.001	194.12	0.018	195.18	0.033
193.08	0.001	194.14	0.019	195.20	0.033
193.10	0.001	194.16	0.019	195.22	0.034
193.12	0.001	194.18	0.019	195.24	0.034
193.14	0.002	194.20	0.020	195.26	0.034
193.16	0.002	194.22	0.020	195.28	0.034
193.18	0.002	194.24	0.021	195.30	0.034
193.20	0.002	194.26	0.021	195.32	**0.035**
193.22	0.002	194.28	0.021		
193.24	0.003	194.30	0.022		
193.26	0.003	194.32	0.022		
193.28	0.003	194.34	0.022		
193.30	0.003	194.36	0.023		
193.32	0.004	194.38	0.023		
193.34	0.004	194.40	0.023		
193.36	0.004	194.42	0.024		
193.38	0.004	194.44	0.024		
193.40	0.004	194.46	0.024		
193.42	0.005	194.48	0.025		
193.44	0.005	194.50	0.025	Outlet Elev.	
193.46	0.005	194.52	0.025		
193.48	0.005	194.54	0.026		
193.50	0.006	194.56	0.026		
193.52	0.006	194.58	0.026		
193.54	0.006	194.60	0.026		
193.56	0.007	194.62	0.027		
193.58	0.007	194.64	0.027		
193.60	0.008	194.66	0.027		
193.62	0.008	194.68	0.027		
193.64	0.009	194.70	0.028		
193.66	0.009	194.72	0.028		
193.68	0.009	194.74	0.028		
193.70	0.010	194.76	0.028		
193.72	0.010	194.78	0.029		
193.74	0.011	194.80	0.029		
193.76	0.011	194.82	0.029		
193.78	0.011	194.84	0.029		
193.80	0.012	194.86	0.030		
193.82	0.012	194.88	0.030		
193.84	0.013	194.90	0.030		
193.86	0.013	194.92	0.030		
193.88	0.014	194.94	0.030		
193.90	0.014	194.96	0.031		
193.92	0.014	194.98	0.031		
193.94	0.015	195.00	0.031		
193.96	0.015	195.02	0.031		
193.98	0.016	195.04	0.032		
194.00	0.016	195.06	0.032		
194.02	0.016	195.08	0.032		
194.04	0.017	195.10	0.032		

Stage-Area-Storage for Pond 9: UG #9 for CB 78

Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)
194.00	0.000	195.06	0.012	196.12	0.024
194.02	0.000	195.08	0.013	196.14	0.024
194.04	0.000	195.10	0.013	196.16	0.024
194.06	0.000	195.12	0.013	196.18	0.024
194.08	0.001	195.14	0.013	196.20	0.024
194.10	0.001	195.16	0.014	196.22	0.024
194.12	0.001	195.18	0.014	196.24	0.025
194.14	0.001	195.20	0.014	196.26	0.025
194.16	0.001	195.22	0.015	196.28	0.025
194.18	0.001	195.24	0.015	196.30	0.025
194.20	0.002	195.26	0.015	196.32	**0.025**
194.22	0.002	195.28	0.015		
194.24	0.002	195.30	0.016		
194.26	0.002	195.32	0.016		
194.28	0.002	195.34	0.016		
194.30	0.002	195.36	0.016		
194.32	0.003	195.38	0.017		
194.34	0.003	195.40	0.017		
194.36	0.003	195.42	0.017		
194.38	0.003	195.44	0.017		
194.40	0.003	195.46	0.018		
194.42	0.003	195.48	0.018		
194.44	0.004	195.50	0.018		
194.46	0.004	195.52	0.018		
194.48	0.004	195.54	0.018		
194.50	0.004	195.56	0.019		
194.52	0.004	195.58	0.019		
194.54	0.005	195.60	0.019		
194.56	0.005	195.62	0.019		
194.58	0.005	195.64	0.019		
194.60	0.006	195.66	0.020		
194.62	0.006	195.68	0.020		
194.64	0.006	195.70	0.020		
194.66	0.007	195.72	0.020		
194.68	0.007	195.74	0.020		
194.70	0.007	195.76	0.021		
194.72	0.007	195.78	0.021		
194.74	0.008	195.80	0.021		
194.76	0.008	195.82	0.021		
194.78	0.008	195.84	0.021		
194.80	0.009	195.86	0.021		
194.82	0.009	195.88	0.022		
194.84	0.009	195.90	0.022		
194.86	0.010	195.92	0.022		
194.88	0.010	195.94	0.022		
194.90	0.010	195.96	0.022		
194.92	0.010	195.98	0.022		
194.94	0.011	196.00	0.023		
194.96	0.011	196.02	0.023		
194.98	0.011	196.04	0.023		
195.00	0.012	196.06	0.023		
195.02	0.012	196.08	0.023		
195.04	0.012	196.10	0.023		



Stage-Area-Storage for Pond 10: UG #10 for CB 79

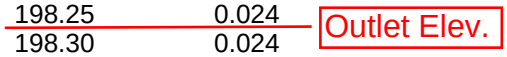
Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)
194.00	0.000	195.06	0.011	196.12	0.021
194.02	0.000	195.08	0.011	196.14	0.021
194.04	0.000	195.10	0.011	196.16	0.021
194.06	0.000	195.12	0.012	196.18	0.021
194.08	0.001	195.14	0.012	196.20	0.021
194.10	0.001	195.16	0.012	196.22	0.021
194.12	0.001	195.18	0.012	196.24	0.021
194.14	0.001	195.20	0.012	196.26	0.022
194.16	0.001	195.22	0.013	196.28	0.022
194.18	0.001	195.24	0.013	196.30	0.022
194.20	0.001	195.26	0.013	196.32	**0.022**
194.22	0.002	195.28	0.013		
194.24	0.002	195.30	0.014		
194.26	0.002	195.32	0.014		
194.28	0.002	195.34	0.014		
194.30	0.002	195.36	0.014		
194.32	0.002	195.38	0.015		
194.34	0.002	195.40	0.015		
194.36	0.003	195.42	0.015		
194.38	0.003	195.44	0.015		
194.40	0.003	195.46	0.015		
194.42	0.003	195.48	0.016		
194.44	0.003	195.50	0.016		
194.46	0.003	195.52	0.016		
194.48	0.003	195.54	0.016		
194.50	0.004	195.56	0.016		
194.52	0.004	195.58	0.017		
194.54	0.004	195.60	0.017		
194.56	0.004	195.62	0.017		
194.58	0.005	195.64	0.017		
194.60	0.005	195.66	0.017		
194.62	0.005	195.68	0.017		
194.64	0.005	195.70	0.018	Outlet Elev.	
194.66	0.006	195.72	0.018		
194.68	0.006	195.74	0.018		
194.70	0.006	195.76	0.018		
194.72	0.006	195.78	0.018		
194.74	0.007	195.80	0.018		
194.76	0.007	195.82	0.018		
194.78	0.007	195.84	0.019		
194.80	0.008	195.86	0.019		
194.82	0.008	195.88	0.019		
194.84	0.008	195.90	0.019		
194.86	0.008	195.92	0.019		
194.88	0.009	195.94	0.019		
194.90	0.009	195.96	0.019		
194.92	0.009	195.98	0.020		
194.94	0.009	196.00	0.020		
194.96	0.010	196.02	0.020		
194.98	0.010	196.04	0.020		
195.00	0.010	196.06	0.020		
195.02	0.010	196.08	0.020		
195.04	0.011	196.10	0.020		

Stage-Area-Storage for Pond 11: UG #11 for CBs 80 & 81

Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)
194.00	0.000	195.06	0.014	196.12	0.027
194.02	0.000	195.08	0.014	196.14	0.027
194.04	0.000	195.10	0.015	196.16	0.027
194.06	0.001	195.12	0.015	196.18	0.027
194.08	0.001	195.14	0.015	196.20	0.027
194.10	0.001	195.16	0.016	196.22	0.028
194.12	0.001	195.18	0.016	196.24	0.028
194.14	0.001	195.20	0.016	196.26	0.028
194.16	0.001	195.22	0.017	196.28	0.028
194.18	0.002	195.24	0.017	196.30	0.028
194.20	0.002	195.26	0.017	196.32	**0.029**
194.22	0.002	195.28	0.017		
194.24	0.002	195.30	0.018		
194.26	0.002	195.32	0.018		
194.28	0.003	195.34	0.018		
194.30	0.003	195.36	0.019		
194.32	0.003	195.38	0.019		
194.34	0.003	195.40	0.019		
194.36	0.003	195.42	0.019		
194.38	0.003	195.44	0.020		
194.40	0.004	195.46	0.020		
194.42	0.004	195.48	0.020		
194.44	0.004	195.50	0.021		
194.46	0.004	195.52	0.021		
194.48	0.004	195.54	0.021		
194.50	0.005	195.56	0.021		
194.52	0.005	195.58	0.022		
194.54	0.005	195.60	0.022		
194.56	0.006	195.62	0.022		
194.58	0.006	195.64	0.022		
194.60	0.006	195.66	0.022		
194.62	0.007	195.68	0.023		
194.64	0.007	195.70	0.023	Outlet Elev.	
194.66	0.007	195.72	0.023		
194.68	0.008	195.74	0.023		
194.70	0.008	195.76	0.023		
194.72	0.008	195.78	0.024		
194.74	0.009	195.80	0.024		
194.76	0.009	195.82	0.024		
194.78	0.009	195.84	0.024		
194.80	0.010	195.86	0.024		
194.82	0.010	195.88	0.025		
194.84	0.010	195.90	0.025		
194.86	0.011	195.92	0.025		
194.88	0.011	195.94	0.025		
194.90	0.011	195.96	0.025		
194.92	0.012	195.98	0.025		
194.94	0.012	196.00	0.026		
194.96	0.012	196.02	0.026		
194.98	0.013	196.04	0.026		
195.00	0.013	196.06	0.026		
195.02	0.013	196.08	0.026		
195.04	0.014	196.10	0.027		

Stage-Area-Storage for Pond 12: UG #12 for CBs 82 & 83

Elevation (feet)	Storage (acre-feet)
195.00	0.000
195.05	0.000
195.10	0.001
195.15	0.001
195.20	0.001
195.25	0.001
195.30	0.002
195.35	0.002
195.40	0.002
195.45	0.002
195.50	0.003
195.55	0.003
195.60	0.004
195.65	0.004
195.70	0.004
195.75	0.005
195.80	0.005
195.85	0.006
195.90	0.006
195.95	0.007
196.00	0.007
196.05	0.008
196.10	0.008
196.15	0.009
196.20	0.009
196.25	0.010
196.30	0.010
196.35	0.010
196.40	0.011
196.45	0.011
196.50	0.012
196.55	0.012
196.60	0.013
196.65	0.013
196.70	0.014
196.75	0.014
196.80	0.014
196.85	0.015
196.90	0.015
196.95	0.016
197.00	0.016
197.05	0.016
197.10	0.017
197.15	0.017
197.20	0.018
197.25	0.018
197.30	0.018
197.35	0.019
197.40	0.019
197.45	0.020
197.50	0.020
197.55	0.020
197.60	0.021
197.65	0.021
197.70	0.021
197.75	0.022
197.80	0.022
197.85	0.022
197.90	0.022
197.95	0.023
198.00	0.023
198.05	0.023
198.10	0.023
198.15	0.024
198.20	0.024
198.25	0.024
198.30	0.024
198.35	0.025
198.40	0.025
198.45	0.025
198.50	**0.025**



Stage-Area-Storage for Pond 13: UG #13 for CBs 48, 49, 50

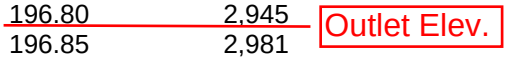
Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
195.00	0	196.06	4,081	197.12	7,710
195.02	51	196.08	4,174	197.14	7,762
195.04	103	196.10	4,266	197.16	7,813
195.06	154	196.12	4,359	197.18	7,864
195.08	206	196.14	4,450	197.20	7,916
195.10	257	196.16	4,541	197.22	7,967
195.12	308	196.18	4,631	197.24	8,019
195.14	360	196.20	4,721	197.26	8,070
195.16	411	196.22	4,809	197.28	8,121
195.18	462	196.24	4,897	197.30	8,173
195.20	514	196.26	4,984	197.32	**8,224**
195.22	565	196.28	5,071		
195.24	617	196.30	5,156		
195.26	668	196.32	5,241		
195.28	719	196.34	5,325		
195.30	771	196.36	5,408		
195.32	822	196.38	5,489		
195.34	873	196.40	5,570		
195.36	925	196.42	5,650		
195.38	976	196.44	5,729		
195.40	1,028	196.46	5,807		
195.42	1,079	196.48	5,883		
195.44	1,130	196.50	5,958		
195.46	1,182	196.52	6,031		
195.48	1,233	196.54	6,103		
195.50	1,284	196.56	6,173		
195.52	1,388	196.58	6,240		
195.54	1,492	196.60	6,306		
195.56	1,596	196.62	6,370		
195.58	1,700	196.64	6,432		
195.60	1,803	196.66	6,493		
195.62	1,907	196.68	6,552		
195.64	2,010	196.70	6,610		
195.66	2,112	196.72	6,667		
195.68	2,215	196.74	6,723		
195.70	2,317	196.76	6,779		
195.72	2,418	196.78	6,833		
195.74	2,520	196.80	6,887		
195.76	2,621	196.82	6,939		
195.78	2,721	196.84	6,991	Outlet Elev.	
195.80	2,821	196.86	7,042		
195.82	2,921	196.88	7,094		
195.84	3,021	196.90	7,145		
195.86	3,119	196.92	7,197		
195.88	3,218	196.94	7,248		
195.90	3,316	196.96	7,299		
195.92	3,413	196.98	7,351		
195.94	3,510	197.00	7,402		
195.96	3,607	197.02	7,453		
195.98	3,702	197.04	7,505		
196.00	3,798	197.06	7,556		
196.02	3,893	197.08	7,608		
196.04	3,987	197.10	7,659		

Stage-Area-Storage for Pond 14: UG #14 for CBs 41, 42

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
195.00	0	196.06	2,921	197.12	5,521
195.02	37	196.08	2,988	197.14	5,558
195.04	74	196.10	3,054	197.16	5,595
195.06	111	196.12	3,120	197.18	5,632
195.08	148	196.14	3,185	197.20	5,669
195.10	184	196.16	3,250	197.22	5,706
195.12	221	196.18	3,314	197.24	5,743
195.14	258	196.20	3,378	197.26	5,779
195.16	295	196.22	3,442	197.28	5,816
195.18	332	196.24	3,505	197.30	5,853
195.20	369	196.26	3,567	197.32	**5,890**
195.22	406	196.28	3,629		
195.24	443	196.30	3,690		
195.26	480	196.32	3,751		
195.28	517	196.34	3,811		
195.30	553	196.36	3,870		
195.32	590	196.38	3,928		
195.34	627	196.40	3,986		
195.36	664	196.42	4,044		
195.38	701	196.44	4,100		
195.40	738	196.46	4,155		
195.42	775	196.48	4,210		
195.44	812	196.50	4,264		
195.46	849	196.52	4,316		
195.48	886	196.54	4,368		
195.50	922	196.56	4,417		
195.52	997	196.58	4,466		
195.54	1,071	196.60	4,513		
195.56	1,145	196.62	4,559		
195.58	1,219	196.64	4,604	Outlet Elev.	
195.60	1,293	196.66	4,647		
195.62	1,367	196.68	4,689		
195.64	1,441	196.70	4,731		
195.66	1,514	196.72	4,772		
195.68	1,587	196.74	4,812		
195.70	1,660	196.76	4,852		
195.72	1,733	196.78	4,891		
195.74	1,805	196.80	4,930		
195.76	1,877	196.82	4,967		
195.78	1,949	196.84	5,005		
195.80	2,021	196.86	5,041		
195.82	2,092	196.88	5,078		
195.84	2,163	196.90	5,115		
195.86	2,234	196.92	5,152		
195.88	2,304	196.94	5,189		
195.90	2,374	196.96	5,226		
195.92	2,444	196.98	5,263		
195.94	2,513	197.00	5,300		
195.96	2,582	197.02	5,337		
195.98	2,651	197.04	5,374		
196.00	2,719	197.06	5,410		
196.02	2,786	197.08	5,447		
196.04	2,854	197.10	5,484		

Stage-Area-Storage for Pond 15: UG #15 for CB 43

Elevation (feet)	Storage (cubic-feet)
194.00	0
194.05	32
194.10	64
194.15	96
194.20	128
194.25	160
194.30	192
194.35	225
194.40	257
194.45	289
194.50	321
194.55	386
194.60	452
194.65	517
194.70	582
194.75	647
194.80	712
194.85	776
194.90	840
194.95	905
195.00	968
195.05	1,032
195.10	1,095
195.15	1,158
195.20	1,221
195.25	1,283
195.30	1,345
195.35	1,407
195.40	1,468
195.45	1,529
195.50	1,590
195.55	1,650
195.60	1,710
195.65	1,769
195.70	1,828
195.75	1,886
195.80	1,944
195.85	2,002
195.90	2,059
195.95	2,115
196.00	2,171
196.05	2,226
196.10	2,281
196.15	2,335
196.20	2,388
196.25	2,440
196.30	2,492
196.35	2,542
196.40	2,592
196.45	2,641
196.50	2,689
196.55	2,736
196.60	2,781
196.65	2,825
196.70	2,868
196.75	2,908
196.80	2,945
196.85	2,981
196.90	3,016
196.95	3,050
197.00	3,082
197.05	3,114
197.10	3,146
197.15	3,178
197.20	3,210
197.25	3,242
197.30	3,275
197.35	3,307
197.40	3,339
197.45	3,371
197.50	**3,403**



Stage-Area-Storage for Pond 16: UG #16 for CBs 45, 46, 47

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
195.00	0	197.65	2,825
195.05	32	197.70	2,868
195.10	64	197.75	2,908
195.15	96	197.80	2,945
195.20	128	197.85	2,981
195.25	160	197.90	3,016
195.30	192	197.95	3,050
195.35	225	198.00	3,082
195.40	257	198.05	3,114
195.45	289	198.10	3,146
195.50	321	198.15	3,178
195.55	386	198.20	3,210
195.60	452	198.25	3,242
195.65	517	198.30	3,275
195.70	582	198.35	3,307
195.75	647	198.40	3,339
195.80	712	198.45	3,371
195.85	776	198.50	**3,403**
195.90	840		
195.95	905		
196.00	968		
196.05	1,032		
196.10	1,095		
196.15	1,158		
196.20	1,221		
196.25	1,283		
196.30	1,345		
196.35	1,407		
196.40	1,468		
196.45	1,529		
196.50	1,590		
196.55	1,650		
196.60	1,710		
196.65	1,769		
196.70	1,828		
196.75	1,886		
196.80	1,944		
196.85	2,002		
196.90	2,059		
196.95	2,115		
197.00	2,171		
197.05	2,226		
197.10	2,281		
197.15	2,335		
197.20	2,388		
197.25	2,440	Outlet Elev.	
197.30	2,492		
197.35	2,542		
197.40	2,592		
197.45	2,641		
197.50	2,689		
197.55	2,736		
197.60	2,781		

Maynard Crossing
129 Parker Street
Maynard, Massachusetts

MA DEP Standard 4: Water Quality Volume Calculations
Raingarden & Basin #3

Water Quality Volume Required to Raingarden	
Water Quality Volume runoff (in.)	1.0
Impervious Area (SF)*	19,423
Required Water Quality Volume (CF)	1,619

Water Quality Volume Provided	
Within raingarden	1,947

Water Quality Volume Required to Basin #3	
Water Quality Volume runoff (in.)	1.0
Impervious Area (SF)*	63,809
Required Water Quality Volume (CF)	5,317

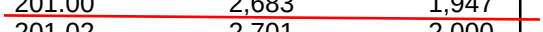
Water Quality Volume Provided	
Within Basin #3	8,869

Prepared By: Bohler Engineering
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

6/28/2017

Stage-Area-Storage for Pond RG: Raingarden

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
200.00	1,210	0
200.02	1,239	24
200.04	1,269	50
200.06	1,298	75
200.08	1,328	102
200.10	1,357	128
200.12	1,387	156
200.14	1,416	184
200.16	1,446	212
200.18	1,475	242
200.20	1,505	271
200.22	1,534	302
200.24	1,564	333
200.26	1,593	364
200.28	1,622	397
200.30	1,652	429
200.32	1,681	463
200.34	1,711	497
200.36	1,740	531
200.38	1,770	566
200.40	1,799	602
200.42	1,829	638
200.44	1,858	675
200.46	1,888	712
200.48	1,917	750
200.50	1,947	789
200.52	1,976	828
200.54	2,005	868
200.56	2,035	909
200.58	2,064	950
200.60	2,094	991
200.62	2,123	1,033
200.64	2,153	1,076
200.66	2,182	1,119
200.68	2,212	1,163
200.70	2,241	1,208
200.72	2,271	1,253
200.74	2,300	1,299
200.76	2,329	1,345
200.78	2,359	1,392
200.80	2,388	1,439
200.82	2,418	1,487
200.84	2,447	1,536
200.86	2,477	1,585
200.88	2,506	1,635
200.90	2,536	1,686
200.92	2,565	1,737
200.94	2,595	1,788
200.96	2,624	1,840
200.98	2,654	1,893
201.00	2,683	1,947
201.02	2,701	2,000
201.04	2,718	2,055
201.06	2,736	2,109
201.08	2,754	2,164
201.10	2,771	2,219
201.12	2,789	2,275
201.14	2,807	2,331
201.16	2,824	2,387
201.18	2,842	2,444
201.20	2,860	2,501
201.22	2,877	2,558
201.24	2,895	2,616
201.26	2,913	2,674
201.28	2,930	2,732
201.30	**2,948**	**2,791**



Stage-Area-Storage for Pond B3: Open Basin 3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
197.00	4,911	0
197.05	4,968	247
197.10	5,025	497
197.15	5,082	750
197.20	5,140	1,005
197.25	5,197	1,263
197.30	5,254	1,525
197.35	5,311	1,789
197.40	5,368	2,056
197.45	5,425	2,326
197.50	5,483	2,598
197.55	5,540	2,874
197.60	5,597	3,152
197.65	5,654	3,434
197.70	5,711	3,718
197.75	5,768	4,005
197.80	5,825	4,295
197.85	5,883	4,587
197.90	5,940	4,883
197.95	5,997	5,181
198.00	6,054	5,483
198.05	6,198	5,789
198.10	6,342	6,102
198.15	6,485	6,423
198.20	6,629	6,751
198.25	6,773	7,086
198.30	6,917	7,428
198.35	7,061	7,778
198.40	7,204	8,134
198.45	7,348	8,498
198.50	7,492	8,869
198.55	7,636	9,247
198.60	7,780	9,633
198.65	7,923	10,025
198.70	8,067	10,425
198.75	8,211	10,832
198.80	8,355	11,246
198.85	8,499	11,667
198.90	8,642	12,096
198.95	8,786	12,532
199.00	8,930	12,975
199.05	8,997	13,423
199.10	9,064	13,874
199.15	9,130	14,329
199.20	9,197	14,787
199.25	9,264	15,249
199.30	9,331	15,714
199.35	9,398	16,182
199.40	9,464	16,653
199.45	9,531	17,128
199.50	9,598	17,607
199.55	9,665	18,088
199.60	9,732	18,573
199.65	9,798	19,061
199.70	9,865	19,553
199.75	9,932	20,048
199.80	9,999	20,546
199.85	10,066	21,048
199.90	10,132	21,553
199.95	10,199	22,061
200.00	**10,266**	**22,573**

Outlet Elevation

Stage-Area-Storage for Pond BP: Central Pond (Proposed)

Elevation (feet)	Storage (cubic-feet)
189.00	0
189.15	1,982
189.30	4,097
189.45	6,334
189.60	8,687
189.75	11,155
189.90	13,734
190.05	16,424
190.20	19,204
190.35	22,068
190.50	25,016
190.65	28,046
190.80	31,157
190.95	34,350
191.10	37,620
191.25	40,960
191.40	44,366
191.55	47,840
191.70	51,379
191.85	54,985
192.00	58,655
192.15	62,393
192.30	66,199
192.45	70,074
192.60	74,017
192.75	78,026
192.90	82,102
193.05	86,243
193.20	90,449
193.35	94,719
193.50	99,053
193.65	103,446
193.80	107,897
193.95	112,396
194.10	116,950
194.25	121,670
194.40	126,571
194.55	131,650
194.70	136,910
194.85	142,350
195.00	147,969
195.15	153,769
195.30	159,748
195.45	165,908
195.60	172,249
195.75	178,769
195.90	185,470
196.05	192,309
196.20	198,736
196.35	204,582
196.50	209,847
196.65	214,531
196.80	218,634
196.95	222,156
197.10	225,397
197.25	229,335
197.40	234,043
197.55	239,522
197.70	245,772
197.85	252,794
198.00	260,586
198.15	268,812
198.30	277,136
198.45	285,559
198.60	294,079
198.75	302,697
198.90	311,412
199.05	320,226
199.20	329,141
199.35	338,159
199.50	347,278
199.65	356,500
199.80	365,824
199.95	**375,250**

LOWEST OUTLET ELEV (193.25)

WATER QUALITY VOLUME PROVIDED IS EQUAL TO HALF OF THE PERMANENT POOL VOLUME = 45,225 CF

Maynard Crossing
129 Parker Street
Maynard, Massachusetts

Forebay Sizing Calculations

Forebay #1 (west)	
Total Post Development Impervious Area (acres)	14.7
Total Post Development Impervious Area (SF)	640,332
Forebay Volume Required (CF)	5336.1
Forebay Volume Provided (CF)*	**5,485**

Forebay #2 (east)	
Total Post Development Impervious Area (acres)	7.51
Total Post Development Impervious Area (SF)	327,136
Forebay Volume Required (CF)	2726.13
Forebay Volume Provided (CF)*	**3,035**

Prepared By: Bohler Engineering
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

6/27/2017

Stage-Area-Storage for Pond FW: West Forebay

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
193.00	2,892	0
193.02	2,905	58
193.04	2,918	116
193.06	2,930	175
193.08	2,943	233
193.10	2,956	292
193.12	2,969	352
193.14	2,982	411
193.16	2,995	471
193.18	3,007	531
193.20	3,020	591
193.22	3,033	652
193.24	3,045	712
193.26	3,058	774
193.28	3,071	835
193.30	3,084	896
193.32	3,096	958
193.34	3,109	1,020
193.36	3,122	1,083
193.38	3,135	1,145
193.40	3,148	1,208
193.42	3,160	1,271
193.44	3,173	1,334
193.46	3,186	1,398
193.48	3,199	1,462
193.50	3,212	1,526
193.52	3,224	1,590
193.54	3,237	1,655
193.56	3,250	1,720
193.58	3,263	1,785
193.60	3,275	1,850
193.62	3,288	1,916
193.64	3,301	1,982
193.66	3,314	2,048
193.68	3,327	2,114
193.70	3,339	2,181
193.72	3,352	2,248
193.74	3,365	2,315
193.76	3,378	2,382
193.78	3,390	2,450
193.80	3,403	2,518
193.82	3,416	2,586
193.84	3,429	2,655
193.86	3,442	2,723
193.88	3,454	2,792
193.90	3,467	2,862
193.92	3,480	2,931
193.94	3,493	3,001
193.96	3,505	3,071
193.98	3,518	3,141
194.00	3,531	3,212
194.02	3,545	3,282
194.04	3,559	3,353
194.06	3,573	3,425
194.08	3,587	3,496
194.10	3,601	3,568
194.12	3,615	3,640
194.14	3,628	3,713
194.16	3,642	3,785
194.18	3,656	3,858
194.20	3,670	3,932
194.22	3,684	4,005
194.24	3,698	4,079
194.26	3,712	4,153
194.28	3,726	4,227
194.30	3,740	4,302
194.32	3,754	4,377
194.34	3,768	4,452
194.36	3,782	4,528
194.38	3,795	4,604
194.40	3,809	4,680
194.42	3,823	4,756
194.44	3,837	4,833
194.46	3,851	4,909
194.48	3,865	4,987
194.50	3,879	5,064
194.52	3,893	5,142
194.54	3,907	5,220
194.56	3,921	5,298
194.58	3,935	5,377
194.60	3,949	5,455
194.62	3,963	5,534
194.64	3,976	5,614
194.66	3,990	5,694
194.68	4,004	5,773
194.70	4,018	5,854
194.72	4,032	5,934
194.74	4,046	6,015
194.76	4,060	6,096
194.78	4,074	6,177
194.80	4,088	6,259
194.82	4,102	6,341
194.84	4,116	6,423
194.86	4,130	6,506
194.88	4,143	6,588
194.90	4,157	6,671
194.92	4,171	6,755
194.94	4,185	6,838
194.96	4,199	6,922
194.98	4,213	7,006
195.00	**4,227**	**7,091**

Volume below water surface not included

Forebay berm crest elev.
Forebay volume:
6,259 - 774= 5,485 cf

Stage-Area-Storage for Pond FE: East Forebay

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
193.00	2,156	0
193.05	2,185	109
193.10	2,214	219
193.15	2,243	330
193.20	2,272	443
193.25	2,301	557
193.30	2,330	673
193.35	2,359	790
193.40	2,388	909
193.45	2,417	1,029
193.50	2,447	1,151
193.55	2,476	1,274
193.60	2,505	1,398
193.65	2,534	1,524
193.70	2,563	1,652
193.75	2,592	1,780
193.80	2,621	1,911
193.85	2,650	2,042
193.90	2,679	2,176
193.95	2,708	2,310
194.00	2,737	2,447
194.05	2,769	2,584
194.10	2,801	2,723
194.15	2,833	2,864
194.20	2,865	3,007
194.25	2,897	3,151
194.30	2,928	3,296
194.35	2,960	3,444
194.40	2,992	3,592
194.45	3,024	3,743
194.50	3,056	3,895
194.55	3,088	4,048
194.60	3,120	4,204
194.65	3,152	4,360
194.70	3,184	4,519
194.75	3,216	4,679
194.80	3,247	4,840
194.85	3,279	5,003
194.90	3,311	5,168
194.95	3,343	5,335
195.00	3,375	5,503
195.05	3,410	5,672
195.10	3,444	5,843
195.15	3,479	6,017
195.20	3,514	6,191
195.25	3,549	6,368
195.30	3,584	6,546
195.35	3,618	6,726
195.40	3,653	6,908
195.45	3,688	7,092
195.50	3,723	7,277
195.55	3,757	7,464
195.60	3,792	7,653
195.65	3,827	7,843
195.70	3,861	8,035
195.75	3,896	8,229
195.80	3,931	8,425
195.85	3,966	8,622
195.90	4,001	8,821
195.95	4,035	9,022
196.00	**4,070**	**9,225**

Volume below water surface not included

Forebay berm crest elev.
Forebay volume:
3,592 - 557 = 3,035 cf

VORTECHS SYSTEM® ESTIMATED NET ANNUAL TSS REDUCTION

CONTECH ENGINEERED SOLUTIONS

MAYNARD CROSSING
MAYNARD, MA
MODEL NAME VORTECHS 4000
SITE DESIGNATION MH-W

Design Ratio[1] = $\frac{(4.39 \text{ acres}) \times (0.9) \times (449 \text{ gpm/cfs})}{(28.3 \text{ sf})}$ **= 62.7**

Estimated bypass occurs at an elevation of 2.5' (at approximately 84 gpm/sf) above inlet invert*
***assuming a weir length of 4 ft**

Rainfall Intensity "/hr	Operating Rate[2] gpm/sf	Treated Flow cfs	% Total Rainfall Volume[3]	Rmvl. Effcy[4] (%)	Rel. Effcy (%)
0.02	1.3	0.08	10.2%	98.0%	10.0%
0.04	2.5	0.15	9.6%	98.0%	9.5%
0.06	3.8	0.23	9.4%	98.0%	9.3%
0.08	5.0	0.30	7.7%	98.0%	7.6%
0.10	6.3	0.38	8.6%	98.0%	8.4%
0.12	7.5	0.45	6.3%	97.6%	6.1%
0.14	8.8	0.53	4.7%	96.9%	4.5%
0.16	10.0	0.60	4.6%	96.0%	4.5%
0.18	11.3	0.68	3.5%	95.3%	3.4%
0.20	12.5	0.75	4.3%	94.7%	4.1%
0.25	15.7	0.94	8.0%	91.8%	7.3%
0.30	18.8	1.13	5.6%	88.8%	5.0%
0.35	21.9	1.32	4.4%	86.8%	3.8%
0.40	25.1	1.50	2.5%	84.9%	2.1%
0.45	28.2	1.69	2.5%	83.1%	2.1%
0.50	31.4	1.88	1.4%	81.7%	1.1%
0.75	47.0	2.82	5.0%	67.7%	3.4%
1.00	62.7	3.76	1.0%	56.4%	0.6%
1.50	50.6	3.04	0.0%	13.8%	0.0%
2.00	57.7	3.46	0.0%	8.0%	0.0%
3.00	71.1	4.27	0.2%	8.0%	0.0%
					92.7%
				% rain falling at >3"/hr or bypassing treatment =	0.3%
				Assumed removal efficiency for bypassed flows =	0.0%
				Estimated reduction in efficiency[4] =	6.5%
				Predicted Net Annual Load Removal Efficiency =	**86%**

1 - Design Ratio = (Total Drainage Area) x (Runoff Coefficient) x (cfs to gpm conversion) / Grit Chamber Area
- The Total Drainage Area and Runoff Coefficient is specified by the site engineer.
- The conversion factor from cfs to gpm is 449.

2 - Operating Rate (gpm/sf) = intensity ("/hr) x Design Ratio.
3 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
4- Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Calculated by:	CJA	6/23/17	Checked by:

VORTECHS SYSTEM® ESTIMATED NET ANNUAL TSS REDUCTION

CONTECH ENGINEERED SOLUTIONS

MAYNARD CROSSING
MAYNARD, MA
MODEL NAME VORTECHS 5000
SITE DESIGNATION MH-G

Design Ratio[1] = $\frac{(5.79 \text{ acres}) \times (0.9) \times (449 \text{ gpm/cfs})}{(38.5 \text{ sf})}$ **= 60.7**

Estimated bypass occurs at an elevation of 2.6' (at approximately 82 gpm/sf) above inlet invert*
***assuming a weir length of 4 ft**

Rainfall Intensity "/hr	Operating Rate[2] gpm/sf	Treated Flow cfs	% Total Rainfall Volume[3]	Rmvl. Effcy[4] (%)	Rel. Effcy (%)
0.02	1.2	0.10	10.2%	98.0%	10.0%
0.04	2.4	0.21	9.6%	98.0%	9.5%
0.06	3.6	0.31	9.4%	98.0%	9.3%
0.08	4.9	0.41	7.7%	98.0%	7.6%
0.10	6.1	0.52	8.6%	98.0%	8.4%
0.12	7.3	0.62	6.3%	97.6%	6.1%
0.14	8.5	0.72	4.7%	96.9%	4.5%
0.16	9.7	0.83	4.6%	96.3%	4.5%
0.18	10.9	0.93	3.5%	96.0%	3.4%
0.20	12.1	1.03	4.3%	94.7%	4.1%
0.25	15.2	1.29	8.0%	91.8%	7.3%
0.30	18.2	1.55	5.6%	88.8%	5.0%
0.35	21.2	1.81	4.4%	86.8%	3.8%
0.40	24.3	2.06	2.5%	85.3%	2.2%
0.45	27.3	2.32	2.5%	83.8%	2.1%
0.50	30.4	2.58	1.4%	82.0%	1.1%
0.75	45.5	3.87	5.0%	69.9%	3.5%
1.00	60.7	5.16	1.0%	58.0%	0.6%
1.50	57.2	4.86	0.0%	17.1%	0.0%
2.00	66.7	5.67	0.0%	8.0%	0.0%
3.00	83.9	7.13	0.2%	8.0%	0.0%
					93.0%
				% rain falling at >3"/hr or bypassing treatment =	0.3%
				Assumed removal efficiency for bypassed flows =	0.0%
				Estimated reduction in efficiency[4] =	6.5%
				Predicted Net Annual Load Removal Efficiency =	**86%**

1 - Design Ratio = (Total Drainage Area) x (Runoff Coefficient) x (cfs to gpm conversion) / Grit Chamber Area
- The Total Drainage Area and Runoff Coefficient is specified by the site engineer.
- The conversion factor from cfs to gpm is 449.

2 - Operating Rate (gpm/sf) = intensity ("/hr) x Design Ratio.
3 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
4- Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Calculated by:	CJA	6/23/17	Checked by:

UNIVERSITY OF MASSACHUSETTS
AT AMHERST
Water Resources Research Center
Blaisdell House, UMass
310 Hicks Way
Amherst, MA 01003

Massachusetts Stormwater Evaluation Project

(413) 545-5532
(413) 545-2304 FAX
www.mastep.net

MASTEP Technology Review

Technology Name: Vortechs System. (Models 1000, 1100, 2000 and 4000 reviewed in these studies)

Studies Reviewed:

- NJCAT Technology Verification. Vortechs. April 2011
- A Study of the Effectiveness of a Vortechs Stormwater Treatment System for Removal of Total Suspended Solids, 2001. NYSDEC
- ETV Rpt. Stormwater Source Area Treatment Device. Vortechnics, inc. Vortechs System, Model 1000, 2005
- NJCAT Technology Verification Vortechnics, Inc. May 4, 2004
- Two Vendor-supplied studies conducted at Delorme Publishing Company, Yarmouth Maine

Date: 11/04/2011
Reviewer: Jerry Schoen

Rating: 1 for SSC, 2 for TSS

Brief rationale for rating: SSC rating is primarily based on the NJCAT 2011 field study; TSS on the ETV field study with some consideration of the NJCAT 2004 laboratory study. All have scientific merit. Both field studies (NJCAT and ETV) monitored 18 storms and provided detailed description of methods, quality control procedures and results. The NJCAT lab study tested a good range of flow rates, particle sizes, influent sediment concentrations. Problems: no scour test, large abnormally large particles sizes in the NJCAT field study; raw data not shown in ETV study, few details on test equipment or setup. Other studies reviewed offer some useful information, but had more significant quality control problems and/or lacked detailed discussion of methods.

TARP Requirements Not Met:

- NJCAT 2011: excessive quality control failure rate for TSS analysis
- ETV: At least 50% of annual rainfall must be sampled (36% was sampled)
- ETV: Minimum of 15” of precipitation must be sampled (11.8” were sampled)

Other Comments:

- NJCAT field study (2011). Conducted on a Vortechs Model 4000, at flows up to 97% design flow. Good documentation of quality control. Mean influent particle sizes were approximately 500 microns, well above the recommended < 100 microns. SSC results were reported for several discreet influent particle size ranges, with results of 52-95% depending on size. TSS and TVSS results not considered reliable in this study because of QC failures, likely due to the large particle sizes, which tend to skew results for this analysis method.
- ETV study: conducted on a Vortechs Model 1000. Quality control results were good, with the exception of some problems with outlet flow measurements. Inlet TSS concentrations were 46-305 mg/l, lower than the target of 100-300 mg/l. this is considered a strong point of the study, since performance usually suffers during “cleaner” storms. Similarly particle size analysis showed a high concentration of fines; most influent particles were less than 62 microns – producing influent sediments that are difficult to treat.
- NJCAT lab study: conducted on a Vortechs Model 2000. 64% TSS removal obtained.

Maynard Crossing
Weighted TSS Removal

Total Water Quality Volume Provided On Site	A	B	A x B
Stormwater BMP	Impervious Area Draining to BMP (Ac.)	TSS %	
CBs to wet basin (see below)	5.58	85	4.74
CBs to Water Quality Unit to wet basin	10.18	97	9.87
Raingarden to Basin #3	0.45	98	0.44
CBs to forebays to Basin #3	1.46	89	1.30
CBs to Isolator Rows to Infiltration	7.18	89	6.39
Totals	24.84		22.74
Total TSS Removal Percentage Provided On Site	**92%**		

Calculations exclude roof toop area

Calculation is a weighted average

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: CBs to Wet Basin

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Wet Basin	**0.80**	**0.75**	**0.60**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**

Total TSS Removal = **85%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project:

Prepared By: **Bohler Engineering**

Date:

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: CBs thru water quality unit to wet basin

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Separator	**0.80**	**0.75**	**0.60**	**0.15**
Wet basin (with forebays)	**0.80**	**0.15**	**0.12**	**0.03**

Total TSS Removal = **97%** **Completed for Each Outlet or**

Project: **W161189**

Prepared By: **Bohler Engineering**

Date: **5/31/2017**

*Equals remaining load from previous BMP (E) which enters the BMP

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: CBs to forebays to open infiltration basin

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Sediment Forebay	**0.25**	**0.75**	**0.19**	**0.56**
Infiltration Basin	**0.80**	**0.56**	**0.45**	**0.11**
	0.00	**0.11**	**0.00**	**0.11**
	0.00	**0.11**	**0.00**	**0.11**

Total TSS Removal = **89%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project:

Prepared By: **Bohler Engineering**

Date:

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Raingarden to open infiltration basin

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Rain Garden	**0.90**	**1.00**	**0.90**	**0.10**
Infiltration Basin	**0.80**	**0.10**	**0.08**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**

Total TSS Removal = **98%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project:

Prepared By: **Bohler Engineering**

Date:

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: CBs to Isolator Rows to Infiltration

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Stormtech Isolator Row	**0.25**	**0.75**	**0.19**	**0.56**
Underground Infiltration Basins	**0.80**	**0.56**	**0.45**	**0.11**

Total TSS Removal = **89%** **Completed for Each Outlet or**

Project: **W161189**

Prepared By: **Bohler Engineering**

Date: **5/31/2017**

*Equals remaining load from previous BMP (E) which enters the BMP

Maynard Crossing
129 Parker Street
Maynard, Massachusetts

MA DEP Standard 3: Drawdown Time Calculations

Drawdown Time - Basin #1	
Volume below outlet pipe (Rv) (CF)	14,985
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	10,213
Drawdown time (Hours)	7.3

Drawdown Time - Basin #2	
Volume below outlet pipe (Rv) (CF)	4,400
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	2,625
Drawdown time (Hours)	8.3

Drawdown Time - Basin #3	
Volume below outlet pipe (Rv) (CF)	8,869
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	6,450
Drawdown time (Hours)	6.8

Drawdown Time - Basin #3	
Volume below outlet pipe (Rv) (CF)	8,869
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	6,450
Drawdown time (Hours)	6.8

Drawdown Time - Basin #1	
Volume below outlet pipe (Rv) (CF)	0
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	10,213
Drawdown time (Hours)	0.0

Drawdown Time - Basin #2	
Volume below outlet pipe (Rv) (CF)	4,400
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	2,625
Drawdown time (Hours)	8.3

Prepared By: Bohler Engineering
352 Turnpike Road
Southborough, MA 01772
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Maynard Crossing
129 Parker Street
Maynard, Massachusetts

Drawdown Time - Basin #3	
Volume below outlet pipe (Rv) (CF)	8,869
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	6,450
Drawdown time (Hours)	6.8

Drawdown Time - Basin #4	
Volume below outlet pipe (Rv) (CF)	3,833
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	3,438
Drawdown time (Hours)	5.6

Drawdown Time - Basin #5	
Volume below outlet pipe (Rv) (CF)	305
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	259
Drawdown time (Hours)	5.9

Drawdown Time - Basin #6	
Volume below outlet pipe (Rv) (CF)	1,002
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	1,131
Drawdown time (Hours)	4.4

Drawdown Time - Basin #7	
Volume below outlet pipe (Rv) (CF)	1,220
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	1,347
Drawdown time (Hours)	4.5

Drawdown Time - Basin #8	
Volume below outlet pipe (Rv) (CF)	1,089
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	1,209
Drawdown time (Hours)	4.5

Drawdown Time - Basin #9	
Volume below outlet pipe (Rv) (CF)	784
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	899
Drawdown time (Hours)	4.3

Prepared By: Bohler Engineering
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Maynard Crossing
129 Parker Street
Maynard, Massachusetts

Drawdown Time - Basin #10	
Volume below outlet pipe (Rv) (CF)	784
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	774
Drawdown time (Hours)	5.0

Drawdown Time - Basin #11	
Volume below outlet pipe (Rv) (CF)	1,002
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	998
Drawdown time (Hours)	5.0

Drawdown Time - Basin #12	
Volume below outlet pipe (Rv) (CF)	1,045
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	557
Drawdown time (Hours)	9.3

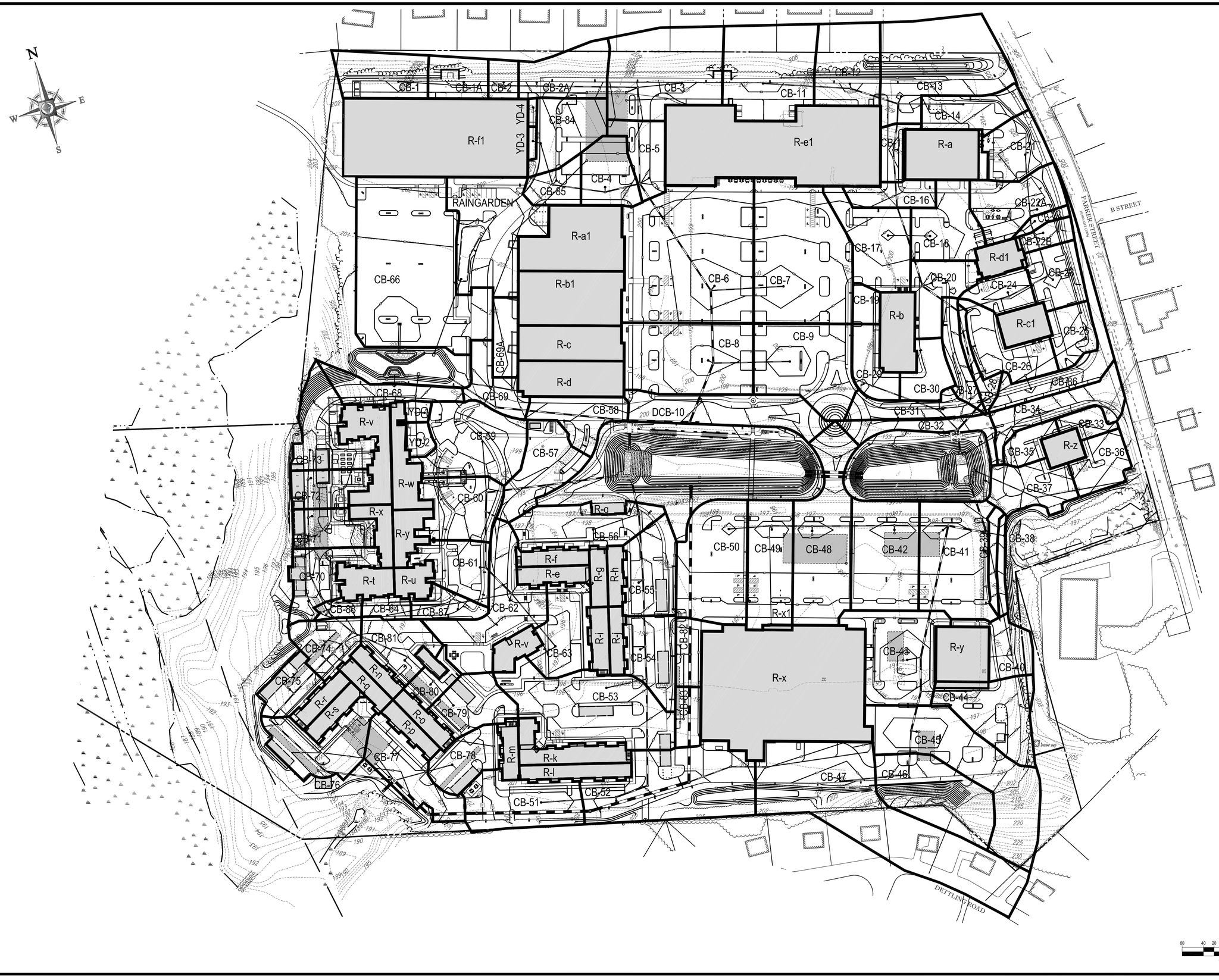
Drawdown Time - Basin #13	
Volume below outlet pipe (Rv) (CF)	6,991
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	6,422
Drawdown time (Hours)	5.4

Drawdown Time - Basin #14	
Volume below outlet pipe (Rv) (CF)	4,604
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	4,612
Drawdown time (Hours)	5.0

Drawdown Time - Basin #15	
Volume below outlet pipe (Rv) (CF)	2,945
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	1,604
Drawdown time (Hours)	9.1

Drawdown Time - Basin #16	
Volume below outlet pipe (Rv) (CF)	3,223
Soil Type	A - Sand
Infiltration rate (K)	2.41
Bottom Area (SF)	2,105
Drawdown time (Hours)	7.6

Prepared By: Bohler Engineering
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900



BOHLER ENGINEERING

SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING
SUSTAINABLE DESIGN
TRANSPORTATION
PROGRAM MANAGEMENT
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL SERVICES

- UPSTATE NEW YORK
- NEW ENGLAND
- NEW YORK METRO
- NEW JERSEY
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- ATLANTA, GA
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- SOUTH FLORIDA
- DALLAS, TX
- LEHIGH VALLEY, PA
- READING/HARRISBURG, PA
- BALTIMORE, MD
- WASHINGTON, DC AND NORTHERN VIRGINIA
- CENTRAL VIRGINIA

REVISIONS

REV	DATE	COMMENT	BY
1	03/21/17	REMOVE CARRIAGE BLDG. (SHEETS 8-12 ONLY)	CFD
2	06/02/17	REV. PER TOWN COMMENTS	CFD
3	06/15/17	DRAINAGE REVISIONS (SHEETS 13-16 ONLY)	GJZ
4	06/20/17	DRAINAGE REVISIONS (FULL SET)	AWP
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

PRELIMINARY

PROJECT No.:	W161189
DRAWN BY:	BLC/CFD
CHECKED BY:	NEM/JAK
DATE:	02/15/2017
SCALE:	AS NOTED
CAD I.D.:	W161189GRAD_STORM

PROJECT:
SITE DEVELOPMENT PLANS
FOR
CAPITAL GROUP PROPERTIES
MAYNARD CROSSING

LOCATION OF SITE
MAP #25 & LOTS #152 & 152-1
129 PARKER STREET (ROUTE 27)
TOWN OF MAYNARD
MIDDLESEX COUNTY
MASSACHUSETTS

BOHLER ENGINEERING
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
Fax: (508) 480-9080
www.BohlerEngineering.com

J.A. KUCICH
PROFESSIONAL ENGINEER
MASSACHUSETTS LICENSE No. 41530
CONNECTICUT LICENSE No. 26177
RHODE ISLAND LICENSE No. 9616
MAINE LICENSE No. 12553

SHEET TITLE:
PROPOSED CATCH BASIN DRAINAGE AREAS

SHEET NUMBER:
CB-1
OF 36

REV 0 - 06/20/2017

Results

Line No.	Line ID	Inlet Time (min)	Tc (min)	i Inlet (in/hr)	Drng Area (ac)	Runoff Coeff (C)	Incr Q (cfs)	Total CxA	Known Q (cfs)	Line Length (ft)	Line Slope (%)	Line Size (in)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	
1	MHW-FES2	0.0	10.7	0.00	0.00	0.00	0.00	5.91	0.00	42.00	0.52	36	33.17	48.27	4.69	192.27	192.05	199.75	196.69	
2	MHV-MHW	0.0	10.4	0.00	0.00	0.00	0.00	4.73	0.00	71.00	0.59	36	26.84	51.30	3.80	192.69	192.27	200.50	197.27	
3	MHT-MHV	0.0	10.2	0.00	0.00	0.00	0.00	4.34	0.00	41.00	0.51	36	24.80	47.73	3.51	192.90	192.69	199.60	197.55	
4	MHT3-MHT	0.0	10.2	0.00	0.00	0.00	0.00	4.14	0.00	13.00	0.54	36	23.73	48.94	3.36	192.97	192.90	199.75	197.76	
5	MHP-MHT3	0.0	9.7	0.00	0.00	0.00	0.00	3.88	0.00	123.00	0.50	30	22.61	28.88	4.61	193.58	192.97	201.55	198.29	
6	MHO-MHP	0.0	9.3	0.00	0.00	0.00	0.00	2.67	0.00	82.00	0.50	30	15.81	29.00	3.22	193.99	193.58	201.05	198.83	
7	MHN-MHO	0.0	8.8	0.00	0.00	0.00	0.00	2.35	0.00	99.00	0.51	30	14.22	29.15	2.90	194.49	193.99	200.35	199.14	
8	MHM-MHN	0.0	8.5	0.00	0.00	0.00	0.00	1.76	0.00	57.00	0.51	24	10.74	16.13	3.42	194.78	194.49	201.40	199.40	
9	MHL-MHM	0.0	8.0	0.00	0.00	0.00	0.00	1.60	0.00	107.00	0.50	24	10.01	16.07	3.19	195.32	194.78	201.80	199.82	
10	MHL3-MHL	0.0	7.7	0.00	0.00	0.00	0.00	1.50	0.00	51.00	0.49	24	9.50	15.84	3.02	195.57	195.32	202.40	200.08	
11	Ra-MHL3	5.0	5.0	7.24	0.33	0.90	2.15	0.30	0.00	20.00	0.50	12	2.15	2.52	2.74	195.67	195.57	201.00	200.31	
12	MHK-MHL3	0.0	7.5	0.00	0.00	0.00	0.00	1.20	0.00	36.00	0.50	24	7.69	15.99	2.45	195.75	195.57	201.80	200.31	
13	CB13-MHK	5.0	5.0	7.24	0.85	0.50	3.08	0.43	0.00	15.00	2.00	18	3.08	14.85	1.74	197.50	197.20	201.70	200.46	
14	CB32-MHW	5.0	5.0	7.24	0.20	0.83	1.20	0.17	0.00	27.00	1.00	12	1.20	3.56	1.53	195.50	195.23	199.50	197.37	
15	MHX-MHW	0.0	6.6	0.00	0.00	0.00	0.00	1.01	0.00	52.00	1.00	18	6.77	10.50	3.83	195.29	194.77	199.60	197.37	
16	CB31-MHX	5.0	5.0	7.24	0.21	0.68	1.03	0.14	0.00	8.00	1.88	12	1.03	4.88	1.32	195.44	195.29	199.50	197.80	
17	CB30-MHX	5.0	5.0	7.24	0.19	0.90	1.24	0.17	0.00	20.00	1.00	12	1.24	3.56	1.58	195.49	195.29	201.00	197.80	
18	MHS2-MHX	0.0	5.8	0.00	0.37	0.80	0.00	0.70	0.00	133.00	0.49	18	4.86	7.34	2.75	195.94	195.29	201.60	197.99	
19	CB27-MHT	5.0	5.0	7.24	0.17	0.69	0.85	0.12	0.00	15.00	2.00	12	0.85	5.04	1.08	195.40	195.10	199.40	197.91	
20	CB28-MHT	5.0	5.0	7.24	0.10	0.80	0.58	0.08	0.00	15.00	2.00	12	0.58	5.04	0.74	195.40	195.10	199.40	197.92	
21	CB20-MHO	5.0	5.0	7.24	0.28	0.89	1.80	0.25	0.00	18.00	2.00	12	1.80	5.04	2.30	196.80	196.44	200.60	199.12	

Project File: W161189_50yr bak.stm | Number of lines: 205 | Date: 06-28-2017

NOTES: Intensity = 33.62 / (Inlet time + 6.50) ^ 0.63 -- Return period = 50 Yrs. ; ** Critical depth

Results

Line No.	Line ID	Inlet Time (min)	Tc (min)	i Inlet (in/hr)	Drng Area (ac)	Runoff Coeff (C)	Incr Q (cfs)	Total CxA	Known Q (cfs)	Line Length (ft)	Line Slope (%)	Line Size (in)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	
22	CB19-MHO	5.0	5.0	7.24	0.08	0.90	0.52	0.07	0.00	130.00	1.00	12	0.52	3.56	0.66	197.00	195.70	201.00	199.18	
23	CB18-MHN	5.0	5.0	7.24	0.37	0.74	1.98	0.27	0.00	43.00	2.02	12	1.98	5.07	2.52	195.80	194.93	199.80	199.44	
24	CB17-MHN	5.0	5.0	7.24	0.45	0.71	2.31	0.32	0.00	36.00	1.97	12	2.31	5.00	2.94	195.80	195.09	199.80	199.42	
25	CB16-MHM	5.0	5.0	7.24	0.18	0.87	1.13	0.16	0.00	25.00	2.00	12	1.13	5.04	1.44	197.00	196.50	201.00	199.76	
26	CB14-MHK	5.0	5.0	7.24	0.28	0.68	1.38	0.19	0.00	123.00	1.00	12	1.38	3.56	1.75	197.00	195.77	201.00	200.63	
27	MHJ-MHK	0.0	6.3	0.00	0.00	0.00	0.00	0.59	0.00	93.00	0.52	24	3.97	16.25	1.26	196.23	195.75	201.85	200.50	
28	CB12-MHJ	5.0	5.0	7.24	0.43	0.51	1.59	0.22	0.00	9.00	2.00	12	1.59	5.04	2.02	198.00	197.82	201.60	200.54	
29	CB11-MHJ	5.0	5.0	7.24	0.68	0.54	2.66	0.37	0.00	165.00	0.50	15	2.66	4.58	2.17	197.16	196.33	201.20	200.80	
30	MHU-MHV	0.0	6.8	0.00	0.00	0.00	0.00	0.39	0.00	96.00	0.60	15	2.57	5.02	2.10	194.66	194.08	200.65	197.77	
31	CB86-MHU	5.0	5.0	7.24	0.35	0.74	1.87	0.26	0.00	27.00	1.00	12	1.87	3.56	2.39	194.93	194.66	198.75	197.90	
32	CB25-MHU	5.0	5.0	7.24	0.18	0.73	0.95	0.13	0.00	134.00	1.00	12	0.95	3.56	1.21	196.00	194.66	200.00	197.96	
33	MHQ-MHP	0.0	7.7	0.00	0.00	0.00	0.00	1.21	0.00	100.00	1.00	18	7.68	10.50	4.35	195.63	194.63	200.90	199.11	
34	MHR-MHQ	0.0	7.2	0.00	0.00	0.00	0.00	0.81	0.00	82.00	1.00	18	5.24	10.50	2.96	196.45	195.63	201.00	199.77	
35	MHS4-MHR	0.0	6.7	0.00	0.00	0.00	0.00	0.62	0.00	81.00	0.49	18	4.15	7.38	2.35	196.85	196.45	200.90	200.05	
36	MHS-MHS4	0.0	6.5	0.00	0.00	0.00	0.00	0.37	0.00	20.00	0.50	18	2.50	7.43	1.42	196.95	196.85	200.90	200.19	
37	MHS3-MHS	5.0	6.0	0.00	0.00	0.00	0.00	0.25	0.00	26.00	0.50	18	1.71	7.43	0.97	197.08	196.95	200.60	200.24	
38	CB21-MHS3	5.0	5.0	7.24	0.27	0.69	1.35	0.19	0.00	106.00	1.00	12	1.35	3.56	1.72	198.34	197.28	201.00	200.40	
39	CB22-MHS	5.0	5.0	7.24	0.05	0.68	0.25	0.03	0.00	10.00	1.00	12	0.25	3.56	0.31	197.05	196.95	200.40	200.25	
40	CB23-MHR	5.0	5.0	7.24	0.25	0.74	1.34	0.19	0.00	12.00	2.00	12	1.34	5.04	1.70	196.70	196.46	200.70	199.98	
41	CB24-MHQ	5.0	5.0	7.24	0.18	0.73	0.95	0.13	0.00	7.00	2.14	12	0.95	5.21	1.21	196.60	196.45	200.60	199.68	
42	CB26-MHT3	5.0	5.0	7.24	0.32	0.81	1.88	0.26	0.00	23.00	2.04	12	1.88	5.09	2.39	195.00	194.53	199.00	198.06	

Project File: W161189_50yr bak.stm | Number of lines: 205 | Date: 06-28-2017

NOTES: Intensity = 33.62 / (Inlet time + 6.50) ^ 0.63 -- Return period = 50 Yrs. ; ** Critical depth

Results

Line No.	Line ID	Inlet Time (min)	Tc (min)	i Inlet (in/hr)	Drng Area (ac)	Runoff Coeff (C)	Incr Q (cfs)	Total CxA	Known Q (cfs)	Line Length (ft)	Line Slope (%)	Line Size (in)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	
43	CB29-MHS2	5.0	5.0	7.24	0.20	0.90	1.30	0.18	0.00	37.00	0.54	12	1.30	2.62	1.66	196.14	195.94	201.00	198.22	
44	Rb-MHS2	5.0	5.0	7.24	0.25	0.90	1.63	0.23	0.00	100.00	1.00	12	1.63	3.56	2.07	196.94	195.94	202.00	198.36	
45	CB15-MHL	5.0	5.0	7.24	0.12	0.83	0.72	0.10	0.00	9.00	1.89	12	0.72	4.89	0.92	196.17	196.00	200.50	200.12	
46	Rc1-MHQ	5.0	5.0	7.24	0.30	0.90	1.95	0.27	0.00	20.00	0.50	12	1.95	2.52	2.49	197.04	196.94	202.00	199.66	
47	Rd1-MHS	5.0	5.0	7.24	0.10	0.90	0.65	0.09	0.00	20.00	0.50	12	0.65	2.52	0.83	197.45	197.35	202.00	200.24	
48	CB22B-MHS3	5.0	5.0	7.24	0.10	0.63	0.46	0.06	0.00	14.00	0.50	12	0.46	2.52	0.58	197.15	197.08	200.40	200.26	
49	CB22A-MHS4	5.0	5.0	7.24	0.37	0.68	1.82	0.25	0.00	15.00	1.00	12	1.82	3.56	2.32	197.00	196.85	200.65	200.16	
50	MHG-FES1	0.0	14.6	0.00	0.00	0.00	0.00	7.60	0.00	56.00	0.50	48	51.03	110.04	4.06	191.94	191.66	200.90	196.65	
51	MHF-MHG	0.0	14.2	0.00	0.00	0.00	0.00	6.52	0.00	113.00	0.52	42	41.06	78.76	4.27	192.71	192.12	199.75	197.07	
52	MHE-MHF	0.0	13.8	0.00	0.00	0.00	0.00	6.12	0.00	119.00	0.50	42	39.50	77.39	4.11	193.31	192.71	199.30	197.49	
53	MHD-MHE	0.0	13.2	0.00	0.00	0.00	0.00	5.02	0.00	137.00	0.50	42	34.37	76.79	3.57	193.99	193.31	199.30	197.95	
54	CB10-MHF	5.0	5.0	7.24	0.50	0.79	2.86	0.40	0.00	14.00	1.00	12	2.86	3.86	3.64	195.50	195.36	199.50	197.47	
55	CB8-MHE	5.0	5.0	7.24	0.74	0.81	4.34	0.60	0.00	11.00	2.00	12	4.34	5.46	5.52	195.50	195.28	199.00	197.89	
56	CB9-MHE	5.0	5.0	7.24	0.65	0.78	3.67	0.51	0.00	144.00	0.50	18	3.67	8.04	2.08	195.22	194.50	199.00	198.10	
57	CB7-MHD	5.0	5.0	7.24	1.05	0.88	6.69	0.92	0.00	137.00	0.50	18	6.69	8.01	3.78	195.38	194.70	199.15	198.62	
58	CB6-MHD	5.0	5.0	7.24	1.43	0.87	9.00	1.24	0.00	11.00	2.00	18	9.00	16.09	5.10	195.50	195.28	199.00	198.22	
59	MHC-MHD	0.0	12.4	0.00	0.00	0.00	0.00	2.85	0.00	241.00	0.50	30	23.56	31.35	4.80	195.19	193.99	202.05	198.83	
60	MHQ2-MHC	0.0	12.2	0.00	0.38	0.79	0.00	1.83	0.00	67.00	0.51	24	9.78	17.45	3.11	195.78	195.44	201.25	199.50	
61	MHB-MHC	0.0	9.3	0.00	0.00	0.00	0.00	1.02	0.00	181.00	0.50	24	14.53	17.37	4.63	196.35	195.44	203.00	199.85	
62	CB3-MHB	5.0	5.0	7.24	0.77	0.61	3.40	0.47	0.00	83.00	1.01	12	3.40	3.88	4.33	197.69	196.85	201.05	200.87	
63	MHY2-MHB	0.0	0.0	0.00	0.00	0.00	8.50	0.00	8.50	24.00	1.04	18	8.50	11.61	4.81	196.60	196.35	203.45	200.32	

Project File: W161189_50yr bak.stm | Number of lines: 205 | Date: 06-28-2017

NOTES: Intensity = 33.62 / (Inlet time + 6.50) ^ 0.63 -- Return period = 50 Yrs. ; ** Critical depth

Results

Line No.	Line ID	Inlet Time (min)	Tc (min)	i Inlet (in/hr)	Drng Area (ac)	Runoff Coeff (C)	Incr Q (cfs)	Total CxA	Known Q (cfs)	Line Length (ft)	Line Slope (%)	Line Size (in)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	
64	MHB1-MHB	0.0	7.7	0.00	0.00	0.00	0.00	0.55	0.00	190.00	0.50	18	3.46	8.04	1.96	197.80	196.85	201.65	200.63	
65	MHA-MHB1	0.0	7.0	0.00	0.00	0.00	0.00	0.36	0.00	62.75	0.49	18	2.35	8.00	1.33	198.11	197.80	201.90	200.75	
66	MHA4-MHA	0.0	6.2	0.00	0.00	0.00	0.00	0.30	0.00	75.00	0.51	15	2.05	4.98	1.67	198.49	198.11	201.80	200.84	
67	CB1-MHA4	5.0	5.0	7.24	0.33	0.54	1.29	0.18	0.00	123.00	0.50	12	1.29	2.72	1.64	199.10	198.49	201.75	201.02	
68	CB1A-MHA4	5.0	5.0	7.24	0.20	0.62	0.90	0.12	0.00	7.00	2.00	12	0.90	5.46	1.14	198.63	198.49	201.60	200.91	
69	MHR1-MHG	0.0	7.7	0.00	0.00	0.00	0.00	1.09	0.00	45.00	0.51	30	11.90	29.32	2.42	192.92	192.69	200.35	197.11	
70	CB58-MHR1	5.0	5.0	7.24	0.27	0.84	1.64	0.23	0.00	15.00	1.00	12	1.64	3.56	2.09	196.00	195.85	200.05	197.26	
71	MHH-MHR1	0.0	6.1	0.00	0.00	0.00	0.00	0.86	0.00	208.00	0.50	30	10.88	29.00	2.22	193.96	192.92	201.30	197.36	
72	FES7-MHH	0.0	0.0	0.00	0.00	0.00	5.00	0.00	5.00	105.00	4.02	18	5.00	21.05	3.82	198.50	194.28	201.00	199.35 j	
73	MHA5-MHH	0.0	6.0	0.00	0.00	0.00	0.00	0.86	0.00	36.00	0.50	15	5.91	4.57	4.82	194.18	194.00	201.20	197.72	
74	CB69-MHA5	5.0	5.0	7.24	0.22	0.80	1.27	0.18	0.00	42.00	1.00	18	1.27	10.50	0.72	194.60	194.18	200.40	198.45	
75	MHA2-MHA5	5.0	5.7	0.00	0.00	0.00	0.00	0.54	0.00	35.00	1.00	15	3.77	6.46	3.07	194.53	194.18	200.95	198.42	
76	Rc-MHA2	5.0	5.0	7.24	0.30	0.90	1.95	0.27	0.00	100.00	0.50	12	1.95	2.52	2.49	195.03	194.53	201.00	198.87	
77	Rd-MHA2	5.0	5.0	7.24	0.30	0.90	1.95	0.27	0.00	10.00	1.00	12	1.95	3.56	2.49	194.63	194.53	200.80	198.60	
78	MHO2-MHQ2	0.0	11.8	0.00	0.00	0.00	0.00	1.31	0.00	99.00	0.51	18	7.09	7.46	4.01	196.28	195.78	201.20	200.18	
79	CB84-MHO2	5.0	11.3	7.24	0.35	0.81	2.05	0.30	0.00	81.00	0.51	12	1.65	2.53	2.10	196.69	196.28	201.00	200.78	
80	CB85-MHO2	5.0	5.0	7.24	0.16	0.87	1.01	0.14	0.00	10.00	1.10	12	1.01	3.74	1.28	196.89	196.78	201.00	200.66	
81	CB4-MHQ2	5.0	5.0	7.24	0.28	0.78	1.58	0.22	0.00	9.00	1.11	12	1.58	3.75	2.01	196.38	196.28	201.00	199.83	
82	Ra1-MHO2	5.0	5.0	7.24	0.51	0.90	3.32	0.46	0.00	20.00	0.50	15	3.32	4.57	2.71	196.88	196.78	202.50	200.62	
83	Rb1-MHO2	5.0	5.0	7.24	0.46	0.90	3.00	0.41	0.00	20.00	0.50	15	3.00	4.57	2.44	196.88	196.78	202.50	200.63	
84	YD3-CB84	5.0	10.6	7.24	0.02	0.42	0.06	0.02	0.00	15.00	1.00	8	0.10	1.21	0.28	197.35	197.20	201.30	200.92	

Project File: W161189_50yr bak.stm | Number of lines: 205 | Date: 06-28-2017

NOTES: Intensity = 33.62 / (Inlet time + 6.50) ^ 0.63 -- Return period = 50 Yrs. ; ** Critical depth

Results

Line No.	Line ID	Inlet Time (min)	Tc (min)	i Inlet (in/hr)	Drng Area (ac)	Runoff Coeff (C)	Incr Q (cfs)	Total CxA	Known Q (cfs)	Line Length (ft)	Line Slope (%)	Line Size (in)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	
85	YD4-YD3	5.0	5.0	7.24	0.02	0.45	0.07	0.01	0.00	63.00	1.00	8	0.07	1.21	0.19	197.98	197.35	201.30	200.92	
86	CB2A-MHB1	5.0	5.0	7.24	0.34	0.55	1.35	0.19	0.00	7.00	2.00	12	1.35	5.04	1.72	198.50	198.36	201.50	200.71	
87	CB2-MHA	5.0	5.0	7.24	0.09	0.63	0.41	0.06	0.00	7.00	2.00	12	0.41	5.04	0.52	198.24	198.10	201.70	200.80	
88	CB69A-MHA5	5.0	5.0	7.24	0.16	0.90	1.04	0.14	0.00	52.00	1.00	12	1.04	3.56	1.33	196.50	195.98	201.00	198.46	
89	MHS1-FES5	0.0	11.2	0.00	0.00	0.00	0.00	2.34	0.00	135.00	0.50	30	12.95	31.30	2.64	192.89	192.22	200.05	196.70	
90	MHT1-MHS1	0.0	10.5	0.00	0.00	0.00	0.00	2.08	0.00	114.00	0.50	30	11.79	31.42	2.40	193.46	192.89	198.90	196.91	
91	MHU1-MHT1	0.0	10.2	0.00	0.00	0.00	0.00	1.71	0.00	36.00	0.53	30	9.81	32.28	2.00	193.65	193.46	198.20	197.05	
92	MHV1-MHU1	0.0	9.3	0.00	0.00	0.00	0.00	1.46	0.00	105.00	0.50	30	8.65	31.27	1.76	194.17	193.65	198.60	197.16	
93	MHW1-MHV1	0.0	8.6	0.00	0.00	0.00	0.00	1.26	0.00	69.00	0.51	30	7.68	31.64	1.57	194.52	194.17	198.70	197.24	
94	CB63-MHW1	5.0	5.0	7.24	0.36	0.73	1.90	0.26	0.00	129.00	0.50	15	1.90	4.93	1.55	195.16	194.52	198.00	197.38	
95	CB62-MHW1	5.0	5.0	7.24	0.58	0.65	2.73	0.38	0.00	13.00	1.00	12	2.73	3.86	3.47	195.31	195.18	198.10	197.34	
96	MHV2-MHW1	0.0	8.1	0.00	0.00	0.00	0.00	0.35	0.00	101.00	0.50	12	2.20	2.74	2.80	195.03	194.52	198.90	197.61	
97	MHI2-MHV2	0.0	7.9	0.00	0.00	0.00	0.00	0.26	0.00	33.00	0.52	12	1.65	2.77	2.10	195.20	195.03	199.25	197.84	
98	CB61-MHV1	5.0	5.0	7.24	0.29	0.68	1.43	0.20	0.00	10.00	1.10	12	1.43	4.05	1.82	194.94	194.83	198.00	197.22	
99	CB60-MHU1	5.0	5.0	7.24	0.38	0.67	1.84	0.25	0.00	7.00	1.00	12	1.84	3.86	2.35	194.38	194.31	198.00	197.12	
100	CB59-MHT1	5.0	5.0	7.24	0.53	0.69	2.65	0.37	0.00	96.00	1.02	12	2.65	3.90	3.37	195.10	194.12	198.00	197.45	
101	CB57-MHS1	5.0	5.0	7.24	0.40	0.66	1.91	0.26	0.00	16.00	1.00	12	1.91	3.86	2.60	196.00	195.84	199.70	196.83	
102	Re-MHW1	5.0	5.5	7.24	0.11	0.90	0.72	0.17	0.00	100.00	0.50	12	1.20	2.52	1.53	195.68	195.18	200.00	197.40	
103	CB64-MHI2	5.0	5.0	7.24	0.08	0.81	0.47	0.06	0.00	103.00	0.50	12	0.47	2.51	0.60	195.71	195.20	199.50	197.99	
104	Rg-MHW1	5.0	5.0	7.24	0.08	0.90	0.52	0.07	0.00	20.00	0.50	12	0.52	2.52	0.66	195.44	195.34	200.00	197.48	
105	Ri-MHW1	5.0	5.0	7.24	0.11	0.90	0.72	0.10	0.00	20.00	0.50	12	0.72	2.52	0.91	195.44	195.34	200.00	197.31	

Project File: W161189_50yr bak.stm | Number of lines: 205 | Date: 06-28-2017

NOTES: Intensity = 33.62 / (Inlet time + 6.50) ^ 0.63 -- Return period = 50 Yrs. ; ** Critical depth

Results

Line No.	Line ID	Inlet Time (min)	Tc (min)	i Inlet (in/hr)	Drng Area (ac)	Runoff Coeff (C)	Incr Q (cfs)	Total CxA	Known Q (cfs)	Line Length (ft)	Line Slope (%)	Line Size (in)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	
106	Ru-MHI2	5.0	5.0	7.24	0.22	0.90	1.43	0.20	0.00	20.00	0.25	12	1.43	1.78	1.82	195.90	195.85	200.00	197.96	
107	CB87-MHV2	5.0	5.0	7.24	0.15	0.60	0.65	0.09	0.00	12.00	1.00	12	0.65	3.56	0.83	195.15	195.03	198.60	197.84	
108	MHL1-FES6	0.0	9.9	0.00	0.00	0.00	0.00	3.11	0.00	66.00	0.48	36	18.00	46.44	2.55	192.37	192.05	199.90	196.64	
109	MHM1-MHL1	0.0	9.3	0.00	0.00	0.00	0.00	2.71	0.00	124.00	0.50	30	16.03	29.00	3.27	192.99	192.37	198.20	196.90	
110	CB56-MHL1	5.0	5.4	7.24	0.43	0.73	2.27	0.40	0.00	91.00	1.24	12	2.86	3.97	3.64	194.50	193.37	198.00	197.29	
111	CB55-MHM1	5.0	5.0	7.24	0.37	0.69	1.85	0.26	0.00	10.00	2.00	15	1.85	9.13	1.51	194.50	194.30	198.00	197.06	
112	MHN1-MHM1	0.0	8.7	0.00	0.00	0.00	0.00	2.45	0.00	125.00	0.52	30	14.91	29.57	3.04	193.64	192.99	198.20	197.11	
113	CB54-MHN1	5.0	5.0	7.24	0.32	0.78	1.81	0.25	0.00	11.00	1.00	12	1.81	3.56	2.30	194.25	194.14	198.00	197.34	
114	MHO1-MHN1	0.0	8.3	0.00	0.00	0.00	0.00	2.06	0.00	61.00	0.57	30	12.72	31.07	2.59	193.99	193.64	198.80	197.35	
115	CB53-MHO1	5.0	5.0	7.24	0.88	0.77	4.90	0.68	0.00	77.00	1.04	15	4.90	6.58	4.00	195.04	194.24	198.00	197.86	
116	MHM2-MHO1	0.0	7.3	0.00	0.00	0.00	0.00	1.38	0.00	107.00	0.51	30	8.90	29.40	1.81	194.54	193.99	200.75	197.52	
117	MHP1-MHM2	0.0	6.5	0.00	0.00	0.00	0.00	1.38	0.00	93.00	0.49	30	9.24	28.84	1.88	195.00	194.54	201.70	197.57	
118	MHQ1-MHP1	0.0	5.9	0.00	0.00	0.00	0.00	1.11	0.00	63.00	0.51	30	7.68	29.23	1.59	195.32	195.00	199.35	197.66	
119	CB52-MHQ1	5.0	5.0	7.24	0.88	0.59	3.76	0.52	0.00	7.00	2.00	15	3.76	9.13	3.06	195.43	195.29	199.00	197.72	
120	CB51-MHQ1	5.0	5.0	7.24	0.95	0.49	3.37	0.47	0.00	141.00	0.50	15	3.37	4.58	2.75	196.03	195.32	198.00	198.08	
121	Rf-CB56	5.0	5.0	7.24	0.10	0.90	0.65	0.09	0.00	20.00	0.50	12	0.65	2.52	0.83	194.60	194.50	200.00	197.81	
122	Rh-MHM1	5.0	5.0	7.24	0.08	0.90	0.52	0.07	0.00	20.00	0.50	12	0.52	2.52	0.66	193.09	192.99	200.00	197.39	
123	Rj-MHN1	5.0	5.0	7.24	0.08	0.90	0.52	0.07	0.00	20.00	0.50	12	0.52	2.52	0.66	193.74	193.64	200.00	197.39	
124	Rk-MHM2	5.0	5.0	7.24	0.21	0.90	1.37	0.19	0.00	20.00	0.50	12	1.37	2.52	1.74	195.10	195.00	200.00	197.66	
125	Rl-MHQ1	5.0	5.0	7.24	0.14	0.90	0.91	0.13	0.00	20.00	0.50	12	0.91	2.52	1.16	195.42	195.32	200.00	197.73	
126	Rm-MHM2	5.0	5.0	7.24	0.09	0.90	0.59	0.08	0.00	20.00	0.50	12	0.59	2.52	0.75	194.64	194.54	200.00	197.68	

Project File: W161189_50yr bak.stm | Number of lines: 205 | Date: 06-28-2017

NOTES: Intensity = 33.62 / (Inlet time + 6.50) ^ 0.63 -- Return period = 50 Yrs. ; ** Critical depth

Results

Line No.	Line ID	Inlet Time (min)	Tc (min)	i Inlet (in/hr)	Drng Area (ac)	Runoff Coeff (C)	Incr Q (cfs)	Total CxA	Known Q (cfs)	Line Length (ft)	Line Slope (%)	Line Size (in)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	
127	MHZ6-MHH2	0.0	9.5	0.00	0.00	0.00	0.00	1.67	0.00	90.00	0.30	60	110.70	142.67	8.05	185.30	185.03	199.00	188.60	
128	MHZ5-MHZ6	0.0	9.3	0.00	0.00	0.00	0.00	1.67	0.00	91.00	0.30	60	110.80	141.88	6.75	185.57	185.30	199.15	189.40	
129	MHZ4-MHZ5	0.0	8.6	0.00	0.00	0.00	0.00	1.67	0.00	213.00	0.30	60	111.06	142.78	6.61	186.21	185.57	200.20	190.04	
130	MHZ3-MHZ4	0.0	8.1	0.00	0.00	0.00	0.00	1.67	0.00	193.00	0.30	60	111.31	142.79	6.28	186.79	186.21	200.75	190.87	
131	MHZ2-MHZ3	0.0	7.4	0.00	0.00	0.00	0.00	1.67	0.00	240.00	0.30	60	111.63	142.66	6.32	187.51	186.79	201.50	191.54	
132	MHN2-MHZ2	0.0	7.3	0.00	0.00	0.00	0.00	0.25	0.00	12.00	2.42	12	1.61	5.54	4.41	196.69	196.40	201.15	197.39	
133	CB82-MHN2	5.0	5.0	7.24	0.16	0.88	1.02	0.14	0.00	13.00	2.08	12	1.02	5.13	3.92	198.25	197.98	200.75	198.73	
134	MHN3-MHN2	0.0	5.2	0.00	0.00	0.00	0.00	0.11	0.00	122.00	1.00	12	0.77	3.56	2.01	198.01	196.79	201.15	198.38 j	
135	OCS1-MHZ2	0.0	0.0	0.00	0.00	0.00	100.89	0.00	100.89	313.00	0.30	60	100.89	142.74	5.50	188.45	187.51	201.00	192.61	
136	Mkt32-MHZ3	5.0	5.0	7.24	1.58	0.90	10.29	1.42	0.00	100.00	0.50	24	10.29	15.99	3.28	190.00	189.50	202.00	192.93	
137	CB83-MHN3	5.0	5.0	7.24	0.12	0.90	0.78	0.11	0.00	14.00	1.00	12	0.78	3.56	2.84	198.25	198.11	200.75	198.63 j	
138	MHH2-OUT	0.0	9.5	0.00	0.00	0.00	0.00	2.93	0.00	29.00	0.83	60	17.38	256.70	5.01	185.03	184.79	197.30	186.19	
139	MHG2-MHH2	0.0	9.0	0.00	0.00	0.00	0.00	2.42	0.00	130.00	1.00	24	14.68	24.50	7.31	191.07	189.77	197.20	192.43	
140	MHX1-MHG2	0.0	8.4	0.00	0.00	0.00	0.00	2.10	0.00	142.00	0.49	24	12.90	17.20	5.14	191.77	191.07	199.25	193.09	
141	MHY1-MHX1	0.0	8.2	0.00	0.00	0.00	0.00	2.10	0.00	67.00	0.49	24	13.05	17.20	4.20	192.10	191.77	198.20	193.99	
142	MHZ1-MHY1	0.0	7.8	0.00	0.00	0.00	0.00	1.96	0.00	88.00	0.50	24	12.35	17.33	3.93	192.54	192.10	198.20	194.52	
143	MHP2-MHZ1	0.0	7.5	0.00	0.00	0.00	0.00	1.81	0.00	71.00	0.51	24	11.58	17.45	3.69	192.90	192.54	199.95	194.95	
144	MHE2-MHP2	0.0	6.0	0.00	0.00	0.00	0.00	0.59	0.00	113.00	0.75	18	4.04	9.87	2.29	193.85	193.00	198.40	195.44	
145	MHF2-MHE2	0.0	5.5	0.00	0.00	0.00	0.00	0.29	0.00	66.00	0.68	12	2.03	3.19	2.69	194.80	194.35	198.40	195.67	
146	CB80-MHF2	5.0	5.0	7.24	0.11	0.75	0.60	0.08	0.00	8.00	1.12	12	0.60	4.09	2.86	195.70	195.61	198.20	196.03	
147	CB79-MHF2	5.0	5.0	7.24	0.29	0.71	1.49	0.21	0.00	59.00	1.00	12	1.49	3.86	3.00	195.70	195.11	198.20	196.22 j	

Project File: W161189_50yr bak.stm | Number of lines: 205 | Date: 06-28-2017

NOTES: Intensity = 33.62 / (Inlet time + 6.50) ^ 0.63 -- Return period = 50 Yrs. ; ** Critical depth

Results

Line No.	Line ID	Inlet Time (min)	Tc (min)	i Inlet (in/hr)	Drng Area (ac)	Runoff Coeff (C)	Incr Q (cfs)	Total CxA	Known Q (cfs)	Line Length (ft)	Line Slope (%)	Line Size (in)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	
148	CB81-MHE2	5.0	5.0	7.24	0.28	0.75	1.52	0.21	0.00	9.00	1.00	12	1.52	3.86	3.93	195.70	195.61	198.20	196.28	
149	CB74-MHZ1	5.0	5.0	7.24	0.25	0.59	1.07	0.15	0.00	10.00	1.00	12	1.07	3.86	3.59	195.50	195.40	198.00	195.97	
150	CB75-MHY1	5.0	5.0	7.24	0.20	0.72	1.04	0.14	0.00	11.00	1.00	12	1.04	3.86	3.60	195.50	195.39	198.00	195.95	
151	MHHR2-MHP2	0.0	7.2	0.00	0.00	0.00	0.00	1.15	0.00	60.00	0.50	18	7.43	8.04	4.20	193.20	192.90	198.95	195.42	
152	MHB2-MHR2	0.0	6.9	0.00	0.00	0.00	0.00	0.87	0.00	76.00	0.51	18	5.70	8.15	3.23	193.29	192.90	198.65	196.00	
153	MHC2-MHB2	0.0	6.1	0.00	0.00	0.00	0.00	0.61	0.00	108.00	0.50	18	4.15	8.04	2.35	193.83	193.29	198.65	196.38	
154	MHD2-MHC2	0.0	5.4	0.00	0.00	0.00	0.00	0.42	0.00	73.00	0.48	18	3.00	7.88	1.70	194.18	193.83	198.65	196.56	
155	CB73-MHD2	5.0	5.0	7.24	0.40	0.65	1.88	0.26	0.00	56.00	2.50	12	1.88	6.10	2.50	195.85	194.45	198.60	196.71	
156	CB72-MHD2	5.0	5.0	7.24	0.22	0.74	1.18	0.16	0.00	7.00	1.86	12	1.18	5.26	2.02	195.95	195.82	198.45	196.58	
157	CB71-MHC2	5.0	5.0	7.24	0.24	0.77	1.34	0.18	0.00	8.00	1.00	12	1.34	3.86	2.91	195.95	195.87	198.45	196.47	
158	CB70-MHB2	5.0	5.0	7.24	0.38	0.68	1.87	0.26	0.00	6.00	1.00	12	1.87	3.86	4.12	195.95	195.89	198.45	196.61	
159	MHK2-MHG2	0.0	0.0	0.00	0.00	0.00	0.14	0.00	0.14	50.00	2.22	15	0.14	9.62	0.88	193.00	191.89	198.50	193.15 j	
160	CB77-MHH2	5.0	5.0	7.24	0.37	0.80	2.14	0.30	0.00	11.00	1.09	12	2.14	3.72	4.46	194.50	194.38	197.00	195.14	
161	Rn-MHP2	5.0	5.0	7.24	0.08	0.90	0.52	0.07	0.00	50.00	0.50	12	0.52	2.52	0.66	193.16	192.91	200.00	195.38	
162	Ro-MHE2	5.0	5.0	7.24	0.10	0.90	0.65	0.09	0.00	50.00	0.50	12	0.65	2.52	0.83	194.10	193.85	200.00	195.60	
163	CB78-MHH2	5.0	5.0	7.24	0.26	0.80	1.51	0.21	0.00	113.00	1.00	12	1.51	3.56	3.99	195.50	194.37	198.00	196.02	
164	CB76-MHG2	5.0	5.0	7.24	0.41	0.79	2.34	0.32	0.00	14.00	1.00	12	2.34	3.56	4.58	194.50	194.36	197.00	195.15	
165	Rt-MHR2	5.0	5.0	7.24	0.25	0.90	1.63	0.23	0.00	20.00	0.50	12	1.63	2.52	2.07	193.40	193.30	200.00	195.94	
166	CB88-MHHR2	5.0	5.0	7.24	0.07	0.81	0.41	0.06	0.00	6.00	1.00	12	0.41	3.56	0.53	195.00	194.94	198.80	195.96	
167	MHC1-FES4	0.0	21.7	0.00	0.00	0.00	0.00	7.05	0.00	96.00	0.99	36	28.99	66.35	4.10	193.35	192.40	201.00	196.77	
168	CB38-MHC1	5.0	5.0	7.24	0.32	0.79	1.83	0.25	0.00	33.00	2.03	12	1.83	5.07	2.59	196.50	195.83	199.50	197.26	

Project File: W161189_50yr bak.stm | Number of lines: 205 | Date: 06-28-2017

NOTES: Intensity = 33.62 / (Inlet time + 6.50) ^ 0.63 -- Return period = 50 Yrs. ; ** Critical depth

Results

Line No.	Line ID	Inlet Time (min)	Tc (min)	i Inlet (in/hr)	Drng Area (ac)	Runoff Coeff (C)	Incr Q (cfs)	Total CxA	Known Q (cfs)	Line Length (ft)	Line Slope (%)	Line Size (in)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	
169	CB39-MHC1	5.0	5.0	7.24	0.08	0.90	0.52	0.07	0.00	8.00	2.00	12	0.52	5.04	0.74	196.50	196.34	199.50	197.28	
170	MHD1-MHC1	0.0	21.5	0.00	0.00	0.00	0.00	6.72	0.00	73.00	0.59	36	27.78	51.19	3.93	193.78	193.35	199.60	197.18	
171	CB41-MHD1	5.0	5.0	7.24	0.66	0.88	4.20	0.58	0.00	13.00	1.00	15	4.20	6.46	4.54	196.65	196.52	200.85	197.47 j	
172	MHH1-MHD1	0.0	7.0	0.00	0.00	0.00	0.00	4.04	0.00	253.00	0.46	36	26.51	45.35	3.79	194.95	193.78	200.35	197.80	
173	MHI1-MHH1	0.0	6.6	0.00	0.00	0.00	0.00	3.44	0.00	64.00	0.50	36	22.88	47.16	3.26	195.27	194.95	201.15	198.15	
174	MHJ1-MHI1	0.0	6.2	0.00	0.00	0.00	0.00	2.86	0.00	76.00	0.50	36	19.48	47.16	2.81	195.65	195.27	200.15	198.42	
175	MHK1-MHJ1	0.0	5.5	0.00	0.00	0.00	0.00	0.91	0.00	82.00	0.50	24	6.44	15.99	2.05	196.06	195.65	200.15	198.67	
176	CB47-MHK1	5.0	5.0	7.24	1.44	0.45	4.69	0.65	0.00	82.00	0.78	18	4.69	9.28	2.65	196.73	196.09	200.15	198.90	
177	MHJ2-MHJ1	0.0	5.5	0.00	0.00	0.00	0.00	1.40	0.00	66.00	0.50	30	9.82	29.00	2.26	196.65	196.32	200.15	198.59	
178	CB45-MHJ1	5.0	5.0	7.24	0.89	0.62	3.99	0.55	0.00	11.00	1.00	15	3.99	6.46	3.25	197.25	197.14	200.00	198.59	
179	CB44-MHI1	5.0	5.0	7.24	0.46	0.80	2.66	0.37	0.00	84.00	1.00	12	2.66	3.56	3.39	196.46	195.62	200.50	198.79	
180	CB43-MHH1	5.0	5.0	7.24	0.75	0.81	4.40	0.61	0.00	26.00	2.00	15	4.40	9.13	3.58	196.80	196.28	199.55	198.17	
181	MHE1-MHD1	0.0	21.1	0.00	0.00	0.00	0.00	2.10	0.00	101.00	0.46	24	8.75	15.26	2.78	194.88	194.42	199.45	197.69	
182	MHF1-MHE1	0.0	20.7	0.00	0.00	0.00	0.00	1.58	0.00	154.00	0.50	18	6.66	7.43	3.77	195.65	194.88	199.70	198.33	
183	MHG1-MHF1	0.0	20.4	0.00	0.00	0.00	0.00	0.95	0.00	76.00	0.50	18	4.04	7.43	2.29	196.03	195.65	199.70	198.61	
184	CB49-MHG1	5.0	5.0	7.24	0.47	0.83	2.82	0.39	0.00	7.00	2.00	15	2.82	9.13	2.30	196.65	196.51	200.85	198.70	
185	Rx1-MHG1	5.0	5.0	7.24	0.01	0.90	0.07	0.01	0.00	172.00	0.99	8	0.07	1.20	0.19	198.00	196.29	202.70	198.78	
186	CB50-MHG1	5.0	5.0	7.24	0.65	0.85	4.00	0.55	0.00	81.00	0.49	15	4.00	4.54	3.26	196.85	196.45	199.85	199.00	
187	CB48-MHF1	5.0	5.0	7.24	0.75	0.84	4.56	0.63	0.00	9.00	2.00	15	4.56	9.13	3.72	196.85	196.67	199.40	198.41	
188	CB42-MHE1	5.0	5.0	7.24	0.60	0.86	3.73	0.52	0.00	8.00	1.25	12	3.73	3.98	4.75	196.39	196.29	199.40	197.79	
189	CB46-MHK1	5.0	5.0	7.24	0.58	0.46	1.93	0.27	0.00	7.00	2.00	12	1.93	5.04	2.46	196.39	196.25	200.40	198.75	

Project File: W161189_50yr bak.stm | Number of lines: 205 | Date: 06-28-2017

NOTES: Intensity = 33.62 / (Inlet time + 6.50) ^ 0.63 -- Return period = 50 Yrs. ; ** Critical depth

Results

Line No.	Line ID	Inlet Time (min)	Tc (min)	i Inlet (in/hr)	Drng Area (ac)	Runoff Coeff (C)	Incr Q (cfs)	Total CxA	Known Q (cfs)	Line Length (ft)	Line Slope (%)	Line Size (in)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	Gnd/Rim El Up (ft)	HGL Up (ft)	
190	Rx-MHJ2	5.0	5.0	7.24	1.55	0.90	10.10	1.40	0.00	100.00	0.50	24	10.10	15.99	3.46	197.12	196.62	202.70	198.74	
191	Ry-MHI1	5.0	5.0	7.24	0.23	0.90	1.50	0.21	0.00	20.00	0.50	12	1.50	2.52	1.91	196.04	195.94	202.70	198.47	
192	MHY-FES3	0.0	7.4	0.00	0.00	0.00	0.00	0.54	0.00	100.00	1.00	15	3.44	6.46	2.81	194.36	193.36	200.30	196.87	
193	MHZ-MHY	0.0	7.1	0.00	0.00	0.00	0.00	0.42	0.00	58.00	1.02	12	2.72	3.59	3.46	194.50	193.91	200.65	197.34	
194	CB33-MHZ	5.0	5.0	7.24	0.10	0.89	0.64	0.09	0.00	105.00	1.40	12	0.64	4.21	0.82	196.00	194.53	200.00	197.73	
195	CB34-MHZ	5.0	5.0	7.24	0.33	0.78	1.86	0.26	0.00	21.00	1.05	12	1.86	3.65	2.37	194.75	194.53	198.75	197.68	
196	CB35-MHY	5.0	5.0	7.24	0.14	0.84	0.85	0.12	0.00	16.00	2.00	12	0.85	5.04	1.08	195.80	195.48	199.80	197.11	
197	Rz-MHZ	5.0	5.0	7.24	0.08	0.90	0.52	0.07	0.00	20.00	0.50	12	0.52	2.52	0.66	194.93	194.83	200.00	197.70	
198	MHHR7-FES8	5.0	8.1	7.24	0.07	0.35	0.18	0.11	0.00	39.00	0.49	12	0.68	2.49	0.87	197.19	197.00	199.75	198.85	
199	MHHR8-MHHR7	5.0	7.4	7.24	0.07	0.35	0.18	0.08	0.00	32.00	0.50	12	0.55	2.52	0.70	197.35	197.19	200.50	198.87	
200	MHHR9-MHH8	5.0	5.2	7.24	0.04	0.45	0.13	0.04	0.00	51.00	0.49	12	0.30	2.49	0.39	197.60	197.35	200.00	198.88	
201	YD1-MHHR8	5.0	5.0	7.24	0.04	0.45	0.13	0.02	0.00	16.00	1.00	8	0.13	1.21	0.37	197.51	197.35	199.80	198.88	
202	YD2-MHHR9	5.0	5.0	7.24	0.07	0.35	0.18	0.02	0.00	7.00	1.00	8	0.18	1.21	0.51	197.67	197.60	199.80	198.89	
203	MHA1-FES10	0.0	6.6	0.00	0.00	0.00	0.00	0.45	0.00	124.00	1.01	15	2.98	6.48	2.43	194.32	193.07	199.85	196.85	
204	CB36-MHA1	5.0	5.0	7.24	0.22	0.88	1.40	0.19	0.00	168.00	1.00	12	1.40	3.56	1.78	196.00	194.32	199.00	197.25	
205	CB37-MHA1	5.0	5.0	7.24	0.32	0.79	1.83	0.25	0.00	15.00	2.00	12	1.83	5.04	2.33	195.70	195.40	199.00	196.99	

Project File: W161189_50yr bak.stm | Number of lines: 205 | Date: 06-28-2017

NOTES: Intensity = 33.62 / (Inlet time + 6.50) ^ 0.63 -- Return period = 50 Yrs. ; ** Critical depth

CATCH BASIN DRAINAGE AREA "C" COEFFICIENTS
PROPOSED DEVELOPMENT
MAYNARD, MA

c coefficient, grass=	0.30
c coefficient, impervious=	0.90

Drainage Area Name	Total Area (sf)	Paved Area (sf)	"C"	Total Area (Ac.)
CB-1	14521	4785	0.50	0.33
CB-1A	8751	3699	0.55	0.20
CB-2	4138	1822	0.56	0.09
CB-2A	14771	4873	0.50	0.34
CB-3	33736	10247	0.48	0.77
CB-4	12242	11132	0.85	0.28
CB-5	10174	6549	0.69	0.23
CB-6	62093	55420	0.84	1.43
CB-7	45836	40030	0.82	1.05
CB-8	32324	28545	0.83	0.74
CB-9	28366	22944	0.79	0.65
CB-10	21674	17837	0.79	0.50
CB-11	29481	10582	0.52	0.68
CB-12	18845	5025	0.46	0.43
CB-13	37488	9990	0.46	0.86
CB-14	11793	7062	0.66	0.27
CB-15	5248	3181	0.66	0.12
CB-16	7710	6806	0.83	0.18
CB-17	19709	17225	0.82	0.45
CB-18	16002	12294	0.76	0.37
CB-19	3625	3555	0.89	0.08
CB-20	12158	10594	0.82	0.28
CB-21	11790	7757	0.69	0.27
CB-22	2160	1465	0.71	0.05
CB-22A	16272	10745	0.70	0.37
CB-22B	4268	2617	0.67	0.10
CB-23	10937	7795	0.73	0.25
CB-24	7666	7293	0.87	0.18
CB-25	7875	5615	0.73	0.18
CB-26	14146	12029	0.81	0.32
CB-27	7402	4759	0.69	0.17
CB-28	4201	3323	0.77	0.10
CB-29	8800	8345	0.87	0.20
CB-30	8388	8126	0.88	0.19
CB-31	9288	6555	0.72	0.21
CB-32	8806	7702	0.82	0.20
CB-33	4341	4122	0.87	0.10
CB-34	14194	11443	0.78	0.33
CB-35	5529	5589	0.91	0.13
CB-36	9577	9053	0.87	0.22
CB-37	12997	11454	0.83	0.30
CB-38	2776	2780	0.90	0.06
CB-39	3320	3320	0.90	0.08
CB-40	9340	5455	0.65	0.21
CB-41	28675	27723	0.88	0.66
CB-42	26322	24410	0.86	0.60
CB-43	32887	28177	0.81	0.75
CB-44	19921	16756	0.80	0.46
CB-45	38622	18802	0.59	0.89
CB-46	25291	4798	0.41	0.58
CB-47	62547	14815	0.44	1.44
CB-48	32887	29557	0.84	0.75
CB-49	20457	18150	0.83	0.47
CB-50	28206	26024	0.85	0.65
CB-51	41323	12990	0.49	0.95
CB-52	38413	18746	0.59	0.88
CB-53	38327	30270	0.77	0.88
CB-54	13731	10985	0.78	0.32
CB-55	16086	10551	0.69	0.37
CB-56	18639	13462	0.73	0.43
CB-57	16305	10504	0.69	0.37
CB-58	11883	8760	0.74	0.27
CB-59	24481	14890	0.66	0.56
CB-60	16399	10298	0.68	0.38
CB-61	12485	7863	0.68	0.29
CB-62	25375	14796	0.65	0.58
CB-63	15615	11125	0.73	0.36
CB-64	3685	3132	0.81	0.08
CB-66	66290	56897	0.81	1.52
CB-68	9739	6912	0.73	0.22
CB-69	9482	7935	0.80	0.22
CB-69A	7092	7092	0.90	0.16
CB-70	13515	10245	0.75	0.31
CB-71	10443	8181	0.77	0.24
CB-72	9516	6998	0.74	0.22
CB-73	17241	9980	0.65	0.40
CB-74	10921	5343	0.59	0.25
CB-75	8676	6041	0.72	0.20
CB-76	17853	14660	0.79	0.41
CB-77	16108	13290	0.80	0.37
CB-78	11429	9441	0.80	0.26
CB-79	12841	8776	0.71	0.29
CB-80	4993	3731	0.75	0.11
CB-81	12032	8988	0.75	0.28
CB-82	6809	6609	0.88	0.16
CB-83	5391	5391	0.90	0.12
CB-84	15302	13469	0.83	0.35
CB-85	7125	6578	0.85	0.16
CB-86	15235	10942	0.73	0.35
CB-87	6343	3150	0.60	0.15
CB-88	2845	2418	0.81	0.07

CB-89 (raingdn)	30440	19423	0.68	0.70
YD-1	1903	460	0.45	0.04
YD-2	3050	270	0.35	0.07
YD-3	961	50	0.33	0.02
YD-4	860	145	0.40	0.02
R-a	14200	14200	0.90	0.33
R-b	11000	11000	0.90	0.25
R-c	13251	13251	0.90	0.30
R-d	13,251	13,251	0.90	0.30
R-e	4,760	4,760	0.90	0.11
R-f	4,431	4,431	0.90	0.10
R-g	3,690	3,690	0.90	0.08
R-h	3,577	3,577	0.90	0.08
R-i	4,587	4,587	0.90	0.11
R-j	3,702	3,702	0.90	0.08
R-k	8,960	8,960	0.90	0.21
R-l	6,176	6,176	0.90	0.14
R-m	3,855	3,855	0.90	0.09
R-n	3,665	3,665	0.90	0.08
R-o	4,375	4,375	0.90	0.10
R-p	4,182	4,182	0.90	0.10
R-q	3,775	3,775	0.90	0.09
R-r	4,359	4,359	0.90	0.10
R-s	4,352	4,352	0.90	0.10
R-t	10,949	10,949	0.90	0.25
R-u	9,731	9,731	0.90	0.22
R-v	11,554	11,554	0.90	0.27
R-w	8,265	8,265	0.90	0.19
R-v	4,621	4,621	0.90	0.11
R-x	67,467	67,467	0.90	1.55
R-x1	533	533	0.90	0.01
R-y	10,050	10,050	0.90	0.23
R-z	3,400	3,400	0.90	0.08
R-a1	22,165	22,165	0.90	0.51
R-b1	20,153	20,153	0.90	0.46
R-c1	6,800	6,800	0.90	0.16
R-d1	4,300	4,300	0.90	0.10
R-e1	55,790	55,790	0.90	1.28
R-f1	50,300	50,300	0.90	1.15
			Total Area (ac.)=	45.55

MAYNARD CROSSING
MAYNARD, MASS.
PROJECT NO. W161189

GROUNDWATER MOUNDING CALCULATIONS

Methodology

The infiltrating basins for this project are designed with less than 4 feet of groundwater separation. They are also designed to attenuate the 10-year storm event or larger. Therefore, groundwater mounding calculations are required according to MA DEP Stormwater Management Guidelines. The purpose of the calculations is to ensure that the mound will not prevent the full draining of the basin. The mounding analysis must show that the recharge volume will exfiltrate within 72 hours. Additionally, it should be verified that the mounding effect will not cause stormwater to surge above the lowest discharge point out of a basin (during the 72-hour period).

The groundwater mounding analysis was performed using an online calculator that uses the Hantush Method. Input parameters are site specific and were determined based on existing and proposed conditions. The required input parameters are the following: hydraulic conductivity and specific yield of the soil; initial saturated thickness; length of application area; width of application area, time to zero outflow from the basin, and time duration of application.

Calculations using the Hantush Method are considered conservative due to the fact that the unsaturated soil zone is not incorporated. In practice, this zone will have a significant positive effect on reducing the groundwater mounding under an infiltration basin by allowing horizontal migration. Our unsaturated zone is approximately 2 feet for all the basins. The outlets of the basins range from within 1.5 to 2.5 feet from the basin bottom. This requires that the mounding must be less than 3.5 feet to 4.5 feet to ensure that stormwater will not bypass the basin and exit out an outlet device. Additionally, we must check the mound after 72 hours to verify that it is less than the unsaturated zone thickness (2 feet for all the basins) to ensure that the basin can exfiltrate within that period of time.

The application rate used is converted from the Rawls value selected for an exfiltration rate in HydroCAD. The duration of application used for the analysis is 72 hours. The specific yield and hydraulic conductivity are taken from guidance documents that consider average values based on soil types. The initial saturated thickness is based upon on-site soil testing results and the estimated depth to the underlying impermeable or restrictive layer. The length and width of the application area are based on the proposed basin size and location.

Results

Based on the criteria mentioned above, the analysis (see attached) indicates that all the mounds are less than 0.5 feet in height and therefore considerably less than the “worse-case” scenario (3.5 - 4.5 feet) listed above. Additionally, the mounding effect at the end of 72 hours is less than 2 feet for all the basins. Given these results, we feel as though the basins will effectively recharge the stormwater volume within 72 hours as required.

GROUNDWATER MOUNDING ANALYSIS PARAMETERS
MAYNARD CROSSING
MAYNARD, MA

Basin #	Basin Btm. Elev. (ft)	GW Elev. (ft)	Depth to GW (ft)	Mounding Analysis Needed?	Basin Length A (ft)	Basin Width B (ft)	Basin Btm. Area (sf)	10 yr storm vol. (cf)	Time to 0 discharge (hr)	w (ft/hr)	Computed Mound (ft)	Distance from Btm. Of BMP to top of mound (ft)	Outlet Elev. (ft)	Height of Outlet above mound (ft)
1	198	195.5	2.5	YES	132	78	10,213	17,860	27	0.06	0.54	1.96	200.10	4.06
2	194	192	2	YES	75	35	2,625	4,879	29	0.06	0.31	1.69	196.50	4.19
3	197	194.7	2.3	YES	129	50	6,450	9,329	25	0.06	0.31	1.99	198.50	3.49

Notes
1. 10 yr storm volume from HydroCAD analysis converted from ac-ft to cf
2. Time to 0 discharge is from HydroCAD hydrographs, first time of 0 discharge
3. 72 hour calculation time based on DEP requirement to drain BMP in 72 hours
4. Hydraulic Conductivity = 2.0 ft/hr, converted from Rawls rate of 2.4 inches/hr and multiplied by 10 per DEP guidelines to account for horizontal conductivity
5. Specific yield for medium sand = 0.28

Groundwater Mound Beneath Rectangular Recharge Area

by Glenn M. Duffield, President, HydroSOLVE, Inc.

Hantush (1967) presented the following equations for predicting the maximum height of the water table beneath a rectangular recharge area:

$$h_m^2 - h_i^2 = Z_m(t) = (2w/K)\nu t S^*(0.5A/(4\nu t)^{1/2}, 0.5B/(4\nu t)^{1/2}) \quad \ldots\ldots (1)$$

$$\nu = K\bar{b}/\varepsilon \quad \ldots\ldots (2)$$

$$\bar{b} = 0.5[h_i(0) + h(t)] \quad \ldots\ldots (3)$$

where h_m is maximum height of mound above aquifer base (i.e., maximum saturated thickness of aquifer beneath recharge area); h_i is initial height of water table above aquifer base (i.e., initial saturated thickness of aquifer); K and ε are hydraulic conductivity and storativity (specific yield) of aquifer, respectively; w is constant rate of percolation from rectangular recharge area of length A and width B; $\bar{b}$ is a constant of linearization; and the function S* is an integral expression (see Hantush 1967). The aquifer is unconfined and assumed to have infinite extent.

If infiltration ends at time $t=t_0$, Hantush (1967) applied the principle of superposition to compute the decay of the mound as follows:

$$h_m^2 - h_i^2 = Z_m(t) - Z_m(t-t_0) \quad \ldots\ldots (4)$$

Equation (1) is nonlinear owing to the definition of $\bar{b}$ in Equation (3); however, the solution is readily obtained by successive approximation.

Results of Groundwater Mounding Calculation

Solution by Successive Approximation

Iteration	$\bar{b}$	h_m*	% Change
1	20	20.5368736529262	2.68436826463081
2	20.268436826463	20.5372880350267	2.01774674939426E-03
3	20.268644017513	20.5372883508547	1.53782730993868E-06

K [L/T]	ε	h_i [L]	A [L]	B [L]	w [L/T]	t [T]	h_m [L]
2	.28	20	132	78	.06	72	20.5372883508547

maximum water-table rise (h_m - h_i) at time t = 72 is
0.537288350854745
decay of mound computed after time t = 27

Return to Groundwater Mounding Calculator

Click here for a benchmark for this calculator.

Hantush mounding calculations with contouring now available in AQTESOLV.

Groundwater Mound Beneath Rectangular Recharge Area

by Glenn M. Duffield, President, HydroSOLVE, Inc.

Hantush (1967) presented the following equations for predicting the maximum height of the water table beneath a rectangular recharge area:

$$h_m^2 - h_i^2 = Z_m(t) = (2w/K)\nu t S^*(0.5A/(4\nu t)^{1/2}, 0.5B/(4\nu t)^{1/2}) \quad \ldots\ldots (1)$$

$$\nu = K\bar{b}/\varepsilon \quad \ldots\ldots (2)$$

$$\bar{b} = 0.5[h_i(0) + h(t)] \quad \ldots\ldots (3)$$

where h_m is maximum height of mound above aquifer base (i.e., maximum saturated thickness of aquifer beneath recharge area); h_i is initial height of water table above aquifer base (i.e., initial saturated thickness of aquifer); K and ε are hydraulic conductivity and storativity (specific yield) of aquifer, respectively; w is constant rate of percolation from rectangular recharge area of length A and width B; $\bar{b}$ is a constant of linearization; and the function S* is an integral expression (see Hantush 1967). The aquifer is unconfined and assumed to have infinite extent.

If infiltration ends at time $t=t_0$, Hantush (1967) applied the principle of superposition to compute the decay of the mound as follows:

$$h_m^2 - h_i^2 = Z_m(t) - Z_m(t-t_0) \quad \ldots\ldots (4)$$

Equation (1) is nonlinear owing to the definition of $\bar{b}$ in Equation (3); however, the solution is readily obtained by successive approximation.

Results of Groundwater Mounding Calculation

Solution by Successive Approximation

Iteration	$\bar{b}$	h_m*	% Change
1	10	10.3068975417711	3.06897541771143
2	10.153448770885	10.3070535799245	1.51391970997228E-03
3	10.153526789962	10.3070536579795	7.57296536590957E-07

K [L/T]	ε	h_i [L]	A [L]	B [L]	w [L/T]	t [T]	h_m [L]
2	.28	10	75	35	.06	72	10.3070536579795

maximum water-table rise (h_m - h_i) at time t = 72 is
0.307053657979473
decay of mound computed after time t = 29

Return to Groundwater Mounding Calculator

Click here for a benchmark for this calculator.

Hantush mounding calculations with contouring now available in AQTESOLV.

Groundwater Mound Beneath Rectangular Recharge Area

by Glenn M. Duffield, President, HydroSOLVE, Inc.

Hantush (1967) presented the following equations for predicting the maximum height of the water table beneath a rectangular recharge area:

$$h_m^2 - h_i^2 = Z_m(t) = (2w/K)\nu t S^*(0.5A/(4\nu t)^{1/2}, 0.5B/(4\nu t)^{1/2}) \quad \ldots\ldots (1)$$

$$\nu = K\bar{b}/\varepsilon \quad \ldots\ldots (2)$$

$$\bar{b} = 0.5[h_i(0) + h(t)] \quad \ldots\ldots (3)$$

where h_m is maximum height of mound above aquifer base (i.e., maximum saturated thickness of aquifer beneath recharge area); h_i is initial height of water table above aquifer base (i.e., initial saturated thickness of aquifer); K and ε are hydraulic conductivity and storativity (specific yield) of aquifer, respectively; w is constant rate of percolation from rectangular recharge area of length A and width B; $\bar{b}$ is a constant of linearization; and the function S* is an integral expression (see Hantush 1967). The aquifer is unconfined and assumed to have infinite extent.

If infiltration ends at time $t=t_0$, Hantush (1967) applied the principle of superposition to compute the decay of the mound as follows:

$$h_m^2 - h_i^2 = Z_m(t) - Z_m(t-t_0) \quad \ldots\ldots (4)$$

Equation (1) is nonlinear owing to the definition of $\bar{b}$ in Equation (3); however, the solution is readily obtained by successive approximation.

Results of Groundwater Mounding Calculation

Solution by Successive Approximation

Iteration	$\overline{b}$	h_m*	% Change
1	20	20.3106761478825	1.55338073941249
2	20.155338073941	220.3107847292551	5.34602451351951E-04
3	20.155392364627	520.3107847669064	1.85375981232028E-07

K [L/T]	ε	h_i [L]	A [L]	B [L]	w [L/T]	t [T]	h_m [L]
2	.28	20	129	50	.06	72	20.3107847669064

maximum water-table rise (h_m - h_i) at time t = 72 is
0.310784766906384
decay of mound computed after time t = 25

Return to Groundwater Mounding Calculator

Click here for a benchmark for this calculator.

Hantush mounding calculations with contouring now available in AQTESOLV.

Empirical Preformed Scour Hole Equations:

Type 1: Scour Hole Depression = one-half pipe rise, m (ft)

$d_{50} = (0.0276\ R_p^2/TW)\ (Q/R_p^{2.5})^{1.333}$ ($d_{50} = (0.0125 R_p^2/TW)\ (Q/R_p^{2.5})^{1.333}$) **(11.35)**

Type 2: Scour Hole Depression = full pipe rise, m (ft)

$d_{50} = (0.0181\ R_p^2/TW)\ (Q/R_p^{2.5})^{1.333}$ ($d_{50} = (0.0082 R_p^2/TW)\ (Q/R_p^{2.5})^{1.333}$) **(11.36)**

d_{50} = median stone size required, m (ft)

For variables S_p, R_p, TW and Q, see Section 11.13.5.

Type 1 and 2 preformed scour hole dimensions (See Figure 11-15)

$C = 3S_p + 6F$	Basin Length m (ft)	
$B = 2S_p + 6F$	Basin Inlet and Outlet Width m (ft)	**(11.37)**
$F = 0.5R_p$ (Type 1) or R_p (Type 2)	Basin Depression m (ft)	

Table 11-14 solves the above set of equations for Type 1 and 2 preformed scour holes for various pipe sizes.

The type of riprap required is as follows:

Modified	$d_{50} < 0.13$m (0.42 ft)
Intermediate	0.13m (0.42 ft) $< d_{50} <$ 0.20m (0.67 ft)
Standard	0.20m (0.67 ft) $< d_{50} <$ 0.38m (1.25 ft)
Special Design	0.38m (1.25 ft) $< d_{50}$

Reference: Report No. FHWA-RD-75-508 ("Culvert Outlet Protection Design: Computer Program Documentation")

OUTLET PROTECTION
OUTLET VELOCITY > 14 feet/sec or Length of Apron exceeds limits shown on Tables 11-12.1 and 11-13.1

Preformed Scour Hole										
(See Figure 11-15)	PIPE DIAMETER OR SPAN (in)									
	12	15	18	24	30	36	42	48	54	60
Type 1										
B	5	6	8	10	13	15	18	20	23	25
C	6	8	9	12	15	18	21	24	27	30
d	Depends on riprap type(see Figure 11-15)									
$2S_p$	2.0	2.6	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
$3S_p$	3.0	3.9	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0
$F = 0.5\ S_p$	0.5	0.625	0.75	1	1.25	1.5	1.75	2	2.25	2.5
Type 2										
B	8	10	12	16	20	24	28	32	36	40
C	9	11	14	18	23	27	32	36	41	45
d	Depends on riprap size (see Figure 11-15)									
$2S_p$	2.0	2.6	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
$3S_p$	3.0	3.9	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0
$F = S_p$	1.0	1.3	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0

Table 11-14.1 - Dimensions of Preformed Scour Hole (Feet)

Maynard Crossing
129 Parker Street
Maynard, Massachusetts

Rip Rap Sizing Calculations
Design Period Storm: 50 Year

Location	Pipe Size (in)	Pipe Size (ft)	Q (cfs)	TW* (ft)	D_{50} (ft)	D_{50**} (in)
FES-1	48	4.0	51.03	0.3	1.24	**15**
FES-2	36	3.0	33.17	0.3	1.02	**12**
FES-3	15	1.3	3.44	0.3	0.16	**6**
FES-4	36	3.0	28.99	0.3	0.86	**10**
FES-5	30	2.5	12.95	0.3	0.37	**6**
FES-6	36	3.0	18.00	0.3	0.45	**6**
FES-7	15	1.3	Inflow	N/A	N/A	**N/A**
FES-8	12	1.0	0.68	0.3	0.02	**6**
FES-10	15	1.25	2.98	0.3	0.13	**6**
FES-11	12	1	1.16	0.3	0.05	**6**
FES-12	12	1	4.46	0.3	0.30	**6**

Based on Eq. 11.35 of ConnDOT Drainage Manual

* Assume tailwater = 0.3' at beginning of storm (lower TW provides more conservative results
** Q<10 cfs - min. 6" stone size, Q>10 cfs - min. 12" stone size

Prepared By: Bohler Engineering
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

APPENDIX G – OPERATIONS AND MAINTENANCE PLAN

- STORMWATER OPERATION AND MAINTENANCE PLAN
- BMP LOCATION MAP
- STORMWATER MANAGEMENT SYSTEM POST CONSTRUCTION INSPECTION REPORT
- STORMWATER INSPECTION AND MAINTENANCE LOG FORM
- LONG TERM POLLUTION PREVENTION PLAN
- ILLICIT DISCHARGE STATEMENT
- SPILL PREVENTION AND RESPONSE PROCEDURE (POST CONSTRUCTION)
- SPILL PREVENTION AND CONTROL COUNTERMEASURE FORM

STORMWATER OPERATION & MAINTENANCE PLAN

Capital Group Properties
Maynard Crossing
129 Parker Road
Maynard, MA

RESPONSIBLE PARTY DURING CONSTRUCTION:

Capital Group Properties (or Designee)
259 Turnpike Road, Suite 100
Southborough, MA 01772

RESPONSIBLE PARTY POST CONSTRUCTION:

Capital Group Properties (or Designee)
259 Turnpike Road, Suite 100
Southborough, MA 01772

Construction Phase

During the construction phase, all erosion control devices and measures shall be maintained in accordance with the final record plans, local/state approvals and conditions, the EPA Construction General Permit and the Stormwater Pollution Prevention Plan (SWPPP). Additionally, the maintenance of all erosion / siltation control measures during construction shall be the responsibility of the general contractor. Contact information of the OWNER and CONTRACTOR shall be listed in the SWPPP for this site. The SWPPP also includes information regarding construction period allowable and illicit discharges, housekeeping and emergency response procedures. Upon proper notice to the property owner, the Town or its authorized designee shall be allowed to enter the property at a reasonable time and in a reasonable manner for the purposes of inspection.

Post Development Controls

Once construction is completed, the post development stormwater controls are to be operated and maintained in compliance with the following permanent procedures (note that the continued implementation of these procedures shall be the responsibility of the Owner or its assignee):

1. Parking lots and on-site driveways: Sweep at least two (2) times per year and on a more frequent basis depending on sanding operations. All resulting sweepings shall be collected and properly disposed of off site in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $2,250 per year

2. Catch basins, yard drains, trench drains, manholes and piping: Inspect four times per year and at the end of foliage and snow-removal seasons. These features shall be cleaned four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the catch basin or underground system. Accumulated sediment and hydrocarbons present must be removed and properly disposed of off site in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $50 per catch basin per year

3. Infiltration Basins: Preventative maintenance after every major storm event during the first three (3) months of operation and at least twice per year thereafter, and after every time drainage discharges through the high outlet orifice/grate or overflow spillway. Inspect structure and pretreatment BMP to ensure proper operation after every major storm event (generally equal or greater to 3.0 inches in 24 hours) for the first three months. Mow the buffer area, side slopes and basin bottom if grassed floor, rake if stone or sand bottom, remove trash and debris, remove grass clippings and accumulated organic matter. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $500 per basin per year

4. Underground Infiltration Systems: Preventative maintenance after every major storm event during the first three (3) months of operation and at least twice per year thereafter. Inspect structure and pretreatment BMP to ensure proper operation after every major storm event (generally equal or greater to 3.0 inches in 24 hours) for the first three months. The outlet of the basin, if any, shall be inspected for erosion and sedimentation, and rip-rap shall be promptly repaired in the case of erosion. Sediment collecting in the bottom of the basin shall be inspected twice annually, and removal shall commence any time the sediment reaches a depth of six inches anywhere in the basin. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $500 per basin per year

5. Central Lined Basin (Wet Pond): The central pond shall be inspected annually to ensure it is operating as intended and that all components are stable and in working order. Inspections shall be by qualified personnel. During the growing season, the side banks shall be mowed at least twice, with additional cuttings performed as needed. All vegetation (i.e. tree saplings) will be removed from embankments and the bottom. The inlets to the pond shall be inspected for erosion and sedimentation, and rip-rap shall be promptly repaired as needed. Sediment shall be cleaned if it reaches a depth that impairs the pond's ability to detain water, or if it reaches the elevation of the outlet weir in any point within the pond. Care shall be taken to not disturb or break the pond's liner. After sediment is removed, replace any vegetation damaged during the clean out by either reseeding or re-sodding. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $500 per year

6. Sediment Forebays

   Check the sediment forebays at least twice a year for accumulated sediment, trash, and debris. Clean debris and trash a minimum of four times per year and remove sediment when it has reached a depth of 3 feet or more. When cleaning the forebays, care shall be taken to not disturb or break the pond's underlying liner.

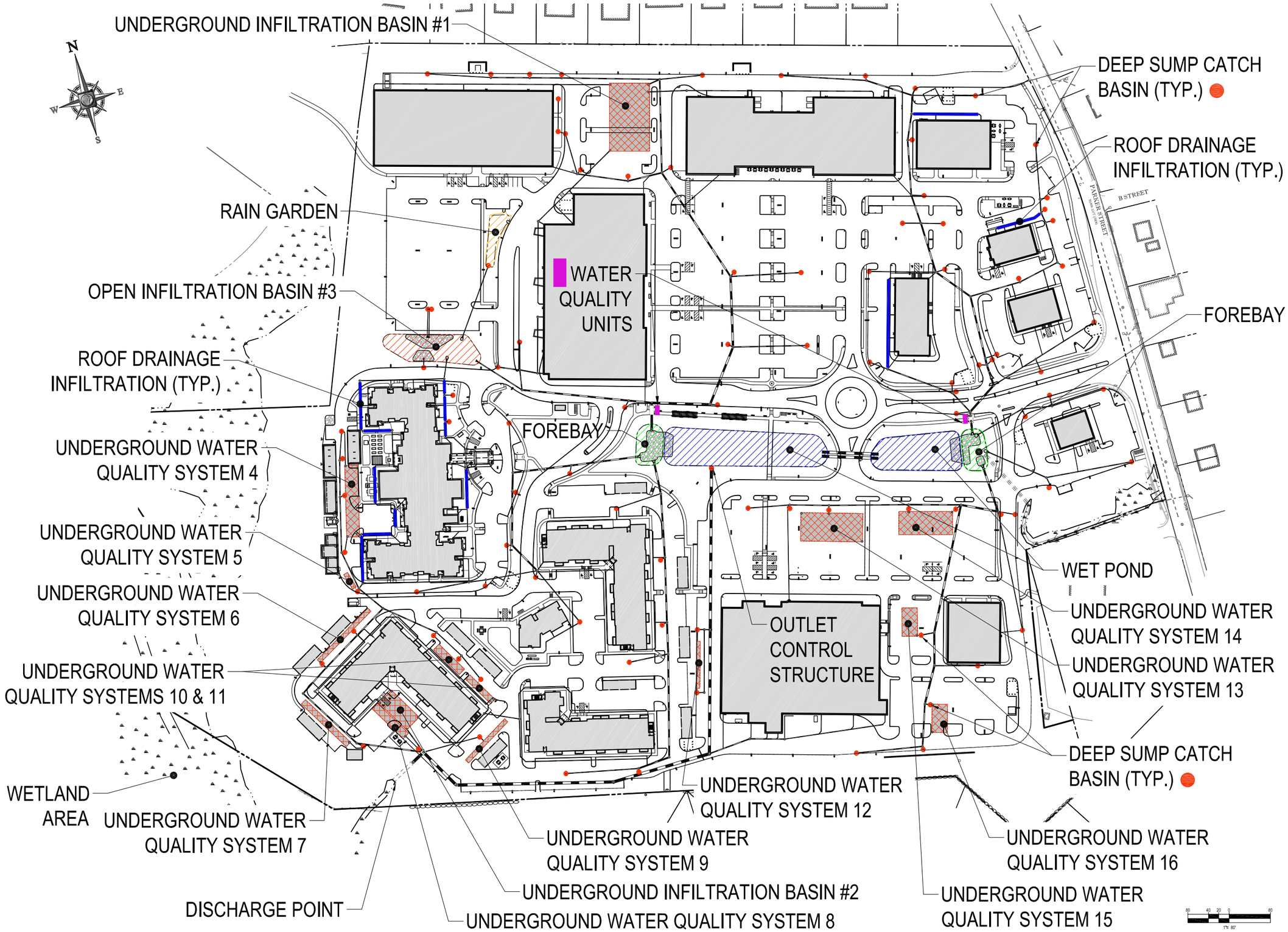
   Approximate Maintenance Budget: $250 per year per forebay

7. Rain Gardens: shall be inspected and cleared of trashed monthly; mowed 2 to 12 times per year; mulched annually; dead vegetation removed annually; pruned annually; replace entire media and all vegetation as needed. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $500/year per area

8. Water Quality Unit (Proprietary Separator): Follow manufacturer's recommendations (attached).

   Approximate Maintenance Budget: $500/year per unit



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PERTH AMBOY, NJ • DALLAS, TX
PRINCETON, NJ
REMSPATH BEACH, DE
SOUTHERN MARYLAND
NORTHERN VIRGINIA
HELLERTOWN, PA
REV. JERSEY, PA

REVISIONS

REV	DATE	COMMENT	BY
1	06/22/17	REV. PER STORMWATER CHANGES	CFD
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

PRELIMINARY

PROJECT No.:	W161189
DRAWN BY:	BLG/CFD
CHECKED BY:	NEM/JAK
DATE:	02/15/2017
SCALE:	AS NOTED
CAD I.D.:	W161189GRAD_STORM

PROJECT:
SITE DEVELOPMENT PLANS
FOR
CAPITAL GROUP
MAYNARD CROSSING
LOCATION OF SITE
MAP #25 & LOTS #152 & 152-1
129 PARKER STREET (ROUTE 27)
TOWN OF MAYNARD
MIDDLESEX COUNTY
MASSACHUSETTS

BOHLER ENGINEERING
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
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PROFESSIONAL ENGINEER
MASSACHUSETTS LICENSE No. 41530
CONNECTICUT LICENSE No. 26177
RHODE ISLAND LICENSE No. 9618
MAINE LICENSE No. 12553

SHEET TITLE:
BMP LOCATION PLAN

SHEET NUMBER:
BMP-1
OF 1

REV 1 - 06/22/2017

STORMWATER MANAGEMENT SYSTEM
POST-CONSTRUCTION INSPECTION REPORT

LOCATION:
Maynard Crossing
129 Parker Road
Maynard, MA

RESPONSIBLE PARTY:
Capital Group Properties
259 Turnpike Road, Suite 100
Southborough, MA 01772

NAME OF INSPECTOR:	INSPECTION DATE:
Note Condition of the Following (sediment depth, debris, standing water, damage, etc.):	
Catch Basins:	
Central Pond including forebays (Wet Basin):	
Underground Infiltration Basins:	
Above ground infiltration basin:	
Rain Garden:	
Discharge Points / Flared End Sections / Rip Rap	
Other:	

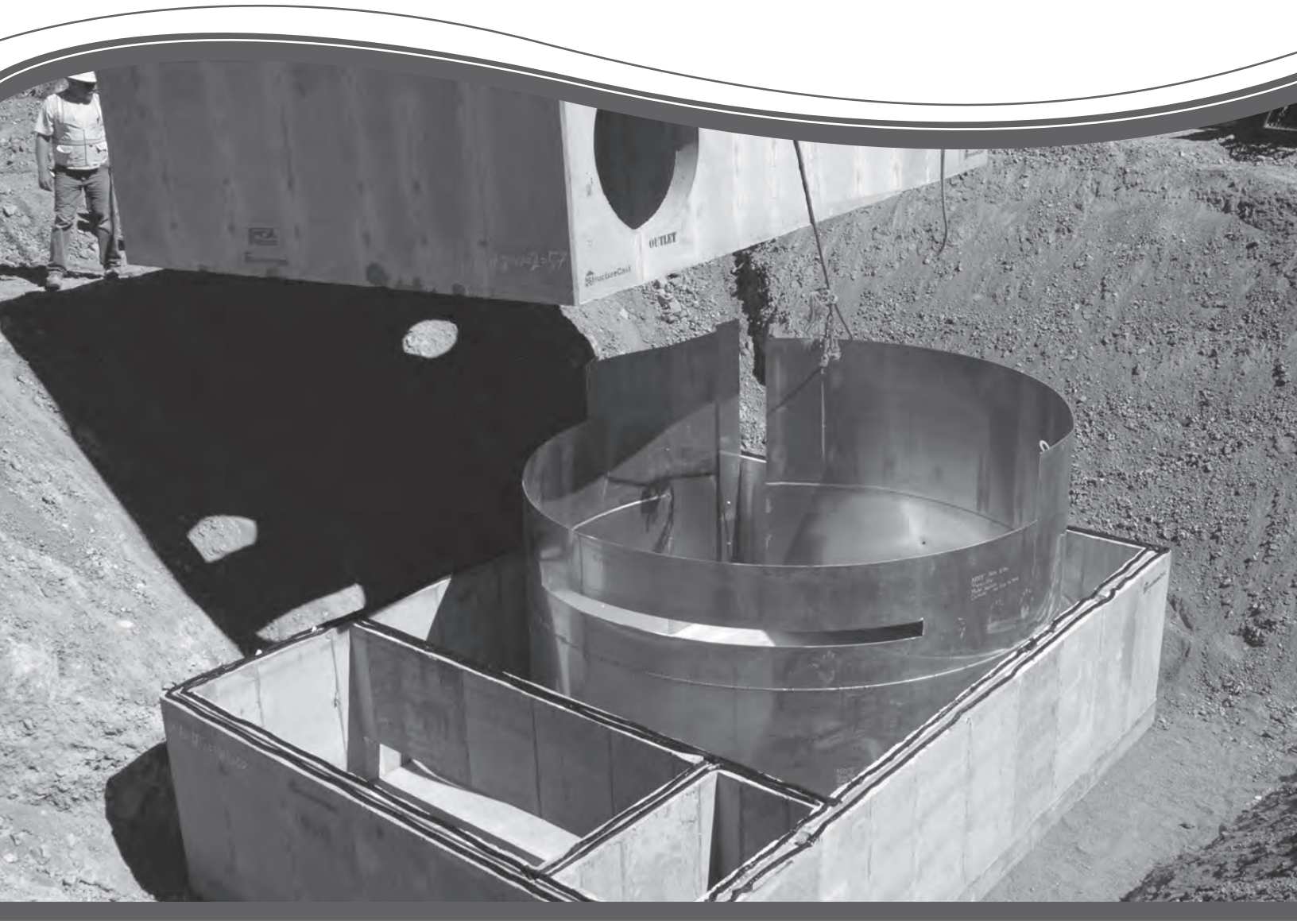
STORMWATER MANAGEMENT SYSTEM
POST-CONSTRUCTION INSPECTION REPORT

Note Recommended Actions to be taken on the Following (sediment and/or debris removal, repairs, etc.):
Catch Basins:
Central Pond including forebays (Wet Basin):
Underground Infiltration Basins:
Above ground infiltration basin:
Rain Garden:
Discharge Points / Flared End Sections / Rip Rap
Other:
Comments:

STORMWATER INSPECTION AND MAINTENANCE LOG FORM			
Maynard Crossing 129 Parker Road, Maynard, MA			
Stormwater Management Practice	Responsible Party	Date	Maintenance Activity Performed
Catch Basins / Yard Drains			
Underground Infil. Basin #1			
Underground Infil. Basin #2			
Surface Infiltration Basin #3			
Raingarden			
Vortechs Water Quality Units			
Central Pond & forebays			
Riprap at Pipe Outlets			
Underground Water Quality			
Infiltration Basins			

CONTECH®
ENGINEERED SOLUTIONS

Vortechs® Guide
Operation, Design, Performance and Maintenance



Vortechs®

Vortechs®

The Vortechs system is a high-performance hydrodynamic separator that effectively removes finer sediment (e.g. 50-microns (μm), oil, and floating and sinking debris. The swirl concentration operation and flow controls work together to minimize turbulence and provide stable storage of captured pollutants. Precast models can treat peak design flows up to 30-cfs (850-L/s); cast-in-place models handle even greater flows. A typical system is sized to provide a specific removal efficiency of a predefined particle size distribution (PSD).

Operation Overview

Stormwater enters the swirl chamber inducing a gentle swirling flow pattern and enhancing gravitational separation. Sinking pollutants stay in the swirl chamber while floatables are stopped at the baffle wall. Vortechs systems are usually sized to efficiently treat the frequently occurring runoff events and are primarily controlled by the low flow control orifice. This orifice effectively reduces inflow velocity and turbulence by inducing a slight backwater that is appropriate to the site.

During larger storms, the water level rises above the low flow control orifice and begins to flow through the high flow control. Any layer of floating pollutants is elevated above the invert of the Floatables Baffle Wall, preventing release. Swirling action increases in relation to the storm intensity, while sediment pile remains stable. When the storm drain is flowing at peak capacity, the water surface in the system approaches the top of the high flow control. The Vortechs system will be sized large enough so that previously captured pollutants are retained in the system, even during these infrequent events.

As a storm subsides, treated runoff decants out of the Vortechs system at a controlled rate, restoring the water level to a dry-weather level equal to the invert of the inlet pipe. The low water level facilitates easier inspection and cleaning, and significantly reduces maintenance costs by reducing pump-out volume.

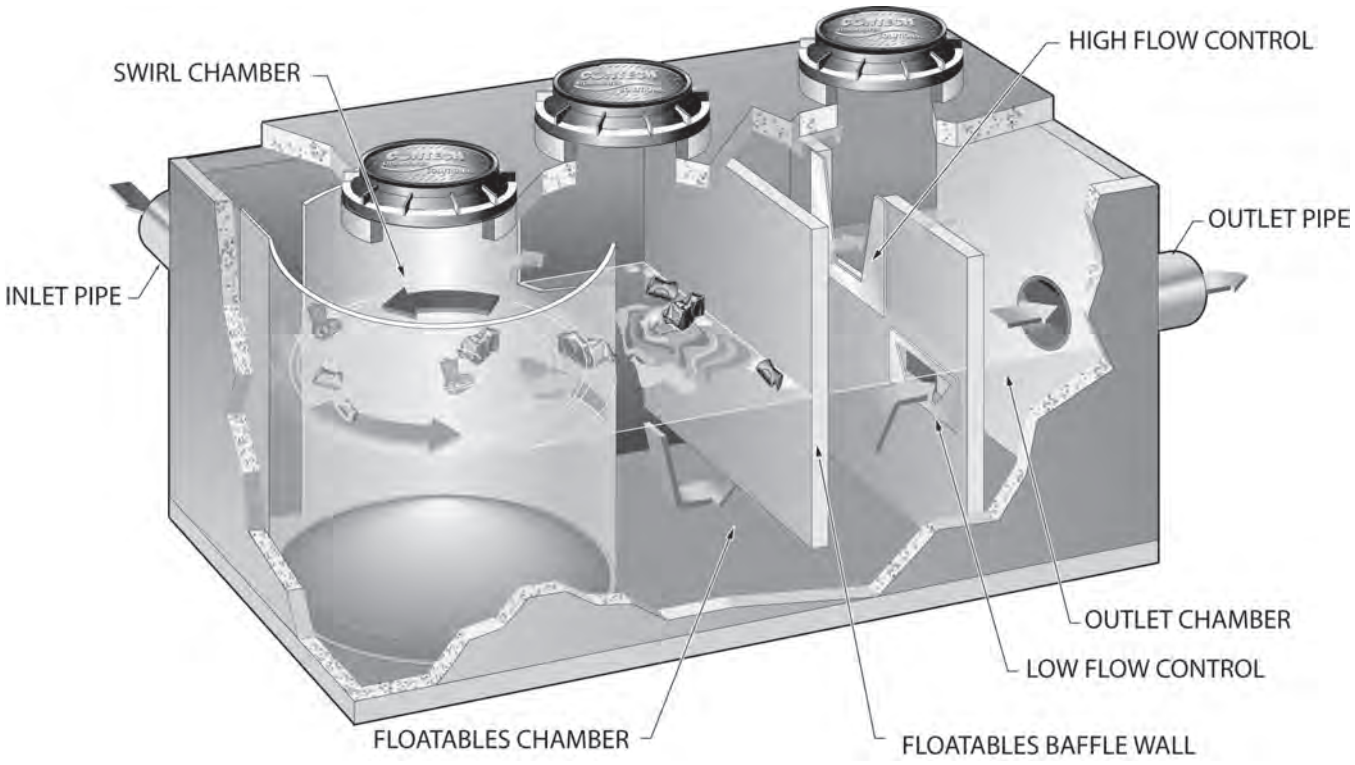
Design Basics

Each Vortechs system is custom designed based on site size, site runoff coefficient, regional precipitation intensity distribution, and anticipated pollutant characteristics. There are two primary methods of sizing a Vortechs system. The first is to determine which model size provides the desired removal efficiency at a given flow for a defined particle size or PSD. The second and more in depth method is the summation of Rational Rainfall Method™ which uses a summation process described below in detail and is used when a specific removal efficiency of the net annual sediment load is required.

Typically Vortechs systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for either 50-μm particles, or a particle gradation found in typical urban runoff (see performance section of this manual for more information).

The Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. It is important to take these factors into consideration when estimating the long-term performance of any stormwater treatment system. The Rational Rainfall Method combines site-specific information with laboratory generated performance data, and local historical precipitation records to estimate removal efficiencies as accurately as possible.



Short duration rain gauge records from across the United States and Canada were analyzed to determine the percent of the total annual rainfall that fell at a range of intensities. US stations' depths were totaled every 15 minutes or hourly and recorded in 0.01-inch increments. Depths were recorded hourly with 1-mm resolution at Canadian stations. One trend was consistent at all sites; the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Rainfall Method. Since most sites are relatively small and highly impervious, the Rational Rainfall Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed Vortechs system are determined. Performance efficiency curve determined from full scale laboratory tests on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Once a system size is established, the internal elements of the system are designed based on information provided by the site engineer. Flow control sizes and shapes, sump depth, oil spill storage capacity, sediment storage volume and inlet and outlet orientation are determined for each system. In addition, bypass weir calculations are made for off-line systems.

Flow Control Calculations

Low Flow Control

The low flow control, or orifice, is typically sized to submerge the inlet pipe when the Vortechs system is operating at 20% of its treatment capacity. The orifice is typically a Cippoletti shaped aperture defined by its flat crest and sides which incline outwardly at a slope of 1 horizontal to 4 vertical.

$$Q_{orifice} = C_d \bullet A \bullet \sqrt{2gh}$$

Where:

$Q_{orifice}$ = flow through orifice, cfs (L/s)

C_d = orifice coefficient of discharge = 0.56 (based on lab tests)

A = orifice flow area, ft^2 (m^2) (calculated by orifice geometry)

h = design head, ft (m) (equal to the inlet pipe diameter)

g = acceleration due to gravity (32.2-ft/s^2 (9.81-m/s^2)

The minimum orifice crest length is 3-in (76-mm) and the minimum orifice height is 4-in (102-mm). If flow must be restricted beyond what can be provided by this size aperture, a Fluidic-Amp™ HydroBrake flow control will be used. The HydroBrake allows the minimum flow constriction to remain at 3-in (76-mm) or greater while further reducing flow due to its unique throttling action.

High Flow Control

The high flow control, or weir, is sized to pass the peak system capacity minus the peak orifice flow when the water surface elevation is at the top of the weir. This flow control is also a Cippoletti type weir.

The weir flow control is sized by solving for the crest length and head in the following equation:

$$Q_{weir} = C_d \bullet L \bullet (h)^{3/2}$$

Where:

Q_{weir} = flow through weir, cfs (L/s)

C_d = Cippoletti weir coefficient = 3.37 (based on lab testing)

h = available head, ft (m) (height of weir)

L = design weir crest length, ft (m)

Bypass Calculations

In most all cases, pollutant removal goals can be met without treating peak flow rates and it is most feasible to use a smaller Vortechs system configured with an external bypass. In such cases, a bypass design is recommended by Contech Engineered Solutions for each off-line system. To calculate the bypass capacity, first subtract the system's treatment capacity from the peak conveyance capacity of the collection system (minimum of 10-year recurrence interval). The result is the flow rate that must be bypassed to avoid surcharging the Vortechs system. Then use the following arrangement of the Francis formula to calculate the depth of flow over the bypass weir.

$$H = (Q_{bypass} / (C_d \bullet L))^{2/3}$$

Where:

H = depth of flow over bypass weir crest, ft (m)

Q_{bypass} = required bypass flow, cfs (L/s)

C_d = discharge coefficient = 3.3 for rectangular weir

L = length of bypass weir crest, ft

The bypass weir crest elevation is then calculated to be the elevation at the top of the Cippoletti weir minus the depth of flow.

Hydraulic Capacity

In the event that the peak design flow from the site is exceeded, it is important that the Vortechs system is not a constriction to runoff leaving the site. Therefore, each system is designed with enough hydraulic capacity to pass the 100-year flow rate. It is important to note that at operating rates above 100-gpm/ft^2 (68-Lps/m^2) of the swirl chamber area (peak treatment capacity), captured pollutants may be lost.

When the system is operating at peak hydraulic capacity, water will be flowing through the gap over the top of the flow control wall as well as the orifice and the weir.

Performance

Full Scale Laboratory Test Results

Laboratory testing was conducted on a full scale Vortechs model 2000. The 150-μm curve demonstrates the results of tests using particles that passed through a 60-mesh sieve and were retained on a 100-mesh sieve. The 50-μm curve is based on tests of particles passing through a 200-mesh sieve and retained on a 400-mesh sieve (38-μm). A gradation with an average particle size (d50) of 80-μm, containing particles ranging from 38–500-μm in diameter was used to represent typical stormwater solids. (Table 1)

Particle Size Distribution (μm)	Percentage of Sample Make-Up
<63	42%
63 - 75	4%
75 - 100	9%
100 - 150	7%
150 - 250	11%
>250	27%

Table 1: Particle gradation of typical urban runoff used for efficiency curve

As shown, the Vortechs system maintains positive total suspended solids (TSS), defined by the tested gradations, removal efficiencies over the full range of operating rates. This allows the system to effectively treat all runoff from large, infrequent design storms, as well as runoff from more frequent low-intensity storms.

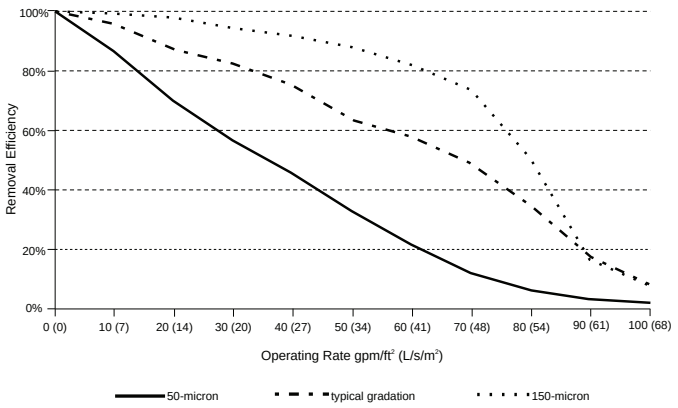


Figure 1: Vortechs model 2000 Removal Efficiencies

Typical Vortechs systems are designed to treat peak flows from 1.6-cfs (45-L/s) up to 30-cfs (850-L/s) online without the need for bypass. However, external bypasses can be configured to convey peak flows around the system if treatment capacity is exceeded. The system can also be configured to direct low flows from the last chamber of the system to polishing treatment when more stringent water quality standards are imposed. In all configurations, high removal efficiencies are achieved during the lower intensity storms, which constitute the majority of annual rainfall volume.

Full report available at www.conteches.com/vortechs.

Laboratory Testing

Full reports available at www.conteches.com/vortechs

Technical Bulletin 1: Removal Efficiencies for Selected Particle Gradations

Technical Bulletin 2: Particle Distribution of Sediments and the Effect on Heavy Metal Removal

Technical Bulletin 3: Sizing for Net Annual Sediment Removal

Technical Bulletin 3a: Determining Bypass Weir Elevation for Off-Line Systems

Technical Bulletin 4: Modeling Long Term Load Reduction: The Rational Rainfall Method

Technical Bulletin 5: Oil Removal Efficiency

Field Monitoring

Following are brief summaries of the field tests completed to date.

Full reports available at www.conteches.com/vortechs

DeLorme Mapping Company

Yarmouth, ME

Contech Engineered Solutions

Prior to this premier field test of the Vortechs system, Contech developed an extensive body of laboratory data to document total suspended solids (TSS) removal efficiency. Contech performed this field study in order to compare the performance predicted using laboratory data to the performance of a correctly sized system in the field.

The study site was the headquarters of DeLorme Mapping in Yarmouth, Maine. The building, driveway, parking lot and ancillary facilities were constructed in 1996. A Vortechs model 11000 was installed to treat runoff from the 300-space, 4-acre (1.62-ha) parking lot.

Testing Period	May 1999 to Dec 1999
# of Storms Sampled	20
Mean Influent Concentration	328-mg/L
Mean Effluent Concentration	60-mg/L
Removal Efficiency	82%

The main purpose of the DeLorme study was to verify that the sizing methodology developed from our full-scale laboratory testing was valid and an accurate means of predicting field performance. The results of the study confirmed our sizing methodology.

Village Marine Drainage

Lake George, NY

New York State Department of Environmental Conservation, Division of Water

The New York State DEC used funds obtained in a Section 319 grant to initiate a study of the effectiveness of the Vortechs system to remove sediment and other pollutants transported

by stormwater to Lake George, Lake George Village, New York. "Since the 1970s, when there was a rapid increase in the rate and concentration of development along the southwestern shores of Lake George, we have been concerned about the impact of stormwater discharges into the lake," said Tracy West, co-author of the study.

Testing Period	Feb 2000 to Dec 2000
# of Storms Sampled	13
Mean Influent Concentration	801-mg/L
Mean Effluent Concentration	105-mg/L
Removal Efficiency	88%

The study concluded that the Village and Town of Lake George should consider installing additional Vortechs systems in areas where sedimentation and erosion have been identified as non-point source pollution problems.

Harding Township Rest Area
Harding Township, NJ
RTP Environmental Associates

This third party evaluation was performed under a U.S. Environmental Protection Agency grant, administered by the New Jersey Department of Environmental Protection. A. Roger Greenway, principal of RTP Environmental Associates, Inc., conducted the study in conjunction with Thonet Associates, which assisted with data analysis and helped develop best management practices (BMP) recommendations.

The Vortechs model 4000 was sized to handle a 100-year storm from the 3 acre (1.21 ha) paved parking area at the Harding Rest Stop, located off the northbound lane of I-287 in Harding Township, New Jersey.

Testing Period	May 1999 to Nov 2000
# of Storms Sampled	5
Mean Influent Concentration (TSS)	493-mg/L
Mean Effluent Concentration (TSS)	35-mg/L
Removal Efficiency (TSS)	93%
Mean Influent Concentration (TPH)	16-mg/L
Mean Effluent Concentration (TPH)	5-mg/L
Removal Efficienty (TPH)	67%

The study concluded that truck rest stops and similar parking areas would benefit from installing stormwater treatment systems to mitigate the water quality impacts associated with stormwater runoff from these sites.

Timothy Edwards Middle School
South Windsor, CT
UCONN Department of Civil & Environmental Engineering

This study of the Vortechs system was published as a thesis by Susan Mary Board, as part of the requirements for a Master of Science degree from the University of Connecticut. Her objective was to determine how well the Vortechs system retained pollutants from parking lot runoff, including total suspended solids (TSS), nutrients, metals, and petroleum hydrocarbons.

A Vortechs model 5000 was installed in 1998 to treat runoff from the 82-space parking lot of Timothy Edwards Middle School. The entire watershed was approximately 2 acres (0.81 ha), and was 80% impervious.

Testing Period	Jul 2000 to Apr 2001
# of Storms Sampled	weekly composite samples taken
Mean Influent Concentration	324-mg/L
Mean Effluent Concentration	73-mg/L
Removal Efficiency	77%

Additionally, the Vortechs system was particularly effective in removing zinc (85%), lead (46%), copper (56%), phosphorus (67%) and nitrate (54%).

The study concluded that the Vortechs system significantly reduced effluent concentrations of many pollutants in stormwater runoff.

Maintenance

The Vortechs system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit, e.g., unstable soils or heavy winter sanding will cause the swirl chamber to fill more quickly but regular sweeping will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant deposition and transport may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. Inspections should be performed twice per year (i.e. spring and fall) however more frequent inspections may be necessary in equipment washdown areas and in climates where winter sanding operations may lead to rapid accumulations. It is useful and often required as part of a permit to keep a record of each inspection. A simple inspection and maintenance log form for doing so is provided on the following page, and is also available on conteches.com.

The Vortechs system should be cleaned when inspection reveals that the sediment depth has accumulated to within 12 to 18 inches (300 to 450 mm) of the dry-weather water surface elevation. This determination can be made by taking two measurements with a stadia rod or similar measuring device; one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. Note: To avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile. Finer, silty particles at the top of the pile typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.

Cleaning

Cleaning of the Vortechs system should be done during dry weather conditions when no flow is entering the system. Clean-out of the Vortechs system with a vacuum truck is generally the most effective and convenient method of excavating pollutants from the system. If such a truck is not available, a "clamshell" grab may be used, but it is difficult to remove all accumulated pollutants using a "clamshell".

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use adsorbent pads to solidify the oil since these pads are usually much easier to remove from the unit individually and less expensive to dispose of than the oil/water emulsion that may be created by vacuuming the oily layer. Floating trash can be netted out if you wish to separate it from the other pollutants.

Cleaning of a Vortechs system is typically done by inserting a vacuum hose into the swirl chamber and evacuating this chamber of water and pollutants. As water is evacuated, the water level outside of the swirl chamber will drop to a level roughly equal to the crest of the lower aperture of the swirl chamber.

Floating pollutants will decant into the swirl chamber as the water level is drawn down. This allows most floating material to be withdrawn from the same access point above the swirl chamber. Floating material that does not decant into the swirl chamber during draw down should be skimmed from the baffle chamber. Sediment may accumulate outside the swirl chamber. If this is the case, it may be necessary to pump out other chambers. It is advisable to check for sediment accumulation in all chambers during inspection and maintenance.

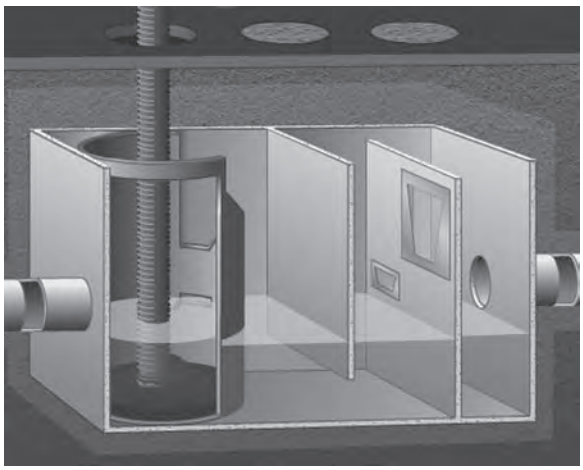
These maintenance recommendations apply to all Vortechs systems with the following exceptions:

1. It is strongly recommended that when cleaning systems larger than the Model 16000 the baffle chamber be drawn down to depth of three feet prior to beginning clean-out of the swirl chamber. Drawing down this chamber prior to the swirl chamber reduces adverse structural forces pushing upstream on the swirl chamber once that chamber is empty.
2. Entry into a Vortechs system is generally not required as cleaning can be done from the ground surface. However, if manned entry into a system is required the entire system should be evacuated of water prior to entry regardless of the system size.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure proper safety precautions. If anyone physically enters the unit, Confined Space Entry procedures need to be followed.

Disposal of all material removed from the Vortechs system should be done in accordance with local regulations. In many locations, disposal of evacuated sediments may be handled in the same manner as disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

Contech has created a network of Certified Maintenance Providers (CCMP's) to provide maintenance on Vortechs systems. To find a CCMP in your area please visit www.conteches.com/maintenance.



Vortechs Inspection & Maintenance Log

Vortech Model: _____ **Location:** _____

Date	Water depth to sediment	Floatable layer thickness	Describe maintenance performed	Maintenance personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than eighteen inches the system should be cleaned out. Note: To avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.
2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

RECYCLED PAPER

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The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; related foreign patents or other patents pending.

vx_manual 04/17 PDF Revision

LONG-TERM POLLUTION PREVENTION PLAN

Capital Group Properties
Maynard Crossing
129 Parker Road
Maynard, MA

RESPONSIBLE PARTY:

Capital Group Properties
259 Turnpike Road, Suite 100
Southborough, MA 01772

For this site, the Long-Term Pollution Prevention Plan will consist of the following:

- The property owner shall be responsible for "good housekeeping" including proper periodic maintenance of building and pavement areas, curbing, landscaping, etc.
- Proper storage and removal of solid waste.
- Sweeping of driveways a minimum of twice per year with a commercial cleaning unit. Any sediment removed shall be disposed of in accordance with applicable local and state requirements.
- Regular inspections and maintenance of Stormwater Management System as noted in the "O&M Plan".
- Snow removal shall be the responsibility of the property owner. Snow shall not be plowed, dumped and/or placed in forebays, infiltration basins or similar stormwater controls. Salting and/or sanding of pavement / walkway areas during winter conditions shall only be done in accordance with all state/local requirements and approvals.
- Trash and other debris shall be removed from all areas of the site at least twice yearly.
- Reseed any bare areas as soon as they occur. Erosion control measures shall be installed in these areas to prevent deposits of sediment from entering the drainage system.
- Plants shall be pruned as necessary.
- The use of pesticides will be kept at a level consistent with typical commercial/residential use.
- Pet waste shall be disposed of in accordance with local regulations. Pet waste shall not be disposed of in a storm drain or catch basin.
- Snow piles shall be located adjacent to or on pervious surfaces in upland areas. This will allow snow melt water to filter in to the soil, leaving behind sand and debris which can be removed in the springtime.
- In no case shall snow be disposed of or stored in resource areas (wetlands, floodplain, streams or other water bodies).
- In no case shall snow be disposed of or stored in the detention basins or pond.
- If necessary, stockpiled snow will be removed from the Site and disposed of at an off-site location in accordance with all local, state and federal regulations.
- Snow removal and deicing procedures shall be performed in accordance with local approvals and the Snow and Ice Management Plan contained in the site's Operations Manual.

The Owner or its assignee shall contract with a licensed stormwater engineer to perform inspections in accordance with the Stormwater Operation and Maintenance Plan. Any noted deficiencies shall be corrected and inspection reports shall be forwarded to the to the Town of Maynard Conservation Commission on an annual basis. The annual report shall include a detailed list of any/all chemicals used or applied at the property for snow and ice removal, lawn treatment, and fertilization purposes.

OPERATON AND MAINTENANCE TRAINING PROGRAM

The Owner will coordinate an annual in-house training session to discuss the Operations and Maintenance Plan, the Long-Term Pollution Prevention Plan, and the Spill Prevention Plan and response procedures. Annual training will include the following:

Discuss the Operations and Maintenance Plan

- Explain the general operations of the stormwater management system and its BMPs
- Identify potential sources of stormwater pollution and measures / methods of reducing or eliminating that pollution
- Emphasize good housekeeping measures

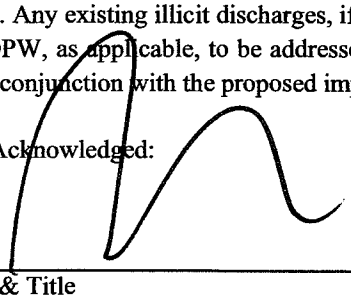
Discuss the Spill Prevention and Response Procedures

- Explain the process in the event of a spill
- Identify potential sources of spills and procedures for cleanup and /or reporting and notification
- Complete a yearly inventory or Materials Safety Data sheets of all tenants and confirm that no potentially harmful chemicals are in use.

ILLICIT DISCHARGE STATEMENT

Certain types of non-stormwater discharges listed below are allowed under the U.S. Environmental Protection Agency Construction General Permit. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come in contact with the water prior to or after its discharge. The control measures which have been outlined previously in this LTPPP will be strictly followed to ensure that no contamination of these non-storm water discharges takes place. Any existing illicit discharges, if discovered during the course of the work, will be reported to MassDEP and the local DPW, as applicable, to be addressed in accordance with their respective policies. No illicit discharges will be allowed in conjunction with the proposed improvements.

Duly Acknowledged:



Name & Title

SPILL PREVENTION AND RESPONSE PROCEDURES (POST-CONSTRUCTION)

In order to prevent or minimize the potential for a spill of Hazardous Substances or Oil or come into contact with stormwater, the following steps will be implemented:

1. All Hazardous Substances or Oil (such as pesticides, petroleum products, fertilizers, detergents, acids, paints, paint solvents, cleaning solvents, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.

2. The minimum practical quantity of all such materials will be kept on site.

3. A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided on site.

4. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

5. It is the OWNER's responsibility to ensure that all Hazardous Waste on site is disposed of properly by a licensed hazardous material disposal company. The OWNER is responsible for not exceeding Hazardous Waste storage requirements mandated by the EPA or state and local authorities.

In the event of a spill of Hazardous Substances or Oil, the following procedures should be followed:

1. All measures should be taken to contain and abate the spill and to prevent the discharge of the Hazardous Substance or Oil to stormwater or off-site. (The spill area should be kept well ventilated and personnel should wear appropriate protective clothing to prevent injury from contact with the Hazardous Substances.)

2. For spills of less than five (5) gallons of material, proceed with source control and containment, clean-up with absorbent materials or other applicable means unless an imminent hazard or other circumstances dictate that the spill should be treated by a professional emergency response contractor.

3. For spills greater than five (5) gallons of material immediately contact the MADEP at the toll-free 24-hour statewide emergency number: **1-888-304-1133**, the local fire department (**9-1-1**) and an approved emergency response contractor. Provide information on the type of material spilled, the location of the spill, the quantity spilled, and the time of the spill to the emergency response contractor or coordinator, and proceed with prevention, containment and/or clean-up if so desired. (Use the form provided, or similar).

4. If there is a Reportable Quantity (RQ) release, then the National Response Center should be notified immediately at (800) 424-8802; within 14 days a report should be submitted to the EPA regional office describing the release, the date and circumstances of the release and the steps taken to prevent another release. This Pollution Prevention Plan should be updated to reflect any such steps or actions taken and measures to prevent the same from reoccurring.

Maynard Crossing
129 Parker Road
Maynard, MA

Spill Prevention Control and Countermeasure Form

Where a release containing a hazardous substance occurs, the following steps shall be taken by the facility manager and/or supervisor:

1. Upon spill, notify property Management (PM) immediately

2. Immediately notify The Maynard Fire Department (at **9-1-1**)

3. PM to notify licensed cleanup contractor (ACV Environmental, Wind River Environmental)

4. Contractor shall take all measures necessary to contain and abate the spill and to prevent the discharge of the pollutant(s) to off-site locations, receiving waters, wetlands and/or resource areas.

5. Notify the Maynard Public Health Department at (978) 897-1302 and the Maynard Conservation Commission at (978) 897-1360.

6. Provide documentation from licensed contractor showing disposal and cleanup procedures were completed as well as details on chemicals that were spilled to the Maynard Public Health Department and Maynard Conservation Commission

Date of spill:_____ Time:_____ Reported By:_____
Weather Conditions:_____

Material Spilled	**Location of Spill**	**Approximate Quantity of Spill (in gallons)**	**Agency(s) Notified**	**Date of Notification**

Cause of Spill:_____

_____

Measures Taken to Clean up Spill:_____

_____

Type of equipment: _____ Make: _____ Size:_____
License or S/N: _____

Location and Method of Disposal_____

_____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring:_____

_____

Additional Contact Numbers:

- DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP)
  EMERGENCY PHONE: 1-888-304-1133

- NATIONAL RESPONSE CENTER
  PHONE: (800) 424-8802

- U.S. ENVIRONMENTAL PROTECTION AGENCY
  PHONE: (888) 372-7341

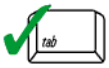
APPENDIX H – STORMWATER MANAGEMENT CHECKLIST

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

---

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

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

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☒ Other (describe): Infiltration Basins, Raingarden

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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