

STORMWATER MANAGEMENT REPORT

FOR

HERB CHAMBERS SPRINTER SERVICE BOSTON

161-165 Linwood Street
Somerville, MA

Prepared for:

The Herb Chambers Companies
259 McGrath Highway
Somerville, MA 02145

Prepared by:

Design Consultants, Inc.
120 Middlesex Avenue, Suite 20
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Project 2014-106
September 2, 2015

Design Consultants, Inc.

CIVIL ENGINEERS and LAND SURVEYORS

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INTRODUCTION

The Herb Chambers Companies proposes the redevelopment of the property at 161-165 Linwood Street in Somerville, MA. The site is zoned Industrial A (IA). The existing parcel is listed as Assessor Map Block 94, Block B, units 2-7 and covers 38,010 square feet (0.872 acres).

There is currently a one-story, brick masonry automobile service shop on the Linwood Street side of the site and a two story steel building on the Joy Street side of the site. There is no curbing along the site's Linwood Street frontage. There are three existing curb cuts at the rear of the site on Joy Street, one to access the site and two to access garage bays. See Figure 1 for the Existing Conditions Plan.

The proposed development includes demolishing the building along Linwood Street (Pat's Auto Body) and constructing a new one-story automotive maintenance building. No renovations are proposed for the existing building along Joy Street. All pavement will be replaced, with the site grading approximating the current site grading. The new building along Linwood will direct roof runoff to a subsurface detention area. See Figure 2 for the Proposed Site Plan.

STORM WATER MANAGEMENT POLICY

The reference document used for developing the proposed stormwater management system for the proposed project is the City of Somerville's Zoning Ordinance, Version June 25, 2009. Section 5.4.6.4 of the Ordinance states: "The development shall incorporate measures that are adequate to prevent pollution of surface and groundwater, to minimize erosion and sedimentation, and to prevent changes in groundwater levels, increased rates of run-off and minimize potential for flooding. Drainage shall be designed so that groundwater recharge is maximized, and at the project boundaries the run-off shall not be increased in amount or velocity."

The 2011 Stormwater Management Policy of the City of Somerville states: "To mitigate problems, the Somerville Zoning Ordinance (SZO) forbids adverse development impacts to abutters, city systems and water quality; the SZO encourages diversion, detention, retention and mandates maximum groundwater recharge with no increase in runoff volume or rate at site boundaries. New sanitary connections for flows over 2,000 GPD require a 4:1 removal of infiltration and/or inflow to qualify for a permit."

Four-to-one Infiltration/Inflow reduction (4:1 I/I) is mandated by the City of Somerville for new sewer flows over 2,000 gallons per day.

The following report explains how the standards are met.

EXISTING HYDROLOGY

The runoff from the site is split into three drainage areas (subcatchments), see Figure 3, Appendix C.

Catchment Area 1 totals 14,663 sf and drains via overland flow to Linwood Street. This catchment includes 6,674 sf of roof area that drains to grade via downspouts as well as 7,989 sf of pavement that flows over to Linwood Street. This catchment is tributary to Design Point 1.

Catchment Area 2 totals 18,119 sf that drains to Joy Street. This catchment includes 313 sf of roof area that drains to grade via downspouts, 13,224 sf of roof area that connects to the 12" drain line in Joy Street and 4,582 sf of pavement that flows overland to Joy Street. This catchment is tributary to Design Point 2.

Catchment Area 3 totals 5,230 sf that drain to the southeast, towards the U-Haul parking lot. This catchment includes 4,974 sf of roof area that drains to grade via downspouts as well as 256 sf of gravel area (between the existing building and the adjacent parking lot). This catchment is tributary to Design Point 3.

Design Point 4 is used to total all off-site runoff for the project.

According to FEMA Flood Insurance Rate Map Number 25017C0439E, with an effective date of June 4, 2010, the site is located in Zone X: "Areas of 0.2% chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood, see Appendix D.

SOILS

The NRCS Web Soil Survey characterizes the soil at the site as entirely "Urban Land, wet substratum" and does not specify a Hydrologic Soil Group (HSG), see Appendix E.

The calculations in this report assume a conservative HSG of C and per the Massachusetts Stormwater Handbook, Table 2.3.3 1982 Rawls Rates, an infiltration rate of 0.017 in/hr has been used in the hydrologic model.

PROPOSED HYDROLOGY

The same general catchment areas and design points are used for the proposed conditions, see Figure 4, Appendix F.

Catchment Area 1 totals 13,550 sf and drains to Linwood Street. This catchment includes 13,328 sf of pavement and 222 sf of gravel area. This catchment is tributary to Design Point 1.

Catchment Area 2 totals 15,681 sf that drains to Joy Street. This catchment includes 9,275 sf of roof area that connects to the 12" drain line in Joy Street and 6,406 sf of pavement that drains to Joy Street. This catchment is tributary to Design Point 2.

Catchment Area 3 totals 881 sf that drain to the southeast, towards the U-Haul parking lot. This catchment includes 345 sf of pavement area as well as 256 of gravel area (between the existing building and the adjacent parking lot) that flows overland. This catchment is tributary to Design Point 3.

Catchment 6 totals 7,900 sf and is the new building on Linwood Street. This catchment is tributary to Pond 5, which is the subsurface detention area. This detention area consists of a Cultec® and stone system. Overflow for the system will occur at the downspouts, at grade.

Design Point 4 is used to total all off-site runoff for the project.

Drainage:

Drainage calculations were conducted to evaluate peak discharges from the project site under the pre-development and post-development conditions, see Appendix G. As required under the City of Somerville's Stormwater Management Policy, peak discharges under post development conditions will not exceed the pre-development conditions.

4:1 Infiltration/Inflow Removal:

Existing and proposed sanitary sewer calculations have been performed in order to assess the applicability of the 4:1 I/I reduction requirements for projects with new sanitary sewer flows greater than 2,000 gallons per day (gpd). The calculations are based on building area based on field survey and existing and proposed building uses based on discussions with the project architect.

The proposed project will have a total decrease in sanitary sewer flow of 1,215 gpd, see Appendix H.

This project does not meet the threshold of 2,000 gpd sewage discharge that requires 4:1 I/I removal, therefore 4:1 I/I removal is not provided.

HYDROLOGIC MODEL

The hydrologic model used for this analysis is based upon the SCS Method. Both existing and proposed conditions are modeled for the 2-year, 10-year, 25-year, and 100-year storm events. The SCS Method allows for variable rainfall intensity throughout the

storm duration, peaking near the middle of the Type III, 24-hour storm. The drainage area's time of concentration (t_c), assumed to be five minutes for this site.

The designed on-site stormwater management system collects and infiltrates site runoff reducing off-site flows for all storm events.

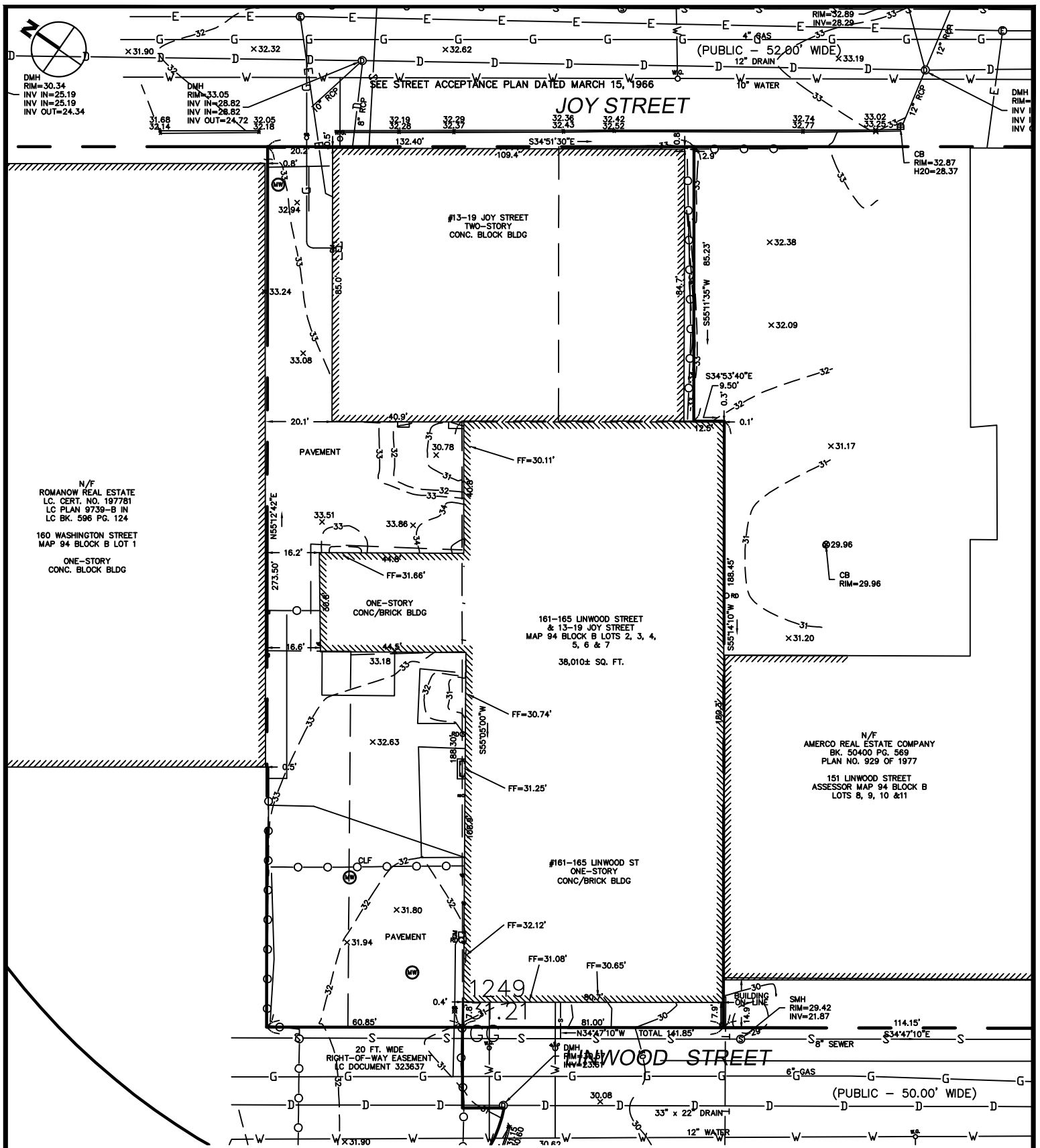
Table 1
Total Offsite Runoff

Rainfall Event		Design Point 1		Design Point 2		Design Point 3		Design Point 4	
		Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
2 Yr	Rate (cfs)	1.05	0.97	1.30	1.12	0.37	0.05	2.71	2.14
	Volume (af)	0.075	0.069	0.093	0.080	0.026	0.003	0.194	0.153
10 Yr	Rate (cfs)	1.53	1.42	1.89	1.64	0.54	0.08	3.97	3.14
	Volume (af)	0.111	0.103	0.137	0.119	0.039	0.006	0.287	0.229
25 Yr	Rate (cfs)	1.81	1.67	2.24	1.93	0.64	0.10	4.69	3.71
	Volume (af)	0.132	0.133	0.163	0.141	0.046	0.007	0.340	0.280
100 Yr	Rate (cfs)	2.22	2.05	2.75	2.38	0.79	0.13	5.76	4.56
	Volume (af)	0.162	0.177	0.200	0.173	0.057	0.009	0.420	0.359

CONCLUSION

Based on DCI's analysis of the existing and proposed conditions, the proposed site condition meets the criteria set forth by the City of Somerville. Off-site runoff volume and peak flow rate for the 2, 10, 25 and 100-year storm events is decreased. If an illicit stormwater connection to the sanitary sewer is found, it will be eliminated and a new connection will be made to the appropriate storm sewer. The 4:1 I/I requirement does not apply to this project. DCI concludes that the proposed development at 161-165 Linwood Street, Somerville, MA meets to all applicable stormwater management standards.

Appendix A



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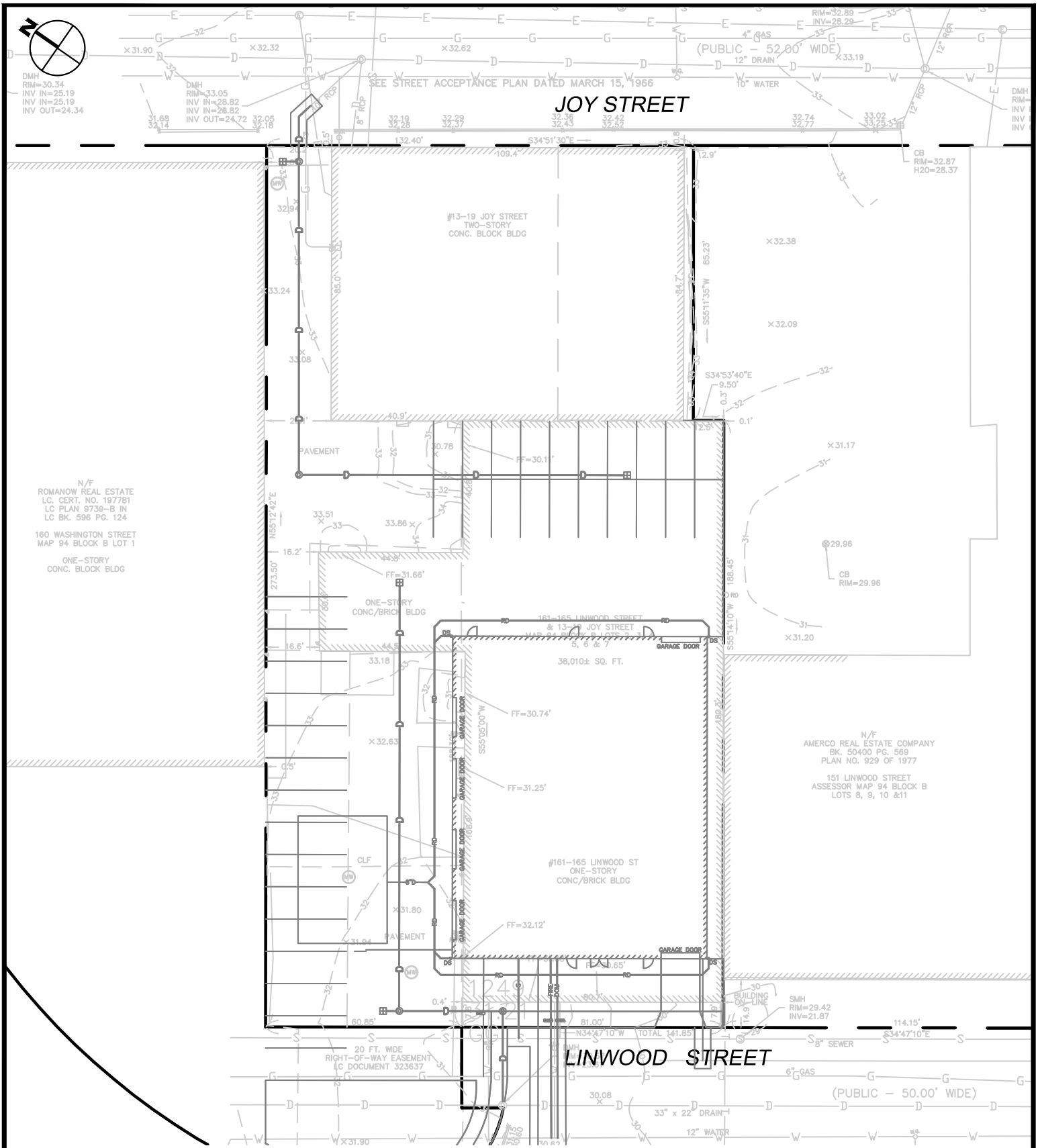
120 MIDDLESEX AVENUE
 SOMERVILLE, MA 02145
 617-776-3350

161-165 Linwood Street
 Somerville, MA

Figure 1
 Existing Conditions
 Plan

1"=40'
 SEPTEMBER 2, 2015 2014-106

Appendix B



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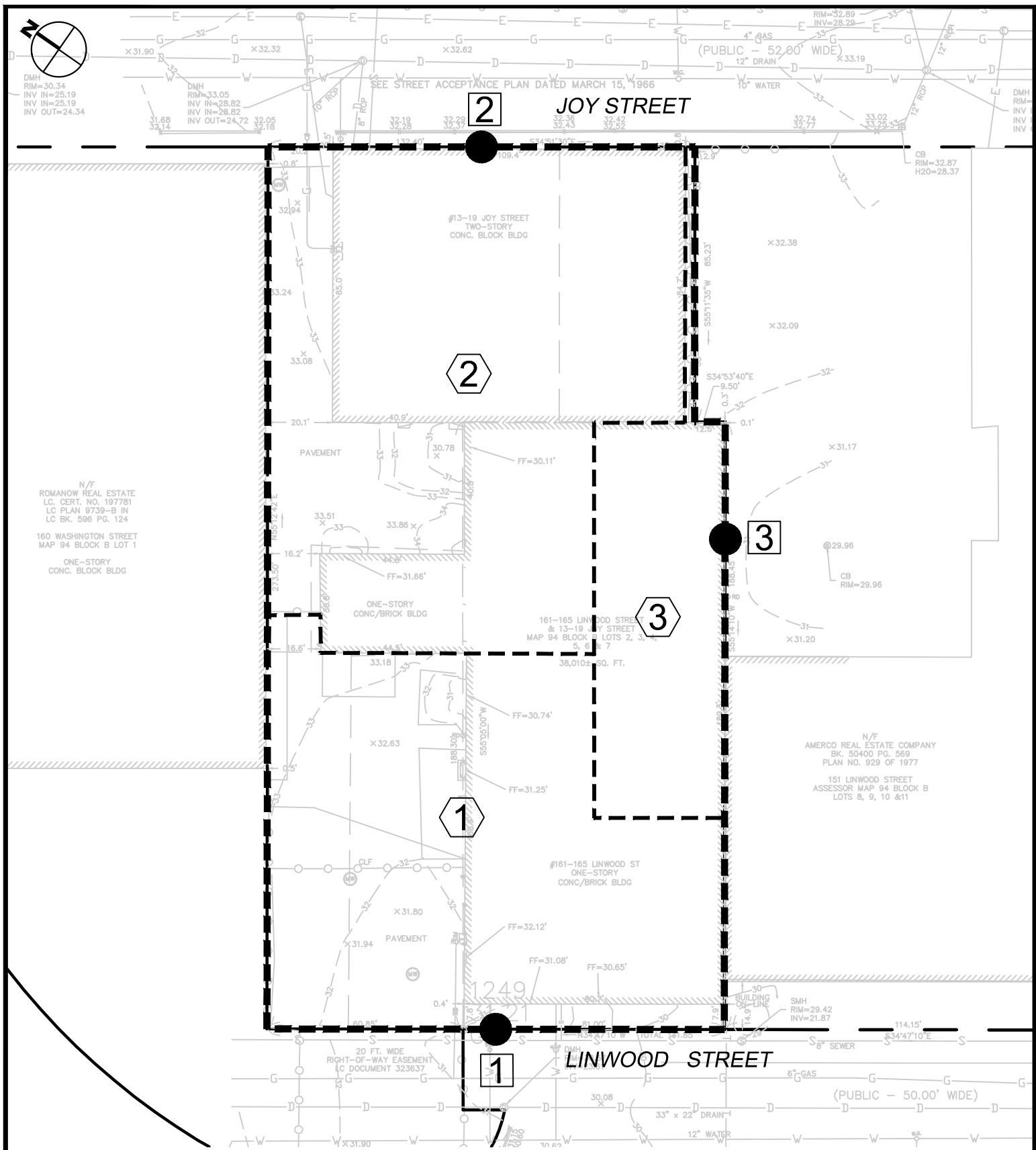
120 MIDDLESEX AVENUE
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161-165 Linwood Street
Somerville, MA


Figure 2
Proposed Conditions
Plan

1"=40'
SEPTEMBER 2, 2015 2014-106

Appendix C



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120 MIDDLESEX AVENUE
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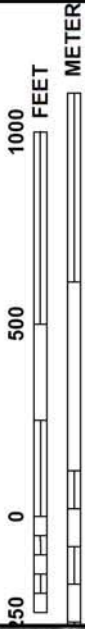
161-165 Linwood Street
 Somerville, MA

Figure 3
 Existing Drainage
 Areas

Appendix D



MAP SCALE 1" = 500'



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0439E

FIRM
FLOOD INSURANCE RATE MAP
MIDDLESEX COUNTY,
MASSACHUSETTS
(ALL JURISDICTIONS)

PANEL 439 OF 656
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EVERETT, CITY OF	250192	0439	E
MEDFORD, CITY OF	250205	0439	E
SOMERVILLE, CITY OF	250214	0439	E

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER
25017C0439E

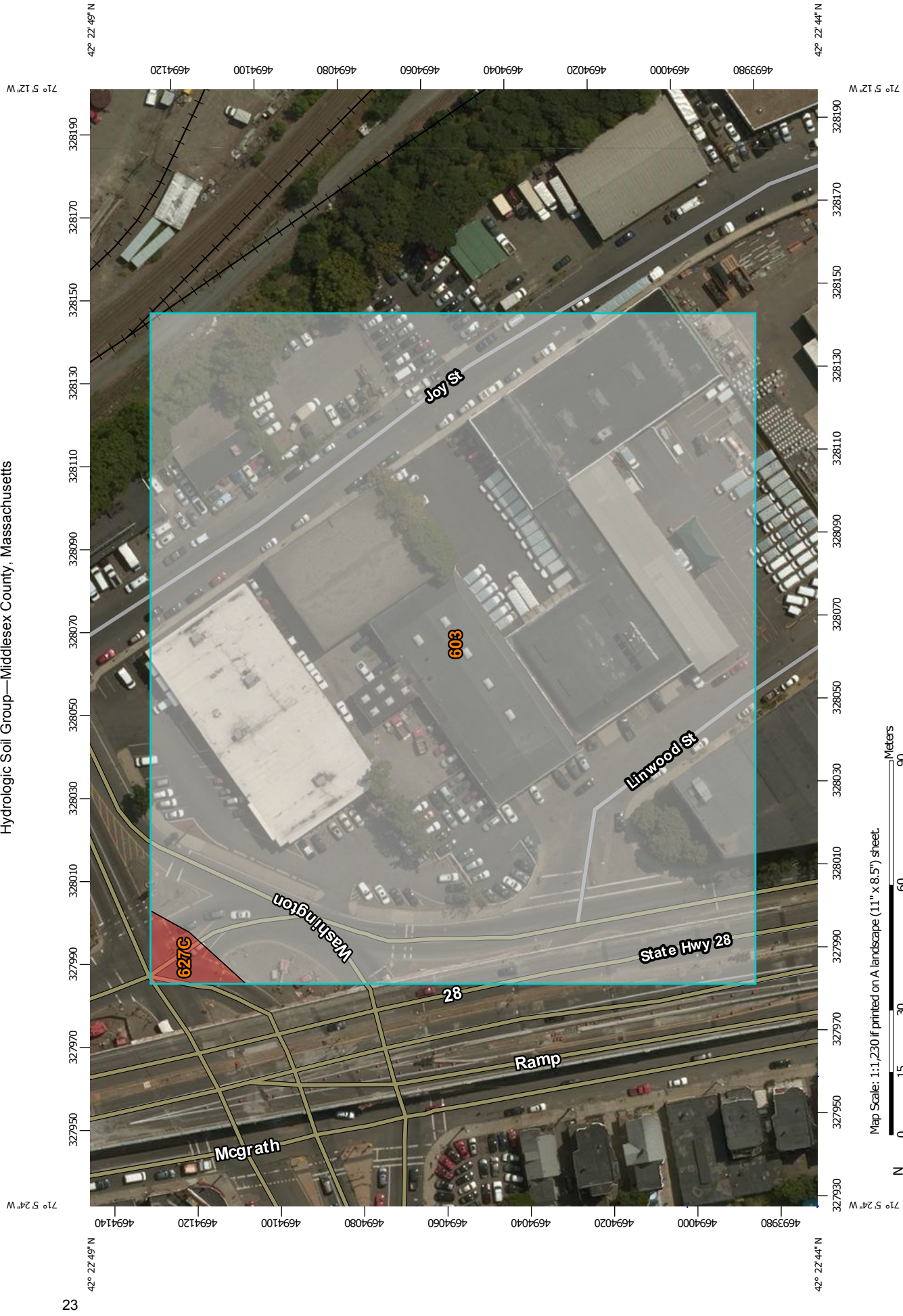
EFFECTIVE DATE
JUNE 4, 2010

Federal Emergency Management Agency


This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



















Appendix E








MAP LEGEND






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


Soils
Soil Rating Polygons
 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines
 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points
 A
 A/D
 B
 B/D

Water Features
 Streams and Canals

Transportation
 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background
 Aerial Photography

MAP INFORMATION

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 14, Sep 19, 2014

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

Date(s) aerial images were photographed: Aug 10, 2014—Aug 11, 2014

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Middlesex County, Massachusetts (MA017)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
603	Urban land, wet substratum		5.8	99.0%
627C	Newport-Urban land complex, 3 to 15 percent slopes	D	0.1	1.0%
Totals for Area of Interest			5.8	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

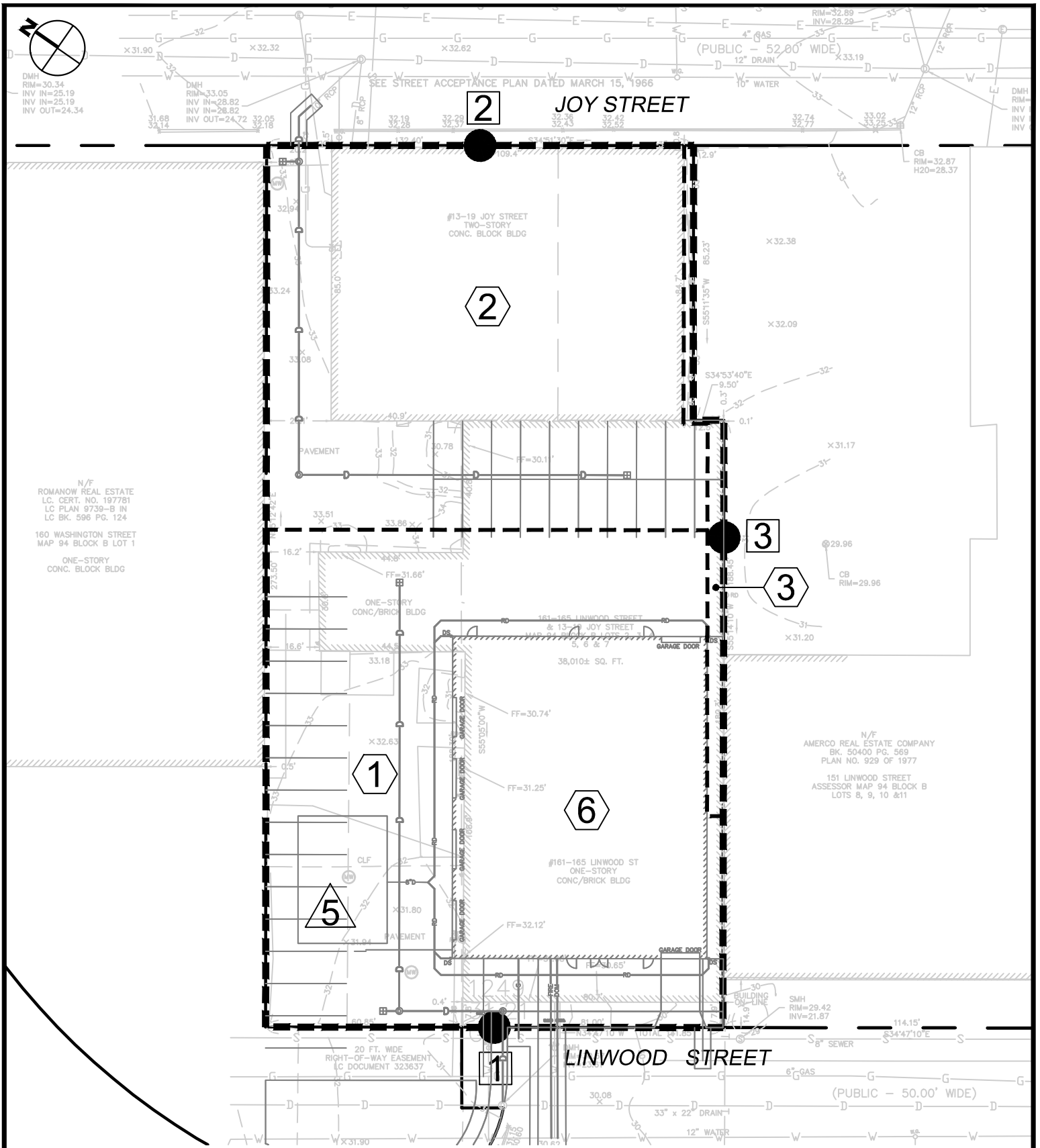
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix F



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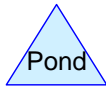
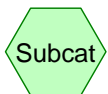
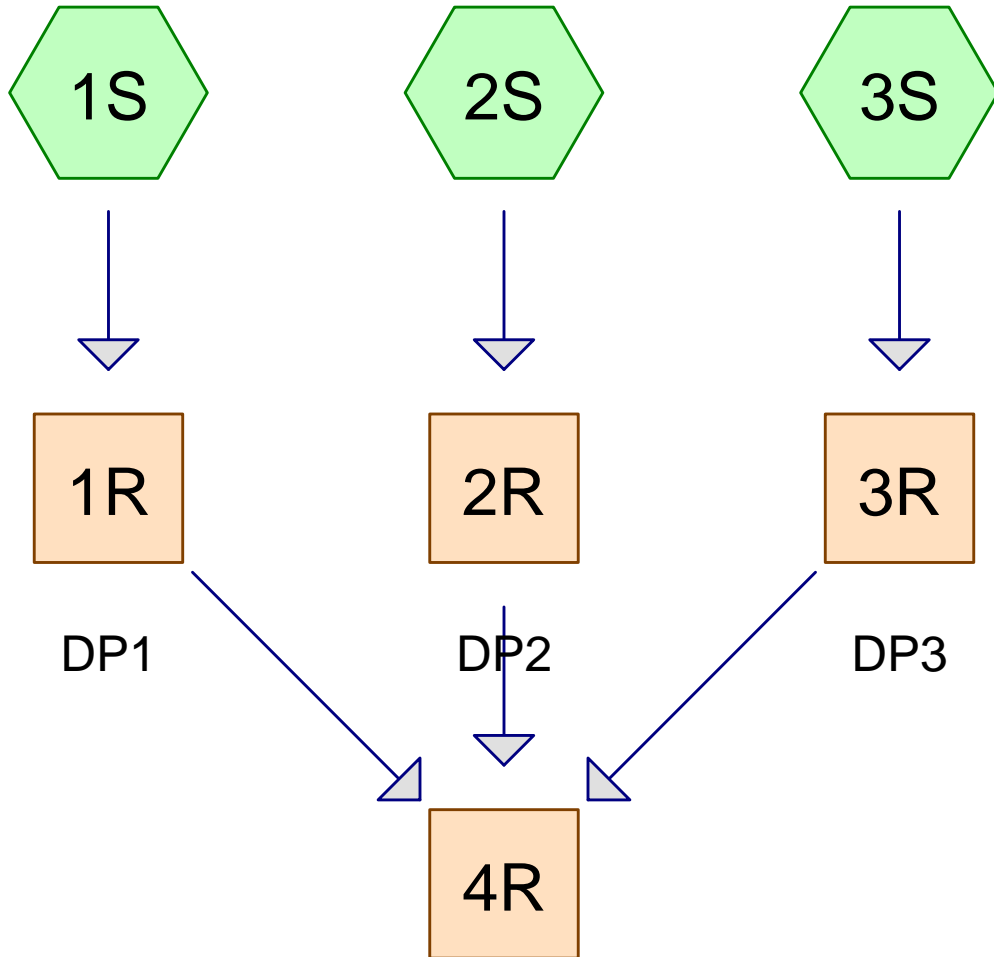
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161-165 Linwood Street
Somerville, MA

Figure 4
Proposed Drainage
Areas

1"=40'
SEPTEMBER 2, 2015 2014-106

Appendix G



Drainage Diagram for 2014-106 HYD EX
 Prepared by Design Consultants, Inc., Printed 8/31/2015
 HydroCAD® 9.10 s/n 00884 © 2010 HydroCAD Software Solutions LLC

2014-106 HYD EX

Prepared by Design Consultants, Inc.
 HydroCAD® 9.10 s/n 00884 © 2010 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S:

Runoff = 1.05 cfs @ 12.07 hrs, Volume= 0.075 af, Depth> 2.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
6,674	98	Roofs, HSG C
7,989	98	Paved parking, HSG C
14,663	98	Weighted Average
14,663		100.00% Impervious Area

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

Summary for Subcatchment 2S:

Runoff = 1.30 cfs @ 12.07 hrs, Volume= 0.093 af, Depth> 2.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
13,537	98	Roofs, HSG C
4,582	98	Paved parking, HSG C
18,119	98	Weighted Average
18,119		100.00% Impervious Area

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

Summary for Subcatchment 3S:

Runoff = 0.37 cfs @ 12.07 hrs, Volume= 0.026 af, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
4,974	98	Roofs, HSG C
256	87	Dirt roads, HSG C
5,230	97	Weighted Average
256		4.89% Pervious Area
4,974		95.11% Impervious Area

2014-106 HYD EX

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161-165 Linwood Street, Somerville
Type III 24-hr 2-Year Rainfall=3.10"

Printed 8/31/2015

Page 3

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

Summary for Reach 1R: DP1

Inflow Area = 0.337 ac, 100.00% Impervious, Inflow Depth > 2.68" for 2-Year event
 Inflow = 1.05 cfs @ 12.07 hrs, Volume= 0.075 af
 Outflow = 1.05 cfs @ 12.07 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: DP2

Inflow Area = 0.416 ac, 100.00% Impervious, Inflow Depth > 2.68" for 2-Year event
 Inflow = 1.30 cfs @ 12.07 hrs, Volume= 0.093 af
 Outflow = 1.30 cfs @ 12.07 hrs, Volume= 0.093 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 3R: DP3

Inflow Area = 0.120 ac, 95.11% Impervious, Inflow Depth > 2.59" for 2-Year event
 Inflow = 0.37 cfs @ 12.07 hrs, Volume= 0.026 af
 Outflow = 0.37 cfs @ 12.07 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 4R:

Inflow Area = 0.873 ac, 99.33% Impervious, Inflow Depth > 2.67" for 2-Year event
 Inflow = 2.71 cfs @ 12.07 hrs, Volume= 0.194 af
 Outflow = 2.71 cfs @ 12.07 hrs, Volume= 0.194 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

2014-106 HYD EX

Prepared by Design Consultants, Inc.

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161-165 Linwood Street, Somerville
Type III 24-hr 10-Year Rainfall=4.50"

Printed 8/31/2015

Page 4

Summary for Subcatchment 1S:

Runoff = 1.53 cfs @ 12.07 hrs, Volume= 0.111 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
6,674	98	Roofs, HSG C
7,989	98	Paved parking, HSG C
14,663	98	Weighted Average
14,663		100.00% Impervious Area

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

Summary for Subcatchment 2S:

Runoff = 1.89 cfs @ 12.07 hrs, Volume= 0.137 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
13,537	98	Roofs, HSG C
4,582	98	Paved parking, HSG C
18,119	98	Weighted Average
18,119		100.00% Impervious Area

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

Summary for Subcatchment 3S:

Runoff = 0.54 cfs @ 12.07 hrs, Volume= 0.039 af, Depth> 3.88"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
4,974	98	Roofs, HSG C
256	87	Dirt roads, HSG C
5,230	97	Weighted Average
256		4.89% Pervious Area
4,974		95.11% Impervious Area

2014-106 HYD EX

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161-165 Linwood Street, Somerville
Type III 24-hr 10-Year Rainfall=4.50"

Printed 8/31/2015

Page 5

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

Summary for Reach 1R: DP1

Inflow Area = 0.337 ac, 100.00% Impervious, Inflow Depth > 3.96" for 10-Year event
 Inflow = 1.53 cfs @ 12.07 hrs, Volume= 0.111 af
 Outflow = 1.53 cfs @ 12.07 hrs, Volume= 0.111 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: DP2

Inflow Area = 0.416 ac, 100.00% Impervious, Inflow Depth > 3.96" for 10-Year event
 Inflow = 1.89 cfs @ 12.07 hrs, Volume= 0.137 af
 Outflow = 1.89 cfs @ 12.07 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 3R: DP3

Inflow Area = 0.120 ac, 95.11% Impervious, Inflow Depth > 3.88" for 10-Year event
 Inflow = 0.54 cfs @ 12.07 hrs, Volume= 0.039 af
 Outflow = 0.54 cfs @ 12.07 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 4R:

Inflow Area = 0.873 ac, 99.33% Impervious, Inflow Depth > 3.95" for 10-Year event
 Inflow = 3.97 cfs @ 12.07 hrs, Volume= 0.287 af
 Outflow = 3.97 cfs @ 12.07 hrs, Volume= 0.287 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Subcatchment 1S:

Runoff = 1.81 cfs @ 12.07 hrs, Volume= 0.132 af, Depth> 4.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
6,674	98	Roofs, HSG C
7,989	98	Paved parking, HSG C
14,663	98	Weighted Average
14,663		100.00% Impervious Area

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

Summary for Subcatchment 2S:

Runoff = 2.24 cfs @ 12.07 hrs, Volume= 0.163 af, Depth> 4.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
13,537	98	Roofs, HSG C
4,582	98	Paved parking, HSG C
18,119	98	Weighted Average
18,119		100.00% Impervious Area

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

Summary for Subcatchment 3S:

Runoff = 0.64 cfs @ 12.07 hrs, Volume= 0.046 af, Depth> 4.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
4,974	98	Roofs, HSG C
256	87	Dirt roads, HSG C
5,230	97	Weighted Average
256		4.89% Pervious Area
4,974		95.11% Impervious Area

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Type III 24-hr 25-Year Rainfall=5.30"

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

Summary for Reach 1R: DP1

Inflow Area = 0.337 ac, 100.00% Impervious, Inflow Depth > 4.69" for 25-Year event
 Inflow = 1.81 cfs @ 12.07 hrs, Volume= 0.132 af
 Outflow = 1.81 cfs @ 12.07 hrs, Volume= 0.132 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: DP2

Inflow Area = 0.416 ac, 100.00% Impervious, Inflow Depth > 4.69" for 25-Year event
 Inflow = 2.24 cfs @ 12.07 hrs, Volume= 0.163 af
 Outflow = 2.24 cfs @ 12.07 hrs, Volume= 0.163 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 3R: DP3

Inflow Area = 0.120 ac, 95.11% Impervious, Inflow Depth > 4.61" for 25-Year event
 Inflow = 0.64 cfs @ 12.07 hrs, Volume= 0.046 af
 Outflow = 0.64 cfs @ 12.07 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 4R:

Inflow Area = 0.873 ac, 99.33% Impervious, Inflow Depth > 4.68" for 25-Year event
 Inflow = 4.69 cfs @ 12.07 hrs, Volume= 0.340 af
 Outflow = 4.69 cfs @ 12.07 hrs, Volume= 0.340 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment 1S:

Runoff = 2.22 cfs @ 12.07 hrs, Volume= 0.162 af, Depth> 5.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
6,674	98	Roofs, HSG C
7,989	98	Paved parking, HSG C
14,663	98	Weighted Average
14,663		100.00% Impervious Area

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

Summary for Subcatchment 2S:

Runoff = 2.75 cfs @ 12.07 hrs, Volume= 0.200 af, Depth> 5.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
13,537	98	Roofs, HSG C
4,582	98	Paved parking, HSG C
18,119	98	Weighted Average
18,119		100.00% Impervious Area

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

Summary for Subcatchment 3S:

Runoff = 0.79 cfs @ 12.07 hrs, Volume= 0.057 af, Depth> 5.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
4,974	98	Roofs, HSG C
256	87	Dirt roads, HSG C
5,230	97	Weighted Average
256		4.89% Pervious Area
4,974		95.11% Impervious Area

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

Summary for Reach 1R: DP1

Inflow Area = 0.337 ac, 100.00% Impervious, Inflow Depth > 5.78" for 100-Year event
 Inflow = 2.22 cfs @ 12.07 hrs, Volume= 0.162 af
 Outflow = 2.22 cfs @ 12.07 hrs, Volume= 0.162 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: DP2

Inflow Area = 0.416 ac, 100.00% Impervious, Inflow Depth > 5.78" for 100-Year event
 Inflow = 2.75 cfs @ 12.07 hrs, Volume= 0.200 af
 Outflow = 2.75 cfs @ 12.07 hrs, Volume= 0.200 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 3R: DP3

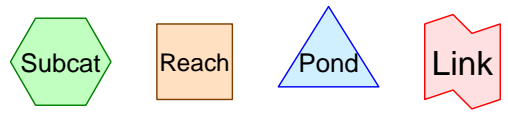
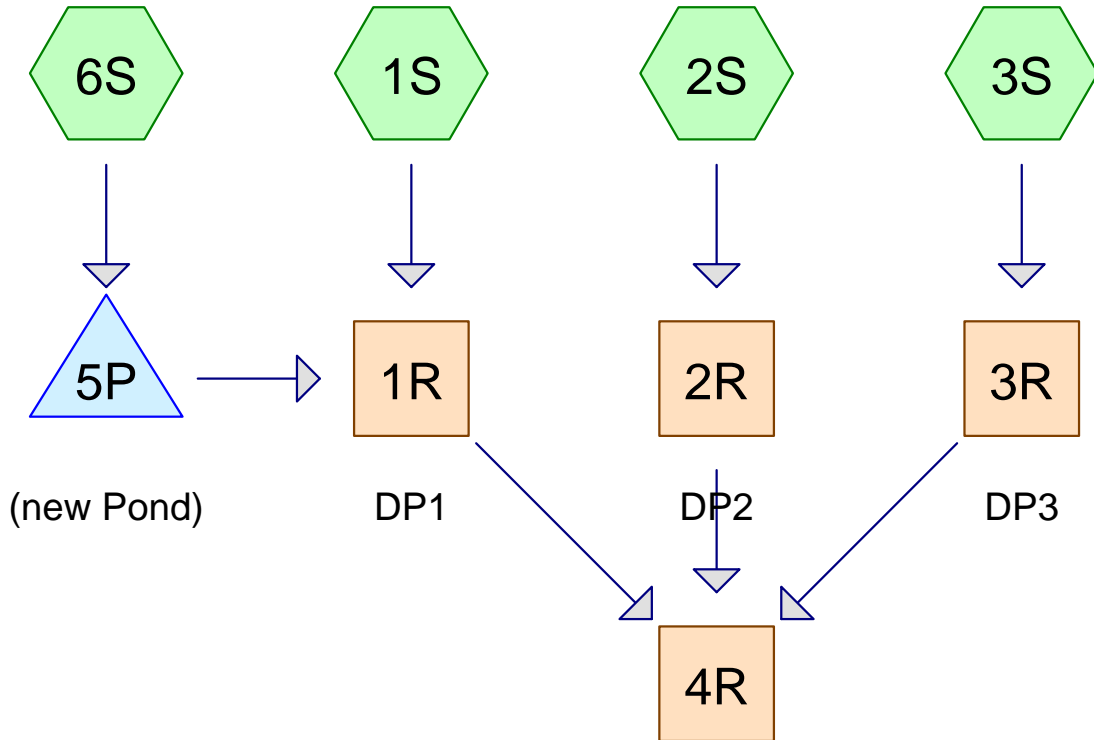
Inflow Area = 0.120 ac, 95.11% Impervious, Inflow Depth > 5.71" for 100-Year event
 Inflow = 0.79 cfs @ 12.07 hrs, Volume= 0.057 af
 Outflow = 0.79 cfs @ 12.07 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 4R:

Inflow Area = 0.873 ac, 99.33% Impervious, Inflow Depth > 5.77" for 100-Year event
 Inflow = 5.76 cfs @ 12.07 hrs, Volume= 0.420 af
 Outflow = 5.76 cfs @ 12.07 hrs, Volume= 0.420 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs



Drainage Diagram for 2014-106 HYD PR
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Summary for Subcatchment 1S:

Runoff = 0.97 cfs @ 12.07 hrs, Volume= 0.069 af, Depth> 2.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
13,328	98	Paved parking, HSG C
222	87	Dirt roads, HSG C
13,550	98	Weighted Average
222		1.64% Pervious Area
13,328		98.36% Impervious Area

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

Summary for Subcatchment 2S:

Runoff = 1.12 cfs @ 12.07 hrs, Volume= 0.080 af, Depth> 2.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
9,275	98	Roofs, HSG C
6,406	98	Paved parking, HSG C
15,681	98	Weighted Average
15,681		100.00% Impervious Area

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

Summary for Subcatchment 3S:

Runoff = 0.05 cfs @ 12.07 hrs, Volume= 0.003 af, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
345	98	Paved parking, HSG C
536	87	Dirt roads, HSG C
881	91	Weighted Average
536		60.84% Pervious Area
345		39.16% Impervious Area

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Type III 24-hr 2-Year Rainfall=3.10"

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

Summary for Subcatchment 6S:

Runoff = 0.56 cfs @ 12.07 hrs, Volume= 0.041 af, Depth> 2.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
7,900	98	Roofs, HSG C
7,900		100.00% Impervious Area

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

Summary for Reach 1R: DP1Inflow Area = 0.492 ac, 98.97% Impervious, Inflow Depth > 1.69" for 2-Year event
Inflow = 0.97 cfs @ 12.07 hrs, Volume= 0.069 af
Outflow = 0.97 cfs @ 12.07 hrs, Volume= 0.069 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: DP2Inflow Area = 0.360 ac, 100.00% Impervious, Inflow Depth > 2.68" for 2-Year event
Inflow = 1.12 cfs @ 12.07 hrs, Volume= 0.080 af
Outflow = 1.12 cfs @ 12.07 hrs, Volume= 0.080 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 3R: DP3Inflow Area = 0.020 ac, 39.16% Impervious, Inflow Depth > 2.04" for 2-Year event
Inflow = 0.05 cfs @ 12.07 hrs, Volume= 0.003 af
Outflow = 0.05 cfs @ 12.07 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

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Summary for Reach 4R:

Inflow Area = 0.873 ac, 98.01% Impervious, Inflow Depth > 2.11" for 2-Year event
 Inflow = 2.14 cfs @ 12.07 hrs, Volume= 0.153 af
 Outflow = 2.14 cfs @ 12.07 hrs, Volume= 0.153 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Pond 5P: (new Pond)

Inflow Area = 0.181 ac, 100.00% Impervious, Inflow Depth > 2.68" for 2-Year event
 Inflow = 0.56 cfs @ 12.07 hrs, Volume= 0.041 af
 Outflow = 0.00 cfs @ 16.66 hrs, Volume= 0.005 af, Atten= 99%, Lag= 275.4 min
 Discarded = 0.00 cfs @ 16.66 hrs, Volume= 0.005 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
 Peak Elev= 24.08' @ 20.00 hrs Surf.Area= 0.025 ac Storage= 0.036 af

Plug-Flow detention time= 307.8 min calculated for 0.005 af (12% of inflow)
 Center-of-Mass det. time= 54.6 min (792.7 - 738.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.00'	0.023 af	27.67'W x 39.50'L x 3.54'H Field A 0.089 af Overall - 0.032 af Embedded = 0.057 af x 40.0% Voids
#2A	22.50'	0.032 af	Cultec R-330 x 30 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 6.25'L = 46.6 cf Overall Size= 52.0"W x 30.5"H x 7.50'L with 1.25' Overlap
#3	24.00'	0.000 af	0.33'D x 11.00'H Vertical Cone/Cylinder x 2
		0.055 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	0.170 in/hr Exfiltration over Surface area
#2	Primary	29.00'	3.0" Vert. Orifice/Grate X 2.00 C= 0.600

Discarded OutFlow Max=0.00 cfs @ 16.66 hrs HW=24.00' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=22.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Subcatchment 1S:

Runoff = 1.42 cfs @ 12.07 hrs, Volume= 0.103 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
13,328	98	Paved parking, HSG C
222	87	Dirt roads, HSG C
13,550	98	Weighted Average
222		1.64% Pervious Area
13,328		98.36% Impervious Area

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

Summary for Subcatchment 2S:

Runoff = 1.64 cfs @ 12.07 hrs, Volume= 0.119 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
9,275	98	Roofs, HSG C
6,406	98	Paved parking, HSG C
15,681	98	Weighted Average
15,681		100.00% Impervious Area

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

Summary for Subcatchment 3S:

Runoff = 0.08 cfs @ 12.07 hrs, Volume= 0.006 af, Depth> 3.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
345	98	Paved parking, HSG C
536	87	Dirt roads, HSG C
881	91	Weighted Average
536		60.84% Pervious Area
345		39.16% Impervious Area

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

Summary for Subcatchment 6S:

Runoff = 0.83 cfs @ 12.07 hrs, Volume= 0.060 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
7,900	98	Roofs, HSG C
7,900		100.00% Impervious Area

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

Summary for Reach 1R: DP1Inflow Area = 0.492 ac, 98.97% Impervious, Inflow Depth > 2.50" for 10-Year event
Inflow = 1.42 cfs @ 12.07 hrs, Volume= 0.103 af
Outflow = 1.42 cfs @ 12.07 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: DP2Inflow Area = 0.360 ac, 100.00% Impervious, Inflow Depth > 3.96" for 10-Year event
Inflow = 1.64 cfs @ 12.07 hrs, Volume= 0.119 af
Outflow = 1.64 cfs @ 12.07 hrs, Volume= 0.119 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 3R: DP3Inflow Area = 0.020 ac, 39.16% Impervious, Inflow Depth > 3.30" for 10-Year event
Inflow = 0.08 cfs @ 12.07 hrs, Volume= 0.006 af
Outflow = 0.08 cfs @ 12.07 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Reach 4R:

Inflow Area = 0.873 ac, 98.01% Impervious, Inflow Depth > 3.12" for 10-Year event
Inflow = 3.14 cfs @ 12.07 hrs, Volume= 0.227 af
Outflow = 3.14 cfs @ 12.07 hrs, Volume= 0.227 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Pond 5P: (new Pond)

Inflow Area = 0.181 ac, 100.00% Impervious, Inflow Depth > 3.96" for 10-Year event
Inflow = 0.83 cfs @ 12.07 hrs, Volume= 0.060 af
Outflow = 0.01 cfs @ 19.93 hrs, Volume= 0.005 af, Atten= 99%, Lag= 471.6 min
Discarded = 0.00 cfs @ 12.25 hrs, Volume= 0.005 af
Primary = 0.01 cfs @ 19.93 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 29.03' @ 19.93 hrs Surf.Area= 0.025 ac Storage= 0.055 af

Plug-Flow detention time= 340.2 min calculated for 0.005 af (8% of inflow)
Center-of-Mass det. time= 45.3 min (780.3 - 735.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.00'	0.023 af	27.67'W x 39.50'L x 3.54'H Field A 0.089 af Overall - 0.032 af Embedded = 0.057 af x 40.0% Voids
#2A	22.50'	0.032 af	Cultec R-330 x 30 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 6.25'L = 46.6 cf Overall Size= 52.0"W x 30.5"H x 7.50'L with 1.25' Overlap
#3	24.00'	0.000 af	0.33'D x 11.00'H Vertical Cone/Cylinder x 2
		0.055 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	0.170 in/hr Exfiltration over Surface area
#2	Primary	29.00'	3.0" Vert. Orifice/Grate X 2.00 C= 0.600

Discarded OutFlow Max=0.00 cfs @ 12.25 hrs HW=24.01' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 19.93 hrs HW=29.03' (Free Discharge)
↑**2=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.59 fps)

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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Subcatchment 1S:

Runoff = 1.67 cfs @ 12.07 hrs, Volume= 0.122 af, Depth> 4.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
13,328	98	Paved parking, HSG C
222	87	Dirt roads, HSG C
13,550	98	Weighted Average
222		1.64% Pervious Area
13,328		98.36% Impervious Area

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

Summary for Subcatchment 2S:

Runoff = 1.93 cfs @ 12.07 hrs, Volume= 0.141 af, Depth> 4.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
9,275	98	Roofs, HSG C
6,406	98	Paved parking, HSG C
15,681	98	Weighted Average
15,681		100.00% Impervious Area

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

Summary for Subcatchment 3S:

Runoff = 0.10 cfs @ 12.07 hrs, Volume= 0.007 af, Depth> 4.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
345	98	Paved parking, HSG C
536	87	Dirt roads, HSG C
881	91	Weighted Average
536		60.84% Pervious Area
345		39.16% Impervious Area

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Type III 24-hr 25-Year Rainfall=5.30"

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

Summary for Subcatchment 6S:

Runoff = 0.97 cfs @ 12.07 hrs, Volume= 0.071 af, Depth> 4.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
7,900	98	Roofs, HSG C
7,900		100.00% Impervious Area

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

Summary for Reach 1R: DP1Inflow Area = 0.492 ac, 98.97% Impervious, Inflow Depth > 3.23" for 25-Year event
Inflow = 1.67 cfs @ 12.07 hrs, Volume= 0.133 af
Outflow = 1.67 cfs @ 12.07 hrs, Volume= 0.133 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: DP2Inflow Area = 0.360 ac, 100.00% Impervious, Inflow Depth > 4.69" for 25-Year event
Inflow = 1.93 cfs @ 12.07 hrs, Volume= 0.141 af
Outflow = 1.93 cfs @ 12.07 hrs, Volume= 0.141 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 3R: DP3Inflow Area = 0.020 ac, 39.16% Impervious, Inflow Depth > 4.04" for 25-Year event
Inflow = 0.10 cfs @ 12.07 hrs, Volume= 0.007 af
Outflow = 0.10 cfs @ 12.07 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Reach 4R:

Inflow Area = 0.873 ac, 98.01% Impervious, Inflow Depth > 3.85" for 25-Year event
 Inflow = 3.71 cfs @ 12.07 hrs, Volume= 0.280 af
 Outflow = 3.71 cfs @ 12.07 hrs, Volume= 0.280 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Pond 5P: (new Pond)

Inflow Area = 0.181 ac, 100.00% Impervious, Inflow Depth > 4.69" for 25-Year event
 Inflow = 0.97 cfs @ 12.07 hrs, Volume= 0.071 af
 Outflow = 0.06 cfs @ 13.70 hrs, Volume= 0.016 af, Atten= 94%, Lag= 97.8 min
 Discarded = 0.00 cfs @ 12.11 hrs, Volume= 0.005 af
 Primary = 0.06 cfs @ 13.70 hrs, Volume= 0.011 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
 Peak Elev= 29.11' @ 13.70 hrs Surf.Area= 0.025 ac Storage= 0.055 af

Plug-Flow detention time= 345.7 min calculated for 0.016 af (23% of inflow)
 Center-of-Mass det. time= 161.2 min (895.2 - 734.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.00'	0.023 af	27.67'W x 39.50'L x 3.54'H Field A 0.089 af Overall - 0.032 af Embedded = 0.057 af x 40.0% Voids
#2A	22.50'	0.032 af	Cultec R-330 x 30 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 6.25'L = 46.6 cf Overall Size= 52.0"W x 30.5"H x 7.50'L with 1.25' Overlap
#3	24.00'	0.000 af	0.33'D x 11.00'H Vertical Cone/Cylinder x 2
		0.055 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	0.170 in/hr Exfiltration over Surface area
#2	Primary	29.00'	3.0" Vert. Orifice/Grate X 2.00 C= 0.600

Discarded OutFlow Max=0.00 cfs @ 12.11 hrs HW=24.03' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.05 cfs @ 13.70 hrs HW=29.11' (Free Discharge)
 ↑**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 1.13 fps)

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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment 1S:

Runoff = 2.05 cfs @ 12.07 hrs, Volume= 0.150 af, Depth> 5.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
13,328	98	Paved parking, HSG C
222	87	Dirt roads, HSG C
13,550	98	Weighted Average
222		1.64% Pervious Area
13,328		98.36% Impervious Area

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

Summary for Subcatchment 2S:

Runoff = 2.38 cfs @ 12.07 hrs, Volume= 0.173 af, Depth> 5.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
9,275	98	Roofs, HSG C
6,406	98	Paved parking, HSG C
15,681	98	Weighted Average
15,681		100.00% Impervious Area

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

Summary for Subcatchment 3S:

Runoff = 0.13 cfs @ 12.07 hrs, Volume= 0.009 af, Depth> 5.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
345	98	Paved parking, HSG C
536	87	Dirt roads, HSG C
881	91	Weighted Average
536		60.84% Pervious Area
345		39.16% Impervious Area

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Type III 24-hr 100-Year Rainfall=6.50"

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

Summary for Subcatchment 6S:

Runoff = 1.20 cfs @ 12.07 hrs, Volume= 0.087 af, Depth> 5.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
7,900	98	Roofs, HSG C
7,900		100.00% Impervious Area

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

Summary for Reach 1R: DP1Inflow Area = 0.492 ac, 98.97% Impervious, Inflow Depth > 4.32" for 100-Year event
Inflow = 2.05 cfs @ 12.07 hrs, Volume= 0.177 af
Outflow = 2.05 cfs @ 12.07 hrs, Volume= 0.177 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: DP2Inflow Area = 0.360 ac, 100.00% Impervious, Inflow Depth > 5.78" for 100-Year event
Inflow = 2.38 cfs @ 12.07 hrs, Volume= 0.173 af
Outflow = 2.38 cfs @ 12.07 hrs, Volume= 0.173 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach 3R: DP3Inflow Area = 0.020 ac, 39.16% Impervious, Inflow Depth > 5.14" for 100-Year event
Inflow = 0.13 cfs @ 12.07 hrs, Volume= 0.009 af
Outflow = 0.13 cfs @ 12.07 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Reach 4R:

Inflow Area = 0.873 ac, 98.01% Impervious, Inflow Depth > 4.94" for 100-Year event
Inflow = 4.56 cfs @ 12.07 hrs, Volume= 0.359 af
Outflow = 4.56 cfs @ 12.07 hrs, Volume= 0.359 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Summary for Pond 5P: (new Pond)

Inflow Area = 0.181 ac, 100.00% Impervious, Inflow Depth > 5.78" for 100-Year event
Inflow = 1.20 cfs @ 12.07 hrs, Volume= 0.087 af
Outflow = 0.66 cfs @ 12.35 hrs, Volume= 0.033 af, Atten= 45%, Lag= 16.8 min
Discarded = 0.00 cfs @ 12.01 hrs, Volume= 0.005 af
Primary = 0.66 cfs @ 12.35 hrs, Volume= 0.027 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 31.27' @ 12.35 hrs Surf.Area= 0.025 ac Storage= 0.055 af

Plug-Flow detention time= 241.0 min calculated for 0.033 af (37% of inflow)
Center-of-Mass det. time= 115.5 min (848.6 - 733.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.00'	0.023 af	27.67'W x 39.50'L x 3.54'H Field A 0.089 af Overall - 0.032 af Embedded = 0.057 af x 40.0% Voids
#2A	22.50'	0.032 af	Cultec R-330 x 30 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 6.25'L = 46.6 cf Overall Size= 52.0"W x 30.5"H x 7.50'L with 1.25' Overlap
#3	24.00'	0.000 af	0.33'D x 11.00'H Vertical Cone/Cylinder x 2
		0.055 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	0.170 in/hr Exfiltration over Surface area
#2	Primary	29.00'	3.0" Vert. Orifice/Grate X 2.00 C= 0.600

Discarded OutFlow Max=0.00 cfs @ 12.01 hrs HW=24.01' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.64 cfs @ 12.35 hrs HW=30.97' (Free Discharge)
↑**2=Orifice/Grate** (Orifice Controls 0.64 cfs @ 6.54 fps)

Appendix H

Herb Chambers Companies
 161 - 165 Linwood Street, Somerville
 Proj. No. 2014-106.00

Sanitary Sewer Flows

Existing

Description	Unit	gpd/unit	Qty ¹	Flow (gpd)
A&E Auto Repair ²	bay	150	4	600
Pat's Towing ³	bay	150	8	1,200
Gino's Ornamental				
Iron Works ⁴	person	15	5	75
			Total	1,875

Proposed

Description	Unit	gpd/unit	Qty ¹	Flow (gpd)
Joy Street Building ⁵	person	15	4	60
Herb Chambers				
Sprinter Service ⁶	bay	150	4	600
			Total	660

Increase/(Decrease) **(1,215)**

Notes:

1. Some quantities assumed based on site visit and discussions with project architect.
2. One-half of first floor taken as "Service Station [no gas]", 310 CMR 15.203.
3. Taken as "Service Station [no gas]", 310 CMR 15.203.
4. One-half of first floor taken as "Factory, Industrial Plant, Warehouse or Dry Storage Space without cafeteria", 310 CMR 15.203.
5. There are no plans to develop the building on Joy Street at this time. Entire first floor area is taken as "Factory, Industrial Plant, Warehouse or Dry Storage Space without cafeteria", 310 CMR 15.203.
6. Taken as "Service Station [no gas]", 310 CMR 15.203.