

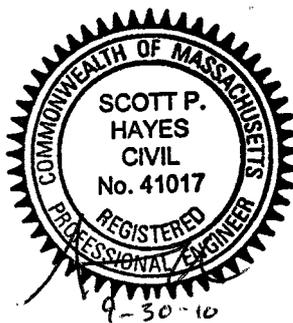
STORMWATER REPORT AND CALCULATIONS

FOR

“BEACON COURT”

Definitive Subdivision, Residential Compound Plan

57 Robbins Street
Acton, Massachusetts



September 30, 2010

Prepared for:

Centennial Homes, LLC
P.O. Box 2170
Acton, Massachusetts 01720

Prepared by:

FORESITE Engineering Associates, Inc.
16 Gleasondale Road, Suite 1-1
Stow, Massachusetts 01775

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I. Introduction

The site of the proposed “Beacon Court” subdivision is a 2.03 acre tract of land located on the east side of Robbins Street between Heron View Road and Prescott Road and currently contains one single family dwelling identified as No. 57 Robbins Street. The project site is located within the Residence 2 zoning district and approximately 25% of the site, or about $\frac{3}{4}$ of an acre, is currently used for residential and accessory uses. The presently undeveloped eastern portion of the site is wooded upland with a wooded red maple wetland bordering along the eastern rear property boundary. Current drainage is generally easterly to the onsite wetlands, with small areas of the site draining to abutting properties north and south and to Robbins Street to the west.

According to the United States Department of Agriculture (USDA) Soil Survey of Middlesex County the soils on site are Charlton Hollis Rock Outcrop complex. These soils are generally deep (5' +) well drained soils with major limitations related to slope and stoniness. The soils were evaluated in the field to verify these conditions. Deep observation test holes and percolation tests were conducted throughout the site and the results of those tests are documented in Appendix E.

The development proposal for the site involves demolition of the existing barn located along the north property boundary clearing of vegetation, grading, and construction of a 12-ft wide access road and two new single family dwellings. The change in surface cover from existing surface covers to proposed less pervious surface covers will increase the rate and volume of runoff from the site. Increase in runoff is proposed to be mitigated by utilizing a Low Impact Development (LID) design for the proposed road, utilizing a porous asphalt pavement system that will directly infiltrate storm water from the roadway through a porous asphalt wearing surface that drains to a stone aggregate bed where runoff will infiltrate into the natural underlying soil beneath the roadway.

Increases in the rate and volume of runoff are managed with infiltrative measures including a porous asphalt pavement system for the roadway, individual driveway infiltration trenches and drywell systems to manage rooftop runoff from proposed dwellings. All infiltrative measures have been sized to effectively manage storm water from the proposed development for the 2-year, 10-year, and 100-year design storms.

II. Methodology & References

Methodology:

SCS TR-55 & SCS TR-20 utilizing HydroCAD (v 8.0) software.

References:

A Guide to Hydrologic Analysis Using SCS Methods, Richard McCuen, copyright 1982, Prentice Hall, Inc.

Natural Resources Conservation Service (NRCS), Web Soil Survey

USGS Quadrangle Map, Maynard, Massachusetts, 1987

III. Results

The drainage study area was divided into 2 sections (or subcatchments as they are defined in the HydroCAD software) each of which drains to a different off-site location. Under pre-development conditions these areas are defined as Subcatchment 1S (draining off site west toward Robbins Street), Subcatchment 2S (draining off site south to abutting property), and Subcatchment 3S (draining east to wetlands). Table 1 below shows the key of each off-site area as it is referenced in the HydroCAD calculations in Appendix G and shows which pre-development areas are compared to which post-development areas in the analysis.

TABLE 1
Pre-development & Post-development Comparison Areas

	PRE	POST
West to Robbins Street	1S	1S
Off Site South	2S	2S
East to Wetlands	3S	100R

The off-site areas were analyzed for rate and volume of runoff under existing conditions for the 2-yr, 10-yr, and 100-yr design storms and the results are shown in Table 2. Under post-development conditions increases in runoff from development activities are controlled with the implementation of stormwater detention and recharge Best Management Practices (BMP's). Comparison of the off site rates and volumes of runoff under pre-development conditions to the off site runoff to the same areas under post-development conditions illustrates the effectiveness of the proposed stormwater controls. The results in Table 2 clearly show that off site runoff rates and volumes are effectively maintained or reduced by the proposed drainage system for the design storms analyzed.

TABLE 2
Pre-development & Post-development Off-site Runoff Rates and Volumes

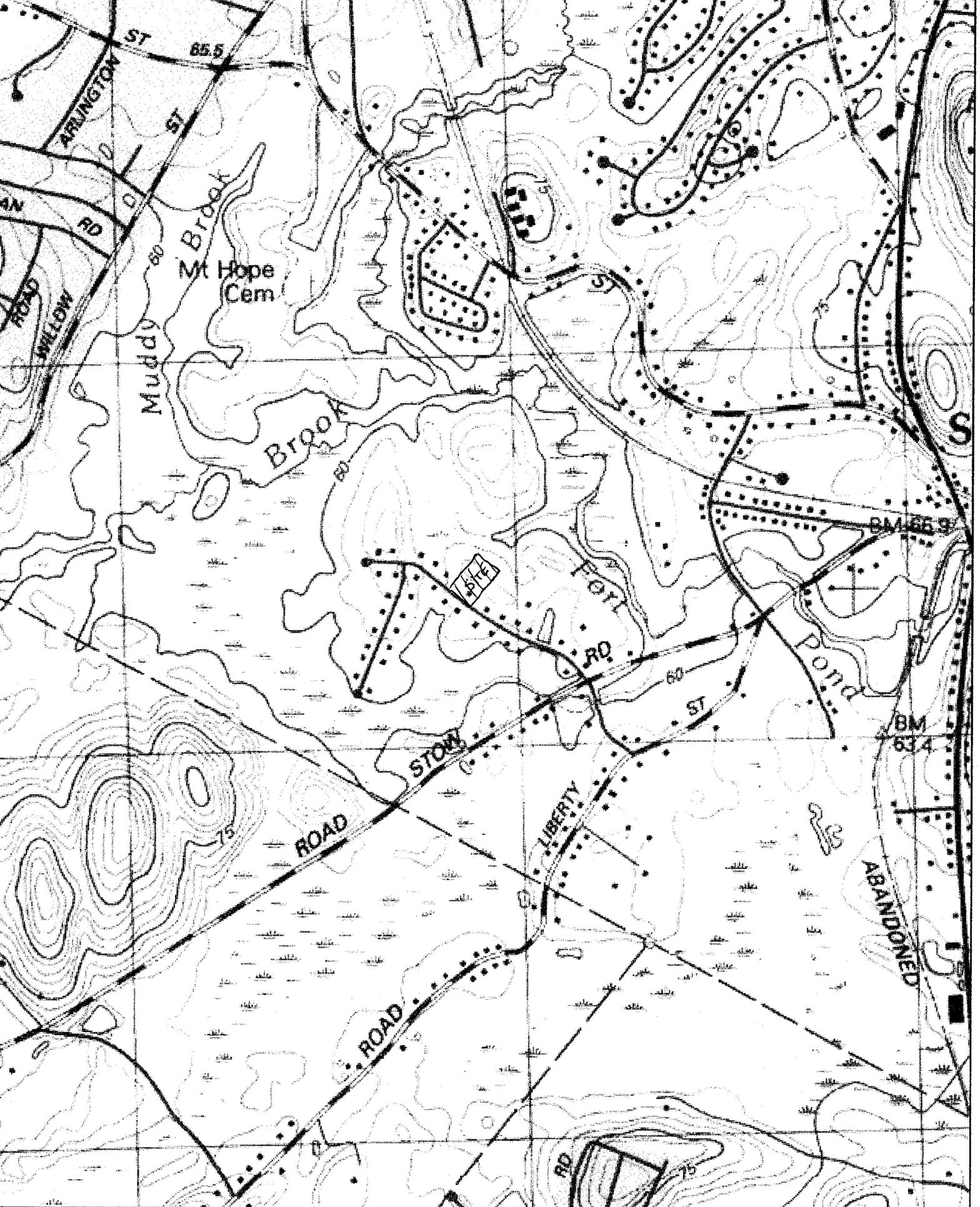
2-YR STORM	PRE-DEVELOPMENT		POST-DEVELOPMENT	
	Q (cfs)	V (ft ³)	Q (cfs)	V (ft ³)
West to Robbins St (1S)	0.23	645	0.11	309
Off Site South (2S)	0.07	271	0.07	271
East to Wetlands (3S; 100R)	0.24	1,586	.22	1,356
10-YR STORM	PRE-DEVELOPMENT		POST-DEVELOPMENT	
	Q (cfs)	V (ft ³)	Q (cfs)	V (ft ³)
West to Robbins St (1S)	0.48	1,280	0.22	595
Off Site South (2S)	0.22	643	0.22	643
East to Wetlands (3S; 100R)	1.15	4,531	1.00	3,784
100-YR STORM	PRE-DEVELOPMENT		POST-DEVELOPMENT	
	Q (cfs)	V (ft ³)	Q (cfs)	V (ft ³)
West to Robbins St (1S)	0.93	2,481	0.42	1,126
Off Site South (2S)	0.52	1,417	0.53	1,417
East to Wetlands (3S; 100R)	3.31	11,211	2.90	9,340

IV. Conclusions

The proposed drainage system adequately controls both the rate and volume of runoff from proposed site improvements at the proposed Beacon Court subdivision. There is no increase in runoff rate or volume from the site above predevelopment rates and volumes to the same off-site areas. The proposed stormwater management controls proposed sufficiently detain and recharge the increase in runoff generated by development to similar or lesser rates and volumes as under predevelopment conditions. All storm water controls have been sized to properly manage storm events up to and including the 100-year, 24 hour design storm. Runoff rates and volumes are reduced or maintained following development and runoff quality is greatly improved through implementation of the proposed Low Impact Development (LID) design.

Appendix A

Portion of USGS Quadrangle Map, Maynard, Massachusetts, 1987
(Scale: 1:25,000)



Appendix B

Soil descriptions from Natural Resources Conservation Service (NRCS) Web
Soil Survey

Soil Map—Middlesex County, Massachusetts
(57 ROBBINS)



Map Scale: 1:3,950 if printed on A size (8.5" x 11") sheet.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Special Point Features

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

-  Very Stony Spot
-  Wet Spot
-  Other

Special Line Features

-  Gully
-  Short Steep Slope
-  Other

Political Features

-  Cities

Water Features

-  Oceans
-  Streams and Canals

Transportation

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

MAP INFORMATION

Map Scale: 1:3,950 if printed on A size (8.5" × 11") sheet.

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 19N NAD83

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 12, Feb 26, 2010

Date(s) aerial images were photographed: 7/28/2003

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

Map Unit Legend

Middlesex County, Massachusetts (MA017)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
36A	Saco mucky silt loam, 0 to 1 percent slopes	2.6	4.2%
51A	Swansea muck, 0 to 1 percent slopes	1.4	2.3%
52A	Freetown muck, 0 to 1 percent slopes	9.2	14.8%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	7.8	12.6%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	25.4	41.0%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	3.5	5.6%
307B	Paxton fine sandy loam, 3 to 8 percent slopes, extremely stony	7.4	11.9%
317B	Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony	4.6	7.5%
Totals for Area of Interest		61.9	100.0%

Appendix C

Pre-development Drainage Plan
(Scale: 1" = 40')

N/F
ANITA A. SUTHERLAND, TRUSTEE
OF THE ANITA A. SUTHERLAND
REALTY TRUST
MAP H-2 PARCEL 7-1

N/F
JOHN G. KILPATRICK, III
AND
MICHELLE T. KILPATRICK
MAP H-2 PARCEL 7

N/F
JOHN G. KILPATRICK, III
AND
MICHELLE T. KILPATRICK
MAP H-2 PARCEL 7

N/F
ELADIO R. AND HAYDEE CORTES
MAP H-2 PARCEL 7-3

N/F
CHRISTOPHER D. BRANDON
AND
JOANN BERRY
MAP H-2 PARCEL 15

N/F
SUYAN DING
AND
JIANXIAN WANG
MAP H-2 PARCEL 15-2

"BEACON COURT"
PRE-DEVELOPMENT DRAINAGE PLAN
57 ROBBINS STREET
ACTON, MASSACHUSETTS

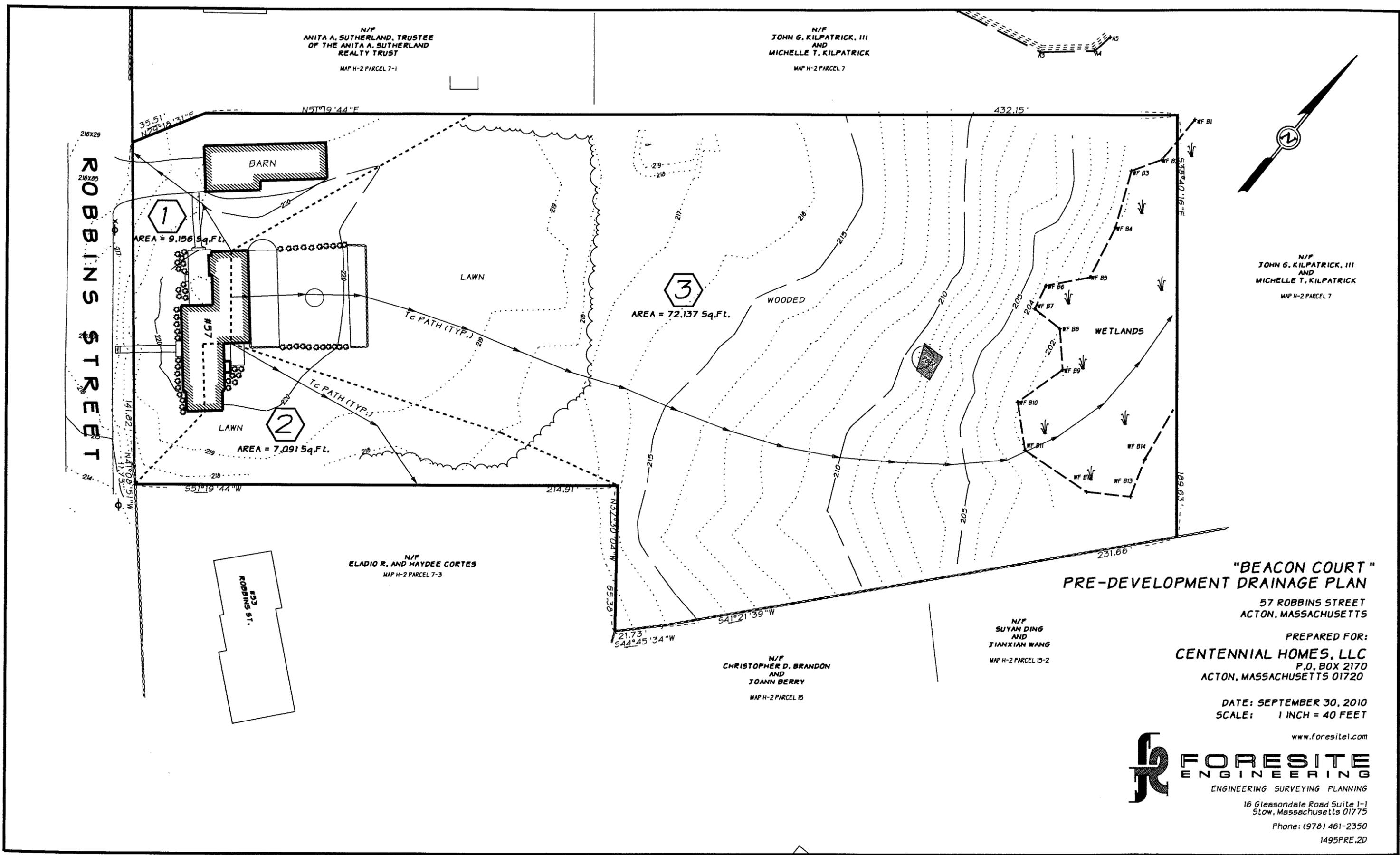
PREPARED FOR:
CENTENNIAL HOMES, LLC
P.O. BOX 2170
ACTON, MASSACHUSETTS 01720

DATE: SEPTEMBER 30, 2010
SCALE: 1 INCH = 40 FEET

www.foresitel.com



16 Gleasondale Road Suite 1-1
Stow, Massachusetts 01775
Phone: (978) 461-2350
1495PRE.2D



Appendix D

Post-development Drainage Plan
(Scale: 1" = 40')

N/F
ANITA A. SUTHERLAND, TRUSTEE
OF THE ANITA A. SUTHERLAND
REALTY TRUST
MAP H-2 PARCEL 7-1

N/F
JOHN G. KILPATRICK, III
AND
MICHELLE T. KILPATRICK
MAP H-2 PARCEL 7

N/F
JOHN G. KILPATRICK, III
AND
MICHELLE T. KILPATRICK
MAP H-2 PARCEL 7

N/F
ELADIO R. AND HAYDEE CORTES
MAP H-2 PARCEL 7-3

N/F
CHRISTOPHER D. BRANDON
AND
JOANN BERRY
MAP H-2 PARCEL 15

N/F
SUYAN DING
AND
JIANXIAN WANG
MAP H-2 PARCEL 15-2

"BEACON COURT" POST-DEVELOPMENT DRAINAGE PLAN

57 ROBBINS STREET
ACTON, MASSACHUSETTS

PREPARED FOR:
CENTENNIAL HOMES, LLC
P.O. BOX 2170
ACTON, MASSACHUSETTS 01720

DATE: SEPTEMBER 30, 2010
SCALE: 1 INCH = 40 FEET

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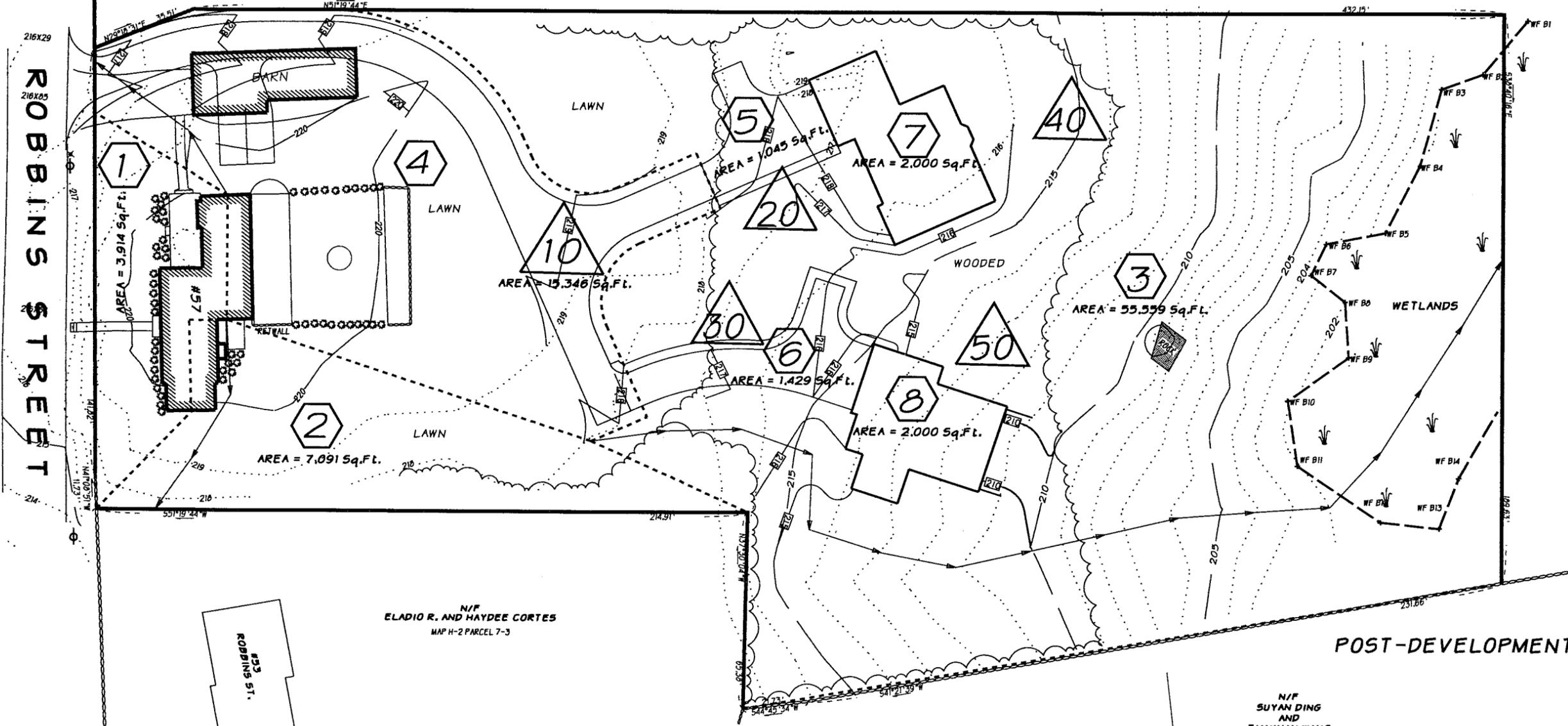


16 Gleasondale Road Suite 1-1
Stow, Massachusetts 01775

Phone: (978) 461-2350

1495PRE.2D

NOTE: ALL SOILS ON SITE ARE MERRIMAC URBAN LAND COMPLEX
NRCS HYDROLOGIC SOIL GROUP A



Appendix E

Deep Observation Test and Percolation Test Results



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

James & Teresa Stellar

Owner Name

57 Robbins Street (Lot 1 - Existing House)

Street Address

Acton

City

MA

State

Map H-2 Parcel 7-2

Map/Lot #

01720

Zip Code

B. Site Information

- (Check one) New Construction Upgrade Repair
- Published Soil Survey Available? Yes No If yes: 1995 1:25,000 103B
Year Published Publication Scale Soil Map Unit
Charlton-Hollis Rock Outcrop Stoniness, slope, depth to bedrock
Soil Name Soil Limitations
- Surficial Geological Report Available? Yes No If yes: 1995 1:25,000 _____
Year Published Publication Scale Map Unit
Till or Bedrock Ground Moraine
Geologic Material Landform
- Flood Rate Insurance Map
 Above the 500-year flood boundary? Yes No Within the 100-year flood boundary? Yes No
 Within the 500-year flood boundary? Yes No Within a velocity zone? Yes No
- Wetland Area: National Wetland Inventory Map U Uplands
Map Unit Map Unit Name
Wetlands Conservancy Program Map _____ _____
Map Unit Name
- Current Water Resource Conditions (USGS): 05/10 Range: Above Normal Normal Below Normal
Month/Year
- Other references reviewed: _____



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserved disposal area)*

Deep Observation Hole Number: 510-1 5/21/10 9:30AM Sunny 70's
Date Time Weather

1. Location

Ground Elevation at Surface of Hole: _____ Location (identify on plan): see sketch

2. Land Use Yard Few 0-3%
(e.g., woodland, agricultural field, vacant lot, etc.) Surface Stones Slope (%)
Lawn Ground Moraine
Vegetation Landform Position on Landscape (attach sheet)

3. Distances from: Open Water Body >150' Drainage Way >150' Possible Wet Area >150'
feet feet feet feet
Property Line >50' Drinking Water Well ND Other _____
feet feet feet feet feet

4. Parent Material: Glacial Till Unsuitable Materials Present: Yes No

If Yes: Disturbed Soil Fill Material Impervious Layer(s) Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: 62" NA
Depth Weeping from Pit Depth Standing Water in Hole

Estimated Depth to High Groundwater: 58" _____
inches elevation



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 510-1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10"	A	10YR3/2				SL	<10%	<10%	Weak	Dry	
10-22"	Bw	10YR5/8				SL	<10%	<10%	Weak	Dry	
22-114"	C	2.5Y5/4	58"	10YR5/8; 2.5Y6/1	>5%	SL	10%	10%	Weak to Mod. Firm	Dry	

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 510-2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10"	A	10YR3/2				SL	<10%	<10%	Weak	Dry	
10-22"	Bw	10YR5/8				SL	<10%	<10%	Weak	Dry	
22-102"	C	2.5Y5/4	54"	10YR5/8; 2.5Y6/1	>5%	SL	10%	10%	Weak to Mod. Firm	Dry	

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

- | | | |
|--|--------------------|--------------------|
| <input type="checkbox"/> Depth observed standing water in observation hole | A. _____
inches | B. _____
inches |
| <input type="checkbox"/> Depth weeping from side of observation hole | A. _____
inches | B. _____
inches |
| <input checked="" type="checkbox"/> Depth to soil redoximorphic features (mottles) | A. 58"
inches | B. 54"
inches |
| <input type="checkbox"/> Groundwater adjustment (USGS methodology) | A. _____
inches | B. _____
inches |

2.

Index Well Number _____	Reading Date _____	Index Well Level _____
Adjustment Factor _____	Adjusted Groundwater Level _____	

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

- Yes No

b. If yes, at what depth was it observed? Upper boundary: 22"
inches Lower boundary: 102"
inches



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

[Handwritten Signature]
Signature of Soil Evaluator
Scott P. Hayes, PE SE#1030
Typed or Printed Name of Soil Evaluator / License #
Justin Snair
Name of Board of Health Witness

6/1/10
Date
July, 1995
Date of Soil Evaluator Exam
Acton Health Dept.
Board of Health

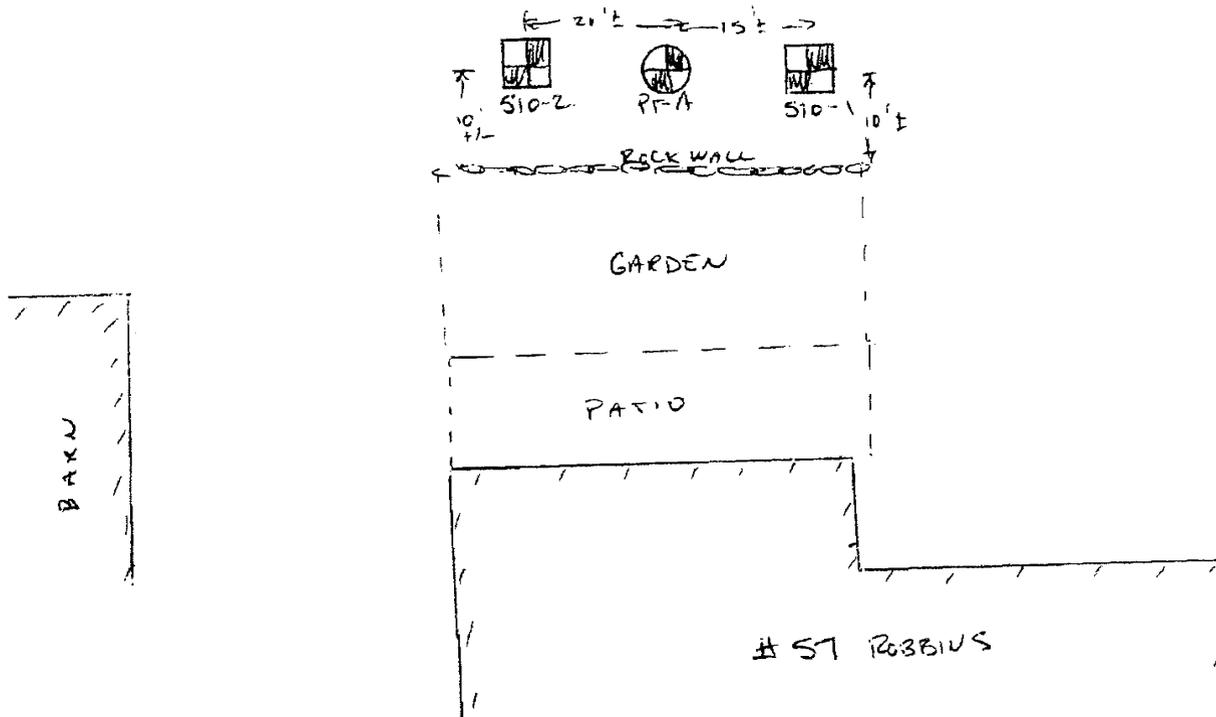
Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Field Diagrams

Use this sheet for field diagrams:

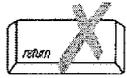
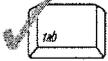




Commonwealth of Massachusetts
 City/Town of Acton
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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



A. Site Information

James & Teresa Stellar

Owner Name

57 Robbins Street

Street Address or Lot #

Acton

City/Town

MA

State

01720

Zip Code

(978) 264-0223

Telephone Number

Contact Person (if different from Owner)

B. Test Results

	5/21/10	1:25PM		
	Date	Time	Date	Time
Observation Hole #	PT-A			
Depth of Perc	48"			
Start Pre-Soak	1:25			
End Pre-Soak	1:45			
Time at 12"	1:45			
Time at 9"	2:09			
Time at 6"	2:49			
Time (9"-6")	40 minutes			
Rate (Min./Inch)	14 MPI			

Test Passed:
 Test Failed:

Test Passed:
 Test Failed:

Scott P. Hayes, PE, FORESITE Engineering

Test Performed By:

Justin Snair, Acton Health Dept.

Witnessed By:

Comments:



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

James & Teresa Stellar

Owner Name

57 Robbins Street (Lot 2)

Street Address

Acton

City

MA

State

Map H-2 Parcel 7-2

Map/Lot #

01720

Zip Code

B. Site Information

1. (Check one) [X] New Construction [] Upgrade [] Repair

2. Published Soil Survey Available? [X] Yes [] No

Charlton-Hollis Rock Outcrop

Soil Name

If yes: 1995 Year Published 1:25,000 Publication Scale 103B Soil Map Unit

Stoniness, slope, depth to bedrock

Soil Limitations

3. Surficial Geological Report Available? [X] Yes [] No

Till or Bedrock

Geologic Material

If yes: 1995 Year Published 1:25,000 Publication Scale Map Unit

Ground Moraine

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [] No

Within the 500-year flood boundary? [] Yes [X] No

Within the 100-year flood boundary? [] Yes [X] No

Within a velocity zone? [] Yes [X] No

5. Wetland Area: National Wetland Inventory Map

Wetlands Conservancy Program Map

U Uplands Map Unit Name

Map Unit Name

6. Current Water Resource Conditions (USGS): 05/10 Month/Year

Range: [] Above Normal [X] Normal [] Below Normal

7. Other references reviewed:



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed primary and reserved disposal area)

Deep Observation Hole Number: 510-7 Date: 5/21/10 Time: 10:30AM Weather: Sunny 70's

1. Location

Ground Elevation at Surface of Hole: Location (identify on plan): see sketch

2. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Few Surface Stones 3-5% Slope (%)

Woods Ground Moraine Position on Landscape (attach sheet)

3. Distances from: Open Water Body >150' feet Drainage Way >100' feet Possible Wet Area >150' feet Property Line >20' feet Drinking Water Well ND feet Other feet

4. Parent Material: Glacial Till Unsuitable Materials Present: [X] Yes [] No

If Yes: [] Disturbed Soil [] Fill Material [] Impervious Layer(s) [] Weathered/Fractured Rock [X] Bedrock

5. Groundwater Observed: [] Yes [X] No If yes: Depth Weeping from Pit Depth Standing Water in Hole

Estimated Depth to High Groundwater: 60" inches elevation



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 510-7

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10"	A	10YR3/2				SL	<10%	<10%	Weak	Dry	
10-22"	Bw	10YR5/8				SL	<10%	<10%	Weak	Dry	
22-88"	C	2.5Y5/4	60"	10YR5/8; 2.5Y6/1	>5%	SL	10%	10%	Weak to Mod. Firm	Dry	

Additional Notes:



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 510-8 Date: 5/21/10 Time: 10:45AM Weather: Sunny, 70's

1. Location

Ground Elevation at Surface of Hole: Location (identify on plan): see sketch

2. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Vegetation: Woods Ground Moraine Landform: Few Surface Stones Slope (%): 3-5% see sketch Position on Landscape (attach sheet)

3. Distances from: Open Water Body >150' feet Drainage Way >150' feet Possible Wet Area >150' feet Property Line >20' feet Drinking Water Well ND feet Other feet

4. Parent Material: Glacial Till Unsuitable Materials Present: [X] Yes [] No

If Yes: [] Disturbed Soil [] Fill Material [] Impervious Layer(s) [] Weathered/Fractured Rock [X] Bedrock

5. Groundwater Observed: [] Yes [X] No If yes: Depth Weeping from Pit Depth Standing Water in Hole

Estimated Depth to High Groundwater: 60" inches elevation



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 510-8

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-16"	A	10YR3/2				SL	<10%	<10%	Weak	Dry	
16-24"	Bw	10YR5/8				SL	<10%	<10%	Weak	Dry	
24-84"	C	2.5Y5/4	60"	10YR5/8; 2.5Y6/1	>5%	SL	10%	10%	Weak to Mod. Firm	Dry	

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

- | | | |
|--|--------------------|--------------------|
| <input type="checkbox"/> Depth observed standing water in observation hole | A. _____
inches | B. _____
inches |
| <input type="checkbox"/> Depth weeping from side of observation hole | A. _____
inches | B. _____
inches |
| <input checked="" type="checkbox"/> Depth to soil redoximorphic features (mottles) | A. 60"
inches | B. 60"
inches |
| <input type="checkbox"/> Groundwater adjustment (USGS methodology) | A. _____
inches | B. _____
inches |

2.

_____	_____	_____
Index Well Number	Reading Date	Index Well Level
_____	_____	
Adjustment Factor	Adjusted Groundwater Level	

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

- Yes No

b. If yes, at what depth was it observed? Upper boundary: 24"
inches Lower boundary: 84"
inches



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.



Signature of Soil Evaluator

Scott P. Hayes, PE SE#1030

Typed or Printed Name of Soil Evaluator / License #

Justin Snair

Name of Board of Health Witness

6/1/10

Date

July, 1995

Date of Soil Evaluator Exam

Acton Health Dept.

Board of Health

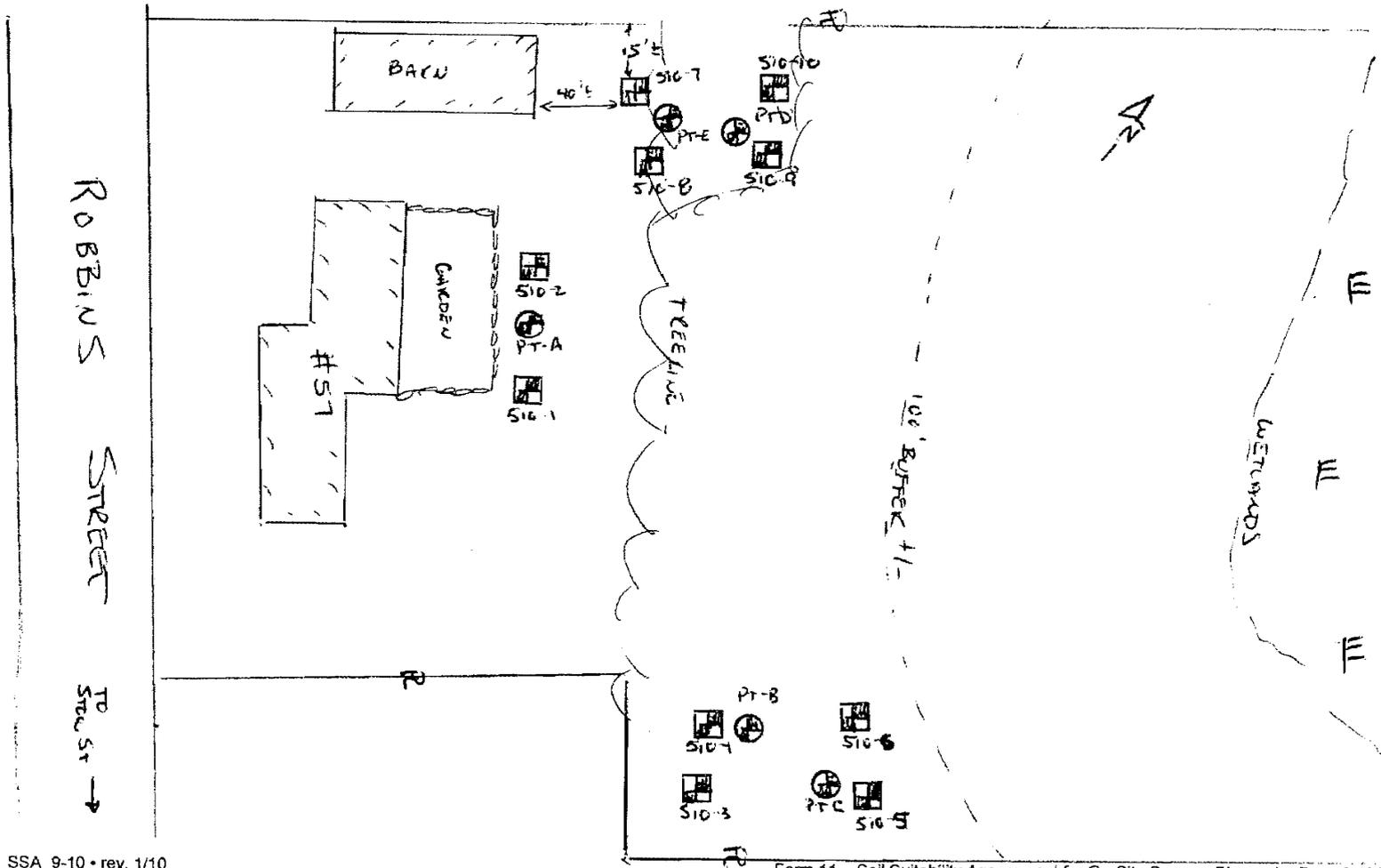
Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Field Diagrams

Use this sheet for field diagrams:

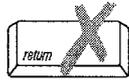




Commonwealth of Massachusetts
 City/Town of Acton
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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



A. Site Information

James & Teresa Stellar

Owner Name

57 Robbins Street

Street Address or Lot #

Acton

City/Town

MA

State

01720

Zip Code

(978) 264-0223

Telephone Number

Contact Person (if different from Owner)

B. Test Results

	5/21/10 Date	1:40PM Time	5/21/10 Date	1:35PM Time
Observation Hole #	PT-B		PT-C	
Depth of Perc	68"		64"	
Start Pre-Soak	1:40		1:35	
End Pre-Soak	1:55		1:50	
Time at 12"	1:55		1:50	
Time at 9"	2:04		2:00	
Time at 6"	3:19		2:08	
Time (9"-6")	75 minutes		8 minutes	
Rate (Min./Inch)	25 MPI		3 MPI	
	Test Passed: <input checked="" type="checkbox"/>		Test Passed: <input checked="" type="checkbox"/>	
	Test Failed: <input type="checkbox"/>		Test Failed: <input type="checkbox"/>	

Scott P. Hayes, PE, FORESITE Engineering

Test Performed By:

Justin Snair, Acton Health Dept.

Witnessed By:

Comments:



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

James & Teresa Stellar

Owner Name

57 Robbins Street (Lot 2)

Street Address

Acton

City

MA

State

Map H-2 Parcel 7-2

Map/Lot #

01720

Zip Code

B. Site Information

1. (Check one) [X] New Construction [] Upgrade [] Repair

2. Published Soil Survey Available? [X] Yes [] No

Charlton-Hollis Rock Outcrop

Soil Name

If yes: 1995 Year Published 1:25,000 Publication Scale 103B Soil Map Unit

Stoniness, slope, depth to bedrock

Soil Limitations

3. Surficial Geological Report Available? [X] Yes [] No

Till or Bedrock

Geologic Material

If yes: 1995 Year Published 1:25,000 Publication Scale Map Unit

Ground Moraine

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [] No

Within the 100-year flood boundary? [] Yes [X] No

Within the 500-year flood boundary? [] Yes [X] No

Within a velocity zone? [] Yes [X] No

5. Wetland Area: National Wetland Inventory Map

U

Map Unit

Uplands

Name

Wetlands Conservancy Program Map

Map Unit

Name

6. Current Water Resource Conditions (USGS): 05/10 Month/Year

Range: [] Above Normal [X] Normal [] Below Normal

7. Other references reviewed:



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed primary and reserved disposal area)

Deep Observation Hole Number: 510-9 Date: 5/21/10 Time: 11:00AM Weather: Sunny 70's

1. Location

Ground Elevation at Surface of Hole: Location (identify on plan): see sketch

2. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Few Surface Stones 3-5% Slope (%)

Woods Vegetation Ground Moraine Landform Position on Landscape (attach sheet)

3. Distances from: Open Water Body >150' feet Drainage Way >100' feet Possible Wet Area >150' feet Property Line >20' feet Drinking Water Well ND feet Other feet

4. Parent Material: Glacial Till Unsuitable Materials Present: [X] Yes [] No

If Yes: [] Disturbed Soil [] Fill Material [] Impervious Layer(s) [] Weathered/Fractured Rock [X] Bedrock

5. Groundwater Observed: [] Yes [X] No If yes: Depth Weeping from Pit Depth Standing Water in Hole

Estimated Depth to High Groundwater: 62" inches elevation



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 510-9

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10"	A	10YR3/2				SL	<10%	<10%	Weak	Dry	
10-24"	Bw	10YR5/8				SL	<10%	<10%	Weak	Dry	
24-84"	C	2.5Y5/4	62"	10YR5/8; 2.5Y6/1	>5%	SL	10%	10%	Weak to Mod. Firm	Dry	

Additional Notes:



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 510-10 Date: 5/21/10 Time: 11:15AM Weather: Sunny, 70's

1. Location

Ground Elevation at Surface of Hole: Location (identify on plan): see sketch

2. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Vegetation: Woods Ground Moraine Landform: Few Surface Stones Slope (%): 3-5% see sketch Position on Landscape (attach sheet)

3. Distances from: Open Water Body >150' feet Drainage Way >150' feet Possible Wet Area >150' feet Property Line >20' feet Drinking Water Well ND feet Other feet

4. Parent Material: Glacial Till Unsuitable Materials Present: [X] Yes [] No

If Yes: [] Disturbed Soil [] Fill Material [] Impervious Layer(s) [] Weathered/Fractured Rock [X] Bedrock

5. Groundwater Observed: [] Yes [X] No If yes: Depth Weeping from Pit Depth Standing Water in Hole Estimated Depth to High Groundwater: 62" inches elevation



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 510-10

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10"	A	10YR3/2				SL	<10%	<10%	Weak	Dry	
10-24"	Bw	10YR5/8				SL	<10%	<10%	Weak	Dry	
24-78"	C	2.5Y5/4	62"	10YR5/8; 2.5Y6/1	>5%	SL	10%	10%	Weak to Mod. Firm	Dry	

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

- | | | |
|--|--------------------|--------------------|
| <input type="checkbox"/> Depth observed standing water in observation hole | A. _____
inches | B. _____
inches |
| <input type="checkbox"/> Depth weeping from side of observation hole | A. _____
inches | B. _____
inches |
| <input checked="" type="checkbox"/> Depth to soil redoximorphic features (mottles) | A. 62"
inches | B. 62"
inches |
| <input type="checkbox"/> Groundwater adjustment (USGS methodology) | A. _____
inches | B. _____
inches |

2.

_____	_____	_____
Index Well Number	Reading Date	Index Well Level
_____	_____	
Adjustment Factor	Adjusted Groundwater Level	

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

- Yes No

b. If yes, at what depth was it observed? Upper boundary: 24"
inches Lower boundary: 78"
inches



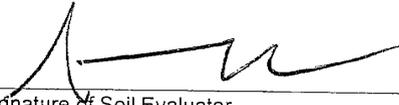
Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.



Signature of Soil Evaluator

Scott P. Hayes, PE SE#1030

Typed or Printed Name of Soil Evaluator / License #

Justin Snair

Name of Board of Health Witness

6/1/10

Date

July, 1995

Date of Soil Evaluator Exam

Acton Health Dept.

Board of Health

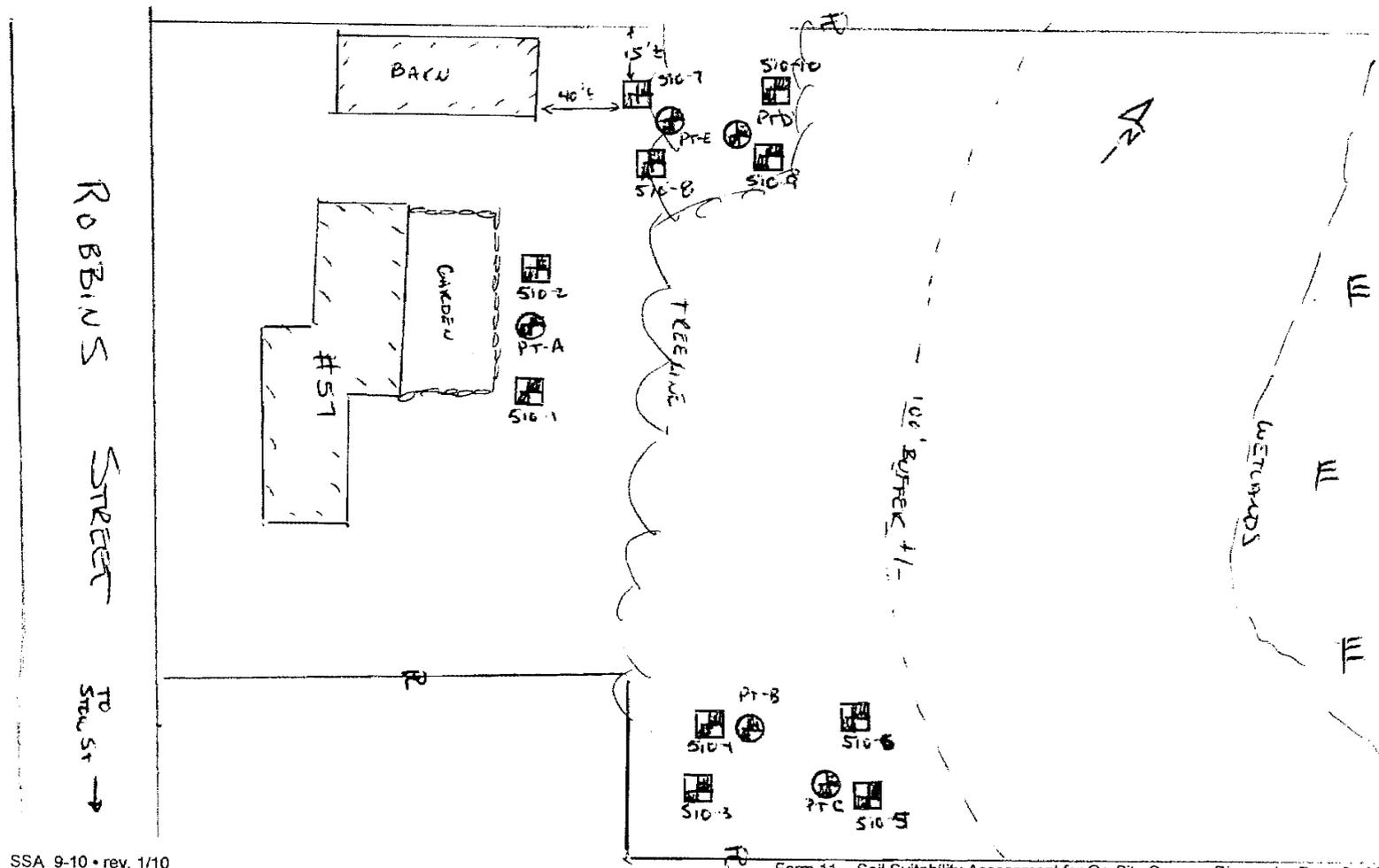
Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Field Diagrams

Use this sheet for field diagrams:





Commonwealth of Massachusetts
 City/Town of Acton
Percolation Test
 Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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



A. Site Information

James & Teresa Stellar
 Owner Name
57 Robbins Street
 Street Address or Lot #
Acton MA 01720
 City/Town State Zip Code
(978) 264-0223
 Contact Person (if different from Owner) Telephone Number

B. Test Results

	<u>5/21/10</u> Date	<u>2:00PM</u> Time	<u>5/21/10</u> Date	<u>2:28PM</u> Time
Observation Hole #	<u>PT-D</u>		<u>PT-E</u>	
Depth of Perc	<u>46"</u>		<u>68"</u>	
Start Pre-Soak	<u>2:00</u>		<u>2:28</u>	
End Pre-Soak	<u>2:16</u>		<u>2:50</u>	
Time at 12"	<u>2:16</u>		<u>2:50</u>	
Time at 9"	<u>2:46</u>		<u>3:50</u>	
Time at 6"	<u>3:20</u>		<u>5:05</u>	
Time (9"-6")	<u>34 minutes</u>		<u>75 minutes</u>	
Rate (Min./Inch)	<u>12 MPI</u>		<u>25 MPI</u>	

Test Passed:
 Test Failed:

Test Passed:
 Test Failed:

Scott P. Hayes, PE, FORESITE Engineering
 Test Performed By:

Justin Snair, Acton Health Dept.
 Witnessed By:

Comments:



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

James & Teresa Stellar

Owner Name

57 Robbins Street (Lot 3)

Street Address

Acton

City

MA

State

Map H-2 Parcel 7-2

Map/Lot #

01720

Zip Code

B. Site Information

1. (Check one) [X] New Construction [] Upgrade [] Repair

2. Published Soil Survey Available? [X] Yes [] No

Charlton-Hollis Rock Outcrop

Soil Name

If yes: 1995 Year Published 1:25,000 Publication Scale 103B Soil Map Unit

Stoniness, slope, depth to bedrock

Soil Limitations

3. Surficial Geological Report Available? [X] Yes [] No

Till or Bedrock

Geologic Material

If yes: 1995 Year Published 1:25,000 Publication Scale Map Unit

Ground Moraine

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? [X] Yes [] No

Within the 500-year flood boundary? [] Yes [X] No

Within the 100-year flood boundary? [] Yes [X] No

Within a velocity zone? [] Yes [X] No

5. Wetland Area: National Wetland Inventory Map

Wetlands Conservancy Program Map

U Map Unit Uplands Name

Map Unit Name

6. Current Water Resource Conditions (USGS): 05/10 Month/Year

Range: [] Above Normal [X] Normal [] Below Normal

7. Other references reviewed:



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed primary and reserved disposal area)

Deep Observation Hole Number: 510-3 Date: 5/21/10 Time: 9:45AM Weather: Sunny 70's

1. Location

Ground Elevation at Surface of Hole: Location (identify on plan): see sketch

2. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Few Surface Stones 3-5% Slope (%)

Woods Vegetation Ground Moraine Landform Position on Landscape (attach sheet)

3. Distances from: Open Water Body >150' feet Drainage Way >100' feet Possible Wet Area >150' feet Property Line >20' feet Drinking Water Well ND feet Other feet

4. Parent Material: Glacial Till Unsuitable Materials Present: [X] Yes [] No

If Yes: [] Disturbed Soil [] Fill Material [] Impervious Layer(s) [] Weathered/Fractured Rock [X] Bedrock

5. Groundwater Observed: [] Yes [X] No If yes: Depth Weeping from Pit Depth Standing Water in Hole

Estimated Depth to High Groundwater: 54" inches elevation



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 510-3

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10"	A	10YR3/2				SL	<10%	<10%	Weak	Dry	
10-22"	Bw	10YR5/8				SL	<10%	<10%	Weak	Dry	
22-84"	C	2.5Y5/4	54"	10YR5/8; 2.5Y6/1	>5%	SL	10%	10%	Weak to Mod. Firm	Dry	

Additional Notes:



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 510-4 Date: 5/21/10 Time: 10:00AM Weather: Sunny, 70's

1. Location

Ground Elevation at Surface of Hole: Location (identify on plan): see sketch

2. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Vegetation: Woods Ground Moraine Landform: Few Surface Stones Slope (%): 3-5% see sketch Position on Landscape (attach sheet)

3. Distances from: Open Water Body >150' feet Drainage Way >150' feet Possible Wet Area >150' feet Property Line >20' feet Drinking Water Well ND feet Other feet

4. Parent Material: Glacial Till Unsuitable Materials Present: [X] Yes [] No

If Yes: [] Disturbed Soil [] Fill Material [] Impervious Layer(s) [] Weathered/Fractured Rock [X] Bedrock

5. Groundwater Observed: [] Yes [X] No If yes: Depth Weeping from Pit Depth Standing Water in Hole Estimated Depth to High Groundwater: 60" inches elevation



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 510-4

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10"	A	10YR3/2				SL	<10%	<10%	Weak	Dry	
10-22"	Bw	10YR5/8				SL	<10%	<10%	Weak	Dry	
22-114"	C	2.5Y5/4	60"	10YR5/8; 2.5Y6/1	>5%	SL	10%	10%	Weak to Mod. Firm	Dry	

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

- | | | |
|--|--------------------|--------------------|
| <input type="checkbox"/> Depth observed standing water in observation hole | A. _____
inches | B. _____
inches |
| <input type="checkbox"/> Depth weeping from side of observation hole | A. _____
inches | B. _____
inches |
| <input checked="" type="checkbox"/> Depth to soil redoximorphic features (mottles) | A. 54"
inches | B. 60"
inches |
| <input type="checkbox"/> Groundwater adjustment (USGS methodology) | A. _____
inches | B. _____
inches |

2.

_____	_____	_____
Index Well Number	Reading Date	Index Well Level
_____	_____	
Adjustment Factor	Adjusted Groundwater Level	

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

- Yes No

b. If yes, at what depth was it observed? Upper boundary: 22"
inches Lower boundary: 84"
inches



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

[Handwritten signature]
Signature of Soil Evaluator

6/1/10
Date

Scott P. Hayes, PE SE#1030
Typed or Printed Name of Soil Evaluator / License #

July, 1995
Date of Soil Evaluator Exam

Justin Snair
Name of Board of Health Witness

Acton Health Dept.
Board of Health

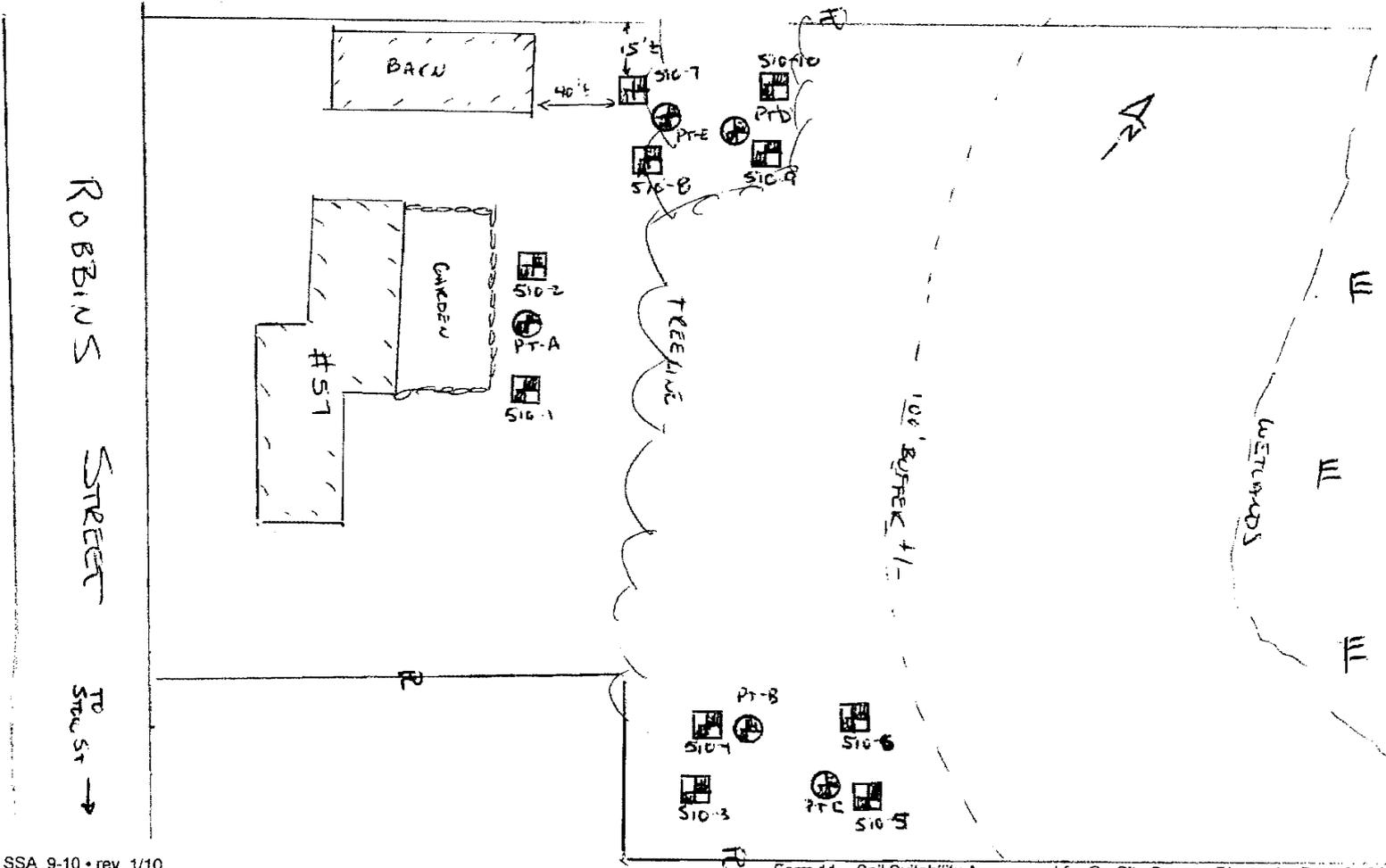
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Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Field Diagrams

Use this sheet for field diagrams:





Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

James & Teresa Stellar

Owner Name

57 Robbins Street (Lot 3)

Street Address

Acton

City

MA

State

Map H-2 Parcel 7-2

Map/Lot #

01720

Zip Code

B. Site Information

1. (Check one) New Construction Upgrade

Repair

2. Published Soil Survey Available? Yes No

If yes: 1995 1:25,000 103B
Year Published Publication Scale Soil Map Unit

Charlton-Hollis Rock Outcrop

Soil Name

Stoniness, slope, depth to bedrock

Soil Limitations

3. Surficial Geological Report Available? Yes No

If yes: 1995 1:25,000 _____
Year Published Publication Scale Map Unit

Till or Bedrock

Geologic Material

Ground Moraine

Landform

4. Flood Rate Insurance Map

Above the 500-year flood boundary? Yes No

Within the 100-year flood boundary? Yes No

Within the 500-year flood boundary? Yes No

Within a velocity zone? Yes No

5. Wetland Area: National Wetland Inventory Map

U Uplands
Map Unit Name

Wetlands Conservancy Program Map

Map Unit Name

6. Current Water Resource Conditions (USGS): 05/10
Month/Year

Range: Above Normal Normal Below Normal

7. Other references reviewed: _____



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed primary and reserved disposal area)

Deep Observation Hole Number: 510-5 Date: 5/21/10 Time: 10:15AM Weather: Sunny 70's

1. Location

Ground Elevation at Surface of Hole: Location (identify on plan): see sketch

2. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Vegetation: Woods Ground Moraine Landform: Few Surface Stones Position on Landscape (attach sheet): 3-5% Slope (%)

3. Distances from: Open Water Body >150' feet Drainage Way >100' feet Possible Wet Area >150' feet Property Line >20' feet Drinking Water Well ND feet Other feet

4. Parent Material: Glacial Till Unsuitable Materials Present: [X] Yes [] No

If Yes: [] Disturbed Soil [] Fill Material [] Impervious Layer(s) [] Weathered/Fractured Rock [X] Bedrock

5. Groundwater Observed: [] Yes [X] No If yes: Depth Weeping from Pit Depth Standing Water in Hole Estimated Depth to High Groundwater: 72" inches elevation



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 510-5

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10"	A	10YR3/2				SL	<10%	<10%	Weak	Dry	
10-22"	Bw	10YR5/8				SL	<10%	<10%	Weak	Dry	
22-120"	C	2.5Y6/4	72"	10YR5/8; 2.5Y6/1	>5%	SL	10%	10%	Weak to Mod. Firm	Dry	

Additional Notes:



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 510-6 Date: 5/21/10 Time: 10:00AM Weather: Sunny, 70's

1. Location

Ground Elevation at Surface of Hole: Location (identify on plan): see sketch

2. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Vegetation: Woods Ground Moraine Landform: Few Surface Stones 3-5% Slope (%) see sketch Position on Landscape (attach sheet)

3. Distances from: Open Water Body >150' feet Drainage Way >150' feet Possible Wet Area >150' feet Property Line >20' feet Drinking Water Well ND feet Other feet

4. Parent Material: Glacial Till Unsuitable Materials Present: [X] Yes [] No

If Yes: [] Disturbed Soil [] Fill Material [] Impervious Layer(s) [] Weathered/Fractured Rock [X] Bedrock

5. Groundwater Observed: [] Yes [X] No If yes: Depth Weeping from Pit Depth Standing Water in Hole

Estimated Depth to High Groundwater: 60" inches elevation



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: 510-6

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10"	A	10YR3/2				SL	<10%	<10%	Weak	Dry	
10-26"	Bw	10YR5/8				SL	<10%	<10%	Weak	Dry	
26-126"	C	2.5Y6/4	60"	10YR5/8; 2.5Y6/1	>5%	SL	10%	10%	Weak to Mod. Firm	Dry	

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

- | | | |
|--|--------------------|--------------------|
| <input type="checkbox"/> Depth observed standing water in observation hole | A. _____
inches | B. _____
inches |
| <input type="checkbox"/> Depth weeping from side of observation hole | A. _____
inches | B. _____
inches |
| <input checked="" type="checkbox"/> Depth to soil redoximorphic features (mottles) | A. 72"
inches | B. 60"
inches |
| <input type="checkbox"/> Groundwater adjustment (USGS methodology) | A. _____
inches | B. _____
inches |

2.

Index Well Number _____	Reading Date _____	Index Well Level _____
Adjustment Factor _____	Adjusted Groundwater Level _____	

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

- Yes No

b. If yes, at what depth was it observed? Upper boundary: $\frac{26''}{\text{inches}}$ Lower boundary: $\frac{120''}{\text{inches}}$



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.



 Signature of Soil Evaluator
 Scott P. Hayes, PE SE#1030

 Typed or Printed Name of Soil Evaluator / License #
 Justin Snair

 Name of Board of Health Witness

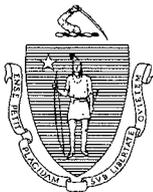
6/1/10

 Date
 July, 1995

 Date of Soil Evaluator Exam
 Acton Health Dept.

 Board of Health

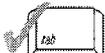
Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.



Commonwealth of Massachusetts
 City/Town of Acton
Percolation Test
 Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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



A. Site Information

James & Teresa Stellar

Owner Name

57 Robbins Street

Street Address or Lot #

Acton

City/Town

MA

State

01720

Zip Code

(978) 264-0223

Telephone Number

Contact Person (if different from Owner)

B. Test Results

	<u>5/21/10</u> Date	<u>1:40PM</u> Time	<u>5/21/10</u> Date	<u>1:35PM</u> Time
Observation Hole #	<u>PT-B</u>		<u>PT-C</u>	
Depth of Perc	<u>68"</u>		<u>64"</u>	
Start Pre-Soak	<u>1:40</u>		<u>1:35</u>	
End Pre-Soak	<u>1:55</u>		<u>1:50</u>	
Time at 12"	<u>1:55</u>		<u>1:50</u>	
Time at 9"	<u>2:04</u>		<u>2:00</u>	
Time at 6"	<u>3:19</u>		<u>2:08</u>	
Time (9"-6")	<u>75 minutes</u>		<u>8 minutes</u>	
Rate (Min./Inch)	<u>25 MPI</u>		<u>3 MPI</u>	
	Test Passed: <input checked="" type="checkbox"/>		Test Passed: <input checked="" type="checkbox"/>	
	Test Failed: <input type="checkbox"/>		Test Failed: <input type="checkbox"/>	

Scott P. Hayes, PE, FORESITE Engineering

Test Performed By:

Justin Snair, Acton Health Dept.

Witnessed By:

Comments:

Appendix F

Stormwater Operation & Maintenance Plan

POROUS PAVEMENT OPERATION AND MAINTENANCE PROTOCOL

General Maintenance

The primary goal of porous pavement maintenance is to prevent the pavement surface and/or the underlying infiltration bed from being clogged with fine sediments. To keep the system clean throughout the year and prolong its lifespan, the pavement surface should be vacuumed biannually with a commercial cleaning unit. All inlet structures within or draining to the infiltration beds should also be cleaned out on a biannual basis.

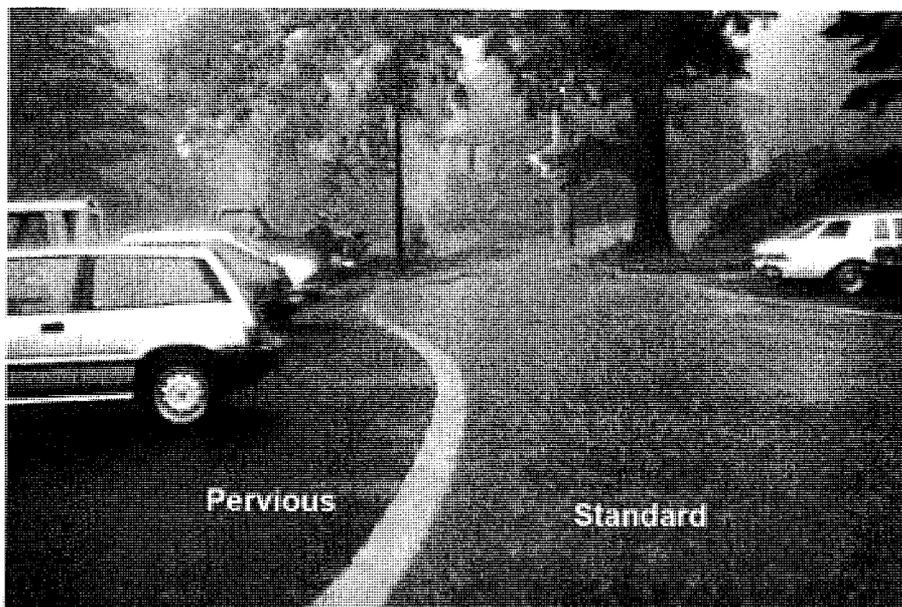


Figure 1: Routine and adequate maintenance has allowed the porous asphalt parking lot at the Morris Arboretum to still be effective 20 years after installation.

Planted areas adjacent to porous pavement should be well maintained to prevent soil washout onto the pavement. If any washout does occur it should be cleaned off the pavement immediately to prevent further clogging of the pores. Furthermore, if any bare spots or eroded areas are observed within the planted areas, they should be replanted and/or stabilized at once. Planted areas should be inspected on a semi-annual basis. All trash and other litter that is observed during these inspections should be removed.

Superficial dirt does not necessarily clog the pavement voids. However, dirt that is ground in repeatedly by tires can lead to clogging. Therefore, trucks or other heavy vehicles should be prevented from tracking or spilling dirt onto the pavement. Furthermore, all construction or hazardous materials carriers should be prohibited from entering a porous pavement lot.

Descriptive signage is recommended to maintain institutional memory of porous pavement

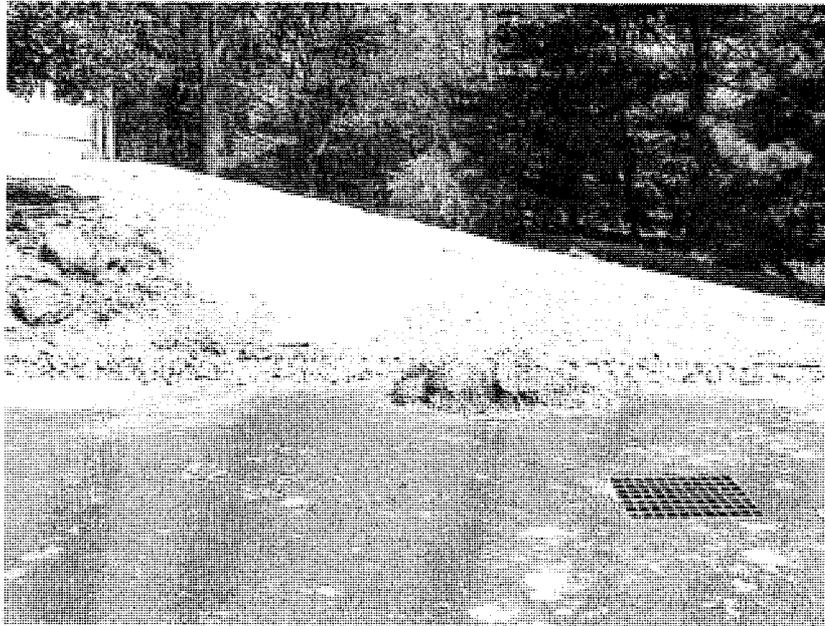


Figure 2: Example of soil wash-on/dumping from unstabilized landscaping.

Vacuuuming

Cahill recommends vacuuming porous asphalt and concrete pavement with a vacuum sweeper on a biannual basis. Acceptable types of vacuum sweepers include the Elgin Whirlwind and the Allianz Model 650. Though much less effective than “pure” vacuum sweepers, regenerative air sweepers, such as the Tymco Model 210, Schwarze 348, Victory, and others, are sometimes used. These units contain a blower system that generates a high velocity air column, which forces the air against the pavement at an angle, creating a ‘peeling’ or ‘knifing’ effect. The high volume air blast loosens the debris from the pavement surface, then transports it across the width of the sweeping head and lifts it into the containment hopper via a suction tube. Thus, sediment and debris are loosened from the pavement and sucked into the unit. (Note: simple broom sweepers are not recommended for porous pavement maintenance.)

If the pavement surface has become significantly clogged such that routine vacuum sweeping does not restore permeability, then a more intensive level of treatment may be required. Recent studies have revealed the usefulness of washing porous pavements with clean, low pressure water, followed by immediate vacuuming. Combinations of washing and vacuuming techniques have proved effective in cleaning both organic clogging as well as sandy clogging. Research in Florida found that a “power head cone nozzle” that “concentrated the water in a narrowly rotating cone” worked best. (Note: if the pressure of

the washing nozzle is too great, contaminants may be driven further into the porous surface.) Maintenance crews are encouraged to determine the most effective strategy of cleaning their porous installations.



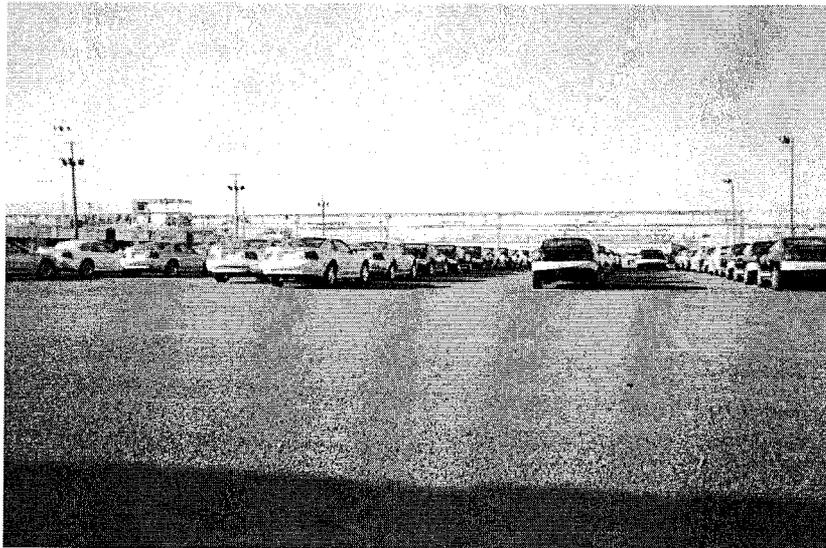
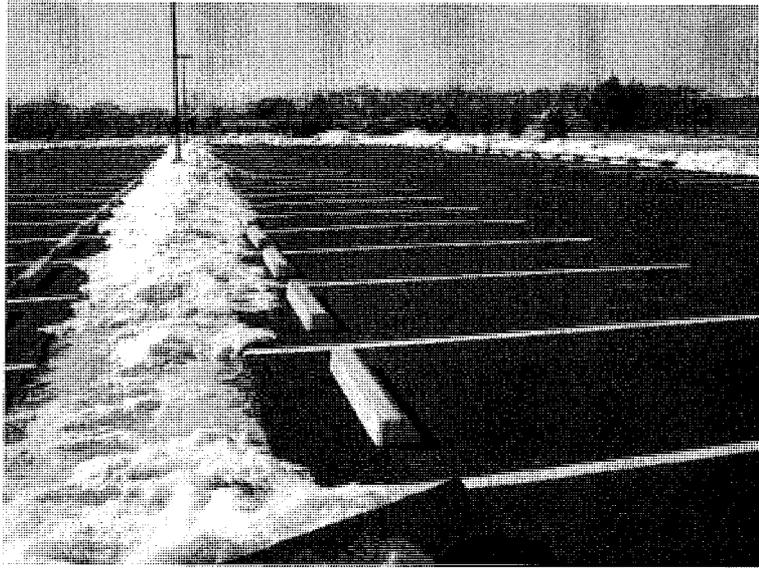
Figure 3: Photo of Elgin Whirlwind Vacuum Air Sweeper, example of effective vacuuming device

For smaller installations, such as sidewalks, plazas, or small parking lots, “walk behind” vacuum units may prove most effective. Though these units can be loud and somewhat messy to the operator due to the lack of dust suppression, they are also relatively easy to operate and inexpensive. Examples of acceptable “walk behind” units include the Billy Goat models, the 5700 industrial-strength Scrubber by Tennant, and the sidewalk class vacuum sweepers made by Nilfisk, Advance and Hako. If “walk behind” units are used, it is recommended that the scrub pressure be kept relatively low. The dirtiest areas may need to be power washed after scrubbing to get out the dirt that has been deeply ground in.

Winter Maintenance

Winter maintenance for a porous parking lot may be necessary, but is usually less intensive than that required for a standard asphalt lot. By its very nature, a porous pavement system with subsurface aggregate bed has superior snow melting characteristics than does standard pavement. Therefore, ice and light snow accumulation are generally not as problematic. However, snow will accumulate during heavier storms. Abrasives such as sand or cinders should not be applied on or adjacent to the porous pavement. Snow plowing is necessary for significant snow accumulation, but should be done carefully (i.e. by setting the blade slightly higher than usual, about an inch). Standard road salt is acceptable for use as a deicer on porous pavement, although a non-toxic, organic deicer, applied either as a blended, magnesium chloride-based liquid product or as pretreated rock salt, is

recommended. Acceptable liquid deicers include Magic-O, Ice B' Gone, Ice Ban, and Geomelt, among others. Magic Salt is an example of an acceptable pretreated salt product. Other acceptable deicer alternatives to standard sodium chloride include calcium chloride, magnesium chloride, potassium chloride, urea, and calcium magnesium acetate. Follow supplier recommendations when applying deicers to pavement.



Figures 4 and 5: Neither the porous asphalt parking lot at the University of Rhode Island nor the one at the Ford Rouge Plant in Dearborn, Michigan have experienced significant snow accumulations on the pavement after multiple harsh winters.

Repairs

Potholes in the porous pavement are extremely unlikely, though settling might occur if a soft spot in the subgrade is not removed during construction. For damaged areas of less than 50 square feet, a declivity could be patched by any means suitable with standard pavement, with the loss of porosity of that area being insignificant. The declivity can also be filled with porous mix. If an area greater than 50 SF is in need of repair, approval of patch type must be sought from either the engineer or owner. Under no circumstance is the pavement surface to ever be seal coated. Any required repair of drainage structures should be done promptly to ensure continued proper functioning of the system.

With minimal maintenance, porous bituminous asphalt can function effectively for well over 20 years. However, in the event that maintenance of the porous pavement is neglected and it becomes clogged over time, the Owner shall vacuum the lot until the original permeability is restored. (If the original permeability of the lot cannot be restored, the pavement should be removed and replaced with a new porous mix.) Recent research has shown that one of the most effective ways of restoring porous pavement is applying a pressurized dose of a non-toxic detergent cleaning solution, allowing adequate soak time, and then vacuuming with a high performance unit (Elgin Whirlwind and the Allianz Model 650). Once again, it is important to note that high pressure washing may drive contaminants further into the porous surface and even into the underlying aggregate. It is therefore recommended that, prior to vacuum sweeping, a low performance pressure washer is used to get the solution to break the surface tension and reach into the pores.



Figure 6: Standard bituminous patch in porous asphalt parking lot. This lot was constructed with an unmodified porous mix (i.e. no polymer modification) and had rutted in the center of the aisle due to construction traffic.

- **Summary**

- **Prevent Clogging of Pavement Surface with Sediment**

- Vacuum pavement twice per year
- Maintain planted areas adjacent to pavement
 - Immediately clean any soil deposited on pavement
- Do not allow construction staging, soil/mulch storage, etc. on unprotected pavement surface
- Clean inlets draining to the subsurface bed twice per year

- **Snow/Ice Removal**

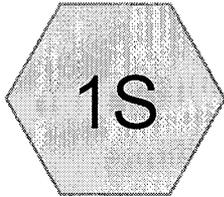
- Porous pavement systems generally perform better and require less treatment than standard pavements
- **Do not apply abrasives such as sand or cinders on or adjacent to porous pavement**
- Snow plowing is fine but should be done carefully (i.e. set the blade slightly higher than usual)
- Salt application is acceptable, although more environmentally-benign deicers are preferable

- **Repairs**

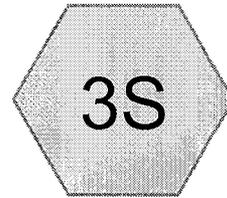
- **Surface should never be seal-coated**
- Inspect for pavement rutting/raveling on an annual basis (some minor ruts may occur in the porous pavement from stationary wheel rotation)
- Damaged areas less than 50 square feet can be patched with porous or standard asphalt
- Larger areas should be patched with an approved porous asphalt

Appendix G

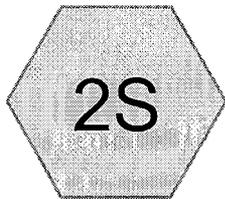
HydroCAD Output



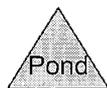
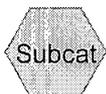
WEST TO ROBBINS ST



EAST TO WETLANDS



OFF SITE SOUTH



Area Listing (all nodes)

<u>Area (sq-ft)</u>	<u>CN</u>	<u>Description (subcats)</u>
56,084	55	Woods, Good, HSG B (3S)
685	60	Woods, Fair, HSG B (2S)
27,539	61	>75% Grass cover, Good, HSG B (1S,2S,3S)
4,076	98	Paved parking & roofs (1S,2S,3S)
<hr/>		
88,384		

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: WEST TO ROBBINS ST

Runoff Area=9,156 sf Runoff Depth>0.84"

Flow Length=65' Tc=3.1 min CN=72 Runoff=0.23 cfs 645 cf

Subcatchment 2S: OFF SITE SOUTH

Runoff Area=7,091 sf Runoff Depth>0.46"

Flow Length=110' Tc=3.7 min CN=63 Runoff=0.07 cfs 271 cf

Subcatchment 3S: EAST TO WETLANDS

Runoff Area=72,137 sf Runoff Depth>0.26"

Flow Length=485' Tc=9.0 min CN=57 Runoff=0.24 cfs 1,586 cf

Total Runoff Area = 88,384 sf Runoff Volume = 2,502 cf Average Runoff Depth = 0.34"

95.39% Pervious Area = 84,308 sf 4.61% Impervious Area = 4,076 sf

Subcatchment 1S: WEST TO ROBBINS ST

Runoff = 0.23 cfs @ 12.06 hrs, Volume= 645 cf, Depth > 0.84"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
6,365	61	>75% Grass cover, Good, HSG B
2,791	98	Paved parking & roofs
9,156	72	Weighted Average
6,365		Pervious Area
2,791		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 Sheet Flow Grass: Short n=0.150 P2= 3.20"
0.4	40	0.0500	1.57		Shallow Concentrated Flow, Overland flow Short Grass Pasture Kv= 7.0 fps
3.1	65	Total			

Subcatchment 2S: OFF SITE SOUTH

Runoff = 0.07 cfs @ 12.09 hrs, Volume= 271 cf, Depth > 0.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
6,046	61	>75% Grass cover, Good, HSG B
360	98	Paved parking & roofs
685	60	Woods, Fair, HSG B
7,091	63	Weighted Average
6,731		Pervious Area
360		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 SHEET FLOW Grass: Short n=0.150 P2= 3.20"
1.0	85	0.0400	1.40		Shallow Concentrated Flow, OVERLAND FLOW Short Grass Pasture Kv= 7.0 fps
3.7	110	Total			

Subcatchment 3S: EAST TO WETLANDS

Runoff = 0.24 cfs @ 12.33 hrs, Volume= 1,586 cf, Depth > 0.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
56,084	55	Woods, Good, HSG B
15,128	61	>75% Grass cover, Good, HSG B
925	98	Paved parking & roofs
72,137	57	Weighted Average
71,212		Pervious Area
925		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	10	0.5000	3.15		Sheet Flow, TR-55 SHEET FLOW Smooth surfaces n= 0.011 P2= 3.20"
2.7	25	0.0300	0.15		Sheet Flow, TR-55 SHEET FLOW Grass: Short n= 0.150 P2= 3.20"
2.1	150	0.0300	1.21		Shallow Concentrated Flow, OVERLAND FLOW Short Grass Pasture Kv= 7.0 fps
4.1	300	0.0600	1.22		Shallow Concentrated Flow, OVERLAND FLOW Woodland Kv= 5.0 fps
9.0	485	Total			

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: WEST TO ROBBINS ST

Runoff Area=9,156 sf Runoff Depth>1.68"

Flow Length=65' Tc=3.1 min CN=72 Runoff=0.48 cfs 1,280 cf

Subcatchment 2S: OFF SITE SOUTH

Runoff Area=7,091 sf Runoff Depth>1.09"

Flow Length=110' Tc=3.7 min CN=63 Runoff=0.22 cfs 643 cf

Subcatchment 3S: EAST TO WETLANDS

Runoff Area=72,137 sf Runoff Depth>0.75"

Flow Length=485' Tc=9.0 min CN=57 Runoff=1.15 cfs 4,531 cf

Total Runoff Area = 88,384 sf Runoff Volume = 6,454 cf Average Runoff Depth = 0.88"

95.39% Pervious Area = 84,308 sf 4.61% Impervious Area = 4,076 sf

Subcatchment 1S: WEST TO ROBBINS ST

Runoff = 0.48 cfs @ 12.06 hrs, Volume= 1,280 cf, Depth > 1.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
6,365	61	>75% Grass cover, Good, HSG B
2,791	98	Paved parking & roofs
9,156	72	Weighted Average
6,365		Pervious Area
2,791		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 Sheet Flow Grass: Short n= 0.150 P2= 3.20"
0.4	40	0.0500	1.57		Shallow Concentrated Flow, Overland flow Short Grass Pasture Kv= 7.0 fps
3.1	65	Total			

Subcatchment 2S: OFF SITE SOUTH

Runoff = 0.22 cfs @ 12.07 hrs, Volume= 643 cf, Depth > 1.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
6,046	61	>75% Grass cover, Good, HSG B
360	98	Paved parking & roofs
685	60	Woods, Fair, HSG B
7,091	63	Weighted Average
6,731		Pervious Area
360		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 SHEET FLOW Grass: Short n= 0.150 P2= 3.20"
1.0	85	0.0400	1.40		Shallow Concentrated Flow, OVERLAND FLOW Short Grass Pasture Kv= 7.0 fps
3.7	110	Total			

Subcatchment 3S: EAST TO WETLANDS

Runoff = 1.15 cfs @ 12.16 hrs, Volume = 4,531 cf, Depth > 0.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
56,084	55	Woods, Good, HSG B
15,128	61	>75% Grass cover, Good, HSG B
925	98	Paved parking & roofs
72,137	57	Weighted Average
71,212		Pervious Area
925		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	10	0.5000	3.15		Sheet Flow, TR-55 SHEET FLOW Smooth surfaces n= 0.011 P2= 3.20"
2.7	25	0.0300	0.15		Sheet Flow, TR-55 SHEET FLOW Grass: Short n= 0.150 P2= 3.20"
2.1	150	0.0300	1.21		Shallow Concentrated Flow, OVERLAND FLOW Short Grass Pasture Kv= 7.0 fps
4.1	300	0.0600	1.22		Shallow Concentrated Flow, OVERLAND FLOW Woodland Kv= 5.0 fps
9.0	485	Total			

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: WEST TO ROBBINS ST

Runoff Area=9,156 sf Runoff Depth>3.25"

Flow Length=65' Tc=3.1 min CN=72 Runoff=0.93 cfs 2,481 cf

Subcatchment 2S: OFF SITE SOUTH

Runoff Area=7,091 sf Runoff Depth>2.40"

Flow Length=110' Tc=3.7 min CN=63 Runoff=0.52 cfs 1,417 cf

Subcatchment 3S: EAST TO WETLANDS

Runoff Area=72,137 sf Runoff Depth>1.86"

Flow Length=485' Tc=9.0 min CN=57 Runoff=3.31 cfs 11,211 cf

Total Runoff Area = 88,384 sf Runoff Volume = 15,110 cf Average Runoff Depth = 2.05"

95.39% Pervious Area = 84,308 sf 4.61% Impervious Area = 4,076 sf

Subcatchment 1S: WEST TO ROBBINS ST

Runoff = 0.93 cfs @ 12.05 hrs, Volume= 2,481 cf, Depth > 3.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
6,365	61	>75% Grass cover, Good, HSG B
2,791	98	Paved parking & roofs
9,156	72	Weighted Average
6,365		Pervious Area
2,791		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 Sheet Flow Grass: Short n= 0.150 P2= 3.20"
0.4	40	0.0500	1.57		Shallow Concentrated Flow, Overland flow Short Grass Pasture Kv= 7.0 fps
3.1	65	Total			

Subcatchment 2S: OFF SITE SOUTH

Runoff = 0.52 cfs @ 12.06 hrs, Volume= 1,417 cf, Depth > 2.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
6,046	61	>75% Grass cover, Good, HSG B
360	98	Paved parking & roofs
685	60	Woods, Fair, HSG B
7,091	63	Weighted Average
6,731		Pervious Area
360		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 SHEET FLOW Grass: Short n= 0.150 P2= 3.20"
1.0	85	0.0400	1.40		Shallow Concentrated Flow, OVERLAND FLOW Short Grass Pasture Kv= 7.0 fps
3.7	110	Total			

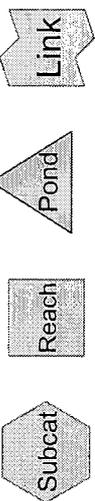
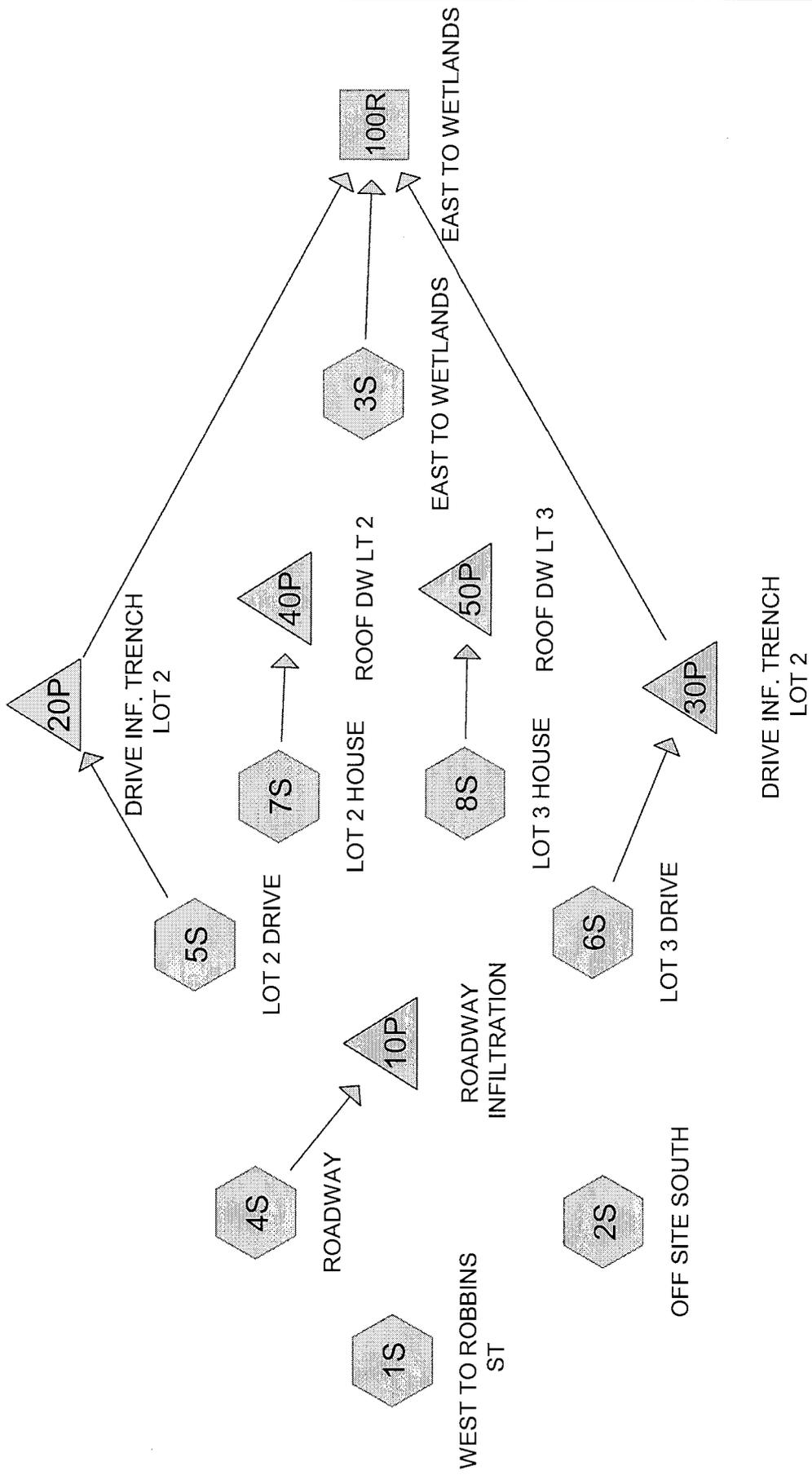
Subcatchment 3S: EAST TO WETLANDS

Runoff = 3.31 cfs @ 12.14 hrs, Volume= 11,211 cf, Depth > 1.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
56,084	55	Woods, Good, HSG B
15,128	61	>75% Grass cover, Good, HSG B
925	98	Paved parking & roofs
72,137	57	Weighted Average
71,212		Pervious Area
925		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	10	0.5000	3.15		Sheet Flow, TR-55 SHEET FLOW Smooth surfaces n= 0.011 P2= 3.20"
2.7	25	0.0300	0.15		Sheet Flow, TR-55 SHEET FLOW Grass: Short n= 0.150 P2= 3.20"
2.1	150	0.0300	1.21		Shallow Concentrated Flow, OVERLAND FLOW Short Grass Pasture Kv= 7.0 fps
4.1	300	0.0600	1.22		Shallow Concentrated Flow, OVERLAND FLOW Woodland Kv= 5.0 fps
9.0	485	Total			



Drainage Diagram for 1547_POST

Prepared by FORESITE Engineering Associates, Inc. 10/4/2010
 HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

Area Listing (all nodes)

<u>Area (sq-ft)</u>	<u>CN</u>	<u>Description (subcats)</u>
28,806	55	Woods, Good, HSG B (3S)
884	60	Woods, Fair, HSG B (2S)
45,054	61	>75% Grass cover, Good, HSG B (1S,2S,3S,4S)
8,181	98	Paved parking & roofs (1S,2S,5S,6S,7S,8S)
5,459	98	Paved roads w/curbs & sewers (4S)
<hr/>		
88,384		

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: WEST TO ROBBINS ST

Runoff Area=3,914 sf Runoff Depth>0.95"
Flow Length=65' Tc=3.1 min CN=74 Runoff=0.11 cfs 309 cf

Subcatchment 2S: OFF SITE SOUTH

Runoff Area=7,091 sf Runoff Depth>0.46"
Flow Length=75' Tc=3.3 min CN=63 Runoff=0.07 cfs 271 cf

Subcatchment 3S: EAST TO WETLANDS

Runoff Area=55,559 sf Runoff Depth>0.29"
Flow Length=375' Tc=8.0 min CN=58 Runoff=0.22 cfs 1,356 cf

Subcatchment 4S: ROADWAY

Runoff Area=15,346 sf Runoff Depth>0.95"
Tc=0.1 min CN=74 Runoff=0.47 cfs 1,213 cf

Subcatchment 5S: LOT 2 DRIVE

Runoff Area=1,045 sf Runoff Depth>2.77"
Flow Length=10' Slope=0.0300 '/' Tc=0.2 min CN=98 Runoff=0.09 cfs 242 cf

Subcatchment 6S: LOT 3 DRIVE

Runoff Area=1,429 sf Runoff Depth>2.77"
Flow Length=10' Slope=0.0300 '/' Tc=0.2 min CN=98 Runoff=0.12 cfs 330 cf

Subcatchment 7S: LOT 2 HOUSE

Runoff Area=2,000 sf Runoff Depth>2.77"
Flow Length=10' Slope=0.0300 '/' Tc=0.2 min CN=98 Runoff=0.16 cfs 462 cf

Subcatchment 8S: LOT 3 HOUSE

Runoff Area=2,000 sf Runoff Depth>2.77"
Flow Length=10' Slope=0.0300 '/' Tc=0.2 min CN=98 Runoff=0.16 cfs 462 cf

Reach 100R: EAST TO WETLANDS

Inflow=0.22 cfs 1,356 cf
Outflow=0.22 cfs 1,356 cf

Pond 10P: ROADWAY INFILTRATION

Peak Elev=214.09' Storage=146 cf Inflow=0.47 cfs 1,213 cf
Outflow=0.22 cfs 1,210 cf

Pond 20P: DRIVE INF. TRENCH LOT 2

Peak Elev=216.50' Storage=90 cf Inflow=0.09 cfs 242 cf
Discarded=0.01 cfs 241 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 241 cf

Pond 30P: DRIVE INF. TRENCH LOT 2

Peak Elev=217.33' Storage=140 cf Inflow=0.12 cfs 330 cf
Discarded=0.01 cfs 288 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 288 cf

Pond 40P: ROOF DW LT 2

Peak Elev=215.83' Storage=462 cf Inflow=0.16 cfs 462 cf
Outflow=0.00 cfs 0 cf

Pond 50P: ROOF DW LT 3

Peak Elev=215.83' Storage=462 cf Inflow=0.16 cfs 462 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 88,384 sf Runoff Volume = 4,646 cf Average Runoff Depth = 0.63"
84.57% Pervious Area = 74,744 sf 15.43% Impervious Area = 13,640 sf

Subcatchment 1S: WEST TO ROBBINS ST

Runoff = 0.11 cfs @ 12.06 hrs, Volume= 309 cf, Depth > 0.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
2,567	61	>75% Grass cover, Good, HSG B
1,347	98	Paved parking & roofs
3,914	74	Weighted Average
2,567		Pervious Area
1,347		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 Sheet Flow Grass: Short n= 0.150 P2= 3.20"
0.4	40	0.0500	1.57		Shallow Concentrated Flow, Overland flow Short Grass Pasture Kv= 7.0 fps
3.1	65	Total			

Subcatchment 2S: OFF SITE SOUTH

Runoff = 0.07 cfs @ 12.08 hrs, Volume= 271 cf, Depth > 0.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
5,847	61	>75% Grass cover, Good, HSG B
360	98	Paved parking & roofs
884	60	Woods, Fair, HSG B
7,091	63	Weighted Average
6,731		Pervious Area
360		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 SHEET FLOW Grass: Short n= 0.150 P2= 3.20"
0.6	50	0.0400	1.40		Shallow Concentrated Flow, OVERLAND FLOW Short Grass Pasture Kv= 7.0 fps
3.3	75	Total			

Subcatchment 3S: EAST TO WETLANDS

Runoff = 0.22 cfs @ 12.20 hrs, Volume= 1,356 cf, Depth > 0.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
28,806	55	Woods, Good, HSG B
26,753	61	>75% Grass cover, Good, HSG B
55,559	58	Weighted Average
55,559		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 SHEET FLOW Grass: Short n= 0.150 P2= 3.20"
2.4	175	0.0300	1.21		Shallow Concentrated Flow, OVERLAND FLOW Short Grass Pasture Kv= 7.0 fps
2.9	175	0.0400	1.00		Shallow Concentrated Flow, OVERLAND FLOW Woodland Kv= 5.0 fps
8.0	375	Total			

Subcatchment 4S: ROADWAY

Runoff = 0.47 cfs @ 12.01 hrs, Volume= 1,213 cf, Depth > 0.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
5,459	98	Paved roads w/curbs & sewers
9,887	61	>75% Grass cover, Good, HSG B
15,346	74	Weighted Average
9,887		Pervious Area
5,459		Impervious Area

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

Subcatchment 5S: LOT 2 DRIVE

Runoff = 0.09 cfs @ 12.00 hrs, Volume= 242 cf, Depth > 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
1,045	98	Paved parking & roofs
1,045		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0300	1.02		Sheet Flow, SHEET FLOW Smooth surfaces n=0.011 P2=3.20"

Subcatchment 6S: LOT 3 DRIVE

Runoff = 0.12 cfs @ 12.00 hrs, Volume= 330 cf, Depth > 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
1,429	98	Paved parking & roofs
1,429		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0300	1.02		Sheet Flow, SHEET FLOW Smooth surfaces n=0.011 P2=3.20"

Subcatchment 7S: LOT 2 HOUSE

Runoff = 0.16 cfs @ 12.00 hrs, Volume= 462 cf, Depth > 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
2,000	98	Paved parking & roofs
2,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0300	1.02		Sheet Flow, SHEET FLOW Smooth surfaces n=0.011 P2=3.20"

Subcatchment 8S: LOT 3 HOUSE

Runoff = 0.16 cfs @ 12.00 hrs, Volume= 462 cf, Depth > 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
2,000	98	Paved parking & roofs
2,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0300	1.02		Sheet Flow, SHEET FLOW Smooth surfaces n=0.011 P2=3.20"

Reach 100R: EAST TO WETLANDS

Inflow Area = 58,033 sf, Inflow Depth > 0.28" for 2-YR event
 Inflow = 0.22 cfs @ 12.20 hrs, Volume= 1,356 cf
 Outflow = 0.22 cfs @ 12.20 hrs, Volume= 1,356 cf, Atten=0%, Lag=0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 10P: ROADWAY INFILTRATION

Inflow Area = 15,346 sf, Inflow Depth > 0.95" for 2-YR event
 Inflow = 0.47 cfs @ 12.01 hrs, Volume= 1,213 cf
 Outflow = 0.22 cfs @ 12.00 hrs, Volume= 1,210 cf, Atten=54%, Lag=0.0 min
 Discarded = 0.22 cfs @ 12.00 hrs, Volume= 1,210 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 214.09' @ 12.17 hrs Surf.Area= 4,674 sf Storage= 146 cf

Plug-Flow detention time= 6.5 min calculated for 1,210 cf (100% of inflow)
 Center-of-Mass det. time= 5.5 min (819.4 - 813.9)

Volume	Invert	Avail.Storage	Storage Description
# 1	214.00'	6,544 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 18,696 cf Overall x 35.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
214.00	4,674	0	0
215.00	4,674	4,674	4,674
216.00	4,674	4,674	9,348
217.00	4,674	4,674	14,022
218.00	4,674	4,674	18,696

Device	Routing	Invert	Outlet Devices
# 1	Discarded	0.00'	2.000 in/hr Exfiltration over Horizontal area

Discarded OutFlow Max=0.22 cfs @ 12.00 hrs HW=214.05' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.22 cfs)

Pond 20P: DRIVE INF. TRENCH LOT 2

Inflow Area = 1,045 sf, Inflow Depth > 2.77" for 2-YR event
 Inflow = 0.09 cfs @ 12.00 hrs, Volume= 242 cf
 Outflow = 0.01 cfs @ 11.30 hrs, Volume= 241 cf, Atten= 92%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 11.30 hrs, Volume= 241 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 216.50' @ 12.81 hrs Surf.Area= 150 sf Storage= 90 cf

Plug-Flow detention time= 96.8 min calculated for 241 cf (100% of inflow)
 Center-of-Mass det. time= 95.7 min (830.0 - 734.2)

Volume	Invert	Avail.Storage	Storage Description
# 1	215.00'	180 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 450 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
215.00	150	0	0
216.00	150	150	150
217.00	150	150	300
218.00	150	150	450

Device	Routing	Invert	Outlet Devices
# 1	Discarded	0.00'	2.000 in/hr Exfiltration over Surface area
# 2	Primary	218.00'	50.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.01 cfs @ 11.30 hrs HW=215.03' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=215.00' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 30P: DRIVE INF. TRENCH LOT 2

Inflow Area = 1,429 sf, Inflow Depth > 2.77" for 2-YR event
 Inflow = 0.12 cfs @ 12.00 hrs, Volume= 330 cf
 Outflow = 0.01 cfs @ 10.95 hrs, Volume= 288 cf, Atten= 94%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 10.95 hrs, Volume= 288 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 217.33' @ 13.29 hrs Surf.Area= 150 sf Storage= 140 cf

Plug-Flow detention time= 152.1 min calculated for 287 cf (87% of inflow)

Center-of-Mass det. time = 111.5 min (845.7 - 734.2)

Volume	Invert	Avail.Storage	Storage Description
# 1	215.00'	180 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 450 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
215.00	150	0	0
216.00	150	150	150
217.00	150	150	300
218.00	150	150	450

Device	Routing	Invert	Outlet Devices
# 1	Discarded	0.00'	2.000 in/hr Exfiltration over Surface area
# 2	Primary	218.00'	50.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.01 cfs @ 10.95 hrs HW=215.03' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=215.00' (Free Discharge)

↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 40P: ROOF DW LT 2

Inflow Area = 2,000 sf, Inflow Depth > 2.77" for 2-YR event
 Inflow = 0.16 cfs @ 12.00 hrs, Volume = 462 cf
 Outflow = 0.00 cfs @ 5.00 hrs, Volume = 0 cf, Atten=100%, Lag=0.0 min

Routing by Stor-Ind method, Time Span=5.00-20.00 hrs, dt=0.05 hrs
 Peak Elev=215.83' @ 20.00 hrs Surf.Area=851 sf Storage=462 cf

Plug-Flow detention time = (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time = (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
# 1	214.00'	1,041 cf	16.00'W x 14.50'L x 3.83'H Prismatic Z=3.8 3,670 cf Overall - 1,067 cf Embedded = 2,604 cf x 40.0% Voids
# 2	215.00'	1,067 cf	11.40'W x 10.50'L x 2.83'H Prismatic Z=2.8 Inside # 1
		2,108 cf	Total Available Storage

Pond 50P: ROOF DW LT 3

Inflow Area = 2,000 sf, Inflow Depth > 2.77" for 2-YR event
 Inflow = 0.16 cfs @ 12.00 hrs, Volume= 462 cf
 Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 215.83' @ 20.00 hrs Surf.Area= 851 sf Storage= 462 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
# 1	214.00'	1,041 cf	16.00'W x 14.50'L x 3.83'H Prismatic Z=3.8 3,670 cf Overall - 1,067 cf Embedded = 2,604 cf x 40.0% Voids
# 2	215.00'	1,067 cf	11.40'W x 10.50'L x 2.83'H Prismatic Z=2.8 Inside # 1
		2,108 cf	Total Available Storage

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: WEST TO ROBBINS ST

Runoff Area=3,914 sf Runoff Depth>1.82"
Flow Length=65' Tc=3.1 min CN=74 Runoff=0.22 cfs 595 cf

Subcatchment 2S: OFF SITE SOUTH

Runoff Area=7,091 sf Runoff Depth>1.09"
Flow Length=75' Tc=3.3 min CN=63 Runoff=0.22 cfs 643 cf

Subcatchment 3S: EAST TO WETLANDS

Runoff Area=55,559 sf Runoff Depth>0.81"
Flow Length=375' Tc=8.0 min CN=58 Runoff=1.00 cfs 3,732 cf

Subcatchment 4S: ROADWAY

Runoff Area=15,346 sf Runoff Depth>1.83"
Tc=0.1 min CN=74 Runoff=0.93 cfs 2,335 cf

Subcatchment 5S: LOT 2 DRIVE

Runoff Area=1,045 sf Runoff Depth>3.96"
Flow Length=10' Slope=0.0300 '/' Tc=0.2 min CN=98 Runoff=0.12 cfs 345 cf

Subcatchment 6S: LOT 3 DRIVE

Runoff Area=1,429 sf Runoff Depth>3.96"
Flow Length=10' Slope=0.0300 '/' Tc=0.2 min CN=98 Runoff=0.16 cfs 472 cf

Subcatchment 7S: LOT 2 HOUSE

Runoff Area=2,000 sf Runoff Depth>3.96"
Flow Length=10' Slope=0.0300 '/' Tc=0.2 min CN=98 Runoff=0.23 cfs 661 cf

Subcatchment 8S: LOT 3 HOUSE

Runoff Area=2,000 sf Runoff Depth>3.96"
Flow Length=10' Slope=0.0300 '/' Tc=0.2 min CN=98 Runoff=0.23 cfs 661 cf

Reach 100R: EAST TO WETLANDS

Inflow=1.00 cfs 3,784 cf
Outflow=1.00 cfs 3,784 cf

Pond 10P: ROADWAY INFILTRATION

Peak Elev=214.33' Storage=548 cf Inflow=0.93 cfs 2,335 cf
Outflow=0.22 cfs 2,330 cf

Pond 20P: DRIVE INF. TRENCH LOT 2

Peak Elev=217.45' Storage=147 cf Inflow=0.12 cfs 345 cf
Discarded=0.01 cfs 293 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 293 cf

Pond 30P: DRIVE INF. TRENCH LOT 2

Peak Elev=218.00' Storage=180 cf Inflow=0.16 cfs 472 cf
Discarded=0.01 cfs 313 cf Primary=0.07 cfs 52 cf Outflow=0.07 cfs 364 cf

Pond 40P: ROOF DW LT 2

Peak Elev=216.20' Storage=660 cf Inflow=0.23 cfs 661 cf
Outflow=0.00 cfs 0 cf

Pond 50P: ROOF DW LT 3

Peak Elev=216.20' Storage=660 cf Inflow=0.23 cfs 661 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 88,384 sf Runoff Volume = 9,443 cf Average Runoff Depth = 1.28"
84.57% Pervious Area = 74,744 sf 15.43% Impervious Area = 13,640 sf

Subcatchment 1S: WEST TO ROBBINS ST

Runoff = 0.22 cfs @ 12.05 hrs, Volume= 595 cf, Depth > 1.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
2,567	61	>75% Grass cover, Good, HSG B
1,347	98	Paved parking & roofs
3,914	74	Weighted Average
2,567		Pervious Area
1,347		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 Sheet Flow Grass: Short n=0.150 P2= 3.20"
0.4	40	0.0500	1.57		Shallow Concentrated Flow, Overland flow Short Grass Pasture Kv= 7.0 fps
3.1	65	Total			

Subcatchment 2S: OFF SITE SOUTH

Runoff = 0.22 cfs @ 12.06 hrs, Volume= 643 cf, Depth > 1.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
5,847	61	>75% Grass cover, Good, HSG B
360	98	Paved parking & roofs
884	60	Woods, Fair, HSG B
7,091	63	Weighted Average
6,731		Pervious Area
360		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 SHEET FLOW Grass: Short n=0.150 P2= 3.20"
0.6	50	0.0400	1.40		Shallow Concentrated Flow, OVERLAND FLOW Short Grass Pasture Kv= 7.0 fps
3.3	75	Total			

Subcatchment 3S: EAST TO WETLANDS

Runoff = 1.00 cfs @ 12.14 hrs, Volume= 3,732 cf, Depth > 0.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
28,806	55	Woods, Good, HSG B
26,753	61	>75% Grass cover, Good, HSG B
55,559	58	Weighted Average
55,559		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 SHEET FLOW Grass: Short n= 0.150 P2= 3.20"
2.4	175	0.0300	1.21		Shallow Concentrated Flow, OVERLAND FLOW Short Grass Pasture Kv= 7.0 fps
2.9	175	0.0400	1.00		Shallow Concentrated Flow, OVERLAND FLOW Woodland Kv= 5.0 fps
8.0	375	Total			

Subcatchment 4S: ROADWAY

Runoff = 0.93 cfs @ 12.01 hrs, Volume= 2,335 cf, Depth > 1.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
5,459	98	Paved roads w/curbs & sewers
9,887	61	>75% Grass cover, Good, HSG B
15,346	74	Weighted Average
9,887		Pervious Area
5,459		Impervious Area

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

Subcatchment 5S: LOT 2 DRIVE

Runoff = 0.12 cfs @ 12.00 hrs, Volume= 345 cf, Depth > 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
1,045	98	Paved parking & roofs
1,045		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0300	1.02		Sheet Flow, SHEET FLOW Smooth surfaces n= 0.011 P2= 3.20"

Subcatchment 6S: LOT 3 DRIVE

Runoff = 0.16 cfs @ 12.00 hrs, Volume= 472 cf, Depth > 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
1,429	98	Paved parking & roofs
1,429		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0300	1.02		Sheet Flow, SHEET FLOW Smooth surfaces n= 0.011 P2= 3.20"

Subcatchment 7S: LOT 2 HOUSE

Runoff = 0.23 cfs @ 12.00 hrs, Volume= 661 cf, Depth > 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
2,000	98	Paved parking & roofs
2,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0300	1.02		Sheet Flow, SHEET FLOW Smooth surfaces n= 0.011 P2= 3.20"

Subcatchment 8S: LOT 3 HOUSE

Runoff = 0.23 cfs @ 12.00 hrs, Volume= 661 cf, Depth > 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
2,000	98	Paved parking & roofs
2,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0300	1.02		Sheet Flow, SHEET FLOW Smooth surfaces n=0.011 P2=3.20"

Reach 100R: EAST TO WETLANDS

Inflow Area = 58,033 sf, Inflow Depth > 0.78" for 10-YR event
 Inflow = 1.00 cfs @ 12.14 hrs, Volume= 3,784 cf
 Outflow = 1.00 cfs @ 12.14 hrs, Volume= 3,784 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 10P: ROADWAY INFILTRATION

Inflow Area = 15,346 sf, Inflow Depth > 1.83" for 10-YR event
 Inflow = 0.93 cfs @ 12.01 hrs, Volume= 2,335 cf
 Outflow = 0.22 cfs @ 11.90 hrs, Volume= 2,330 cf, Atten= 77%, Lag= 0.0 min
 Discarded = 0.22 cfs @ 11.90 hrs, Volume= 2,330 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 214.33' @ 12.40 hrs Surf.Area= 4,674 sf Storage= 548 cf

Plug-Flow detention time= 17.1 min calculated for 2,330 cf (100% of inflow)
 Center-of-Mass det. time= 16.3 min (815.3 - 799.1)

Volume	Invert	Avail.Storage	Storage Description
# 1	214.00'	6,544 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 18,696 cf Overall x 35.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
214.00	4,674	0	0
215.00	4,674	4,674	4,674
216.00	4,674	4,674	9,348
217.00	4,674	4,674	14,022
218.00	4,674	4,674	18,696

Device	Routing	Invert	Outlet Devices
# 1	Discarded	0.00'	2.000 in/hr Exfiltration over Horizontal area

Discarded OutFlow Max=0.22 cfs @ 11.90 hrs HW=214.05' (Free Discharge)

↳ 1=Exfiltration (Exfiltration Controls 0.22 cfs)

Pond 20P: DRIVE INF. TRENCH LOT 2

Inflow Area = 1,045 sf, Inflow Depth > 3.96" for 10-YR event
 Inflow = 0.12 cfs @ 12.00 hrs, Volume= 345 cf
 Outflow = 0.01 cfs @ 10.80 hrs, Volume= 293 cf, Atten= 94%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 10.80 hrs, Volume= 293 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 217.45' @ 13.38 hrs Surf.Area= 150 sf Storage= 147 cf

Plug-Flow detention time= 154.0 min calculated for 293 cf (85% of inflow)
 Center-of-Mass det. time= 108.0 min (839.5 - 731.5)

Volume	Invert	Avail.Storage	Storage Description
# 1	215.00'	180 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 450 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
215.00	150	0	0
216.00	150	150	150
217.00	150	150	300
218.00	150	150	450

Device	Routing	Invert	Outlet Devices
# 1	Discarded	0.00'	2.000 in/hr Exfiltration over Surface area
# 2	Primary	218.00'	50.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.01 cfs @ 10.80 hrs HW=215.03' (Free Discharge)
 ↳1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=215.00' (Free Discharge)
 ↳2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 30P: DRIVE INF. TRENCH LOT 2

Inflow Area = 1,429 sf, Inflow Depth > 3.96" for 10-YR event
 Inflow = 0.16 cfs @ 12.00 hrs, Volume= 472 cf
 Outflow = 0.07 cfs @ 12.25 hrs, Volume= 364 cf, Atten= 56%, Lag= 15.1 min
 Discarded = 0.01 cfs @ 10.05 hrs, Volume= 313 cf
 Primary = 0.07 cfs @ 12.25 hrs, Volume= 52 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 218.00' @ 12.25 hrs Surf.Area= 150 sf Storage= 180 cf

Plug-Flow detention time= 136.7 min calculated for 363 cf (77% of inflow)

1547_POST

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

Prepared by FORESITE Engineering Associates, Inc.

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Center-of-Mass det. time = 78.2 min (809.7 - 731.5)

Volume	Invert	Avail.Storage	Storage Description
# 1	215.00'	180 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 450 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
215.00	150	0	0
216.00	150	150	150
217.00	150	150	300
218.00	150	150	450

Device	Routing	Invert	Outlet Devices
# 1	Discarded	0.00'	2.000 in/hr Exfiltration over Surface area
# 2	Primary	218.00'	50.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.01 cfs @ 10.05 hrs HW=215.03' (Free Discharge)

↳1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.02 cfs @ 12.25 hrs HW=218.00' (Free Discharge)

↳2=Broad-Crested Rectangular Weir (Weir Controls 0.02 cfs @ 0.13 fps)

Pond 40P: ROOF DWLT 2

Inflow Area = 2,000 sf, Inflow Depth > 3.96" for 10-YR event
 Inflow = 0.23 cfs @ 12.00 hrs, Volume= 661 cf
 Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 216.20' @ 20.00 hrs Surf.Area= 1,021 sf Storage= 660 cf

Plug-Flow detention time = (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time = (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
# 1	214.00'	1,041 cf	16.00'W x 14.50'L x 3.83'H Prismaoid Z=3.8 3,670 cf Overall - 1,067 cf Embedded = 2,604 cf x 40.0% Voids
# 2	215.00'	1,067 cf	11.40'W x 10.50'L x 2.83'H Prismaoid Z=2.8 Inside # 1
		2,108 cf	Total Available Storage

Pond 50P: ROOF DWLT 3

Inflow Area = 2,000 sf, Inflow Depth > 3.96" for 10-YR event
 Inflow = 0.23 cfs @ 12.00 hrs, Volume= 661 cf
 Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 216.20' @ 20.00 hrs Surf.Area= 1,021 sf Storage= 660 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
# 1	214.00'	1,041 cf	16.00'W x 14.50'L x 3.83'H Prismatic Z=3.8 3,670 cf Overall - 1,067 cf Embedded = 2,604 cf x 40.0% Voids
# 2	215.00'	1,067 cf	11.40'W x 10.50'L x 2.83'H Prismatic Z=2.8 Inside # 1
		2,108 cf	Total Available Storage

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: WEST TO ROBBINS ST

Runoff Area=3,914 sf Runoff Depth>3.45"
Flow Length=65' Tc=3.1 min CN=74 Runoff=0.42 cfs 1,126 cf

Subcatchment 2S: OFF SITE SOUTH

Runoff Area=7,091 sf Runoff Depth>2.40"
Flow Length=75' Tc=3.3 min CN=63 Runoff=0.53 cfs 1,417 cf

Subcatchment 3S: EAST TO WETLANDS

Runoff Area=55,559 sf Runoff Depth>1.95"
Flow Length=375' Tc=8.0 min CN=58 Runoff=2.78 cfs 9,035 cf

Subcatchment 4S: ROADWAY

Runoff Area=15,346 sf Runoff Depth>3.45"
Tc=0.1 min CN=74 Runoff=1.75 cfs 4,417 cf

Subcatchment 5S: LOT 2 DRIVE

Runoff Area=1,045 sf Runoff Depth>5.87"
Flow Length=10' Slope=0.0300 '/' Tc=0.2 min CN=98 Runoff=0.18 cfs 512 cf

Subcatchment 6S: LOT 3 DRIVE

Runoff Area=1,429 sf Runoff Depth>5.87"
Flow Length=10' Slope=0.0300 '/' Tc=0.2 min CN=98 Runoff=0.24 cfs 700 cf

Subcatchment 7S: LOT 2 HOUSE

Runoff Area=2,000 sf Runoff Depth>5.87"
Flow Length=10' Slope=0.0300 '/' Tc=0.2 min CN=98 Runoff=0.34 cfs 979 cf

Subcatchment 8S: LOT 3 HOUSE

Runoff Area=2,000 sf Runoff Depth>5.87"
Flow Length=10' Slope=0.0300 '/' Tc=0.2 min CN=98 Runoff=0.34 cfs 979 cf

Reach 100R: EAST TO WETLANDS

Inflow=2.90 cfs 9,340 cf
Outflow=2.90 cfs 9,340 cf

Pond 10P: ROADWAY INFILTRATION

Peak Elev=214.93' Storage=1,515 cf Inflow=1.75 cfs 4,417 cf
Outflow=0.22 cfs 4,410 cf

Pond 20P: DRIVE INF. TRENCH LOT 2

Peak Elev=218.00' Storage=180 cf Inflow=0.18 cfs 512 cf
Discarded=0.01 cfs 320 cf Primary=0.07 cfs 79 cf Outflow=0.08 cfs 399 cf

Pond 30P: DRIVE INF. TRENCH LOT 2

Peak Elev=218.01' Storage=180 cf Inflow=0.24 cfs 700 cf
Discarded=0.01 cfs 339 cf Primary=0.24 cfs 227 cf Outflow=0.25 cfs 565 cf

Pond 40P: ROOF DW LT 2

Peak Elev=216.67' Storage=979 cf Inflow=0.34 cfs 979 cf
Outflow=0.00 cfs 0 cf

Pond 50P: ROOF DW LT 3

Peak Elev=216.67' Storage=979 cf Inflow=0.34 cfs 979 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 88,384 sf Runoff Volume = 19,165 cf Average Runoff Depth = 2.60"
84.57% Pervious Area = 74,744 sf 15.43% Impervious Area = 13,640 sf

Subcatchment 1S: WEST TO ROBBINS ST

Runoff = 0.42 cfs @ 12.05 hrs, Volume= 1,126 cf, Depth > 3.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
2,567	61	>75% Grass cover, Good, HSG B
1,347	98	Paved parking & roofs
3,914	74	Weighted Average
2,567		Pervious Area
1,347		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 Sheet Flow Grass: Short n= 0.150 P2= 3.20"
0.4	40	0.0500	1.57		Shallow Concentrated Flow, Overland flow Short Grass Pasture Kv= 7.0 fps
3.1	65	Total			

Subcatchment 2S: OFF SITE SOUTH

Runoff = 0.53 cfs @ 12.06 hrs, Volume= 1,417 cf, Depth > 2.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
5,847	61	>75% Grass cover, Good, HSG B
360	98	Paved parking & roofs
884	60	Woods, Fair, HSG B
7,091	63	Weighted Average
6,731		Pervious Area
360		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 SHEET FLOW Grass: Short n= 0.150 P2= 3.20"
0.6	50	0.0400	1.40		Shallow Concentrated Flow, OVERLAND FLOW Short Grass Pasture Kv= 7.0 fps
3.3	75	Total			

Subcatchment 3S: EAST TO WETLANDS

Runoff = 2.78 cfs @ 12.12 hrs, Volume= 9,035 cf, Depth > 1.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
28,806	55	Woods, Good, HSG B
26,753	61	>75% Grass cover, Good, HSG B
55,559	58	Weighted Average
55,559		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		Sheet Flow, TR-55 SHEET FLOW Grass: Short n=0.150 P2= 3.20"
2.4	175	0.0300	1.21		Shallow Concentrated Flow, OVERLAND FLOW Short Grass Pasture Kv= 7.0 fps
2.9	175	0.0400	1.00		Shallow Concentrated Flow, OVERLAND FLOW Woodland Kv= 5.0 fps
8.0	375	Total			

Subcatchment 4S: ROADWAY

Runoff = 1.75 cfs @ 12.00 hrs, Volume= 4,417 cf, Depth > 3.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
5,459	98	Paved roads w/curbs & sewers
9,887	61	>75% Grass cover, Good, HSG B
15,346	74	Weighted Average
9,887		Pervious Area
5,459		Impervious Area

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

Subcatchment 5S: LOT 2 DRIVE

Runoff = 0.18 cfs @ 12.00 hrs, Volume= 512 cf, Depth > 5.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
1,045	98	Paved parking & roofs
1,045		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0300	1.02		Sheet Flow, SHEET FLOW Smooth surfaces n= 0.011 P2= 3.20"

Subcatchment 6S: LOT 3 DRIVE

Runoff = 0.24 cfs @ 12.00 hrs, Volume= 700 cf, Depth > 5.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
1,429	98	Paved parking & roofs
1,429		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0300	1.02		Sheet Flow, SHEET FLOW Smooth surfaces n= 0.011 P2= 3.20"

Subcatchment 7S: LOT 2 HOUSE

Runoff = 0.34 cfs @ 12.00 hrs, Volume= 979 cf, Depth > 5.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
2,000	98	Paved parking & roofs
2,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0300	1.02		Sheet Flow, SHEET FLOW Smooth surfaces n= 0.011 P2= 3.20"

Subcatchment 8S: LOT 3 HOUSE

Runoff = 0.34 cfs @ 12.00 hrs, Volume= 979 cf, Depth > 5.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
2,000	98	Paved parking & roofs
2,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0300	1.02		Sheet Flow, SHEET FLOW Smooth surfaces n=0.011 P2=3.20"

Reach 100R: EAST TO WETLANDS

Inflow Area = 58,033 sf, Inflow Depth > 1.93" for 100-YR event
 Inflow = 2.90 cfs @ 12.13 hrs, Volume= 9,340 cf
 Outflow = 2.90 cfs @ 12.13 hrs, Volume= 9,340 cf, Atten=0%, Lag=0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 10P: ROADWAY INFILTRATION

Inflow Area = 15,346 sf, Inflow Depth > 3.45" for 100-YR event
 Inflow = 1.75 cfs @ 12.00 hrs, Volume= 4,417 cf
 Outflow = 0.22 cfs @ 11.70 hrs, Volume= 4,410 cf, Atten= 88%, Lag= 0.0 min
 Discarded = 0.22 cfs @ 11.70 hrs, Volume= 4,410 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 214.93' @ 12.53 hrs Surf.Area= 4,674 sf Storage= 1,515 cf

Plug-Flow detention time= 54.6 min calculated for 4,395 cf (99% of inflow)
 Center-of-Mass det. time= 53.7 min (838.3 - 784.6)

Volume	Invert	Avail.Storage	Storage Description
# 1	214.00'	6,544 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 18,696 cf Overall x 35.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
214.00	4,674	0	0
215.00	4,674	4,674	4,674
216.00	4,674	4,674	9,348
217.00	4,674	4,674	14,022
218.00	4,674	4,674	18,696

Device	Routing	Invert	Outlet Devices
# 1	Discarded	0.00'	2.000 in/hr Exfiltration over Horizontal area

Discarded OutFlow Max=0.22 cfs @ 11.70 hrs HW=214.05' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.22 cfs)

Pond 20P: DRIVE INF. TRENCH LOT 2

Inflow Area = 1,045 sf, Inflow Depth > 5.87" for 100-YR event
 Inflow = 0.18 cfs @ 12.00 hrs, Volume= 512 cf
 Outflow = 0.08 cfs @ 12.17 hrs, Volume= 399 cf, Atten= 57%, Lag= 9.8 min
 Discarded = 0.01 cfs @ 9.70 hrs, Volume= 320 cf
 Primary = 0.07 cfs @ 12.17 hrs, Volume= 79 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 218.00' @ 12.15 hrs Surf.Area= 150 sf Storage= 180 cf

Plug-Flow detention time= 127.7 min calculated for 399 cf (78% of inflow)
 Center-of-Mass det. time= 69.2 min (798.7 - 729.5)

Volume	Invert	Avail.Storage	Storage Description
# 1	215.00'	180 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 450 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
215.00	150	0	0
216.00	150	150	150
217.00	150	150	300
218.00	150	150	450

Device	Routing	Invert	Outlet Devices
# 1	Discarded	0.00'	2.000 in/hr Exfiltration over Surface area
# 2	Primary	218.00'	50.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.01 cfs @ 9.70 hrs HW=215.03' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.02 cfs @ 12.17 hrs HW=218.00' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 0.02 cfs @ 0.13 fps)

Pond 30P: DRIVE INF. TRENCH LOT 2

Inflow Area = 1,429 sf, Inflow Depth > 5.87" for 100-YR event
 Inflow = 0.24 cfs @ 12.00 hrs, Volume= 700 cf
 Outflow = 0.25 cfs @ 12.02 hrs, Volume= 565 cf, Atten= 0%, Lag= 0.9 min
 Discarded = 0.01 cfs @ 8.70 hrs, Volume= 339 cf
 Primary = 0.24 cfs @ 12.02 hrs, Volume= 227 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 218.01' @ 12.00 hrs Surf.Area= 150 sf Storage= 180 cf

Plug-Flow detention time= 96.7 min calculated for 563 cf (81% of inflow)

Center-of-Mass det. time= 43.7 min (773.2 - 729.5)

Volume	Invert	Avail.Storage	Storage Description
# 1	215.00'	180 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 450 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
215.00	150	0	0
216.00	150	150	150
217.00	150	150	300
218.00	150	150	450

Device	Routing	Invert	Outlet Devices
# 1	Discarded	0.00'	2.000 in/hr Exfiltration over Surface area
# 2	Primary	218.00'	50.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.01 cfs @ 8.70 hrs HW=215.03' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.12 cfs @ 12.02 hrs HW=218.01' (Free Discharge)

↑2=Broad-Crested Rectangular Weir (Weir Controls 0.12 cfs @ 0.25 fps)

Pond 40P: ROOF DWLT 2

Inflow Area = 2,000 sf, Inflow Depth > 5.87" for 100-YR event
 Inflow = 0.34 cfs @ 12.00 hrs, Volume= 979 cf
 Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 216.67' @ 20.00 hrs Surf.Area= 1,264 sf Storage= 979 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
# 1	214.00'	1,041 cf	16.00'W x 14.50'L x 3.83'H Prismatic Z=3.8 3,670 cf Overall - 1,067 cf Embedded = 2,604 cf x 40.0% Voids
# 2	215.00'	1,067 cf	11.40'W x 10.50'L x 2.83'H Prismatic Z=2.8 Inside # 1
		2,108 cf	Total Available Storage

Pond 50P: ROOF DWLT 3

Inflow Area = 2,000 sf, Inflow Depth > 5.87" for 100-YR event
 Inflow = 0.34 cfs @ 12.00 hrs, Volume= 979 cf
 Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 216.67' @ 20.00 hrs Surf.Area= 1,264 sf Storage= 979 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
# 1	214.00'	1,041 cf	16.00'W x 14.50'L x 3.83'H Prismatic Z=3.8 3,670 cf Overall - 1,067 cf Embedded = 2,604 cf x 40.0% Voids
# 2	215.00'	1,067 cf	11.40'W x 10.50'L x 2.83'H Prismatic Z=2.8 Inside # 1
		2,108 cf	Total Available Storage