Stamski And McNary, Inc.
Engineering - Planning – Surveying
1000 Main Street; Acton, MA 01720 (978) 263-8585
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Stormwater Management Report

For

Pine Ridge Farm Lane
A
Residential Compound at 366 Pope Road

Acton, MA

COMMONWEALTH OF MASSACHUSETTS
JOSEPH
MARCH
CIVIL
#40472
REGISTERED
PROFESSIONAL ENGINEER

April 10, 2012

Applicant: Mike Paratore
366 Pope Road
Acton, MA 01720

SM-4574A File: 4574A Drainage toc.doc

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Drainage Analysis Summary

Stormwater Management

The proposed project is to develop a two lot residential compound subdivision from an existing residential parcel. An existing single family dwelling will be replaced and one new single family dwelling will be constructed with both being served by the same private way. As part of the Definitive Subdivision application for the residential compound, this Report has been prepared which analyzes the proposed stormwater management system designed for the site and demonstrates its control of peak rate of runoff from pre to post-development conditions.

The Natural Resources Conservation Service (N.R.C.S.) soil survey indicated the presence of Charlton-Hollis-Rock outcrop and Canton fine sandy loam which are both rated as Hydrologic Group B.

Pre-Development

The site is approximately 5.2 acres that has previously been developed. Existing structures onsite include a single family dwelling, detached garage, and a number of barns and stables. A gravel drive runs from Pope Road up to the garage and around the back of the site to a barn and horse riding area. Bordering Vegetated Wetlands run along the western property line and also along Spencer Brook at the southern corner of the site. Previous owners of the site have taken measures to redirect runoff across the site. A trench was formed leading to two 6" pipes on the west property line near the wetlands. These pipes discharge into a channel behind the existing dwelling that runs into another 6" pipe underground. This pipe flows out at a headwall along with the foundation drain of the existing dwelling. The runoff from the headwall flows through a brief channel that dissipates into surface sheet flow down to the wetlands toward the south. Offsite, the wetlands along with all runoff into Pope Road flow into a drop inlet with a culvert under the road that discharges to Spencer Brook. Runoff from the site flowing to the southern wetlands and Pope Road has been analyzed as Subcatchment 1. On the north section of the site, a rip rap depression collects runoff at and discharges through a pipe towards catch basins in Triangle Farm Lane. This runoff, including direct runoff flowing offsite towards Triangle Farm Lane has been analyzed as Subcatchment 2. The catch basins in Triangle Farm Lane are tied directly into the drainage system in Pope Road that flows to the same drop inlet and culvert towards Spencer Brook. As such, both Subcatchments have been analyzed independently and together to ensure there is no additional runoff flowing off site to Triangle Farm Lane or to the wetlands and Spencer Brook.

Post-Development

A stormwater management system that controls the peak rate of runoff has been designed for the proposed project in accordance with local subdivision rules and regulations. The existing house will be razed and a new home constructed along with one new single family dwelling. The existing gravel drive will become a paved private way. The detached garage and some barns will also be removed. A headwall with drain manhole structures will replace the existing pipe network from the western wetlands to the

southern wetlands. This uncontrolled runoff is Subcatchment 1A. For Subcatchment 1B, the rip rap depression will be replaced with a drop inlet structure connected to a drain manhole that flows into Basin 1B onsite. Basin 1B will also collect additional runoff flowing overland into a headwall and through a culvert within the right-of-way. The basin will be fitted with an outlet riser with a pipe to a flared end where runoff will dissipate into sheet flow over a grass area and into the drop inlet of Pope Road. The roof of the new single family dwelling will be directly infiltrated through a roof drywell for Subcatchment 1C. The remaining area that flows offsite towards Triangle Farm Lane is Subcatchment 2A. With Basin 1B and the roof drywell controlling runoff, excess stormwater runoff from the site will be controlled. Pre-Development and Post-Development runoff conditions comparing Subcatchment 2 to 2A towards Triangle Farm Lane, and the site as a whole have been summarized in the following tables.

Discharge Summary Tables

Subcatchment 2 (Offsite to Triangle Farm Lane): Peak Rate

2-year Storm		10-year Storm		100-year Storm	
Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
0.042	0.023	0.250	0.137	0.727	0.397

Total Site (Into Pope Road culvert): Peak Rate

2-year Storm		10-year Storm		100-year Storm	
Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
1.558	1.493	4.907	4.842	10.73	10.45

The proposed stormwater management system will reduce the peak rate of runoff by using a Basin with an outlet control structure, infiltrating the new dwelling's roof, and removing extra impervious areas. The peak rate of runoff for the 2-year, 10-year, and 100-year storm events has been controlled.

Design Basis

1. The United States Department of Agriculture Natural Resource Conservation Service (N.R.C.S.) TR55 methodology was used to determine offsite rates of runoff.
2. The twenty-four hour rainfall, taken from N.R.C.S. publications, is 6.4 inches for the 100-year storm, 4.5 inches for the 10-year storm, and 3.1 inches for the 2-year storm event.
3. The hydrologic calculations were performed using the computer program: "Hydraflow Hydrographs 2007" by Intelisolve.
4. The soil types of the site were taken from the N.R.C.S. Soil Survey Map for Concord.
5. Soil conditions and estimated seasonal high groundwater table were based on on-site soil evaluations.

Pre-Development Hydrology

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	1.532	2	736	8,400	----	------	------	Pre Sub. 1
2	SCS Runoff	0.042	2	746	413	----	------	------	Pre Sub. 2
3	Combine	1.558	2	736	8,814	1, 2	------	------	PRE TOTAL
5	SCS Runoff	1.223	2	734	6,440	----	------	------	Post Sub. 1A
6	SCS Runoff	0.431	2	730	2,343	----	------	------	Post Sub. 1B
7	Reservoir	0.300	2	744	2,341	6	195.35	253	Basin 1B
8	SCS Runoff	0.203	2	724	683	----	------	------	Post Sub. 1C
9	Reservoir	0.000	2	532	0	8	1.58	307	Drywell 1C
10	SCS Runoff	0.023	2	744	215	----	------	------	Post Sub. 2A
11	Combine	1.493	2	736	8,996	5, 7, 9, 10	------	------	POST TOTAL

Hydrograph Summary Report

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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	4.666	2	732	20,664	----	------	------	Pre Sub. 1
2	SCS Runoff	0.250	2	736	1,376	----	------	------	Pre Sub. 2
3	Combine	4.907	2	732	22,040	1, 2	------	------	PRE TOTAL
5	SCS Runoff	3.537	2	732	15,473	----	------	------	Post Sub. 1A
6	SCS Runoff	1.586	2	728	6,155	----	------	------	Post Sub. 1B
7	Reservoir	1.197	2	734	6,153	6	196.01	733	Basin 1B
8	SCS Runoff	0.297	2	724	1,016	----	------	------	Post Sub. 1C
9	Reservoir	0.000	2	452	0	8	2.30	511	Drywell 1C
10	SCS Runoff	0.137	2	732	709	----	------	------	Post Sub. 2A
11	Combine	4.842	2	732	22,335	5, 7, 9, 10	------	------	POST TOTAL

Hydrograph Summary Report

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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	10.01	2	732	41,622	----	------	------	Pre Sub. 1
2	SCS Runoff	0.727	2	732	3,242	----	------	------	Pre Sub. 2
3	Combine	10.73	2	732	44,864	1, 2	------	------	PRE TOTAL
5	SCS Runoff	7.417	2	732	30,735	----	------	------	Post Sub. 1A
6	SCS Runoff	3.625	2	726	12,868	----	------	------	Post Sub. 1B
7	Reservoir	2.656	2	734	12,865	6	196.73	1,470	Basin 1B
8	SCS Runoff	0.423	2	724	1,468	----	------	------	Post Sub. 1C
9	Reservoir	0.000	2	348	0	8	3.55	800	Drywell 1C
10	SCS Runoff	0.397	2	730	1,664	----	------	------	Post Sub. 2A
11	Combine	10.45	2	732	45,264	5, 7, 9, 10	------	------	POST TOTAL

Worksheet 2: Runoff curve number and runoff **SM-4574A**

Project: 366 Pope Road By ECS Date 1/19/2012

Location: Acton, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment 1

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
B	Woods- Good Condition	55			0.40	22.00
B	Open Space- Good Condition	61			3.55	216.55
B	Brush- Good Condition	48			0.09	4.32
B	Gravel	90			0.33	29.70
B	Impervious	98			0.22	21.56
				Totals =	4.59	294.13

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{294.13}{4.59} = 64.08$; Use CN = 64.1

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.....	yr	2	10	100
Rainfall, P (24-hour).....	in	3.1	4.5	6.4
Runoff, Q..... (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.52	1.27	2.56
Runoff, Q.....	cf	8603	21174	42659

D-2 (210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-4574A**

Project: 366 Pope Road By ECS Date 1/19/12

Location: Acton, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment 1
Circle one: Tc Tt through subarea

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			Grass			
2. Mannings roughness coeff., n (table 3-1)			0.24			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.01			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.20			0.20

Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			UNPAVED			
8. Flow Length, L		ft	527			
9. Watercourse slope, s		ft/ft	0.06			
10. Average Velocity, V (figure 3-1)		ft/s	3.95			
11. Tt = L / 3600V	Compute Tt	hr	0.04			0.04

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.24
min 14.2

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Mar 13, 2012

Hyd. No. 1

Pre Sub. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.532 cfs
Storm frequency	= 2 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 8,400 cuft
Drainage area	= 4.590 ac	Curve number	= 64.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 14.2 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time (min)	Outflow (cfs)
734	1.528
736	1.532 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Mar 13, 2012

Hyd. No. 1

Pre Sub. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 4.666 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 20,664 cuft
Drainage area	= 4.590 ac	Curve number	= 64.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 14.2 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
732	4.666 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Mar 13, 2012

Hyd. No. 1

Pre Sub. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 10.01 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 41,622 cuft
Drainage area	= 4.590 ac	Curve number	= 64.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 14.2 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
730	9.936
732	10.01 <<

...End

Worksheet 2: Runoff curve number and runoff **SM-4574A**

Project: 366 Pope Road By ECS Date 1/19/2012

Location: Acton, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment 2

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
B	Woods- Good Condition	55			0.40	22.00
B	Open Space- Good Condition	61			0.07	4.27
B	Brush- Good Condition	48			0.05	2.40
B	Gravel	90			0.00	
B	Impervious	98			0.00	
				Totals =	0.52	28.67

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{28.67}{0.52} = 55.13$; Use CN = 55.1

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.....	yr	2	10	100
Rainfall, P (24-hour).....	in	3.1	4.5	6.4
Runoff, Q..... (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.23	0.75	1.76
Runoff, Q.....	cf	426	1415	3330

D-2 (210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-4574A**

Project: 366 Pope Road By ECS Date 1/19/12

Location: Acton, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment 2
Circle one: Tc Tt through subarea

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			Woods			
2. Mannings roughness coeff., n (table 3-1)			0.8			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.08			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.21			0.21
Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			UNPAVED			
8. Flow Length, L		ft	249			
9. Watercourse slope, s		ft/ft	0.09			
10. Average Velocity, V (figure 3-1)		ft/s	4.84			
11. Tt = L / 3600V	Compute Tt	hr	0.01			0.01
Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.22
min 13.4

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Mar 13, 2012

Hyd. No. 2

Pre Sub. 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.042 cfs
Storm frequency	= 2 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 413 cuft
Drainage area	= 0.520 ac	Curve number	= 55.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 13.4 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
746	0.042 <<
748	0.042

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Mar 13, 2012

Hyd. No. 2

Pre Sub. 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.250 cfs
Storm frequency	= 10 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 1,376 cuft
Drainage area	= 0.520 ac	Curve number	= 55.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 13.4 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
734	0.250
736	0.250 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Mar 13, 2012

Hyd. No. 2

Pre Sub. 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.727 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 3,242 cuft
Drainage area	= 0.520 ac	Curve number	= 55.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 13.4 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
732	0.727 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Mar 13, 2012

Hyd. No. 3

PRE TOTAL

Hydrograph type	= Combine	Peak discharge	= 1.558 cfs
Storm frequency	= 2 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 8,814 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 5.110 ac

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time (min)	Hyd. 1 + (cfs)	Hyd. 2 = (cfs)	Outflow (cfs)
734	1.528	0.020	1.548
736	1.532 <<	0.026	1.558 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Mar 13, 2012

Hyd. No. 3

PRE TOTAL

Hydrograph type	= Combine	Peak discharge	= 4.907 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 22,040 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 5.110 ac

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time (min)	Hyd. 1 + (cfs)	Hyd. 2 = (cfs)	Outflow (cfs)
732	4.666 <<	0.242	4.907 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Mar 13, 2012

Hyd. No. 3

PRE TOTAL

Hydrograph type	= Combine	Peak discharge	= 10.73 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 44,864 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 5.110 ac

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time (min)	Hyd. 1 + (cfs)	Hyd. 2 = (cfs)	Outflow (cfs)
730	9.936	0.707	10.64
732	10.01 <<	0.727 <<	10.73 <<

...End

Post-Development Hydrology

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	1.532	2	736	8,400	----	------	------	Pre Sub. 1
2	SCS Runoff	0.042	2	746	413	----	------	------	Pre Sub. 2
3	Combine	1.558	2	736	8,814	1, 2	------	------	PRE TOTAL
5	SCS Runoff	1.223	2	734	6,440	----	------	------	Post Sub. 1A
6	SCS Runoff	0.431	2	730	2,343	----	------	------	Post Sub. 1B
7	Reservoir	0.300	2	744	2,341	6	195.35	253	Basin 1B
8	SCS Runoff	0.203	2	724	683	----	------	------	Post Sub. 1C
9	Reservoir	0.000	2	532	0	8	1.58	307	Drywell 1C
10	SCS Runoff	0.023	2	744	215	----	------	------	Post Sub. 2A
11	Combine	1.493	2	736	8,996	5, 7, 9, 10	------	------	POST TOTAL

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2	SCS Runoff	0.250	2	736	1,376	----	------	------	Pre Sub. 2
3	Combine	4.907	2	732	22,040	1, 2	------	------	PRE TOTAL
5	SCS Runoff	3.537	2	732	15,473	----	------	------	Post Sub. 1A
6	SCS Runoff	1.586	2	728	6,155	----	------	------	Post Sub. 1B
7	Reservoir	1.197	2	734	6,153	6	196.01	733	Basin 1B
8	SCS Runoff	0.297	2	724	1,016	----	------	------	Post Sub. 1C
9	Reservoir	0.000	2	452	0	8	2.30	511	Drywell 1C
10	SCS Runoff	0.137	2	732	709	----	------	------	Post Sub. 2A
11	Combine	4.842	2	732	22,335	5, 7, 9, 10	------	------	POST TOTAL

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1	SCS Runoff	10.01	2	732	41,622	----	------	------	Pre Sub. 1
2	SCS Runoff	0.727	2	732	3,242	----	------	------	Pre Sub. 2
3	Combine	10.73	2	732	44,864	1, 2	------	------	PRE TOTAL
5	SCS Runoff	7.417	2	732	30,735	----	------	------	Post Sub. 1A
6	SCS Runoff	3.625	2	726	12,868	----	------	------	Post Sub. 1B
7	Reservoir	2.656	2	734	12,865	6	196.73	1,470	Basin 1B
8	SCS Runoff	0.423	2	724	1,468	----	------	------	Post Sub. 1C
9	Reservoir	0.000	2	348	0	8	3.55	800	Drywell 1C
10	SCS Runoff	0.397	2	730	1,664	----	------	------	Post Sub. 2A
11	Combine	10.45	2	732	45,264	5, 7, 9, 10	------	------	POST TOTAL

Worksheet 2: Runoff curve number and runoff **SM-4574A**

Project: 366 Pope Road By ECS Date 1/19/2012

Location: Acton, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment 1A

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
B	Woods- Good Condition	55			0.29	15.95
B	Open Space- Good Condition	61			2.47	150.67
B	Brush- Good Condition	48			0.06	2.88
B	Gravel	90			0.09	8.10
B	Impervious	98			0.36	35.28
				Totals =	3.27	212.88

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{212.88}{3.27} = 65.10$; Use CN = 65.1

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.....	yr	2	10	100
Rainfall, P (24-hour).....	in	3.1	4.5	6.4
Runoff, Q..... (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.56	1.34	2.66
Runoff, Q.....	cf	6606	15870	31524

D-2 (210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-4574A**

Project: 366 Pope Road By ECS Date 1/19/12

Location: Acton, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment 1A

Circle one: **Tc** Tt through subarea _____

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			Grass			
2. Mannings roughness coeff., n (table 3-1)			0.24			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.01			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.20			0.20
Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			UNPAVED			
8. Flow Length, L		ft	511			
9. Watercourse slope, s		ft/ft	0.06			
10. Average Velocity, V (figure 3-1)		ft/s	3.95			
11. Tt = L / 3600V	Compute Tt	hr	0.04			0.04
Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.24
min 14.2

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Mar 13, 2012

Hyd. No. 5

Post Sub. 1A

Hydrograph type	= SCS Runoff	Peak discharge	= 1.223 cfs
Storm frequency	= 2 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 6,440 cuft
Drainage area	= 3.270 ac	Curve number	= 65.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 14.2 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
734	1.223 <<
736	1.217

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Mar 13, 2012

Hyd. No. 5

Post Sub. 1A

Hydrograph type	= SCS Runoff	Peak discharge	= 3.537 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 15,473 cuft
Drainage area	= 3.270 ac	Curve number	= 65.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 14.2 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
732	3.537 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Mar 13, 2012

Hyd. No. 5

Post Sub. 1A

Hydrograph type	= SCS Runoff	Peak discharge	= 7.417 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 30,735 cuft
Drainage area	= 3.270 ac	Curve number	= 65.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 14.2 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
730	7.375
732	7.417 <<

...End

Worksheet 2: Runoff curve number and runoff **SM-4574A**

Project: 366 Pope Road By ECS Date 1/19/2012

Location: Acton, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment 1B

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
B	Woods- Good Condition	55			0.09	4.95
B	Open Space- Good Condition	61			1.14	69.54
B	Brush- Good Condition	48			0.18	8.64
B	Gravel	90			0.04	3.60
B	Impervious	98			0.07	6.86
				Totals =	1.52	93.59

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{93.59}{1.52} = 61.57$; Use CN = 61.6

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.....	yr	2	10	100
Rainfall, P (24-hour).....	in	3.1	4.5	6.4
Runoff, Q..... (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.42	1.11	2.33
Runoff, Q.....	cf	2338	6146	12854

D-2 (210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-4574A**

Project: 366 Pope Road By ECS Date 1/19/12

Location: Acton, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment 1B

Circle one: **Tc** Tt through subarea _____

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			Grass			
2. Mannings roughness coeff., n (table 3-1)			0.24			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.04			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.11			0.11
Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			UNPAVED			
8. Flow Length, L		ft	234			
9. Watercourse slope, s		ft/ft	0.07			
10. Average Velocity, V (figure 3-1)		ft/s	4.27			
11. Tt = L / 3600V	Compute Tt	hr	0.02			0.02
Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.12 min 7.2

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Mar 13, 2012

Hyd. No. 6

Post Sub. 1B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.431 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 2,343 cuft
Drainage area	= 1.520 ac	Curve number	= 61.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7.2 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
730	0.431 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Mar 13, 2012

Hyd. No. 6

Post Sub. 1B

Hydrograph type	= SCS Runoff	Peak discharge	= 1.586 cfs
Storm frequency	= 10 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 6,155 cuft
Drainage area	= 1.520 ac	Curve number	= 61.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7.2 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
728	1.586 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Mar 13, 2012

Hyd. No. 6

Post Sub. 1B

Hydrograph type	= SCS Runoff	Peak discharge	= 3.625 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 12,868 cuft
Drainage area	= 1.520 ac	Curve number	= 61.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7.2 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- (min)	Outflow (cfs)
726	3.625 <<

...End

Hydrograph Report

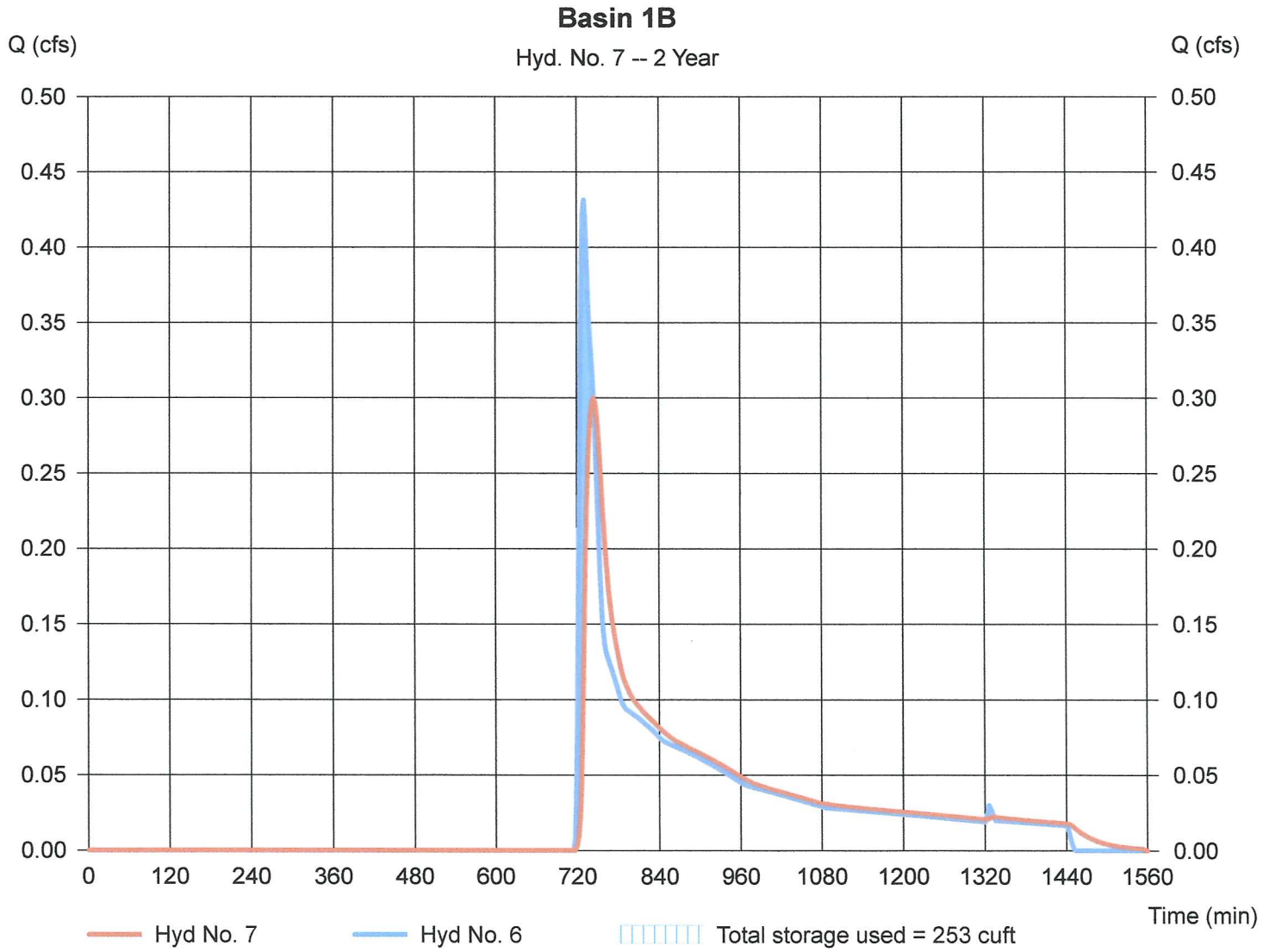
Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Apr 10, 2012

Hyd. No. 7

Basin 1B

Hydrograph type	= Reservoir	Peak discharge	= 0.300 cfs
Storm frequency	= 2 yrs	Time to peak	= 744 min
Time interval	= 2 min	Hyd. volume	= 2,341 cuft
Inflow hyd. No.	= 6 - Post Sub. 1B	Max. Elevation	= 195.35 ft
Reservoir name	= Basin 1B	Max. Storage	= 253 cuft

Storage Indication method used.



Hydrograph Report

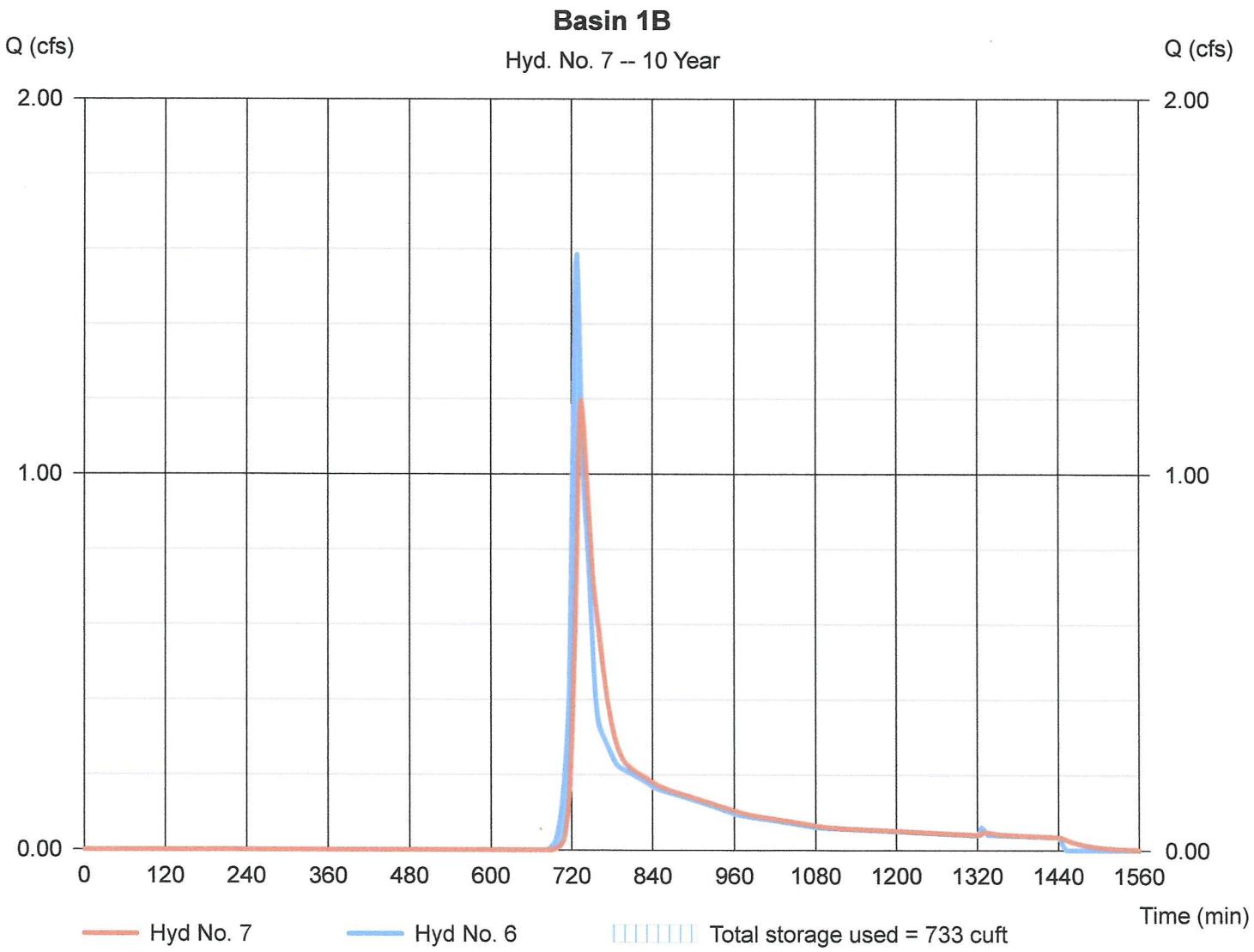
Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Apr 10, 2012

Hyd. No. 7

Basin 1B

Hydrograph type	= Reservoir	Peak discharge	= 1.197 cfs
Storm frequency	= 10 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 6,153 cuft
Inflow hyd. No.	= 6 - Post Sub. 1B	Max. Elevation	= 196.01 ft
Reservoir name	= Basin 1B	Max. Storage	= 733 cuft

Storage Indication method used.



Hydrograph Report

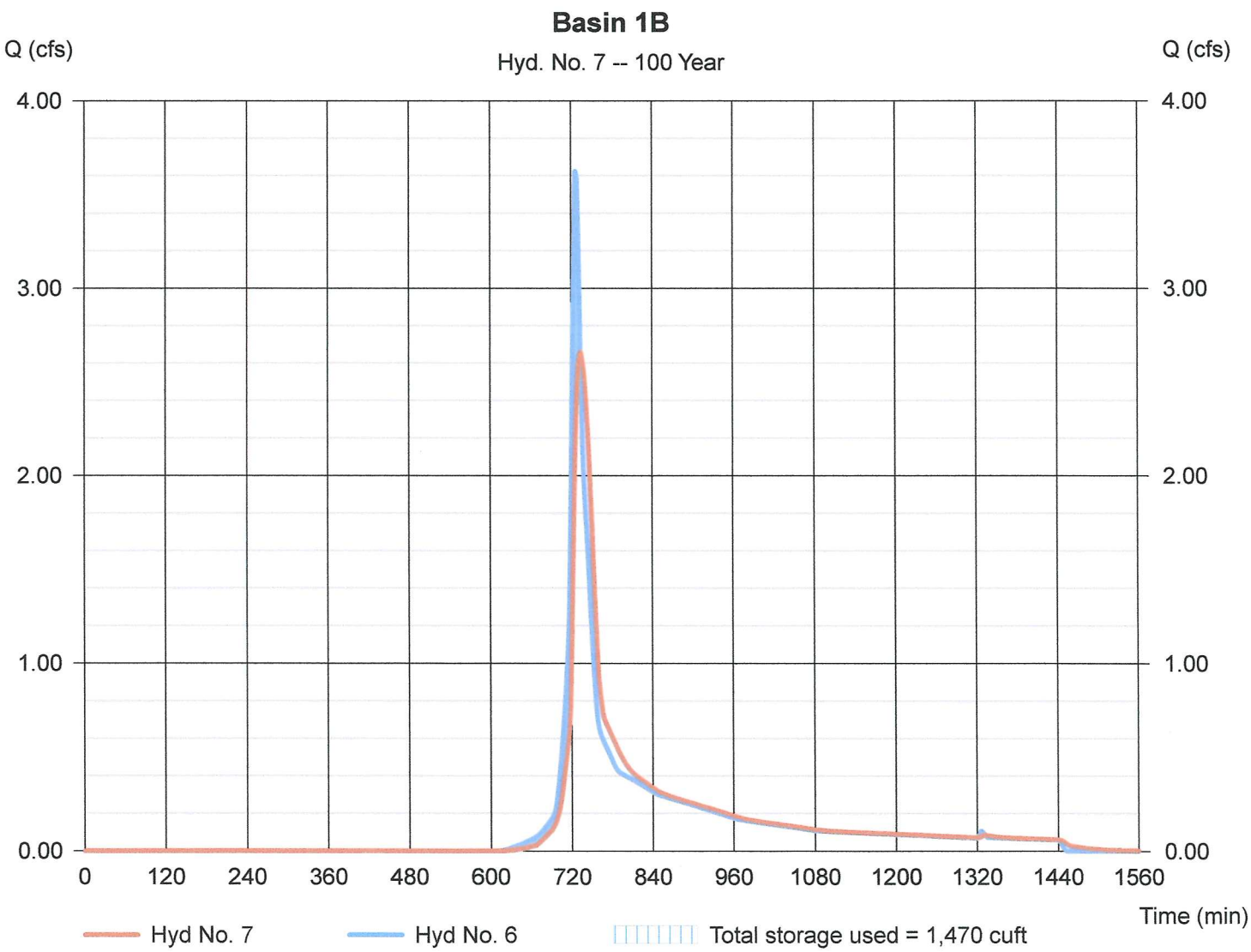
Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Apr 10, 2012

Hyd. No. 7

Basin 1B

Hydrograph type	= Reservoir	Peak discharge	= 2.656 cfs
Storm frequency	= 100 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 12,865 cuft
Inflow hyd. No.	= 6 - Post Sub. 1B	Max. Elevation	= 196.73 ft
Reservoir name	= Basin 1B	Max. Storage	= 1,470 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Apr 10, 2012

Pond No. 1 - Basin 1B

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 195.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	195.00	593	0	0
1.00	196.00	852	718	718
2.00	197.00	1,258	1,048	1,766

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 10.00	6.00	6.00	0.00
Span (in)	= 10.00	6.00	6.00	0.00
No. Barrels	= 1	1	2	0
Invert El. (ft)	= 192.25	195.00	195.75	0.00
Length (ft)	= 130.00	0.00	0.00	0.00
Slope (%)	= 0.01	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	0.00	0.00	0.00
Crest El. (ft)	= 196.75	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	195.00	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.00	718	196.00	2.36 oc	0.82 ic	0.33 ic	---	0.00	---	---	---	---	---	1.153
2.00	1,766	197.00	3.31 oc	0.35 ic	0.70 ic	---	2.26 s	---	---	---	---	---	3.307

Worksheet 2: Runoff curve number and runoff **SM-4574A**

Project: 366 Pope Road By ECS Date 1/19/2012

Location: Acton, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment 1C

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
B	Woods- Good Condition	55			0.00	
B	Open Space- Good Condition	61			0.00	
B	Brush- Good Condition	48			0.00	
B	Gravel	90			0.00	
B	Impervious	98			0.07	6.86
				Totals =	0.07	6.86

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{6.86}{0.07} = 98.00$; Use CN = 98.0

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.....	yr	2	10	100
Rainfall, P (24-hour).....	in	3.1	4.5	6.4
Runoff, Q..... (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	2.87	4.26	6.16
Runoff, Q.....	cf	729	1083	1566

D-2 (210-VI-TR-55, Second Ed., June 1986)

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Mar 13, 2012

Hyd. No. 8

Post Sub. 1C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.203 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 683 cuft
Drainage area	= 0.070 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
724	0.203 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Mar 13, 2012

Hyd. No. 8

Post Sub. 1C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.297 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 1,016 cuft
Drainage area	= 0.070 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
724	0.297 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Mar 13, 2012

Hyd. No. 8

Post Sub. 1C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.423 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 1,468 cuft
Drainage area	= 0.070 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
724	0.423 <<

...End

Hydrograph Report

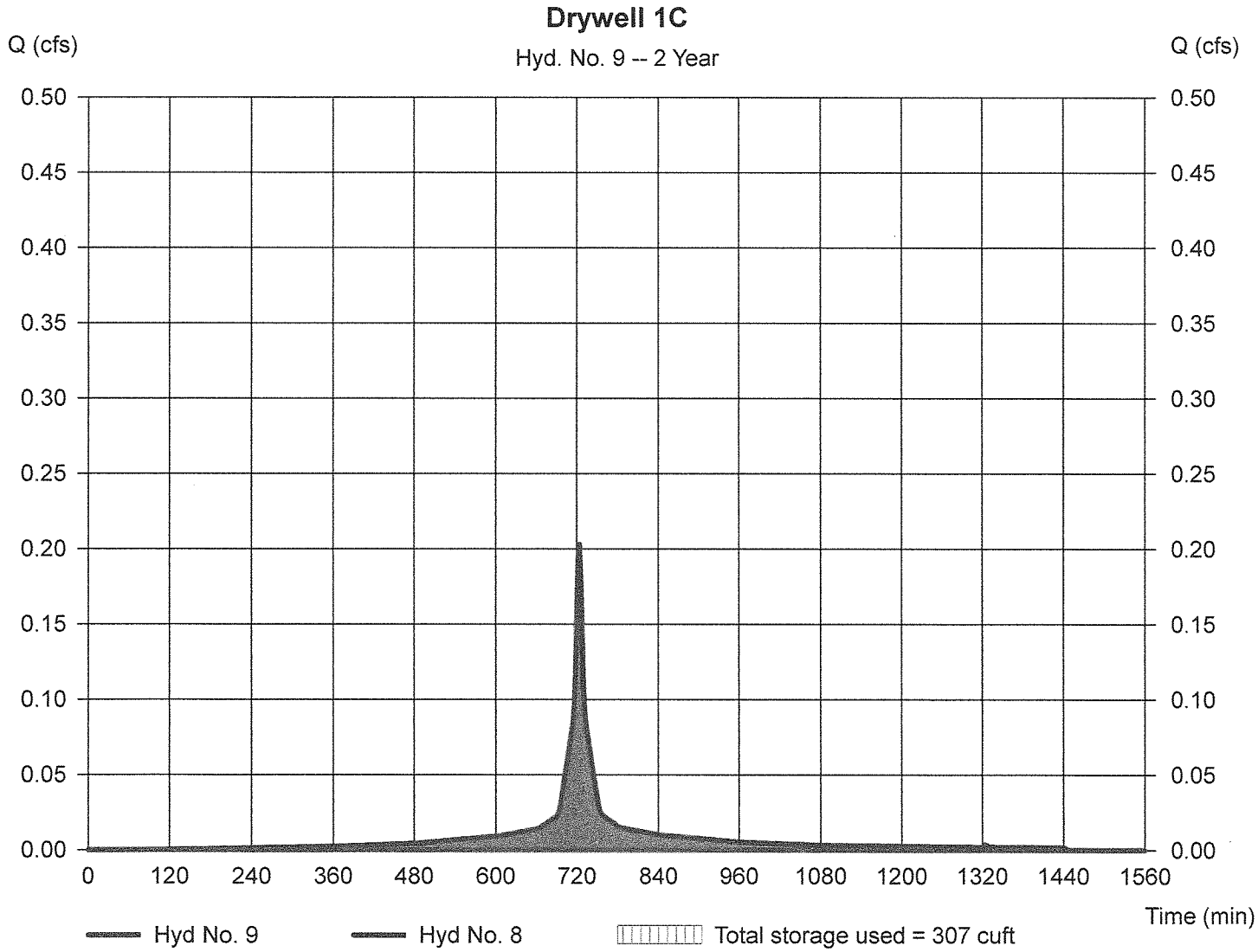
Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Mar 13, 2012

Hyd. No. 9

Drywell 1C

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 532 min
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 8 - Post Sub. 1C	Max. Elevation	= 1.58 ft
Reservoir name	= Drywell 1C	Max. Storage	= 307 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

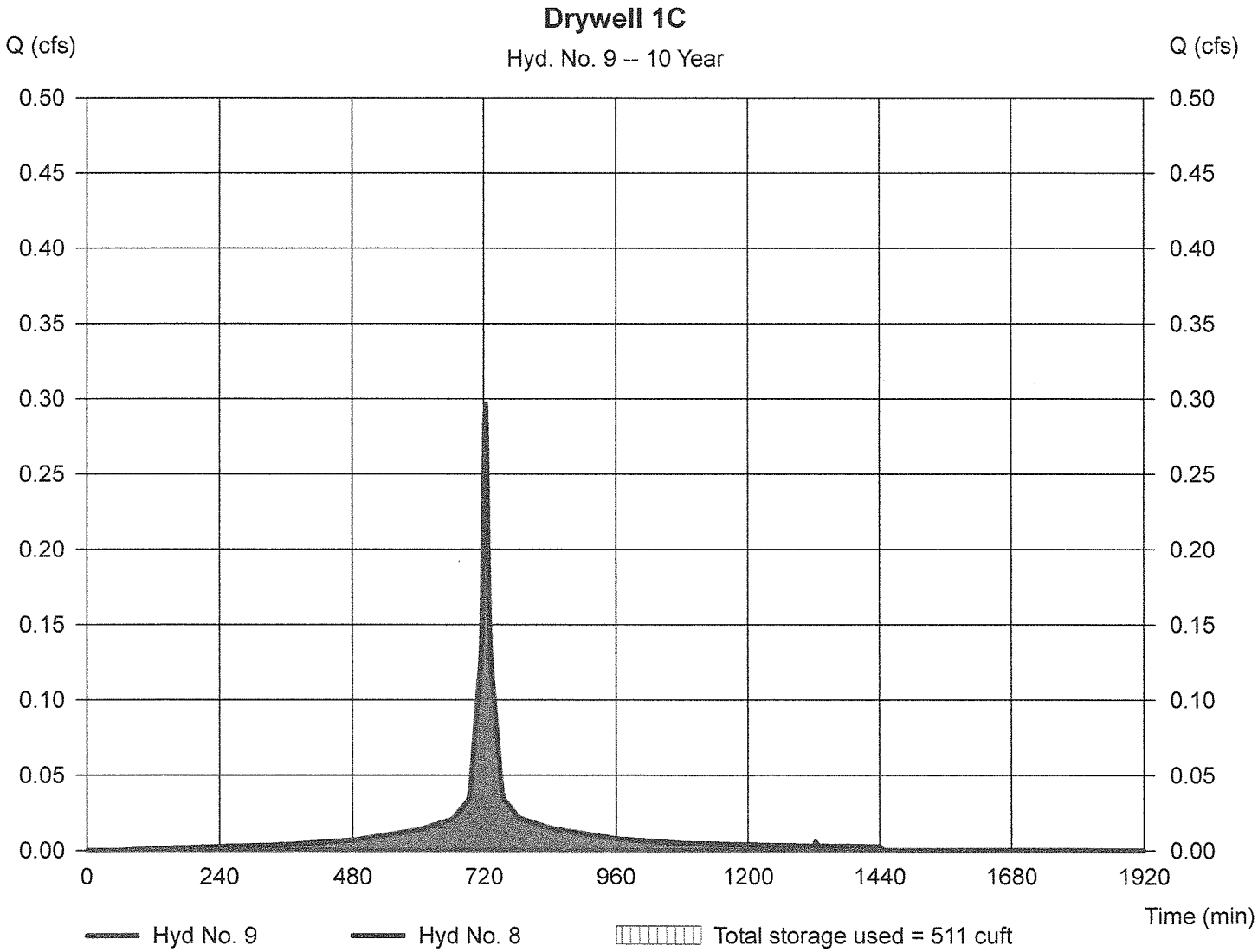
Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Mar 13, 2012

Hyd. No. 9

Drywell 1C

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= 452 min
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 8 - Post Sub. 1C	Max. Elevation	= 2.30 ft
Reservoir name	= Drywell 1C	Max. Storage	= 511 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

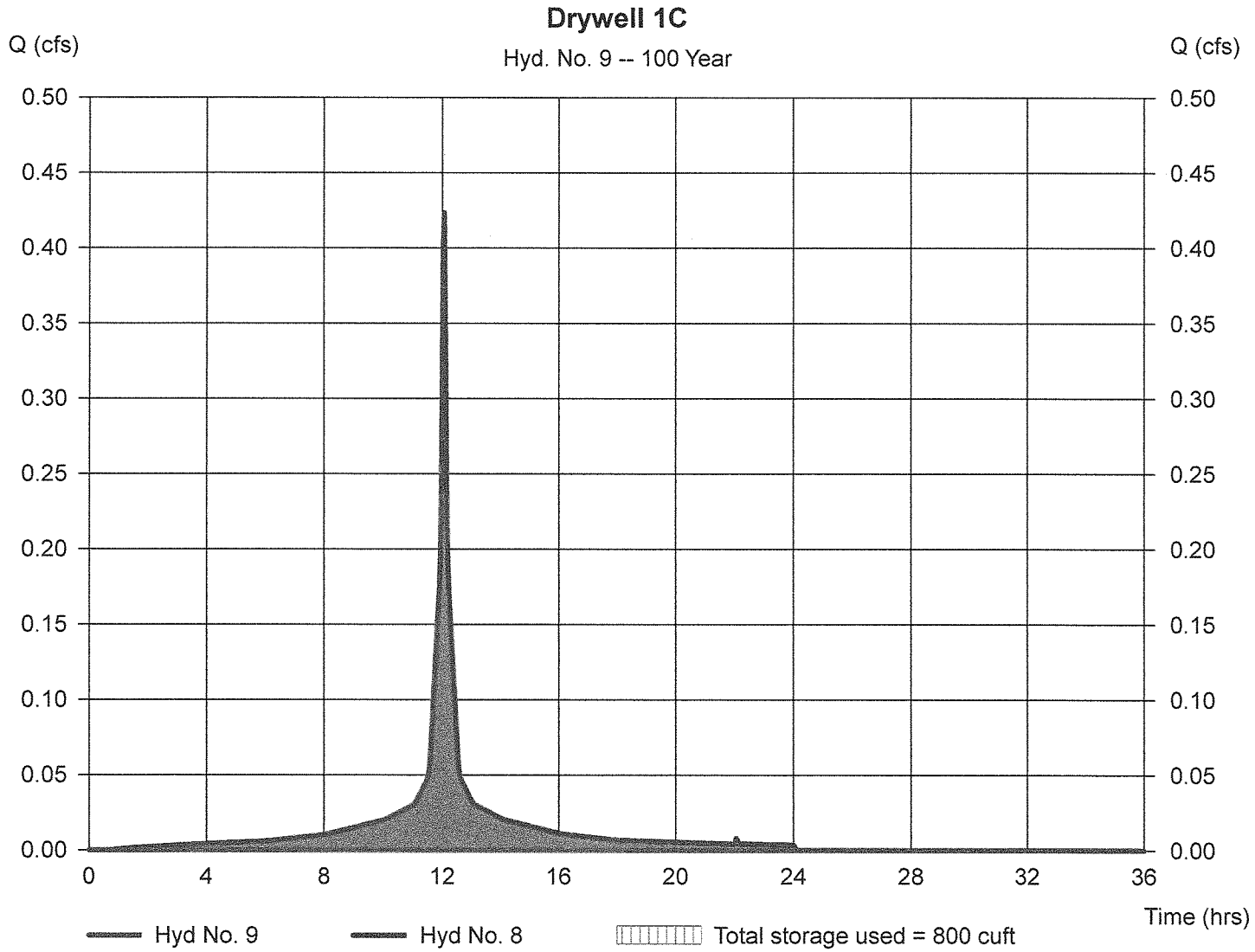
Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Mar 13, 2012

Hyd. No. 9

Drywell 1C

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= 5.80 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 8 - Post Sub. 1C	Max. Elevation	= 3.55 ft
Reservoir name	= Drywell 1C	Max. Storage	= 800 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Mar 13, 2012

Pond No. 3 - Drywell 1C

Pond Data

UG Chambers - Invert elev. = 1.00 ft, Rise x Span = 2.54 x 4.33 ft, Barrel Len = 21.00 ft, No. Barrels = 3, Slope = 0.00%, Headers = No
Encasement - Invert elev. = 0.00 ft, Width = 5.33 ft, Height = 4.54 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	0.00	n/a	0	0
0.45	0.45	n/a	61	61
0.91	0.91	n/a	61	122
1.36	1.36	n/a	120	242
1.82	1.82	n/a	133	375
2.27	2.27	n/a	129	504
2.72	2.72	n/a	121	625
3.18	3.18	n/a	108	733
3.63	3.63	n/a	82	815
4.09	4.09	n/a	61	876
4.54	4.54	n/a	61	936

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 1.020 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	0.00	---	---	---	---	---	---	---	---	0.000	---	0.000
0.45	61	0.45	---	---	---	---	---	---	---	---	0.009	---	0.009
0.91	122	0.91	---	---	---	---	---	---	---	---	0.011	---	0.011
1.36	242	1.36	---	---	---	---	---	---	---	---	0.012	---	0.012
1.82	375	1.82	---	---	---	---	---	---	---	---	0.013	---	0.013
2.27	504	2.27	---	---	---	---	---	---	---	---	0.015	---	0.015
2.72	625	2.72	---	---	---	---	---	---	---	---	0.016	---	0.016
3.18	733	3.18	---	---	---	---	---	---	---	---	0.017	---	0.017
3.63	815	3.63	---	---	---	---	---	---	---	---	0.019	---	0.019
4.09	876	4.09	---	---	---	---	---	---	---	---	0.020	---	0.020
4.54	936	4.54	---	---	---	---	---	---	---	---	0.021	---	0.021

Worksheet 2: Runoff curve number and runoff **SM-4574A**

Project: 366 Pope Road By ECS Date 1/19/2012

Location: Acton, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment 2A

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
B	Woods- Good Condition	55			0.13	7.15
B	Open Space- Good Condition	61			0.07	4.27
B	Brush- Good Condition	48			0.05	2.40
B	Gravel	90			0.00	
B	Impervious	98			0.00	
				Totals =	0.25	13.82

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{13.82}{0.25} = 55.28$; Use CN = 55.3

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.....	yr	2	10	100
Rainfall, P (24-hour).....	in	3.1	4.5	6.4
Runoff, Q..... (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.23	0.76	1.78
Runoff, Q.....	cf	208	687	1612

D-2 (210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-4574A**

Project: 366 Pope Road By ECS Date 1/19/12

Location: Acton, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment 2A

Circle one: **Tc** Tt through subarea _____

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			Woods			
2. Mannings roughness coeff., n (table 3-1)			0.8			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.08			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.21			0.21

Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			UNPAVED			
8. Flow Length, L		ft	233			
9. Watercourse slope, s		ft/ft	0.09			
10. Average Velocity, V (figure 3-1)		ft/s	4.84			
11. Tt = L / 3600V	Compute Tt	hr	0.01			0.01

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)	hr	0.22
	min	13.3

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Mar 13, 2012

Hyd. No. 10

Post Sub. 2A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.023 cfs
Storm frequency	= 2 yrs	Time to peak	= 744 min
Time interval	= 2 min	Hyd. volume	= 215 cuft
Drainage area	= 0.250 ac	Curve number	= 55.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 13.3 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
744	0.023 <<
746	0.022

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Mar 13, 2012

Hyd. No. 10

Post Sub. 2A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.137 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 709 cuft
Drainage area	= 0.250 ac	Curve number	= 55.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 13.3 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
732	0.137 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Mar 13, 2012

Hyd. No. 10

Post Sub. 2A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.397 cfs
Storm frequency	= 100 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 1,664 cuft
Drainage area	= 0.250 ac	Curve number	= 55.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 13.3 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 99.00% of Qp.)

Time -- Outflow (min	cfs)
730	0.397 <<

...End

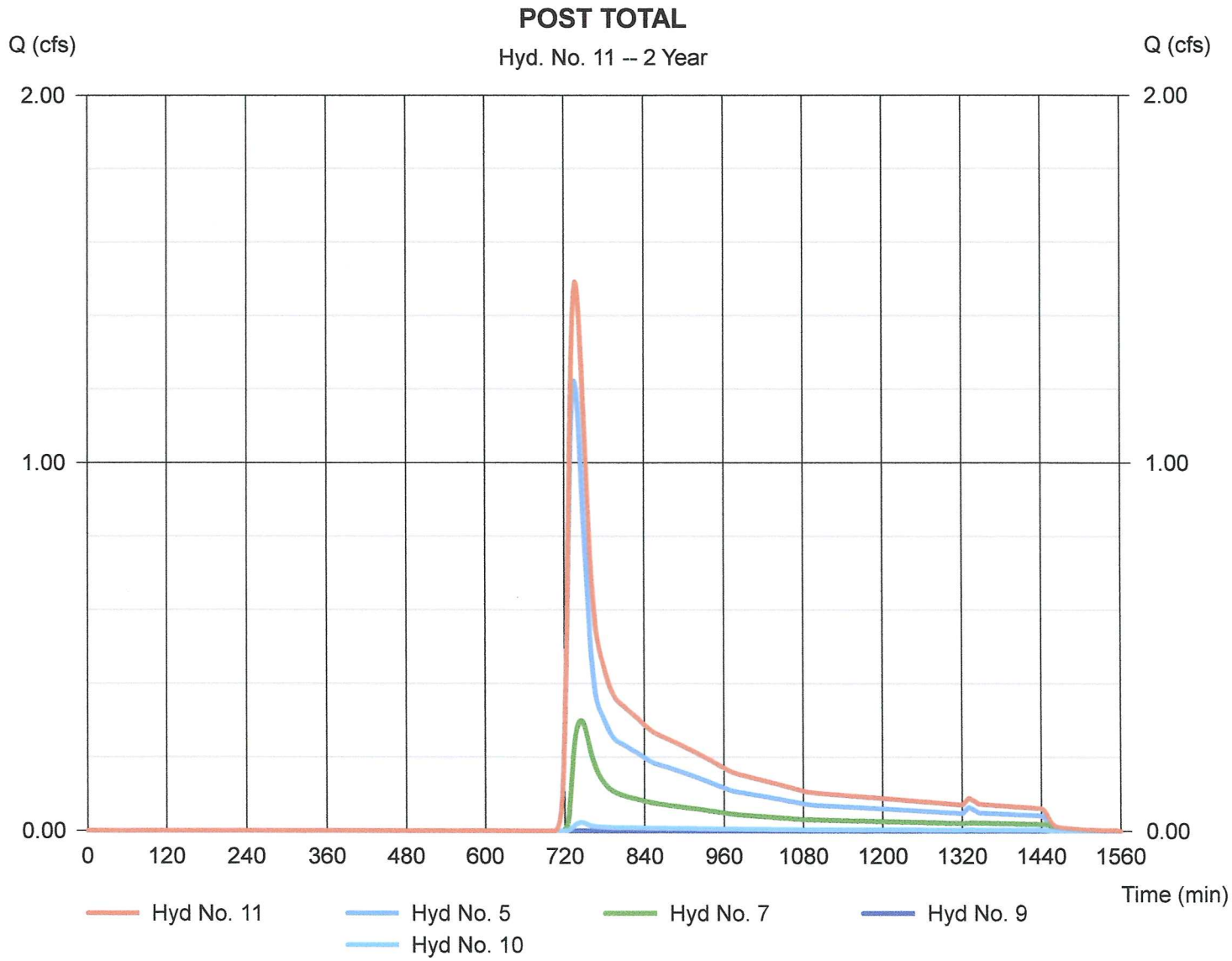
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Apr 10, 2012

Hyd. No. 11

POST TOTAL

Hydrograph type	= Combine	Peak discharge	= 1.493 cfs
Storm frequency	= 2 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 8,996 cuft
Inflow hyds.	= 5, 7, 9, 10	Contrib. drain. area	= 3.520 ac



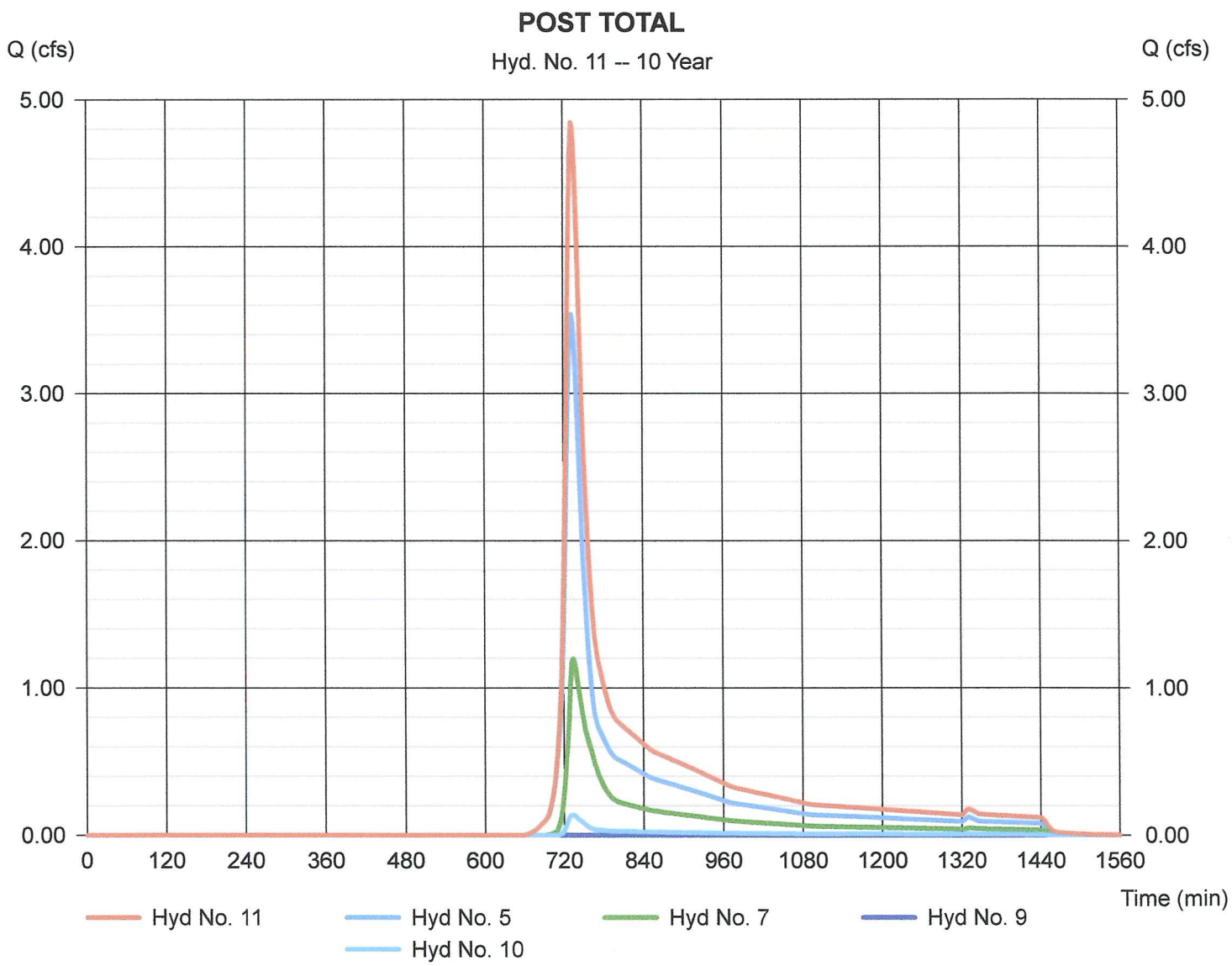
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Apr 10, 2012

Hyd. No. 11

POST TOTAL

Hydrograph type	= Combine	Peak discharge	= 4.842 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 22,335 cuft
Inflow hyds.	= 5, 7, 9, 10	Contrib. drain. area	= 3.520 ac



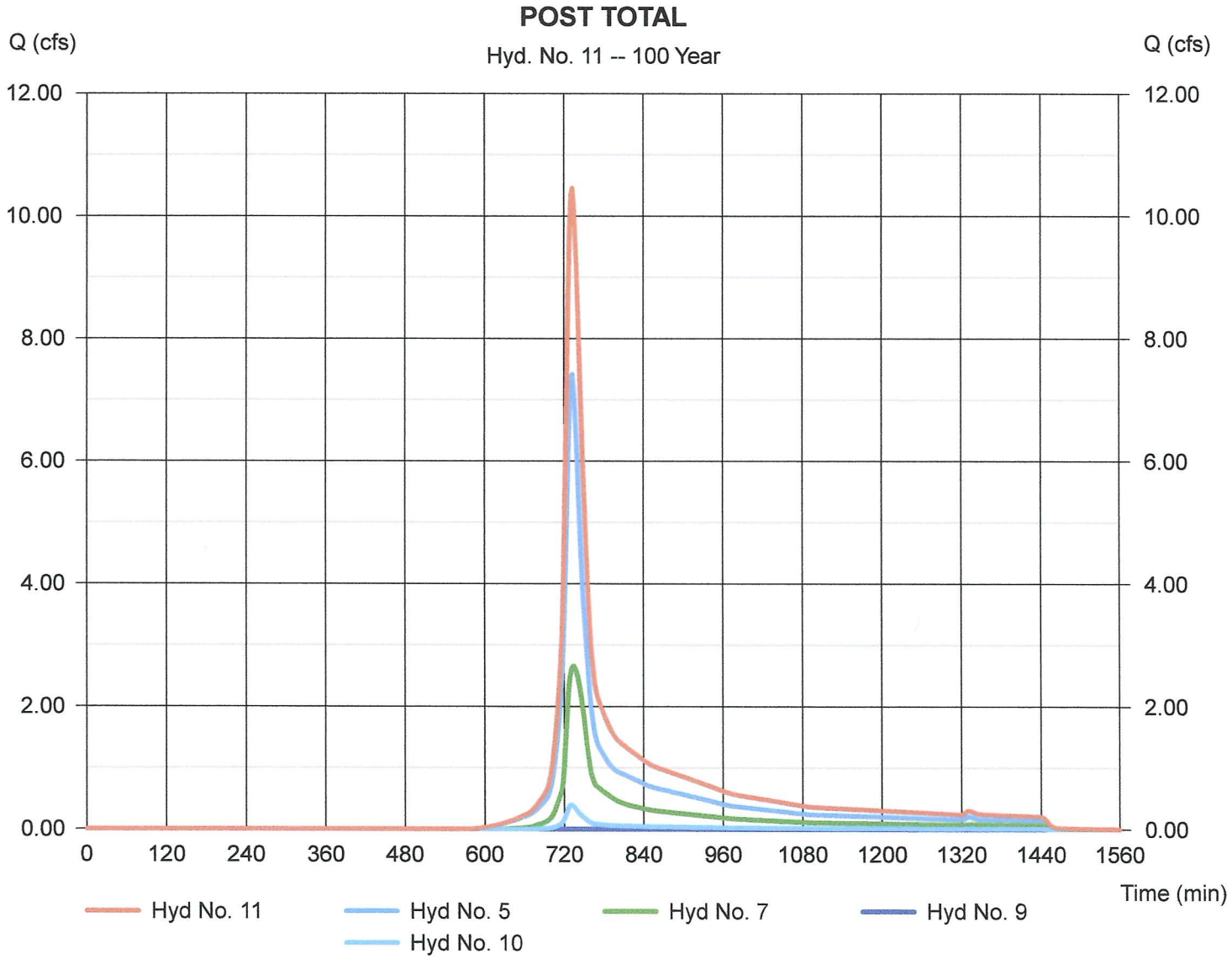
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Apr 10, 2012

Hyd. No. 11

POST TOTAL

Hydrograph type	= Combine	Peak discharge	= 10.45 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 45,264 cuft
Inflow hyds.	= 5, 7, 9, 10	Contrib. drain. area	= 3.520 ac



Water Balance Calculations

Water Balance Calculations

SM-4574A

Project: 366 Pope Road By: ECS Date: 2/28/2012

Location: Acton MA Checked: Date:

Pre-Development Recharge

CN=	63.2					
From Figure 1, infiltration=	18.2	in/year				
Drainage Area=	222,592	s.f.				
Recharge=	222,592	x	18.2	/12 in/ft	337,597	c.f./year

Post-Development Recharge

CN=	55.3					
From Figure 1, infiltration=	18	in/year				
Drainage area=	222,592	s.f.				
Recharge=	222,592	x	18	/12 in/ft	333,887	c.f./year

Post-Development Drywell Infiltration

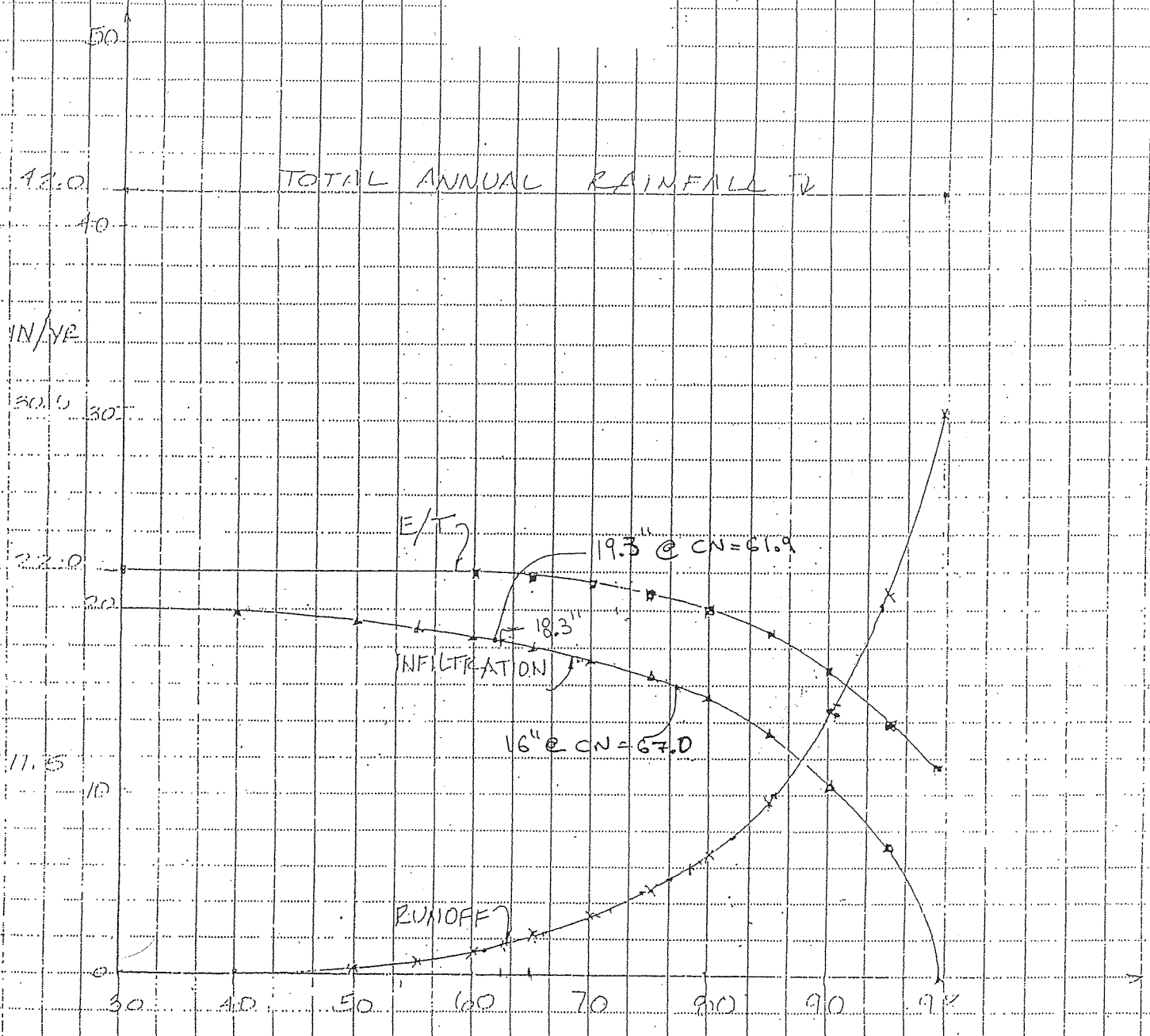
CN=	98					
From Figure 1, runoff=	30.6	in/year (directed to drywells)				
Roof Area =	3,200	s.f.				
Recharge=	3,200	x	30.6	/12 in/ft	8,160	c.f./year

Post-Development	Vs.	Pre-Development
342,047	>	337,597
c.f./year		c.f./year

STAMSKI AND McNARY, INC.
1000 Main Street
ACTON, MASSACHUSETTS 01720
TEL (978) 263-8585
FAX (978) 263-9883

JOB _____
SHEET NO. _____ OF _____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

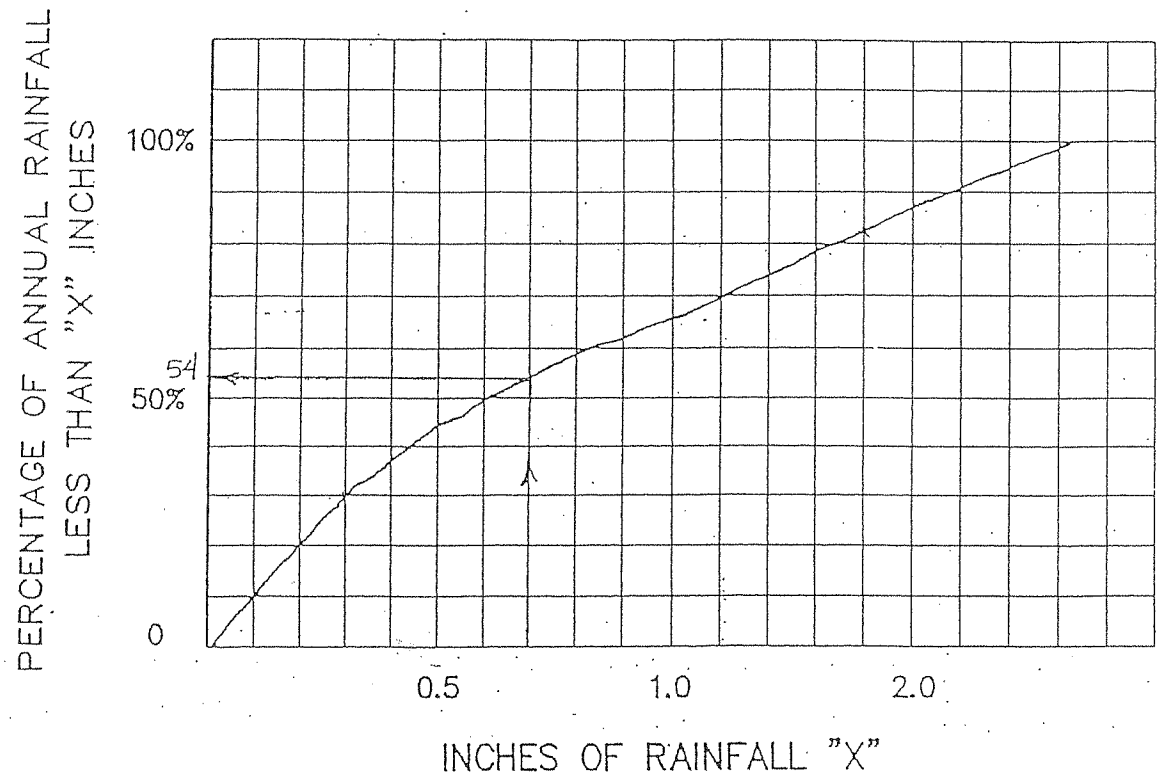
Figure 1



$\frac{55+70}{2} = 62.5 = CN$

NOTE: GRAPH COMPILED FROM DATA PUBLISHED BY NOAA (1954 - 1985)

Figure 2



Compiled data published by the National Oceanic and Atmospheric Administration (N.O.A.A.) for 1984 through 1988)

Cut and Fill Calculations

366 Pope Road Right-of-Way
Cut and Fill Calculation

Job: SM-4574A
Done by: Stamski and McNary, Inc.
Date: 2/27/2012
Plan Reference: *Definitive Subdivision Plan* by Stamski and McNary, Inc. dated 3/15/12.

Grading required:
Scaled from profile
Average cut along drive = 466 s.f.
Volume of cut = 466 s.f. x 12' wide drive = 5,592 c.f. = 207 c.y. of topsoil

Pavement to be provided:
3" depth of bituminous concrete (STA 0+00 to 2+50)
Pavement Area = 3,000 s.f.
Volume of pavement = (3/12) x 3,000 = 750 c.f. = 28 c.y. of pavement

Gravel Base to be provided:
12" depth of gravel base (STA 0+00 to 2+50) (3' shoulders)
Gravel Base Area = 4,500 s.f.
Gravel Base = (12/12) x 4,500 = 4,500 c.f. = 167 c.y.

Total Volume:

207+28+167 = **402 c.y. TOTAL CUT in Right-of-Way**

Cut to be used on adjacent lots for general grading. No soil is to be removed from site.

Soil Testing

Commonwealth of Massachusetts
City/Town of

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

A. Facility Information

MICAELA GARZONI
Owner Name

366 POPE ROAD
Street Address

MAP E6 / PARCEL 4
Map/Lot #

ACTON
City

MA
State

01720
Zip Code

B. Site Information

1. (Check one) ☑ New Construction ☐ Upgrade ☐ Repair

2. Published Soil Survey Available? ☑ Yes ☐ No If yes: ONLINE (Year Published) _____ (Publication Scale) _____ (Soil Map Unit)

   CHARLTON - HOLLIS - ROCK OUTCROP COMPLEX AND CANTON FINE SANDY LOAM
   Soil Name — Soil Limitations

3. Surficial Geological Report Available? ☑ Yes ☐ No If yes: ON LINE (Year Published) _____ (Publication Scale) _____ (Map Unit)

   TILL OR BEDROCK
   Geologic Material — 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 — Map Unit: UPLAND — Name: _____

   Wetlands Conservancy Program Map — Map Unit: UPLAND — Name: _____

6. Current Water Resource Conditions (USGS): 8/2011 (Month/Year) Range: ☑ Above Normal ☐ Normal ☐ Below Normal

7. Other references reviewed: _____

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

366 POPE RD
Site Address or Map/Lot Number

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

Deep Observation Hole A: 9/20/11 (Date) 8:30 (Time) RAIN (Weather)

1. Deep Observation Hole Logs

   Deep Hole Number TP-1 Ground Elevation at Surface of Hole _____

   Location (Identify on Plan) _____

2. Land Use: FIELD (e.g. woodland, agricultural field, vacant lot, etc.) FEW (Surface Stones) 0-5% (Slope (%))

   GRASS (Vegetation) _____ (Landform) _____ (Position on landscape (attach sheet))

3. Distances from: Open Water Body >100' (feet) Drainage Way >100' (feet) Possible Wet Area >100' (feet)

   Property Line >10' (feet) Drinking Water Well >100' (feet) Other _____

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: Depth Weeping from Pit 70" Depth Standing Water in Hole 80"

   Estimated Depth to High Groundwater: 47" (Inches) _____ (elevation)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

366 POPE RD
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-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			
0-8"	A	10YR 3/3	—	—	—	LOAM	—	—	MASSIVE	FRIABLE	
8-16"	B	10YR 5/6	—	—	—	SANDY LOAM	—	—	MASSIVE	FRIABLE	
16-84"	C	2.5Y 5/4	47"	HIGH & LOW CHROMA	>5%	LOAMY SAND	5	10	MASSIVE	FRIABLE	

Additional Notes REFUSAL @ 84"

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

366 POPE RD
Site Address or Map/Lot Number

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

Deep Observation Hole A: 9/20/11 (Date) 9:00 (Time) RAIN (Weather)

1. Deep Observation Hole Logs

   Deep Hole Number TP-2 Ground Elevation at Surface of Hole _____

   Location (Identify on Plan) _____

2. Land Use: FIELD (e.g. woodland, agricultural field, vacant lot, etc.) FEW (Surface Stones) 0-5% (Slope (%))

   GRASS (Vegetation) _____ (Landform) _____ (Position on landscape (attach sheet))

3. Distances from: Open Water Body >100' (feet) Drainage Way >100' (feet) Possible Wet Area >100' (feet)

   Property Line >10' (feet) Drinking Water Well >100' (feet) Other _____

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: Depth Weeping from Pit 74" Depth Standing Water in Hole 74"

   Estimated Depth to High Groundwater: 34" (Inches) _____ (elevation)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

366 POPE RD
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-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			
0-6"	A	10YR 3/3	—	—	—	LOAM	—	—	MASSIVE	FRIABLE	
6-19"	B	10YR 5/6	—	—	—	SANDY LOAM	—	—	MASSIVE	FRIABLE	
19-84"	C	2.5Y 5/4	34"	HIGH & LOW CHROMA	>5%	LOAMY SAND	5	10	MASSIVE	FRIABLE	

Additional Notes REFUSAL @ 84"

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

366 POPE RD
Site Address or Map/Lot Number

C. On-Site Review

(minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: 9/20/11 (Date) 9:30 (Time) RAIN (Weather)

1. Deep Observation Hole Logs

   Deep Hole Number TP-3 Ground Elevation at Surface of Hole _____

   Location (Identify on Plan) _____

2. Land Use: FIELD (e.g. woodland, agricultural field, vacant lot, etc.) FEW Surface Stones 0-5% Slope (%)

   GRASS Vegetation _____ Landform _____ Position on landscape (attach sheet)

3. Distances from: Open Water Body >100' feet Drainage Way >100' feet Possible Wet Area >100' feet

   Property Line >10' feet Drinking Water Well >100' feet Other _____

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: Depth Weeping from Pit 54" Depth Standing Water in Hole 68"

   Estimated Depth to High Groundwater: 38" inches _____ elevation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

366 POPE RD
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-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			
0-22"	FILL	—	—	—	—	—	—	—	—	—	
22-84"	C	10YR 5/2	38"	HIGH & LOW CHROMA	75%	LOAMY SAND	5	10	MASSIVE	FRIABLE	

Additional Notes REFUSAL @ 84"

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

366 POPE RD
Site Address or Map/Lot Number

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

Deep Observation Hole A: 9/20/11 (Date) 10:00 (Time) RAIN (Weather)

1. Deep Observation Hole Logs

   Deep Hole Number TP-4 Ground Elevation at Surface of Hole _____

   Location (Identify on Plan) _____

2. Land Use: FIELD (e.g. woodland, agricultural field, vacant lot, etc.) FEW (Surface Stones) 0-5% (Slope (%))

   GRASS (Vegetation) _____ (Landform) _____ (Position on landscape (attach sheet))

3. Distances from: Open Water Body >100' (feet) Drainage Way >100' (feet) Possible Wet Area >100' (feet)

   Property Line >10' (feet) Drinking Water Well >100' (feet) Other _____

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: Depth Weeping from Pit 62" Depth Standing Water In Hole 67"

   Estimated Depth to High Groundwater: 33" (Inches) _____ (elevation)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

366 POPE RD
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-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			
0-11"	A	10YR 3/3	—	—	—	LOAM	—	—	MASSIVE	FRIABLE	
11-24"	B	10YR 5/6	—	—	—	SANDY LOAM	—	—	MASSIVE	FRIABLE	
24-84"	C	2.5Y 5/4	33"	HIGH & LOW CHROMA	75%	LOAMY SAND	5	10	MASSIVE	FRIABLE	

Additional Notes REFUSAL @ 84"

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

366 POPE RD
Site Address or Map/Lot Number

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

Deep Observation Hole A: 9/20/11 (Date) 10:30 (Time) RAIN (Weather)

1. Deep Observation Hole Logs

   Deep Hole Number TP-5 Ground Elevation at Surface of Hole _____

   Location (Identify on Plan) _____

2. Land Use: FIELD (e.g. woodland, agricultural field, vacant lot, etc.) FEW Surface Stones 0-5% Slope (%)

   GRASS Vegetation _____ Landform _____ Position on landscape (attach sheet)

3. Distances from: Open Water Body >100' feet Drainage Way >100' feet Possible Wet Area >100' feet

   Property Line >10' feet Drinking Water Well >100' feet Other _____

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: Depth Weeping from Pit 58" Depth Standing Water in Hole 64"

   Estimated Depth to High Groundwater: 38" Inches _____ elevation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

366 POPE RD
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-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			
0-28"	FILL	—	—	—	—	—	—	—	—	—	
28-80"	C	2.5Y 5/4	38"	HIGH & LOW CHROMA	>5%	LOAMY SAND	5	10	MASSIVE	FRIABLE	

Additional Notes REFUSAL @ 80"

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

366 POPE RD
Site Address or Map/Lot Number

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

Deep Observation Hole A: 9/20/11 (Date) 11:00 (Time) RAIN (Weather)

1. Deep Observation Hole Logs

   Deep Hole Number TP-6 Ground Elevation at Surface of Hole _____

   Location (Identify on Plan) _____

2. Land Use: FIELD (e.g. woodland, agricultural field, vacant lot, etc.) FEW Surface Stones 0-5% Slope (%)

   GRASS Vegetation _____ Landform _____ Position on landscape (attach sheet)

3. Distances from: Open Water Body >100' feet Drainage Way >100' feet Possible Wet Area >100' feet

   Property Line >10' feet Drinking Water Well >100' feet Other _____

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: Depth Weeping from Pit 65" Depth Standing Water in Hole 75"

   Estimated Depth to High Groundwater: 40" (Inches) _____ (elevation)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

366 POPE RD
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-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			
0-15"	FILL	—	—	—	—	—	—	—	—	—	
15-84"	C	2.5Y 5/4	40"	HIGH & LOW CHROM	75%	LOAMY SAND	5	10	MASSIVE	FRIABLE	

Additional Notes REFUSAL @ 84"

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program

366 POPE RD
Site Address or Map/Lot Number

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

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

Deep Observation Hole A: 9/20/11 (Date) 11:30 (Time) RAW (Weather)

1. Deep Observation Hole Logs

   Deep Hole Number TP-7 Ground Elevation at Surface of Hole _____

   Location (Identify on Plan) _____

2. Land Use: FIELD (e.g. woodland, agricultural field, vacant lot, etc.) FEW Surface Stones 0-5% Slope (%)

   GRASS Vegetation _____ Landform _____ Position on landscape (attach sheet)

3. Distances from: Open Water Body 100' feet Drainage Way 100' feet Possible Wet Area 100' feet

   Property Line 70' feet Drinking Water Well 100' feet Other _____

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: Depth Weeping from Pit — Depth Standing Water in Hole —

   Estimated Depth to High Groundwater: 62" Inches _____ elevation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program

366 POPE RD
Site Address or Map/Lot Number

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

Deep Observation Hole A: Deep Hole Number: TP-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			
0-40"	FILL	—	—	—	—	—	—	—	—	—	
40-96"	C	2.5Y5/4	62"	HIGH & LOW CHROMA	75%	LOAMY SAND	10	10	MASSIVE	FRIABLE	

Additional Notes REFUSAL @ 96"

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program

366 POPE RD
Site Address or Map/Lot Number

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

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

Deep Observation Hole A: 9/20/11 (Date) 12:00 (Time) RAIN (Weather)

1. Deep Observation Hole Logs

   Deep Hole Number TP-8 Ground Elevation at Surface of Hole _____

   Location (Identify on Plan) _____

2. Land Use: FIELD (e.g. woodland, agricultural field, vacant lot, etc.) FEW Surface Stones 0-5% Slope (%)

   GRASS Vegetation _____ Landform _____ Position on landscape (attach sheet)

3. Distances from: Open Water Body >100' feet Drainage Way >100' feet Possible Wet Area >100' feet

   Property Line >10 feet Drinking Water Well >100' feet Other _____

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: Depth Weeping from Pit ___ Depth Standing Water in Hole ___

   Estimated Depth to High Groundwater: 94" Inches _____ elevation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program

366 POPE RD
Site Address or Map/Lot Number

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

Deep Observation Hole A: Deep Hole Number: TP-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			
0-68"	FILL	—	—	—	—	—	—	—	—	—	
68-132"	C	2.5Y 5/4	94"	HIGH & LOW CHROMA	75%	LOAMY SAND	10	10	MASSIVE	FRIABLE	

Additional Notes _____

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program

366 POPE RD
Site Address or Map/Lot Number

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

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

Deep Observation Hole A: 9/20/11 (Date) 12:30 (Time) RAW (Weather)

1. Deep Observation Hole Logs

   Deep Hole Number TP-D1 Ground Elevation at Surface of Hole _____

   Location (Identify on Plan) _____

2. Land Use: FIELD (e.g. woodland, agricultural field, vacant lot, etc.) FEW (Surface Stones) 0-5% (Slope (%))

   GRASS (Vegetation) _____ (Landform) _____ (Position on landscape (attach sheet))

3. Distances from: Open Water Body >100' (feet) Drainage Way >100' (feet) Possible Wet Area >100' (feet)

   Property Line >10' (feet) Drinking Water Well >100' (feet) Other _____

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: Depth Weeping from Pit — Depth Standing Water in Hole —

   Estimated Depth to High Groundwater: 59" (Inches) _____ (elevation)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program

366 POPE RD
Site Address or Map/Lot Number

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

Deep Observation Hole A: Deep Hole Number: TP-D1

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	10YR 3/3	—	—	—	LOAM	—	—	MASSIVE	FRIABLE	
10-26"	B	10YR 5/8	—	—	—	SANDY LOAM	—	—	MASSIVE	FRIABLE	
26-84"	C	2.5Y 5/4	59"	HIGH & LOW CHROMA	75%	LOAMY SAND	5	10	MASSIVE	FRIABLE	

Additional Notes REFUSAL @ 84"

Commonwealth of Massachusetts
City/Town of
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

Owner Name: MICAELA GARZON

Street Address or Lot #: 366 POPE ROAD

City/Town: ACTON | State: MA | Zip Code: 01720

Contact Person (if different from Owner): | Telephone Number:

B. Test Results

	Date: 9/20/11 Time: 12:30	Date: 9/20/11 Time:
Observation Hole #	PT-A	PT-B
Depth of Perc	52"	56"
Start Pre-Soak	12:34	
End Pre-Soak	12:49	TOO
Time at 12"	12:55	WET
Time at 9"	1:09	TO
Time at 6"	1:29	PERC.
Time (9"-6")	20 MIN	
Rate (Min./Inch)	7 MPI	
	Test Passed: ☑ Test Failed: ☐	Test Passed: ☐ Test Failed: ☐

Test Performed By: STAMSKI AND MCNARY, INC., EVAN STINHAM

Witnessed By: JUSTIN SNAIR, ACTON BOARD OF HEALTH

Comments:

Commonwealth of Massachusetts
City/Town of
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

Owner Name: MICAELA GALZONI

Street Address or Lot #: 366 POPE ROAD

City/Town: ACTON | State: MA | Zip Code: 01720

Contact Person (if different from Owner): | Telephone Number:

B. Test Results

Date	9/20/11	9/20/11
Time		
Observation Hole #	PT-C	PT-D
Depth of Perc	52"	75"
Start Pre-Soak	12:42	12:28
End Pre-Soak	12:57	12:43
Time at 12"	12:58	12:45
Time at 9"	1:22	1:08
Time at 6"	1:46	1:31
Time (9"-6")	24 MIN	23 MIN
Rate (Min./Inch)	8 MPI	8 MPI
Test Passed:	☑	☑
Test Failed:	☐	☐

Test Performed By: STAMSKI AND McNARY, INC.; EVAN STIRNAM

Witnessed By: JUSTIN SNAIR; ACTON BOARD OF HEALTH

Comments:

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

☐ Depth observed standing water in observation hole	A. * inches	B. * inches
☐ Depth weeping from side of observation hole	A. * inches	B. * inches
☐ Depth to soil redoximorphic features (mottles)	A. * inches	B. * inches
☐ 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: * inches Lower boundary: * inches

* SEE SOIL LOGS

Commonwealth of Massachusetts
City/Town of

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	Date: 9/20/11
Typed or Printed Name of Soil Evaluator / License #: EVAN SIDHAM - # 12586	Date of Soil Evaluator Exam: JULY 2008
Name of Board of Health Witness: JUSTIN SNAIR	Board of Health: ACTON

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

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

Field Diagrams

Use this sheet for field diagrams:

No. 1363

Date: 11/16/06

Commonwealth of Massachusetts
ACTON, Massachusetts

Soil Suitability Assessment for On-site Sewage Disposal

Performed By: Russell Wilson - R. Wilson Assoc Date: 9/25/06
Witnessed By: Heather Hasz - Acton BOH

Location Address or Lot # 366 Pope Rd Lot A New Construction ☐ Repair ☑	Owner's Name, Address, and Telephone # Micaela Gorzoni 366 Pope Rd Acton MA (978) 274-2017

Office Review

Published Soil Survey Available: No ☐ Yes ☑
Year Published 1989 Publication Scale 1:25000 Soil Map Unit 203
Drainage Class I Soil Limitations Slope, Stoniness
Surficial Geologic Report Available: No ☐ Yes ☐
Year Published ..... Publication Scale .....
Geologic Material (Map Unit) .....
Landform Drumlin
Flood Insurance Rate Map:
Above 500 year flood boundary No ☐ Yes ☑
Within 500 year flood boundary No ☑ Yes ☐
Within 100 year flood boundary No ☑ Yes ☐
Wetland Area:
National Wetland Inventory Map (map unit) .....
Wetlands Conservancy Program Map (map unit) .....

Current Water Resource Conditions (USGS): Month .....
Range: Above Normal ☐ Normal ☑ Below Normal ☐
Other References Reviewed: .....

Location Address or Lot No. 366 Pope Rd Acton

On-site Review

Deep Hole Number 906-1 Date: 9/25/06 Time: Weather cldy 60°
Location (identify on site plan)
Land Use horse corrall Slope (%) 4 Surface Stones none
Vegetation grass
Landform dominic
Position on landscape (sketch on the back)
Distances from:

Open Water Body — feet Drainage way — feet
Possible Wet Area 200' ± feet Property Line 75' ± feet
Drinking Water Well feet Other

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0" - 10"	A	SL	10YR2/2		massive, friable
10" - 24"	B	SL	7.5YR5/6		friable
				>5% @	24"
24" - 44"	C1	Rotted Ledge	—		not suitable

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) glacial till Depth to Bedrock: 24"
Depth to Groundwater: Standing Water in the Hole: none Weeping from Pit Face: none
Estimated Seasonal High Ground Water: 24"

Location Address or Lot No. 366 Pope Rd Acton

On-site Review

Deep Hole Number 906-2 Date: 9/25/06 Time: Weather cldy 60°
Location (identify on site plan)
Land Use horse pasture Slope (%) 4 Surface Stones none
Vegetation grass
Landform drumlin
Position on landscape (sketch on the back)
Distances from:

Open Water Body — feet Drainage way feet
Possible Wet Area 250± feet Property Line 120± feet
Drinking Water Well feet Other

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0" - 10"	A	SL	10YR3/2		massive friable
10" - 24"	B	SL	7.5YR5/6		friable
24" - 54"	C1	LS	5Y2.6/3		compacted - ledge 10% fragments

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) glacial till Depth to Bedrock: 54"
Depth to Groundwater: Standing Water in the Hole: none Weeping from Pit Face: none
Estimated Seasonal High Ground Water: 54"

Location Address or Lot No. 366 Pope Rd Acton

On-site Review

Deep Hole Number 906-3 Date: 9/25/06 Time: Weather cldy 60°
Location (identify on site plan)
Land Use horse corrall Slope (%) 3 Surface Stones none
Vegetation grass
Landform drumlin
Position on landscape (sketch on the back)
Distances from:

Open Water Body — feet Drainage way — feet
Possible Wet Area 300± feet Property Line 65± feet 35'±(street)
Drinking Water Well feet Other

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0" - 8"	A	SL	10YR3/2		massive friable
8" - 24"	B	SL	7.5YR5/6		friable
				>5% @ 44"	
24" - 64"	C	SL	5YR6/4		not compacted 10% angular fragments

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) glacial till Depth to Bedrock: 64"
Depth to Groundwater: Standing Water in the Hole: none Weeping from Pit Face: none
Estimated Seasonal High Ground Water: 44"

Location Address or Lot No. 366 Pope Rd Acton

On-site Review

Deep Hole Number 900-4 Date: 9/25/00 Time: Weather cldy 60°
Location (identify on site plan)
Land Use horse corral Slope (%) 3 Surface Stones none
Vegetation grass
Landform drumlin
Position on landscape (sketch on the back)
Distances from:

Open Water Body — feet Drainage way — feet
Possible Wet Area 350± feet Property Line 65'± feet 56' street
Drinking Water Well feet Other

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0" - 60"	F	loam/mix	—		no stones sand/silt/loam mix
60" - 82"	C	SL	5YR6/3	75% @ 60"	not compacted (moist)

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) glacial till Depth to Bedrock: 82"
Depth to Groundwater: Standing Water in the Hole: none Weeping from Pit Face: none
Estimated Seasonal High Ground Water: 60"

Location Address or Lot No. 366 Pope Rd Acton

On-site Review

Deep Hole Number 906-5 Date: 9/25/06 Time: Weather cldy 60°
Location (identify on site plan)
Land Use horse corral Slope (%) 3 Surface Stones none
Vegetation grass
Landform drumlin
Position on landscape (sketch on the back)
Distances from:

Open Water Body — feet Drainage way — feet
Possible Wet Area 130'± feet Property Line 120'± feet (45' street)
Drinking Water Well feet Other

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0"-5"	A	SL	10YR3/2		massive friable
5"-12"	B	SL	7.5YR5/6	75% @ 48"	friable
12"-74"	C	LS	5YR6/4		30% stone > 3" dia

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) glacial till Depth to Bedrock: 74"
Depth to Groundwater: Standing Water in the Hole: none Weeping from Pit Face: none
Estimated Seasonal High Ground Water: 48"

Location Address or Lot No. 366 Pope Rd Acton

On-site Review

Deep Hole Number 906-6 Date: 9/25/06 Time: Weather cldy 60°
Location (identify on site plan)
Land Use horse corral Slope (%) 4 Surface Stones none
Vegetation grass
Landform drumlin
Position on landscape (sketch on the back)
Distances from:

Open Water Body — feet Drainage way — feet
Possible Wet Area 130± feet Property Line 120'± feet 85'(Street)
Drinking Water Well feet Other

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0"-5"	A	SL	10YR3/2		massive friable
5"-12"	B	SL	7.5YR5/6		friable
			mottles 75% c	50"	
12"-77"	C	LS	5YR6/4		30% stone > 3" dia - not compacted

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) glacial till Depth to Bedrock: 77"
Depth to Groundwater: Standing Water in the Hole: none Weeping from Pit Face: none
Estimated Seasonal High Ground Water: 50"

Location Address or Lot No. 366 Pope Rd Acton

Determination for Seasonal High Water Table

Method Used:

- ☐ Depth observed standing in observation hole ..... inches
- ☐ Depth weeping from side of observation hole ..... inches
- ☑ Depth to soil mottles 48 inches
- ☐ Ground water adjustment ..... feet

Index Well Number ..... Reading Date ..... Index well level .....

Adjustment factor ..... Adjusted ground water level .....

Depth of Naturally Occurring Pervious Material

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

If not, what is the depth of naturally occurring pervious material? _____

Certification

I certify that on 7/95 (date) I have passed the soil evaluator examination approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature Russell J. Wilson Date 11/16/06

Location Address or Lot No. 366 Pope Rd

COMMONWEALTH OF MASSACHUSETTS

Acton , Massachusetts

Percolation Test*

Date: 9/25/06 Time:

Observation Hole #	A	
Depth of Perc	42"	
Start Pre-soak	1:32	
End Pre-soak	1:48	
Time at 12"	1:48	
Time at 9"	1:53	
Time at 6"	2:00	
Time (9"-6")	7	
Rate Min./Inch	3	

* Minimum of 1 percolation test must be performed in both the primary area AND reserve area.

Site Passed ☑ Site Failed ☐

Performed By: Jason & Josh Wilson - R. Wilson Assoc

Witnessed By: Heather Hasz - Acton BOH

Comments:

Drainage Maps

DEFINITIVE PLAN
FOR
366 POPE ROAD
IN
ACTON, MA

PRE-DEVELOPMENT
DRAINAGE MAP

FOR: PARATORE
SCALE: 1"=40' MARCH 15, 2012

STAMSKI AND McNARY, INC.
1000 MAIN STREET ACTON, MASS.
ENGINEERING - PLANNING - SURVEYING

0 20 40 80 160

SM-4574A (4574A-RC2.DWG)

COMMONWEALTH OF MASSACHUSETTS
JOSEPH MARCH CIVIL #40472
REGISTERED PROFESSIONAL ENGINEER

DEFINITIVE PLAN
FOR
366 POPE ROAD
IN
ACTON, MA

POST–DEVELOPMENT DRAINAGE MAP

FOR: PARATORE
SCALE: 1"=40' APRIL 10, 2012

STAMSKI AND McNARY, INC.
1000 MAIN STREET ACTON, MASS.
ENGINEERING – PLANNING – SURVEYING

0 20 40 80 160

SM–4574A (4574A–RC2.DWG)

COMMONWEALTH OF MASSACHUSETTS
JOSEPH MARCH
CIVIL
#40472
REGISTERED PROFESSIONAL ENGINEER