

EXISTING GRADE, INC.

LAND SURVEYING - CIVIL ENGINEERING
LAND DEVELOPMENT - CONSTRUCTION SUPERVISION

LOT DRAINAGE ANALYSIS
WILDWOOD LANE
BOURNE, MA

Prepared for
Ocean Pines LLC.
Newtown Road
Littleton, MA

May 31, 2007

RECEIVED
JUN 01 2007
TOWN PLANNER
TOWN OF BOURNE



5/31/07

Location
11 Jan Sebastian Drive, Unit 12
Sandwich, MA 02563

Tel: 508-833-7303 • Fax: 508-833-7304
e-mail: email@existinggrade.com

Mailing
P.O. Box 682
Forestdale, MA 02644

BUILDING AREAS

Parcel name: BLDG 1

Perimeter: 268.00 Area: 2,862 sq. ft. 0.07 acres

Parcel name: BLDG 2

Perimeter: 268.00 Area: 2,862 sq. ft. 0.07 acres

2397φ

Parcel name: BLDG 3

Perimeter: 286.17 Area: 2,782 sq. ft. 0.06 acres

Parcel name: BLDG 4

Perimeter: 268.00 Area: 2,862 sq. ft. 0.07 acres

*7/19/07
new area
2397φ*

Parcel name: BLDG 5

Perimeter: 286.00 Area: 2,782 sq. ft. 0.06 acres

Parcel name: BLDG 6

Perimeter: 268.00 Area: 2,862 sq. ft. 0.07 acres

Parcel name: BLDG 7

Perimeter: 268.00 Area: 2,862 sq. ft. 0.07 acres

Parcel name: BLDG 8

Perimeter: 268.00 Area: 2,862 sq. ft. 0.07 acres

Parcel name: BLDG 9

Perimeter: 286.00 Area: 2,782 sq. ft. 0.06 acres



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CULTEC, Inc.
 878 Federal Road
 P.O. Box 280
 Brookfield, CT 06804

CULTEC STORMWATER DESIGN CALCULATOR v.2005-3

PREPARED FOR:
 Hebb
 Hebb Builders, Inc
 PO Box 1093
 Littleton, MA
 508-743-0900
 508-743-0900

PROJECT INFORMATION:
 Wildwood - Building Infiltrators
 Wildwood Road
 Bourne, MA

ENGINEER:
 EGI
 Existing Grade, Inc
 P.O. Box 682
 Forestdale, MA
 508-833-7303
 508-833-7304

INPUT

Please fill in your parameters
 Workable / Effective depth (ft)
 Is this a paved application? (1=no, 0=yes)
 Is this a traffic application? (1=yes, 0=no)
 System Storage Requirement (CF)
 Limiting Dimension (ft)

10
0
1
1100
20



CALCULATED BY:

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 Forestdale, Ma
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Check Product of Choice	Model name	Approx. Unit Count	Number of Rows Wide	Number of Units Long	Total Number of Chambers Needed	Storage Provided (CF)	Bed Area Needed (SF)	Bed Width (ft)	Bed Length (ft)	Minimum Bed Depth (ft)	Volume of Stone Needed (CY)
	Recharger® 330HD Heavy Duty	15	3	5	15	1218.35	552.00	16.00	34.50	4.38	45.47
	Recharger® 330 Standard Duty										

WILDWOOD - BUILDINGS

Type III 24-hr 10 YEAR Rainfall=4.80"

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Page 1

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Subcatchment 1S: Roof Runoff

Runoff = 0.33 cfs @ 12.07 hrs, Volume= 0.025 af, Depth> 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.80"

Area (sf)	CN	Description
3,000	98	Paved parking & roofs
3,000		Impervious Area

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

Pond 1P: Infiltration Chambers

Inflow Area = 0.069 ac, Inflow Depth > 4.35" for 10 YEAR event
 Inflow = 0.33 cfs @ 12.07 hrs, Volume= 0.025 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 3.03' @ 20.00 hrs Surf.Area= 552 sf Storage= 1,088 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	0.00'	688 cf	16.00'W x 34.50'L x 4.38'H Prismaoid 2,418 cf Overall - 699 cf Embedded = 1,719 cf x 40.0% Voids
#2	0.00'	699 cf	47.8"W x 30.0"H x 6.25'L Cultec R-330 x 15 Inside #1
		1,386 cf	Total Available Storage

PARKING AREAS

Parcel name: PARKING BLDG 1-3

Perimeter: 589.91 Area: 5,562 sq. ft. 0.13 acres

Parcel name: PARKING BLDG 2-4

Perimeter: 759.31 Area: 8,443 sq. ft. 0.19 acres

Parcel name: PARKING BLDG 5-9

Perimeter: 1174.48 Area: 12,607 sq. ft. 0.29 acres

Parcel name: PARKING BLDG 6-8

Perimeter: 875.41 Area: 8,582 sq. ft. 0.20 acres

Parcel name: PARKING BLDG 10

Perimeter: 450.73 Area: 3,896 sq. ft. 0.09 acres

Parcel name: PARKING BLDG 11-15

Perimeter: 773.83 Area: 8,190 sq. ft. 0.19 acres

Parcel name: PARKING BLDG 12

Perimeter: 486.11 Area: 4,275 sq. ft. 0.10 acres

Parcel name: PARKING BLDG 14-17

Perimeter: 1141.45 Area: 10,895 sq. ft. 0.25 acres

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CULTEC STORMWATER DESIGN CALCULATOR v.2005-3

PREPARED FOR:

Hebb
 Hebb Builders, Inc
 PO Box 1093
 Littleton, MA
 508-743-0900
 508-743-0900

PROJECT INFORMATION:

Wildwood parking Lot infiltrators Bldg 1-3
 Wildwood Road
 Bourne, MA

ENGINEER:

EGI
 Existing Grade, Inc
 P.O. Box 682
 Forestdale, MA
 508-833-7303
 508-833-7304

INPUT

Please fill in your parameters

Workable / Effective depth (ft)

Is this a paved application? (1=no, 0=yes)

Is this a traffic application? (1=yes, 0=no)

System Storage Requirement (CF)

Limiting Dimension (ft)

10
0
1
2005
20

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Model name	Approx. Unit Count	Number of Rows Wide	Number of Units Long	Total Number of Chambers Needed	Storage Provided (GF)	Bed Area Needed (SF)	Bed Width (ft)	Bed Length (ft)	Minimum Bed Depth (ft)	Volume of Stone Needed (CY)
Recharger® 330HD Heavy Duty	28	3	9	27	2120.67	952.00	16.00	59.50	4.38	77.22
Recharger® 330 Standard Duty	--	--	--	--	--	--	--	--	--	--

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 PO Box 1093
 Littleton, MA
 508-743-0900
 508-743-0900

PROJECT INFORMATION:
 Wildwood parking Lot Infiltrators Bldg 2-4
 Wildwood Road
 Bourne, MA

ENGINEER:
 EGI
 Existing Grade, Inc
 P.O. Box 682
 Forestdale, MA
 508-833-7303
 508-833-7304

INPUT

Please fill in your parameters
 Workable / Effective depth (ft)
 Is this a paved application? (1=no, 0=yes)
 Is this a traffic application? (1=yes, 0=no)
 System Storage Requirement (CF)
 Limiting Dimension (ft)



CALCULATED BY:

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Check Product of Choice	Model name	Approx. Unit Count	Number of Rows-Wide	Number of Units Long	Total Number of Chambers Needed	Storage Provided (CF)	Bed Area Needed (SF)	Bed Width (ft)	Bed Length (ft)	Minimum Bed Depth (ft)	Volume of Stone Needed (CY)
	Recharger® 330HD Heavy Duty	43	3	14	42	3248.58	1452.00	16.00	90.75	4.38	116.91
	Recharger® 330 Standard Duty										

WILDWOOD - PARKING 1-3, 2-4

Type III 24-hr 10 YEAR Rainfall=4.80"

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Page 1

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Subcatchment 1S: PARKING BLDG 1-3

Runoff = 0.60 cfs @ 12.07 hrs, Volume= 0.046 af, Depth> 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.80"

Area (sf)	CN	Description
5,562	98	Paved parking & roofs
5,562		Impervious Area

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

Subcatchment 2S: PARKING BLDG 2-4

Runoff = 0.92 cfs @ 12.07 hrs, Volume= 0.070 af, Depth> 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.80"

Area (sf)	CN	Description
8,443	98	Paved parking & roofs
8,443		Impervious Area

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

Pond 1P: Infiltration Chambers

Inflow Area = 0.128 ac, Inflow Depth > 4.35" for 10 YEAR event
Inflow = 0.60 cfs @ 12.07 hrs, Volume= 0.046 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 3.32' @ 20.00 hrs Surf.Area= 952 sf Storage= 2,017 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	0.00'	1,165 cf	16.00'W x 59.50'L x 4.38'H Prismaoid 4,170 cf Overall - 1,257 cf Embedded = 2,912 cf x 40.0% Voids
#2	0.00'	1,257 cf	47.8"W x 30.0"H x 6.25'L Cultec R-330 x 27 Inside #1
		2,422 cf	Total Available Storage

WILDWOOD - PARKING 1-3, 2-4

Type III 24-hr 10 YEAR Rainfall=4.80"

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Page 2

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Pond 2P: Infiltration Chambers

Inflow Area = 0.194 ac, Inflow Depth > 4.35" for 10 YEAR event
Inflow = 0.92 cfs @ 12.07 hrs, Volume= 0.070 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 3.25' @ 20.00 hrs Surf.Area= 1,452 sf Storage= 3,062 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	0.00'	1,762 cf	16.00'W x 90.75'L x 4.38'H Prismatic 6,360 cf Overall - 1,956 cf Embedded = 4,404 cf x 40.0% Voids
#2	0.00'	1,956 cf	47.8"W x 30.0"H x 6.25'L Cultec R-330 x 42 Inside #1
		3,717 cf	Total Available Storage

LEACHING STRUCTURE SIZING (BARNSTABLE METHOD)

Sheet 1 of 1

Job Description: Wildwood
 Job Number: 1292 Calculated by: _____
 Date: 5/29/2007 Checked by: _____

Structure Description: Leach Pit for Parking Lot for Building 1 & 3

Design Formula: $Q \text{ (cfm)} = I \times C \times A \times 60.5$
 Design Storm: 10 year

$I = 2.0$ in/hr
 $CA = 0.00$ woods (ac)
 0.00 grass (ac)
 0.13 paved (ac)
 $CA = 0.12$
 $Q = 14$ cfm

Perc Rate: 8 min/in
 Rounded Perc: 8 *
 Infiltration rate = 0.12 (copy from Table 1 for rounded perc)
 0.12 (next slower rate from Table 1)
 Weighted rate = 0.12 gal/sf/min
 = **0.016** cf/sf/min

TABLE 1	
perc rate min/in	allowable infiltration gal/sf/min
<2.0	0.5
4	0.25
6	0.17
8	0.12
10	no good

* (round perc rate down to nearest even number shown in Table 1)

Infiltration area required = **882** sf

2 Pits: 6 ft diameter 6 ft deep 4 ft stone surround
 Assume stone voids = 0.45 percent

Radius of excavation = 7
 Infiltration area provided = 836 sf
 Infiltration volume provided = 1018 cf

Sustained infiltration rate = 13 cfm
 Time to fill structure = **136.6** min.
 Excess Runoff = -57 cf
 Time to Discharge Excess = **-4.3** min.

LEACHING STRUCTURE SIZING (BARNSTABLE METHOD)

Sheet 1 of 1

Job Description: Wildwood
 Job Number: 1292 Calculated by: _____
 Date: 5/29/2007 Checked by: _____

Structure Description: Leach Pit for Parking Lot for Building 2 & 4

Design Formula: $Q \text{ (cfm)} = I \times C \times A \times 60.5$
 Design Storm: 10 year

$I = 2.0$ in/hr

CA = 0.00 0.20 woods (ac)
 0.00 0.30 grass (ac)
 0.20 0.90 paved (ac)

CA = 0.18

Q = 22 cfm

Perc Rate: 8 min/in

Rounded Perc: 8 *

Infiltration rate = 0.12 (copy from Table 1 for rounded perc)
 0.12 (next slower rate from Table 1)

Weighted rate = 0.12 gal/sf/min
 = 0.016 cf/sf/min

TABLE 1	
perc rate min/in	allowable infiltration gal/sf/min
<2.0	0.5
4	0.25
6	0.17
8	0.12
10	no good

* (round perc rate down to nearest even number shown in Table 1)

Infiltration area required = 1358 sf

4 Pits: 6 ft diameter 6 ft deep 4 ft stone surround

Assume stone voids = 0.45 percent

Radius of excavation = 7
 Infiltration area provided = 1671 sf
 Infiltration volume provided = 2036 cf

Sustained infiltration rate = 27 cfm
 Time to fill structure = 243.1 min.
 Excess Runoff = 922 cf
 Time to Discharge Excess = 34.4 min.



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CULTEC STORMWATER DESIGN CALCULATOR v.2005-3

ENGINEER:
 EGI
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 P.O. Box 682
 Forestdale, MA
 508-833-7303
 508-833-7304

PROJECT INFORMATION:
 Wildwood parking Lot Infiltrators Bldg 5-9
 Wildwood Road
 Bourne, MA

PREPARED FOR:
 Hebb
 Hebb Builders, Inc
 PO Box 1093
 Littleton, MA
 508-743-0900
 508-743-0900

CALCULATED BY:
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 Existing Grade, Inc.
 P.O. Box 682
 Forestdale, MA
 508-833-7303
 508-833-7304

10
0
1
4575
20



INPUT
 Please fill in your parameters
 Workable / Effective depth (ft)
 Is this a paved application? (1=yes, 0=no)
 Is this a traffic application? (1=yes, 0=no)
 System Storage Requirement (CF)
 Limiting Dimension (ft)

Check Product of Choice	Model name	Approx. Unit Count	Number of Rows Wide	Number of Units Long	Total Number of Chambers Needed	Storage Provided (GF)	Bed Area Needed (SF)	Bed Width (ft)	Bed Length (ft)	Minimum Bed Depth (ft)	Volume of Stone Needed (CY)
	Recharger® 330HD Heavy Duty	64	3	20	60	4602.06	2052.00	16.00	128.25	4.38	164.53
	Recharger® 330 Standard Duty										

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 Hebb
 Hebb Builders, Inc
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 Littleton, MA
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 508-743-0900

PROJECT INFORMATION:
 Wildwood parking Lot infiltrators Bldg 6-8
 Wildwood Road
 Bourne, MA

ENGINEER:
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 Existing Grade, Inc
 P.O. Box 682
 Forestdale, MA
 508-833-7303
 508-833-7304

INPUT

Please fill in your parameters
 Workable / Effective depth (ft)
 Is this a paved application? (1=no, 0=yes)
 Is this a traffic application? (1=yes, 0=no)
 System Storage Requirement (CF)
 Limiting Dimension (ft)



10
0
1
3093
20

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 Forestdale, Ma
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 508-833-7304

Check Product of Choice	Model name	Approx. Unit Count	Number of Rows Wide	Number of Units Long	Total Number of Chambers Needed	Storage Provided (CF)	Bed Area Needed (SF)	Bed Width (ft)	Bed Length (ft)	Minimum Bed Depth (ft)	Volume of Stone Needed (CY)
	Recharger® 330HD Heavy Duty	43	3	14	42	3248.58	1452.00	16.00	90.75	4.38	116.91
	Recharger® 330 Standard Duty	--	--	--	--	--	--	--	--	--	--

WILDWOOD - PARKING 5-9, 6-8

Type III 24-hr 10 YEAR Rainfall=4.80"

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Page 1

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Subcatchment 1S: PARKING BLDG 5-9

Runoff = 1.37 cfs @ 12.07 hrs, Volume= 0.105 af, Depth> 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.80"

Area (sf)	CN	Description
12,607	98	Paved parking & roofs
12,607		Impervious Area

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

Subcatchment 2S: PARKING BLDG 6-8

Runoff = 0.93 cfs @ 12.07 hrs, Volume= 0.071 af, Depth> 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.80"

Area (sf)	CN	Description
8,582	98	Paved parking & roofs
8,582		Impervious Area

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

Pond 1P: Infiltration Chambers

Inflow Area = 0.289 ac, Inflow Depth > 4.35" for 10 YEAR event

Inflow = 1.37 cfs @ 12.07 hrs, Volume= 0.105 af

Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 3.53' @ 20.00 hrs Surf.Area= 2,052 sf Storage= 4,573 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	0.00'	2,477 cf	16.00'W x 128.25'L x 4.38'H Prismaoid 8,988 cf Overall - 2,794 cf Embedded = 6,194 cf x 40.0% Voids
#2	0.00'	2,794 cf	47.8"W x 30.0"H x 6.25'L Cultec R-330 x 60 Inside #1
		5,272 cf	Total Available Storage

WILDWOOD - PARKING 5-9, 6-8

Type III 24-hr 10 YEAR Rainfall=4.80"

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Page 2

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Pond 2P: Infiltration Chambers

Inflow Area = 0.197 ac, Inflow Depth > 4.35" for 10 YEAR event
 Inflow = 0.93 cfs @ 12.07 hrs, Volume= 0.071 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 3.34' @ 20.00 hrs Surf.Area= 1,452 sf Storage= 3,113 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	0.00'	1,762 cf	16.00'W x 90.75'L x 4.38'H Prismatic 6,360 cf Overall - 1,956 cf Embedded = 4,404 cf x 40.0% Voids
#2	0.00'	1,956 cf	47.8"W x 30.0"H x 6.25'L Cultec R-330 x 42 Inside #1
		3,717 cf	Total Available Storage

LEACHING STRUCTURE SIZING (BARNSTABLE METHOD)

Sheet 1 of 1

Job Description: Wildwood
 Job Number: 1292 Calculated by: _____
 Date: 5/29/2007 Checked by: _____

Structure Description: Leach Pit for Parking Lot for Building 5 & 7 & 9

Design Formula: $Q \text{ (cfm)} = I \times C \times A \times 60.5$
 Design Storm: 10 year

I = 2.0 in/hr

CA = 0.00 0.20 woods (ac)
 0.00 0.30 grass (ac)
 0.30 0.90 paved (ac)

CA = 0.27

Q = 33 cfm

Perc Rate: 8 min/in

Rounded Perc: 8 *

Infiltration rate = 0.12 (copy from Table 1 for rounded perc)
 0.12 (next slower rate from Table 1)

Weighted rate = 0.12 gal/sf/min
 = 0.016 cf/sf/min

TABLE 1	
perc rate min/in	allowable infiltration gal/sf/min
<2.0	0.5
4	0.25
6	0.17
8	0.12
10	no good

* (round perc rate down to nearest even number shown in Table 1)

Infiltration area required = 2036 sf

5 Pits: 6 ft diameter 6 ft deep 4 ft stone surround

Assume stone voids = 0.45 percent

Radius of excavation = 7
 Infiltration area provided = 2089 sf
 Infiltration volume provided = 2545 cf

Sustained infiltration rate = 34 cfm
 Time to fill structure = 159.9 min.
 Excess Runoff = 85 cf
 Time to Discharge Excess = 2.5 min.

LEACHING STRUCTURE SIZING (BARNSTABLE METHOD)

Sheet 1 of 1

Job Description: Wildwood
 Job Number: 1292 Calculated by: _____
 Date: 5/29/2007 Checked by: _____

Structure Description: Leach Pit for Parking Lot for Building 6 & 8

Design Formula: $Q \text{ (cfm)} = I \times C \times A \times 60.5$
 Design Storm: 10 year

$I = 2.0$ in/hr

CA = 0.00 woods (ac)
 0.00 grass (ac)
 0.20 paved (ac)

CA = 0.18

Q = 22 cfm

Perc Rate: 8 min/in

Rounded Perc: 8 *
 Infiltration rate = 0.12 (copy from Table 1 for rounded perc)
 0.12 (next slower rate from Table 1)
 Weighted rate = 0.12 gal/sf/min
 = 0.016 cf/sf/min

TABLE 1	
perc rate min/in	allowable infiltration gal/sf/min
<2.0	0.5
4	0.25
6	0.17
8	0.12
10	no good

* (round perc rate down to nearest even number shown in Table 1)

Infiltration area required = 1358 sf

4 Pits: 6 ft diameter 6 ft deep 4 ft stone surround

Assume stone voids = 0.45 percent

Radius of excavation = 7
 Infiltration area provided = 1671 sf
 Infiltration volume provided = 2036 cf

Sustained infiltration rate = 27 cfm
 Time to fill structure = 243.1 min.
 Excess Runoff = 922 cf
 Time to Discharge Excess = 34.4 min.



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 Wildwood Road
 Bourne, MA

PREPARED FOR:
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CALCULATED BY:
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10
0
1
1394
20



INPUT
 Please fill in your parameters
 Workable / Effective depth (ft)
 Is this a paved application? (1=yes, 0=no)
 Is this a traffic application? (1=yes, 0=no)
 System Storage Requirement (CF)
 Limiting Dimension (ft)

Check Product of Choice	Model name	Approx. Unit Count	Number of Rows Wide	Number of Units Long	Total Number of Chambers Needed	Storage Provided (CF)	Bed Area Needed (SF)	Bed Width (ft)	Bed Length (ft)	Minimum Bed Depth (ft)	Volume of Stone Needed (CY)
	Recharger® 330HD Heavy Duty	19	3	6	18	1443.93	652.00	16.00	40.75	4.38	53.41
	Recharger® 330 Standard Duty										



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CULTEC STORMWATER DESIGN CALCULATOR v.2005-3

PREPARED FOR:
 Hebb
 Hebb Builders, Inc
 PO Box 1093
 Littleton, MA
 508-743-0900
 508-743-0900

PROJECT INFORMATION:
 Wildwood parking Lot infiltrators Bldg 11-15
 Wildwood Road
 Bourne, MA

ENGINEER:
 EGI
 Existing Grade, Inc
 P.O. Box 682
 Forestdale, MA
 508-833-7303
 508-833-7304

INPUT

Please fill in your parameters
 Workable / Effective depth (ft)
 Is this a paved application? (1=no, 0=yes)
 Is this a traffic application? (1=yes, 0=no)
 System Storage Requirement (CF)
 Limiting Dimension (ft)

10
0
1
2965
20



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Check Product of Choice	Model name	Approx. Unit Count	Number of Rows Wide	Number of Units Long	Total Number of Chambers Needed	Storage Provided (CF)	Bed Area Needed (SF)	Bed Width (ft)	Bed Length (ft)	Minimum Bed Depth (ft)	Volume of Stone Needed (CY)
	Recharger® 330HD Heavy Duty	41	3	13	39	3022.99	1352.00	16.00	84.50	4.38	108.97
	Recharger® 330 Standard Duty										

WILDWOOD - PARKING 10, 11-15

Type III 24-hr 10 YEAR Rainfall=4.80"

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Page 1

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Subcatchment 1S: PARKING BLDG 10

Runoff = 0.42 cfs @ 12.07 hrs, Volume= 0.032 af, Depth> 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.80"

Area (sf)	CN	Description
3,896	98	Paved parking & roofs
3,896		Impervious Area

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

Subcatchment 2S: PARKING BLDG 11-15

Runoff = 0.89 cfs @ 12.07 hrs, Volume= 0.068 af, Depth> 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.80"

Area (sf)	CN	Description
8,190	98	Paved parking & roofs
8,190		Impervious Area

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

Pond 1P: Infiltration Chambers

Inflow Area = 0.089 ac, Inflow Depth > 4.35" for 10 YEAR event

Inflow = 0.42 cfs @ 12.07 hrs, Volume= 0.032 af

Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 3.49' @ 20.00 hrs Surf.Area= 652 sf Storage= 1,413 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	0.00'	807 cf	16.00'W x 40.75'L x 4.38'H Prismatic 2,856 cf Overall - 838 cf Embedded = 2,018 cf x 40.0% Voids
#2	0.00'	838 cf	47.8"W x 30.0"H x 6.25'L Cultec R-330 x 18 Inside #1
		1,645 cf	Total Available Storage

WILDWOOD - PARKING 10, 11-15

Type III 24-hr 10 YEAR Rainfall=4.80"

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Page 2

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Pond 2P: Infiltration Chambers

Inflow Area = 0.188 ac, Inflow Depth > 4.35" for 10 YEAR event
Inflow = 0.89 cfs @ 12.07 hrs, Volume= 0.068 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 3.48' @ 20.00 hrs Surf.Area= 1,352 sf Storage= 2,971 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	0.00'	1,642 cf	16.00'W x 84.50'L x 4.38'H Prismatic 5,922 cf Overall - 1,816 cf Embedded = 4,106 cf x 40.0% Voids
#2	0.00'	1,816 cf	47.8"W x 30.0"H x 6.25'L Cultec R-330 x 39 Inside #1
		3,458 cf	Total Available Storage

LEACHING STRUCTURE SIZING (BARNSTABLE METHOD)

Sheet 1 of 1

Job Description: Wildwood
 Job Number: 1292 Calculated by: _____
 Date: 5/29/2007 Checked by: _____

Structure Description: Leach Pit for Parking Lot for Building 10

Design Formula: $Q \text{ (cfm)} = I \times C \times A \times 60.5$
 Design Storm: 10 year

$I = 2.0$ in/hr
 $CA = 0.00$ woods (ac)
 0.00 grass (ac)
 0.09 paved (ac)
 $CA = \boxed{0.08}$
 $Q = \boxed{10}$ cfm

Perc Rate: 8 min/in
 Rounded Perc: 8 *
 Infiltration rate = 0.12 (copy from Table 1 for rounded perc)
 0.12 (next slower rate from Table 1)
 Weighted rate = 0.12 gal/sf/min
 = $\boxed{0.016}$ cf/sf/min

TABLE 1	
perc rate min/in	allowable infiltration gal/sf/min
<2.0	0.5
4	0.25
6	0.17
8	0.12
10	no good

* (round perc rate down to nearest even number shown in Table 1)

Infiltration area required = $\boxed{611}$ sf

2 Pits: 6 ft diameter 6 ft deep 4 ft stone surround
 Assume stone voids = 0.45 percent

Radius of excavation = 7
 Infiltration area provided = 836 sf
 Infiltration volume provided = 1018 cf

Sustained infiltration rate = 13 cfm
 Time to fill structure = $\boxed{328.6}$ min.
 Excess Runoff = 968 cf
 Time to Discharge Excess = $\boxed{72.2}$ min.

LEACHING STRUCTURE SIZING (BARNSTABLE METHOD)

Sheet 1 of 1

Job Description: Wildwood
 Job Number: 1292 Calculated by: _____
 Date: 5/29/2007 Checked by: _____

Structure Description: Leach Pit for Parking Lot for Building 11 & 15

Design Formula: $Q \text{ (cfm)} = I \times C \times A \times 60.5$
 Design Storm: 10 year

$I = 2.0$ in/hr

CA = 0.00 0.20 woods (ac)
 0.00 0.30 grass (ac)
 0.19 0.90 paved (ac)

CA = 0.17

Q = 21 cfm

Perc Rate: 8 min/in

Rounded Perc: 8 *

Infiltration rate = 0.12 (copy from Table 1 for rounded perc)
 0.12 (next slower rate from Table 1)

Weighted rate = 0.12 gal/sf/min
 = 0.016 cf/sf/min

TABLE 1	
perc rate min/in	allowable infiltration gal/sf/min
<2.0	0.5
4	0.25
6	0.17
8	0.12
10	no good

* (round perc rate down to nearest even number shown in Table 1)

Infiltration area required = 1290 sf

4 Pits: 6 ft diameter 6 ft deep 4 ft stone surround

Assume stone voids = 0.45 percent

Radius of excavation = 7
 Infiltration area provided = 1671 sf
 Infiltration volume provided = 2036 cf

Sustained infiltration rate = 27 cfm
 Time to fill structure = 279.5 min.
 Excess Runoff = 1343 cf
 Time to Discharge Excess = 50.1 min.



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ENGINEER:
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PROJECT INFORMATION:
 Wildwood parking Lot Infiltrators Bldg 12
 Wildwood Road
 Bourne, MA

PREPARED FOR:
 Hebb
 Hebb Builders, Inc
 PO Box 1093
 Littleton, MA
 508-743-0900
 508-743-0900

CALCULATED BY:
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 Forestdale, Ma
 508-833-7303
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10
0
1
1570
20



INPUT
 Please fill in your parameters
 Workable / Effective depth (ft)
 Is this a paved application? (1=no, 0=yes)
 Is this a traffic application? (1=yes, 0=no)
 System Storage Requirement (CF)
 Limiting Dimension (ft)

Check Product of Choice	Model name	Approx. Unit Count	Number of Rows Wide	Number of Units Long	Total Number of Chambers Needed	Storage Provided (CF)	Bed Area Needed (SF)	Bed Width (ft)	Bed Length (ft)	Minimum Bed Depth (ft)	Volume of Stone Needed (CY)
	Recharger® 330HD Heavy Duty	22	3	7	21	1669.51	752.00	16.00	47.00	4.38	61.35
	Recharger® 330 Standard Duty										



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ENGINEER:
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PROJECT INFORMATION:
 Wildwood parking Lot infiltrators Bldg 14-17
 Wildwood Road
 Bourne, MA

PREPARED FOR:
 Hebb Builders, Inc
 PO Box 1093
 Littleton, MA
 508-743-0900
 508-743-0900

CALCULATED BY:
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 508-833-7304

10
0
1
3965
20



INPUT
 Please fill in your parameters
 Workable / Effective depth (ft)
 Is this a paved application? (1=no, 0=yes)
 Is this a traffic application? (1=yes, 0=no)
 System Storage Requirement (CF)
 Limiting Dimension (ft)

Check Product of Choice	Model name	Approx. Unit Count	Number of Rows Wide	Number of Units Long	Total Number of Chambers Needed	Storage Provided (CF)	Bed Area Needed (SF)	Bed Width (ft)	Bed Length (ft)	Minimum Bed Depth (ft)	Volume of Stone Needed (CY)
	Recharger® 330HD Heavy Duty	56	3	18	54	4150.90	1852.00	16.00	115.75	4.38	148.66
	Recharger® 330 Standard Duty										

WILDWOOD - PARKING 12, 14-17

Type III 24-hr 10 YEAR Rainfall=4.80"

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Page 1

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Subcatchment 1S: PARKING BLDG 12

Runoff = 0.46 cfs @ 12.07 hrs, Volume= 0.036 af, Depth> 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.80"

Area (sf)	CN	Description
4,275	98	Paved parking & roofs
4,275		Impervious Area

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

Subcatchment 2S: PARKING BLDG 14-17

Runoff = 1.18 cfs @ 12.07 hrs, Volume= 0.091 af, Depth> 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.80"

Area (sf)	CN	Description
10,895	98	Paved parking & roofs
10,895		Impervious Area

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

Pond 1P: Infiltration Chambers

Inflow Area = 0.098 ac, Inflow Depth > 4.35" for 10 YEAR event

Inflow = 0.46 cfs @ 12.07 hrs, Volume= 0.036 af

Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 3.20' @ 20.00 hrs Surf.Area= 752 sf Storage= 1,551 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	0.00'	926 cf	16.00'W x 47.00'L x 4.38'H Prismaoid 3,294 cf Overall - 978 cf Embedded = 2,316 cf x 40.0% Voids
#2	0.00'	978 cf	47.8"W x 30.0"H x 6.25'L Cultec R-330 x 21 Inside #1
		1,904 cf	Total Available Storage

WILDWOOD - PARKING 12, 14-17

Type III 24-hr 10 YEAR Rainfall=4.80"

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Page 2

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Pond 2P: Infiltration Chambers

Inflow Area = 0.250 ac, Inflow Depth > 4.35" for 10 YEAR event
 Inflow = 1.18 cfs @ 12.07 hrs, Volume= 0.091 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 3.30' @ 20.00 hrs Surf.Area= 1,852 sf Storage= 3,952 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	0.00'	2,239 cf	16.00'W x 115.75'L x 4.38'H Prismaoid 8,112 cf Overall - 2,515 cf Embedded = 5,597 cf x 40.0% Voids
#2	0.00'	2,515 cf	47.8"W x 30.0"H x 6.25'L Cultec R-330 x 54 Inside #1
		4,754 cf	Total Available Storage

LEACHING STRUCTURE SIZING (BARNSTABLE METHOD)

Sheet 1 of 1

Job Description: Wildwood
 Job Number: 1292 Calculated by: _____
 Date: 5/29/2007 Checked by: _____

Structure Description: Leach Pit for Parking Lot for Building 12

Design Formula: $Q \text{ (cfm)} = I \times C \times A \times 60.5$
 Design Storm: 10 year

I = 2.0 in/hr

CA = 0.00 0.20 woods (ac)
 0.00 0.30 grass (ac)
 0.10 0.90 paved (ac)

CA = 0.09

Q = 11 cfm

Perc Rate: 8 min/in

Rounded Perc: 8 *
 Infiltration rate = 0.12 (copy from Table 1 for rounded perc)
 0.12 (next slower rate from Table 1)
 Weighted rate = 0.12 gal/sf/min
 = 0.016 cf/sf/min

TABLE 1	
perc rate min/in	allowable infiltration gal/sf/min
<2.0	0.5
4	0.25
6	0.17
8	0.12
10	no good

* (round perc rate down to nearest even number shown in Table 1)

Infiltration area required = 679 sf

2 Pits: 6 ft diameter 6 ft deep 4 ft stone surround

Assume stone voids = 0.45 percent

Radius of excavation = 7
 Infiltration area provided = 836 sf
 Infiltration volume provided = 1018 cf

Sustained infiltration rate = 13 cfm
 Time to fill structure = 243.1 min.
 Excess Runoff = 461 cf
 Time to Discharge Excess = 34.4 min.

LEACHING STRUCTURE SIZING

(BARNSTABLE METHOD)

Sheet 1 of 1

Job Description: Wildwood
 Job Number: 1292 Calculated by: _____
 Date: 5/29/2007 Checked by: _____

Structure Description: Leach Pit for Parking Lot for Building 14 & 16 & 17

Design Formula: $Q \text{ (cfm)} = I \times C \times A \times 60.5$
 Design Storm: 10 year

$I = 2.0$ in/hr

CA = 0.00 0.20 woods (ac)
 0.00 0.30 grass (ac)
 0.25 0.90 paved (ac)

CA = 0.23

Q = 27 cfm

Perc Rate: 8 min/in

Rounded Perc: 8 *
 Infiltration rate = 0.12 (copy from Table 1 for rounded perc)
 0.12 (next slower rate from Table 1)
 Weighted rate = 0.12 gal/sf/min
 = 0.016 cf/sf/min

TABLE 1	
perc rate min/in	allowable infiltration gal/sf/min
<2.0	0.5
4	0.25
6	0.17
8	0.12
10	no good

* (round perc rate down to nearest even number shown in Table 1)

Infiltration area required = 1697 sf

5 Pits: 6 ft diameter 6 ft deep 4 ft stone surround

Assume stone voids = 0.45 percent

Radius of excavation = 7
 Infiltration area provided = 2089 sf
 Infiltration volume provided = 2545 cf

Sustained infiltration rate = 34 cfm
 Time to fill structure = 243.1 min.
 Excess Runoff = 1152 cf
 Time to Discharge Excess = 34.4 min.

SITE AREAS

Parcel name: ROADWAY AREA

Perimeter: 1295.29 Area: 34,448 sq. ft. 0.79 acres

Parcel name: SITE AREA 1

Perimeter: 707.96 Area: 19,488 sq. ft. 0.45 acres

Parcel name: SITE AREA 2

Perimeter: 928.31 Area: 13,255 sq. ft. 0.30 acres

Parcel name: SITE AREA 3

Perimeter: 367.37 Area: 5,207 sq. ft. 0.12 acres

POND AREAS

Parcel name: POND 84

Perimeter: 155.65 Area: 1,766 sq. ft. 0.04 acres

Parcel name: POND 86

Perimeter: 225.30 Area: 3,194 sq. ft. 0.07 acres

Parcel name: POND 88

Perimeter: 372.29 Area: 6,071 sq. ft. 0.14 acres

Parcel name: POND 90

Perimeter: 411.39 Area: 8,205 sq. ft. 0.19 acres

Parcel name: POND 92

Perimeter: 442.35 Area: 10,244 sq. ft. 0.24 acres

Parcel name: POND 94

Perimeter: 476.30 Area: 12,162 sq. ft. 0.28 acres

WILDWOOD - POND

Type III 24-hr 25 YEAR Rainfall=5.70"

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Subcatchment 1S: SITE

Runoff = 2.81 cfs @ 12.06 hrs, Volume= 0.528 af, Depth> 3.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 1.00 hrs
Type III 24-hr 25 YEAR Rainfall=5.70"

Area (sf)	CN	Description
34,448	98	Paved roads w/curbs & sewers
19,488	69	50-75% Grass cover, Fair, HSG B
13,255	69	50-75% Grass cover, Fair, HSG B
5,207	69	50-75% Grass cover, Fair, HSG B
72,398	83	Weighted Average
37,950		Pervious Area
34,448		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0200	0.11		Sheet Flow, OVERLAND Grass: Dense n= 0.240 P2= 3.60"
1.0	135	0.0200	2.28		Shallow Concentrated Flow, OVERLAND Unpaved Kv= 16.1 fps
2.6	500	0.0250	3.21		Shallow Concentrated Flow, ROADWAY Paved Kv= 20.3 fps
11.3	685	Total			

Pond 1P: EXISTING POND

Inflow Area = 1.662 ac, Inflow Depth > 3.81" for 25 YEAR event
Inflow = 2.81 cfs @ 12.06 hrs, Volume= 0.528 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 1.00 hrs
Peak Elev= 89.32' @ 24.00 hrs Surf.Area= 7,444 sf Storage= 22,913 cf

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

Volume #1	Invert	Avail.Storage	Storage Description		
	84.00'	69,015 cf	SURFACE AREA (Conic) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
84.00	1,766	0	0	1,766	
86.00	3,194	4,890	4,890	3,236	
88.00	6,071	9,112	14,002	6,152	
90.00	8,205	14,223	28,225	8,368	
92.00	10,244	18,411	46,636	10,518	
94.00	12,162	22,379	69,015	12,577	