

## **Groundwater Recharge Calculations**



## Recharge Volume Calculations

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Job: SM-92

Calculated by: JTM

Date: 7/27/2016

### P4

Soils: Deerfield Loamy Sand

Hydrologic Group: B

Required Recharge Volume

0.35 inches of runoff x impervious area

Impervious area: 0.02 acres  
980 s.f.

### Required Recharge Volume (Rv)

$$Rv = 980 \text{ s.f.} \times \frac{0.35}{12} = 29 \text{ c.f.}$$

### Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 0.5 ft  
K (saturated hydraulic conductivity): 1.02 inches/hour  
0.085 feet/hour  
T (time): 2 hours  
A = 348 s.f.  
Voids = 0.40  
Volume of Chambers = 176  
Rv = 305 c.f. > 29 c.f.

### 72 Hour Drawdown

$$Rv / (K \times \text{Bottom Area}) = 1.10 \text{ Hours}$$

**1.10 < 72 hours O.K.**

### Roof Drywell

Soils: Deerfield Loamy Sand

Hydrologic Group: B

Required Recharge Volume

0.35 inches of runoff x impervious area

Impervious area: 0.10 acres

4,236 s.f.

### Required Recharge Volume (Rv)

$$Rv = 4,236 \text{ s.f.} \times \frac{0.35}{12} = 124 \text{ c.f.}$$

### Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 1 ft  
K (saturated hydraulic conductivity): 1.02 inches/hour  
0.085 feet/hour  
T (time): 2 hours  
A = 480 s.f.  
Voids = 0.40  
Volume of Chambers = 551  
Rv = 824 c.f. > 124 c.f.

### 72 Hour Drawdown

$$Rv / (K \times \text{Bottom Area}) = 1.76 \text{ Hours}$$

**1.76 < 72 hours O.K.**

## **TSS Removal Calculations**



**INSTRUCTIONS:**

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Non-automated: Mar. 4, 2008

Location:

A BMP <sup>1</sup>	B TSS Removal Rate <sup>1</sup>	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
VortSentry HS 36	91.5%	1.00	0.92	0.08
Stormtech subsurface Structure	80%	0.08	0.06	0.02

**Total TSS Removal =**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project:   
 Prepared By:   
 Date:

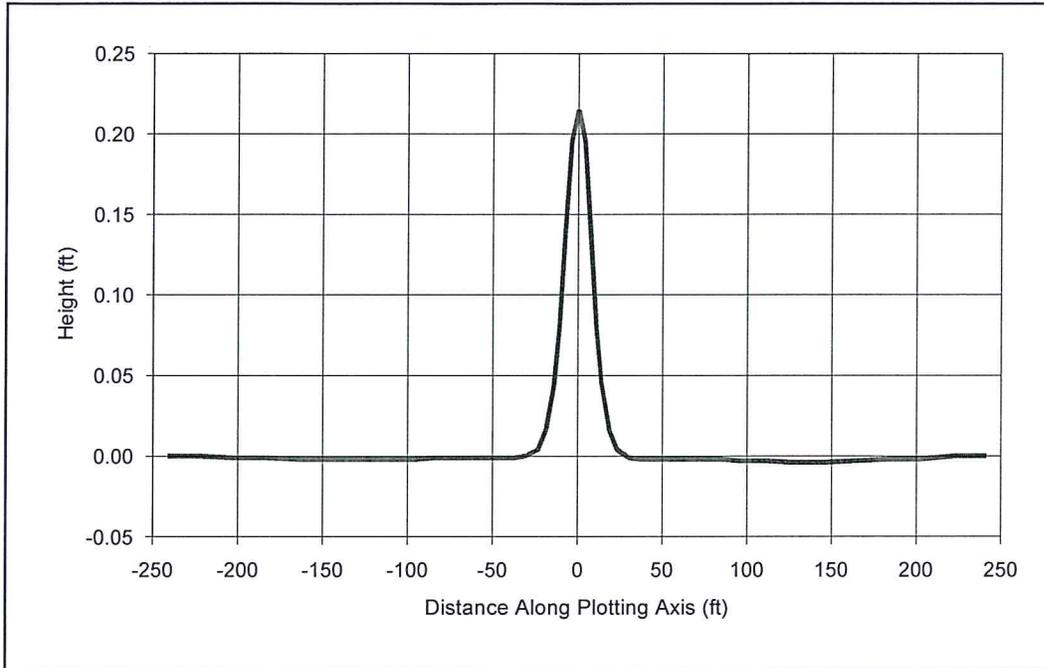
\*Equals remaining load from previous BMP (E) which enters the BMP



## **Groundwater Mounding Calculations**



## Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: 92 Inf Area 1

ANALYST: James Melvin

DATE: 7/28/2016 TIME: 12:58:31 PM

**INPUT PARAMETERS**

Application rate: 0.12 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.35

Hydraulic conductivity: 2.04 ft/day

Initial saturated thickness: 10 ft

Length of application area: 23.36 ft

Width of application area: 14.9 ft

Constant head boundary used at: 240 ft

Plotting axis from Y-Axis: 90 degrees

Edge of recharge area:

positive X: 7.4 ft

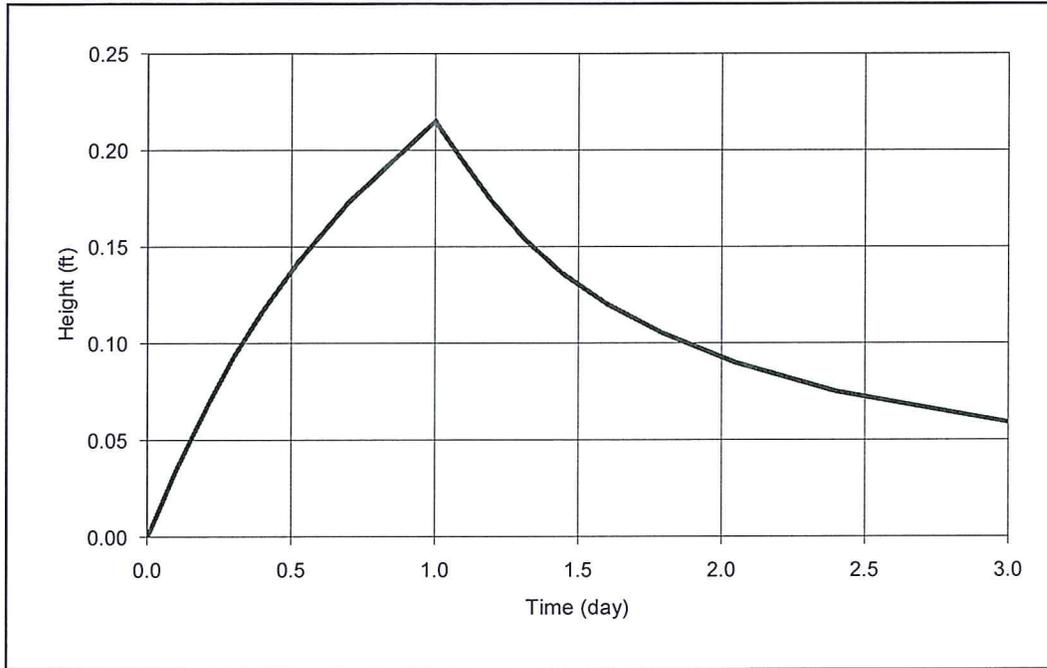
positive Y: 0 ft

Total volume applied: 41.76768 c.ft

**MODEL RESULTS**

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-240	0	-240	0
-201.8	0	-202	0
-163.7	0	-164	0
-125.5	0	-125	0
-95.5	0	-95	0
-72.2	0	-72	0
-53.2	0	-53	0
-37.2	0	-37	0
-23.3	0	-23	0
-13.9	0	-14	0.04
-7.6	0	-8	0.14
0	0	0	0.22
7.6	0	8	0.14
13.9	0	14	0.04
23.3	0	23	0
37.2	0	37	0
53.2	0	53	0
72.2	0	72	0
95.5	0	95	0
125.5	0	125	0
163.7	0	164	0
201.8	0	202	0
240	0	240	0

## Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: 92 Inf Area 1

ANALYST: James Melvin

DATE: 7/28/2016 TIME: 12:58:43 PM

### INPUT PARAMETERS

Application rate: 0.12 c.ft/day/sq. ft

Duration of application: 1 day

Total simulation time: 3 day

Fillable porosity: 0.35

Hydraulic conductivity: 2.04 ft/day

Initial saturated thickness: 10 ft

Length of application area: 23.36 ft

Width of application area: 14.9 ft

Constant head boundary used at: 240 ft

Groundwater mounding @

X coordinate: 0 ft

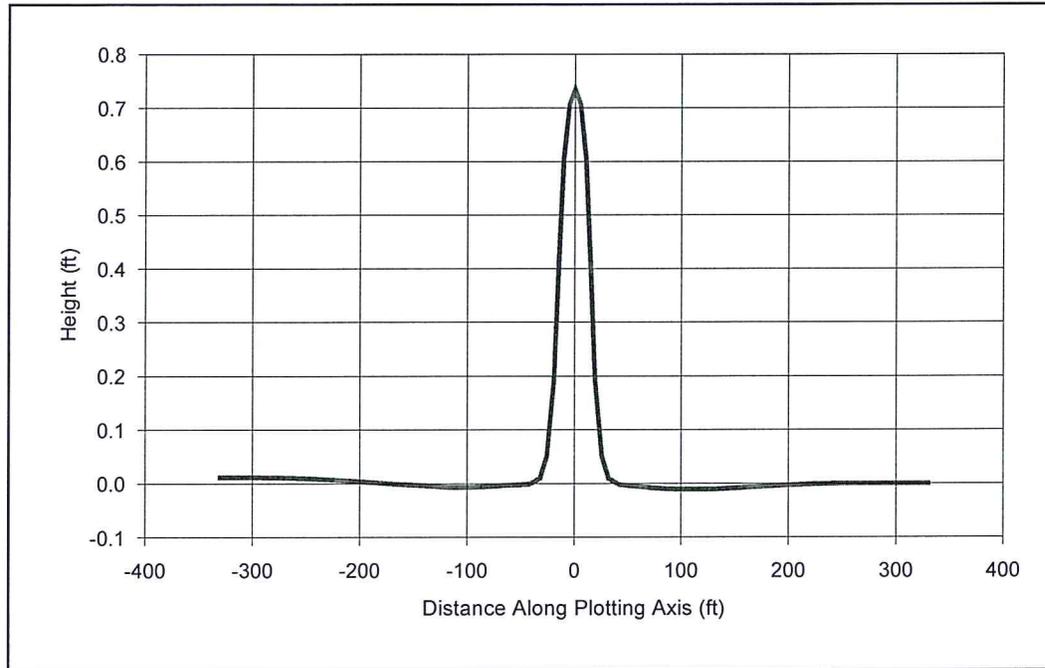
Y coordinate: 0 ft

Total volume applied: 41.76768 cft

### MODEL RESULTS

Time (day)	Mound Height (ft)
0	0
0	0
0	0.02
0.1	0.03
0.2	0.05
0.2	0.07
0.3	0.09
0.4	0.12
0.5	0.14
0.7	0.17
1	0.22
1	0.21
1.1	0.2
1.2	0.17
1.3	0.15
1.4	0.14
1.6	0.12
1.8	0.1
2	0.09
2.4	0.08
3	0.06

## Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: 92 Roof Drywell

ANALYST: James Melvin

DATE: 7/28/2016 TIME: 1:00:14 PM

### INPUT PARAMETERS

Application rate: 0.37 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.35

Hydraulic conductivity: 2.04 ft/day

Initial saturated thickness: 10 ft

Length of application area: 30.48 ft

Width of application area: 15.75 ft

Constant head boundary used at: 330 ft

Plotting axis from Y-Axis: 0 degrees

Edge of recharge area:

positive X: 0 ft

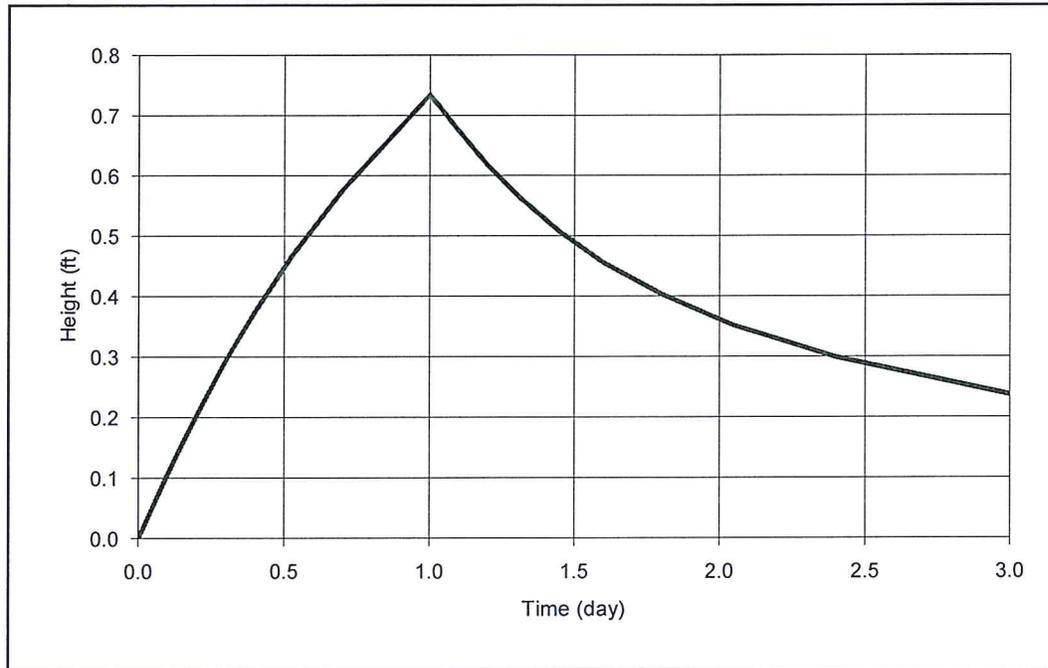
positive Y: 15.2 ft

Total volume applied: 177.6222 c.ft

### MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
0	-330	-330	0.01
0	-277.5	-278	0.01
0	-225	-225	0.01
0	-172.6	-173	0
0	-131.3	-131	0
0	-99.3	-99	-0.01
0	-73.2	-73	0
0	-51.1	-51	0
0	-32	-32	0.01
0	-19.1	-19	0.19
0	-10.4	-10	0.6
0	0	0	0.73
0	10.4	10	0.6
0	19.1	19	0.19
0	32	32	0.01
0	51.1	51	0
0	73.2	73	-0.01
0	99.3	99	-0.01
0	131.3	131	-0.01
0	172.6	173	-0.01
0	225	225	0
0	277.5	278	0
0	330	330	0

## Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: 92 Roof Drywell

ANALYST: James Melvin

DATE: 7/28/2016 TIME: 1:00:22 PM

### INPUT PARAMETERS

Application rate: 0.37 c.ft/day/sq. ft

Duration of application: 1 day

Total simulation time: 3 day

Fillable porosity: 0.35

Hydraulic conductivity: 2.04 ft/day

Initial saturated thickness: 10 ft

Length of application area: 30.48 ft

Width of application area: 15.75 ft

Constant head boundary used at: 330 ft

Groundwater mounding @

X coordinate: 0 ft

Y coordinate: 0 ft

Total volume applied: 177.6222 cft

### MODEL RESULTS

Time (day)	Mound Height (ft)
0	0
0	0.01
0	0.05
0.1	0.1
0.2	0.16
0.2	0.22
0.3	0.3
0.4	0.37
0.5	0.46
0.7	0.58
1	0.73
1	0.72
1.1	0.68
1.2	0.62
1.3	0.56
1.4	0.51
1.6	0.46
1.8	0.4
2	0.35
2.4	0.3
3	0.24

**STAMSKI AND McNARY, INC.**

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TEL (978) 263-8585  
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JOB SM 92 JOYLWILDE FARM

SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

CALCULATED BY JTM DATE 7/27/16

CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

SCALE \_\_\_\_\_

RATE OF APPLICATION

INF. AREA

WATER QUALITY VOLUME

$$480 \times \frac{5}{12} = 40.83 \text{ C.F.}$$

$$\text{APPLICATION RATE} = \frac{40.83}{(23.36 \times 14.9)} = \frac{40.83}{348} = 0.12$$

ROOF DRYWELL

WATER QUALITY VOLUME

$$4236 \times \frac{5}{12} = 176.5 \text{ C.F.}$$

$$\text{APPLICATION RATE} = \frac{176.5}{(30.48 \times 15.75)} = \frac{176.5}{480} = 0.37$$



## **Storm Sewer Design**







Closed Drainage System

SM-92

1 of 1

Project: 362-364 Central Street

By JTM Date 7/27/2016

Location: Acton, MA

Checked \_\_\_\_\_ Date \_\_\_\_\_

Rational Method

Q = peak flow rate, (cfs)

i = rainfall intensity inches/hour

C = runoff coefficient,

A = area (ac)

C = 0.90 impervious

C = 0.20 landscaped / grass

C = 0.15 woods

Line Drain

Surface Cover	A (ac)	C	Product A x C
impervious	0.02	0.9	0.018
lands/grass	0.00	0.2	0
woods	<u>0</u>	0.15	<u>0</u>
sum =	0.02	sum =	0.018

C = 0.90 = total product / total area

DMH-1

Surface Cover	A (ac)	C	Product A x C
Line Drain	0.02	0.90	0.018
	<u>0.02</u>		<u>0.000</u>
sum =	0.02	sum =	0.018

C = 0.90 = total product / total area



## **Soil Evaluation**



Location Address or Lot No. Central St Gas Station next to  
Boysville

**On-site Review**

Deep Hole Number \_\_\_\_\_ Date: 5/21 Time: 10<sup>am</sup> TP SM-1  
Weather hot clear  
Location (identify on site plan) \_\_\_\_\_  
Land Use \_\_\_\_\_ Slope (%) Flat Surface Stones none  
Vegetation grass  
Landform \_\_\_\_\_  
Position on landscape (sketch on the back) \_\_\_\_\_  
Distances from:

Open Water Body 7100 feet Drainage way 7100 feet  
Possible Wet Area 7100 feet Property Line 20<sup>±</sup> feet  
Drinking Water Well 7100 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)
0-12	Ap	Sandy loam	10YR 3/2	-	
12-24	Bw	Sandy loam	10YR 5/6	-	
24-48	C <sub>1</sub>	Loamy Sand	10YR 6/3	-	
48-80	C <sub>2</sub>	Sandy loam	10YR 6/2	-	
	- Refus -	80"		many mottles below 3'	many boulders - friable see page 4-6

\* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) \_\_\_\_\_ Depth to Bedrock: \_\_\_\_\_  
Depth to Groundwater: Standing Water in the Hole: \_\_\_\_\_ Weeping from Pit Face: \_\_\_\_\_  
Estimated Seasonal High Ground Water: \_\_\_\_\_



Monitoring well  
5'-4" in front of  
building

2100

Location Address or Lot No. \_\_\_\_\_

**On-site Review**

Deep Hole Number 2 Date: 5/21 Time: 10:30 Weather hot clear  
 Location (identify on site plan) \_\_\_\_\_  
 Land Use \_\_\_\_\_ Slope (%) \_\_\_\_\_ Surface Stones \_\_\_\_\_  
 Vegetation \_\_\_\_\_  
 Landform \_\_\_\_\_  
 Position on landscape (sketch on the back) \_\_\_\_\_  
 Distances from:  
 Open Water Body \_\_\_\_\_ feet Drainage way \_\_\_\_\_ feet  
 Possible Wet Area \_\_\_\_\_ feet Property Line \_\_\_\_\_ 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)
0-5"	A	loys 4/3	Sandy brown		
5-20	Bw	loys 5/3	"		
20-48	C	loys 4/3	"	mottling 4/6 <sup>11</sup>	boulders & cobbles some fill
	Refusal	- don't go beyond well		monotony	@ end of hole Friable
	Refusal @ 68"				monotony in well 4 WL = 57"

\* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) \_\_\_\_\_ Depth to Bedrock: \_\_\_\_\_

Depth to Groundwater: Standing Water in the Hole: \_\_\_\_\_ Weeping from Pit Face: \_\_\_\_\_

Estimated Seasonal High Ground Water: \_\_\_\_\_



DEP APPROVED FORM - 12/07/95

3-0" bottom

Per next to TP 2  
 begin soak 9:55  
 begin test 10:10 12"  
 10:39 9"  
 11:20 6"  
 2:0

14"  
 37 41  
 2

# **Operation and Maintenance Manual**



**Schedule for Inspection and Maintenance:**

**Contech Proprietary BMP: (DMH-1)**

Inspection and maintenance of the unit can be performed from the surface, without entry into the unit. Perform maintenance a minimum of twice per year. The unit should be cleaned once the sediment has reached a depth of 75% of the sump in the chamber. Perform frequent inspections during the first year of installation to accurately establish the maintenance schedule.

Remove oil and sediment through the manhole cover with the use of a vacuum truck. Disposal from the unit is similar to that of any other best management practice (BMP). Consult local guidelines or your Contech area marketing manager prior to disposing the separator contents.

**Subsurface Structures:**

Inspect the chambers after every major storm for the first few months to ensure proper stabilization and function. Thereafter, inspect and clean at least twice per year. Any debris that may clog the system shall be removed. Water levels should be recorded over several days to check the drywell drainage. If chambers cannot be cleaned they may have to be re-installed.

**Interceptor Line Drain:**

Inspect the interceptor line drain after every major storm for the first few months to ensure proper stabilization and function. Thereafter, inspect and clean at least once per year. Water levels should be recorded over several days to check the line drain drainage.

**Emergency Contacts:**

In the event of a hazardous materials spill on the site the following parties shall be contacted:

Fire Department: ph: 978-264-9645

**Records:**

The responsible parties shall maintain an inspection log of all elements of the storm water management plan. The responsible parties shall maintain a maintenance log documenting the inspection and maintenance of the drainage structures under his control. A copy of the erosion control and storm water maintenance plan and inspection logs shall be kept onsite at all times.

**Responsibility Party:**

The current Owner shall be responsible for all inspection and maintenance of the items.

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**362-364 Central St**  
Operation and Maintenance Inspection Log

Year: \_\_\_\_\_

<b>Subsurface Drainage Structure</b>	<b>Once per year</b>
<b>Contech Units</b>	<b>Two times per year</b>
<b>Interceptor Line Drain</b>	<b>Once per year</b>

**Contech Units (DMH 1)**

Previous Inspection Date: \_\_\_\_\_  
Inspection Date: \_\_\_\_\_  
Inspector Name: \_\_\_\_\_  
Comments:

Action Required:

**Subsurface Drainage Structure**

Previous Inspection Date: \_\_\_\_\_  
Inspection Date: \_\_\_\_\_  
Inspector Name: \_\_\_\_\_  
Comments:

Action Required:

**Interceptor Line Drain:**

Previous Inspection Date: \_\_\_\_\_  
Inspection Date: \_\_\_\_\_  
Inspector Name: \_\_\_\_\_  
Comments:

Action Required:

## **Drainage Maps**



**3.7 WATER BALANCE CALCULATIONS**  
**for**  
**362-364 Central Street**  
**Acton, MA**

**PREPARED FOR:**

**Idylwilde Farm, Inc.**  
**366 Central Street**  
**Acton, MA 01720**

**PREPARED BY:**

**Stamski and McNary, Inc.**  
**1000 Main Street**  
**Acton, MA 01720**

**Engineering-Planning-Surveying**



## Water Balance Calculations

SM-92

Project: 92 Central Street

By: JTM

Date: 7/27/2016

Location: Acton MA

Checked:

Date:

### Pre-Development Recharge

CN= 88.1  
From Figure 1, infiltration= 12.5 in/year  
Drainage Area= 163,350 s.f.

Recharge= 163,350 x 12.5 /12 in/ft 170,156 c.f./year

### Pre-Development Sewage Flow

Leaching Area= 2,343 gpd  
Total Design Flow= 2,343 gpd

2,343 gpd x 365 days/year x 0.134 s.f./gal = 114,316 c.f./year  
Average(50%)= 57,158 c.f./year

### Post-Development Recharge

CN= 88.8  
From Figure 1, infiltration= 12 in/year  
Drainage area= 163,350 s.f.

Recharge= 163,350 x 12 /12 in/ft 163,350 c.f./year

### Post-Development Sewage Flow

Leaching Area= 2,988 gpd  
Total Design Flow= 2,988 gpd

2,988 gpd x 365 days/year x 0.134 s.f./gal = 145,785 c.f./year  
Average(50%)= 72,893 c.f./year

### Post-Development Subsurface Infiltration

CN= 98.0  
From Figure 1, runoff= 13 in/year (directed to drywells)  
Impervious Area 5,306 s.f.

Recharge= 5,306 x 13 /12 in/ft 5,748 c.f./year

**Post-Development Vs. Pre-Development**

241,991 > 227,314

c.f./year c.f./year





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JOB \_\_\_\_\_

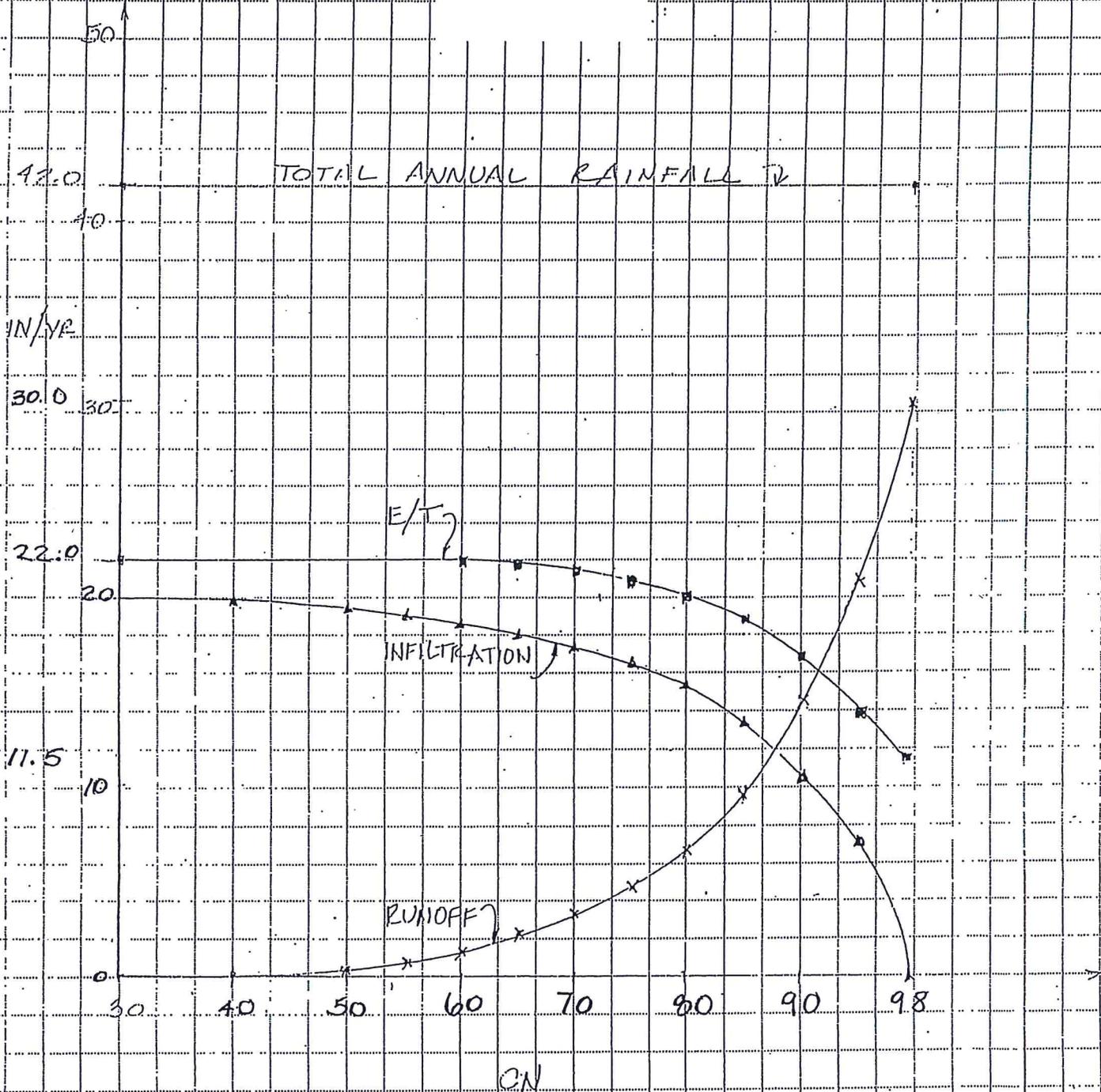
SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

CALCULATED BY \_\_\_\_\_ DATE \_\_\_\_\_

CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

SCALE \_\_\_\_\_

**Figure 1**



NOTE: GRAPH COMPILED FROM DATA PUBLISHED BY NOAA (1984-1988)  
(SEE REPORT FROM STAMSKI & McNARY INC. SUBMITTED W/ TOWN OF ACTON ENG. DEPT.)

**3.8 EARTH REMOVAL CALCULATIONS**  
**for**  
**362-364 Central Street**  
**Acton, MA**

**PREPARED FOR:**

**Idylwilde Farm, Inc.**  
**366 Central Street**  
**Acton, MA 01720**

**PREPARED BY:**

**Stamski and McNary, Inc.**  
**1000 Main Street**  
**Acton, MA 01720**

**Engineering-Planning-Surveying**



# Cut/Fill Report

**Generated:** 2016-07-28 12:27:07  
**By user:** James.melvin  
**Drawing:** Z:\0-1000\0092\CAD DRAWINGS\CIVIL 3D\Z:\0-1000\0092\CAD  
 DRAWINGS\CIVIL 3D\92.SITE1 cut fill.dwg

Volume Summary							
Name	Type	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Surface1	full	1.000	1.000	11871.36	624.82	114.14	510.67<Cut>

Totals				
	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Total	11871.36	624.82	114.14	510.67<Cut>

\* Value adjusted by cut or fill factor other than 1.0



## **3.9 PLANS**

Attached plans include: Title Sheet, Existing Conditions Plan, Layout Plan,  
Grading plan, Drainage & Utilities Plan, Detail Sheet  
- By: Stamski & McNary, Inc.

Architectural Plans- By E.J. Rempelakis Associates



**FULL SIZE  
PLANS**



## **FLOOR PLANS**



**3.9.10**  
**Lighting Plan**



### **Lighting Plan**

The existing site currently has 21 lights. The proposed work will not require more than 5 lights. The proposed lighting for the food preparation building will not increase the total site lighting by more than 25%, therefore, a lighting plan is not required.



### **3.10 Traffic Study**



### **Traffic Study**

The proposed building will produce a maximum of 6.2 trips during a peak hour and 29.7 trips during a weekday. Since the proposed development will produce less than 30 trips in a peak hour and less than 400 trips on a weekday, this project is not subject to a traffic impact study. The calculations were made based on Manufacturing listed in the ITE Trip Generation Manual, 9<sup>th</sup> Edition, Volume 2.

**STAMSKI AND McNARY, INC.**

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TEL (978) 263-8585  
FAX (978) 263-9883

JOB SM-92 IDYLWILDE FARM

SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

CALCULATED BY JTM DATE 7/29/16

CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

SCALE \_\_\_\_\_

TRAFFIC STUDY CALCULATIONS

GROSS FLOOR AREA OF BUILDING = 7773 S.F.

MANUFACTURING

3.82 TRIPS PER DAY PER 1000 S.F. OF GFA

$$7773 \times \frac{3.82}{1000} = 29.7 \text{ TRIPS/DAY}$$

29.7 TRIPS < 400 TRIPS

0.79 TRIPS PER 1000 S.F. OF GFA PEAK HOUR

$$7773 \times \frac{0.79}{1000} = 6.2 \text{ TRIPS PEAK HOUR}$$

6.2 TRIPS < 30 TRIPS

★ NUMBERS BASED ON ITE TRIP GENERATION  
MANUAL 9TH EDITION, VOLUME 2