3.14 Water Balance Calculations

Water Balance Calculations

SM-3283B

Project: Residences at Quail Ridge By GD Date 07/16/07

Location: Acton, MA Checked JEM Date

Pre-development recharge

CN= 61.9
From Figure 1, infiltration= 19.30 in./year
Drainage Area= 7,567,243 s.f. (includes offsite area for simplicicty)

Recharge= 7,567,243 x 19.30 /12 in/ft = 12,170,649 c.f./year

Post-development recharge

CN= 67.0
From Figure 1, infiltration= 16.00 in./year
Drainage Area= 7,567,243 s.f.

Recharge= 7,567,243 x 16.00 /12 in/ft = 10,089,658 c.f./year

Irrigation (32.8+/- ac to irrigate) 1,428,768 sf x 16 weeks x 0.04 ft/week = 914,412 cf/year

685,809 cf/year
w/25% deep infiltration (DEP SMP)

Difference to Recharge= 12,170,649 - 10,089,658 + 685,809 = 2,766,801 c.f./year must be recharged

Sewage flow 30,000 gpd x 365 days/year x 0.134 cf/gal = 1,463,904 cf/year

Stormwater Recharge from calculations = 1,325,378 cf/year

TOTAL = 2,789,281 cf/year

2,789,281 cf/year > 2,766,801 cf/year OK

Overall CN Calculations

SM-3286B

Project: Residences at Quail Ridge By GD Date 07/16/07

Location: Acton, MA Checked JEM Date

Pre-development CN

suubcatchment	Area (acres)	CN	Product
1	18.62	60.5	1126.4
2	10.69	61.3	655.27
3	14.69	59.47	873.6
4	3.62	59.92	216.92
5	9.50	63.39	602.16
6	17.66	64.24	1134.44
7	18.74	57.24	1072.61
8	7.73	56.66	438.02
9	33.53	65.34	2190.95
10	10.90	65.41	712.99
11	25.21	61.28	1544.84
12	2.83	66.82	189.1
	173.72		10757.30

Overall CN: 61.9

Post-development CN

suubcatchment	Area (acres)	CN	PRODUCT
1	37.62	66.3	2494.99
2	10.59	64.9	687.74
3	8.68	59.4	515.35
4	8.08	57.8	467.07
5	1.97	69.5	136.95
6	3.21	64.3	206.37
7	1.40	73.7	103.14
8	3.97	72.0	286.03
9	2.64	74.6	196.98
10	2.00	74.0	147.9
11	4.53	76.5	346.63
12	1.04	78.8	81.94
13	4.11	79.6	327.3
14	3.44	63.0	216.61
15	4.01	79.5	318.73
16	4.57	79.3	362.35
17	1.53	75.8	115.9
18	4.37	63.0	275.46
19	13.95	62.6	872.59
20	9.56	61.0	583.08
21	4.31	62.5	269.26
22	1.68	70.3	118.02
23	20.8	61.6	1280.74
24	2.57	72.2	185.58
SUB 25 ROOFS	0.66	98.0	64.68
26	5.48	79.1	433.74
27	1.53	82.1	125.58
28	1.85	75.0	138.82
29	0.75	85.8	64.38
30	0.11	94.6	10.41
31	1.36	65.9	89.62
32	0.23	70.7	16.261
33	0.23	98.0	22.54
34	0.15	90.6	13.59
35	0.11	74.5	8.19
36	0.09	85.7	7.71
SUB 24 ROOFS	0.08	98.0	7.84
SUB 29 ROOFS	0.06	98.0	5.88
SUB 26 ROOFS	0.07	98.0	6.86
SUB 7 ROOFS	0.07	98.0	6.86
SUB 12 ROOFS	0.08	98.0	7.84
SUB 17 ROOFS	0.1	98.0	9.8
SUB 18 ROOFS	0.08	98.0	7.84
	173.72		11645.15

Overall CN: 67.0

Project: Residences at Quail Ridge By GD Date 07/16/07

Location: Acton, MA Checked JEM Date 07/17/06

INFILTRATION OF ROOF RUNOFF:

Area of roofs being infiltrated for 100 year storm:	23,522 sf	
Runoff from Roofs (CN=98):	30.5 in/year	
Total Runoff from roofs being infiltrated:	59,786 cf/year	

INFILTRATION IN BASINS:

BASIN 12:

Subcatchement Area:	45,302 sf	
Subcatchement CN:	78.8	
Infiltration volume for 1 year storm (2.6 in):	1,409 cf	(from Hydrology)
Depth of runoff over drainage area:	0.37 in	
Rainfall to generate Runoff:	1.74 in	(TR55)
% of Annual rainfall Infiltrated:	80 %	(figure 2)
From Graph 1, Annual runoff :	6 in/year	
Annual Runoff x %infiltrated x Area =	18,121 cf/year	

BASIN 16:

Subcatchement Area:	199,089 sf	
Subcatchement CN:	79.3	
Infiltration volume for 1 year storm (2.6 in):	9,255 cf	(from Hydrology)
Depth of runoff over drainage area:	0.56 in	
Rainfall to generate Runoff:	2.05 in	(TR55)
% of Annual runoff Infiltrated:	68 %	(figure 2)
From Graph 1, Annual runoff :	6.4 in/year	
Annual Runoff x %infiltrated x Area =	93,430 cf/year	

BASIN 22:

Subcatchement Area:	272,250 sf	
Subcatchement CN:	76.9	
Infiltration volume for 1 year storm (2.6 in):	7,533 cf	(from Hydrology)
Depth of runoff over drainage area:	0.33 in	
Rainfall to generate Runoff:	2.2 in	(TR55)
% of Annual runoff Infiltrated:	90 %	(figure 2)
From Graph 1, Annual runoff :	5.4 in/year	
Annual Runoff x %infiltrated x Area =	110,261 cf/year	

BASIN 27:

Subcatchement Area:	66,647 sf	
Subcatchement CN:	82.1	
Infiltration volume for 1 year storm (2.6 in):	3,121 cf	(from Hydrology)
Depth of runoff over drainage area:	0.56 in	
Rainfall to generate Runoff:	1.85 in	(TR55)
% of Annual runoff Infiltrated:	83 %	(figure 2)
From Graph 1, Annual runoff :	7.6 in/year	
Annual Runoff x %infiltrated x Area =	35,034 cf/year	

BASIN 29:

Subcatchement Area:	32,670 sf	
Subcatchement CN:	85.8	
Infiltration volume for 1 year storm (2.6 in):	1,284 cf	(from Hydrology)
Depth of runoff over drainage area:	0.47 in	
Rainfall to generate Runoff:	1.47 in	(TR55)
% of Annual runoff Infiltrated:	75 %	(figure 2)
From Graph 1, Annual runoff :	10 in/year	
Annual Runoff x %infiltrated x Area =	20,419 cf/year	

BASIN 20:

Subcatchement Area:	416,434 sf	
Subcatchement CN:	61.0	
Infiltration volume for 1 year storm (2.6 in):	8,090 cf	(from Hydrology)
Depth of runoff over drainage area:	0.23 in	
Rainfall to generate Runoff:	2.6 in	(TR55)
% of Annual runoff Infiltrated:	100 %	(figure 2)
From Graph 1, Annual runoff :	1.4 in/year	
Annual Runoff x %infiltrated x Area =	48,584 cf/year	

BASIN 21:

Subcatchement Area:	187,744 sf	
Subcatchement CN:	62.5	
Infiltration volume for 1 year storm (2.6 in):	1,165 cf	(from Hydrology)
Depth of runoff over drainage area:	0.07 in	
Rainfall to generate Runoff:	1.9 in	(TR55)
% of Annual runoff Infiltrated:	85 %	(figure 2)
From Graph 1, Annual runoff :	1.8 in/year	
Annual Runoff x %infiltrated x Area =	23,937 cf/year	

Project: Residences at Quail Ridge By GD Date 07/16/07

Location: Acton, MA Checked JEM Date 07/17/07

Pond 3

Subcatchement Area:	378,101	sf	
Subcatchement CN:	59.4		
Infiltration volume for 1 year storm (2.6 in):	6,101	cf	(from Hydrology)
Depth of runoff over drainage area:	0.19	in	
Rainfall to generate Runoff:	2.6	in	(TR55)
% of Annual runoff Infiltrated:	100	%	(figure 2)
From Graph 1, Annual runoff :	2.6	in/year	
Annual Runoff x %infiltrated x Area =	81,922	cf/year	

BASINS ON COURSE:

Misc. Basins on Course:	Infiltration (CF)(1yea	Tributary Area* (SF)	CN	Depth of Runoff Over drain area (in) TR55*	Rainfall to gen runoff (in) (TR55)	% of Annual Runoff Infiltrated	From Graph 1 Annual runoff in/year	Annual Infiltration (in)
Subcatchement 1:	16,278	514,042	66.3	0.38	2.6	100	1.4	59,972
Subcatchement 2:	6,551	238,218	64.9	0.33	2.6	100	2.0	39,703
Subcatchement 8:	2,907	60,145	72.0	0.58	2.6	100	3.7	18,545
Subcatchement 18:	1,734	74,314	63.0	0.28	2.6	100	1.8	11,147
Subcatchement 19:	8,020	356,444	62.6	0.27	2.6	100	1.7	50,496

*Proportions tributary area to accomodate 2.6" storm

INFILTRATION TRENCHES:

Designed for 100 year storm (6.4 in Rain)	Subcatchment Area* (SF)	CN	% of Annual Runoff Infiltrated	From Graph 1 Annual runoff in/year	Annual Infiltration (in)
Subcatchement 30 IMP:	4,356	98.0	100	30.5	11,072
Subcatchement 30 OS:	436	61.0	100	1.4	51
Subcatchement 31:	59,242	65.9	100	2.4	11,848
Subcatchement 32:	10,019	70.7	100	3.4	2,839
Subcatchement 33:	10,019	98.0	100	30.5	25,464
Subcatchement 34:	6,534	90.6	100	15.0	8,168
Subcatchement 35:	4,792	74.5	100	4.6	1,837
Subcatchement 36 IMP:	2,614	98.0	100	30.5	6,643
Subcatchement 36 OS:	1,307	61.0	100	1.4	152
CB's ON QR DRIVE IMP:	67,082	98.0	100	30.5	170,501
CB's ON QR DRIVE OS:	50,094	61.0	100	1.4	5,844
CB54 IMP:	15,246	98.0	100	30.5	38,750
CB54 OS:	5,227	61.0	100	1.4	610

ADDITIONAL INFILTRATION OF ROOF RUNOFF:

Area of roofs being infiltrated for 1 year storm:	124,482	sf
Runoff from Roofs (CN=98):	30.5	in/year
Total Runoff from roofs being infiltrated:	316,392	cf/year

DECK INFILTRATION

AREA OF DECKS WITH CRUSHED STONE (OR PORCHES WITH DRIPEDGES)	21,187	sf
Runoff from Roofs (CN=98):	30.5	in/year
Total Runoff from roofs being infiltrated:	53,850	cf/year

Annual Infiltration of Stormwater in basins/trenches: 1,325,378 cf/year

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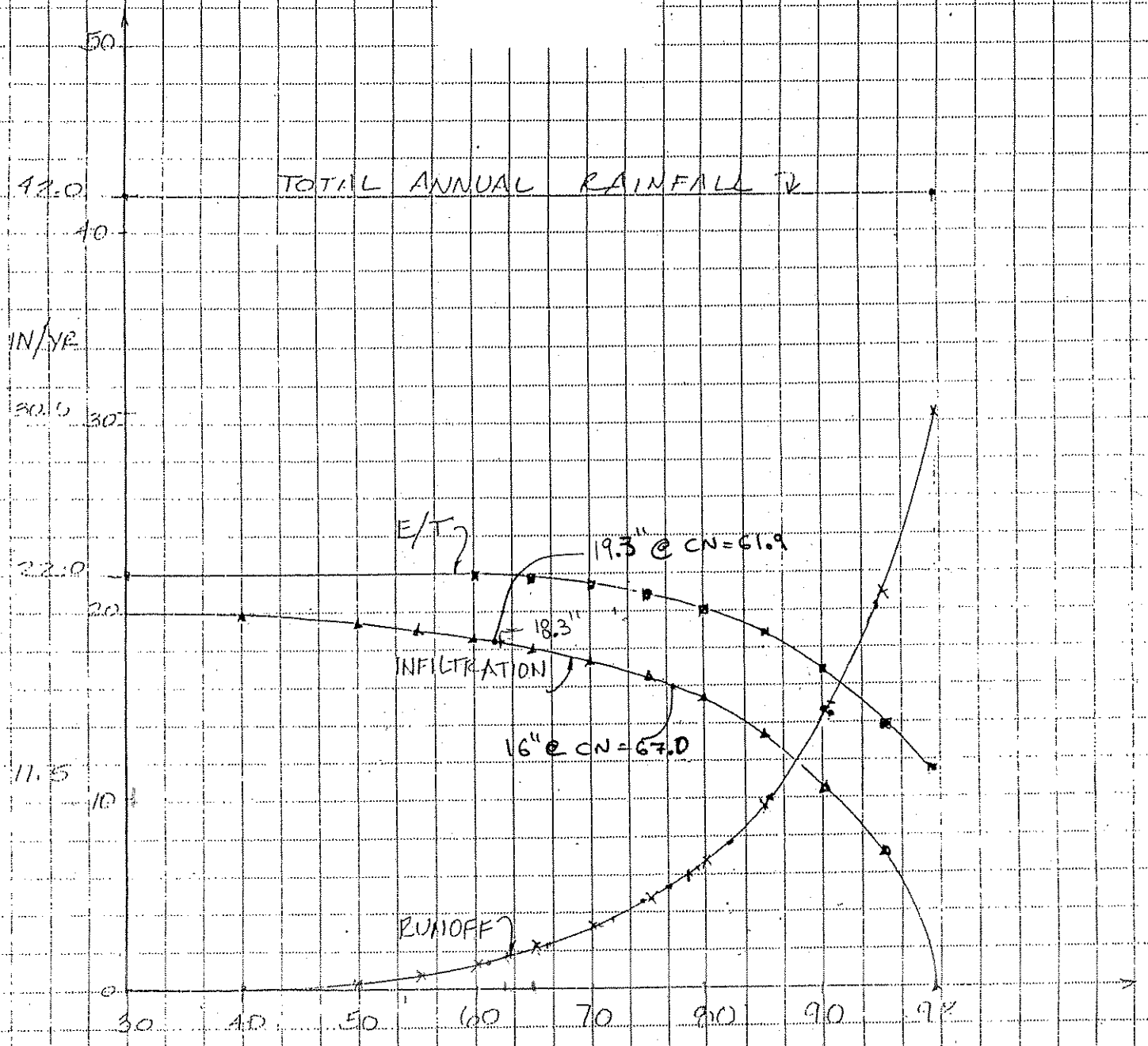
JOB
SHEET NO. OF
CALCULATED BY DATE
CHECKED BY DATE
SCALE

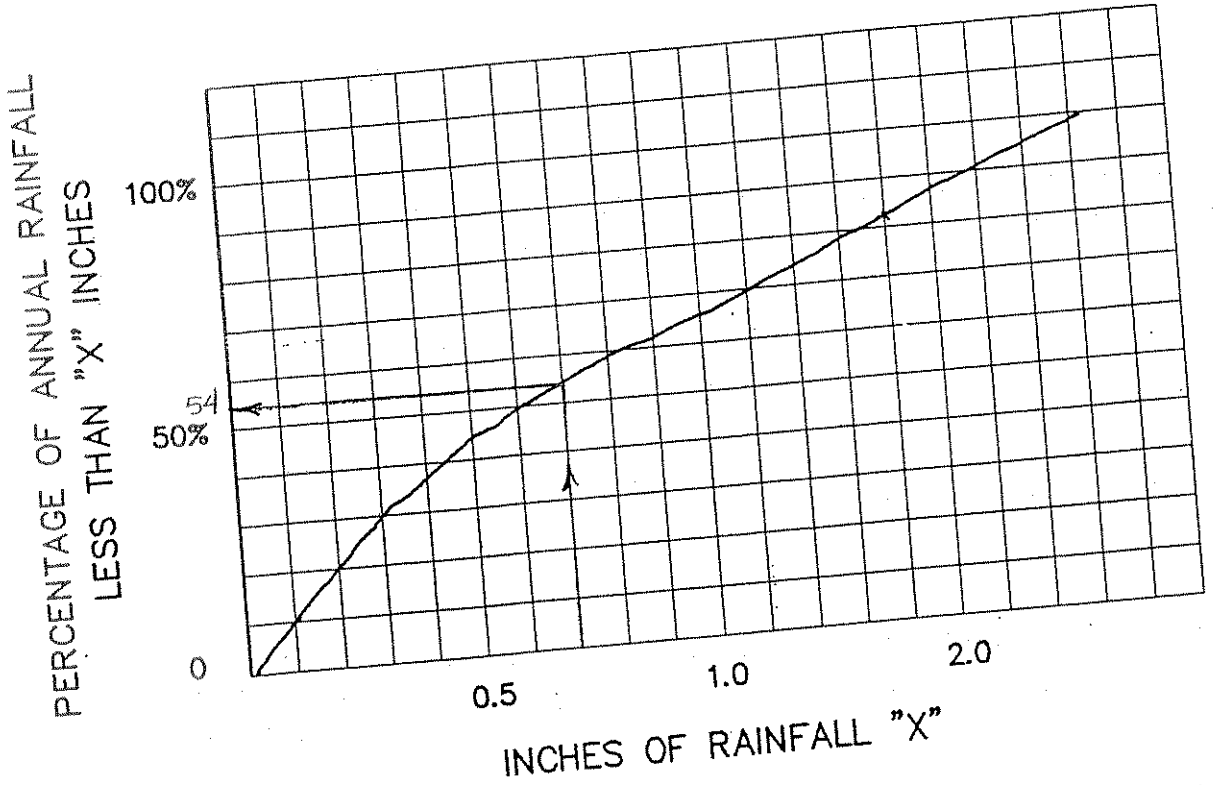
Figure 1



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

NOTE: GRAPH COMPILED FROM DATA PUBLISHED BY NOAA (1954-1955)
(SEE REPORT FROM STAMSKI & MCNARY INC. SUBMITTED TO TOWN OF ACTON ENG. DEPT.)

Figure 2



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