

Appendix G-5
SONIR Model Results, Alternative 3



SIMULATION OF NITROGEN IN RECHARGE (SONIR)

NELSON, POPE & VOORHIS, LLC MICROCOMPUTER MODEL

NAME OF PROJECT

The Hills at Southampton
Alternative 3 - East Quogue LUP

DATA INPUT FIELD

<i>A</i>	<i>Site Recharge Parameters</i>	<i>Value</i>	<i>Units</i>	<i>B</i>	<i>Nitrogen Budget Parameters</i>	<i>Value</i>	<i>Units</i>										
1	Area of Site	591.00	acres	1	Persons per Dwelling	2.50	persons										
2	Precipitation Rate	49.90	inches	2	Nitrogen per Person per Year	10.0	lbs										
3	Acreage of Rough/Res/Golf Landsc.	46.53	acres	3	a. Sanitary Nitrogen Leaching Rate	50%	percent										
4	Fraction of Land in above	0.079	fraction	3	b. Treated Sanitary Nitrogen Leaching Rate	90%	percent										
5	Evapotranspiration from above	23.00	inches	4	Fertilized Land (Golf Rough/Res/Golf Landsc.)	46.53	acres										
6	Runoff from above	0.35	inches	5	Fertilizer Application Rate (for above)	1.00	lbs/1000 sq ft										
7	Acreage of Greens/Tees/Fairways	42.00	acres	6	Fertilizer Nitrogen Leaching Rate (for above)	10%	percent										
8	Fraction of above	0.071	fraction	7	Fertilized Land (Greens/Tees/Fairways)	42.00	acres										
9	Evapotranspiration from above	23.90	inches	8	Fertilizer Application Rate (for above)	2.50	lbs/1000 sq ft										
10	Runoff from above	0.35	inches	9	Fertilizer Nitrogen Leaching Rate (for above)	10%	percent										
11	Acreage of Unvegetated/Dirt Roads	2.30	acres	10	Pet Waste Application Rate	3.19	lbs/pet										
12	Fraction of above	0.004	fraction	11	Pet Waste Nitrogen Leaching Rate	50%	percent										
13	Evapotranspiration from above	21.20	inches	12	Area of Land Irrigated	88.53	acres										
14	Runoff from above	1.05	inches	13	Irrigation Rate	24.00	inches										
15	Acreage of Water/Ponds/Wetlands	5.85	acres	14	Irrigation Nitrogen Leaching Rate	10%	percent										
16	Fraction of Site in above	0.010	fraction	15	Nitrogen in Precipitation	0.75	mg/l										
17	Evaporation from above	30.00	inches	16	Precipitation Nitrogen Leaching Rate	15%	percent										
18	Makeup Water (if applicable)	0.00	inches	17	Nitrogen in Water Supply	2.00	mg/l										
19	Acreage of Natural/Natural Reveg.	469.62	acres	18	Nitrogen in Sanitary Flow -1	50.00	mg/l										
20	Fraction of above	0.795	fraction	19	Nitrogen in Sanitary Flow -2	19.00	mg/l										
21	Evapotranspiration from above	23.00	inches	<table border="1"> <thead> <tr> <th><i>C</i></th> <th><i>Comments</i></th> </tr> </thead> <tbody> <tr> <td>1)</td> <td>Please refer to SONIR User Manual for data input instructions.</td> </tr> <tr> <td>Developed Area</td> <td>117.68 20%</td> </tr> <tr> <td>Natural/Unvegetated/Revegetated Area</td> <td>473.32 80%</td> </tr> <tr> <td>Total Acreage Check</td> <td>591.00 100%</td> </tr> </tbody> </table>				<i>C</i>	<i>Comments</i>	1)	Please refer to SONIR User Manual for data input instructions.	Developed Area	117.68 20%	Natural/Unvegetated/Revegetated Area	473.32 80%	Total Acreage Check	591.00 100%
<i>C</i>	<i>Comments</i>																
1)	Please refer to SONIR User Manual for data input instructions.																
Developed Area	117.68 20%																
Natural/Unvegetated/Revegetated Area	473.32 80%																
Total Acreage Check	591.00 100%																
22	Runoff from above	0.35	inches														
23	Acreage of Impervious/Paved/Bldgs	23.30	acres														
24	Fraction of Land in above	0.039	fraction														
25	Evapotrans. from above	4.99	inches														
26	Runoff from Impervious	0.00	inches														
23	Acreage of Other (Rain Gardens)	1.40	acres														
24	Fraction of Land in above	0.061	fraction														
25	Evapotrans. from above	30.00	inches														
26	Runoff from above	0.00	inches														
27	Acreage of Land Irrigated	88.53	acres														
28	Fraction of Land Irrigated	0.150	fraction														
29	Irrigation Rate	24.00	inches														
30	Number of Dwellings	108	units														
31	Water Use per Dwelling	300	gal/day														
32	Wastewater Design Flow (units)	6,414	gal/day														
33	Wastewater Design Flow (total)	38,814	gal/day														
34	Adjusted WW Design Flow (total)	38,814	gal/day														



SIMULATION OF NITROGEN IN RECHARGE (SONIR)

NELSON, POPE & VOORHIS, LLC MICROCOMPUTER MODEL

Alternative 3 - East Quogue LUP

SITE RECHARGE COMPUTATIONS

<i>A</i>	<i>Landscaping</i>	<i>Value</i>	<i>Units</i>
1	A = Fraction of Land in Cover Type	0.079	fraction
2	P = Precipitation Rate	49.90	inches
3	E = Evapotranspiration Rate	23.00	inches
4	Q = Runoff Rate	0.35	inches
5	R(a) = P - (E + Q)	26.55	inches
6	R(A) = R(a) x A	2.09	inches

<i>B</i>	<i>Unfertilized Landscape</i>	<i>Value</i>	<i>Units</i>
1	A = Fraction of Land in Cover Type	0.071	fraction
2	P = Precipitation Rate	49.90	inches
3	E = Evapotranspiration Rate	23.90	inches
4	Q = Runoff Rate	0.35	inches
5	R(b) = P - (E + Q)	25.65	inches
6	R(B) = R(b) x A	1.82	inches

<i>C</i>	<i>Unvegetated/Dirt Roads</i>	<i>Value</i>	<i>Units</i>
1	A = Fraction of Land in Cover Type	0.004	fraction
2	P = Precipitation Rate	49.90	inches
3	E = Evapotranspiration Rate	21.20	inches
4	Q = Runoff Rate	1.05	inches
5	R(c) = P - (E + Q)	27.65	inches
6	R(C) = R(c) x A	0.11	inches

<i>D</i>	<i>Water/Ponds</i>	<i>Value</i>	<i>Units</i>
1	A = Fraction of Site in Water	0.010	fraction
2	P = Precipitation Rate	49.90	inches
3	E = Evaporation Rate	30.00	inches
4	Q = Runoff Rate	0.00	inches
5	M = Makeup Water	0.00	inches
6	R(d) = {P - (E+Q)} - M	19.90	inches
7	R(D) = R(d) x A	0.20	inches

<i>E</i>	<i>Natural/Natural Revegetation</i>	<i>Value</i>	<i>Units</i>
1	A = Fraction of Land in Cover Type	0.795	fraction
2	P = Precipitation Rate	49.90	inches
3	E = Evapotranspiration Rate	23.00	inches
4	Q = Runoff Rate	0.35	inches
5	R(e) = P - (E + Q)	26.55	inches
6	R(E) = R(e) x A	21.10	inches

<i>F</i>	<i>Impervious/Paved/Roads</i>	<i>Value</i>	<i>Units</i>
1	A = Fraction of Land in Cover Type	0.039	fraction
2	P = Precipitation Rate	49.90	inches
3	E = Evapotranspiration Rate	4.99	inches
4	Q = Runoff Rate	0.00	inches
5	R(f) = P - (E + Q)	44.91	inches
6	R(F) = R(f) x A	1.77	inches

<i>F</i>	<i>Rain Gardens/Wetlands</i>	<i>Value</i>	<i>Units</i>
1	A = Fraction of Land in Cover Type	0.061	fraction
2	P = Precipitation Rate	49.90	inches
3	E = Evapotranspiration Rate	30.00	inches
4	Q = Runoff Rate	0.00	inches
5	R(g) = P - (E + Q)	19.90	inches
6	R(G) = R(g) x A	1.21	inches

<i>H</i>	<i>Irrigation Recharge</i>	<i>Value</i>	<i>Units</i>
1	A = Fraction of Land Irrigated	0.150	fraction
2	I = Irrigation Rate	24.00	inches
3	E = Evapotranspiration Rate	20.54	inches
4	Q = Runoff Rate	0.35	inches
5	R(h) = I - (E + Q)	3.11	inches
6	R(H) = R(h) x A	0.47	inches

<i>J</i>	<i>Wastewater Recharge</i>	<i>Value</i>	<i>Units</i>
1	WDF = Wastewater Design Flow	38,814	gal/day
2	WDF = Wastewater Design Flow	1,894,143	cu ft/yr
3	A = Area of Site	25,743,960	sq ft
4	R(j) = WDF/A	0.07	feet
5	R(I) = Wastewater Recharge	0.88	inches

<i>J</i>	<i>Runoff Recharge</i>	<i>Value</i>	<i>Units</i>
1	Q(A) = Runoff from Rough/Landscaped	0.028	inches
2	Q(B) = Runoff from Tees/Fairways	0.025	inches
3	Q(C) = Runoff from Unvegetated	0.004	inches
4	Q(E) = Runoff from Natural	0.278	inches
5	Q(H) = Runoff from Rain Gardens	0.000	inches
6	Q(I) = Runoff from Irrigation	0.05	inches
7	Q(tot) = Q(A)+Q(B)+Q(C)+Q(E)+Q(H)+Q(I)	0.39	inches

Total Site Recharge	
R(T) =	R(A)+R(B)+R(C)+R(D)+R(E)+R(F)+R(G)+R(H)+R(I)+R(J)+Q(tot)
R(T) =	30.03 inches



SITE NITROGEN BUDGET

<i>A</i>	<i>Sanitary Nitrogen-Residential</i>	<i>Value</i>	<i>Units</i>
1	Number of Dwellings	0	units
2	Persons per Dwelling	2.50	capita
3	P = Population	0.00	capita
4	N = Nitrogen per person	10	lbs
6	N = (total; pre loss/removal)	0	lbs
7	LR = Leaching Rate	50%	percent
8	N(S) = P x N x LR	0.00	lbs
9	N = loss/removed	0.00	lbs

<i>B</i>	<i>Pet Waste Nitrogen</i>	<i>Value</i>	<i>Units</i>
1	AR = Application Rate	3.19	lbs/pet
2	Human Population	45	capita
3	Pets = 17 percent of capita	8	pets
4	N(p) = AR x pets	24.40	lbs
5	LR = Leaching Rate	50%	percent
6	N(P) = N(p) x LR	12.20	lbs
7	N = (loss/removed)	12.20	lbs

<i>C</i>	<i>Sanitary Nitrogen (Wastewater Design Flow)</i>		
1	CF = Commercial/STP Flow	38,814	gal/day
2	CF = Commercial/STP Flow	53,622,511	liters/yr
3	N = Nitrogen (1)	50.00	mg/l
4	N = Nitrogen (1)	5911.88	lbs
5	N = Nitrogen (2)	50.00	mg/l
6	N = Nitrogen (2)	5911.88	lbs
7	LR = Leaching Rate	50%	percent
8	N(S) = CF x N x LR	1,340,562,784	milligrams
9	N(S) = Sanitary Nitrogen	2955.94	lbs
10	N = loss/removed	2955.94	lbs

<i>D</i>	<i>Water Supply Nitrogen (other than wastewater, if applicable)</i>		
1	WDF = Wastewater Design Flow	0	gal/day
2	WDF = Wastewater Design Flow	0	liters/yr
3	N = Nitrogen in Water Supply	2.00	mg/l
4	N(WW) = WDF x N	0	milligrams
5	N(WW) = Wastewater Nitrogen	0.00	lbs

<i>E</i>	<i>Fertilized Landscaping</i>		
1	A = Area of Land Fertilized 1	2,026,847	sq ft
2	AR = Application Rate	1.00	lbs/1000 sf
3	N(T) = Nitrogen (total applied)	2026.85	lbs
4	LR = Leaching Rate	10%	percent
5	N(F1) = A x AR x LR	202.68	lbs
6	N = loss/removed	1824.16	lbs

<i>F</i>	<i>Unfertilized Landscape</i>		
1	A = Area of Land Fertilized 2	1,829,520	sq ft
2	AR = Application Rate	2.50	lbs/1000 sf
3	N(T) = Nitrogen (total applied)	4573.80	lbs
4	LR = Leaching Rate	10%	percent
5	N(F2) = A x AR x LR	457.38	lbs
6	N = loss/removed	4116.42	lbs

<i>G</i>	<i>Precipitation Nitrogen (existing condition)</i>		
1	R(n) = Natural Recharge (feet)	1.87	feet
2	A = Area of Site (sq ft)	25,743,960	sq ft
3	R(N) = R(n) x A	48,031,934	cu ft
4	R(N) = Natural Recharge (liters)	1,360,264,366	liters
5	N = Nitrogen in Precipitation	0.75	mg/l
6	N(T) = Nitrogen (total)	2,250	lbs
7	LR = Leaching Rate	15%	percent
8	N(ppt) = R(N) x N x LR	153,029,741.18	milligrams
10	N(irr) = Irrigation Nitrogen	337.43	lbs
9	N = loss/removed	1912.11	lbs

<i>H</i>	<i>Irrigation Nitrogen</i>		
1	R = Irrigation Recharge (inches)	0.47	inches
2	R = Irrigation Rate (feet)	0.04	feet
3	A = Area of Land Irrigated	3,856,367	sq ft
4	R(I) = R(irr) x A	0	cu ft
5	R(I) = Site Precipitation (liters)	0	liters
6	N = Nitrogen in Water Supply	2.00	mg/l
7	N(T) = Nitrogen (total applied)	0.00	lbs
8	LR = Leaching Rate	10%	percent
9	N(irr) = R(I) x N x LR	0	milligrams
10	N(irr) = Irrigation Nitrogen	0.00	lbs
11	N = loss/removed	0.00	lbs

Total Site Nitrogen		
N=	N(S) + N(P) + N(WW) + N(F1) + N(F2) + N(ppt) + N(irr)	
N=	3,965.64	lbs



NAME OF PROJECT

The Hills at Southampton
Alternative 3 - East Quogue LUP

FINAL COMPUTATIONS

<i>A</i>	<i>Nitrogen in Recharge</i>	<i>Value</i>	<i>Units</i>
1	N = Total Nitrogen (lbs)	3,965.64	lbs
2	N = Total Nitrogen (milligrams)	1,800,399,628	milligrams
3	R(T) = Total Recharge (inches)	30.03	inches
4	R(T) = Total Recharge (feet)	2.50	feet
5	A = Area of Site	25,743,960	sq ft
6	R = R(T) x A	64,429,814	cu ft
7	R = Site Recharge Volume	1,824,652,331	liters
9	NR = N/R	0.99	mg/l

CONCENTRATION OF NITROGEN IN RECHARGE	0.99
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<i>B</i>	<i>Site Recharge Summary</i>	<i>Value</i>	<i>Units</i>
1	R(T) = Total Site Recharge	30.03	inches/yr
2	R = Site Recharge Volume	64,429,814	cu ft/yr
3	R = Site Recharge Volume	481,968,512	gal/yr
4	R = Site Recharge Volume	481.97	MG/yr

<i>Conversions used in SONIR</i>	
Acres	x 43,560 = Square Feet
Cubic Feet	x 7.48052 = Gallons
Cubic Feet	x 28.32 = Liters
Days	x 365 = Years
Feet	x 12 = Inches
Gallons	x 0.1337 = Cubic Feet
Gallons	x 3.785 = Liters
Grams	/ 1,000 = Milligrams
Grams	x 0.002205 = Pounds
Milligrams	/ 1,000 = Grams

