Appendix K

APPENDIX XX
SOUTHAMPTON DAY CAMP
NITROGEN LOAD MODEL

PWGC
Strategic Environmental Engineering Solutions

Nitrogen Load Model
Appendix to the
Draft Environmental Impact Statement

Prepared for: Southampton Racquet Club and Camp.

Prepared by:

PWGC

P.W. Grosser Consulting, Inc.
630 Johnson Avenue, Suite 7
Bohemia, New York 11716
Ph: 631-589-6353

Paul W. Grosser, PhD., PE, President
Pablo Rodriguez, PE, Senior Engineer
Brian Barth, Sr. GIS Analyst/ES

Table of Contents

Purpose

The purpose of this report is to document the findings of a nitrogen load prediction effort performed by P.W. Grosser Consulting (PWGC) for the evaluation of environmental impacts of the proposed facility upgrade of Southampton Racquet Club and Camp. The facility is composed of 17.28 acres of developed, landscaped and undeveloped land located adjacent to the southeast portion of Little Fresh Pond at 665 Majors Path, Southampton, Town of Southampton, Suffolk County, New York. The proposed upgrade will incorporate the addition of cottages, a new building facility, paved areas and playing courts.

Nitrogen Mass Balance Prediction

PWGC has evaluated the expected nitrogen loading to groundwater from the proposed facility upgrade using the BURBS model. The BURBS model, developed at Cornell University by Hughes et al. (1985), is a computer simulation program that computes the potential impact of a proposed development on groundwater within a community due to nitrogen. Cornell University has developed this model for specific application on Long Island. For comparative purposes, PWGC has prepared a BURBS computation for the existing conditions, and proposed development. Based on PWGCs experience, this program will predict a conservative estimate of nitrogen recharged to groundwater. It calculates loadings from wastewater, turf, natural land, atmospheric deposition, and runoff from impervious surfaces.

The Burbs model predicts nitrogen leached to groundwater independent of land area (i.e.: lbs N/acre/year). In order to calculate the estimated mass of nitrogen leached to groundwater, the acreage of each of the project components is multiplied by the model output, yielding pounds of nitrogen per year. The parameters used in the Burbs model include:

1. Fraction of Land in Turf
2. Fraction of Land which is impervious
3. Average persons per dwelling
4. Housing density
5. Precipitation rate
6. Water recharged from turf
7. Water recharged from natural land
8. Evaporation from impervious surface
9. Runoff from impervious recharged
10. Home water use per person
11. Nitrogen concentration in precipitation
12. Nitrogen concentration in water used
13. Turf fertilization rate
14. Fraction of nitrogen leached from turf
15. Fraction of wastewater N lost as gas
16. Wastewater fraction removed by Sewer
17. Nitrogen per person in wastewater
18. Nitrogen removal rate of natural land.

Each of these parameters is discussed and model inputs are defined. The demographic type parameters (i.e.: land areas, persons per dwelling, etc.) were derived from the DEIS and information provided by VHB **(Table 2).**

Fraction of Land in Turf, Impervious, and Natural

The fraction of land in turf refers to areas maintained as lawn, landscaping, revegetation, mulch areas and paths. The fraction of land which is impervious is the sum of roof areas, driveways, roads, and playing courts. Both the fraction of land in turf and impervious must be between 0 and 1. The fraction of land in natural vegetation is computed as 1 minus the sum of the fraction in turf and impervious, thus the sum of these must be less than 1 (BURBS). Land counted as natural vegetation included pervious surfaces, such as gravel and decks, which do not alter water recharge into the surface. Land areas for the existing conditions and proposed development were given or derived from the preliminary site plans and existing permits included in Appendix B & C of the DEIS.

Average Persons per Dwelling

The average number of people living in each house or dwelling unit (BURBS). The value used for the existing conditions model was 1.22 and the value used for the proposed development model was 1.42. These values were derived using Table 8- Existing and Proposed Density Flow Calculations from the DEIS using the total number of people and average daily flow per dwelling in gallons per day. Assuming 4 people per dwelling and a daily flow of 300 gpd per dwelling the calculated flow per person is 75 gpd. Using the total calculated flows of 5,440 gpd for existing conditions and 6,800 gpd for proposed conditions the adjusted number of people are 73 and 90.7 for the existing and proposed conditions, respectively. The DEIS states the premise is occupied 80 days per year, or 0.22 percent yearly occupancy (fraction). Using the adjusted number of people per year multiplied by the fraction of yearly occupancy the average person per dwelling for the existing conditions was calculated as 1.22 and 1.42 for the proposed development. (**Table 2)**.

Table 8 – Existing and Proposed Density Flow Calculation – (DEIS - Sec. 3.2.2.2)

EXISTING CONDITIONS (i.e., Anticipated 2016 Occupancy)				
STRUCTURE USE	SF, # SEATS, OR # UNITS	POPULATION DENSITY LOAD		
		GPD/SEAT/UNIT		
CAMPERS + DAY STAFF	293	5	1,465	GPD
OVERNIGHT STAFF	49	75	3,675	GPD
RESIDENCE / DWELLING	1 (4 overnight staff)	300	300	GPD
		TOTAL	5,440	GPD
PROPOSED CONDITIONS				
STRUCTURE USE	SF, # SEATS, OR # UNITS	POPULATION DENSITY LOAD		
		GPD/SEAT/UNIT		
CAMPERS + DAY STAFF	385	5	1,925	GPD
OVERNIGHT STAFF	61	75	4,575	GPD
RESIDENCE / DWELLING	1 (4 overnight staff)	300	300	GPD
		TOTAL	6,800	GPD

Housing Density

The number of dwelling units per acre (BURBS). The housing density used for the existing development was 0.752 units per acre. This was derived from the 13 cottages presently on the property and the total acreage of the property (17.28 acres). The housing density for the proposed development was 0.810 units per acre. This was based upon the proposed development's increase in number of cottages to 14 cottages on the total acreage (17.28 acres) of the property.

Precipitation Rate

The annual average precipitation in inches (BURBS). A value of 44 inches was used for this project. This is the value provided by the DEIS as the average precipitation rate in Southampton.

Water recharged from Turf and Natural Land

The amount of water per unit area of turf which drains to groundwater (BURBS). Based upon PWGCs experience and Long Island geology, approximately 50% of rainfall is recharged. Therefore, 22 inches per year was used for both water recharged from turf and natural land.

Evaporation from Impervious Surfaces

The fraction of precipitation falling on impervious surface assumed to evaporate (BURBS). A value of 0.1 was used for each of the models run. This amount is recommended by the Burbs parameter description.

Runoff from Impervious Recharged

The fraction of the runoff which is recharged through recharge basins, ponds, etc (BURBS). Evaporation is subtracted. For the purposes of these models a value of 0.9 was assumed for both existing and proposed models.

Water Use per Person

Average in-home use of water (BURBS). The value used here was 75 gallons per person per day. This value was derived from the density flow calculations (Table 4) provided in the DEIS.

Nitrogen Concentration in Precipitation

Average concentration. The Burbs models recommends using data from the closest weather station where nitrogen tests were taken (BURBS). An average value of 0.78 mg/L was used in each of the Burbs models run. This was derived from the National Atmospheric Deposition Program NTN Site NY96 - Cedar Beach, Southold, New York. Concentration of nitrate (NO3) were given for the years 2004 through 2014, ranging from 0.62 mg/L to 0.9 mg/l.

Nitrogen Concentration in Water Used

Average concentration in water used in homes (BURBS). A value of 3.47 mg/L was used when running each of the models. This value was taken from the *Suffolk County Water Authority (SCWA) 2014 Drinking Water Quality Report – Distribution Area 23, p. 37.*

Turf Fertilization Rate

Average yearly nitrogen application rate expected for residential turf (BURBS). The value of 1.50 pounds of fertilizer per 1000 square feet of land was used in each model.

Fraction of Nitrogen Leached from Turf

The fraction of nitrogen applied from fertilizer, precipitation, etc. which leached to groundwater. The Burbs model recommends 0.35 for sandy soil if clippings are removed, or 0.5 if clippings are left on turf. These values are based on Long Island studies *Hughes, Henry B.F. and K.S. Porter. 1983. Land Use and Ground Water Quality in the Pine Barrens of Southampton. Center for Environmental Research, Cornell University, Ithaca, N.Y.* and *Hughes, Henry B.F., J. Pike and K.S. Porter. 1985. Assessment of Ground-Water Contamination by Nitrogen and Synthetic Organics in Two Water Districts in Nassau County, N.Y. Center for Environmental Research, Cornell University, Ithaca, N.Y.* The value 0.35 was used for each model.

Fraction of Wastewater Nitrogen Lost as Gas

Fraction of nitrogen in wastewater which volatilizes or is converted to gaseous nitrogen through denitrification. Both existing and proposed models used 0.5 as the value. The Burbs model states the fractional value of wastewater nitrogen lost as gas as roughly 0.5 under Long Island, New York conditions (BURBS [5]).

Fraction of Wastewater Removed by Sewer

The efficiency of sewer systems. If no sewers are present use 0 (BURBS).As the Southampton Racquet Club and Camp property is not connected to sewers, a value of 0 was used for this parameter when running the Burbs models.

Nitrogen per Person in Wastewater

The average in the United States is 10 pounds per person per day (BURBS). This value was used when running the Burbs models.

Nitrogen Removal Rate of Natural Land

The fraction of nitrogen in precipitation which is removed by natural land before the water is recharged. Should be at least 90 percent (BURBS). Based upon the recommendations made by the Burbs parameter description, a value of 0.9 was used when running the Burbs Model.

Results

As shown in **Table** 1, the modeling results indicate that the proposed facility upgrade will increase the mass of nitrogen recharged to groundwater by approximately 34.28 pounds per year. The concentration of nitrogen in recharge will increase from 2.06 mg/L to approximately 2.39 mg/L.

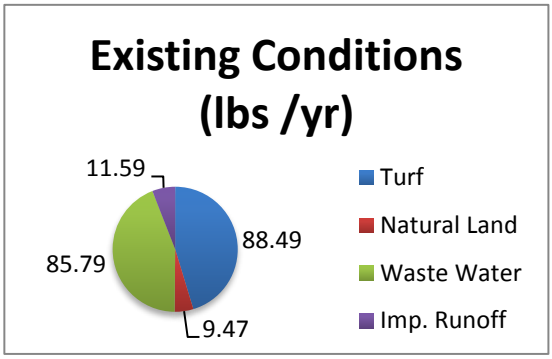
Table 1

Southampton Day Camp - Nitrogen Load Model

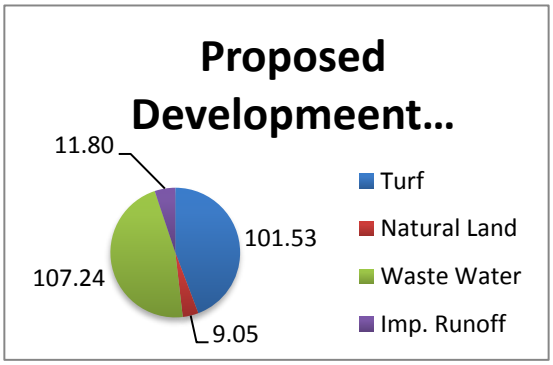
Results Summary

SITE AREA = **752,677 sq ft** **17.28 ac**

Existing Conditions:		
N Leached:	(lbs/ac/yr)	(lbs /yr)
Turf	5.12	88.49
Natural Land	0.55	9.47
Waste Water	4.96	85.79
Imp. Runoff	0.67	11.59
Total	**11.30**	**195.33**
N conc. In Recharge	**2.06**	mg/L



Proposed Development:		
N Leached:	(lbs/ac/yr)	(lbs /yr)
Turf	5.88	101.53
Natural Land	0.52	9.05
Waste Water	6.21	107.24
Imp. Runoff	0.68	11.80
Total	**13.29**	**229.61**
N conc. In Recharge:	**2.39**	mg/L



Net Change:		
N Leached:	(lbs/ac/yr)	(lbs/yr)
Turf	0.75	13.0
Natural Land	-0.02	-0.4
Waste Water	1.24	21.4
Imp. Runoff	0.01	0.2
Total	**1.98**	**34.3**
Percent Increase	**17.55%**	**17.55%**
N Conc. In Recharge:		
Net Change	**0.34**	mg/L
Percent Increase	**16%**	

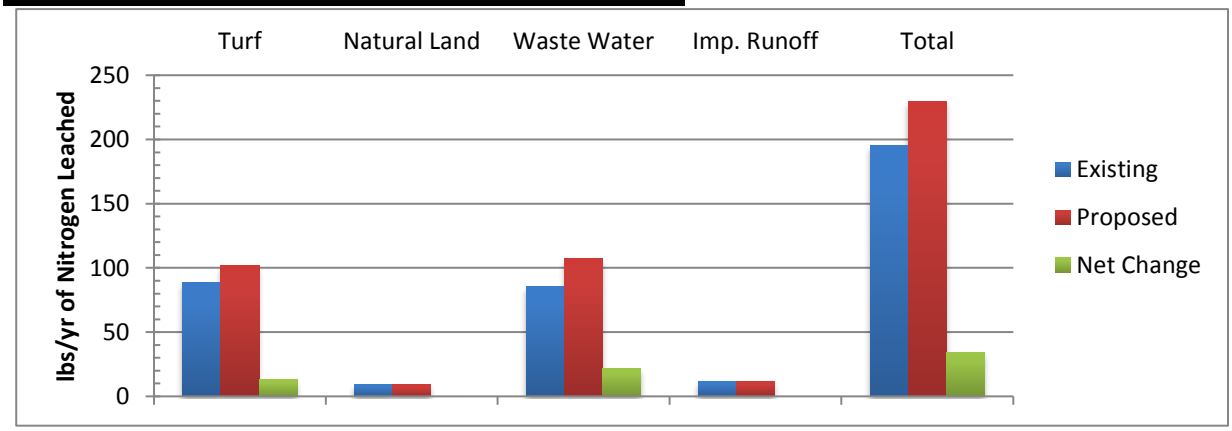


Table 2

Southampton Day Camp

Nitrogen Load Model - Input Parameter Calculations

Total Site Area	**752,677 sq ft**	**17.28 ac**

	Existing Area (Sq.Ft.)		Proposed Area (Sq.Ft.)	
Roadway and Parking Area	**Pervious (Gravel)**	**Impervious (Asphalt)**	**Pervious (Gravel)**	**Impervious (Asphalt)**
Bus Loop	13,013		27,551	
West Drive	5,971		1,988	
Dumpster Slab				144
Loading Area				380
South Drive	7,058			
East Minor Loop	804			
Parking Area and Drive @ Welcome Center	5,464		11,885	
H.C. Parking and Walk to Welcome Center				595
Tennis Parking Area & Drive-Gravel	18,837		20,684	
H.C. Parking				280
Roadway and Parking Area Total	**51,147**		**62,108**	**1,399**

Note: Pervious-gravel surfaces are included as "natural area."

	Existing Area (Sq.Ft.)		Proposed Area (Sq.Ft.)	
Other Impervious Areas: Playing Courts	**Pervious**	**Impervious**	**Pervious**	**Impervious**
Pool Deck/ Tennis Ct Surface Area		12,497		
3 Pool Area/Deck Surface				11,855
7 Tennis Court Surface		37,665		37,665
Ex. Tennis Ct to be converted to basketball ct		7,099		5,361
Existing basketball ct		1,952		1,952
Play Area				2,380
Playing Courts Total		**59,213**		**59,213**

	Existing Area (Sq.Ft.)		Proposed Area (Sq.Ft.)	
Building footprints/porch areas	**Pervious (Decks)**	**Impervious (Bldg Footprint)**	**Pervious (Decks)**	**Impervious (Bldg Footprint)**
Cottage No. 1		670		670
Deck 1	202		202	
Cottage No. 2		932		932
Deck 2	318		318	
Cottage No. 3		507		507
Entry 3		11		11
Deck 3	136		136	
Cottage 4		355		0
Deck 4	85		0	
Cottage 5		358		0
Deck 5	196		0	
Cottage 6		556		556
Entry 6		40		40
Deck 6	120		120	
Cottage 7		419		419
Entry 7		39		39
Deck 7	151		151	
Cottage 8		535		535
Entry Porch 8		58		58
Cottage 9		483		483
Entry Porch 9		47		47
Detatched Deck 9	166		0	
Cottage 10		478		478
Porch 10		49		49
Detatched Deck 10	119		0	

Table 2

Southampton Day Camp

Nitrogen Load Model - Input Parameter Calculations

Cottage 11		574		574
Deck 11	77		77	
Cottage No. 12		598		598
Deck 12	314		314	
Bldg 13- Caretakers Cottage		137		137
Deck 13	43		43	
NEW Cottage 14				562
Entry 14				35
Deck 14			152	
Dining Hall		2,470		2,470
Entry DH		71		71
Deck DH	266		665	
Clubhouse		660		660
Deck Clubhouse	1,100		1,100	
Welcome Center- Residence		1,857		1,857
Patio		407		407
Changing Sheds (qty 2)				380
Covered Lean-to (not included in total building area)		120		0
Garden Shed (shed)		94		0
Shed (Storage & Shop)		180		180
Pump House		135		0
Building Footprint/Porch Area Total	**3,293**	**12,840**	**3,278**	**12,755**

	Existing Area (Sq.Ft.)		Proposed Area (Sq.Ft.)	
Miscellaneous Quantities	**Pervious (Gravel)**	**Impervious**	**Pervious (Gravel)**	**Impervious**
Parking Count - Tennis Ct. Prkg Area	7,200		8,460	
Parking Count - Welcome Cntr Prkg Area	900		4,140	
Area of Disturbance		277,232		311,760
Miscellaneous Quantities Total	**8,100**	**277,323**	**12,600**	**311,760**

	Existing Area (Sq.Ft.)		Proposed Area (Sq.Ft.)	
	Pervious (Gravel)	**Impervious**	**Pervious (Gravel)**	**Impervious**
TOTAL FROM ABOVE	**62,540**	**72,053**	**77,986**	**73,367**

[02] FRACTION IMPERVIOUS	**0.096**	**0.097**

Fraction Impervious is sum of areas categorized as impervious divided by total site area of 752,677 sq ft

	Existing Area (Sq.Ft.)	Proposed Area (Sq.Ft.)
Lawn/Landscaping/Re-veg/Mulch areas and Paths	**Turf**	**Turf**
area to be revegetated:		
Formally East Minor Loop		1,975
Southeast Drive Relocation		2,656
Tennis Ct Prkg Drive Relocation		2,099
Balance of converted Tennis Ct		1,738
Area adjacent to converted Tennis CT		695
Formally Maintenance Shop Location		120
Formally Maintenance Shed Location		94
Formally Cot.#4 & Deck Location		440
Formally Cot. #5 & Deck Location		554
Formally P/O West Drive		3,983
Formally South Drive		7,058
Lawn/Landscaping	150,789	151,595

Table 2

Southampton Day Camp

Nitrogen Load Model - Input Parameter Calculations

Lawn/Landscaping/Re-veg/Mulch areas total	**150,789**	**173,007**
[01] FRACTION TURF	**0.200**	**0.230**

Fraction turf is sum of areas categorized as turf divided by total site area of 752,677 sq ft

	Existing Area (Sq.Ft.)	Proposed Area (Sq.Ft.)
Natural Area	**Pervious (Natural Land)**	**Pervious (Natural Land)**
Area to Remain Natural- Wooded Area	452,153	417,625
Wetlands	23,292	23,292
Natural Area Total	**475,445**	**440,917**
FRACTION NATURAL LAND	**0.632**	**0.586**
SUM FRACTIONS (IMP+TURF+NAT)	0.93	0.91

	Existing		Proposed	
Table 8 DEIS - Data for Density Flow Calculations	**Existing**	**GPD**	**Existing**	**GPD**
Campers + Day Staff (5 GPD)	293	1,465	385	1,925
Overnight Staff (75 GPD)	49	3,675	61	4,575
TOTAL	**342**		**446**	
Residence / Dwelling (300 GPD)	1	300	1	300
TOTAL		**5,440**		**6,800**
Adjusted Number of Campers. Staff & Res.		**73**		**90.7**
Total flow (GPD) divided by 75 gal per person.				
Assumed days of occupancy per yer		80		80
Percent yearly occupancy (fraction)		0.22		0.22
Adjusted number of people per year		**16**		**20**
The adjusted number of campers, staff, and res. multiplied by percent yearly occupancy				
Number of Cottages		13		14
[4] HOUSING DENSITY (dwellings / acre)		**0.752**		**0.810**
[3] AVERAGE PERSON PER DWELLING		**1.22**		**1.42**

Southampton Day Camp - N Load Model

Existing

Welcome to BURBS

A Lotus 1-2-3 spreadsheet for calculating the impact of residentia
development on the nitrate concentration in groundwater.
<<<< Center for Environmental Research, Cornell University >>>>
Ithaca, N.Y. 1985

There are 9 pages:

```
                    A      B   C   D  E  F  G  H  I       J
                  1 +-----------------------------------------------+
Press the "Alt"     š    Welcome    š Instructions  š  Definitions  š
key with one        š (you are here)š    <Alt> I    š   (3 pages)   š
letter            20 +---------------+--------------+    <Alt> D    š
to switch           š  Parameters   š    Results    š                š
sections.           š   <Alt> P     š    <Alt> R    š                š
                  40 +---------------+--------------+                š
                    š  Calculations š               š                š
Special             š    <Alt> C    š               š                š
Commands:         60 +---------------+               +---------------+
<Alt> W = results + parameters on split screen      š Bibliography  š
<Alt> U = undo split screen      <Alt> G = graphs   +----<Alt> B----+
```

DATA - Enter a values for each parameter:

1.	Fraction of land in turf	0.20	fraction
2.	Fraction of land which is impervious	0.10	fraction
3.	Average persons per dwelling	1.22	people
4.	Housing density	0.75	dwellings/acre
5.	Precipitation rate	44.00	inches/year
6.	Water recharged from turf	22.00	inches/year
7.	Water recharged from natural land	22.00	inches/year
8.	Evaporation from impervious surface	0.10	fraction
9.	Runoff from impervious recharged	0.90	fraction
10.	Home water use per person	75.00	gallons/day
11.	Nitrogen concentration in precip.	0.78	mg/l
12.	Nitrogen concentration in water used	3.47	mg/l
13.	Turf fertilization rate	1.50	lbs/1000 sq ft
14.	Fraction of nitrogen leached from turf	0.35	fraction
15.	Fraction of wastewater N lost as gas	0.50	fraction
16.	Wastewater fraction removed by Sewer	0.00	fraction
17.	Nitrogen per person in wastewater	10.00	lbs/year
18.	Nitrogen removal rate of natural land	0.90	fraction

INTERMEDIATE CALCULATIONS

Fraction Natural Land	0.70	
Population Density	0.92	people/acre
Nitrogen addition from precipitation	7.78	lbs/acre/year
N content of wastewater incl. water used	10.79	lbs/person/year

LABELS FOR GRAPH

Turf
Natural
Sewage
Runoff

Overall
Nitrate
Conc. =
2.1
mg / liter

Southampton Day Camp - N Load Model

Existing

INSTRUCTIONS

It is assumed that you already know how to use Lotus 1-2-3. This 1-2-3 spreadsheet is set up to calculate the amount of water and nitrogen which will be recharged from a residential development. It calculates loadings from wastewater, turf, natural land and runoff from impervious surfaces.

You must enter values for all the parameters on the data page which starts in cell A21. These parameters are defined and discussed on the page to right of this one. ----->

If you are uncertain of the appropriate value to use for a parameter, we suggest that you try several values in the range of possible values. The numerical output from this model is only as accurate as the parameters and assumptions and hence should be interpreted carefully.

There are several predefined graphs which you can use.

This software is free to all owners of Lotus 1-2-3 and carries no guarantee.

RESULTS:

	WATER RECHARGED		NITROGEN LEACHED	
	inches/yr	percent	lbs/acre/yr	percent
Turf	4.4	18%	5.1	45%
Natural Land	15.5	64%	0.5	5%
Wastewater	0.9	4%	5.0	44%
Impervious Runoff	3.4	14%	0.7	6%
TOTAL	24.2		11.3	

Nitrogen concentration in recharge 2.1 mg/l

Graphs of the data can be accessed by typing <Alt> G.

Select a graph, then type "Q" to exit graph menu.

Southampton Day Camp - N Load Model

Existing

Parameter Definitions

---

1. Fraction of land in turf - refers to area maintaned as lawn, must be between 0 and 1.
2. Fraction of land which is impervious - sum of roof area, driveways and roads; must be between 0 and 1. The fraction of land in natural vegetation is computed as 1 minus the sum of fraction in turf and the fraction impervious, thus the sum of these 2 must be less than 1.
3. Average persons per dwelling - the average number of people living in each house or dwelling unit.
4. Housing density - the number of dwelling units per acre.
5. Precipitation rate - the annual average precipitation in inches.
6. Water recharged from turf - the amount of water per unit area of turf which drains to groundwater. This can be computed from a water budget for the root zone. A 1-2-3 spreadsheet is available for this. [1]
7. Water recharged from natural land - the amount of water per unit area of natural of natural vegetation which drains to groundwater. This can be computed from a water budget.
8. Evaporation from impervious surface - the fraction of precipitation falling on impervious surface assumed to evaporate. Try 0.10. [1]
9. Runoff from impervious recharged - The fraction of the runoff which is recharged through recharge basins, ponds etc. Evaporation is subtracted. Use 0 here if storm sewers drain all runoff to surface waters.
10. Water use per person - average in-home use of water. Try 44 gallons per person per day. [2]
11. Nitrogen concentration in precipitation - average concentration, Use data from closest weather station where nitrogen tests were done.
12. Nitrogen concentration in water used - average concentration in water used in homes.
13. Turf fertilization rate - average yearly nitrogen application rate expected for residential turf.
14. Fraction of nitrogen leached from turf - the fraction of nitrogen applied from fertilizer, precipitation etc. which leaches to groundwater. For sandy soil try 0.35 if clippings are removed, or try 0.5 if clippings are left on turf. These values are based on Long Island studies [3],[4]. For tighter soils the fraction leached will probably be less.
15. Fraction of Wastewater N lost as gas - fraction of nitrogen in wastewater which volatilizes or is converted to gaseous N through denitrification. Roughly 0.50 under Long Island, N.Y. conditions.[5] This value is dependent on temperature and soil. Warmer areas will probably have higher fractions volatilized as will areas with tighter soils. Colder areas will probably have lower fractions. Vary this widely in your sensitivity analysis. (Perhaps 0.2 to 0.8)
16. Fraction of wastewater removed by sewer - efficiency of sewer. Try 0.90 which is to assume that 10% exfiltrates from sewers. If no sewers are present use 0. [4]
17. Nitrogen per person in wastewater - the average in the U.S. is 10 lbs/person/day. [2]
18. Nitrogen removal rate of natural land - the fraction of nitrogen in precipitation which is removed by natural land before the water is recharged. Should be at least 90 percent. Try 95 percent for forested areas.

Southampton Day Camp - N Load Model
Proposed

Welcome to BURBS

A Lotus 1-2-3 spreadsheet for calculating the impact of residentia
development on the nitrate concentration in groundwater.
<<<< Center for Environmental Research, Cornell University >>>>
Ithaca, N.Y. 1985

There are 9 pages:

```
                    A      B   C   D  E  F  G  H  I       J
                  1 +-----------------------------------------------+
Press the "Alt"     š    Welcome    š Instructions  š  Definitions  š
key with one        š (you are here)š    <Alt> I    š   (3 pages)   š
letter            20 +---------------+--------------+    <Alt> D    š
to switch           š  Parameters   š    Results    š                š
sections.           š   <Alt> P     š    <Alt> R    š                š
                  40 +---------------+--------------+                š
                    š  Calculations š               š                š
Special             š    <Alt> C    š               š                š
Commands:         60 +---------------+               +---------------+
<Alt> W = results + parameters on split screen      š Bibliography  š
<Alt> U = undo split screen      <Alt> G = graphs   +----<Alt> B----+
```

DATA - Enter a values for each parameter:

1.	Fraction of land in turf	0.23	fraction
2.	Fraction of land which is impervious	0.10	fraction
3.	Average persons per dwelling	1.42	people
4.	Housing density	0.81	dwellings/acre
5.	Precipitation rate	44.00	inches/year
6.	Water recharged from turf	22.00	inches/year
7.	Water recharged from natural land	22.00	inches/year
8.	Evaporation from impervious surface	0.10	fraction
9.	Runoff from impervious recharged	0.90	fraction
10.	Home water use per person	75.00	gallons/day
11.	Nitrogen concentration in precip.	0.78	mg/l
12.	Nitrogen concentration in water used	3.47	mg/l
13.	Turf fertilization rate	1.50	lbs/1000 sq ft
14.	Fraction of nitrogen leached from turf	0.35	fraction
15.	Fraction of wastewater N lost as gas	0.50	fraction
16.	Wastewater fraction removed by Sewer	0.00	fraction
17.	Nitrogen per person in wastewater	10.00	lbs/year
18.	Nitrogen removal rate of natural land	0.90	fraction

INTERMEDIATE CALCULATIONS

Fraction Natural Land	0.67	
Population Density	1.15	people/acre
Nitrogen addition from precipitation	7.78	lbs/acre/year
N content of wastewater incl. water used	10.79	lbs/person/year

LABELS FOR GRAPH

Turf
Natural
Sewage
Runoff

Overall
Nitrate
Conc. =
2.4
mg / liter

Southampton Day Camp - N Load Model
Proposed

INSTRUCTIONS

It is assumed that you already know how to use Lotus 1-2-3. This 1-2-3 spreadsheet is set up to calculate the amount of water and nitrogen which will be recharged from a residential development. It calculates loadings from wastewater, turf, natural land and runoff from impervious surfaces.

You must enter values for all the parameters on the data page which starts in cell A21. These parameters are defined and discussed on the page to right of this one. ----->

If you are uncertain of the appropriate value to use for a parameter, we suggest that you try several values in the range of possible values. The numerical output from this model is only as accurate as the parameters and assumptions and hence should be interpreted carefully.

There are several predefined graphs which you can use.

This software is free to all owners of Lotus 1-2-3 and carries no guarantee.

RESULTS:

	WATER RECHARGED		NITROGEN LEACHED	
	inches/yr	percent	lbs/acre/yr	percent
Turf	5.1	21%	5.9	44%
Natural Land	14.8	60%	0.5	4%
Wastewater	1.2	5%	6.2	47%
Impervious Runoff	3.5	14%	0.7	5%
TOTAL	24.5		13.3	

Nitrogen concentration in recharge 2.4 mg/l

Graphs of the data can be accessed by typing <Alt> G.
Select a graph, then type "Q" to exit graph menu.

BIBLIOGRAPHY

[1] Mather, John R. 1979. The Influence of Land-Use Change on Water Resources. Water Resources Center, University of Delaware. Newark, Delaware.

[2] Long Island Regional Planning Board. 1978. Long Island Comprehensive Waste Treatment Management Plan (208 study). Hauppauge, N.Y.

[3] Hughes, Henry B.F. and K.S. Porter. 1983. Land Use and Ground Water Quality in the Pine Barrens of Southampton. Center for Environmental Research, Cornell University, Ithaca, N.Y.

[4] Hughes, Henry B.F., J. Pike and K.S. Porter. 1985. Assessment of Ground-Water Contamination by Nitrogen and Synthetic Organics in Two Water Districts in Nassau County, N.Y. Center for Environmental Research, Cornell University, Ithaca, N.Y.

[5] Andreoli, A., R. Reynolds, N. Bartilucci and R. Forgione. 1977. Pilot Plant Study: Nitrogen Removal in a Modified Residential Subsurface Disposal System. Suffolk County Department of Health Services, Hauppauge, N.Y.