

NH Residential Loading Model

The New Hampshire Department of Environmental Services has created *The New Hampshire Residential Loading Model*, a modeling tool for homeowners to estimate their stormwater footprint. It is available for download on the [NHDES Stormwater Management website](#). This model is designed to estimate the loading of nutrients, specifically phosphorus and nitrogen, as well as sediment (as total suspended solids) from your property. This model can be used in a number of ways including:

1. To calculate your “stormwater footprint”, or how much phosphorus, nitrogen, and sediment your property contributes to the watershed in which you live.
2. To calculate the benefit of installing stormwater treatment practices on your property.
3. To compare the existing and planned development conditions of your property with or without the application of stormwater treatment practices. For example, to estimate the impact that building a garage on your property would have on nutrient loading.
4. To determine if your property meets a targeted nutrient goal or nutrient reduction for your watershed, if such a goal exists.

TIPS FOR NAVIGATING THE MODEL

ENTER WORKSHEETS IN ORDER: In order for the model to work correctly, the worksheet tabs at the bottom of the screen (“Site Conditions”, “Existing SW Treatment”, etc.) must be completed in order from left to right. Each worksheet contains instructions on how to enter information. You will find that by either hovering over or clicking on a given cell, instructions and hints will be displayed.

ENTER ONLY IN DATA INPUT CELLS: Throughout the spreadsheet only certain cells are “unlocked” and can be modified. You should only type values in the data input cells. It is suggested that you do not perform a copy and paste as you may mistakenly paste a formula.

KEY: **data input cells** **read only cells**

0	0.00
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SQUARE FEET to ACRE CONVERSION: Throughout the spreadsheet, “Square Feet” is the unit of area that must be entered (1 acre = 43, 560 square feet). The model has a conversion box to help you convert from square feet to acres or acres to square feet.

EXAMPLE:

QUICK CONVERSION:	square feet	acres
	square feet to acres:	20,000
	acres	square feet
	acres to square feet:	0.5

Instructions for Using the Model

The step-by-step instructions below will guide you through the model. You will need Microsoft Excel 2002 or newer to use the model.

GENERAL INSTRUCTIONS

1. Open the spreadsheet and save under a new name.
2. Use the “Project Planning Worksheet” at the end of this document (and Appendix D of the *New Hampshire Homeowner’s Guide to Stormwater Management*) to gather the information needed to run this model. Instructions for the Project Planning Worksheet are in the “Create a Project Plan” section of the guide, available on the [NHDES Stormwater Management website](#).
2. **INSTRUCTIONS WORKSHEET:** Read through the “Instructions” worksheet before starting. Worksheets should be completed in the following order:
 1. Instructions
 2. Site Conditions
 3. Existing SW Treatment
 4. Planned SW Treatment
 5. Results
3. **SITE CONDITIONS WORKSHEET:** This worksheet gathers all of the basic information for your property. It asks you to estimate the annual average rainfall, land uses, and fertilizer usage for the existing condition (before land use changes) and an anticipated future planned condition (after land use changes). All of the “data input cells” should be populated even if many of the cells contain a zero (0). This information is automatically carried forward to the other worksheets. Follow steps a - d below to complete the worksheet.
 - a. **Weather:** Enter the average annual rainfall in inches in the appropriate cell. Use the “Look-up Your Rainfall” button to find the weather station nearest your property and use that rainfall value.

WEATHER	
1. RAINFALL:	40
	INCHES
<input type="button" value="Look-up Your Rainfall"/>	

▶ ▶ Instructions Site Conditions Existing SW Treatment Planned SW Treatment Goals Summary SW Drawing ◀ ◀

- b. **Property Land Uses (Existing Land Use Conditions):** Enter the square footage of Forest, Lawn/Landscape, Impervious Roof, and Other Hard Surface areas that currently exist on your property into the appropriate cells in the “Existing Land Use Conditions” column. Find data in your town assessor’s office, on-line, or by measuring them directly.

PROPERTY LAND USES	EXISTING LAND USE CONDITIONS			PLANNED LAND USE CONDITIONS	
	SQUARE FEET	ACRES		SQUARE FEET	ACRES
1. FOREST:	0	0.00	Go to the Conversion Block in the Instructions	0	0.00
2. LAWN/LANDSCAPE:	0	0.00		0	0.00
3. IMPERVIOUS ROOF:	0	0.00		0	0.00
4. OTHER HARD SURFACES:	0	0.00		0	0.00
TOTAL:	0	0.00		0	0.00

[Instructions](#) / [Site Conditions](#) / [Existing SW Treatment](#) / [Planned SW Treatment](#) / [Goals Summary](#)

- c. **Property Land Uses (Planned Land Use Conditions):** Enter the square footage of Forest, Lawn/Landscape, Impervious Roof, and Other Hard Surface areas that you are proposing to change on your property in the appropriate cells in the “Planned Land Use Conditions” column.

NOTE: If you are not proposing any changes to the land use conditions of your property, simply enter the same square footage values from the “Existing Land Use Conditions” column into the corresponding cells in the “Planned Land Use Conditions” column.

PROPERTY LAND USES	EXISTING LAND USE CONDITIONS			PLANNED LAND USE CONDITIONS	
	SQUARE FEET	ACRES		SQUARE FEET	ACRES
1. FOREST:	0	0.00	Go to the Conversion Block in the Instructions	0	0.00
2. LAWN/LANDSCAPE:	0	0.00		0	0.00
3. IMPERVIOUS ROOF:	0	0.00		0	0.00
4. OTHER HARD SURFACES:	0	0.00		0	0.00
TOTAL:	0	0.00		0	0.00

[Instructions](#) / [Site Conditions](#) / [Existing SW Treatment](#) / [Planned SW Treatment](#) / [Goals Summary](#)

- d. **Fertilizer Use:** Enter the amount of phosphorus and nitrogen fertilizers that you currently apply to your property (in lbs/acre/year) in the “Existing Land Use Conditions” column. Enter the amount that you propose to apply to your property in the “Planned Land Use Conditions” column.

Click on the “Help me calculate my application rate” button to access the fertilizer application rate worksheet.

NOTE: The model uses default values for phosphorus (15 lbs/ac/yr) and nitrogen (150 lbs/ac/yr) automatically. If you know the amount of fertilizer you apply, replace the default values with the real application values. If you do not apply fertilizer and do not plan on using it in the future, replace these default values with zero (0).

FERTILIZER USE	EXISTING LAND USE CONDITIONS	PLANNED LAND USE CONDITIONS
PHOSPHORUS FERTILIZER USE (lbs/acre/year):	15	15
NITROGEN FERTILIZER USE (lbs/acre/year):	150	150

[Help me calculate my application rate](#)

Consider reducing your fertilizer use to help protect the health of New Hampshire's waters.

4. **EXISTING SW TREATMENT WORKSHEET:** This worksheet gathers information on stormwater treatment practices that currently exist on your property.

Not all of the “data input cells” in this worksheet need to be filled in because in many cases there may be no existing treatment practices. If your property has existing treatment practices, use the steps a - c to complete this worksheet.

NOTE: If your property has no existing stormwater treatment, skip to the “Planned SW Treatment” worksheet.

The DIY practices are described in the *New Hampshire Homeowner’s Guide to Stormwater Management*, available on the [NHDES Stormwater website](#). All other stormwater treatment practices are described in [Volume 2 of the New Hampshire Stormwater Manual](#).

SW Treatment Sets: This worksheet gives three blocks or SETS to model runoff to multiple treatment practices from each land use type (lawn/landscape, impervious roof, other hard surfaces). If all of your roof runoff

goes into a single practice, you will only need to use SET ONE. If however, one side of your roof drains to one practice and the other side of your roof drains to a different practice, you should enter one roof side in SET ONE and the other roof side in SET TWO.

Treatment Practices in Series: Do you have two stormwater treatment practices in a row? For example, you may have roof runoff going to a vegetated swale and any excess flow then enters a rain garden. You can model the two practices in series by entering the vegetated swale as the “Stormwater Treatment Practice Applied” and entering the rain garden as the “Second practice applied downstream” within a single SET.

- a. **SW Drawing:** Click on the link to the “Example with Sets and Second Treatment Practices Applied Downstream Concepts” to better understand the sets and treatment practices in series, if needed.
- b. **Determine Property Drainage Areas:** Determine the drainage areas on your property. Doing a sketch of your property can be helpful to understand where runoff is coming from, how it flows across your property, and where it ends up. Your sketch should identify the roof, driveway, walkways and other impervious areas, lawn and landscaping, existing wooded or natural areas, steep slopes, streams or ponds, the existing stormwater flow path, and any existing stormwater treatment practices.
Instructions for estimating the drainage area to each treatment practices are included in the “Create a Project Plan” section of the *New Hampshire Homeowner’s Guide to Stormwater Management*, available on the [NHDES Stormwater website](#).
- c. **Sets One, Two, and Three:** Identify existing stormwater treatment practices for each land use category (lawn/landscape, impervious roof, other hard surfaces), use the pick list in the row titled “Stormwater Treatment Practice Applied?” to select a practice that most accurately reflects the stormwater management on your property. In the blue cell immediately below, enter the square footage of your property that is being directed to that practice for each land use. If there is no practice for a particular land use, select “None” from the pick list.
For each land use with a practice in series, use the pick list in the row titled “Is there a second treatment practice applied downstream?” to select a practice that most accurately reflects the stormwater management on your property. Since the treatment practice is in series, the square footage from the first practice in the series is reused.

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PROPERTY EXISTING STORMWATER TREATMENT CONDITIONS

ABOUT THIS WORKSHEET:

This worksheet gathers information on the stormwater treatment practices that currently exist on your property. Not all of the 'data input cells' in this worksheet need to be filled in because in many cases, there may be no existing treatment practices. If your property does have existing treatment practices use the steps below to complete this worksheet. **NOTE: If your property has no existing treatment practices, skip to the 'Planned SW Treatment' worksheet.**

Go to the Step-by-Step Instructions for this tab

Open the Example with Sets and Second Treatment Practice Applied Downstream Concepts

Show More of the Intermediate Math

Open the Stormwater Treatment Practices Efficiencies Summary Page

1	SET ONE	1. FOREST:	2. LAWN/LANDSCAPE:	3. IMPERVIOUS ROOF:	4. OTHER HARD SURFACES:
	Square Feet of land use	0	0	0	0
	Acres of land use	0.00	0.00	0.00	0.00
	Stormwater Treatment Practice Applied? <i>(choose from the picklists)</i>		None	None	None
	Square Feet of land use draining to practice		0	0	0
	Is there a second treatment practice applied downstream?		None	None	None

2	SET TWO	1. FOREST:	2. LAWN/LANDSCAPE:	3. IMPERVIOUS ROOF:	4. OTHER HARD SURFACES:
	Remaining Square Feet of land use	0	0	0	0
	Acres of land use	0.00	0.00	0.00	0.00
	Stormwater Treatment Practice Applied? <i>(choose from the picklists)</i>		None	None	None
	Square Feet of land use draining to practice		0	0	0
	Is there a second treatment practice applied downstream?		None	None	None

	SET THREE	1. FOREST:	2. LAWN/LANDSCAPE:	3. IMPERVIOUS ROOF:	4. OTHER HARD SURFACES:
	Square Feet of land use	0	0	0	0
	Acres of land use	0.00	0.00	0.00	0.00
	Stormwater Treatment Practice		None	None	None

- 5. PLANNED SW TREATMENT WORKSHEET:** This worksheet gathers information on future stormwater treatment practices that are being proposed for your property.

Not all of the “data input cells” in this worksheet need to be filled in because in many cases there may be no treatment practices proposed. If you are proposing future practices for your property, follow a - c in step 4 above for the proposed future condition to complete this worksheet.

Instructions for determining the drainage area to each stormwater treatment practice are included in the “Create a Project Plan” section of the *New Hampshire Homeowner’s Guide to Stormwater Management* available on the [NHDES Stormwater Management website](#).

NOTE: If you have existing stormwater treatment practices entered in the “Existing SW Treatment” worksheet and you plan on keeping them, you will need to re-enter them into the “Planned SW Treatment” worksheet to be accounted for in the future, planned condition.

Descriptions of the DIY practices are included in the New Hampshire Homeowner’s Guide to Stormwater Management, available on the [NHDES Stormwater website](#).

All other stormwater treatment practices are described in [Volume 2 of the New Hampshire Stormwater Manual](#).

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PROPERTY PLANNED STORMWATER TREATMENT CONDITIONS

ABOUT THIS WORKSHEET

This worksheet gathers information on future stormwater treatment practices that are being proposed for your property. Not all of the 'data input cells' in this worksheet need to be filled in because in many cases, there may be no treatment practices planned. If you are planning future treatment practices for your property, follow a. through c. in step 4 in the instructions page to complete this worksheet. **NOTE: 1 - If your property is not proposing treatment practices, skip to the 'Results' worksheet. 2 - If there are treatment practices in the 'Existing' condition, re-enter those BMPs here.**

Go to the Step-by-Step Instructions for this tab	Open the Example with Sets and Second Treatment Practice Applied Downstream Concepts
Hide the Intermediate Math	Open the Stormwater Treatment Practices Efficiencies Summary Page

1	SET ONE	1. FOREST:	2. LAWN/LANDSCAPE:	3. IMPERVIOUS ROOF:	4. OTHER HARD SURFACES:
	Square Feet of land use	0	0	0	0
	Acres of land use	0.00	0.00	0.00	0.00
	Stormwater Treatment Practice Applied? <i>(choose from the picklists)</i>		None	None	None
	Square Feet of land use draining to practice		0	0	0
	Is there a second treatment practice applied downstream?		None	None	None

2	SET TWO	1. FOREST:	2. LAWN/LANDSCAPE:	3. IMPERVIOUS ROOF:	4. OTHER HARD SURFACES:
	Remaining Square Feet of land use	0	0	0	0
	Acres of land use	0.00	0.00	0.00	0.00
	Stormwater Treatment Practice Applied? <i>(choose from the picklists)</i>		None	None	None
	Square Feet of land use draining to practice		0	0	0
	Is there a second treatment practice applied downstream?		None	None	None

	SET THREE	1. FOREST:	2. LAWN/LANDSCAPE:	3. IMPERVIOUS ROOF:	4. OTHER HARD SURFACES:
	Square Feet of land use	0	0	0	0
	Acres of land use	0.00	0.00	0.00	0.00

- 6. RESULTS WORKSHEET:** This worksheet lets you choose from three different results options listed in a - c below. Results are a summary of the runoff volumes and nutrient loading of your property. The numeric results for your property are shown for each parameter in the “Existing Land Use Conditions” and “Planned Land Use Conditions” columns.

The middle columns gives a message to tell you whether or not you have met your goal. If you have met your goal, congratulations! If you have not met your goal, you can go back to the “Site Conditions” and “Planned SW Treatment” worksheets and make adjustments to the number or type of stormwater treatment practices being planned.

NOTE: Creating and modeling alternative scenarios can be done quickly by re-saving the file under a new name, and the modifying your input variables in the data entry cells.

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Please select a results scenario: [Go to the step by step instructions for this page](#)

Existing vs. Planned Stormwater Footprint Comparison

Percent Reduction Needed

Targeted Stormwater Footprint

Results Options

NOTE: You can model all of the parameters (runoff volume, total suspended solids, phosphorus, and nitrogen) using the same option, or you can model different option for each parameter.

- a. Existing vs. Planned development option:** This option is set up to show a comparison between the existing condition and the planned condition of your property. The goal of this option is to have no increase in pollutant loading so that the planned pollutant loading is less than or equal to the existing pollutant loading. This worksheet also allows you to see how your results compare to a “Best Stormwater Footprint for Your Property” scenario.

ABOUT THIS WORKSHEET

This worksheet provides the existing versus planned land use conditions runoff volumes and nutrient footprints with the stormwater treatment practices (if any) you entered in steps 4 and 5. The green "existing land use conditions" column displays your existing "stormwater footprint". View the "Best Stormwater Footprint for your property" column to see how your property compares to a "best possible scenario".

Go to the Step-by-Step Instructions for this tab

RUNOFF VOLUME	EXISTING LAND USE CONDITIONS (includes treatment practices if in place) (cubic feet/year)		PLANNED LAND USE CONDITIONS (includes BMPs if in place) (cubic feet/year)	Best Stormwater Footprint for Your Property
<p>This is the annual treatable volume of stormwater runoff from your property.</p> <ul style="list-style-type: none"> - For the existing condition, it is the volume of runoff from the undeveloped portion that is to be developed and any existing developed portions of the lot. - For the planned condition it is the runoff from the developed portion of 	0		0	0
RUNOFF NUTRIENT MASS	EXISTING LAND USE CONDITIONS (includes treatment practices if in place) (lbs/year)		PLANNED LAND USE CONDITIONS (includes BMPs if in place) (lbs/year)	
<p>"Total Suspended Solids (TSS) Footprint" - This is the annual mass of Total Suspended Solids (TSS) in stormwater runoff for your property.</p>	#DIV/0!		#DIV/0!	#DIV/0!
<p>"Phosphorus Footprint" - This is the annual mass of phosphorus in</p>	#DIV/0!		#DIV/0!	#DIV/0!

- b. Percent reduction option:** If you want to see if your property meets a specific nutrient reduction (for example to reduce phosphorus loading by 10%), use this option.

In the “Percent Reduction Needed” column, enter the percent reduction you are trying to achieve for runoff volume and each parameter being modeled.

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ABOUT THIS WORKSHEET

Percent reduction option: If you want to see if your property meets a specific nutrient reduction (for example to reduce phosphorus loading by 10%). In the “Percent Reduction Needed” column, enter the percent reduction you are trying to achieve for runoff volume and each parameter being modeled in the appropriate cells.

RUNOFF VOLUME	Percent Reduction Needed	EXISTING LAND USE CONDITIONS (includes treatment practices if in place) (cubic feet/year)		PLANNED LAND USE CONDITIONS (includes BMPs if in place) (cubic feet/year)
This is the annual treatable volume of stormwater runoff from your property. - For the existing condition, it is the volume of runoff from the undeveloped portion that is to be developed and any existing developed portions of the lot. - For the planned condition it is the runoff from the developed portion of	0%	0		0
RUNOFF NUTRIENT MASS	Percent Reduction Needed	EXISTING LAND USE CONDITIONS (includes treatment practices if in place) (lbs/year)		PLANNED LAND USE CONDITIONS (includes BMPs if in place) (lbs/year)
"Total Suspended Solids (TSS) Footprint" - This is the annual mass of Total Suspended Solids (TSS) in stormwater runoff for your property.	0%	#DIV/0!		#DIV/0!
"Phosphorus Footprint" - This is the annual mass of phosphorus in stormwater runoff for your property.	0%	#DIV/0!		#DIV/0!

- c. **Targeted footprint option:** If you want to see if your property meets a specific targeted footprint (for example X pounds of phosphorus per year), use this option.

In the "Targeted Footprint" column, enter the target you are trying to achieve for each parameter being modeled in the appropriate blue cells. Notice the units of each parameter before entering.

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ABOUT THIS WORKSHEET

Targeted footprint option: If you want to see if your property meets a specific targeted footprint (for example X pounds of phosphorus per year). In the "Targeted Footprint" column, enter the target you are trying to achieve for each parameter being modeled in the appropriate cells. Notice the units of each parameter before entering.

RUNOFF VOLUME	Targeted Footprint cubic feet/acre/year	EXISTING LAND USE CONDITIONS (includes treatment practices if in place) (cubic feet/year)		PLANNED LAND USE CONDITIONS (includes BMPs if in place) (cubic feet/year)
This is the annual treatable volume of stormwater runoff from your property. - For the existing condition, it is the volume of runoff from the undeveloped portion that is to be developed and any existing developed portions of the lot. - For the planned condition it is the runoff from the developed portion of	0	0		0
RUNOFF NUTRIENT MASS	Targeted Footprint lbs/acre/year	EXISTING LAND USE CONDITIONS (includes treatment practices if in place) (lbs/year)		PLANNED LAND USE CONDITIONS (includes BMPs if in place) (lbs/year)
"Total Suspended Solids (TSS) Footprint" - This is the annual mass of Total Suspended Solids (TSS) in stormwater runoff for your property.	0	#DIV/0!		#DIV/0!
"Phosphorus Footprint" - This is the annual mass of phosphorus in stormwater runoff for your property.	0	#DIV/0!		#DIV/0!
Existing SW Treatment / Planned SW Treatment / Results / Existing vs. Planned Comparison / Percent Reduction				

FOR MORE INFORMATION: For more information on the NH Residential Loading Model please contact

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Site Sketch Grid

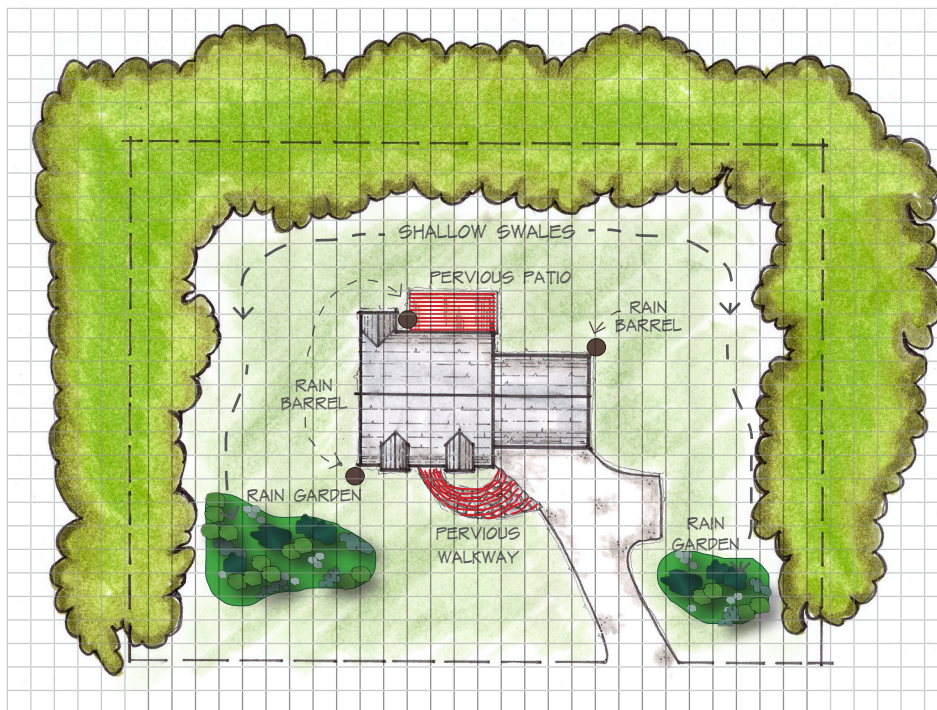
Use the grid on the following page to sketch your property and identify the property features listed below for the existing and the planned conditions.

- Impervious Roof
- Other Hard Surfaces (including driveways, walkways, decks, and patios)
- Lawn and Landscaped Areas
- Forest or other Undisturbed Areas
- Drainage Patterns (the way the water flows on your property)
- Best Management Practices (BMPs)

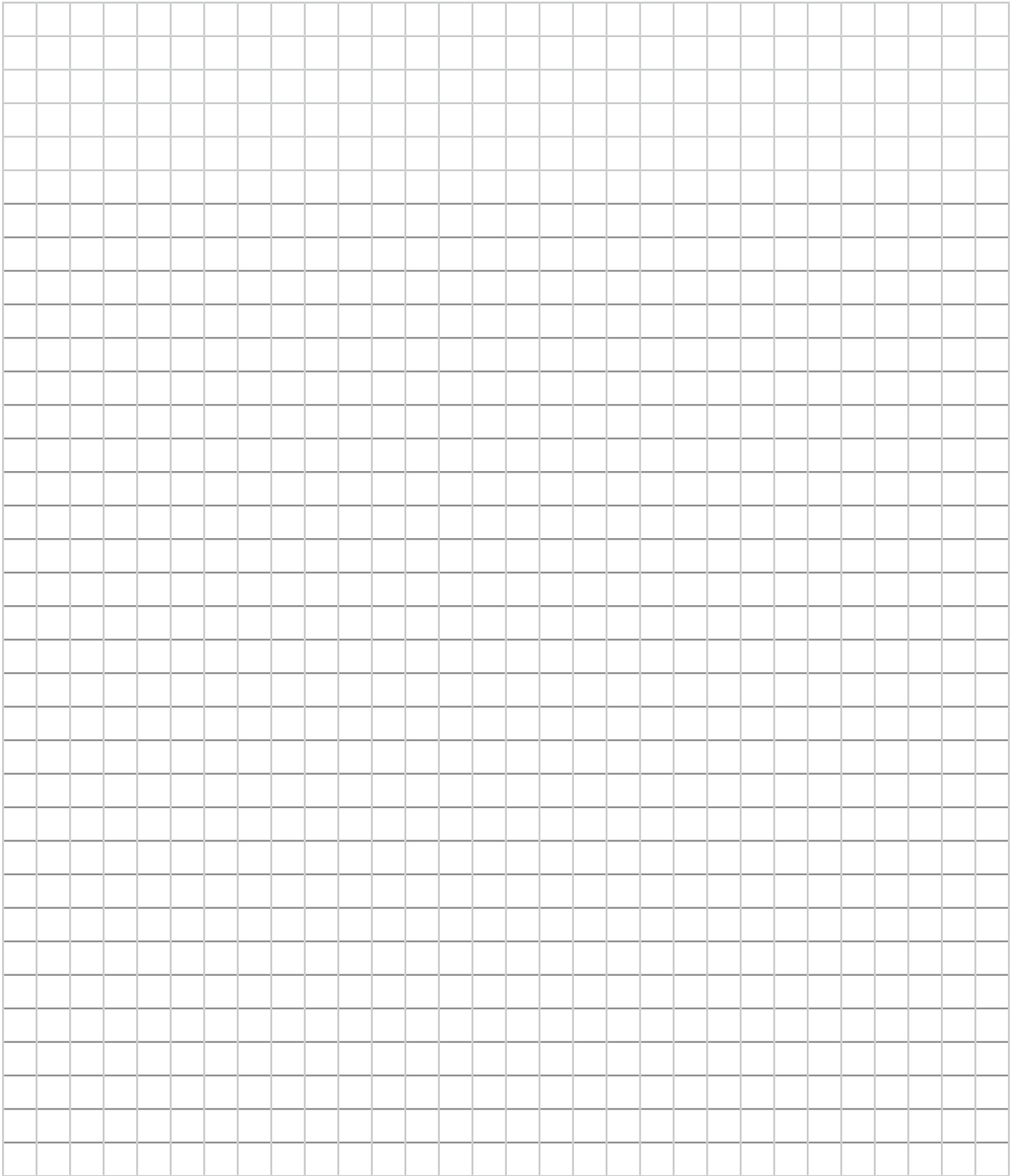
Approximations: For a 1/2 acre lot: 1 square = 5 ft. x 5 ft. (25 sq. ft.)

For a 1 acre lot: 1 square = 7 ft. x 7 ft. (50 sq. ft)

For a 2 acre lot: 1 square = 10 ft. x 10 ft. (100 sq. ft)



Example future conditions site sketch.



Project Planning Worksheet

Print and complete this worksheet to help plan your project. This information can be entered into the NH Residential Loading Model available on the [NHDES Stormwater website](#) to estimate your “stormwater footprint” and quantify the water quality benefit of installing stormwater treatment practices on your property.

EXISTING CONDITION

1. Lot size: _____ ft²

2. Impervious Roof

House: _____ ft²

Garage: _____ ft²

Other: _____ ft²

TOTAL: _____ ft²

3. Other Hard Surfaces

Driveway:

_____ ft X _____ ft = _____ ft²
length avg. width

Walkways:

_____ ft X _____ ft = _____ ft²
length avg. width

Decks:

_____ ft X _____ ft = _____ ft²
length avg. width

Patios:

_____ ft X _____ ft = _____ ft²
length avg. width

4. Lawn/landscaped areas

$$\left(\frac{\text{_____ ft}}{\text{length}} \times \frac{\text{_____ ft}}{\text{avg. width}} \right) - \left(\text{totals from 2 \& 3 above} \right)$$

$$= \text{_____ ft}^2$$

5. Forested/natural areas:

$$\text{lot size} - \left(\text{totals from 2, 3 \& 4 above} \right) = \text{_____ ft}^2$$

PLANNED CONDITION

1. Lot size: _____ ft²

2. Impervious Roof

House: _____ ft²

Garage: _____ ft²

Other: _____ ft²

TOTAL: _____ ft²

3. Other Hard Surfaces

Driveway:

_____ ft X _____ ft = _____ ft²
length avg. width

Walkways:

_____ ft X _____ ft = _____ ft²
length avg. width

Decks:

_____ ft X _____ ft = _____ ft²
length avg. width

Patios:

_____ ft X _____ ft = _____ ft²
length avg. width

4. Lawn/landscaped areas

$$\left(\frac{\text{_____ ft}}{\text{length}} \times \frac{\text{_____ ft}}{\text{avg. width}} \right) - \left(\text{totals from 2 \& 3 above} \right)$$

$$= \text{_____ ft}^2$$

5. Forested/natural areas:

$$\text{lot size} - \left(\text{totals from 2, 3 \& 4 above} \right) = \text{_____ ft}^2$$

EXISTING CONDITION

Stormwater Volume Created:

(total impervious roof + total other hard surfaces) X
(1 inch / 12) = _____ ft³

PLANNED CONDITION

Stormwater Volume Created:

(total impervious roof + total other hard surfaces) X
(1 inch / 12) = _____ ft³

EXISTING CONDITION

Stormwater Treatment Practices:

Example:

Type: Rain Garden

area draining to it: 600 ft²

from (land use type): impervious roof

Type: _____

area draining to it: _____

from (land use type): _____

Type: _____

area draining to it: _____

from (land use type): _____

Type: _____

area draining to it: _____

from (land use type): _____

Type: _____

area draining to it: _____

from (land use type): _____

PLANNED CONDITION

Stormwater Treatment Practices:

Type: _____

area draining to it: _____

from (land use type): _____

Type: _____

area draining to it: _____

from (land use type): _____

Type: _____

area draining to it: _____

from (land use type): _____

Type: _____

area draining to it: _____

from (land use type): _____

Type: _____

area draining to it: _____

from (land use type): _____

Simple Perc Test - test up to 5 different sites on your property to select the best location

	1	2	3	4	5
starting water level (inches)					
ending water level - after 15 minutes (inches)					

Soil Ribbon Test - test up to 5 different sites on your property to select the best location

	1	2	3	4	5
ribbon length (inches)					