EPA Stormwater Calculator
Demonstration for Planning Boards

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As a planning board member you are called upon to evaluate how proposed projects may affect abutting land, properties in the neighborhood and the town in general. Among the issues you should consider is increased runoff that will result from the construction of buildings, driveways, other impervious areas and the conversion of fields and woods to lawns. Not all towns in Lincoln County have the same regulations. Some towns require that the rate of off-site runoff after completion of the project not be greater than the pre-development condition. To accomplish this, the developer might install detention ponds, berms and other structure to "slow" the rate of runoff (but not necessarily reduce the overall volume of runoff). Other towns simply require that runoff not be directed to adjacent properties or use some similar subjective standard. Furthermore, some towns use different standards to apply to subdivisions vs. site plan developments or they may simply ignore runoff altogether.

Over the last several decades we have seen that storms have become more intense and more frequent, resulting in increased stormwater flows, and with a warming climate, these trends will likely grow. That is, any existing deficiencies in handling runoff that now exist on individual properties, within neighborhoods and within municipal culverts, ditches and pipes will be exacerbated. While the Planning Board has little or no authority to deal with existing problems, it does have the ability through either existing or future ordinances to ensure that new development does not further contribute to stormwater problems in the community.

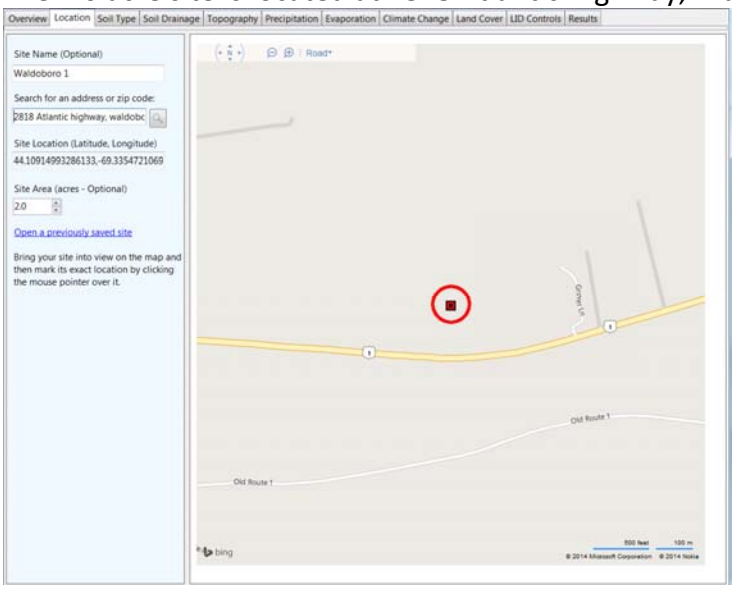
The purpose of this memo is to demonstrate the impact of applying Low Impact Development (LID) practices on site runoff. To do this I am using the EPA National Stormwater Calculator. In spite of its name, it is a mostly user friendly tool that uses a lot of readily available site-specific data on soils type, topography, rainfall and drainage. While it is intended to be used mostly by a developer in the pre-engineering phase of a project, it is very useful for a planning board wishing to better understand what happens to runoff when a site is developed and when specific LID practices are implemented. The EPA Stormwater Calculator is at http://www.epa.gov/nrmrl/wswrd/wq/models/swc/ and the User Guide is at http://nepis.epa.gov/Adobe/PDF/P100GOQX.pdf. It requires a Windows computer and internet connection. Once the program is downloaded it will appear on your Start menu.

The following is a demonstration of how the Stormwater Calculator is used on a hypothetical development scenario. To make it more realistic, I reviewed the MLS listings for commercial properties in Lincoln County and found a 2-acre site off Atlantic Highway in Waldoboro. For the purposes of this demonstration, we will assume that the site will be developed with a building and parking lot with a total of 1 acre of impervious area.

Existing Conditions Scenario

Step 1 – Enter Site Location

The 2.0 acre site is located at 2818 Atlantic Highway, Waldoboro. Enter this information as shown below.



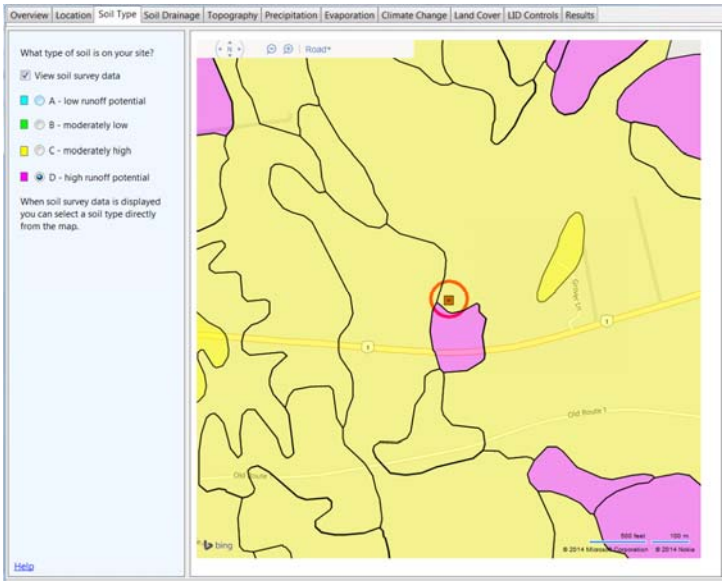
Step 2 Existing Site Conditions

In order to see existing site conditions use Google Earth or Google Maps (earth view) and enter the location.

The site has a small building and driveway. The rest appears to be mostly lawn with some fields. Estimate the % of the site that is impervious (building and driveway – I assumed 10%), in fields (10%) and in lawn (80%). Save this information for step 8.

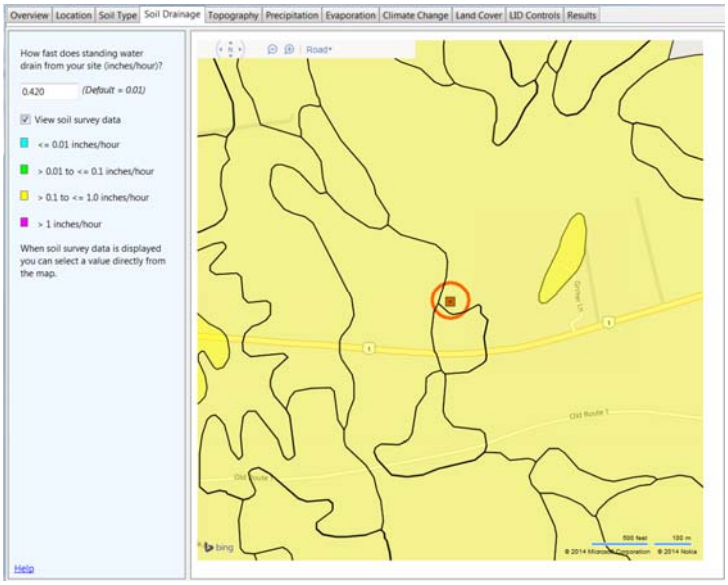
Step 3 Soil Conditions

Click on the Soils tab and click “View soil survey data”. As you can see from the graphic below, the site has a high runoff potential so click that box



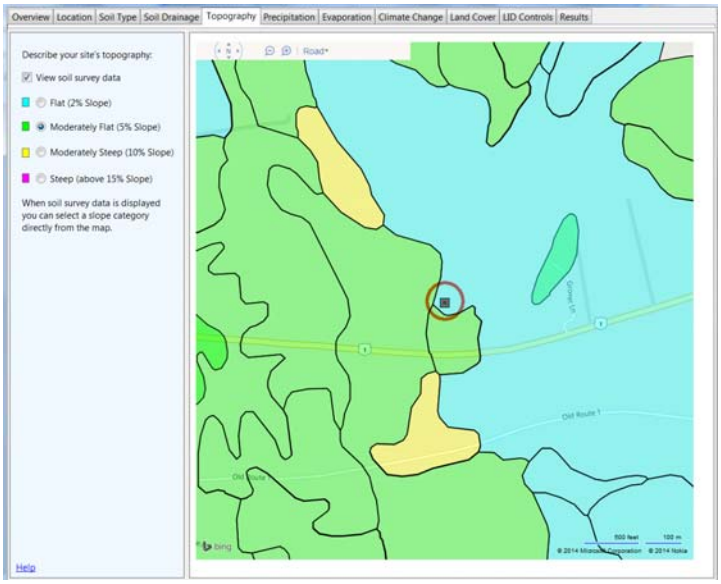
Step 4 Soil Drainage

Click on the Soil Drainage tab and click “View soil survey data”. The entire site is in the 0.1-1.0 inches/hour range. Click on the site on the map and the proper drainage data will appear in the window.



Step 5 Topography

Click on the Topography tab and click “View soil survey data”. The site is mostly “moderately flat” so click that box.

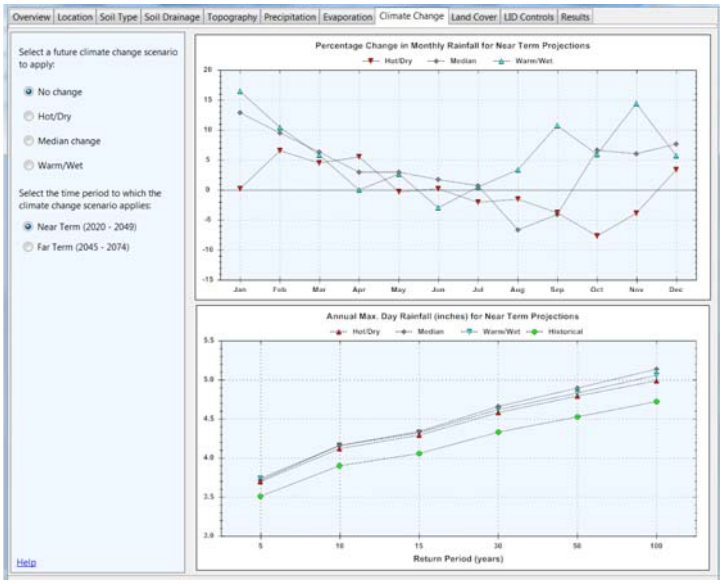


Step 6 Precipitation and Evaporation

For the next two tabs, select “Newcastle” as this is the closest location to the site.

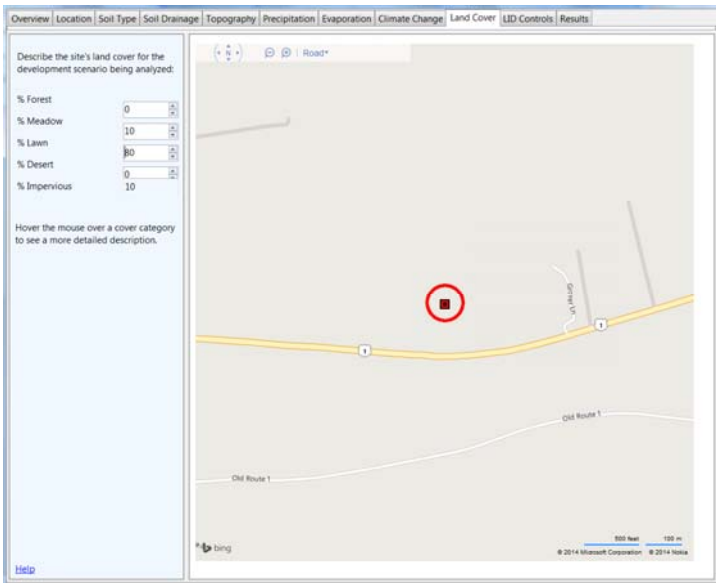
Step 7 Climate Change

You have the option of selecting four future climate scenarios and a time frame for the selected scenario. For the purpose of this demonstration, “no change” in the “near term” is selected.



Step 8 Land Cover

Enter the land cover percentages estimated from the Google Earth or Google Map from step 2. The program will automatically calculate impervious area.

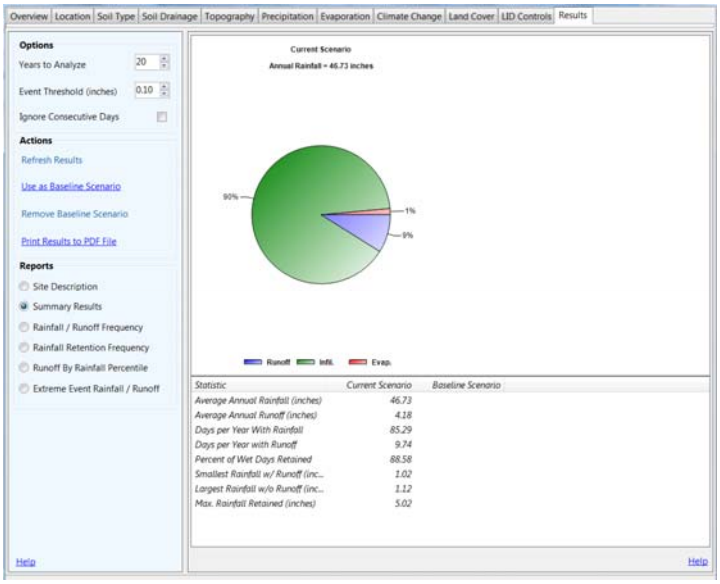


Step 9 LID Controls

Because this is a pre-project scenario, no LID practices are selected at this time.

Step 10 Results

The program uses past rainfall data so select how many years back to be analyzed. The program also needs to know the minimum amount of rain in a day that is to be considered as a rainfall event. For purposes of the demonstration enter 20 years and 0.10 inches then click “results” and then “summary results” under reports.



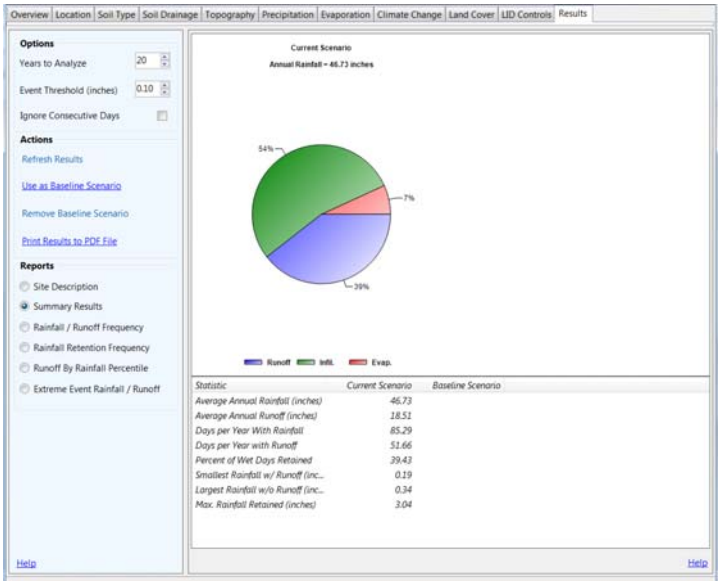
The program calculates that, under existing pre-development conditions, of the 46.73 inches of annual rainfall, 9% or 4.18 inches will be runoff leaving the site and that will occur on 9.74 days per year (other reports are available by clicking the various boxes and the entire results can be saved and printed by clicking “print results to PDF file”). These values – 4.18 inches and 9.74 days – are the baseline conditions, which are used to

compare what will occur both when the site is redeveloped without considering runoff and also when LID practices are employed on the redevloped site.

Proposed Development Scenario with no LIDs

Step 1 Change Land Cove

Because no LIDs are being selected in this scenario, the only change to make to the program will be in the land cover tab. Assume that the proposed development will consist of a total 10,000 sf retail building and 30,000 sf of paved driveway and parking. This means that 46% of the site will be impervious (vs. 10% currently). This will result in a reduction in lawn cover % from 80% to 44%. Enter this in the Land Cover tab and click "refresh results" in the Results tab.



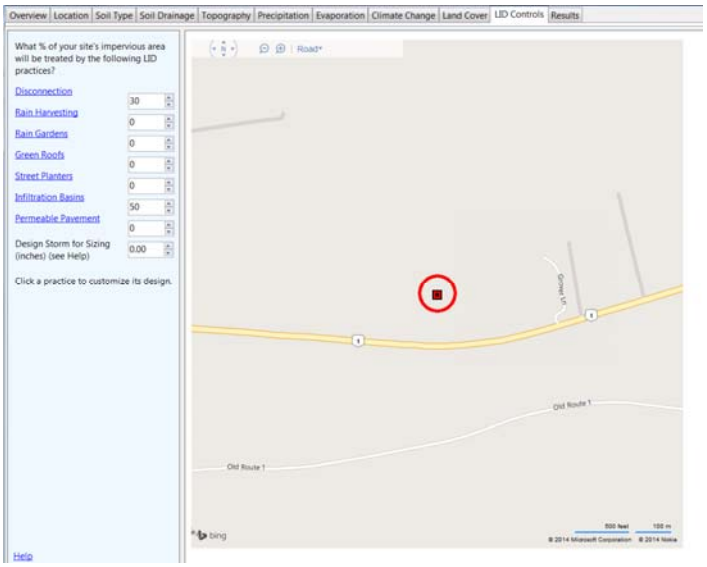
As can be seen in the graphic above, the proposed development without any LID practices will result in a more than four fold increase in runoff leaving the site, from 4.18" to 18.51". There will also be a significant increase in the number of days per year when runoff leaves the site, from 9.74 days to 51.66 days per year.

Proposed Development Scenario with LIDs

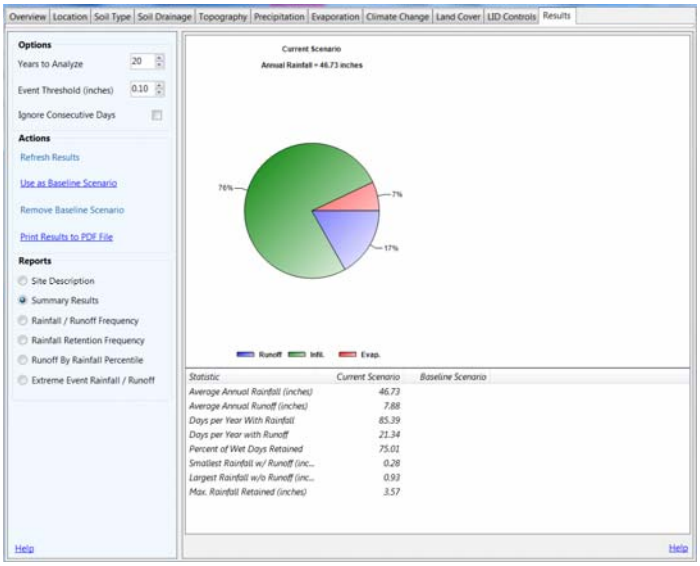
Step 1 Select LID Practices

In this scenario, LID practices will be selected and applied to the proposed development so the only change to be made to the program will be in the LID tab. The LID tab has seven LID practices that can be selected and applied in a mix if desired (vegetative swales and infiltration trenches are not included because their effectiveness is dependent upon their location within the site, which is beyond the scope of the calculator). The simplest way to incorporate the LID practices is to select the percentage of the site's *impervious* area that will be treated by each LID practice. Clicking a practice provides an explanation of the technique (it also permits some additional modifications to the sizing and effectiveness of the practices but these are beyond the scope of this demonstration).

The following graphic shows that 30% has been entered under “disconnection” (runoff from the impervious area will be directed to the lawn or a vegetative strip where it will infiltrate) and 50% under “infiltration basin” (runoff from the impervious area will be collected in an infiltration basis where it will be absorbed into the ground. The 20% of runoff from impervious areas that is not accounted for will not be treated and will exit the site via culvert, ditch or stormwater basin.



By then clicking the “Results” tab and “Renew Results, the updated scenario reveals that runoff has been reduced from 39% to 17% with the application of two simple and easy to maintain LID practices. In addition, the total annual runoff leaving the site is now 7.88” vs. 18.51” without controls and the number of days per year when runoff leaves the site has been reduced from 51.66 to 21.24. Runoff can be further reduced by directing more runoff from impervious areas to these practices or by employing additional practices.



It is important to note that this Stormwater Calculator will not subsitute for the preparation of a drainage study by the developer’s engineer. The study is required to properly size and design all LID practices but it does provide the planning board as well as a property owner a much better understanding of the benefits of addressing stormwater on the site rather than allowing it to exit the site as runoff.