**Assignments due 1/14/17 (Week 2)**

Exercise #1 from the SWMM Applications Manual demonstrates how to construct a hydrologic model of an urban catchment and use it to compare stormwater runoff under both pre- and post-development conditions. It also is a good introduction to some basic SWMM functions. The exercise is based on a 29-acre natural catchment on which a residential development is planned, and shows you how to subject the pre- and post-developed site to 2 hour storms of 2, 10, and 100 year return periods.

After you go through the example, your assignment is to follow the same steps replacing the example site with your Grenada study area. We will assume that the pre-developed site corresponds to what that piece of land looked like in 1986 (pre-developed conditions), and in 2013 (post-developed conditions), per the beow. (The 2001 data is only provided for background to the rate of development).

|  |  |  |  |
| --- | --- | --- | --- |
| **Study Area** | **1986** | **2001** | **2013** |
| Grand Anse Beach | 12% | 43% | 48% |
| Carenage | 35% | 70% | 71% |

After finishing Exercise E1, here are more explicit instructions

* Import the image of your study site, provided.
* Scale it in SWMM using the scale on the figure and SWMM’s ruler tool to select the x and y coordinates of the upper right hand corner (lower left hand corner is 0,0).
* Then start creating the pre-development model by creating one subcatchment corresponding to the entire watershed. Establish its properties as follows:

Area: 574.57 acres (Carenage) or 545.06 acres (Grande Anse Beach)

Width: you will need to do an area weighted average. Use 500 ft for all non-urban catchments.

For urban catchments, W=A/Lbar where Lbar is the average maximum distance that runoff needs to flow before entering a collection system (assumed to be in the streets)

% slope: per the contours provided in the pdfs (again do an area-weighted average)

% imperv 0% for predevelopment

N-perv pick out appropriate value from SWMM users manual (Table A.6) given undeveloped state

N-imperv users manual

D-store again, pick out relevant values from Users Manual (Table A.5)

% zero imp irrelevant for pre-developed

Subarea ro outlet

Percent routed 100%

Infiltration Horton

Other props Irrelevant for now

For the pre-development infiltration properties, use the Horton method and the same parameters used in Exercise #1. The routing method is Kinematic wave (we will talk about this in upcoming classes), and other default values are as shown in Table 1-3 in Exercise #1.

The post-developed site refers to the site in its 2013 configuration (e.g. urbanized to its current extent but prior to any greening taking place.) The first step in simulating the post-developed site is to decide how to discretize the entire site into individual subcatchments and then to appropriately derive the parameters to describe each one of them. You will need to use the various maps and drawings provided, and other information that you can glean from google earth or other such sources. Keep in mind that later in the term we will be adding sewer pipes to the model and so you’ll want to select subcatchments that make for convenient connections later on (you can always adjust this later if need be – so don’t sweat this too much). You will find that defining subcatchments is “an art” in that there are multiple ways that you could construct the post-development model. **However you decide to discretize the study area, the area average imperviousness of the entire watershed area should match the 2013 values shown in the table above.**

For the rain gage, you will need to adjust the values for Grenada’s 5, 10, and 50 year 2-hour storms (note the change in return period) which we will assume to be 4 in, 4.5 in, and 5 inches respectively in total depth (Note: These are assumed values based on general information available for the Caribbean since accurate precip data is difficult to come by for Grenada).

Note we will use the same 2 hour distribution of rain as in Example 1, but you will need to change the 5 minute intensities such that the percent of the total rainfall depth that occurs in each 5 minute period is as indicated in the table below. For example, 2% of the 4 inches of the 2 year storm fell in the first 5 minutes, or a total of 0.08 inches. The intensity (in inches/hour) of the first five minutes of this storm then had to be (0.08 in/5min)\*(60min/1hr)=0.96 in/hr which is the value you would put in the first row of the rain gage table… and so on. After you’ve adjusted your rain amounts and run the model make sure that your sums add up to the correct values.

|  |  |
| --- | --- |
| time (h:m) | % of total storm depth |
| 0:00 | 2% |
| 0:05 | 3% |
| 0:10 | 3% |
| 0:15 | 5% |
| 0:20 | 7% |
| 0:25 | 13% |
| 0:30 | 26% |
| 0:35 | 10% |
| 0:40 | 6% |
| 0:45 | 4% |
| 0:50 | 3% |
| 0:55 | 3% |
| 1:00 | 2% |
| 1:05 | 2% |
| 1:10 | 2% |
| 1:15 | 1% |
| 1:20 | 1% |
| 1:25 | 1% |
| 1:30 | 1% |
| 1:35 | 1% |
| 1:40 | 1% |
| 1:45 | 1% |
| 1:50 | 1% |
| 1:55 | 1% |
|  |  |
| sum | 100% |

After subjecting the pre- and post-developed sites to Grenada’s 5, 10, and 50 year 2-hour storms, you will then reproduce the following tables figures:

* Table 1-1, summarizing the subcatchment properties that you specified for the undeveloped site
* Table 1-5, summarizing the subcatchment properties that you specified for the developed site (use as many rows as necessary)
* Figure 1-7, Table 1-4 (results for the undeveloped site)
* Figure 1-11 and Table 1-8 (results for the developed site)
* Table 1-9 for a comparison of the two sets of results

Fill out the homework template with your results, and submit on Drexel Learn (one per group).