BAE 590-601: DRAINMOD Spring 2011

Homework 2: Trafficability

Due by 5PM EST on Friday, January 28, 2011

FILES TO SUBMIT

- Report in .doc or .docx format and named as shown below. Replace LastName with your last name.
  - ✓ LastName.590.2011.HW02

- Spreadsheet in .xls, .xlsx, .xlsm format and named as shown below.
  - ✓ LastName.590.2011.HW02

- Zip file(s) including DRAINMOD inputs (PRJ, GEN, SIN, RAI, and TEM). Name your PRJ and GEN file as shown below.
  - ✓ YourInitials_hw02

    - For example, my PRJ file would be named: bdp_hw02.prj
    - If you use different project files for each drain depth, label similar to the following scheme:
      1. bdp_hw02_90cm.prj
      2. bdp_hw02_120cm.prj
      3. Etc…
    - As long as your PRJ and GEN files begin with YourInitials_hw02, a naming scheme is up to you
    - If you use the *Backup* button from within DRAINMOD to zip your project, the zip file generated should reside in your inputs folder.

- PDF's of any referenced material not distributed in the course (when possible)

HW INFORMATION

- Total possible points: 30
- Use the report template
- Post questions to the *Homework Q & A* forum

PROBLEM STATEMENT

A drainage system is needed to provide conditions suitable for the construction of a building and associated parking lot on a poorly drained site in Wilmington, NC.

Latitude = 34D 16M
HI = 85
Monthly PET Correction Factors listed below
DRAINMOD Weather Files: Wilmington5009

The soil is Rains sandy loam. The restrictive layer is 210 cm below the soil surface and the hydraulic conductivities are given below.

Depth	Lateral Hydraulic Conductivity
0-45 cm	8 cm / hr
45 – 210cm	1 cm / hr
> 210cm	0

A drainage canal (2.4 m deep) is adjacent to the site and can be used as an outlet for subsurface drains. Surface drainage is relatively good with depression storage of 1.5 cm (max value). Construction work can be done if the water table is 1 m deep or deeper. This corresponds to a drained water-free pore space of 6.9 cm under drained to equilibrium conditions for the Rains soil. Rainfall greater than 2 cm will delay construction for two days.

Conduct all simulations for the period January 1960 – December 2009 (50 years). The working hours of a day during February and March are from 8am to 5pm. Assume that 4-in. (10 cm) corrugated plastic drainage pipe (CPP) with an effective radius of 2.0 cm will be used for the subsurface drains. Assume the drainage coefficient is 2.5 cm/day. Initial water table depth is not important, leave at 50cm.

► Determine the drain spacings (nearest 0.25 m) required for drains 0.9, 1.2, 1.5, and 1.8 m deep to provide a 90% probability [10 Year recurrence interval (YRI)] of having at least 30 days suitable for work in the months of February and March.

► Plot the number of working days (10 YRI) as a function of drain spacing for the four drain depths. Perform simulations for drain spacings from 2 m to 30 m with an incremental spacing change of 2 m.

► On a separate graph, plot the average number of working days versus drain spacing for the four depths. Again, plot results for 2-30 m drain spacing.

► Discuss the trends (and apply what you have learned in the lectures to your discussion). Is there a drainage design for the 90cm drain depth that satisfies the criteria? Discuss that situation.

► Include the RNK files for the spacing that satisfies the 10YRI criteria for each depth in the Appendices section of your report. The RNK files are text files (open in notepad++ or similar) and can be copied / pasted in to your document editor. Decrease the font size to 10. A new RNK file should go in a new Appendix.

PET Correction Factors for Wilmington, NC

Month	Correction Factor	Month	Correction Factor
1	2.01	7	0.86
2	2.32	8	0.82
3	2.10	9	0.92
4	1.72	10	1.05
5	1.23	11	1.22
6	1.0	12	1.44