Statewide LID Training Program

INSTRUCTORS

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Senior Engineer
Key project experience: Stormwater monitoring, design, hydrologic modeling and NPDES Permit compliance

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Staff Engineer
Key project experience: Stormwater monitoring, design, hydrologic modeling

PROGRAM OVERVIEW

• 2012: Public and private partners engage state legislature to fund program
• June 2012: LID Training Steering Committee convened
• 2012-2013: Washington State LID Training Plan developed: www.wastormwatercenter.org/statewide-lid-training-program-plan
• 2014: Training program built from state LID Training Plan
Program Overview

- Implement second phase of trainings (September 2014 through May 2015)
- 49 trainings offered in western and eastern WA first year
- 45 trainings scheduled for western and eastern WA in current phase (through June 2016)
- Three levels: Introductory, Intermediate, and Advanced
- Statewide LID Certificate now available

Overview of Program

**Project Lead**

**Core Team**

**Additional Training Support**

Introduction to LID for Inspection & Maintenance Staff

Intermediate LID Topics: NPS/Pluvial

Intermediate LID Design: Site Assessment, Planning & Layout

Intermediate LID Design: Hydrologic Modeling

Intermediate LID Design: Vegetative Systems & Vegetated Roofs

Intermediate LID Design: Hydraulics & Modeling

Advanced Topics for Long-Term LID Operations: Bioretention

Advanced Topics for Long-Term LID Operations: Permeable Pavement

Advanced Topics in LID Design: Design & Construction

Advanced Topics in LID Design: Maintenance & Operation

Advanced Topics in LID Design: hydraulic modeling

Advanced Topics in LID Design: Vegetative Systems & Vegetated Roofs

Advanced Topics in LID Design: Assessment, Planning & Layout

Advanced Topics in LID Design: Bioretention Media and Compost Amended Soils

Advanced Topics for Long-Term LID Operations: Hydrologic Modeling

Introduction to LID for Developers & Contractors: Make Money Be Green
AGENDA

introduction

review hydrologic modeling basics

exercises #1-4

advanced modeling discussion

wrap up
LEARNING OBJECTIVES

1. Gain an intermediate to advanced level of knowledge using WWHM and MGSFlood to predict pre- and post-development flow volumes and durations.

2. Learn intermediate to advanced level skills to size bioretention, permeable pavement, and vegetated roofs in residential and commercial settings using WWHM and MGSFlood.

3. Understand the advantages and limitations of WWHM and MGSFlood and are introduced to additional modeling tools for specific predictions.

LOGISTICS

SCHEDULE
- 8-hour classroom training with breaks as needed
- Lunch (provided)

OTHER LOGISTICS
- Restroom location
- Food
- Turn off cell phones
- Sign in and sign out

introduction
review hydrologic modeling basics
exercises #1-4
advanced modeling discussion
wrap up
Advanced Modeling Topics: Optimizing Detention

19.3. Guidelines for Adjusting Model Performance

1. Increase the detention volume by increasing the value in the second inflow source and decreasing the value in the outflow source.

2. Increase the detention volume by increasing the value in the second inflow source and decreasing the value in the outflow source.

3. Increase the detention volume by increasing the value in the second inflow source and decreasing the value in the outflow source.

4. Increase the detention volume by increasing the value in the second inflow source and decreasing the value in the outflow source.

5. Increase the detention volume by increasing the value in the second inflow source and decreasing the value in the outflow source.

Figure 19.4 - General Guidance for Adjusting Model Performance

MGS Flood User Manual (2009)
### Advanced Modeling Topics: Optimizing Detention

- Analyze the detention curve from bottom to top, and adjust outlets from bottom to top.
- The bottom outlet corresponds with the discharge from the bottom outlet. Reducing the bottom outlet discharge lowers and shortens the bottom arc while increasing the bottom outlet causes and lengthens the bottom arc.
- Inflations point in the outflow detention curve occur when additional structures (tunnels, overflows, downstream outlets are added.
- Lifting the upper outlet causes the transition right on the lower arc, and raising the upper outlet moves the breakthrough left of the lower arc.
- The upper arc represents the combined discharge of both outlets. Adjustments are made to the second outlet as described above for the bottom outlet.
- Increasing the facility volume moves the entire curve down and to the left. This is done to control over-overflow conditions. Decreasing facility volume moves the entire curve up and to the right. This is done to ensure that the outflow detention curve extends up to control over-overflow.

### Advanced Modeling Topics: Importing Precip

Select Tools

Import Dataset – allows users to import any time series data in comma-delimited file or text file.
Advanced Modeling Topics: Importing Precip

Specify time series type. Can be precipitation, flow, evaporation, or stage data.

Specify start date, end date, timestep, and the timestep to be used in the model.

A WDM data set number between 1 and 9999 must be assigned.

Select missing value method.

Advanced Modeling Topics: HSPF Parameters

PERLND5 – Pervious Land Segments – model parameters that define interception, infiltration, and movement of moisture through soil.

PERLND5 parameters definitions:
- LIND = area weight per pixel (acres)
- PHIP = infiltration (alfalfa hay field)
- PHIF = infiltration (hay field)
- SDT = slope of surface over land flow (dry input)
- IC = wet interception (average moisture contents) 
- HINF = infiltration parameters
- DPCT = infiltr. parameter
- RES = interception
- BASEL = infiltration parameters
- AWDPE = roughness (topography)
- CSPEC = wet interception
- LINS = infiltration (input)
- NCH = infiltration of surface runoff
- SINF = infiltration of surface
- SINF = infiltration of surface
- SINF = infiltration of surface

MGS Flood User Manual (2009)
Advanced Modeling Topics: Editing HSPF Parameters

Select Tools

Advanced Modeling Topics: Editing HSPF Parameters

IMPLND – parameters for simulation of runoff and water quality constituents from impervious land areas.

PRLND – parameters for simulation of runoff and water quality constituents from pervious land areas.

Advanced Modeling Topics: Editing HSPF Parameters

Change IMPLND by land cover.
Advanced Modeling Topics: Editing HSPF Parameters in WWHM

LSUR – overland flow length (ft)
SLSUR – slope of overland flow (ft/ft)
NSUR – Manning’s n

*Note that the 2012 SWMMWW (Amended 2014) only allows the user to edit LSUR, SLSUR, and NSUR as these are parameters whose values are observable at an undeveloped site, and whose values can be reasonably estimated for the proposed development site.

Advanced Modeling Topics: Editing HSPF Parameters in MGS Flood

Select Tools Tab
Edit HSPF Parameters

*Note that the 2012 SWMMWW (Amended 2014) only allows the user to edit LSUR, SLSUR, and NSUR as these are parameters whose values are observable at an undeveloped site, and whose values can be reasonably estimated for the proposed development site.
Advanced Modeling Topics: HSPF Parameters

**PERLNDS** – Pervious Land Segments – model parameters that define interception, infiltration, and movement of moisture through soil.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERL</td>
<td>0.5</td>
<td>interception factor for wet areas</td>
</tr>
<tr>
<td>INFIL</td>
<td>0.1</td>
<td>infiltration rate constant</td>
</tr>
<tr>
<td>RINF</td>
<td>0.01</td>
<td>runoff coefficient</td>
</tr>
</tbody>
</table>

Advanced Modeling Topics: HSPF Parameters

**IMPLNDS** – Impervious Land Segments – model runoff parameters for impervious surfaces.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMPR</td>
<td>0.5</td>
<td>impervious runoff factor</td>
</tr>
<tr>
<td>INFIL</td>
<td>0.1</td>
<td>infiltration rate constant</td>
</tr>
<tr>
<td>RINF</td>
<td>0.01</td>
<td>runoff coefficient</td>
</tr>
</tbody>
</table>

**INPCTD Parameters Definitions:**
- IMPR: length of surface event from flow plane (foot)
- INFIL: depth of surface event from flow plane (foot)
- RINF: runoff coefficient of surface event from flow plane (Defining - 1)
Statewide LID Training Program

OVERVIEW OF PROGRAM

**INTRODUCTORY**

2.1 Introduction to LID for Inspection & Maintenance Staff

2.2 Introduction to LID for Inspectors & Maintenance Staff

**INTERMEDIATE**

3.1 Intermediate LID Design: Rainwater Collection Systems & Vegetated Roofs

3.2 Intermediate LID Design: Hydrologic Modeling

3.3 Intermediate LID Design: Site Assessment, Planning & Layout

**ADVANCED**

4.0 Advanced Topics in LID Design: Hydrologic Modeling

4.1 Advanced Topics in LID Design: Site Assessment, Planning & Layout

4.2 Advanced Topics in LID Design: Site Assessment, Planning & Layout

4.3 Advanced Topics in LID Design: Bioretention Media and Compost Amended Soils

4.4 Advanced Topics in LID Design: Permeable Pavement

4.5 Advanced Topics in LID Design: Rainwater Collection Systems & Vegetated Roofs

5.0 Advanced Topics in LID Design: Permeable Pavement

5.1 Advanced Topics in LID Design: Permeable Pavement

5.2 Advanced Topics in LID Design: Permeable Pavement

5.3 Advanced Topics in LID Design: Permeable Pavement

5.4 Advanced Topics in LID Design: Permeable Pavement

5.5 Advanced Topics in LID Design: Permeable Pavement

Two certificates now available:

- LID Design certificate
- Long-term LID Operations certificate

Sign out!

For Information on training and other resources, visit the Washington Stormwater Center website:

http://www.wastormwatercenter.org

Stay connected through Social Media

- Come "Like" our Page
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Further questions? Contact:
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