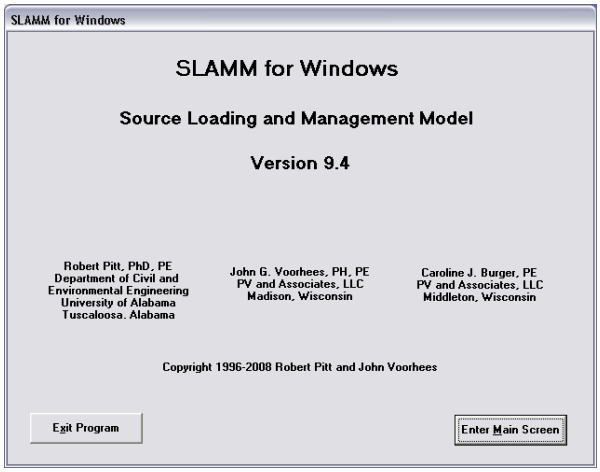
Urban Stormwater Pollution Prediction Using: WinSLAMM



Model Purpose and Capabilities

WinSLAMM was developed to better understand the relationships between sources of urban runoff pollutants and stormwater runoff quality. The program can aid a user in identifying pollutant sources and evaluating the effects of different stormwater control practices and runoff management strategies. Control strategies include infiltration devices, wet detention ponds, porous pavement, street cleaning, biofiltration, roof gardens, percolation ponds, grass swales, catchbasin cleaning and roof and pavement drainage practices, all individually or in combination, at source areas, within the drainage system, or at outfalls.

Inherent in its design, WinSLAMM calculates pollutant mass balances and runoff volumes for different urban land characteristics and rainfalls. It was designed to provide relatively simple outputs such as pollutant mass discharges and control measure effects for a large variety of potential conditions.

WinSLAMM is mostly used as a planning tool to better understand sources of urban runoff pollutants and their control. WinSLAMM has been used in many areas of North America and has been shown to accurately predict stormwater flows and pollutant characteristics for a broad range of rains, urban development characteristics, and control practices.

WinSLAMM incorporates unique process descriptions to more accurately predict the sources of runoff pollutants and flows for the storms of most interest in stormwater quality analyses. WinSLAMM can be effectively used in conjunction with drainage design models to incorporate the mutual benefits of water quality controls on drainage design.

Key Model Concepts and Features

- Stormwater pollutants are primarily generated from smaller rainfall events because they are much more frequent, so special emphasis is placed on small storm hydrology and particulate washoff.
- The model incorporates unique process descriptions to more accurately predict the sources of runoff pollutants and flows for the storms of most interest in storm water quality analyses.
- Can be effectively used in conjunction with drainage design models to incorporate the mutual benefits of water quality controls with drainage flow management design.

Model Strengths and Limitations

Strengths:

- The model is based on actual field observations and data, with minimal reliance on pure theoretical processes that have not been adequately documented or confirmed in the field.
- The model can consider many stormwater controls (affecting source areas, drainage systems, and outfalls) together, for a long series of rains.
- The model will accurately describe a drainage area in sufficient detail for water quality investigations, without requiring a great deal of unnecessary information that field studies have shown to be of little value to accurately predict stormwater quality.

- The model will predict runoff volumes and pollutant loadings for one or many years of rainfall data.

Limitations:

- WinSLAMM does not currently evaluate snowmelt and baseflow conditions.
- The model evaluates runoff characteristics at the source area within a watershed and at the discharge outfall, but does not consider in-stream system processes that can remove or transform pollutants. It can be used in conjunction with in-stream models.
- WinSLAMM uses simplified routing for drainage systems in conjunction with detailed routing through ponds and biofiltration devices
- It does not currently model mass erosion from pervious areas or construction sites.
- Is not intended for design storm analysis or for rural conditions.

Land Uses

There are five land use categories defined by the model: ▸ Residential ▸ Institutional ▸ Freeway ▸ Commercial ▸ Industrial.
Each of these can be further refined by describing the type and amount of the source areas within the land use (for example, Medium Density Residential). Each land use is further defined by source areas and optional control devices described below.

Source Areas
Roofs
Sidewalks/Walks
Other Impervious Areas
Paved Parking/Storage
Streets/Alleys
Freeway Lanes/Shoulders
Unpaved Parking/Storage
Undeveloped Areas
Large Turf Areas
Playgrounds
Small Landscaped Areas
Large Landscaped Areas
Driveways
Other Pervious Areas

Stormwater Controls
Grass Swales
Catchbasins
Roof Disconnections
Wet Detention Ponds
Street Cleaning
Biofiltration
Infiltration
Porous Pavement
Hydrodynamic Devices
Rain Gardens
Cisterns

What Types of Policy Questions Might Be Answered By This Model?

- ✓ What is a communities "base level" of pollution loading stormwater regulatory purposes?
- ✓ What type of flow and pollutant discharges may result from different development scenarios, using various urban runoff control practices?
- ✓ What are the sources of the problem pollutants in runoff?
- ✓ How effective are various storm water management practices in controlling pollutants at their sources and at outfalls?
- ✓ What combination of BMPs best meets the pollution reduction requirements of a stormwater regulatory program?

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