Section 1
Introduction

1.1 Project Background

The Spruce Run and Mulhockaway Creek are part of the North & South Branch Raritan River Watershed Management Area (WMA), known also as WMA08. Both of these streams and several neighboring tributaries drain into the Spruce Run Reservoir, a major recreational area and potable water supply[1] maintained by the New Jersey Water Supply Authority. Protecting the quality of water feeding the reservoir is essential to ensure its integrity for potable water supply and recreation for years to come.

The watersheds of the Spruce Run and Mulhockaway Creek are located almost entirely within Hunterdon County, with a small portion of the Spruce Run Creek watershed in Morris County. In recent years, urban sprawl has begun to drastically change the landscape of this area. Between 1984 and 1995, the North & South Branch Raritan WMA experienced an increase in developed land area from 22% to 27% or, 57,900 acres.[2] Large-scale changes in land use can have irreparable consequences on water quality and quantity. The intent of this study was to analyze the existing water quality pollutant loads and to assess the potential impacts of increased urbanization in the watersheds of the Spruce Run Creek and Mulhockaway Creek and those that drain directly to the Spruce Run Reservoir.

The study was divided into two study areas, the Spruce Run Creek and neighboring watersheds (referred to as the Spruce Run study area and model) and the Mulhockaway Creek and neighboring watersheds (referred to as the Mulhockaway Creek study area and model). The study areas are shown in Figure 1.1. A stormwater model was created for each of the study areas using the USEPA Stormwater Management Model (SWMM). The models were developed using existing land use conditions and a potential build out land use scenario under existing local zoning ordinances.

1.2 Scope and Extent of the Project

The objective of this project was to develop two stormwater models to be used as watershed management tools for the Spruce Run and Mulhockaway Creek watersheds. The models were calibrated for accuracy in simulating flow using stream flow records at USGS gauging stations within each of the study areas. Although one goal of the project was to use local water quality data to "validate" model results, the existing data were not representative of wet weather conditions. Water quality was sampled quarterly at USGS gages, but few of the sampling events could be correlated

[1] Spruce Run Reservoir is part of the Raritan Basin System, which provides water for 1.2 million people in central New Jersey. The reservoir collects and stores water to offset high demands in summer months. Drinking water intakes are located downstream of the reservoir in the Raritan River.
[2] Lathrop R.G., October 2000, New Jersey Land Cover Change Analysis Project. Rutgers University.

with wet weather events. Thus, the existing water quality data were not representative of stormwater quality, and therefore, not useful for this study.

The project was completed in two phases using the following progressive process:

?? Data Collection
?? Data Development
?? Spruce Run Model Development
?? Spruce Run Model Calibration
?? Spruce Run Model Runs – Existing and Build Out Conditions
?? Mulhockaway Creek Model Development
?? Mulhockaway Creek Model Calibration
?? Mulhockaway Creek Model Runs – Existing and Build Out Conditions

Data collection and development were conducted simultaneously for both study areas. The Spruce Run model was developed first and the Mulhockaway model was developed after the Spruce Run model was calibrated. This report summarizes the development and calibration of the SWMM models for each of the study areas and the simulation results for existing and build out conditions.

1.3 Physical Setting

The watersheds of the Spruce Run study area total approximately 13,200 acres. The watersheds are generally located within the Highlands physiographic province, which is characterized by ridges of very hard rock and valleys comprised of much softer materials.[3] The topography of the study area ranges from a maximum of approximately 1,000 feet above sea level to a minimum of approximately 260 feet above sea level. The predominant soil type within the Spruce Run study area is from the Parker Series, which is described in the Hunterdon County Soil Survey as being "excessively drained, gravelly or cobbly soils." The permeability of these soils is moderately rapid in the surface layers, and rapid in the substratum.[4] While the Spruce Run is the major waterway within the Spruce Run study area, Willoughby Brook, Rocky Run, Black Brook, and Alpaugh Brook also are tributary to the Spruce Run Reservoir.

The watersheds of the Mulhockaway Creek study area total approximately 13,200 acres. These watersheds also are generally located within the Highlands physiographic province. The topography of the study area ranges from a maximum of

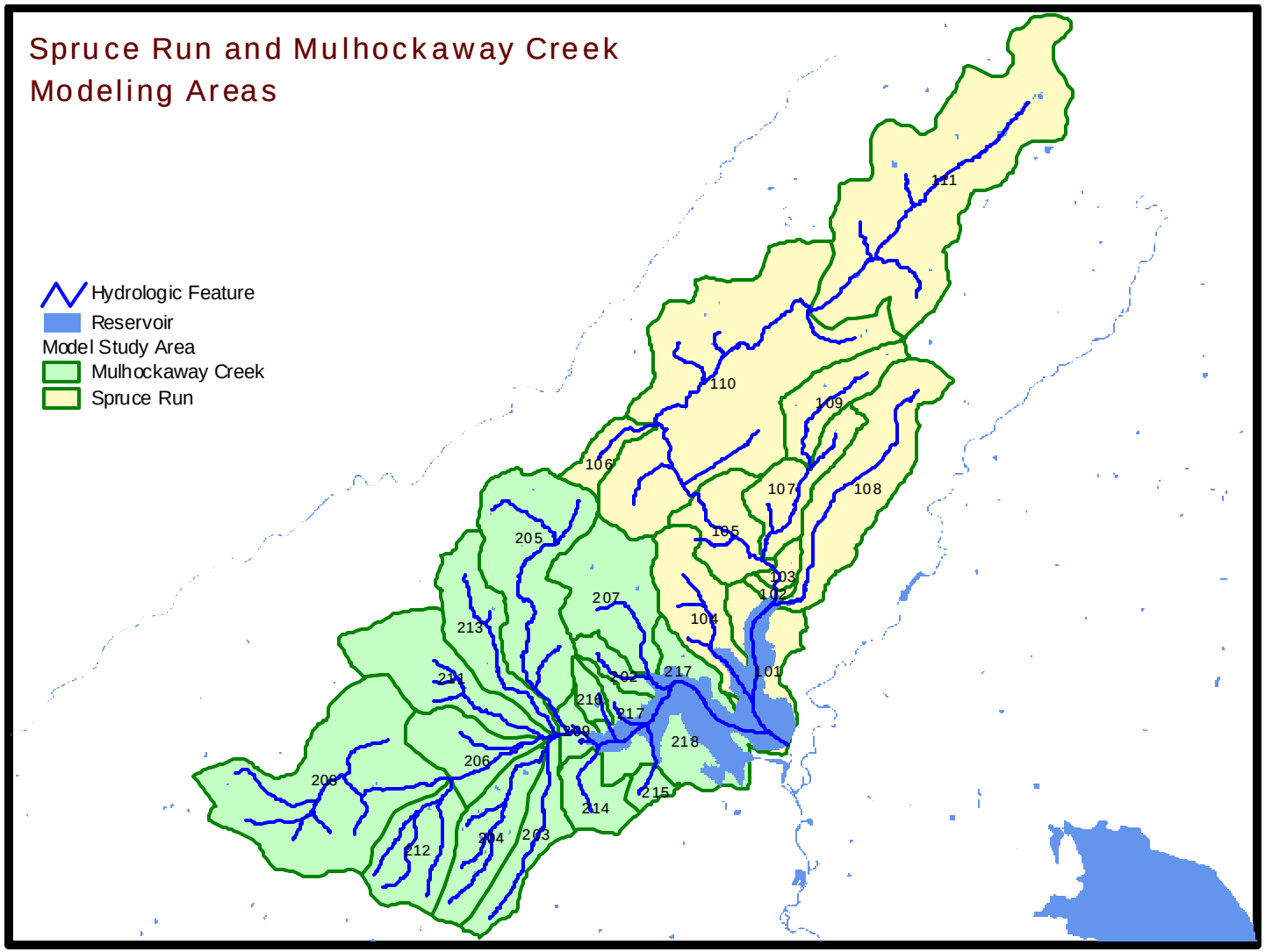
[3] Setting of the Raritan River Basin. NJWSA.

[4] Soil Survey Hunterdon County New Jersey, November 1974, United States Department of Agriculture Soil Conservation Service and Jablonski, C.F. 1988. Soil Survey of Hunterdon County, New Jersey. United States Department of Agriculture Soil Conservation Service, in Cooperation with the New Jersey Agricultural Experiment Station and the New Jersey Department of Agriculture. New Jersey Department of Agriculture. Trenton, NJ.

approximately 975 feet above sea level to a minimum of approximately 260 feet above sea level. The predominant soil type within the Mulhockaway Creek study area is from the Edneyville Series, which is described in the Hunterdon County Soil Survey as being “well-drained, gravelly soils”. The permeability is described as “moderately permeable” and the survey also notes that the soil originally contained many stones and rocks, but that extensive areas have been cleared for agriculture.

The New Jersey Department of Environmental Protection has designated all influent streams to the Spruce Run Reservoir as Category 1. Category 1 waters are those waters designated for the purposes of implementing the antidegradation policy, for protection from measurable changes in water quality characteristics because of their clarity, color, scenic setting, other characteristics of aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance or exceptional fisheries resource(s). In addition, all waters upstream of the reservoir are designated as either trout maintenance (supports trout) or trout production (for spawning and nursery purposes).

Figure 1.1


Spruce Run and Mulhockaway Creek
Modeling Areas
Hydrologic Feature
Reservoir
Model Study Area
Mulhockaway Creek
Spruce Run
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