



# Research Project Statement 20-012 FY 2019 Annual Program

<b>Title:</b>	Developing Peak Rate Factor (PRF) Guidance in Hydrologic Modeling
<b>The Problem:</b>	<p>The US Department of Agriculture (USDA) Soil Conservation Service, later known as the National Resource Conservation Service (NRCS), developed a method of watershed modeling in the 1970s based on a dimensionless unit hydrograph (DUH). This method originally published in the National Engineering Handbook part 4 (NEH-4) is still widely used throughout Texas and the nation in hydrologic modeling. The DUH has two key parameters: time to peak (in hours) and peak rate factor (in cfs/square mile). Time to peak is estimated from empirical relationships by given watershed area and time of concentration. The standard peak rate factor (PRF) is 484 cfs/square mile, but the current NRCS National Engineering Handbook part 630 (NEH-630) includes values in the range from 100 to 600; however, the NEH methodology for developing appropriate PRF values is complex and cumbersome, and is not commonly used.</p> <p>For areas of flat topography in the southeast United States, NRCS developed a simpler relationship between PRF and two readily measured watershed characteristics; drainage area and main channel slope. This relationship provides a simple, easy to use tool that is compatible with common hydrologic methods. The most current or common Texas practice is to adjust PRF after initial modeling has been performed as a rough calibration to expected values. This current practice lacks guidance and consistency. Further, slight changes to PRF values have a large effect on the peak flow values and resulting sizes for hydraulic structures. Prior research on appropriate PRF values for Texas has been performed in the mid-2000s, but a relationship of recommended values for varied watersheds and physiographic regions in Texas was not evident at that time. Additional research is needed to build off prior Texas research and establish solid guidance for a range of reasonable PRF values for all areas of Texas.</p>
<b>Technical Objectives:</b>	<p>This research will investigate and determine the most accurate and reasonable methods for developing PRF values for hydrologic modeling.</p> <p>The researchers shall address the following:</p> <ol style="list-style-type: none"> <li>1. Conduct a literature review of prior Peak Rate Factor (PRF) development and guidance.</li> <li>2. Perform analysis and modeling to develop appropriate relationships in establishing PRF values from easily obtainable watershed characteristics, such as watershed area, main channel slope, or time of concentration.</li> <li>3. Develop simple guidance on the development of appropriate values for PRF in Texas.</li> </ol> <p>The expectation of this project is that the end product will obtain a TRL level 5.</p>
<b>Desired Deliverables:</b>	<ol style="list-style-type: none"> <li>1. Technical memorandum for each task completed.</li> <li>2. Monthly progress reports.</li> <li>3. Value of Research (VoR) that includes both qualitative and economic benefits, to be included in the final research report.</li> <li>4. Research report documenting the findings of the research, including a summary of the analysis and modeling performed to best establish PRF values and guidance on development of PRF values for direct insertion in the Hydraulic Design Manual (HDM).</li> <li>5. Project Summary Report.</li> </ol>
<b>Proposal Requirements:</b>	<ol style="list-style-type: none"> <li>1. Utilize the "Proj/Agre" and "PA_Form" templates located at the <a href="#">TxDOT RTI website</a>.</li> <li>2. Proposals will be considered non-responsive and will not be accepted for technical evaluation if they are not received by the deadline or do not meet the requirements stated in RTI's <a href="#">University Handbook</a>, which is also located at the RTI website.</li> <li>3. Proposals should be submitted in PDF format, 1 PDF file per proposal. File name should include project name and university abbreviation.</li> <li>4. This project will be tracked during the life of the project using a Technology Readiness Level (TRL) scale. For more information about the use of a <a href="#">TRL</a>, click.</li> </ol>