Univ. of Tennessee Scientists' Comments on Proposed Rule 0400-40-10-.04
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Findings: Though we also have some issues regarding policy implications of the new Rule, herein as independent scientists we emphasize science rather than policy issues. Our specific comments are listed below, identified by the relevant section in the proposed Rule. Excerpts from the Rule text are included (in italics) for clarity.

Section 2(a)

The permanent stormwater management program must require new development projects to be designed to reduce pollutants to the maximum extent practicable.

Comment 2(a).1 – The Rule here mentions MEP, but never clearly states that MEP is defined by 2(b).

Section 2(b)

Compliance with permanent stormwater standards for new development projects is determined by designing and installing SCMs as established by this rule and complying with other requirements of this rule. For design purposes, total suspended solids may be used as the indicator for the removal of pollutants (such as sediment, nutrients, and pathogens). SCMs must be designed to provide full treatment capacity within 72 hours following the end of the preceding rain event for the life of the new development project. The design storm is a 1-year, 24-hour storm event.

Comment 2(b).1 – No mention is made of the basis of design storm selection. Many previous documents from EPA and others indicate that a 95th percentile event is appropriate for permanent stormwater designs, but this new Rule requires an event that for much of Tennessee will be around a 99th percentile event. For Knoxville, the former is about 1.45" and is larger than all events comprising well over 80% of the total annual rainfall, while the latter is about 2.90" and is larger than events comprising 98.1% of total annual rainfall, which seems excessive for a design whose failure would not cause significant risk to life or property. It is also not clear that utilizing a larger storm event benefits a TSS-removal water treatment design. In fact, designing for such a large and infrequent event could lead to poor performance for the many smaller events comprising most of the runoff and pollution. For example, a hydrodynamic separator designed for a very high flow rate work may not perform well for the vast number of much smaller events, as those would not produce sufficient flow velocity to generate the centrifugal forces necessary to separate particles. Bigger is not necessarily better.

Comment 2(b).2 – No mention is made of the storm intensity distribution that should be used in routing the storm event through the design. EPA design examples assume a uniform distribution over 24 hours. For other hydrologic designs a Type II distribution is assumed. These would give greatly different results for any design element defined by flow rates or infiltration rates.

Comment 2(b).3 – The storm definition issues mentioned above combine in complicated ways. For example, with the previously-used Knoxville 95th percentile event depth (1.45") and an assumed Type II distribution, the 1st inch of rainfall occurred well past the very high-intensity Type II peak, which is where most runoff is generated. Moving to the 1-yr event (2.9") means that the 1st inch occurs well before the Type II peak, so less runoff is actually generated by that 1st inch of rainfall. This is exacerbated by defining it as a 24-hr event, which stretches the intensity peak out even further from the previously-used 15 hours, further reducing the runoff volume from the first inch.

Section 2(c)

The water quality treatment volume (WQTV) is a portion of the runoff generated from impervious surfaces at a new development project by the design storm, as set forth below. SCMs must be designed, at a minimum, to achieve an overall treatment efficiency of 80% TSS removal from the WQTV. The quantity of the WQTV depends on the type of treatment provided, as established in the following table:

Water Quality Treatment Volume and the Corresponding SCM Treatment Type for the 1-year 24-hour design storm		
WQTV	*SCM Treatment Type*	*Clarifications*
first 1 inch of the design storm	*infiltration, evaporation, transpiration, and/or reuse*	
first 1.25 inches of the design storm	*biologically active filtration, with an underdrain*	*biologically active filtration must provide minimum of 12 inches of internal water storage*
first 2.5 inches of the design storm	*sand or gravel filtration, settling ponds, extended detention ponds, and wet ponds*	*Ponds must provide forebays comprising a minimum of 10% of the total design volume. Existing regional detention ponds are not subject to the forebay requirement.*
maximum flowrate of the design storm	*flow-through manufactured treatment devices*	*e.g., hydrodynamic separators with NJCAT verification*

<u>Comment 2(c).1</u> – Are there data showing equal TSS concentrations generated from all impervious surfaces, so that roofs are truly like parking lots as suggested by "impervious surfaces"? If not, on what basis are all impervious surfaces lumped for a TSS-based rule? If a designer provides evidence that 95% of all TSS is generated from parking lots, based on this Rule it should be acceptable to remove 84% of the parking lot runoff TSS (thereby providing 0.95 * 0.84 = 0.80 = 80% total TSS removal) without treating any roof runoff. In that case, it is not justified to define the WQTV based on all impervious surface equally.

<u>Comment 2(c).2</u> – On what basis are the WQTV depths increased depending on practice type, and what are the justifications for the selected increases? Note that this is more complicated that it first seems, and may lead to unexpected consequences as described above in <u>Comment 2(b).3</u>.

<u>Comment 2(c).3</u> – The table is difficult to interpret, likely because the overarching treatment goal is confused and confusing. Though only a TSS removal goal is stated in the previous text, the table text indicates an unstated desire to increase infiltration and to remove Nitrogen (N). Though it is mentioned that TSS is considered as a surrogate for many other contaminants, the standard is clearly based on TSS removal, as some of the table alternatives really only remove that.

<u>Comment 2(c).4</u> – MS4s with existing validated and previously-approved methods for defining and determining adequate treatment should be allowed to continue with their current approaches, as those meet the 80% TSS removal criteria, often using a combination of infiltration and other treatment approaches. In other words, the "grandfather clause" present in the current 2016 Permit should be retained in this Rule in some way, as the science on which those previous methods were based went through a rigorous development and approval process. On what basis are those previously-approved methods now presumed to be inadequate? On what basis was that clause removed?

<u>Comment 2(c).5</u> – It is not clear how the WQTV should be calculated for designs using combinations of SCMs falling in different rows. If forced to design the entire system for the largest WQTV, designers will lose all incentive to use SCMs in the earlier rows, which based on the different WQTV requirements appear to be implicitly preferred.

<u>Comment 2(c).6, table row 2</u> – Why does the filter need to be "biologically active", when TSS removal is the sole performance criteria? In addition, the 12" of internal water storage in these practices is meant for N rather than TSS removal, so is also irrelevant. If N removal is a requirement for this row of practices, how do we justify leaving that out of the other rows? If TSS removal is truly the sole performance criterion, then those two specifications for N removal found in this row should be deleted. This should solely require filter material providing 80% TSS removal from the influent.

<u>Comment 2(c).7, table row 2</u> – There is no standard definition of "biologically active filtration" nor standard specifications for what counts as "internal water storage", and this new terminology is not consistent with existing state and local technical guidance. Again, as described above in <u>Comment 2(c).5, table row 2,</u> none of this is even relevant for TSS removal. If the rule is expanded to include within the definition of MEP treatment of other contaminants, these

specifications would need to be greatly expanded to insure adequate treatment, as per designs in North Carolina and Minnesota.

<u>Comment 2(c).8, table row 3</u> – Previously-approved Permits allowed use of wet ponds and extended detention basins for 80% TSS removal based on a 1" WQTV. This proposed Rule suddenly jumps that up to a WQTV of 2.5". Does the State have evidence to justify such a substantial size increase for a previously-approved practice?

<u>Comment 2(c).9</u> – Based on an infiltration modeling analysis of the table rows (using STAR, which is an improved version of the RRAT design tool previously approved by TDEC and external reviewers), designers should clearly use the 2nd row. Assuming a sand-compost mixture for the filter material, the sole limiting factor is how fast water can be shoved through the material before reaching the underdrain. Where under the previous Permit requiring some on-site retention the highest impervious-treatment ratio was around 16:1 (matching very well with published results), with filter practices adequately removing TSS but requiring no infiltration this can easily be pushed up to 50:1. If it is assumed that the rainfall is evenly distributed evenly over 24 hours, this can rise even higher. Such a filter (much less a hydrodynamic separator) is clearly not near as representative of the natural hydrologic state as achieving infiltration, but since the Rule includes no infiltration requirement that is irrelevant.