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Peer Review File

Assessing the Accuracy of HydroCAD for Pre-Development Runoff in Wooded Coastal Watersheds

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Round 1

We are grateful to the reviewers for their constructive feedback and the opportunity to strengthen our manuscript. Our detailed responses are provided below, following each reviewer comment (or the corresponding redacted in-text comment, **shown in blue**). All revisions have been tracked and are available in the appropriately labeled attachment.

Starting with in-text comments, where reviewer identification was redacted. As such, responses start in order of appearance.

Line 78: Brief overview of this might be helpful (TR-55)

> We added a few lines to provide more insight into why/how TR-55 is used. (starts around line 78).

Line 90: Coming back after finishing the paper, a brief overview of how sheet flow length fits into all of this might be helpful. How is sheet flow typically parameterized? Is it common to just use maximum or is it calibrated?

> A few sentences were added in the introduction to address these comments (Line 93).

Line 107: Are we talking about model parameters or results here?

> We're talking about modeled results. This was clarified (Line 112-115).

Line 108: What model values are we talking about here?

> It concerned CNs, Tc, and peak discharge (Qp) values generated by the model. This was clarified (Line 114).

Line 110: Writing can be improved here. Fragmented sentence.

> Sentence was rephrased for clarity. The fragmented sentence was fixed (Lines 112-122).

Line 113: Set the stage about this before bringing it into the objective.

> A line was added in the introduction when referencing sheet flow to help set the stage (Line 93).

Line 113: Perhaps this can be setup while giving brief overview about TR-55.

A line was added in the introduction when references sheet flow to help set the stage (Line 93).

Line 116: First state the rationale then state the objective. Also need reference for this.

We flipped the structure to state rationale first and then the objective. A reference was also added (Lines 112-122).

Line 124: Why is it greatest in undeveloped areas?

A line was added to explain why limitations in TR-55 are greatest in undeveloped areas. (Line 126).

Line 128: Can you be more specific about the landuse percentage? This will be relevant given the difference in runoff generation for difference land use. A table might be useful.

Land use percentages were added when introducing the two sites additionally a table was provided (Line 136).

Line 134: Minimize the white space. Perhaps Fig 2 an d 3 can be merged. Also labeling the panels might improve clarity.

Figures 2 and 3 were merged to minimize white space (Line 132).

Line 145: It is not clear how the direct measurements was done. Did you first measure the depth of flow using a staff or a depth and velocity sensor was place? I think it would improve clarity if direct measurements and Model had their own subsections within methodology.

The entire methods section was reorganized for better flow and clarity. Similarly, subsections were created to better explain which direct measurements were taken and how (Line 147; 182).

Line: 147: How did modeled sub-catchments looked like? How many HSG classifications were available in each site? Do you have to extract the HSG classifications for the watershed or is directly available through HydroCAD?

What the modeled sub-catchments looked like/how many per site was clarified. The number of many HSGs available and how it's put into HydroCAD was clarified (Line 193).

Line 151: Was this the rainfall amount for the day of flow measurements? Or was this obtained from weather station? Even a small figure showing the rainfall distribution might be helpful.

It was rainfall amount for the day of that storm event, this was clarified (Line 199).

Line 172: What was the manning's roughness coefficient? How was it determined?

The manning's roughness coefficient used for the sheet flow in wooded areas was stated, along with how it was determined (Line 255).

Line 174: What was the changes made to these parameters?

Types of changes made to these parameters was clarified and a table of modeled scenarios was added (Lines 252-272).

Line 174: Provide a table of scenarios that are modeled…this will make it easier to refer to these scenarios while discussing the results.

A table of modeled scenarios was added for clarity (Line 2572.

Line 178: What were the exact locations where soil samples were collected? Showing the soil sampling locations as a point in a map with various HSG classifications for each study site's drainage area will improve clarity.

Figure was added that included soil sampling locations with the HSG soil contours for each study site (Line 178).

Line 188: Move this up – before discharge calculation. Alos how often was the flow measured? It is just the single storm or over a certain period?

The entire methods section was reorganized to enhance flow and clarity. In addition, how often flow was measured as well as if one single storm was observed vs over a time period was clarified (Lines 185-190).

Line 198: Move this up – as a part of modeled input

We moved it to the Methods section (Line 203).

Line 204: For each drainage area? A map of HSG distribution for both locations would improve clarity since it is an important input.

This figure was added (Line 178).

Line 206: References?

> Two references were added for the Virginia Runoff Reduction Method (VRRM) and Virginia Administrative Code (Line 204, 207).

Line 210: Maybe more detail on this would improve clarity.

> More detail was included in other sections during the reorganization of the methods section (Lines 210-217).

Line 214: Since this is still pat of model inputs…this can go into methodology. Add a map of drainage area for both study sties. Also show the HSG distribution of each location.

> A section was included in the methods during reorganization. A map of the drainage area for both study sites with HSG distribution in each location and soil borings was added to methods.

Line 225: This should be in methods. Also what are the locations where soil borings are collected?

> We have moved this information to the Methods section during reorganization. A map of the drainage area, including soil boring locations and HSG distributions, has been added to the Methods section (164, 178).

Line 228: What percentage of soils that were classified as C were actually C? How about for A and B classifications? Table S1 can be aggregated to extract useful information which could be conveyed to the readers which can be provided as a much smaller table.

> A stacked bar chart was added to the Results section to show the percentages of misclassified C and D soil. Additionally, a few sentences were added in the Results section to highlight the largest discrepancies (Lines 277-284).

Line 230: This table should be in the main paper as a map. A map would clearly show how often the soils were misclassified.

> Per another reviewer's comment, a stacked bar chart was chosen to be added in the results section to show the percentages of misclassified C and D soil (Line 284).

Line 230: USDA HSG classification can be a polygon. And soil boring result can be points (each field sample classification can be represented by different symbols)

A figure was created that shows the soil contours with their respective HSG classifications, the drainage boundary, and the location of the soil borings that were taken at each site (Line 178).

Line 234: A table summary showing the model results for each scenario would be helpful.

A summary table for the HydroCAD modeled results of each scenario was added at the end of section 3.3 (Line 269).

Line 238: Are there three types of Qp? What is 0.217 cms?

In this study, only pre-development Qp was analyzed, this is clarified throughout the paper. Cms was changed to m3/s throughout the paper for uniformity.

Line 265: Why did ALL C HSG condition brought very little change in New Kent?

A paragraph in the Results section was added to clarify this (Line 326), which states, "Notably, the All C HSG condition produced very little change in Q_p for New Kent, whereas Cow Swamp showed more pronounced changes. This difference is attributable to the baseline (USDA Soil Map) HSG distribution at each site. New Kent's soils were classified predominately as "C" and "D" soil, therefore assigning all "C" results in minimal deviation from the baseline. Cow Swamp, on the other hand, was predominantly "B" soil, making the All "C" assumption for notable. A similar trend between the two sites can be observed in the All D HSG condition as well."

Line 279: Font size different

Font size fixed (Line 362).

Line 279: Are we looking at the Qp after the soil groups were corrected or baseline Qp?

We're looking at baseline Qp compared to 4 hypothetical uniform HSG scenarios and then the corrected soil Qp. This was clarified (Line 359).

Line 288: Was the Qp should in the results pre-development or post-development? Was the pre and post development Qp not shown?

Only pre-development peak discharges were analyzed, this is clarified in the Results section by removing the part of that line that talks about post-development Qp, as this is further explained in an additional paragraph in that section (Lines 367-375).

Line 304: You mean flow length?

> Thank you for catching this error. Yes, that is what we meant and have corrected it (Line 404).

Line 401: Reference formatting is not very consistent

> We apologize for that oversight. Reference formatting was fixed.

Individual peer review reports as provided in the JEED revisions dashboard begin below. Full reviewer reports were not included, just aspects of the 'Reviewer summary to be shared with author and editors' that involved questions from reviewers directly related to the manuscript and authors/co-authors.

Reviewer: Anonymous A

This study talks about how discrepancy in publicly available soil group classification through USGS could be inaccurate and how it could lead to huge discrepancies in model simulation results.

The study is important to illustrate the problem in using publicly available soil data for hydrological and hydraulic modeling.

The clarity of this study still needs improvement before publication. Check the comments in the submitted PDF file.

Following are more general comments:

Better clarification needs to be made about what were the inputs used and the scenarios modeled in this study.

> The Methods section was restructured and revised for greater clarity, per reviewer comments. A table was added in the methods section that outlines the inputs that were used and the modeled scenarios analyzed in this study (Line 269).

Also, clarity in the result is needed. I think more figures and tables can be added to improve clarity and visual aid.

> Clarity was added by addressing reviewer in-text comments. Similarly, more figures and tables (i.e., model outputs summary table, modeled sheet flow lengths figure) were added in the results section along with the full data in supplemental material.

Since the implication of the study is significant, a clearer picture of soil sampling result and just how different they were in comparison to the USDA soil maps would be beneficial.

A stacked bar chart was added in the results section to provide a clearer picture of how often the soil borings were misclassified as C and D soils (Line 284).

Why would misclassification of soil group result in such a huge discrepancy in runoff? A more clear picture of underlying hydrological process here would make this paper standalone. This is actually briefly touched on in the abstract but not mentioned in the main paper.

A paragraph was added in the discussion to provide more clarity of this (Lines 392-400).

How would overestimation of predevelopment Qp would result in underestimation of retention pond? A line or two of explanation would improve clarity.

Overestimating pre-development peak discharge means that difference between pre-and post-development peak discharge will likely be small (since we know that development increase impervious surfaces and therefore rates of runoff). This means that the retention pond will be sized to accommodate a smaller increase in runoff, i.e., undersized pond. A few sentences were added in the discussion to help clarify why this is the case, additionally, a table with hypothetical data to further illustrate this concept was included in the discussion as well (lines 392-400).

Also it is not clear whether the Qp was modeled both pre and post development. It is briefly mentioned in the results but not clarified how the post development scenario was parameterized.

A few sentences were added in the discussion to help clarify this as well to make sure that this was clearly stated through the entire paper to avoid confusion.

Reviewer: Joseph Smith, The Ohio State University

Detailed reviewer notes to be shared with the author and editors:

Line 68: Typo “Transprotation”

Thank you for catching that, the change was made (Line 66).

Line 90: Perhaps Equation 2 is missing.

Equation 2 (Time of concentration) was added below Equation 1. Subsequently Manning’s Equation was changed to Equation 3 (Line 109).

Lines 109-110: This is not a complete sentence. Then, this information is repeated in section 2.1.

Sentence was rephrased for clarity and repetition as found in section 2.1 was removed.

Figure 2: Consider improving the map by adding an inset with the entire USA, labeling waterways, and dragging the scale bar to a "cleaner" number like 250 instead of 252 miles. Also, consider units of kilometers instead of miles to reach a broader international audience.

> Due to another reviewer's suggestion to merge figures 2 and 3, a base map using labeled USA waterways was too small to effectively see it, therefore, a basemap was used instead for the zoomed out overview of the study sites within the context of VA's coastline and the broader US inset (Line 132).

Line 294: Units for Q should be cm/s or cm*s^-1, not cms.

> The units were changed to m^3/s to achieve better clarity and limit confusion.

*Methods section requires some introduction to the statistical and sensitivity analyses that were performed.

> Clarity was added during the reorganization of the entire methods section (Line 208). Per reviewer(s) comments it was reordered as follows: Study Sites, Field Measurements and Data Collection, Topographic Surveys, Soil Sampling, HydroCAD Modeling, and Peak Discharge Calculations. Tables or sentences in the Results section that were repetitive or better suited for the Method section were moved and structured accordingly.

General: I found myself getting a but confused by the various terms used for the same site (e.g., project impetus, Grand Canyon, Williamsburg Grand Canyon). Consider more a more consistent term.

> Consistency in terms was insured by using only 'Project impetus' when describing that site in the manuscript per comment.

Reviewer: Anonymous B

1) Content and argument

Please comment on the originality, relevance and scholarly rigor of the article.

The manuscript focuses on the utilization of the TR-55 model in the HydroCAD® software for the prediction of pre-development peak flows and runoff volumes from watersheds in coastal Virginia, USA. Further, the argument presented is that the use of Hydrological Soils Groups (HSGs) to calculate Curve Numbers (CNs) in HydroCAD® is "flawed" based on a comparison of predicted values to actual field characterization and discharge measurements. The topic is important because of the critical need to develop more accurate methods for predicting these

types of flows. However, I had several fundamental issues with the scope, methods, and arguments presented in this manuscript:

I do not feel that the presented work adheres to or aligns with ecological engineering principles and current relevant research in general. I propose a rewriting to better fit the journal's scope if submission to JEED is still being considered.

Second, only two storms (one at each site) were monitored and modeled, but given the variability (seasonal, etc.) in hydrologic conditions at any given watershed, how could one storm inform the model and field comparison? If you had the instrumentation to collect relevant data, why didn't you model/measure more storm events?

> Due to logistical constraints, only one summer was allotted for sampling. As such, storm events were narrowed to a three-month window and only two rainfall events were notable (exceeded >1 inch of rainfall).
>
> Additionally, this study followed common practices in licensed engineering firms when it came to modeling pre-development stormwater events. In the area of this study, firms typically model for 1-, 2-, and 10-year storms when sizing retention ponds. This includes changing the rainfall amount in HydroCAD before running it. This study used an observed rainfall event, one that could be considered 'normal,' and ran the model the same way a firm would (with commonly provided resources and no field data collection) to compare HydroCAD peak discharge outputs with a model run that had site-verified data (corrected soil classification from field samples).
>
> Upon corroborating the soils map and correcting the soils classification in the model, the peak discharge outcomes were noticeably different. Hence, the conclusion of this study: that while only one rainfall event was observed per site, peak discharge changed drastically when site characteristics were confirmed and corrected as opposed to relying on online data (i.e., soils maps, web soil survey).
>
> Clarification was added to emphasize that these two sites were representative cases chosen for proof-of-concept rather than a perceived generalization or full calibration of HydroCAD (line 440). Similarly, verbiage was included to further denote that the HydroCAD model itself does not have inherent limitations or flaws, instead it is the data being input that can result in flawed model outcomes (Line 449-451).

Third, the overall CN method and its parameters include more than just HSG-related factors. What about antecedent moisture conditions and/or initial abstraction? I do not believe this was fully discussed or considered in this study. Thus, in this evaluation of HydroCAD® and its use of HSGs, it was determined that the primary "inaccuracies" were how soil groups were

used, as well as how these were linked to the Web Soil Survey, and this led to the assessment that HydroCAD® is "flawed". While I partially agree with this argument, and based on your presented results I do understand your point, but I feel strongly that calling the software "flawed" with this limited assessment is a stretch.

> Ia/S and antecedent moisture condition was thoroughly addressed in the master's thesis that this study was adapted from. However, due to journal length requirements, these were not included in the JEED manuscript. While changes in the Ia/S ratio did alter the overall peak discharge outcome, it wasn't nearly as influential as changes to the soil groups. Moreover, engineering firms do not typically change the Ia/S ratio when they use the software. Similarly, they do not typically change the antecedent moisture content. These are generally treated as fixed values. This study aimed to use the software in the same manner any practicing firm would. Since the overall findings from the thesis showed that the more influential parameter was HSG classifications, that became the main focus of this manuscript. A few sentences were added in the introduction to clarify this and Tables including the sensitivity of Ia/S ratio iterations were added as supplemental material (Line 84).

**Authorline: two authors (Ownby-Connolly "a" and Strosnider "e") have the same affiliation but separate letters; if this is an author oversight, please correct it.

> We appreciate you catching that, the change was made were the same affiliation now has the same letter.

Line 245: replace "then" with "than"

> Then was replaced with than (Line 303).

Round 2

We appreciate the helpful reviews received and used those to further improve the manuscript. Our responses to each reviewer comment are bolded in blue below.

Reviewer: M. Samrat Dahal, Geosyntec Consultants

The authors have considerably improved the clarity of the study following the suggestions from the reviewers. I am generally satisfied with the revision. My only suggestion would be to improve the quality of figures.

Figure 3: Colors are too bright. The red text is hard to see. The legend is dangling out of the plot; consider changing the legend location to the bottom of the plot (and horizontal) or just bring it inside. 'Soils legend' as legend name is redundant. The panel size for two locations is unequal.

> The red and yellow were darkened to aid in readability. The legend was location was changed to the bottom of the plot per suggestion and the 'Soils Legend' was removed to avoid redundancy. Only one north arrow and legend bar was kept (per reviewer #158's suggestion) and the scale was changed to meters (Line 183).

Figure 4: Increase legend font size. The color here is not as bad but could be improved.

> Legend font size was increased, and colors were adjusted and color-blind friendly (Line 296).

Figure 5: The lines are pixelated (either increase thickness or use higher resolution). The y axis label and unit have different font size. Word 'Legend' is redundant.

> Resolution was fixed and the 'Legend' was removed to avoid redundancy (Line 328).

Figure 6. Same problem with Legend as above but text size could be improved.

> Legend and x/y-axes were adjusted for readability and 'Legend' was removed (Line 364).

Table 4 mentioned in the text but table 4 is not shown.

> That was an oversight, there is no Table 4. That was removed from the text.

Reviewer: Anonymous B

Nothing to address and no further comments to provide

Reviewer: Anonymous C

Line 21: Suggest removing HydroCAD since its in the title

> HydroCAD was removed from keywords (Line 21).

Line 25: Suggesting deleting =

> The equal sign was deleted (line 25).

Line 28: Adopted for what? Please add a word or two.

Additional words were added to improve clarity (27).

Line 37: Please write (Qp)

Qp was added in (Line 36).

Line 53: I suggest changing it to ponds. Both dry and wet ponds help in slow rates

Wet retention ponds were changed to just ponds (Line 53).

Line 56: This may be a better fit for the study site description section

This section was moved under the "Study Sites" section (starts at line 108).

Line 61: Reference?

Reference was added (Line 113).

Line 71: This might be suitable for the site description section. It is good here too. I can see both ways.

This section was moved under the "Study Sites" section (Line 123).

Line 85: Can the authors provide a number instead of minor? Was it 10%, 20%?

Percentages were added and additional sentences were added to further explain the justification for focusing on HSG classifications instead of Ia/S ratios (Lines 68-72).

Line 87: Is it Fig. 1? Not sure if this is the correct reference.

Yes, (Fig. S1) is referring to the supplementary material of the Ia/S sensitivity for each iteration (0.01-0.20) (Line 72).

Line 101: May want to use the below format

The provided format was used to edit the equation (Line 86).

Line 109: May want to use the below format for equations

The provided format was used to edit the equation (Line 91).

Lines 112-122: This section may require some edits, something like below-

Have a clear case, with an overall goal, followed by specific objectives.

Although a wealth of scientific literature addresses stormwater and BMP modeling, design, and performance, a clear gap remains regarding commonly used stormwater modeling software HydroCAD and potential limitations in user error for sizing retention ponds. Therefore, the goal of this study was to compare HydroCAD model outputs (e.g., Q_p) to field measurements and evaluate the influence of key parameters (HSGs, CN, and T_c) on those outputs. Specifically, this study investigates two questions: (1) Sensitivity of Q_p to changes in HSG classifications, and (2) As stated in TR-55, does a maximum distance of 91.44 m (300 ft) for sheet flow fit realistic site behaviors?

> We appreciate the suggested paragraph rephrasing. We incorporated parts of this in the restructuring of the paragraph along with changes of our own to better enhance clarity and flow (Lines 96-104).

Line 113: Define it, please, since this is used here for the first time.

> The definition for Qp was added (Line 99).

Lines 115-117: Is this a method or a goal?

> Method, this was clarified (starts line 99).

Lines 117-120: This may go before the objective.

> This was adjusted (starts line 96).

Lines 120-122: Objectives?

> Yes, this was clarified in the rewrite (Line 99).

Lines 126-131: This is more like background. May go into the intro section.

> For sake of brevity, that sentence was disregarded.

Lines 126-131: Focus on the study site, site characteristics.

> Study site characteristics were honed and focused, with the background-type information either condensed or removed.

Line 132: The scale is not legible and is in English units. Please change that to SI units. May have on scale if for scalability and reference comparison.

> Scale was increased for legibility and units were switched to metric. One scale was used for reference (Line 131).

Lines 133-134: Please have a map of the USA, show the sites on the map and may use callouts to pinpoint the location.

> We appreciate the reviewer's suggestion to include a map of the USA with callouts to pinpoint study stie locations. We carefully considered this approach during figure revision. However, given the existing multipanel structure and the limited spatial extent of the study sites within a single region of Virgina, displaying all three locations at the continental U.S. scale resulted in substantial symbol overlap and reduced legibility. At that scale, individual sites were not distinguishable and appeared as a single clustered point, which diminished clarity rather than improved it.
>
> To balance geographic context with readability, we retained the regional locator map and detailed site-scale panels, which more effectively convey both the relative positions of the sites within Virginia and their local spatial characteristics. This approach prioritizes interpretability at the scales most relevant to the study objectives, while still providing sufficient broader context. Notably, this figure structure was found to be clear by other reviewers.
>
> We believe the current presentation offers the best compromise between spatial context and figure clarity, and there did not implement a continental-scale callout map in this revision. However, we did edit the scale bars, switching the units to meters, adjusting size for readability, and referred to just one north arrow and bar, as suggested (Line 131).

Lines 135-136: State?

> Virginia was added for clarity (Line 135).

Line 137: I added up the area in Table 1. The total area is 328,754 m2.

> Thank you for catching that, this was a marginal error due to rounding and non-uniform sig fig use, this was corrected (Lines 136-137).

Line 138: This number should be 319,930 m2 based on Table 1.

> Thank you for catching that, this was a marginal error due to rounding and non-uniform sig fig use, this was corrected (Lines 136-137).

Line 140: Where was the monitoring site located?

Monitoring equipment was utilized at both sites to record water levels during rainfall events. This was clarified (Line 139).

Lines 146-147: Please be consistent with degree decimal.

This was corrected (Line 146).

Lines 146-147: Please be consistent with significant digits.

Decimal degrees were made consistent (Line 146).

Line 148: Was rainfall data collected?

Yes, a sentence was added to clarify this (Line 149).

Line 153: You may want to have three significant digits

The current value, 0.0305, is already rounded to 3 sig fig. Additionally, all other values were adjusted to 3 sig figs for consistency (Line 158).

Line 156: Was the survey conducted after the monitoring station was installed or before?

Yes, the surveys were conducted after the monitoring stations were installed at each site. This added for clarity (Line 159).

Line 165: were soil borings randomly taken?

Yes, soil borings were randomly taken. This was added for clarity (Line 168).

Line 177: Scale in meters please. Please use one scale and one north arrow. Please show the watershed outlet.

The scale was changed to meters and just one scale and one north arrow are used. The watershed outlet for this area is miles away, too far to be shown without losing resolution (Line 182).

Line 184: Location of the flow monitoring equipment? For how long the data was collected?

Location and duration were added in this section (Line 189).

Line 210: Why 5? Reference?

The five iterations for HSG refers to the "All A", "All B", "All C", "All D", and "Corrected HSG" scenarios. Wanting to compare the USDA soil map HSG classifications to these five scenarios is what dictated the number of runs and therefore no reference is cited. We believe this is clear from a reading of the revised manuscript (Starting at line 218).

Line 211: Why 5? Reference?

Similar to the HSG response above, when using these 5 different soil group scenarios this also generated 5 new CNs, resulting in "5 iterations per site."

Line 211: Why 30? 5, 5, 30? References?

For sheet flow lengths, 30 iterations were chosen since we varied sheet flow length from 10 to 300ft in units of 10. This was done for evenness and simplicity, as well as exploratory interest in the overall effect of varied sheet flow lengths on model outputs and therefore no reference is cited.

Lines 214-215: Please provide references for the sensitivity analysis.

A sentence describing sensitivity analyses used and primary reference was added (Line 216).

Lines 215-216: Please provide references.

A sentence describing second-order polynomial regression used and primary reference was added (Line 224).

Line 223: References?

A reference was added (Line 232).

Lines 223-224: References?

A reference was added (Line 235).

Line 227: References?

A reference was added (Line 240).

Line 228: References?

A reference was added (Line 240).

Line 229: Please see my previous comments on writing equations in a manuscript.

Per pervious comments, equation format was adjusted (Line 242).

Line 273: Why 10?

10 is an even interval so it was chosen for ease of use in going from 10ft to 300ft.

Line 287: This is not a stack bar.

Thank you for catching that, this was corrected to a grouped bar chart (Line 297).

Line 316: Inconsistent y-axis fonts.

y-axis font was fixed (Line 326).

Line 334: Inconsistent units.

Units were changed to metric (Line 345).

Line 334: Inconsistent units.

Units were changed to metric (Line 345).

Line 359: Not sure S1 to be here.

Fig. S1 reviewers to the graph showing the negative correlation of the sheet flow iterations at both sites, which is in line with what Line 369 states).

Lines 359-360: Please provide some explanation.

More of an explanation was provided (Line 371).

Lines 361-362: What other models were explored?

A sentence briefly explaining other models that were explored and the justification for the second order polynomial was added (starts at 375).

Line 363: Significant digits

This was corrected to 3 sig figs (Line 380).

Line 364: Significant digits

> This was corrected to 3 sig figs (Line 380).

Line 371: Period or comma

> A period was meant to be used instead of a comma, this was fixed (Line 388).

Line 383: poorly drained soil?

> "Poor soil" was changed to "Low permeability soil" for clarity (Line 400).

Line 387: Where is Table 4?

> That was an oversight (table was removed prior to re-submission but the in-text reference was missed). This has been fixed.

Line 412: Please be consistent with significant digits. While 91.44 here, earlier in the paragraph it is 91.4

> This was fixed. Per suggestion, three sig figs have been adjusted throughout the manuscript. (Lines 421-431).

Line 418: 2 yr, and 10-year, 24 hour storm

> 24-hour storms was added (Line 435).

Line 419: 24 hours storm

> 24-hour storms was added (Line 436).

Line 420: 24 hour storm, please mention 24 hours.

> 24-hour storms was added (Line 438).

Lines 426-439: This looks like the justification of the study and may go into the introduction.

Lines 442- May be well suited for background of the study and the importance of the study.Lines 455-461: Site specific discussion. May be not the appropriate place under National Implication section.

Response for lines 426-461:

> We appreciate the reviewer's suggestion regarding the placement and framing of the regional and national implications section while portions of this discussion address broader context and motivation, we elected to retain this material within the discussion rather than relocating it to the introduction due to journal constraints on introduction length and to preserve narrative flow from results to implications.
>
> However, in response to the reviewer's comments, we revised these sections to more clearly distinguish between regional and national implications and to reduce site-specific detail in the national implications section. The revised text emphasizes how the observed sensitivities and stormwater modeling inputs are broadly applicable to TR-55 based modeling practices nationwide, rather than being limited to the specific study sites. We believe these revisions better align the discussion with this intended purpose while maintaining clarity and coherence within the manuscript structure.

Line 474: significant digits

> This was fixed (Line 495).

Round 3

Reviewer: M. Samrat Dahal, Geosyntec Consultants

The authors have addressed the comments.

Reviewer: Anonymous C

The authors have included the majority of the suggestions. It is good to go now.