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Project No: 133904

San Diego Hydromodification Management Plan

Subject: Responses to Comments on HMP Modeling Approach and BMP Configurations
Date: March 24, 2010
To: Sara Agahi, P.E. – County of San Diego
From: Eric Mosolgo, P.E. – Brown and Caldwell
Tony Dubin, P.E. – Brown and Caldwell

This draft technical memorandum summarizes the review comments received regarding the HMP Modeling Approach and BMP Configurations Draft Technical Memorandum (dated March 2, 2010) and Brown and Caldwell's (BC's) responses to these comments.

Review comments were received from the following groups:

- San Diego County Flood Control - Anthony Barry
- Clear Creek Solutions - Doug Beyerlein and Joe Brascher
- West Consultants - Marty Teal
- Hunsaker & Associates - Luis Parra

Table 1 below provides a summary of each comment, the corresponding page location from the original Draft Technical Memorandum, and Brown and Caldwell's response.

Limitations:

This document was prepared solely for the County of San Diego in accordance with professional standards at the time the services were performed and in accordance with the contract between the County of San Diego and Brown and Caldwell. This document is governed by the specific scope of work authorized by the County of San Diego; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work.

No.	Reviewer	Page	Comment	Response
1	Anthony Barry, San Diego County	7	It is mentioned on page 7 that the vegetation types are not “sufficiently variable among developable lands to require separate scenarios”. This statement should be further justified in a manner similar to the effects of porosity in the last bullet on page 8.	<p>We made the decision to focus on one land cover type for the following reason:</p> <p>1) We assume the vast majority of projects regulated by the HMP flow control standard will be in previously undeveloped areas with scrub vegetation. Conversely, many of the areas with “landscape/grass” as a pre-project land cover may not be covered by the flow control requirements, because these projects would be small or located in urban areas that qualify for some type of exemption.</p> <p>2) We examined the range HSPF PERLND parameter values used in previous Southern CA studies and values included in the SDHM software – in particular the INFILT parameter. The parameter values were less variable for different land cover types than we expected, and this makes it likely that the variation in land cover type would have little impact on the computed LID BMP sizes.</p> <p>3) The modeling “pre-sizing” analysis used to compute the sizing factors for the Sizing Calculator requires us to constrain or limit the variability of input parameters as much as possible. Because scrub/shrub vegetation will be encountered in most of the development projects, we think this is a good place to start with HSPF simulations and the Sizing Calculator. The County and its Copermittees could add more land cover types, BMPs or other features in V2.0 of the Sizing Calculator.</p>

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2	Anthony Barry, San Diego County	11	Is the BMP area discussed in the second paragraph of Section 3.1.2 considered to be pervious area in the modeling? If so, and alterations to the standard (modeled) design are allowed (as suggested in the last paragraph on page 12), the depth of a BMP could be increased and the plan area decreased. This could allow an increase in the actual impervious area above what was considered in the modeling, without requiring the appropriate increase in required BMP volume.	The BMPs are modeled using “FTABLEs” in HSPF, which detail stage-area-volume-discharge relationships. The model allows rainfall to occur directly on the BMP (as would happen in real life). The Sizing Calculator contains a “check” to ensure that the total contributing watershed area to the mitigation facility plus the mitigation facility area equates to the total project area. If a development engineer incorporates a narrow/deep ponding layer, the computed drainage management area (DMA) tributary to the BMP must accurately reflect the entire paved area draining to the BMP. We suggest allowing development engineers to vary the configuration of the surface ponding layer to better fit site constraints (e.g., wider/shallower to limit trip hazards; narrower/deeper to limit at-grade footprint). However, the sizing factor is based on the plan area of the growing medium underneath. For the Contra Costa HMP, we tested the sensitivity of BMP sizes to different ponding layer configurations and found that as long as the recommended volume is provided, wide/shallow, deep/narrow surface ponding layer configurations performed similarly enough not to impact BMP sizing factors.
3	Anthony Barry, San Diego County	17	If vegetated bioswales are for water quality only, and do not provide flow control (as mentioned on page 17), why are they being included? Details on how to design a vegetated swale are covered in the CASQA BMP handbook.	This “treatment only” option has been proposed in response to a request from the Copermittees. The Sizing Calculator will allow users to size BMPs to meet either the “water quality treatment only” OR “flow control + treatment” requirement. The vegetated bioswale option will only be available as a selection in the Sizing Calculator if the user chooses “water quality treatment only” as the project design goal.
4	Doug Beyerlein, Joe Brascher; Clear Creek Solutions	7	Only one land cover vegetation type is offered: scrub, shrub. Different vegetation types change the pre-development runoff. The user should be given more vegetation type options.	See response to comment #1.

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5	Doug Beyerlein, Joe Brascher; Clear Creek Solutions	7	The sizing calculator assumes no increase in pervious runoff with development. Runoff from pervious surfaces can and does increase with development due to soil compaction from construction activities, the replacement of native vegetation with urban vegetation, and the addition of irrigation. These effects should be included in the sizing of BMP facilities.	The Countywide Model SUSMP adequately addresses this issue with its requirements for managing runoff from developed/pervious areas. For example, the SUSMP directs project proponents to control pervious runoff as much as possible using grading patterns, soil amendments, etc., so that these areas do not contribute runoff to paved areas and do not increase overall site runoff (relative to pre-project conditions). If a pervious area does drain to a paved area, and then into a BMP, this area must be accounted for within the Sizing Calculator to ensure the BMP is appropriately sized.
6	Doug Beyerlein, Joe Brascher; Clear Creek Solutions	N/A	The HSPF parameter values selected for the BMP sizing calculator are critical in the computation of the existing and development runoff and the sizing of BMP facilities. However, we have had no opportunity to review and comment on these parameter values.	We will issue a separate technical memorandum detailing the selection of HSPF model parameters.
7	Doug Beyerlein, Joe Brascher; Clear Creek Solutions	N/A	We have had no opportunity to review and comment on the HSPF FTABLEs used to represent different BMP facilities nor their associated HSPF UCI files. Nor have we had the opportunity to review and comment on the assumptions used in the construction of the HSPF FTABLEs and UCI files that produce the facility sizing results reported by the BMP sizing calculator.	The soil physics and key assumptions used to route water through the BMPs are described in Appendix A. This will be distributed to the TAC.
8	Marty Teal, West Consultants	2	Will it be obvious which of the various lower control threshold values someone is supposed to use/analyze?	Yes. The critical flow calculator allows a project proponent to determine which lower control threshold will apply to a specific project site. The critical flow calculator will be included in the overall BMP Sizing Calculator.
9	Marty Teal, West Consultants	2	Will the Sizing Calculator automatically determine/report whether a proposed BMP will meet the peak flow and flow duration performance requirement?	Yes. The Sizing Calculator will compute and report a BMP's minimize required size to meet the HMP stormwater control performance requirements.
10	Marty Teal, West Consultants	8	Page 8 states, "Infiltration and soil water movement is a 1-dimensional flux in the vertical direction (neglecting lateral flows is a conservative assumption)." Why is neglecting lateral flows a conservative assumption?	If we assumed water would move laterally out of the BMP, the BMP would have a higher capacity to capture and mitigate stormwater flows.

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11	Luis Parra, Hunsaker	7	The model does not include enough variability of vegetation cover to characterize the expected variation on infiltration. Among the most important vegetation type excluded, grass in fair to good condition comes to mind, as many of the developed areas will occur in this type of existing vegetation.	See response to comment #1.
12	Luis Parra, Hunsaker	9	Figure 3 is wrong and does not correspond with the one presented in page 78 of the Countywide Model SUSMP. The French drain should be placed on top, with only few inches on gravel above the top of the pipe, and the gravel below. This way, water retained below the French drain will be incorporated into the underground media.	Figure 3 was included simply to describe the function of LID BMPs. It could be replaced with Figure 6, which is consistent with the Countywide Model SUSMP.
13	Luis Parra, Hunsaker	9-11	As the hydraulic conductivity of the amended soil is the flow constraining factor (and less than the conductivity of the gravel) the only way that gravel on top makes sense is if an orifice constraining the flow in the French drain is used. This aspect, however, does not exclude the possibility of having some retention below the French drain. For instance, in a soil Type D with a hydraulic saturated conductivity of 0.1 in/hr, the equivalent of 7.2 in of ponding can be placed below the invert elevation of the French drain. With an assumed porosity of 0.4, this corresponds to an additional retention depth of 18" below the French drain. The model should allow retention as a function of the hydraulic conductivity of the bottom soil.	The gravel layer is proposed below the amended soil layer. We will follow up with reviewer to clarify this comment.
14	Luis Parra, Hunsaker	N/A	Water table constraints should be included in the model. For example, it should be recommended that the water table must be at a given depth below the bottom of the gravel to be sure that the vertical assumption is valid.	The Countywide Model SUSMP describes specific site conditions that affect the feasibility of LID BMPs (e.g., steep slopes, high groundwater). Furthermore, the HMP Decision Matrix requires applicants to complete a geotechnical investigation which would identify such design constraints. A project applicant would first need to determine whether these constraints apply. If not, the project proponent could use the Sizing Calculator to plan BMPs. The Sizing Calculator will not apply in high groundwater conditions.

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15	Luis Parra, Hunsaker	9	It is not clear to me if growing medium as a maximum limit of 1.5 ft. The user should be able to increase this depth. As a matter of fact, the Maryland Manual (the one that initiated the bio-retention revolution) suggests using at least 2 ft of amended soil. The user should have the option to increase this depth up to 3-4 ft.	A project proponent could specify a deeper growing medium. However, to pre-size BMPs for the Sizing Calculator we need to limit the number of potential BMP configurations. Other design scenarios can be modeled through the preparation of continuous simulation hydrologic models such as HSPF.
16	Luis Parra, Hunsaker	9	Van Genuchten relations are mentioned in page 9 but never shown.	The Van Genuchten relations are included in Appendix A. This document will be distributed to the reviewers and the TAC.
17	Luis Parra, Hunsaker	9-10	Neglecting lateral percolation and limiting infiltration to the saturated hydraulic conductivity of the existing soil is a reflection of simplicity and building upon conservative assumptions rather than a reality. Also neglecting the influence of the water pressure of the gravel in the infiltration occurring at the bottom soil is another conservative assumption not discussed. I would suggest to allow for adding an increase infiltration dimensionless factor if measurements demonstrate that the discharge is actually much less than what the model predicts.	The conservative assumptions detailed in the HMP Modeling Approach memo serve as a hedge against real-world installation problems, occasional BMP failures, etc., so that the integrated effectiveness of distributed BMP performance is consistent with the requirements of the NPDES permit. The accuracy of the sizing factors will be measured by the Copermitees' monitoring program, which will be conducted over the ensuing 5 years and beyond. If the monitoring results indicate deviations from the sizing factor predictions, then adjustments to the sizing factors will be proposed.
18	Luis Parra, Hunsaker	12	The user should have flexibility to determine design parameters of the bio-retention: ponding depth (it can be more than 10 inches, no reason why this has to be the limit); growing medium (it can be more than 18" and as a matter of fact many references recommend at least 2 to 3 ft); storage layer: it can be more than 30" and it is associated with the possibility of the Bio-retention to be able to drain in 72 hrs. Also remember the possibility to add gravel below the invert of the French drain for retention purposes and groundwater recharge purposes.	Regarding ponding depth comment: The selection of a maximum ponding depth is a policy decision. Because bioretention is often installed in pedestrian-friendly areas, these systems often have limited ponding depth to eliminate trip hazards. Regarding growing medium and gravel comment: see response to comment #15.
19	Luis Parra, Hunsaker	12	Drawdown considerations for the bio-retention should be included to determine the maximum depth of the combination of ponding, amended soil, and gravel than can drain in 72 hrs.	Vector control is a major benefit of stormwater LID. Conventionally, drawdown considerations only apply to the surface ponding layer of bioretention devices and not the below ground layers. The surface ponding layer will fully drain within a few hours of the end of a storm event. The sizing calculator will include drawdown calculations.

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20	Luis Parra, Hunsaker	12	It is not clear in page 12 if the other option of conversion is valid: the example describes a situation where the design engineer can convert the ponding layer with half the depth but twice the area, and actually design engineers are more interested in doing exactly the opposite: half the area and twice the depth. I am assuming that this is also a valid option.	The Countywide Model SUSMP specifies the allowable configurations for bioretention BMPs.
21	Luis Parra, Hunsaker	13	Comments 2 and 3 (#12 and #13 in this table) are also applicable to figure 6 of page 13.	The figures on pages 77 and 78 of the Countywide Model SUSMP should be modified to show the underdrain pipe at or near the bottom of the storage layer (i.e., the gravel layer).
22	Luis Parra, Hunsaker	N/A	There is no opportunity to make comments in hidden parameters or assumptions made by the program, but to trust blindly on the results. Unfortunately the engineer will become more of a technician running a black-box program than an engineer using criteria an experience to come up with a good design.	The Sizing Calculator is a simple-to-use tool that allows engineers to quickly size stormwater BMPs based on detailed "pre-sizing" modeling exercise (performed by Brown and Caldwell). Project proponents could perform their own hydrologic and hydraulic modeling analyses to size modified BMP designs, if desired.