Summary of Changes February 2, 2009

Chapter 1
Section 1.6 Definitions
Added Definitions for:
Channel Protection Detention
Indigenous Plant

Deleted the definition of:
Redevelopment

Section 1.11
Added raingardens to the list of infiltration practices in bullets at end of section.

Deleted pervious pavement from the list of infiltration practices in the bullets at the end of the section.

Added channel protection detention basins to the detention practices in bullets at the end of the section.

Chapter 2
Section 2.2.2.B
Corrected spelling of "disturbed" in 2.2.2.B Curve Number Coefficients for disturbed soils.

Changed Existing Condition Curve Number in section 2.2.2.B (Under "Agricultural and Unplanned Areas") to 78.

Chapter 5
Section 5.1.3
Deleted "…within the stream buffer,…" from the first sentence and replaced it with "…within the inner stream buffer…".

Section 5.1.3.A
Changed to say that a stream assessment is required when working within the inner stream buffer. Also said to look to the buffer language to determine what to do in areas where there is no official buffer.

Also added some language trying to better explain the purpose of the assessment and how to use the assessment information.

Section 5.1.3.B
Added "Hydraulic and Geomorphic…" to the section title.

Section 5.1.3.F
Added "…and fluvial geomorphic…" to last sentence.

Section 5.1.4 Stream Assessment

Added "…(or 10 channel widths in streams with ill-defined meander patterns.)…" between second and third sentences.

Section 5.1.4.B

Deleted "…as the 100% storm flow, and the bank-full width and depth estimated based on the dimensions of the 100% storm flow through the channel." from the second sentence.

Added "…as the elevation and spread of the of the 1-year storm flow, based on routing the 1-year storm flow through the existing channel using Mannings equation at a representative cross section." to the second sentence.

Section 5.1.4.C

Added "Where pools and riffles are not well defined, survey one cross section every 7 channel widths." to the end of the section

Section 5.1.4.D

Deleted "The median (D50) particle size shall be determined using the Wolman Pebble Count Method (USDA, 1994, Chapter 11) for each reach where the bed material visually changes."

Added "Estimate the median partical size (D50) for each reach where the bed material visually changes."

Section 5.1.4.F

Clarified Thalweg/Valley ratio.

Section 5.2.5 Freeboard

Changed "…low exterior sill or low opening…" to "…low floor of…" in second sentence.

Chapter 6

Section 6.1

Deleted "This section governs the requirements and design of these stormwater management facilities." from first paragraph.

Added:

"These facilities shall be designed to provide either flood protection or channel protection. To determine which is required, the developer may perform a flood study downstream of the proposed development to the point of interest, where the development constitutes 10% of the total watershed. The flood study must be performed based on the parameters in Section 6.1.1. If the post development water surface is within two feet or less of the lowest entry to a structure, then a flooding problem will be assumed to exist.

"Where a flooding problem exists (i.e. a complaint is on file with the City) or is assumed to exist as a result of the flood study, flood protection detention must be installed to control runoff as set forth in section 6.4.2.D.

"Developers may try to demonstrate, with proper supporting information, that there will not be a flooding problem because there are no structures or roads that can flood downstream to the point of interest. This must be demonstrated to the satisfaction of City staff and the supporting information must include, at a minimum, a drawing showing the drainage area with the most up-to-date topo and planimetrics showing structures and roads.

"If the developer does not wish to perform a flood study, then flood protection detention must be provided.

"If no flooding problem exists, or none is assumed to exist as a result of the flood study, channel protection detention must be provided."

Added:
"6.1.1 Flood Study Parameters
"A. Hydrology
NRCS modeling as given in Chapter 2 using a fully developed condition in all areas contributing to the point of interest.

"B. Hydraulics
Use the Army Corps of Engineers HEC-RAS program with flow analyzed as subcritical. The modeling of the stream may need to be carried downstream beyond the point of interest to account for backwater effects of bridges, culverts or other stream obstructions.

"C. The City hydrology model will be made available to the engineer. As part of the study, the engineer will modify and/or add to that model and provide a copy of the approved hydrology and hydraulics model back to the City before a permit will be issued for the development."

Section 6.2.1
Replaced "...sill elevation…" in third sentence with "…floor…".

Section 6.2.2
Replaced "…side slope…" with "…cross slope…" in first sentence.

Section 6.2.3
Added "…reinforced…" and "…2-year storm elevation in the…"

Section 6.4.1.D

Deleted:

"D. Redevelopment projects

"1. No detention required when redeveloping within the central business district.

"2. Redevelopment projects that do not increase the amount of impervious surface shall incorporate stormwater detention structures to release the 100% and 50% storm events at the predeveloped rate using a pre-development CN = 78.

"3. Redevelopment projects which increase impervious surface shall follow all design criteria as set out in the design manual including those stormwater management practices to control peak flows and those BMPs to preserve water quality.

"4. Redevelopment projects shall also conform to the water quality goals and BMP criteria."

Replaced it with:

"D. Projects involving replacement of, or additions or other improvements to, existing structures or pavement or other impervious surfaces

"1. No detention required on such projects within the central business district.

"2. Such projects that do not increase the amount of impervious surface shall install detention, as determined in Section 6.1, for 1.5 times the area of any parts of the site where pavements and/or structures are removed and replaced.

"3. Such projects which increase impervious surface shall provide detention as determined in Section 6.1, for 1.5 times the area of the additional impervious surface and 1.5 times the area of any other parts of the site where pavements and/or structures are removed and replaced.

"4. Each successive project on a given site will be required to provide detention as specified in the above sections until the entire site is brought to the standards for new development in this manual, at which time nothing further will be required.

"5. Such projects shall also conform to the water quality goals and BMP criteria as specified in Section 6.8.1 Water Quality for Previously Developed Sites.

"6. Such projects less than 3000 square feet shall provide a Small Site BMP, as outlined in Section 6.8.3 and Appendix A, which will be considered to satisfy both flood protection detention and water quality requirements."

Section 6.4.2.D. Release Rate

Added:

"Channel Protection

Release rate for the channel protection volume shall be such that the time between the centers of mass of the inflow and outflow hydrographs of the 1-year storm shall be at least 24 hours, except that on half inch shall be the smallest control orifice size. (See section 6.4.3.D.)"

Deleted "…1%, 10%, 50%, and 100% storms to the predevelopment peak flow rates for the 1%, 10%, 50% and 100% storms respectively.

Added "…post-development…" and "…to the predevelopment rates for the 1, 2, 10 and 100 year storms (the 100%, 50%, 10% and 1%, respectively)…" to the flood protection paragraph.

Added:

"Where flood protection detention is installed in redeveloping areas as outlined in Section 6.4.1.D, the predevelopment rate shall be determined per Chapter 2, Sections 2.2.2.B.1 and 2.2.2.E."

Section 6.4.3

Added **"…**except that discharges for channel protection basins shall be governed by 6.4.2.D." to Section D.

Added:

"G. Control structures that are small require particular attention to prevent clogging. One way of doing so is to make an underdrain system the primary outlet for the very small basins. To do so, the soil above the underdrain should be free draining such as sandy loam or loamy sand such that the soil and the inlet perforations of the underdrain provide far in excess of the design discharge. The control for the basin can then be provided by a cap on the underdrain."

Section 6.5.2.B

Added "…unless water quality features requiring flat surfaces are incorporated in the bottom."

Section 6.5.5

Changed this section from "Other Storage" to "Ponds and Lakes" and added:

"Detention storage and/or stormwater quality treatment in natural ponds or lakes is not allowed. Detention storage and/or stormwater quality treatment in naturalized ponds and lakes is strongly discouraged. "Naturalized" in this context refers to ponds and lakes which were not created for urban stormwater management which have native vegitation on the banks and/or which have native plants or animals in the permanent pool.

"Using such ponds or lakes for stormwater storage and treatment will likely lead to accelerated eutrophication which will ruin the water body or cause greatly increased maintenance."

Section 6.5.6

Moved “Other Storage” to this new section.

Section 6.8

Deleted:

“This section presents the Level of Service (LS) Method for BMP selection and the procedure to determine water quality design goals, assess predevelopment and proposed post-development site conditions, and to creat a package of BMPs that achieves stormwater quality design goals for that site.”

Added:

“Water quality goals and BMP selection shall be met by following the March 2008 edition of the “Manual of Best Management Practices for Stormwater Quality” developed by the Kansas City Mid-America Regional Council (MARC) and the Kansas City Metro Chapter of the American Public Works Association (APWA), hereafer referred to as the KCBMP Manual.

“Sections 4 through 8 of the above manual are adopted with exceptions as noted below:

“A. Exceptions

“1. Section 4.1 Development Conditions

“2. Figures 4 and 5 in Section 4.2.

“3. The steps for determining a Level of Service for previously developed sites in section 4.2.

“4. Section 5.1 Stream Buffers”

Section 6.8.1

Changed the title of this section from “The Level of Service Method” to “Water Quality for Previously Developed Sites”

Deleted:

“The LS requirement for the development is determined by the change in runoff from the predevelopment condition.

“The procedure outlined in Figure 6.8.1 is described in the following paragraphs. Supporting information for selecting site design strategies and BMPs are included as Tables 6.8.1.1 through 6.8.2.1 and the worksheets at the end of section 6.8 include detailed, step-by-step instructions and examples.

“A. Calculate Predevelopment Condition

"For previously undeveloped sites, calculate the predevelopment condition by determining the development site's predevelopment curve number (CN) or weighted CN using Table 6.8.1.1. For sites with more than one cover type or HSG, determine a CN for each combination of cover type and HSG, and an area-weighted CN for the entire site.

"For previously developed sites, see D (this section) LS Methods Previously Developed Sites.

"B. Postdevelopment Conditions

"Use the same method to calculate the postdevelopment condition CN. Calculate the postdevelopment condition by determining the development site's postdevelopment curve number (CN) or weighted CN using Table 6.8.1.1. For sites with more than one cover type or HSG, determine a CN for each combination of cover type and HSG, and an area-weighted CN for the entire site.

"C. Determine Level of Service (LS) Requirement

"Determine the net change in CN from predevelopment to proposed postdevelopment conditions by subtracting the predevelopment CN from the postdevelopment CN. Next, determine the LS that the postdevelopment stormwater management system must provide using Table 6.8.1.2. LS of 4 signifies no change in CN.

"D. LS Method for Previously Developed Sites

"For previously developed sites,… "

Added:

"For work being done on previously developed sites that includes replacement of, or additions or other improvements to, existing structures or pavement or other imperivous surfaces, there are two options for meeting water quality goals:

Option 1 Provide treatment for all impervious disturbed areas (areas where pavement and/or buildings etc. are removed and replaced), all additional impervious areas and an area of the existing undisturbed impervious surface on the site that equals 50 percent of all removed and replaced impervious area and additional impervious area.

A Level of Service of 8 shall be required for the total area required to be treated.

Option 2 Provide treatment for the entire site as outlined below.
First…"

Section 6.8.2

Changed title from "Postdevelopment LS and BMP Determination" to "Further Guidance/Requirements".

Deleted:

"This section describes the procedure to create a stormwater management plan that meets the required LS. The LS for a site is the sum of the weighted Value Rating (VR) for each site cover type or best management practice.

"Water quality protection strategies include site design choices such as BMPs. Site design options include minimizing and disconnecting impervious cover. BMPs include both non-structural approaches (such as preserving existing vegetative buffers or establishing native landscaping) and structural approaches (such as installing a wet detention pond, extended detention or engineered swale). In some cases, a site design feature can be a BMP, such as preserving sufficient existing vegetation to reduce the site's postdevelopment CN and corresponding LS. The following is a 4 step proceedure to calculate LS for proposed sites:

"Step 1**:** Determine the value rating (VR) for each proposed cover type and BMP from the menu of choices in Table 6.8.2.1. A VR is the assumed water quality improvement value of a cover type or BMP, based on its water quality treatment efficiency and ability to retain stormwater. A higher VR represents increasing water quality improvement value. Traditional cover types and stormwater management practices, such as pavement, turf grass landscaping, and dry detention basins, are included in Table 6.8.2.1 along with their respective VRs.

"Step 2: Determine the percent of the site treated by each cover type or BMP. This is accomplished by dividing the area of each cover type or area draining to each treatment BMP by the total site area. The sum of all the percents of the site can not exceed 100%.

"Step 3: Determine the weighted VRs by multipling the VR for each cover type or BMP by the percent of the site treated by each cover type or BMP.

"Step 4: Determine the total LS for the site by adding the weighted VRs together.

"The LS of the proposed development must meet or exceed the required LS. For example, if the required LS for the proposed development is 6, the sum of weighted VR's of the proposed stormwater management plan must be equal or exceed 6.00.

"Multiple combinations of site design and BMPs may be tested using this procedure until the optimum water quality protection package is attained. Changes in the proposed site design or stormwater management practices may reduce the postdevelopment CN. If a

selected site design feature or BMP will decrease the proposed development's CN, recalculate the weighted CN using and resulting LS requirement.

"BMPs required to achieve the appropriate LS, must be selected carefully by considering their suitability to the site's unique conditions. Table 6.8.2.1 lists land use, treatment suitability, physical feasibility, cost, and community and environmental benefits; however, consult the more detailed guidance and specifications provided in Appendix A, B, C and E before making a final selection.

"Detailed step-by-step instructions and worksheets for selecting water quality protection packages are provided in the WORKSHEETS at the end of this section, along with examples.

"A. Increasing VR by Using BMP's In Series

"A treatment train may help remove additional pollutants or maximize available space on the site by successively removing pollutants from the stormwater flow. Just as the first BMP removes a percentage of pollutants from the flow, each additional BMP placed in series will remove a percentage of the remaining pollutants. For this reason, the effective value of the secondary practice is a function of the effectiveness of the primary practice and the VR for the combination is increased accordingly. The effective VR of a series of BMPs is calculate as follows:

"Effective VR = VR of BMP 1 + [(VR of BMP 1 + VR of BMP 2)/VR of BMP 1]

"Example:
"BMP 1 -- Engineered swale VR = 8.08

"BMP 2 -- Bioretention cell fed by the engineered swale
Bioretention VR = 8.38

"Effective VR for Series= 8.08+[(8.38+8.08)/8.08] = 10.12

"Use the Effective VR when calculating the LS for BMPs that are designed to work in the series."

Added:

"A. KCBMP Section 8.5.5 Porous Pavement Design Requirements and Considerations

"1. Three-to-one impervious-to-pervious shall govern the surface area of the pervious pavement.
"2. Landscaped area (including turf, but excepting tree islands) must drain away from porous pavemets.
"3. If roof drains are routed directly to the rock storage layer beneath the pavement, pretreatment must be provided to remove sediments and debris.

The pretreatment must be easily accessible for cleaning and must be sized to allow the design flow into the storage layer in a 50% clogged condition.

"4. Signage must be specified as part of the plan and installed with the development to clearly delineate the area of porous pavement and prohibit the uses of sand or cinders in winter conditions and prohibit sealing the area.

"5. Stone used under the pavement must be double washed.

"B. KCBMP Sections 8.2 Infiltration Basins and 8.3 Infiltration Trenches

"1. Infiltration practices require a soils report per 12A-88 (f) (3). The design infiltration rate shall be 20% of the rate determined by the soils report.

"2. Stormwater infiltration practices shall not be allowed to treat areas that may constitute stormwater hotspots as outlined in Section 4.4 of the KCBMP Manual.

"3. Sand and stone in infiltration basins must be double washed."

Section 6.8.3 Small Area BMP

Added this section with the following text:
For small impervious areas (less than 3000 square feet) a rain garden equal to 20% of the contributing impervious area may be installed. This area is to catch, filter and infiltrate the water quality storm from the impervious area.

These BMPs should be kept a minimum of 10 feet from building foundations. It is the desing engineer's responsibility to ensure that the BMP does not cause damage to adjacent structures, properties or operations.

Guidance for the small area BMPs may be found in Appendix A.

An extensive vegetated roof, a minimum of 3" thick, may be used for buildings. This option will provide other benefits such as increased roof life and less energy required for cooling than other buildings. It is strongly encouraged to work with a designer who has experience in detailing green roofs if this option is chosen.

Section 6.8.4 Conflicting Language, Definitions or Rules

Added this section with the following text:
In any conflict between the KCBMP Manual and other sections of the City of Columbia Stormwater Management and Water Quality Manual, the City of Columbia manual shall take precedence.

Appendix A

Changed title from "Structural Guidance for Non Structural BMPs" to "General Guidance for Small-Area BMPs" and change text of guidance accordingly.

Appendix B
Eliminated this appendix.

Appendix C
Eliminated this appendix.

Appendix E
Eliminated this appendix.

Appendix F
Added attribution to Figure 2.2.1.1 Rainfall/Intensity/Duration Frequency Curves noting that data for curves 1% through 50% are from TP 40, 1961, and the data for the (nominal) 100% curve is from Bulletin 71, 1992.