

STORM WATER MANAGEMENT REPORT GUIDANCE

PROCEDURES, FORMAT & GUIDELINES

July 2007

City of Lenexa
Planning and Development Department
Engineering Division

Index

<u>Section</u>	<u>Title</u>	<u>Page No.</u>
Section 100	GENERAL	3
100.1	Introduction:	3
100.2	Purpose:	3
100.3	Definitions:	3
100.4	General Requirements:	5
100.5	Other Regulating Agencies:	6
Section 200	PROCEDURES	6
200.1	Transmittals:	6
200.2	Initial Submittals:	7
200.3	Re-submittals:	7
200.4	Amendments and Supplements:	7
200.5	Rejections:	7
200.6	Coordination:	8
Section 300	FORMAT	8
300.1	Report Cover:	8
300.2	Executive Summary:	10
300.3	Table of Contents:	10
300.4	General Information:	12
300.5	Existing Condition Analysis:	12
300.6	Proposed Condition Analysis - Methodology:	13
300.7	Summary and Recommendations:	15
300.8	Appendix A – Level of Service:	15
300.9	Appendix B – Supporting Calculations and Maps:	16
300.10	Appendix C - Routing:	17
300.11	Appendix D - Details:	17
300.12	Appendix E – Memorandum of Resource Management:	17

300.13 Appendix F – Establishment and Maintenance Plan:	19
300.14 Appendix G – Stream Analysis:	20
Section 400 ADDITIONAL GUIDELINES AND INFORMATION	20
400.1 Purpose:	20
400.2 Lenexa Standards, Criteria, and Details:	20
400.3 Project Managers:	21
400.4 Minimum Low Openings and Minimum Floor Elevations:	21
400.5 Alternate Stormwater Designs:	21

List of Figures

Figure 1 – Example Title Page.....	9
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List of Tables

Table 1 – Existing Runoff Conditions	13
Table 2 - Proposed Runoff Conditions	14
Table 3 - Proposed Runoff Conditions	15

STORM WATER MANAGEMENT PLAN

April 1, 2007

Section 100 GENERAL

100.1 Introduction:

This is a guidance document to assist in the proper preparation of a Stormwater Management Plan/Report for the City of Lenexa, Kansas (City). This document applies to all proposed developments to be reviewed by the Development Engineering Division, and is presented to clarify the specific submittal requirements for a storm water drainage study used to establish designs and/or evaluate types of drainage systems or facilities ordinarily encountered in local urban, suburban and/or critical storm drainage areas. More specialized circumstances may arise which require other or additional methods, techniques or strategies not ordinarily encountered. It is not the intent that this document be restrictive in any manner to the needs created by special and/or site specific circumstances.

These procedures, format and guidelines have been developed with the guidance of Lenexa's current stormwater management codes. However, in the event any requirement of this document conflicts with any ordinance, or other City requirement, that which imposes the highest standard shall control.

100.2 Purpose:

The primary purpose of this document is to standardize and clearly define the requirements for a complete and acceptable storm water drainage study submittal. Additionally, it is hoped that a study prepared and submitted in accordance with this document will reduce the time required for review, eliminate the need for multiple re-submittals, enhance the developer's understanding of the improvements and documentation required, and assure equitable requirements are being imposed on all development interests.

This document establishes minimum performance standards pertaining to procedures, format and guidelines for a storm water management plan "drainage study" to be reviewed by the Development Engineering Division.

The accepted and approved storm water drainage study will become a City record along with all review documentation of the stormwater design for a given development.

100.3 Definitions:

The following are the general stormwater definitions utilized in the interpretation of Lenexa's codes and requirements, for the purpose of this policy:

1% Storm Stage: The storm water elevation (determined to be at the energy gradient line) within a conveyance system that will occur during a 1% storm event (base flood).

Base Flood: The design storm for which there is a 1% likelihood of occurrence within any given year (commonly referred to as the 100-Yr storm event).

BMP: Best Management Practice – a storm water facility that will treat water quality as well as quantity. Typically a BMP will detain or store water for a longer period than a storm water detention basin.

Design Storm: The combination of rainfall depth, duration, and distribution of a hypothetical rainfall event with a given likelihood of occurring in any year.

Easement: Authorization by a property owner for the use by another for a specified purpose.

Emergency Spillway: A device or devices used to discharge water under conditions of inflow that exceed the design outflow from the storm water detention facility. The emergency spillway functions primarily to prevent damage to the detention facility.

Engineered Channel: An open drainage channel that has been explicitly designed to convey stormwater runoff.

Engineered Swale: An open drainage channel that has been explicitly designed to convey stormwater runoff.

Floodplain: The channel of a water course and those portions of the adjoining land area which are required to carry a flood.

Floodway: The channel of a water course and those portions of the adjoining land area that must be reserved in order to discharge the base flood without cumulatively increasing water surface elevations more than a designated height.

Floodplain Fringe: That portion of the floodplain between the floodway and the natural outline of the floodplain of the base flood.

Freeboard: The difference in elevation between the top of a structure or elevation of concern and the maximum water surface elevation for a given design storm. (It is an allowance or safety factor against inundation or overtopping.)

Impervious Surface: A surface that prevents the infiltration of stormwater.

Minimum Floor Elevation (M.F.E.): The elevation of the lowest floor (including basement) within a structure.

Minimum Low Opening (M.L.O.): The lowest opening of a structure, at which point storm water could potentially enter the structure. (Typically referred to in the context of elevation.)

Natural Channel: Any non man-made waterway, such as a ravine, creek, stream, or river which conveys stormwater during a rain event. (These channels may or may not contain permanently running water during non-rain event periods.)

Positive Drainage: The minimum grade or slope necessary to induce the movement or conveyance of water in a particular direction. (In Lenexa, typically considered to be a minimum of 3% for residential turf.)

Storm Drainage System: All of the natural and man-made facilities and appurtenances such as ditches, natural channels, pipes, culverts, bridges, engineered channels, engineered swales, street gutters, inlets, and detention facilities which serve to convey surface drainage.

Storm Water Detention Facility: Any structure, device, or combination thereof which provides for the temporary storage of water, with a controlled discharge rate.

Tributary Area: All land draining to the point of consideration, regardless of ownership.

Wet Retention Facility: A detention facility that is designed to include permanent storage of water in addition to the temporary storage of water used to control discharge rates from the facility.

100.4 General Requirements:

The storm water drainage study shall describe, analyze, clarify, summarize, record, and quantify all storm drainage considerations associated with the subject project. Quantitative results shall be summarized and supported by computations using approved methodology. Detailed quantitative results and conclusions shall be presented to clearly ascertain all areas of conformance and non-conformance with the adopted criteria. Conclusions and recommendations shall be appropriately justified.

The storm water drainage study shall be performed by a State of Kansas licensed Professional Engineer (Engineer of Record).

The Engineer of Record shall affix his/her original seal to the report, at a minimum, on the title or cover sheet, providing that the signed title or cover clearly indicates all of the sheets (pages, maps, exhibits, etc.) contained in the report.

The Engineer of Record shall be completely familiar with all Lenexa City Codes, standards, and requirements. Most specifically the adopted *Kansas City Metropolitan Chapter of the American Public Works Association – Standard Specifications and Design Criteria: Division V, Section 5600, Storm Drainage Systems and Facilities* (APWA 5600) and the adopted *Mid-America Regional Council and American Public Works Association Manual of Best Management Practices For Stormwater Quality* (BMP Manual) including all Lenexa additions and exceptions to said documents.

100.5 Other Regulating Agencies:

These procedures and guidelines have been prepared with respect to the City of Lenexa codes, standards, and requirements. Other regulating jurisdictions, both State and Federal may apply to any given site. It is the Engineer of Record's responsibility to ascertain that all municipal, State, and Federal requirements are being evaluated and met.

When conflicts are encountered, the most rigorous criteria shall govern. Other Codes, Standards, and agencies that may have criteria and regulations pertaining to storm water management include, but are not limited to, the following:

FEMA – Federal Emergency Management Agency

KDHE – Kansas Department of Health and Environment

USACE – United States Army Corps of Engineers

Section 200 PROCEDURES

200.1 Transmittals:

Transmittal letters or forms accompanying drainage study submittals or correspondence to the City may contain general information, such as project status (i.e., initial submittal, re-submittal, final approval submittal, related submittal schedules, status of approvals by other agencies or parties, etc.); general coordination information (i.e., City reviewer, A/E Project Engineer contact, relevant agency contact persons, etc.), or general summary and conclusions, etc. However, any summary and/or conclusion statements by the applicant must also be included within the body of the report document.

Reports should be bound appropriate for the purpose of duplicating, recording, and filing. Three ring binders are discouraged due to problems with filing, as are permanent bindings that hinder reproduction.

The City assigned case number (i.e. PL07-05P) must be clearly designated on all correspondence (within the RE: section), as well as clearly designated on any submitted report (on the cover page).

Drainage studies to be submitted are those associated with either preliminary plans or plats (Preliminary Stormwater Management Studies), or final plans or plats (Final Stormwater Management Studies). Other stormwater studies not associated with the above referenced development types may occasionally be required, depending on site-specific circumstances and conditions.

Although reports will ultimately be routed to the Engineering Division, all submittals should be submitted to the **Planning Division of the Planning and Development Department** along with the other sundry project required submittals.

200.2 Initial Submittals:

The initial storm water drainage study submittal shall be a fully complete, bound, document with all supporting data included. The report should clearly identify, elaborate, and or demonstrate compliance with all areas as identified in the format and guideline sections below.

Three (3) copies of the initial submittal shall be submitted, all sealed by the Engineer of Record. The initial submittal date should be clearly reflected on the cover sheet.

200.3 Re-submittals:

Re-submittals shall completely address all City review comments and shall include a separate cover letter stating each comment, and how that comment was addressed. The current revision date of the re-submittal should be clearly identified on the cover letter, and it should be added under the original submission date (or previous revision date in instances of multiple re-submissions) of the cover page of the report.

Each re-submittal should consist of three (3) copies of the revised stormwater report, unless otherwise approved by the City reviewer. (In which case three (3) copies of the approved revised sheets would need to be submitted.)

200.4 Amendments and Supplements:

Amendments and supplements to the Drainage Study, if approved by the City reviewer instead of a re-submittal revision, shall be sealed by the Engineer of Record. The original seal shall appear on the title or cover sheet and shall include the date and number of the amendment or supplement and shall clearly indicate all of the sheets (pages, maps, exhibits, etc.) contained therein. The amendment or supplement shall also include a copy of the original report cover and the sheet(s) from that report displaying the seal of the Engineer of Record and the original report contents that were changed.

200.5 Rejections:

Incomplete and returned submittals: Storm water drainage study submitted by non-registrants, that do not meet the requirements contained herein, submittals which are not

sealed by a State of Kansas licensed Professional Engineer, and/or those deemed incomplete or inadequate by the Development Engineering Administrator will be rejected and returned without written comments by the City reviewer.

200.6 Coordination:

Lenexa Staff will make every reasonable attempt to provide discussion and coordination with regards to matters relating to the proper completion of the Drainage Study, upon request. After contact with City Staff, a meeting will be arranged at City Hall as soon as a reasonable, open meeting time can be arranged.

Section 300 FORMAT

The following format establishes minimum requirements for a drainage study to be reviewed by the Engineering Division.

Please note that the specific order identified below, **must** be consistent / maintained with regards to the presentation order within the report. This will allow for a consistent report layout, which should both provide equity among all development types, as well as increased review efficiency, and thus minimizing of review time necessary to review the report.

Unless otherwise specifically allowed below, the Study shall not be hand written.

300.1 Report Cover:

The report cover shall contain the following information:

- a) Report Title – “Stormwater Management Plan,” with the study description “Preliminary” or “Final” preceding “Stormwater ...” as appropriate, in bold, large font.
- b) Project name or the plat name and phase.
- c) Project address or location (including City of Lenexa).
- d) By whom the report was prepared, including address and phone number.
- e) For whom the report was prepared, including address and phone number.
- f) Date the report was prepared and all subsequent revision dates.
- g) City of Lenexa case number, in bold.
- h) Seal and signature

(See Figure 1, next page for example.)

Figure 1 – Example Title Page

Final Stormwater Management Plan

Project Name
Project Address / Location
City of Lenexa

Prepared by
Business Name
Business Address
Phone Number

Prepared for
Business Name
Business Address
Phone Number

Date
Revision Date (if needed)
Revision Date (if needed)
City of Lenexa Project Number

Seal and Signature

300.2 Executive Summary:

The executive summary should be a brief synopsis of the results of your study. It should include a short description of the existing conditions, proposed conditions, required LOS, achieved LOS, the BMP's necessary to achieve the required LOS, and any off-site ramifications (or lack thereof) if implemented as proposed.

The executive summary should be no more than three (3) paragraphs summarizing the document that follows.

300.3 Table of Contents:

A table of contents shall be included in all reports to clearly indicate the full content of the report. The table of contents shall include the name and number of each section and/or exhibit/attachment contained in the report with the total pages/sheets comprising the section and/or exhibit/attachment identified.

The order of the report body and appendices (exhibits/attachments) shall be as follows:

Body of the Report

1. Report Cover
2. Executive Summary
3. Table of Contents
4. General Information
5. Existing Condition Analysis
 - Existing Conditions Table
6. Proposed Condition Analysis – Methodology
 - Proposed Conditions Table
7. Summary and Recommendations

Appendix A – Level of Service

- Level of Service Worksheet # 1
 - Map supporting Worksheet # 1 existing – Map A
 - Map supporting Worksheet # 1 proposed – Map B
- Level of Service Worksheet # 2
 - Map supporting Worksheet # 2's proposed BMP package
- A soils map of the project area, including the engineering properties of on-site soils

Appendix B – Supporting Calculations and Maps

- Drainage area map, including sub-basin areas.
- Time of Concentration calculations
 - Map identifying Time of Concentration flow paths
- Weighted run-off coefficient calculations (*when necessary*)
- Outfall protection calculations (i.e. rip-rap calculations)

- Throat, orifice, weir, spillway, etc. calculations
- Down-stream capacity analysis (to point that proposed facility is 10% or less of watershed)
- Any other calculations supporting the design proposed, including copies of any pertinent charts, tables, nomographs, rain fall intensity table, etc.

(Calculations for Appendix B may be hand-written, as long as they are clear and legible.)

Appendix C - Routing

- Routing Summary Sheet
- Appropriate pond or BMP routing
- Stage-storage tables

Appendix D - Details

1. All necessary details to clearly identify outfall structures, outlet systems, emergency overflow structures, under-drains, select filtration media, BMP design (i.e. rain-garden, etc.), planting layout or information,

Appendix E – Memorandum of Resource Management

- A current aerial photograph of the project area
- A copy of potential or identified areas of wetland delineation
- A plan / map identifying trees, tree groupings, and other significant vegetation
- Soils map from NCRS identifying the soils located on the project site;
- Delineation of any FEMA floodplain present
- Delineation of Johnson County designated floodplain present
- Lenexa stream buffer setbacks
- Copy of the Notice of Intent letter sent to the state
- A letter to the Corp of Engineers *(if applicable)*
- Supplemental Maps *(if necessary)*
- Supplemental Photos *(if necessary)*

Appendix F – Establishment and Maintenance Plan

- Stand-alone Document within pocket
 - Establishment Section (for Years 1-3₊)
 - Maintenance Section (for Years 3₊)

Appendix G – Stream Analysis (if necessary due to stream segments on property)

- Plan Form Analyses and Inventory
- Longitudinal profile with sections
- Cross sections (bank-full width, depth, and discharge)
- Bed and bank materials analysis
- Critical shear stress analysis
- Plan form ratios
- Completed channel scoring matrix form

300.4 General Information:

The general information section should include a written project description clearly providing information for the site and proposed project. Such information should contain, but is not limited to, the following:

- name of the project, including plat or project name and phase,
- the location of the project, including section, township and range,
- size of the project (site acreage), and
- the proposed development information (including land use, building type and size, etc.)

300.5 Existing Condition Analysis:

This section should address the current condition of the proposed site and should cover any existing natural features, paying special attention to the stream ways, bodies of water and wetland areas. The existing analysis should state the condition of the flood plain in the proposed area, outline the existing soil types, ground cover, and overland flow conditions.

Any references (such as the soils map data in Appendix E) should be referenced. In addition, the following items should be included / addressed as well:

- Identify and determine, through research of available private and public resources, whether there exists previous drainage studies or recommendations on or near the proposed site, or existing drainage infrastructure that would impact the proposed development of the site.
- Describe, analyze and review the existing storm water runoff conditions at the site and in the surrounding area, including the flow quantity and characteristics, to determine the existing impacted systems and their adequacy using APWA Section 5600 and other applicable City criteria and standards.
- Determine and identify all issues of non-conformance with the adopted criteria, including, but not limited to, conditions associated with existing public or private systems.
- Prepare and include an existing conditions drainage area map, displaying the delineated existing drainage area(s) and all other information necessary for confirmation of the existing conditions analysis (i.e., existing structure size, flow line elevations, existing channels and ditches, with slope, etc.)
- Quantitative analysis or calculations supporting the results and conclusions noted above should be attached and clearly referenced in Appendix B.

An existing flows table should also be included within this section. This table should follow the following format, as shown in Table 1:

Table 1 – Existing Runoff Conditions

Drainage Sub-Basin	Runoff Coeff. (CN)	Time of Concentrtn (min)	Area (acres)	1-Year Peak Flow (cfs)	10-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)
DA-1	74	5.0	4.52	7.34	9.97	17.49
DA-2	82	10.0	6.55	14.73	20.31	35.87
DA-3	74	9.5	12.40	16.7	22.99	40.64

300.6 Proposed Condition Analysis - Methodology:

This section outlines your proposal for the site as well as conveys and documents the methodology followed (i.e., the general design approach), including the methods employed (e.g. SCS TR-55, HEC-1, HEC-HMS, Pondpack, etc.) and basis, during preparation of the report.

Unit hydrograph methods for runoff determination, as identified in Section 5602 are required (SCS, Type II, 24-hour rainfall). Rational method will be allowed to determine peak flows for the purposes of pipe sizing /design ONLY.

Hydrograph routing should be by modified-Puls level pool routing. The modified rational method will NOT be allowed. Requests to utilize alternate routing methods must be approved by the City for consideration of use.

Time of concentration calculations (with associated flow-path maps) should be included in Appendix B, which support the time of concentrations utilized in design. Staff would note that in the detailed calculations for time of concentration, utilization of 300' for sheet flow MUST be clearly justified. We have found that the 300' maximum allowed is over-utilized as a blanket dimension, and typically sheet flow turns to shallow concentrated flow in the 100 to 150' range.

It is not acceptable to use different methods to evaluate similar components within a study, nor is it acceptable to mix methods inappropriately during evaluation of a single system component.

In general, the proposed storm water controls to be utilized on the site should successfully demonstrate that the proposed development will not:

- Cause flooding outside of the existing flood plan boundary during a 1% or more frequent flood that would not have occurred without the proposed improvements.
- Cause or increase flooding of existing structures.

- Contribute to unacceptable channel erosion as predicted using criteria established by the City. Unacceptable erosion will include: erosion outside of the 1% flood plain, erosion encroachment close to existing structures, erosion encroachment into roads and infrastructure, threats to designated stream assets, and rapid progression of the channel erosion upstream.
- Contribute sedimentation to the channels or detention areas. The developer will be responsible for the removal and disposal of all sedimentation that occurs from failure of an approved erosion plan that has been contributed to the proposed development in the joint-use detention basins downstream of the proposed improvements.
- Create or contribute adverse impacts to water quality.

Impacts from the flow rate, the velocity and the quality of the runoff will be considered. The velocity shall not erode or deposit sediments in designated stream assets. The runoff should not contain excessive sediment concentrations, biological oxygen demand, dissolved oxygen, nutrient, organic, total dissolved solid, heavy metal or pathogen levels that threaten the viability and health of the designated stream assets or the joint-use or regional retention system. The threshold of acceptable limits shall be based on the limits set by KDHE in Article 16. Water Pollution Control, Surface Water Quality Standards, KAR 28-26-28e.

In addition, the City's review and approval process will involve the consideration of the applicant's use of alternative design methods to reduce imperviousness, peak flows, and velocities to minimize erosion and sedimentation and to protect the water quality of the storm water runoff discharged into the storm water system.

A proposed flows table should also be included within this section. This table should follow one of the following formats, as shown in Tables 2 or 3:

Table 2 - Proposed Runoff Conditions

Drainage Sub-Basin	Runoff Coeff. (CN)	Time of Concentrtn (min)	Area (acres)	1-Year Peak Flow (cfs)	10-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)
DA-1	74	5.0	4.52	7.34	9.97	17.49
DA-2	82	10.0	6.55	14.73	20.31	35.87
DA-3	74	9.5	12.40	16.7	22.99	40.64

or

Table 3 - Proposed Runoff Conditions

Drainage Sub-Basin	Proposed Run-off Coeff. (CN)	Proposed Time of Conc. (min)	Area (acres)	Existing 1-Year Peak Flow (cfs)	Proposed 1-Year Peak Flow (cfs)	Existing 10-Year Peak Flow (cfs)	Proposed 10-Year Peak Flow (cfs)	Existing 100-Year Peak Flow (cfs)	Proposed 100-Year Peak Flow (cfs)
DA-1	74	5.0	4.52	7.34	6.98	9.97	9.80	17.49	17.95
DA-2	82	10.0	6.55	14.73	14.25	20.31	20.12	35.87	38.32
DA-3	74	9.5	12.40	16.7	15.95	22.99	20.50	40.64	44.52

If a table similar to Table 2 is utilized, then a comparative table (similar to Table 3) must also be included.

300.7 Summary and Recommendations:

The summary and recommendations shall provide in narrative form a condensed version of the main points and/or facts, with all details, illustrations, and elaborations omitted. At a minimum, the following shall points shall be included / documented:

- a. Project name and extent of proposed development.
- b. Adequacy of the existing system to convey existing site runoff.
- c. The effect of other studies and plans on this study.
- d. Whether or not there currently are, or will be, any adverse impacts to the receiving system(s).
- e. Major components of the storm water management plan established by the study.
- f. The appropriateness and effectiveness of the proposed storm water management plan.
- g. Implementation schedule for the plan (i.e., with Phase 1; after XX acres developed; etc.).
- h. Special circumstances or conditions that need to be highlighted.

300.8 Appendix A – Level of Service:

All Appendices shall be distinct, tabbed sections.

The applicant shall provide an analysis of the Level of Service required for the development plan, as defined by the BMP Manual, including demonstration of how necessary BMPs may be incorporated into the site, more specifically:

- a. Completed Worksheet 1 providing the calculations for determining the required level of service;
- b. A plan depicting the associated CN coverage areas for the existing conditions, along with the predevelopment portion of Worksheet 1 determining the weighted curve number (CN) for pre-development conditions. *Technical Release 55 (TR-*

- 55), from the NRCS should be utilized in preparing / calculating the CN values;
- c. A plan depicting the associated CN coverage areas for the proposed conditions, along with the completed post-development portion of Worksheet 1 determining the weighted curve number (CN) for post-development conditions. *Technical Release 55 (TR-55), from the NRCS should be utilized in preparing / calculating the CN values;*
 - d. A completed Worksheet 2 providing the calculations for determining the mitigation package required, including any necessary supporting treatment train calculation sheets;
 - e. A plan clearly illustrating the drainage areas for the various impervious and BMP areas utilized in Worksheet 2;

300.9 Appendix B – Supporting Calculations and Maps:

All Appendices shall be distinct, tabbed sections.

Any necessary supporting maps should be included, with at minimum a drainage basin map, clearly identifying sub-basins, labeled with a sub-basin name, area, and CN value.

Supporting calculations and computations shall be provided for all data contained in the report including calculations/computations for:

- Time of Concentration calculations – with an accompanying map depicting the flow paths utilized in the calculations;
- Weighted run-off coefficient calculations (*when necessary and not included in the LOS appendix*);
- Outfall protection calculations (i.e. rip-rap calculations);
- Throat, orifice, weir, spillway, etc. calculations;
- Down-stream capacity analysis. This should be completed to a point that the proposed facility is 10% or less of the contributing watershed;
- Any other calculations supporting the design proposed, including copies of any pertinent charts, tables, nomographs, rain fall intensity table, etc.

Each page of the supporting calculations and computations shall include the calculation title, page number and the number of pages comprising the set of calculations.

All supporting calculations shall be referenced in the appropriate section of the report narrative by title and the purpose of providing the calculations shall be clearly stated.

Supporting calculations and computations shall be complete, legible, and follow a logical trail.

300.10 Appendix C - Routing:

All Appendices shall be distinct, tabbed sections.

This appendix should contain the routing data and output for any stormwater facilities requiring routing as part of their design function. All output should be clearly labeled, for example that a particular run is for the 1-Yr existing storm event or the 1-Yr proposed storm event, and each page should be clearly numbered.

An appropriate summary sheet should be created and placed at the front of the appendix, which clearly identifies each nodes existing and proposed characteristics, so that it may be readily accessed.

Other supporting tables and figures, such as the stage-storage tables and basin volume tables should be included here as well.

300.11 Appendix D - Details:

All Appendices shall be distinct, tabbed sections.

These details should typically be 8.5" x 11" or 11" x 17" format, bound within the report. It will however, also be acceptable to provide 22 x 36 format, folded and placed within pockets.

City standard details are preferred / required when existing, or for those non-standard facility designs, the detail should include plan and profile information as well as any appropriate notes.

All appropriate design details, from the overall stormwater facility, to component specific details (such as structural components of a larger facility) should be included.

300.12 Appendix E – Memorandum of Resource Management:

All Appendices shall be distinct, tabbed sections.

- A current aerial photograph of the project area
- A copy of potential or identified areas of wetland delineation
- A plan / map identifying trees, tree groupings, and other significant vegetation
- Soils map from NCRS identifying the soils located on the project site, including appropriate data property tables;
- Copy of the Notice of Intent letter sent to the state
- Delineation of any FEMA floodplain present (*if existing on-site*)
- Delineation of Johnson County designated floodplain present (*if existing on-site*)
- Lenexa stream buffer setbacks (*if streams exist on the proposed site*)
- A letter to the Corp of Engineers (*if applicable*)
- Supplemental Maps (*if necessary*)

- Supplemental Photos (*if necessary*)

To aid in the obtaining of much of this material, we have provided additional detail and references below, where various components of the data may be obtained on-line.

- Provide a graphic representation of the location and legend of soil types present on site, accompanied by pertinent soil type engineering sheets (including source of information).

Photo-copies of applicable information from NRCS Soil Survey of Johnson County (including Tables 14 – Physical & Chemical Properties and 15 - Soil & Water Features) will satisfy this requirement; OR it can be obtained on-line at <http://websoilsurvey.nrcs.usda.gov/app/>.

Note: If NRCS information is downloaded and printed from an on-line source, include Tables 19 - 22 and the appropriate quadrangle map with site and soils type number clearly legible.

- Wetland delineation and copy of National Wetland Inventory report for this site or statement and report showing wetlands do not exist; Location of any wetlands identified by National Wetlands Inventory (NWI) at: <http://nmviewogc.cr.usgs.gov/viewer.htm> Verify jurisdictional or non-jurisdictional status of wetlands indicated on National Wetland Inventory map.
- Habitat evaluation for threatened and endangered (T&E) species.

For T&E fauna: Contact Nate Davis, Kansas Department of Wildlife & Parks, 512 SE 25th Ave., Pratt, KS 67124, nated@wp.state.ks.us, P: 620-672-0720, F: 620-672-2972.

To request T&E flora information, contact the Kansas Biological Survey, Kansas Natural Heritage Inventory at <http://www.ksnhi.ku.edu/data/html/request.htm>

- Location and general type of existing trees and significant vegetation and trees proposed for preservation and removal if estimated to be greater than 10” caliper, (prepared from aerial photo or survey);
- Latest (< 2yrs old) aerial photograph can be obtained through JoCo AIMS mapping at <http://aims.jocogov.org/legal/imsterms.asp>.
- Contour information may be obtained from survey or general topography is available through JoCo AIMS mapping.
- FEMA information may also be obtained through JoCo AIMS mapping. Additional detail with regards to the Johnson County floodplain may be obtained from the City.

300.13 Appendix F – Establishment and Maintenance Plan:

All Appendices shall be distinct, tabbed sections.

This plan should be a separate and distinct document, placed within a pocket for easy removal, rather than bound in the report.

The preliminary plan submittal must include a preliminary establishment and maintenance plan which should generally address the items outlined below.

The following information is a guideline and does not necessarily cover all required items for a particular site.

Establishment (years 1 -3 +/-):

- Define establishment techniques for all types of installations utilized on site (seed, plugs, etc.).
- Define acceptable coverage for vegetative growth at regular timeframes and provide measurement techniques.
- Address possible need for over-seeding and provide seed source and content information.
- Identify problematic weeds and invasive species types and methods for eradication.
- Provide watering requirements and guidelines for supplemental watering at various stages of establishment.
- Address the use & application or prohibition of fertilizers, pesticides, and herbicides.

Maintenance (post establishment (3+ yrs):

- Define preferred long-term maintenance techniques (mowing / burns / dredging / soil replacement, etc.) and timeframes for said techniques.
- Address the need, or lack there of, of supplemental watering.
- Include a short general paragraph explaining the purpose of each BMP type (or one paragraph explaining the water quality benefits of all the BMP's and role of plant material)
- Include a requirement that any alterations to the BMP(s) (physical or vegetative) requires city review and approval.
- Include a map showing location of BMP's with location of stream setbacks (if present). Stream setbacks must be as-surveyed location.
- Dedications of stream corridors to the city must include access for future maintenance operations.
- Include an inspection schedule and checklists for inspections.

The final version of an establishment and maintenance plan for the proposed vegetation must be submitted for Final Plan review and approval.

The final plan should include added detail and specific information related to the types of plant material and the method of installation. In addition, any outstanding comments from the preliminary submittal should be addressed.

300.14 Appendix G – Stream Analysis:

All Appendices shall be distinct, tabbed sections.

A stream assessment (when streams/creeks exist on-site), including the completed assessment form and all ancillary information as identified in Section 5605 shall be provided within this Appendix based upon the type of construction as below:

1. For allowed areas of construction within the stream or the stream buffer, a complete stream assessment will be required. This includes (reference 5605 for complete information):
 - a. Plan Form Analyses and Inventory
 - b. Longitudinal profile with sections
 - c. Cross sections (bank-full width, depth, and discharge)
 - d. Bed and bank materials analysis
 - e. Critical shear stress analysis
 - f. Plan form ratios
 - g. Completed channel scoring matrix form
2. For allowed discharge outfalls into a stream or stream buffer, a partial stream assessment, consisting of the surveying and identification portion of the assessments will be required to appropriate design the discharge outfall. *This will include surveying of the stream a minimum of one (1) wavelength both up and down stream to include configuration items such plan form items as pool & riffle sequences, etc.*

Section 400 ADDITIONAL GUIDELINES AND INFORMATION

400.1 Purpose:

The following subsections of Section 400 Guidelines contain additional City of Lenexa specific information that may be relevant to the previous sections of this document and should be followed in the performance of this document.

400.2 Lenexa Standards, Criteria, and Details:

Lenexa provides our City codes, specifications, general criteria, standards, and standard details on-line in formats available for download. The textual documents are provided in PDF format, and the details are provided in both PDF format as well as AutoCAD dwg format (zipped by section to minimize file size).

These documents may be found at <http://www.ci.lenexa.ks.us/publicworks/index.html>. From this page, select Construction Docs. from the list on the left. This will open a pull down, where the various items may be selected from (i.e. design criteria, specifications, details, pre-approved materials list, etc.).

For those Engineers of Record working in the City of Lenexa, please take the time to read all of Lenexa's documentation, particularly the City's code exceptions to 5600, as well as general criteria. The City has several changes that are not necessarily typical. To highlight this, a few Lenexa specific standards, although certainly not all standards or criteria are identified below:

- the minimum storm pipe size in Lenexa is 15-inches,
- Utilization of CMP, or metal pipes, are not allowed in Lenexa's public infrastructure,
- With regards to stream protection, Lenexa has determined that all streams must be protected, therefore all site design must mitigate the 1-Yr and 10-Yr storm events such that they match pre-development conditions.
- Minimum low openings and minimum floor elevations (described in more detail in 400.4).

400.3 Project Managers:

Architects who will act as the project managers should consult with their retained engineer during the preliminary phases of design so that all drainage issues and conditions can be addressed during project formulation and prior to final submission.

400.4 Minimum Low Openings and Minimum Floor Elevations:

Lenexa's codes and policies often create the design requirement for either (or both) Minimum Low Openings (MLO's) and Minimum Floor Elevations (MFE's) on proposed building sites to protect the interests of the property owner.

Generally an MLO will be required when a building is adjacent to an engineered swale (or any other surface water conveyance system).

Generally an MFE will be required when a building is adjacent to a natural or man-made body of water (or any other area where water is purposefully being impounded and detained).

Please contact staff early in the design process if you have any questions regarding either MLO's or MFE's.

400.5 Alternate Stormwater Designs:

Many alternate stormwater designs may exist for any given project. It is not the intent of this document to restrict the possible available site solutions, but only to provide a consistent and uniform logic guide by which to establish a site solution that meets the

City's standards and criteria.

Ultimately, the burden for this determination and analysis resides with the engineer of record hired by the developer and not the City. Additionally, in order for the City to record and review the engineer's determination and recommendations generally requires that all components of this document be presented. It is the Engineer's professional obligation to protect the general safety and welfare of the public. It is the City's intent to facilitate this intent.

The City understands that issues of feasibility, cost, present conditions, etc., may have an important bearing on the proposed design of a site by the Engineer. However, please understand that the City cannot vary from the minimum or necessary criteria, based solely on these issues, especially if there is potential for compromising our primary obligation to the safety, health, property and welfare of the public.

DISCLAIMER OF LIABILITY

The procedures, format and guidelines set forth herein establish minimum requirements which must be implemented with good engineering practice and workmanship. Use of the information contained herein shall not constitute a representation, guarantee, or warranty of any kind by the City, or its officers and employees, of the adequacy or safety of any storm water management structure or use of land. Nor shall the approval of a Storm water Management Plan and the issuance of storm sewer permits imply that land or land uses permitted will be free from damages caused by storm water runoff. The degree of protection required by the criteria and performance standards referenced herein is considered reasonable for regulatory purposes and is based on historical records, engineering, and scientific methods of study. Larger storms may occur or storm water runoff heights may be increased by man-made or natural causes. This information, therefore, shall not create liability on the part of the City or any officer or employee with respect to any legislative or administrative decision lawfully made hereunder.