CITY OF FARMINGTON

BILL NO. 44072012 **ORDINANCE NO. 11-2I 86**

AN ORDINANCE AMENDING THE MUNICIPAL CODE OF THE CITY OF FARMINGTON, MISSOURI, BY AMENDING TITLE IV: LAND USE, CHAPTER 420: STORMWATER MANAGEMENT REGULATIONS, A LAND USE KNOWN AS "STORMWATER MANAGEMENT PLANS AND STORMWATER MANAGEMENT REGULATIONS" AND ENACTING CERTAIN REGULATIONS PERTAINING THERETO.

WHEREAS, there has been presented on this date an amendment to the Municipal Code of the City of Farmington related to definitions, purpose and permits, application and process, stormwater management plans, stormwater prevention plans, project classifications and fees, design requirements, enforcement and penalties, and inspections, completion, acceptance and maintenance of improvements; and

WHEREAS, the proposed amendment has been affirmatively recommended by the Planning and Zoning Commission of the City of Farmington; and

WHEREAS, a public hearing regarding the proposed amendment was held on July 12, 2012 wherein all citizens or parties in interest were given the opportunity to address the City Council regarding said amendment; now therefore,

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF FARMINGTON, MISSOURI AS FOLLOWS.

SECTION 1: That Title IV: Land Use, Chapter 420: Stormwater Management Regulations is hereby repealed and;

SECTION 2: That a new Title IV: Land Use, Chapter 420: Stormwater Management Regulations is hereby enacted.

Chapter 420: STORMWATER MANAGEMENT REGULATIONS

Article I. In General

SECTION 420.010: DEFINITIONS

Unless specifically defined elsewhere in this Title, words or phrases shall be interpreted so as to give them the meaning they have in common usage and to give this Chapter it's most reasonable application:

2 (TWO)-YEAR STORM: Rainstorms of varying duration and intensity having a fifty percent (50%) probability of being equaled or exceeded in any given year.

10 (TEN)-YEAR STORM: Rainstorms of varying duration and intensity having a ten percent (10%) probability of being equaled or exceeded in any given year.

25 (TWENTY-FIVE)-YEAR STORM: Rainstorms of varying duration and intensities having a four percent (4%) probability of being equaled or exceeded in any given year.

100 (ONE HUNDRED)-YEAR STORM: Rainstorm of varying duration and intensity having a one percent (1%) probability of recurring in any one (1) year.

ADMINISTRATIVE OFFICER: The duly appointed City Administrator or his/her designated representative.

ADVERSE IMPACT: Any modifications, alterations or effects on a feature or characteristic of surface waters including their quality, quantity, hydrodynamics, surface area, species composition, living resources, aesthetics or usefulness for human or natural uses which are or may potentially be harmful or injurious to human health, welfare, safety or property, to biological productivity, diversity or stability, or which unreasonably interfere with the enjoyment of life or property, including outdoor recreation. The term includes secondary and cumulative, as well as direct impacts.

APPEAL: As defined in Title IV of this Code

APPLICANT: The owner of record, or his/her authorized representative, of a tract of land that is the site of development, or development activity within the scope of this Chapter.

BASE FLOOD ELEVATION: The elevation at any location delineating high waters having a one percent (1%) probability of being equaled or exceeded in any given year (also known as the 100-year flood).

BEST MANAGEMENT PRACTICES (BMPs): The Best Management Practices referenced in this ordinance are thoroughly described in the publication "Protecting Water Quality – A field guide to erosion, sediment and stormwater best management practices for development sites in Missouri and Kansas". It is available free of charge at: http://www.dnr.mo.gov/env/wpp/wpcp-guide.htm

BUILDING: As defined in Chapter 410 of this Code

BYPASS FLOWS: Stormwater runoff from an upstream property's tributary to a property's drainage system, but not under the control of the drainage system.

CAPACITY OF A STORM DRAINAGE FACILITY: The maximum flow at atmospheric pressure that can be conveyed by the facility without causing damage to the public or encroachment upon private property. The capacity of a stormwater drainage facility is determined utilizing "Manning's Equations" or other methods acceptable to the Administrative Officer.

CHANNEL: A natural or artificial open watercourse with definite bed and banks which periodically or continuously contains moving water or which forms a connecting link between two (2) bodies of water.

CHANNEL MODIFICATION: Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, rip rapping, widening, deepening, straightening, relocating, lining, and significant removal of bottom or woody rooted vegetation. Channel modification does not include the clearing of debris or removal of trash.

COMMON PROMOTIONAL PLAN: A plan, undertaken by one (1) or more persons, to offer lots for sale or lease; where the land is offered by sale by a person or group of persons acting in concert and the land is contiguous or is known, designated or advertised as a common unit or by a common name or similar names, the land is presumed without regard to the number of lots covered by each individual offering, as being offered for sale or lease as part of a common promotional plan.

COMPENSATORY STORAGE--FLOODPLAIN: An artificially excavated, hydraulically equivalent volume of storage within the floodplain used to balance the loss of natural flood storage capacity when fill or structures are placed within the floodplain.

COMPENSATORY STORAGE--UPLAND DEPRESSIONAL: An artificial storage provided to balance the loss of natural flood storage capacity when fill or structures are placed within natural upland depressional storage areas.

CONDUIT: Any channel, pipe, sewer or culvert used for the conveyance or movement of water, whether open or closed.

CONSTRUCTION: Any activities including, but not limited to, the erection, installation, or significant modification of any dwelling, structure, building, sewer system, water contaminant source or point source. Construction commences with any preparatory activity including, but not limited to, trenching, excavation for any building or structure, but shall not include interior remodeling of residential, commercial, industrial, or institutional buildings or structures, which will not result in a substantial change in wastewater volume, nature or change in the nature or strength of the discharge therefrom.

CONTROL DEVICE: An element of a discharge structure which allows the gradual release of water under controlled conditions.

CONTROL ELEVATION: Design elevation of a discharge structure at which, or below which, water is contained behind the structure.

CULVERT: A closed conduit for the passage of surface drainage water under a roadway, railroad, canal or other impediment.

DETENTION: The delay of storm runoff prior to discharge into receiving waters.

DETENTION BASIN: A facility constructed or modified to restrict the discharge of stormwater to a prescribed maximum rate and to concurrently detain the excess waters that accumulate behind the outlet. A wet-bottom detention basin is a structure designed to retain a permanent pool of water after having provided its planned detention of runoff during a storm event. A dry-bottom detention basin is designed to be completely dewatered after having provided its planned detention of runoff during a storm event.

DETENTION BASIN, OFF-SITE: A feature or structure for temporarily storing excess stormwater originating at two (2) or more sites having devices for controlling the rate of release of the stored water and located downstream of all sites where the runoff originates.

DETENTION BASIN, ON-SITE: A feature or structure for temporarily storing excess stormwater, having devices for controlling the rate of release of the stored waters, and located within the sites where the runoff originates.

DETENTION STORAGE: The temporary detaining or storage of stormwater in storage basins, or rooftops, in streets, parking lots, school yards, parks, open space, or other areas under predetermined and controlled conditions, with the rate of drainage therefrom regulated by appropriately installed devices.

DETENTION TIME: The mean residence time of stormwater in a detention basin.

DETENTION VOLUME: The volume of water required to be detained to allow the post-construction peak runoff rate leaving a site or subdivision to be less than or equal to the pre-construction peak runoff rate.

DEVELOPER: Any person who, directly or indirectly, sells, leases or offers to sell or lease or advertises for sale or lease any lots in a subdivision, but shall not include any licensed broker or licensed salesman who is not a shareholder, director, officer or employee of a developer and who has no legal or equitable interest in the land.

DEVELOPMENT: Any manmade change to real estate including: construction, reconstruction or placement of a structure, building, or any addition to a structure or building; installation of a manufactured home or modular structure on a site, preparing a site for a Recreational Vehicle; construction of roads, bridges or similar projects; redevelopment of a site; filling, dredging, grading, clearing, excavating, paving, or other non-agriculture alterations of the ground surface; storage of materials or deposit of solid or liquid waste; any other activity that might increase the magnitude, frequency, deviation, direction or velocity of stormwater flows from a property.

DIFFERENTIAL RUNOFF: The difference in rate and volume of stormwater runoff from a parcel or project in its undeveloped natural condition and its developed condition.

DISCHARGE: The causing or permitting of one (1) or more water contaminants to enter Waters of the State.

DISCHARGE STRUCTURE: Structural control device, usually made of concrete, through which water is discharged from a project to the receiving water.

DRAINAGE AREA: The area from which water is carried off by a drainage system; a watershed or catchment area above a given point of study.

DRAINAGE PLAN: A plan, including engineering drawing and supporting calculations, which describes the existing stormwater drainage system and environmental features, as well as the drainage system and environmental features which will be in place after development of a property.

DRAINAGE FACILITY: An element in a drainage system which includes, but is not limited to, any of the following: conduits and appurtenant features, canals, channels, detention basins, ditches, streams, culverts, streets and pumping stations.

DRAINAGE SYSTEM: The surface or subsurface system which conveys water from or over the land including all watercourses, water bodies and wetlands (also referred to as the stormwater management system).

DRAINAGE SYSTEM, MAJOR: That part of a drainage system needed to store and convey flows beyond the capacity of the minor drainage system.

DRAINAGE SYSTEM, MINOR: That part of a drainage system designed for the convenience of the public. It consists of street gutters, storm sewers, small open channels and swales and is usually designed to handle the twenty five (25)-year runoff event or less.

EASEMENT: A grant by a property owner to the public, a corporation or a person of the use of land for a specific purpose.

EASEMENT, DRAINAGE: Authorization by a property owner allowing use of a designated portion of his/her property by others for drainage purposes.

ELEVATION: Height in feet above mean sea level according to a National Geodetic Vertical Datum (NGVD).

ELEVATION , HIGH-WATER: The elevation of floodwaters of a flood of specified frequency or occurrence at any given point.

EMERGENCY SPILLWAY: Saddle or low point facility located around the rim of a dammed impoundment such as a detention or retention basin for providing an efficient and safe means of conveying the maximum design flood discharge through the impoundment, without overtopping the dam.

EROSION: The wearing away of the land surface by the action of the wind, water, ice, gravity or any combination thereof.

EXCESS STORMWATER RUNOFF: The volume and rate of flow of stormwater discharged from a drainage area which is or will be in excess of that volume and rate which is specified in this Chapter.

FINAL STABILIZATION: All soil disturbing activities at the site have been completed and a uniform perennial vegetative cover with a density of seventy percent (70%) of the cover for unpaved areas not covered by permanent structures has been established or equivalent permanent stabilization measures (such as the use of riprap, gabions or geotextiles) have been employed.

FLOODPLAIN: The special flood hazard land adjoining a watercourse, the surface elevation of which is equal to or lower than the base flood elevation [the one hundred (100)-year flood / one percent (1%) chance per year], which is subject to periodic inundation during floods.

FLOODWAY: The channel and that part of the floodplain adjacent to a stream or watercourse which is needed to store and convey the anticipated existing and future one hundred (100)-year frequency flood discharge with no more than a one-tenth (0.1) foot increase in stage caused by any loss of flood conveyance or storage and no more than a ten percent (10%) increase in velocities.

FLOODWAY FRINGE: That part of the floodplain outside of the regulatory floodway.

FREEBOARD: The difference in elevation between the maximum design surface water elevation and the top of the channel, detention basin berm, top of stormwater control structure, or the finished floor of a structure.

FREQUENCY: An expression or measure of how often a hydrologic event of given size or magnitude should, on an average, be equaled or exceeded.

GRADE: The inclination or slope of a channel, canal, conduit, etc., or natural ground surface, usually expressed in terms of the percentage the vertical rise (or fall) bears to the corresponding horizontal distance.

HYDROGRAPH: A graph showing, for a given location on a stream or conduit, the flow rate with respect to time.

IMPERVIOUS SURFACE: A surface which has been compacted or covered with a layer of materials so that it is highly resistant to infiltration of water. The term includes most conventionally surfaced streets, roofs, sidewalks, parking lots and similar structures.

IMPROVEMENT: A building or structure on, or other addition or alteration of, land on a given site including, but not limited to, grading, street surfaces and/or pavements, sanitary and storm sewers, water mains, and utilities and all other appropriate improvements required to render land suitable for the use proposed.

LAND DISTURBANCE: Any construction, development, or improvement activity which changes the physical condition of a land form, vegetation, hydrology, or otherwise may cause erosion or sedimentation by any means including but not limited to: land clearing and grubbing, grading, excavation or filling, removing and replacing soil, contouring, cutting, topsoil stripping, blading, trenching, sidecutting, overburden and spoil disposal, ground levelling, land development, timber harvesting activities, paving, quarrying, mining, blasting, or the construction or alteration of earth dams or embankments; and the construction, realignment, or widening of streets, roadway or access routes, parking or loading/unloading areas, parking or loading dock facilities, railways, and similar features, facilities, or activities. It excludes agricultural cultivation and domestic gardening, the digging of holes for the erection of posts or poles, the planting of trees or similar landscaping activities not listed above, and the general maintenance of existing improvements, infrastructure, or facilities.

LOSING STREAM: A stream which distributes thirty percent (30%) or more of its flow during low flow conditions through natural processes, such as through permeable geologic materials into a bedrock aquifer within two (2) miles' flow distance downstream of an existing or proposed discharge. Flow measurements to determine percentage of water loss must be corrected to approximate the seven (7) day Q10 stream flow. If a streambed or drainage way has an intermittent flow or a flow insufficient to measure in accordance with this rule, it may be determined to be a losing stream on the basis of channel development, valley configuration, vegetation development, dye tracing studies, bedrock characteristics, geographical data and other geological factors. Losing streams are listed in Table J of 10 CSR 20-7.031; additional streams may be determined to be losing by the Division of Geology and Land Survey.

NATURAL DRAINAGE: Water flow by gravity along the true surface topography of the earth or in channels prior to development.

NATURAL SAFE STORMWATER DRAINAGE CAPACITY: The quantity of stormwater runoff that can be transported by means of a channel, passage, conduit, tube, duct, or combination thereof in such a manner that the elevation of the water does not rise significantly above the level of the adjacent soil surface and cause damage or encroachment upon public or private property.

OVERFLOW ELEVATION: Design elevation of a discharge structure at which point, or above which point, water leaks out, or bleeds out, through a control device down to the control elevation.

PEAK FLOW: The maximum rate of flow of water at a given point in a channel or conduit resulting from a predetermined storm or flood.

POINT SOURCE: Any discernible, confined and discrete conveyance including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, separate storm sewer or vessel or other floating craft from which pollutants are, or may be, discharged.

POLLUTANT: Dredged spoil, solid waste, incinerator residue, sewage, garbage, sewer sludge, munitions, chemical waste, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, filter backwash or industrial, municipal or agricultural waste discharged into water.

POST-DEVELOPMENT CONDITIONS: Those conditions which are expected to exist, or do exist, after alteration, resulting from human activity, of the natural topography, vegetation and rate, volume or direction of surface or subsurface flow.

PRE-DEVELOPMENT CONDITIONS: Those conditions which existed at the time this Chapter becomes effective in terms of topography, vegetation and rate, volume or direction of surface or subsurface flow, as indicated by the best available historical date.

PRIMARY DRAINAGE (WATER MANAGEMENT) SYSTEMS: Includes major waterways and appurtenant structures or systems whose total tributary area from origin to outfall exceeds or equals fifty (50) acres.

RATIONAL METHOD: An empirical formula for calculating peak rates of runoff resulting from rainfall. Expressed mathematically, the formula is:

Q = CIA

Q = Peak flow in cubic feet per second (c.f.s.).

C = Runoff coefficient, or fraction of runoff to rainfall, dependent on type of surface cover and topography.

I = Rainfall intensity, in inches per hour, for a specific storm and duration.

A = Watershed area, in acres.

RECEIVING BODIES OF WATER: Any water body or stream into which surface waters flow.

REGISTERED DESIGN PROFESSIONAL: A Professional Engineer Registered with the Missouri Board for Architects, Professional Engineers, Professional Land Surveyors and Landscape Architects.

RESIDENCE, SINGLE-FAMILY: Any structure or dwelling which is intended for or is used by a single household complying with the provisions of this Title and Title V.

SEDIMENTATION: The process by which suspended solids from erosion are transported and deposited.

STORMWATER RUNOFF: The waters derived from rain falling or snow melting within a tributary drainage basin flowing over the surface of the ground or collected in a stormwater drainage system, storm sewer or watercourse.

SUBDIVISION: As defined in Chapter 410 of this Code.

TIME OF CONCENTRATION: The elapsed time for stormwater to flow from the most distant point in a drainage basin to the outlet or point in question.

WATER CONTAMINANT: Any particulate matter or solid matter or liquid or any gas or vapor or any combination thereof or any temperature change which is in or enters any Waters of the State either directly or indirectly by surface runoff, by sewer, by subsurface seepage or otherwise, which causes or would cause pollution upon entering Waters of the State or which violates or exceeds any of the standards, regulations or limitations under the Missouri Clean Water Law or the Federal Clean Water Act or is included in the definition of pollutant in the Federal act.

WATERCOURSE: Any stream, creek, brook, branch, natural or artificial depression, slough, gulch, reservoir, lake, pond or natural or manmade drainageway in or into which stormwater runoff and floodwaters flow either regularly or intermittently.

WATERS OF THE STATE: All rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the State which are not entirely confined and located completely upon lands owned, leased or otherwise controlled by a single person or by two (2) or more persons jointly or as tenants in common. These waters also include waters of the United States lying within or adjacent to the State.

SECTION 420.020: PURPOSE

1. This Chapter provides minimum standards, controls and criteria for stormwater management. The principal design consideration in this Chapter is to minimize the harmful physical and economic effects of erosion, sedimentation and flooding from stormwater runoff. This is to be accomplished through the requirement of special measures to mitigate erosion both during and after construction, the detention and controlled discharge of the differential runoff from the development, and a well designed stormwater conveyance system.

2. The developer shall provide stormwater calculations that indicate that the stormwater flows generated from the developed conditions does not exceed the stormwater flows generated from the undeveloped condition for each discharge point of the property.

SECTION 420.030: PERMIT

A development permit shall be required for any of the following:

1. *Land disturbance.* Any land disturbance as defined by this Title.

2. *Stormwater point sources.* The operation, use or maintenance of existing stormwater point sources or disturbing land which would result in a stormwater point source.

3. *Exemptions.* The following is a list of activities that may be exempt from permit requirements, if otherwise exempt from obtaining a State Land Disturbance Permit.

a. Certain linear strip or ribbon construction or maintenance operations such as regrading existing roadways or cleaning existing road ditches as long as best management practices are utilized.

b. Trenches less than two (2) feet in width, along with any emergency repairs or replacement to any existing facilities as long as best management practices are employed.

c. Farmlands, domestic gardens or lands used for sludge management where domestic sludge is beneficially used and which are not physically located in the confines of a producing facility.

d. Mowing, brush hog clearing, tree cutting or similar activities which do not grade, dig, excavate or otherwise remove or kill the surface growth and root system of the ground cover.

e. Agricultural stormwater discharges and irrigation return flows. For purposes of this permit, land disturbance activities from Class I Concentrated Animal Feeding Operations (CAFO) are not considered an agricultural activity and therefore are not exempted.

4. *Other permit requirements.* Activities exempt from permits shall not cause any violations of water quality standards or other provisions of this Title. Any activity which is exempt from a development permit shall conform to the requirements of this Title for Best Management Practices.

SECTION 420.040: APPLICATION AND PROCESS

The owner or an authorized agent of the owner shall submit an application and obtain a permit prior to commencement of any work requiring a permit.

1. *Applications.* A complete application shall consist of the following:

a. *Application form.* The application form shall contain information including, but not limited to, the following:

(1) The name, address, and telephone number of the applicant and the owner if different from the applicant.

(2) Name, address, and telephone number of the registered design professional.

(3) The location of the property.

(4) A description of the work to be performed.

(5) Signature of the property owner or owner's authorized representative.

b. At least three (3) copies of a Storm Water Pollution Prevention Plan (SWPPP) complying with this Chapter.

c. At least three (3) copies of a Stormwater Management Plan complying with this Chapter and one (1) copy of supporting calculations.

d. At least three (3) copies of Construction Plans complying with this Chapter.

e. All required fees.

2. *Process.* The Administrative Officer shall review all applications to determine if they are complete.

a. Complete application shall be submitted to the Administrative Officer or other persons with special technical expertise as needed.

b. The application shall be approved, denied or conditionally approved within a reasonable time.

c. All reasons for denial or conditions of approval shall be clearly stated with the denied application or permit as applicable.

SECTION 420.050: APPLICABILITY

Stormwater management plans shall be submitted to the Administrative Officer or his/her designated representative by the owner, or owner's representative, of any proposed residential, commercial, industrial, or institutional development unless the Administrative Officer an alternative in writing for one (1) of the following reasons:

1. *Off-site facility, two (2) or more developments.* If two (2) or more developments, including that of the applicant, have provided for a common system meeting the requirements and intent of this Chapter.

2. *Off-site facility by City.* If an off-site stormwater management system has been either constructed or programmed, or identified for construction by the City or if, as a result of the topographical conditions present at the development site, there exists in the opinion of the Administrative Officer a suitable natural retention area and the applicant has agreed to either contribute to a stormwater management fund or participate in the construction of

an off-site system as part of a City project. The applicant must agree in writing to contribute to the City fund in accordance with Subsection 4 of this Section.

3. *Other management techniques.* Management techniques other than detention facilities may be utilized by the development provided the techniques proposed meet the intent of this Chapter and provide a benefit to the watershed that equals or exceeds the benefit that a detention facility would provide.

4. *Stormwater Management Fund.* A Stormwater Management Fund is hereby created and established by City. Said fund shall be used exclusively by City for programs and projects designed to help control the effects of stormwater within the City limits. Any contribution made by an applicant in lieu of constructing an on-site facility shall be deposited into said fund with any interest income on such funds to remain a part of such fund. In order to participate in such fund, the following shall apply:

a. *Eligibility.* It is determined that no adverse effects will result to adjacent property, and a contribution is made to the Stormwater Management Improvements Fund. Residential development of four (4) acres or less and commercial/industrial developments of two (2) acres or less will be considered as prime candidates for a contribution in lieu of on-site detention. It is the City's desire that regional detention storage be utilized to accommodate these smaller developments.

b. *Contribution.* The contribution shall be an amount equal to a cost estimate prepared by a professional engineer for site specific improvements necessary to provide detention as provided herein. All cost estimates for site specific detention facilities shall be subject to review and approval by the Administrative Officer. The cost estimate must include the value of the land which otherwise would have been used as part of the system with the value of the subject land determined by an independent appraiser paid for by the developer. Alternatively, the procedure detailed in Section 420.140 can be used to determine contribution.

SECTION 420.060: STORMWATER POLLUTION PREVENTION PLAN

A Stormwater Pollution Prevention Plan (SWPPP) as required for the DNR Land Disturbance permit shall be submitted as a part of any application for a development permit for a land disturbance activity. A SWPPP shall be prepared by a registered design professional.

1. *General.* Drawn and written descriptive materials shall be provided which contain information including, but not limited to, the following:

a. A site and physical condition description.

b. How the drainage area will be protected from erosion and discharge of sediment.

c. Description of Best Management Practices (BMP) that will be used.

d. Locations at the site where BMP will be installed.

e. A description of the types of temporary and permanent structural and non-structural BMP that will be used.

f. Location of the sedimentation basin for each drainage area with ten (10) or more acres disturbed at one time, with sizing and overflow calculations as outlined in the DNR NPDES Permit.

g. Additional site management BMP to be used, such as solid and hazardous waste management, provision of portable toilets, proper storage of construction materials, installation of containment berms and use of drip pans at petroleum product and liquid storage tanks and containers.

2. *Drawings.* The drawn portion of the overall plan shall also conform to the following requirements:

a. Shall be of sufficient clarity to clearly indicate proposed buildings, structures or uses or other features shown on the plan.

b. Shall be drawn to scale not greater than one (1) inch equals twenty (20) feet nor less than one (1) inch equals two hundred (200) feet.

c. Shall identify property by lot lines and location, including dimensions, angles and size, correlated with the legal description of said property.

d. Shall show the scale, north point, boundary dimensions, natural features such as woods, streams, rivers, lakes, drains, topography [contour interval shall be two (2) foot] and similar features.

e. Shall show existing manmade features such as buildings, structures, easements, high tension towers, pipelines, existing utilities such as water and sewer lines, etc., excavations, bridges, culverts and drains and shall identify adjacent properties within one hundred (100) yards and their existing uses.

f. Shall show the location, proposed finished floor and grade line elevations, size of proposed main and accessory buildings, their relation one to another and to any existing structures to remain on the site and the height of all buildings and structures, as well as building elevations and materials proposed for the structures under consideration.

g. Shall show the existing and proposed public and private streets, driveways, sidewalks, and other vehicular and pedestrian circulation features within and adjacent to the site; also the location, size and number of parking spaces in the off-street and on-street parking areas and identification of service lands, service parking, and loading zones required or provided in conformance with the requirements set forth in this Title.

h. Shall show the location and size of all existing utilities serving the property as well as the location and size of all proposed utilities to serve the property.

i. Shall show existing and proposed topography of the subject property and adjacent properties within fifty (50) feet of the subject property and gutter line or edge of pavement of existing public or private streets, access roadways, or drives adjacent of the subject property. Any proposed alterations to the topography and other natural features shall be indicated.

j. Shall show the existing and post-developed site information.

k. Shall show the location of vegetative cover and soil types and characteristics representative of the design conditions, where percolation or exfiltration systems are proposed.

l. Shall show the location of streams, their normal channels and the extent of the floodplains at the established high water elevations and the limits of the floodway.

m. Shall show the location of lakes, ponds, swamps and detention basins indicating their normal shorelines, floodplains, floodways and lines of inflow and outflow.

n. Shall show the location of farm drains, inlets and outfalls, storm, and sanitary sewers and outfalls, septic tank systems and outlets, if any, and seeps, springs and flowing and other wells.

o. Shall show the location and description of nearby existing off-site water management facilities such as wells, lakes, drainageways and other similar features which are potentially directly affected by the proposed construction or development.

p. Shall show all existing drainage facilities which are to be maintained, altered or enlarged as part of the stormwater management system; provide information as to their size, slopes, depths, outfalls, receiving waters, elevations, cross sections, profiles, construction materials and other design details as applicable.

q. Shall show the location of all new drainage facilities, including detention basins, to be constructed and provide design details on each as applicable.

r. Shall show the location and extent of right-of-way and easements for the stormwater management system, including all areas to be dedicated for water management purposes.

s. Shall identify and describe any special or required maintenance procedures for the project to continue to function as designed.

t. Shall include any other information required by the Administrative Officer to determine compliance with this Title.

u. Shall be signed and sealed by a registered design professional.

3. *Construction details.* Detailed construction drawings clearly indicating the proposed locations, materials and specifications of any structural BMP shall be submitted.

4. *Additional requirements.* Additional requirements pertaining to the SWPPP shall be as follows.

a. After a permit is approved, a copy of the SWPPP shall be kept on site during the entire term of the land disturbance activity and shall be made available to all local, State and Federal authorities having jurisdiction upon request.

b. The SWPPP shall be amended or updated as appropriate during the term of the land disturbance activity.

c. Amendments or updates shall be also be submitted to the Administrative Officer for approval and are to be included in the permit record.

SECTION 420.070: STORMWATER MANAGEMENT PLAN

A stormwater management plan shall be designed to safely manage stormwater runoff resulting from the critical duration storm event. The plan will identify infrastructure improvements designed to reduce stormwater discharge rates to pre-development levels through detention of excess runoff. Stormwater management plans shall be prepared by a Professional Engineer, registered in the State of Missouri.

1. *Grading/detention plan.* The minimum requirement for a grading/detention plan are the same as those listed for the SWPPP drawings defined in Section 420.060, paragraph 2.

2. *Report.* A stormwater management report shall be provided along with the grading and detention plan. The minimum requirements for a stormwater management report complying with this Chapter shall be as follows.

a. Shall include the design calculations.

(1) Design storms used.

(2) Calculated hydrographs of outflow of design storm's runoff from the project site existing and developed conditions.

(3) For all detention basins, a plot or tabulation of storage volumes with corresponding water surface elevations and of the basin outflow rates for those water surface elevations.

b. Shall include the acreages and percentage of property proposed as:

(1) Impervious surfaces.

(2) Pervious surfaces (green areas).

(3) Lakes, canals, detention areas, etc.

(4) Total acreage of project.

(5) Other pertinent information.

c. Shall include runoff routing calculation showing discharge, elevations and volumes retained and/or detained during applicable storm event.

d. Shall include calculations required for determination of minimum building floor and road elevations.

e. Shall include the name of the entity responsible for operation and maintenance of the system.

f. The requirements for specific plan elements cited above may be waived at the discresion of the Administrative Officer. No plan element waiver on the part of the Administrative Officer shall have the effect of a variance or relieve any person from complying with all other applicable provisions of this Title.

3. *Construction details.* Detailed construction drawings clearly indicating the proposed locations, materials and specifications of any stormwater improvements shall be submitted. The design of all such improvements details shall comply with the subdivision regulations in addition to this Chapter.

4. *Other construction documents.* The Administrative Officer may require other drawn or written descriptive documentation or materials to determine compliance with the requirements of this Chapter.

5. *Waivers.* The Administrative Officer may waive specific submittal information from time to time as deemed appropriate.

a. Sufficient documentation shall be provided to the Administrative Officer to determine whether a waiver is appropriate.

b. A statement from a registered design professional certifying that the differential runoff shall result in no adverse impact to the area or adjoining properties.

c. The Administrative Officer may require a review and written supportive recommendation from a consulting engineer or other persons having specialized technical knowledge prior to waiving such information whenever necessary.

d. No waiver on the part of the Administrative Officer shall have the effect of a variance or relieve any person from complying with all other applicable provisions of this Title.

6. *Plan adherence.* The owner or authorized agent applicant shall be required to adhere strictly to the stormwater management plan as approved. Any changes or amendments to the plan must be approved by the Administrative Officer in accordance with the procedures set forth in this Chapter.

7. *Final Inspection & Approval by Design Professional.* A final inspection by the design professional shall be required on each project to verify that all stormwater pipes, structures, basins, etc. have been built according to the approved plan and specifications. A written approval by the design professional shall be provided to the Administrative Officer (see Section 420.170)

SECTION 420.080: PROJECT CLASSIFICATION AND FEES

1. All applications shall be accompanied by a fee of two hundred dollars ($200) plus ten dollars ($10.00) per acre or fraction thereof for every acre over two (2) acres. The Administrative Officer shall be permitted to establish a refund policy. No fee shall be refunded for failure to act in favor of the applicant.

2. The effective acreage for a project is not limited to a fractional part of the total concept, rather if a project is developed in phases or small plots, the total acreage of the conceptual project will be considered.

3. The review fee shall be collected at the time the stormwater management plan application is submitted by the applicant to the Administrative Officer and will reflect the cost of the administration and management of the review process. These fees may be adjusted from time to time by the City Council to reflect actual costs of administration and review.

SECTION 420.090: GENERAL DESIGN REQUIREMENTS FOR STORMWATER MANAGEMENT PLANS

1. A stormwater management system shall be provided for protecting lots, roads, streets and buildings in the project area from the potential adverse impacts of stormwater runoff. Streets, blocks, depths of lots, parks and other public grounds, and ultimate land usage shall be determined, located and laid out in such a manner as to reduce the velocity

of overland flow and allow the maximum opportunity for infiltration of stormwaters into the ground and to preserve and utilize natural streams, channels and detention basins and, wherever possible, to include streams and floodplains within parks or other public grounds.

2. The maximum allowable release rate of stormwater after development at each point of discharge shall not exceed the pre-development rate for that location (see Section 420.100). The total drainage area must be used in calculating the allowable release rate.

3. The increased stormwater runoff resulting from the proposed development shall be detained on-site by appropriate detention basins; by storage on flat roofs, parking lots or streets; or by other acceptable techniques. Control devices shall limit the discharge from storage to a rate no greater than that prescribed by this Chapter. Downstream property, watercourses, channels or conduits shall not receive stormwater runoff from proposed development at a higher peak flow rate than that which existed prior to the development.

4. Generally acceptable locations of the stormwater runoff channels in the design of the project area may include the following:

a. In a depressed median of a double roadway, street or parkway, provided the median is wide enough to permit required roadway shoulders.

b. In a depressed area long roadway, street or parkway, provided the area is wide enough to permit side slopes as required in other Sections of this Chapter and the right of way is widened to encompass the area of the depression.

c. Alternative systems such as curb and gutter and storm sewers that discharge into an appropriate detention basin may be incorporated into the stormwater management plan.

d. The smaller, uppermost reaches of drainage channels and swales forming the natural drainage system near a watershed divided may be relocated or eliminated and incorporated into the planned system of storm sewers and open channels designed consistent with the requirements of this Chapter.

e. Stormwater runoff channels will not be allowed on private lots. However, stormwater piping systems may be centered on the rear lot lines in a block or entirely within the rear yards of a single row of lots or parcels, provided that in either case the lots are deep enough to permit the drainage easement and a building site.

5. Locations where drainage facilities serve multiple properties, are to be located and maintained shall have a continuous utility-drainage easement provided. The utility-drainage easement shall be at least twenty (20) feet wide. Within the area so designed for the passage or storage of waters, no structure may be erected, no fences, shrubbery or trees planted, or changes made to the prescribed grades and contours of the specified stormwater runoff channels.

6. All storm sewer outfalls shall be so designed, that they will continue to drain the areas they are designed to serve unless the provision is made for sewer backups into planned storage locations.

7. All sanitary sewer manholes constructed in a floodplain, or in an area designed for the storage or passage of floodwater or stormwater shall be provided with either a watertight bolted manhole cover, a watertight concealed pick-hole cover, or be constructed with a rim elevation at or above the high-water elevation of the 100-year flood or the high-water elevation of the design storm, whichever is applicable to the specific area.

8. Projects that are to be developed in phases will require the submission of a master plan of the applicant's contiguous land holdings. Applications for individual project phases may be considered only when the phases are totally independent of, or make sufficient provisions for, adjacent lands.

9. The plan shall include provisions for any off-site development activity related to the project. All land within the City on which development activity related to a project is proposed shall be identified and included in the plan. All owners of property where development activity related to the project is proposed shall be identified and included in the application.

SECTION 420.100: STORMWATER CONTROL DESIGN CRITERIA

1. Rainfall Frequency. All conduit facilities shall be designed to carry a twenty five (25)-year storm while maintaining a minimum of one (1) foot of freeboard between the hydraulic grade line and the gutter or other surcharge point. All channels shall be designed to carry a twenty five (25)-year storm while maintaining a minimum of one (1) foot of freeboard. All stormwater detention facilities shall be designed as required in Section 420.100. The Administrative Officer may require a different design storm if there are downstream flooding problems or in the opinion of the Administrative Officer, a public health or safety issue would exist otherwise. All systems shall be designed to allow for a one hundred (100)-year storm to pass through the development without destroying or damaging property or inundating dwellings. Sufficient design information shall be provided by the developer to verify that the requirements of this section have been met.

2. *Calculation of Runoff.* The method of calculating and routing stormwater runoff shall be a generally accepted stormwater management practice. The drainage area shall consider all on- and off-site lands contributing to the proposed development's drainage system. Capacity for such facilities shall be based on the maximum potential water shed development permitted by current zoning. In the case of most development, hydrograph routing will be required. Hydrograph routing requires that time be taken into account in the hydrologic model. Hydrograph Modeling using HEC-I (or HEC-HMS) and the Kinematic Wave Method is the preferred method for most complex urban runoff

conditions. Other allowable methods include Pond Pack and EPA-SWMM. Additional methods may be approved by the Administrative Officer. For instances where hydrograph routing is not required and land use in the watershed is homogeneous (i.e. calculating storm inlet capacity and pipe sizing), the rational method for calculating stormwater runoff may be used.

3. *Runoff Coefficient.* The runoff coefficient "C" is the variable in the Rational Formula least susceptible to precise determination and the one, which requires the greatest exercise of engineering judgment because of the many area characteristics, which affect the coefficient. Among the factors to be considered in influencing the runoff coefficients are the following: present and future zoning; terrain; local ponding or depressions; the amount of pavement; roofs, turf, and other areas having different degrees of imperviousness. The selection of coefficient should take into consideration the probable ultimate development of presently underdeveloped areas. Suggested values of runoff coefficients are included in "Chapter 420, Table A" at the end of this Chapter.

4. *Runoff Curve Number Determination.* The determination of the Curve Number (CN) value for a watershed is a function of soil characteristics, hydrologic condition and cover or land use. CN values for undeveloped and developed areas are provided in "Chapter 420, Table B" and "Chapter 420, Table C" respectively at the end of this Chapter. For watershed with multiple soil types or land uses, an area-weighted CN should be calculated. When significant differences in land use or natural control points exist, the watershed should be broken into smaller drainage areas for modeling purposes.

5. *Rainfall Intensity.* Maximum intensity of rainfall of a given expectancy is greater for a short period of time than for longer periods. Therefore, it is assumed that the maximum runoff will occur as soon as all parts of the drainage area under consideration are contributing. The length of time from the beginning of rainfall until runoff from the hydraulically most remote point in the drainage area reaches the point under consideration is called the time of concentration. This may include overland flow time and channel or gutter flow time. Once the time of concentration is known, the design intensity rainfall may be determined from the rainfall intensity curves developed from the Weather Bureau data. For Rational Method analysis, rainfall intensity in inches per hour must be determined from an event with a duration equivalent to the time of concentration. "Chapter 420, Tables D" and "Chapter 420, Tables E" at the end of this Chapter provide depth and intensity values for various rainfall durations and frequencies in the Farmington area.

6. *Temporal Rainfall Distribution.* When using the Kinematic Wave Method or SCS Method for runoff computations, the NRCS Type II and Huff rainfall distribution methods shall be used for the temporal distribution. Different families of Huff distribution curves are applicable for different drainage areas. Each family of curves consists of four storms (first-quartile, second-quartile, third-quartile, and fourth quartile) that correspond to the quartile within the storm event when the bulk of the rainfall occurs. As part of the stormwater management plan, a critical duration analysis shall be

performed for all drainage facilities. The analysis shall determine the storm duration causing the maximum peak flow or maximum peak stage for a storm event of a given magnitude. Storms with durations of six (6) hours or less, six (6) to twelve (12) hours, twelve (12) to twenty four (24) hours, and greater than twenty four (24) hours tend to be associated with the first (1st)-, second (2nd)-, third (3rd)-, and fourth (4th)-quartile storms, respectively (Huff and Angel 1992).

7. *Open Channels.* Open channels consist of swales, ditches or depressions, both natural and manmade, that convey water. Channels shall be protected from scour and erosion by providing a channel lining adequate to sustain the velocity of the design storm. If velocities in channels exceed three and one-half (3.5) feet per second during the design storms, then erosion control other than vegetation shall be provided in channel construction. Channels shall have the hydraulic capacity to carry the design storm runoff within the channel bed and banks with one (1) foot of freeboard. Out of bank flow may be permitted on land slopes parallel to the channel where it can be shown that no erosion damage or property damage will result. Channels that function as part of the major drainage system shall be evaluated for the one hundred (100)-year design storm to determine the impacts of runoff on adjacent property. The channel's hydraulic capacity shall be increased where adjustments to channel geometry provide significant protection to adjacent properties during the one hundred (100)-year event.

8. *Closed Conduit Storm Sewers.* Pipe sizes for closed conduit flow shall be based on the design storm runoff and minimum allowable velocities. The system shall provide for the clearing of sediment and other deposits by maintaining a minimum velocity of two (2) feet per second during the 2 (two)-year storm. Pipe sizes in a storm system may not be reduced smaller than the upstream pipe section even though the smaller pipe may have adequate flow capacity. The smallest pipe size allowed in storm systems is eighteen (18) inches in diameter. Manning's Equation is the most common method of estimating the capacity and flow resistance in closed conduits, although the Kutter, Hazen-Williams, and Darcy Weisbach formulas are also acceptable.

9. *Drainage and Storm Sewer Systems.* All drainage and storm sewer systems shall be designed and constructed in accordance with standards and specifications of the City. All facilities shall be designed to carry a twenty five (25)-year storm while maintaining a minimum of one (1) foot of freeboard between the hydraulic grade line and the gutter. The developer's engineer shall verify that the one hundred (100)-year storm may be contained in the road right-of-way and/or in a dedicated drainage easement. The engineer shall provide a stormwater report to document meeting these requirements. Generally, pressure flow (when the hydraulic grade line is above the crown of the pipe) occurs where the capacity of a pipe run is exceeded by the design flow or the outfall point controls the discharge rate. Storm sewer systems may be designed for pressure flow. The decision to design a pressure flow system may be based on aesthetics, the need to submerge outfalls, economics, limitations associated with reduced pipe sizes, or grade constraints at the system discharge point.

10. *Inlets.* Calculations shall be submitted to demonstrate the capacity of all inlets, such calculations must consider the cross-slope of the pavement, depth of water at the curb face, size of opening, and the longitudinal grade of street. Street inlets and inlets in parking areas shall reduce the spread and depth of flow to acceptable levels during the twenty five (25)-year design storm. Inlets located on continuous grades may be designed to permit a portion of flow to bypass the structure; however, calculations for the downstream structure must consider the bypass. Street flow shall be limited by pavement encroachment and depth of flow are included in "Chapter 420, Table F" at the end of this Chapter.

10. *Plans And Calculations.* Plans And Calculations shall be in accordance with he following:

a. A drainage map shall be developed from a base reproduction of the site plan or grading plan. The existing and proposed contours shall be shown, of suitable scale and one (1) foot contour interval for the subject property, extending off-site one hundred (100) feet or less as determined by the City for proper design of the proposed improvements. Contour intervals other than the above may be used if approved by the Administrative Officer.

b. The location of existing and proposed property lines, streets, sinkholes, railroads, areas within the tract subject to inundation by stormwater and other significant natural features, such as wooded areas and rock formations, etc., shall be included on the map. All existing and proposed stormwater facilities, such as inlets, manholes, pipes, culverts, bridges, channels, etc., and all existing and proposed improvements required for property design review, such as pavement, buildings, etc., shall be included on the map.

c. The location of streams and other floodwater runoff channels, calculations supporting the method and capacity needed for the safe and temporary storage of increased runoff resulting from the proposed development.

d. Basic information regarding the receiving watercourse into which the proposed stormwater system will discharge.

e. The runoff details shall be required, showing individual flows for each existing and proposed structure and cumulative flows in pipes and gutters, including flow rate (Q) and area. The map shall show all bodies of water, such as ponds or lakes (including surface area and elevation), wetlands, and all waterways (including their names or the names of creeks or rivers they flow into).

f. Lots shall be laid out so as to provide positive drainage away from all buildings. Individual lot drainage shall be shown and coordinated with the drainage pattern for the area and designed so that runoff from one (1) lot will not adversely affect an adjoining lot. All necessary grading to direct stormwater runoff shall be located within a drainage easement. A layout of the proposed stormwater management

system including the location and size of all drainage structures, storm sewers, channels, channel sections, detention basins, and analysis regarding the effect said improvements will have upon the receiving channel and its high water elevation.

g. The Administrative Officer may require alternative designs or features to reduce the cost of long-term maintenance.

h. In critical areas, the Administrative Officer may require additional hydraulic capacity above the minimum set forth above, up to the one hundred (100)-year frequency design.

i. All computations, plans, and specifications related to the implementation of this Chapter must be prepared and sealed by a professional engineer registered in the State of Missouri.

SECTION 420.110: DETENTION STORAGE CAPACITY

1. The peak rates (pre-developed and post-developed) of runoff shall be determined for the 2 (two)-, 10 (ten)-, 25 (twenty)- and 100 (one hundred)-year rainfall frequencies. The minimum storm duration shall be twenty (20) minutes.

2. Stormwater shall be detained on site or on adjacent property under agreement and metered out at the pre-developed rate for the above frequencies and critical duration to prevent possible flooding and erosion downstream.

3. In the event the natural downstream channel or storm sewer system is inadequate to accommodate the release rate provided above, then the allowable release rate shall be reduced to that rate permitted by the capacity of the downstream channel or storm sewer system to the fullest extent practical.

4. Detention basin volume will be based on hydrograph method routing of all post-developed runoff through the detention facility while satisfying the appropriate allowable release rate.

5. Credit pursuant to this Section will be given for existing impervious area.

SECTION 420.120: STORMWATER MANAGEMENT SYSTEM DESIGN REQUIREMENTS

1. *Method Of Evaluation.* Differential runoff evaluation consists of the determination of rates of runoff before and after development, the determination of required volume of detention and verification of adequacy of discharge and control structures.

2. *Control Structures.* Detention facilities shall be provided with obvious and effective control structures. Plan view and sections of the structure with adequate detail shall be included in plans.

a. The sizing of the control structure shall be by the appropriate weir and orifice formulas.

b. The overflow opening or spillway shall be designed to accept the total peak runoff of the improved tributary area.

3. *Detention Design Criteria.* Detention in the overall system, including swales, lakes, canals, greenways, etc., shall be provided as follows:

a. *General*

(1) *Storage volumes.* The storage volume required shall be determined as outlined in Section 420.100 while maintaining a minimum of one (1) foot of free-board.

(2) *Outlet control structures.* Outlet control structures shall be designed to operate simply and automatically. They will limit discharges into existing or planned downstream channels or conduits so as not to exceed predetermined maximum authorized peak flow rates.

(3) *Emergency spillway.* Emergency overflow facilities must be provided in all instances so that stored waters will not exceed the safe capacity of the basin. At a minimum, the emergency spillway must be able to pass the one hundred (100)-year storm without overtopping.

(4) *Appearance.* Designs should result in aesthetically pleasing configurations which will enhance public acceptability.

b. *Dry-Detention Facilities.*

(1) Perimeter maintenance, access, and operation easements of fifteen (15) feet minimum width beyond the top of the slope shall be provided in accordance with Section 420.160 of this Chapter.

(2) Side slopes of the facility shall not be steeper than 3:1 (three horizontal to one vertical). The bottom of the facility shall not be flatter than one and one-half percent (1.5%) to facilitate complete drainage. If retaining walls are utilized, vehicular access into the bottom of the basin must be provided for maintenance.

(3) The low-flow channel invert through dry detention facilities on other than permanently flowing streams shall be concrete and have a minimum slope of one-half percent (0.5%). Other materials for constructing the low-flow channel invert may be considered by the Administrative Officer.

(4) Provisions must be incorporated to facilitate complete interior drainage to dry-bottom basins, to include the provision of natural grades to outlet structures,

longitudinal and transverse grades to perimeter drainage facilities, or the installation of sub-surface drains.

(5) Multi-purpose features may be designed to serve secondary purposes for recreation, open space or other types of use which will not be adversely affected by occasional or intermittent flooding.

(6) The entire reservoir area shall be seeded, fertilized and mulched, sodded or paved.

c. *Wet-Detention Facilities.*

(1) Perimeter maintenance, access, and operation easements of fifteen (15) feet minimum width beyond the top of the slope shall be provided in accordance with Section 420.160 of this Chapter.

(2) Control elevations should be no higher than two and one-half (2½) feet below the minimum road centerline elevation within two hundred (200) feet of the detention pond to protect the road subgrade when structures are constructed near roads.

(3) Side slopes shall not be steeper than 3:1 (horizontal to vertical) out to a depth of two (2) feet below the control elevation, then as steep as soils stability will allow.

(4) If fish are to be used to help keep the basin clean, at least one-quarter (¼) of an area of the permanent pool must be a minimum depth of ten (10) feet.

(5) For emergency purposes, cleaning or shoreline maintenance, facilities shall be provided or plans prepared for the use of auxiliary equipment to permit emptying and drainage.

(6) The limits of maximum ponding elevations are to be no closer than twenty-five (25) feet horizontally from any building and no less than two (2) feet below the lowest sill elevation of any building.

d. *Impervious Areas.* Paved parking lots may be designed to provide detention storage of stormwaters on all or a portion of their surfaces. Outlets will be designed so as to slowly empty the stored waters, and depths of storage must be limited to a maximum depth of six (6) inches so as to prevent damage to parked vehicles. Ponding should be regulated to those positions of the parking lots farthest from the area served.

e. *Rooftop Storage.* Detention storage requirements may be met in total or in part by detention on flat roofs. Details of such designs to be included in the stormwater management plan application shall include the depth and volume of storage, details of outlet devices and down-drains, elevations of overflow scuppers, design loadings for the roof-structure and emergency overflow provisions.

f. *Underground Storage.* All or a portion of the detention storage may also be provided for in underground facilities, as long as all applicable requirements of this Chapter are met. Details of such designs are to include type of facility, depth and volume of storage, details of inlet and outlet devices and locations, emergency overflow and maintenance provisions, and measures to be used for surface water and ground water pollution control.

g. *Design Alternatives.* The above listing of design criteria is not intended to preclude the use of other known state-of-the-art methods and available best management practices and should not be construed as a mechanism to discourage innovative design concepts.

4. *Development Adjoining A Floodplain.* Where a development adjoins or encompasses a portion of a FEMA designated floodplain, the following shall apply:

a. The applicant shall comply with the requirements contained in Chapter 415 of this Title and show the floodplain and floodway on the stormwater management plan.

b. The applicant shall include in the stormwater management plan all other plans, plats, specifications, etc., required by Federal, State, County and/or municipal laws or regulations detailing such provisions or restrictions as are necessary to comply with the following:

(1) All applicable Zoning and Subdivision requirements.

(2) All applicable Building Code requirements.

(3) All requirements of other Federal, State or local agencies exercising jurisdiction over the area (i.e. FEMA, Corps of Engineers, MoDNR, etc.).

5. *Channel Flow.* The applicant shall not alter any channel in such a way that would prohibit any section of the channel from conveying, in its post-development state, the same amount of flow that is conveyed in its pre-development state.

6. *Modifications Of Channel.* The applicant shall furnish, for the Administrative Officer's review and approval, the following information pertaining to proposed channel modifications:

a. Typical cross sections of the existing and proposed channel.

b. Plan view of the channel showing the location of existing constrictions, obstructions and other non-typical areas.

c. Hydrographs and/or flood routing calculations and backwater curve profiles of the proposed waterway corresponding to a storm recurrence interval of one hundred (100) years.

d. Engineering evaluation of all potential increases in flood hazards to the adjacent upstream or downstream private or public lands and facilities located thereon, showing provisions for eliminating any and all adverse impacts on such land and facilities at no public cost.

e. Minimum finished floor elevations shall be set at or above the maximum water surface elevation as determined by the following in accordance with Section 420.150:

(1) "Flood Insurance Rate Map" published by the Federal Emergency Management Agency.

(2). Backwater curve profiles of the proposed waterway due to a one hundred (100)-year storm recurrence interval.

(3) The slab on grade finish floor elevation or the top of foundation of a building or structure shall be a minimum of twelve (12) inches above the lowest elevation of the public street gutter (at the lowest point perpendicular to the structure) PLUS Two percent (2%) times the distance between the public street curb face (or edge of existing asphalt street) and the building or structure.

(4) The minimum finish floor elevation for the allowable building area or footprint identified on a Preliminary Plat, Final Record Plat, and Boundary Adjustment for a lot or subdivision shall be a minimum of twelve (12) inches above the lowest elevation of the public street gutter (at the lowest point perpendicular to the structure) PLUS Two percent (2%) times the distance between the public street curb face (or edge of existing asphalt street) and the building setback.

(5) Shall comply with the applicable minimum elevation requirements of the Building and Residential Code (an example has been provided in "Chapter 420, Table G").

(6) Designation on the final plan of all areas reserved for flood routing, detention or storage, together with the required wording pertaining to restrictions, dedications and maintenance responsibilities of such areas.

f. Designation on the final plan of all areas reserved for flood routing, detention or storage, together with the required wording pertaining to restrictions, dedications and maintenance responsibilities of such areas.

7. *Detention Storage.* If detention storage is provided within a floodplain, only the net increase in storage volume above that which naturally existed on the floodplain shall be credited to the development. No credit will be granted for volumes below the elevation of the regulatory flood at that location unless compensatory storage is also provided.

8. *Verification Of Adequacy.* Analysis of all elements of design is to be verified by the engineer of record submitting the plan. The following outline is provided to ascertain that certain critical elements are in workable compliance with the aims of this Chapter and Title.

a. Verification shall be made of:

(1) Volume of detention for the total project.

(2) Peak flowrate for the item being studied.

(3) Detention routing calculations.

(4) Sizing of all stormwater channels and conduits.

(5) Sizing of the detention control structure.

(6) Stability of detention dikes.

(7) Safety features.

(8) Maintenance features.

10. *Installation Of Stormwater Runoff Control Measures.* Positive stormwater runoff control shall be provided for during development. Stormwater management plans shall include a schedule for the installation, construction or modification of all drainage facilities. Erosion control measures and a schedule for their installation shall be shown on the stormwater management plan. Installation of drainage facilities and erosion control measures shall proceed as scheduled in the approved stormwater management plan.

11. *Best Management Practices.* Best management practices to prevent erosion, sedimentation and other contamination of the municipal storm sewer system or the Waters of the State shall be incorporated into the Storm Water Pollution Prevention Plan. Such measures shall be implemented from the time the land is disturbed until final stabilization of the land is achieved. Permitted best management practices may include, but are not limited to, the following.

a. Site planning.

b. Silt fencing.

c. Straw bales.

d. Rock dams.

e. Mulching.

f. Temporary berms.

g. Sediment basins.

h. Temporary seeding.

i. Permanent seeding.

j. Maintain vegetation.

The best management practices utilized shall be in accordance with the publication "Protecting Water Quality" as published by the Missouri Department of Natural Resources. Use of other State-approved standard specifications or methods which offer a higher level of protection may also be incorporated by the design professional.

SECTION 420.130: MATERIAL AND CONSTRUCTION STANDARDS

1. Storm pipes shall be protected from excessive bearing pressures by placing them outside the forty-five degree (45°) influence zone of building structures unless an engineer's calculations show the pipe material or soil condition to be adequate for the subjected load.

2. Pipes on twenty percent (20%) slopes or greater shall be anchored securely with concrete anchors or their equal to prevent the pipe from creeping downhill. The minimum allowable pipe slope is one-half percent (0.5%).

3. Pipes or structures constructed on fill shall be stable and protected against settlement by compacting fill material to ninety five percent (95%) of the modified proctor maximum dry density.

4. Pipes thirty-six (36) inches or larger may be placed on a curved alignment utilizing alignment radii established by the pipe manufacturer.

5. The receiving surface where pipes discharge shall be protected from erosion by evaluating the discharge velocity for the 25-year design storm. The use of energy-dissipating devices may be necessary to reduce the velocity to acceptable levels for the receiving surface. The energy-dissipating device used shall be a minimum length of ten (10) times the diameter of the discharge pipe.

6. A manhole, inlet or junction box shall be located at changes in pipe size, grade, alignment or material except for cases where the pipe size is thirty-six inches (36") or greater

7. The angle between influent and effluent pipes shall be not less than ninety degrees (90°), and the drop between inverts shall be not less than one-tenth (0.1) foot.

8. Manhole and inlet castings located in travelways shall be capable of withstanding traffic loads and shall be constructed flush with the finished surface.

9. All materials and appurtenances for stormwater management systems shall conform to current standards of the American Society for Testing and Materials (ASTM).

10. Manholes shall be pre-cast or cast-in-place concrete with concrete risers and approved manhole covers.

11. A new drainage channel or pipe shall intersect an existing drainage channel at a maximum angle of sixty degrees (60°).

12. All trenches under roadway pavement shall be backfilled with MHTD Type I aggregate in six (6) inch layers and compacted to ninety-five percent (95%) of the modified proctor maximum dry density.

13. All piping shall be bedded per the manufacturer's requirements.

14. Grated inlets will not be allowed without special approval by the Administrative Officer.

15. All materials used in the construction of storm sewers shall be subject to inspection and approval of the Administrative Officer or his/her designated representative.

16. Acceptable pipe material shall be reinforced concrete pipe, corrugated metal pipe and corrugated polyethylene pipe. Reinforced concrete pipe shall conform to the requirements of the Specifications for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe, ASTM C76. Strength class or classes shall be as required per design specifications of the latest edition of the Concrete Pipe Handbook as published by the American Pipe Association. Corrugated aluminized metal pipe shall conform to the appropriate requirements of AASHTO or Missouri Department of Transportation. Structural design requirements shall be per the latest edition of the Handbook of Steel Drainage and Highway Construction Products as published by the American Iron and Steel Institute. Use of corrugated metal pipe greater than forty-eight (48) inches in diameter shall only be allowed after approval by the Administrative Officer. Corrugated polyethylene pipe shall conform to the requirements of AASHTO M294, "Standard Specifications for Corrugated Polyethylene Pipe". All polyethylene pipe should be installed according to ASTM D 2321, "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications".

17. All construction details pertaining to stormwater drainage shall be in accordance with the City and State requirements, unless otherwise noted herein.

SECTION 420.140: STORMWATER DETENTION PAYMENT IN LIEU OF CONSTRUCTION

1. Whenever the stormwater analysis is presented by the registered design professional and accepted by the Administrative Officer, shows that detention provides no significant benefit, the property owner or developer may apply for a buyout of the required detention volume. A

buyout of the detention facility construction may not be allowed if the Administrative Officer has made a finding that there is a significant drainage problem below the property where the buyout is proposed to occur even though the detention facility is marginally efficient. The Administrative Officer may consider in making such determination that the discharge of any additional waters at an increased rate onto the properties down-stream is not desirable due to the significant drainage problems that exist on down-stream properties.

2. Buyout funds shall be used by the City to construct and maintain regional detention and conveyance systems within the City.

3. Detention buyouts are not automatic and must be considered on a case-by-case basis by submission of the completed Buyout Fund application form, a copy of which is on file in the City offices. Initial determination of approval will be made by the Administrative Officer. That decision may be appealed in writing to the Board of Adjustment for a final determination.

4. When a buyout is approved, it is the responsibility of the developer to convey the stormwater runoff from the development to the existing storm sewer system by making whatever modifications are necessary to the existing system.

5. When the detention volume is less than five thousand (5,000) cubic feet, the table shown in "Chapter 420, Table H" at the end of this Chapter and a copy of which is outlined on the Buyout Application form, a copy of which is on file in the City offices, shall be used to determine the buyout amount.

6. The contribution to the stormwater management fund for the detention buyout is as follows:

a. A cost estimate shall be prepared by a professional engineer for site specific improvements necessary to provide detention as provided herein. All cost estimates for site specific detention facilities shall be subject to review and approval by the Administrative Officer. The cost estimate must include the value of the land which otherwise would have been used as part of the system with the value of the subject land determined by an independent appraiser paid for by the property owner or developer.

b. Alternately, for single and two-family residential developments, the contribution shall be one dollar ($1.00) for each cubic foot up to twenty four thousand (24,000) cubic feet and half-dollar ($0.50) for each cubic foot above twenty four thousand (24,000) cubic feet.

c. For developments other than single or two-family residential developments, the contribution shall be two dollars ($2.00) for each cubic foot of detention volume up to twenty four thousand (24,000) cubic feet, one dollar ($1.00) for each cubic foot between twenty four thousand (24,000) cubic feet and one hundred thousand (100,000) cubic feet, and $0.50 for each cubic foot in excess of one hundred thousand (100,000) cubic feet.

7. The payment in lieu of construction may be revised by the Administrative Officer to reflect the annual percentage change in construction costs by using the Construction Price Index, increase or decrease, from the previous amount.

SECTION 420.150: MINIMUM FINISHED FLOOR ELEVATIONS

1. Minimum finished floor elevations shall be set at or above the maximum water surface elevation as determined by the following:

(A) "Flood Insurance Rate Map" published by the Federal Emergency Management Agency.

(B). Backwater curve profiles of the proposed waterway due to a one hundred (100)-year storm recurrence interval.

(C) The slab on grade finish floor elevation or the top of foundation of a building or structure shall be a minimum of twelve (12) inches above the lowest elevation of the public street gutter (at the lowest point perpendicular to the structure) PLUS Two percent (2%) times the distance between the public street curb face (or edge of existing asphalt street) and the building or structure.

(D) The minimum finish floor elevation for the allowable building area or footprint identified on a Preliminary Plat, Final Record Plat, and Boundary Adjustment for a lot or subdivision shall be a minimum of twelve (12) inches above the lowest elevation of the public street gutter (at the lowest point perpendicular to the structure) PLUS Two percent (2%) times the distance between the public street curb face (or edge of existing asphalt street) and the building setback.

(E) Shall comply with the applicable minimum elevation requirements of the adopted Building and Residential Code pursuant to Title V of this Code (an example has been provided in "Chapter 420, Table G").

SECTION 420.160: EASEMENTS AND DEDICATIONS

1. All stormwater management facilities for residential, commercial, industrial, or institutional subdivisions, multiple lots or multiple land tracts shall be constructed within a public right-of-way or land dedicated to the City of Farmington for stormwater management use and shall be connected to a public road or other approved location from which operation and maintenance is legally available. Minimum rights-of-way and maintenance easements shall be provided by instrument or plat dedication for all waterways used to convey or detain runoff. The minimum widths of rights-of-way and easements shall be in accordance with "Chapter 420, Table I" at the end of this Chapter.

2. Easements must include the "top of the bank width" and the maintenance access width.

3. The maintenance access width begins at the top of the bank or slope of the facility.

4. Additional maintenance access width may be required by the Administrative Officer in special circumstances where more width on one (1) or both sides is necessary for maintenance purposes.

SECTION 420.170: INSPECTION AND COMPLETION OF CONSTRUCTION

1. *General.* The Administrative Officer and other officials of the City charged with the enforcement of this Chapter are hereby granted inspection rights and right-of-entry privileges in order to ensure compliance with the requirements of this Chapter.

2. *Inspections During Construction.* The owner or authorized agent shall employ a registered design professional to inspect all stormwater improvements during construction. The Administrative Officer or other City officials may conduct inspections from time to time as necessary to ensure compliance with the provisions of this Chapter. The owner or authorized agent shall coordinate with the City a minimum of twenty four (24) hours in advance of beginning work on the public infrastructure components to facilitate inspection times and shall provide any field survey as required to verify that the elevations of improvements are in accordance with the plans.

3. *After Construction.* The following procedures shall apply after construction activity is completed.

a. Upon completion of any stormwater improvements, the owner or authorized agent shall also submit a certification letter signed by the registered design professional of the project to the Administrative Officer which states that the improvements have been completed in accordance with the following:

(1) The approved project plans and specifications.

(2) All ordinances and specifications of the City of Farmington.

b. The inspection and completion of construction of public and private stormwater improvements shall comply with all applicable provisions of this Title and the Plumbing Code of the City.

c. After final stabilization of the site is achieved, the owner or authorized agent shall submit a written request for notice of termination, for the Administrative Officer to terminate the permit. The notice shall contain the following information.

(1) Name, address and telephone of the owner or authorized agent.

(2) The permit number.

(3) An indication of why the permit should be terminated.

(4) The signature of the owner or authorized agent.

d. Notwithstanding the requirements of this Subsection, the Administrative Officer shall terminate the permit after determining that final stabilization has been achieved.

SECTION 420.180: MAINTENANCE

1. *General.* The owner or authorized agent shall utilize methods, approaches and techniques in the design and construction stormwater management improvements that will allow for the improvements to be properly maintained.

2. *Responsibility.* The responsibility for maintenance of stormwater management facilities shall be as follows.

a. The owner or authorized agent shall be responsible for all stormwater management improvements not officially accepted by the City.

b. The owner or authorized agent shall be responsible for all stormwater management improvements on any lot that is not a part of a common promotional plan.

c. The owner or authorized agent shall be responsible for the stormwater management improvements on property that is part of a common promotional plan until the improvements are either accepted by the City or the improvements are accepted by a board, association or other permanent maintenance organization.

3. *Maintenance Arrangements.* Any maintenance arrangements shall conform to the following.

a. No detention basin shall be considered accepted by the City unless specifically expressed, written approval and acceptance is made by the City Council.

b. The maintenance of stormwater management improvements by a board, association or other permanent maintenance organization shall be arranged through appropriate legal means such as agreements, indentures or covenants. Any such documents shall be submitted to the Administrative Officer for review and approval.

c. The owner or authorized agent shall dedicate all necessary easements to the City for all stormwater management improvements to be accepted by the City in accordance with the requirements of this Chapter and the Subdivision Code.

4. *Minimum Standards.* Stormwater management improvements shall be maintained in a clean, safe, sanitary condition complying with all applicable provisions of this Chapter and the Property Maintenance Code of the City and shall not cause a public nuisance as defined by the Municipal Code.

5. *Periodic Inspections.* The Administrative Officer may inspect existing stormwater management improvements from time to time in order to ensure compliance with the provisions of this Section.

SECTION 420.190: ENFORCEMENT

1. *Approved Projects.* The Administrative Officer or his/her designated representative shall carry out periodic inspections of the project site to ensure the applicant's compliance with this Chapter. If it is determined that the project is not being carried out in accordance with the approved stormwater management plan, the Administrative Officer is authorized to:

a. *Written notice.* Issue written notice to the applicant or owner, specifying the nature and location of the alleged non-compliance, with a description of the remedial actions necessary to bring the project into compliance within a reasonable specified time.

b. *Stop work order.* Issue a stop work order directing the applicant or owner to cease and desist all or any portion of the work which violates the provisions of this Chapter, if the remedial work identified in the "written notice" is not completed within the specified time.

c. *Revocation of approval.* Should the applicant or owner not bring the project into compliance with the written notice and stop work order, he/she shall then be subject to immediate revocation of his/her stormwater management plan approval and to the penalties described in Section 420.190.

d. *Appeals.* The Board of Adjustment shall serve as the means of appeal or variance in accordance with the zoning regulation of the City.

2. *Unapproved Project.* With respect to any development activity determined by the Administrative Officer or his/her designated representative to be subject to this Chapter or Title and being carried out without approval, the Administrative Officer is authorized to:

a. *Written notice.* Issue written notice to the owner specifying the nature and location of the alleged non-compliance, with a description of the remedial actions necessary to bring the project into compliance within a reasonable specified time.

b. *Stop work order.* Issue a stop work order directing the owner to cease and desist all or any portion of the work which violates the provisions of this Chapter, if the remedial work identified in the "written notice" is not completed within the specified time.

c. *Non-compliance with stop work order.* Should the owner not bring the project into compliance with the written notice and stop work order, he/she shall then be subject to the penalties described in Section 420.190.

d. *Appeals.* The Board of Adjustment shall serve as the means of appeal or variance in accordance with the zoning regulation of the City.

SECTION 420.200: PENALTIES FOR VIOLATION

1. *General.* Violation of the provisions of this Chapter or failure to comply with any of its requirements, including conditions and safeguards established in connection with variances or special use permits, shall constitute an ordinance violation. Any person who violates this Chapter or fails to comply with any of its requirements shall upon conviction thereof be fined not more than five hundred dollars ($500.00) or imprisoned for not more than three (3) months, or both and, in addition, shall pay all costs and expenses involved in the case. Each day such violation continues shall be considered a separate ordinance violation.

2. *Corrective Actions.* Nothing herein contained shall prevent the City from taking such other lawful action as is necessary to prevent or remedy any violation. All such costs connected therewith shall accrue to the person responsible.

SECTION 420.210: VESTED RIGHTS

This Chapter shall not in any way limit or modify the vested rights of any person to complete any development or improvement to lands based upon prior law where a previous permit or authorization has been granted or applied for and where such previous permit or authorization remains in effect. The City may acknowledge vested rights in other circumstances where it is equitable and just.

SECTION 420.220: CONFLICT WITH OTHER ORDINANCES AND CODES

In case of conflicts within this Chapter or any part thereof and the whole or part of any other existing or future ordinance or Code of the City, the most restrictive in each case shall apply.

SECTION 420.230: OTHER APPROVALS AND PERMITS

1. Before starting any work regulated by this Chapter, an applicant shall comply with the requirements set forth in all other applicable ordinances including but not limited to:

   a. The submission and approval of preliminary and final subdivision plats, boundary adjustments, rezoning, improvement plans, site plans, and plot plans for construction.

   b. Building, grading, development, and zoning permits, along with those set forth in this Chapter and as may be required by State Statutes and the regulations of any department of the State.

2. A discharge permit from the State of Missouri shall be obtained individually or under the applicable general permit for any activity regulated under the Department of Natural Resources Clean Water Commission (10 CSR 20) Stormwater.

3. A permit or other appropriate approval shall be obtained from the Missouri Department of Transportation to discharge stormwater onto State rights-of-way.

SECTION 420.240: INTERPRETATION

In the interpretation and application of this Chapter, the provisions expressed herein shall be held to be the minimum requirements and shall be liberally construed in favor of the City and shall not be deemed a limitation or repeal of any other powers granted by State Statutes.

SECTION 420.250: ABROGATION AND GREATER RESTRICTIONS

It is not intended by this Chapter to repeal, abrogate or impair any existing casements, covenants or deed restrictions. However, where this Chapter imposes greater restrictions, the provision of this Chapter shall prevail.

SECTION 420.260: LIABILITY DISCLAIMER

The performance standards and design criteria set forth herein establish minimum requirements which must be implemented with good engineering practice and workmanship. Use of the requirements contained herein shall not constitute a representation, guarantee or warranty of any kind by the municipality or its officers and employees of the adequacy or safety of any drainage management structure or use of land. Nor shall the approval of a stormwater management plan and the issuance of a permit imply that land use permitted will be free from damages caused by stormwater runoff. The degree of protection required by these regulations is considered reasonable for regulatory purposes and is based on historical records, engineering and scientific methods of study. Larger storms may occur or stormwater runoff heights may be increased by manmade or natural causes. Enforcement of these provisions, therefore, shall not create liability on the part of the municipality or any officer of the municipality with respect to any legislative or administrative decision lawfully made hereunder, nor shall compliance relieve an owner, developer and/or permittee from responsibility under any circumstances where liability would otherwise exist.

SECTION 3: That Chapter 420, Table A of the Stormwater Management Ordinance is hereby amended by adding the Chapter 420, Table A entry listed within Exhibit A:

SECTION 4: That Chapter 420, Table B of the Stormwater Management Ordinance is hereby amended by adding the Chapter 420, Table B entry listed within Exhibit B:

SECTION 5: That Chapter 420, Table C of the Stormwater Management Ordinance is hereby amended by adding the Chapter 420, Table C entry listed within Exhibit C:

SECTION 6: That Chapter 420, Table D of the Stormwater Management Ordinance is hereby amended by adding the Chapter 420, Table D entry listed within Exhibit D:

SECTION 7: That Chapter 420, Table E of the Stormwater Management Ordinance is hereby amended by adding the Chapter 420, Table E entry listed within Exhibit E:

SECTION 8: That Chapter 420, Table F of the Stormwater Management Ordinance is hereby amended by adding the Chapter 420, Table F entry listed within Exhibit F:

SECTION 9: That Chapter 420, Table G of the Stormwater Management Ordinance is hereby amended by adding the Chapter 420, Table G entry listed within Exhibit G:

SECTION 10: That Chapter 420, Table H of the Stormwater Management Ordinance is hereby amended by adding the Chapter 420, Table H entry listed within Exhibit H:

SECTION 11: That Chapter 420, Table I of the Stormwater Management Ordinance is hereby amended by adding the Chapter 420, Table I entry listed within Exhibit I:

SECTION 12: Nonconforming Use. A nonconforming use of land existing lawfully at the time of the enactment of this section may be continued, but shall not be extended, expanded, or enlarged.

SECTION 13: That the sections, paragraphs, sentences, clauses and phrases of this ordinance are severable, and if any phrase, clause, sentence, paragraph, or section shall be declared unconstitutional or otherwise invalid by valid judgment or decree of a court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs and sections of this ordinance.

SECTION 14: That this ordinance shall be in full force and effective on September 4, 2012 upon passage by the City Council and approval of the Mayor.

DULY READ AND PASSED THIS 23RD DAY OF JULY, 2012.

Stuart "Mit" Landrum, Mayor

ATTEST:

Paula Cartee, City Clerk

Approved this 30th Day of July, 2012.

Stuart "Mit" Landrum, Mayor

ATTEST:

Paula Cartee, City Clerk

APPROVED AS TO FORM:

R. Scott Reid, City Counselor

Exhibit A

Chapter 420, Table A

SUGGESTED RUNOFF COEFFICIENTS "C"	
"C" Value	Surface Conditions
.13	Unimproved Land
.17	Parks, golf courses, farms and on-acre, single-family residences
.35	Single-family residences on lots of not less than 15,000 square feet
.45	Single-family residences on lots of not less than 10,000 square feet
.47	Single-family residences on lots of not less than 7,500 square feet
.51	Single-family residences on lots of not less than 6,000 square feet
.95	Gravel surfaces
1.00	Asphalt and concrete surfaces
1.00	Buildings and other structures.

Exhibit B

Chapter 420, Table B

Runoff Curve Number (CN) Values for Undeveloped Lands (USDA NRCS 1986)

Cover Description	**Curve numbers for Hydrologic soil group**			
Cover type and hydrologic condition	**A**	**B**	**C**	**D**
Idle lands (not yet developed)				
Pasture, grassland or range – continuous forage for grazing: Good condition (ground cover > 75% and only occasionally grazed	39	61	74	80
Meadow – continuous grass, protected from grazing and generally mowed for hay	30	58	71	78
Woods – grass (50%-50%) combination, orchard or tree farm Other combinations can be calculated as composite of pasture and woods Good condition	32	58	72	79
Wood Good condition (i.e., woods are protected from grazing, and litter and brush adequately cover the soil)	30	55	70	77
Farmsteads – buildings, lanes, driveways and surrounding lots	59	74	82	86

Notes:

1. CN for use with SCS Unit Hydrograph Method for average runoff conditions (initial abstractions = 0.2 x Maximum Runoff Retention) (USDA NRCS 1986).
2. Typical cover condition in Farmington area is "Good." Fair" or "Poor" condition must be demonstrated by engineer prior to City approval of associated CN adjustments.
3. This table is based on average antecedent soil moisture conditions.

Exhibit C

Chapter 420, Table C

Runoff Curve Number (CN) Values for Fully Developed and Developing Urban Areas (USDA NRCS 1986)

Cover description		**Curve numbers for Hydrologic soil group**			
Cover type and hydrologic condition	**Average percent Impervious area**	**A**	**B**	**C**	**D**
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.):					
Good condition (grass cover > 75%)		39	61	74	80
Fair condition (grass cover 50% to 75%)		49	69	79	84
Poor condition (grass cover less than 50%)		68	79	86	89
Impervious areas:					
Paved parking lots, roofs, driveways, compacted gravel, etc. (excluding right-of-way)		98	98	98	98
Small open spaces within developments or ROW:		72	82	87	89
Streets and roads:					
Paved; curbs and storm sewers (including right-of-way)		90	93	95	97
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (townhouses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86

1/2 acre 1 acre 2 acres	25 20 12	54 51 46	70 68 65	80 79 77	85 84 82
Developing urban areas: Newly graded areas (pervious areas only, no vegetation)		77	86	91	94

Notes:

1. CN for use with SCS Unit Hydrograph Method for average runoff conditions (initial abstractions = 0.2 x Maximum Runoff Retention) (USDA NRCS 1986).
2. Typical cover condition in Farmington area is "Good", "Fair", or "Poor" condition must be demonstrated by engineer prior to City approval of associated CN adjustments.
3. This table is based on average antecedent soil moisture conditions.
4. Curve numbers provided for streets and roads are typical for residential or collector streets. Curve numbers for arterials and heavily developed areas should be calculated.
5. Curve numbers provided for urban districts are a typical composite of large areas. Curve numbers for individual sites should be calculated based on the proposed development.

Soil types are found in the *Soil Survey of St. Francois County, Missouri* (USDA NRCS 1981). Soils are classified into hydrologic soil groups (HSGs) as an indicator of infiltration rate. The HSGs are A, B, C, and D, with A having the highest infiltration rate and D having the lowest, as defined in the USDA Manual, *Urban Hydrology for Small Watersheds*, *Technical Release 55* (TR-55) (USDA NRCS 1986). The HSG and land cover are used in determining the CN value.

For areas where the soil profile has been disturbed, the HSG should be adjusted up one level (i.e., from A to B, B to C, or C to D) unless it can be shown that the predevelopment soil profile has been reestablished.

Special circumstance may dictate that the developed impervious area may differ from that shown in the above table. An example may be single-family lots of larger than fifteen thousand (15,000) square feet. Calculations prepared by a licensed professional engineer may be submitted to the Administrative Officer for his/her evaluation to determine if a minimum impervious area which differs from that shown in the above table may be utilized. Likewise, the Administrative Officer may determine that the percent of impervious area for a particular development differs from that shown in the appropriate Tables referenced at the end of this Chapter.

Exhibit D

Chapter 420, Table D

Rainfall Depth and Rate for varying Storm Durations and Return Frequencies										
			2-Year		10-Year		25-Year		100-Year	
Storm Duration (Days)	Storm Duration (Hours)	Storm Duration (Min.)	Rainfall Depth (inch)	Rainfall Rate (in/hr)	Rainfall Depth (inch)	Rainfall Rate (in/hr)	Rainfall Depth (inch)	Rainfall Rate (in/hr)	Rainfall Depth (inch)	Rainfall Rate (in/hr)
		5	0.42	5.04	0.67	8.04	0.79	9.48	0.98	11.76
		10	0.74	4.44	1.17	7.02	1.38	8.28	1.72	10.32
		15	0.95	3.80	1.50	6.00	1.77	7.08	2.21	8.84
		30	1.30	2.60	2.05	4.10	2.43	4.86	3.03	6.06
	1	60	1.65	1.65	2.61	2.61	3.08	3.08	3.84	3.84
	2	120	2.00	1.00	2.95	1.48	3.49	1.75	4.39	2.20
	3	180	2.20	0.73	3.21	1.07	3.74	1.25	4.74	1.58
	6	360	2.63	0.44	3.74	0.62	4.45	0.74	5.75	0.96
	12	720	3.16	0.26	4.24	0.35	5.40	0.45	6.60	0.55
1	24	1,440	3.56	0.15	4.90	0.20	5.59	0.23	7.50	0.31
2		2,880	3.90	0.08	5.49	0.11	6.49	0.14	8.10	0.17
3		4,320	4.26	0.06	6.00	0.08	6.90	0.10	9.05	0.13
5		7,200	4.80	0.04	7.00	0.06	8.00	0.07	9.90	0.08
10		14,400	6.05	0.03	8.10	0.03	9.41	0.04	11.90	0.05
Ref: Bulletin 71, Rainfall Frequency Atlas of the Midwest, Huff & Angel 1992										

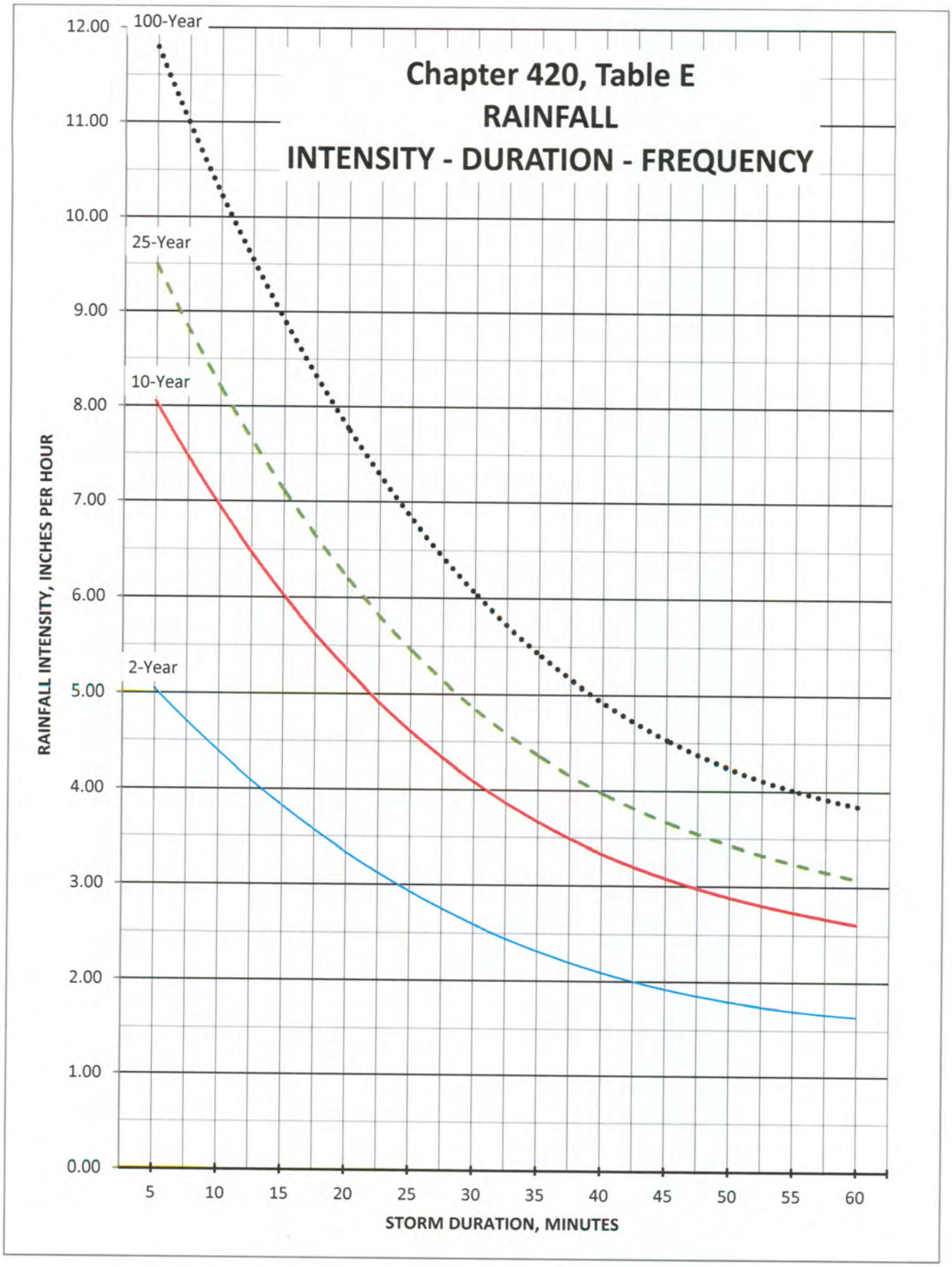

Chapter 420, Table E
RAINFALL
INTENSITY - DURATION - FREQUENCY
100-Year
25-Year
10-Year
2-Year
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
RAINFALL INTENSITY, INCHES PER HOUR
5
10
15
20
25
30
35
40
45
50
55
60
STORM DURATION, MINUTES

Exhibit F

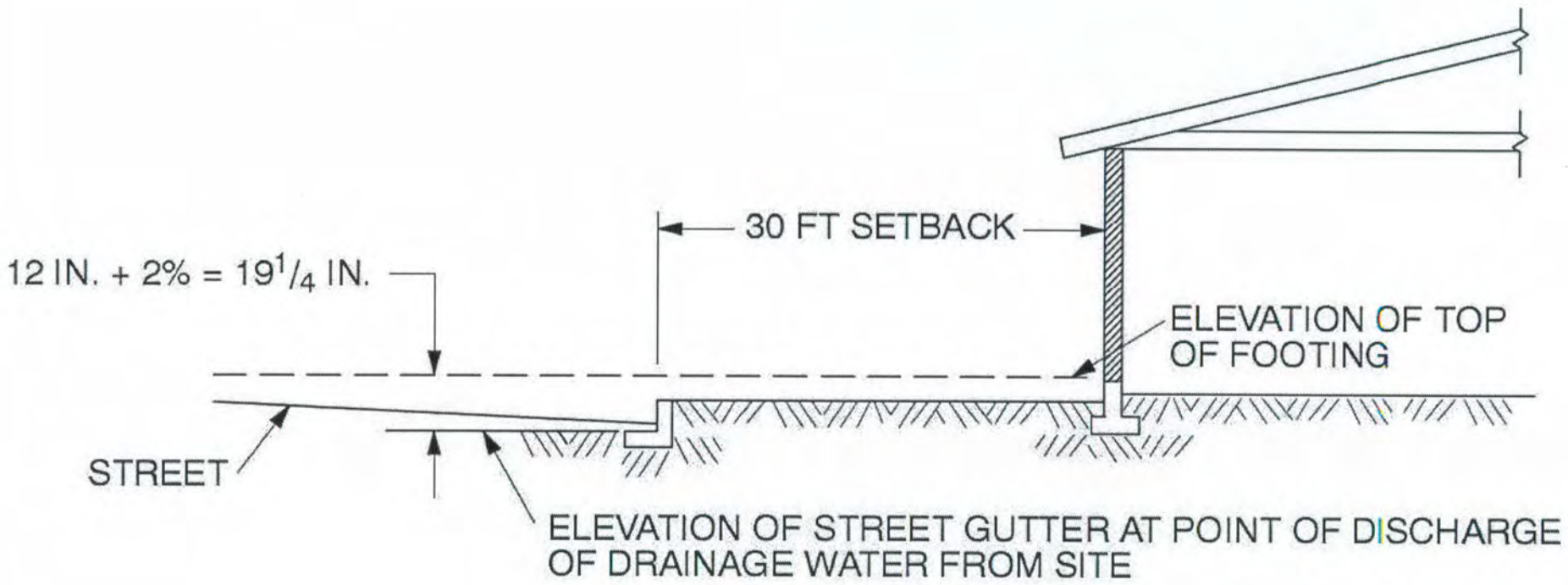
Chapter 420, Table F

Street flow shall be limited by pavement encroachment and depth of flow

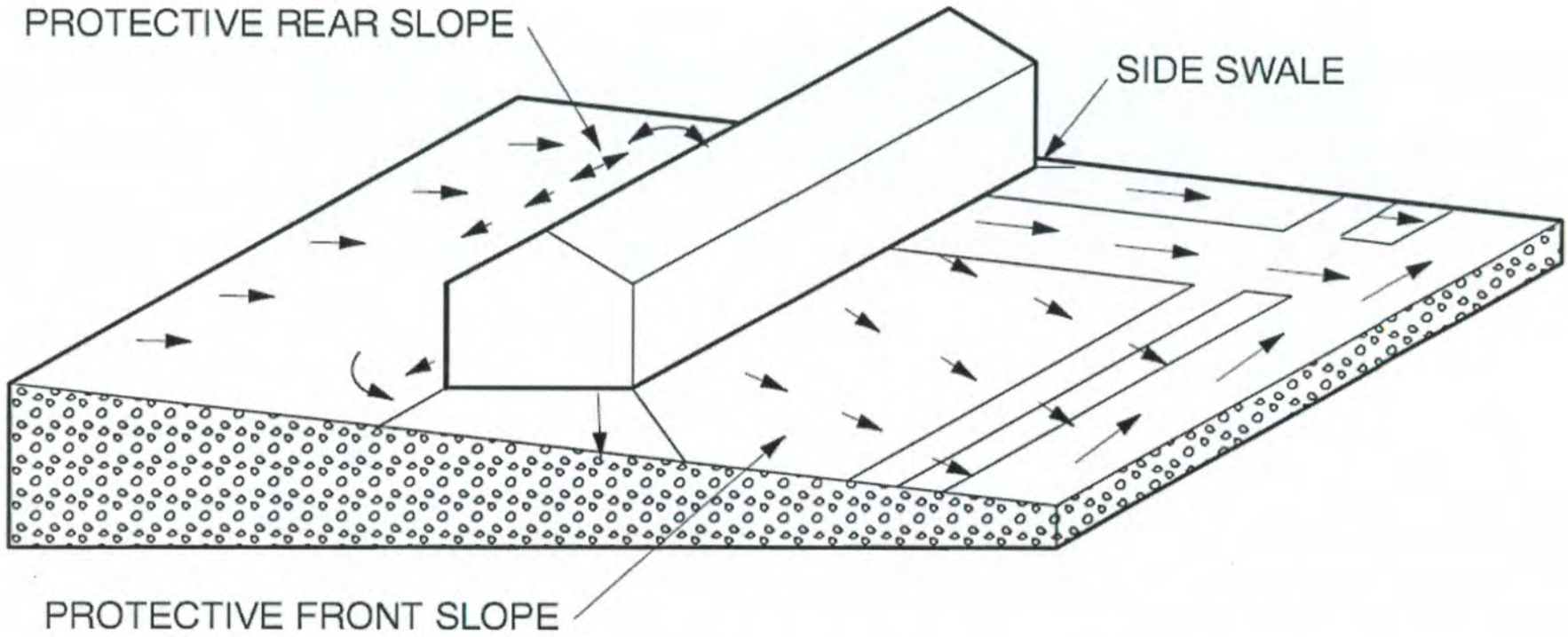
Street Classification	* Maximum Encroachment of a ten (10)year Storm
Local	No curb overtopping. Flow may spread to crown of street.
Collector	No curb overtopping. Flow may leave the equivalent of one (1) ten (10)-foot driving lane clear of water.
Arterials	No curb overtopping. Flow spread must leave the equivalent of two (2) ten (10)-foot driving lanes clear of water. One (1) lane in each direction. Where no curbing exists, encroachment shall not extend past property lanes.
The storm sewer system shall commence at the point where the volume of flow equals five (5) cfs during a ten (10)-year storm.	
Street Classification	Allowable Depth and Inundated Areas 100-year Storm
Local and Collector	Residential dwellings, public, commercial and industrial buildings shall not be inundated at the ground line. The depth of water over the gutter flowline shall not exceed eighteen (18) inches.
Arterials	Residential dwellings, public, commercial and industrial buildings shall not be inundated at the ground line. Depth of water at the street crown shall not exceed six (6) inches to allow operation of emergency vehicles. The depth of water over the gutter flowline shall not exceed eighteen (18) inches.

Exhibit G

Chapter 420, Table G



Example 1



GRADING METHOD FOR LOT WHERE SLOPE IS FROM REAR TO FRONT LOT.
DRAINAGE SWALES ARE LOCATED AT REAR AND SIDES OF DWELLING.

Example 2

Chapter 420, Table H

Stormwater Buyout Rate Table and Stormwater Improvements Standards

STORMWATER BUYOUT RATE TABLE

Volume of Detention	One- or Two- Family Residential	Other Land Uses
0-24,000 c.f.	$1 per c.f.	$2 per c.f.
24,000-100,000 c.f.	$0.50 per c.f.	$1 per c.f.
>100,000 c.f.	$0.50 per c.f.	$0.50 c.f.

Note:

1. The Stormwater Buyout Rate structure used to determine the amount of the payment is based on the proposed land use.

CUBIC FEET OF DETENTION REQUIRED % IMPROVED TABLE

ACRES DEVELOPED		20	30	40	50	60	70	80	90	100
	0.10	250	390	500	640	765	900	1,020	1,150	1,280
	0.20	500	765	1,020	1,275	1,530	1,800	2,040	2,300	2,550
	0.30	765	1,150	1,530	1,920	2,300	2,680	3,060	3,450	3,830
	0.40	1,020	1,530	2,040	2,550	3,060	3,570	4,080	4,600	
	0.50	1,280	1,910	2,550	3,200	3,830	4,460			
	0.60	1,530	2,300	3,060	3,830	4,600				
	0.70	1,800	2,680	3,570	4,460					
	0.80	2,040	3,060	4,080						
	0.90	2,300	3,450	4,590						
	1.00	2,550	3,830							
	1.25	3,190	4,780							
	1.5	3,830								
	1.75	4,470								

Notes:

1. Detention may be bought out if no immediate flooding exists.

2. If detention was previously bought out for the subject property, it and the current proposed buyout, are larger than the total allowed, then all the detention must be constructed with no refund of previous buyout funds.

Stormwater Improvements Standards

A. *A Downstream Impact Analysis.* A Downstream Impact Analysis shall be provided by the Registered Design Professional pursuant to this Chapter to show that detention for this development provides no downstream benefit. The analysis must extend downstream from the development to a point where the "10 Percent Rule" holds true (The point where the area of the development is less than 10 percent of the total contributing drainage area). All calculations, maps, and specification pursuant to this Chapter shall be provided to determine the location downstream of the site where the "10 Percent Rule" holds true.

1. If the "10 Percent Rule" holds true at the point runoff leaves the site, no further off-site analysis is necessary. The "No Downstream Impact Certification Statement" shall be provided and shall bear the signature, date, and seal of the State of Missouri Registered Design Engineer for the project.

(a) *No Downstream Impact Certification Statement.* As the professional engineer or architect of record, I certify that, based on my analysis using standard engineering practices, stormwater detention for this development will not provide any downstream benefits and the development will not increase downstream flooding.

2. If the "10 Percent Rule" does not hold true at the discharge point from the property, the downstream location where the "10 Percent Rule" does hold true must be determined to establish the limits of the required analysis. The following information must be submitted:

(a) A map showing the proposed development, the total contributing drainage and all conveyance facilities within all limits of the analysis. Provide a complete inventory of all structures and distinct channel reaches within the limits of the analysis. Show at each structure and distinct reach the design flow and hydraulic capacity of the existing facilities. Provide information about known or determined flooding problems that exist within the limits of the analysis with an emphasis on flooding of buildings, streets, and yards.

(b) If it is found that either the "10 Percent Rule" holds true at the discharge point from the property or if it is found that all downstream facilities within the limits of the analysis meet or exceed City standards under post-developed conditions, then the

following statement shall be provided and shall bear the signature, date, and seal for the State of Missouri Registered Design Engineer of the project pursuant to this Chapter:

(1) As the professional engineer of record, I certify that, based on my analysis using standard engineering practices, with the proposed downstream stormwater improvements, the development will not increase downstream flooding.

B. *Primary Stormwater Improvements Standards.* The primary City standards for stormwater improvements are as follows:

1. Culverts, pipes, and ditches draining more than 1 square mile must be designed for the one hundred (100)-year storm.

2. Culverts, pipes, and ditches draining 1 square mile or less must be designed for the twenty five (25)-year storm.

3. The storm sewer must commence in a street at the point where the two (2)-year storm is five (5) cubic feet a second (cfs).

4. The maximum depth in a streets shall conform to Table F of this chapter

5. Where streets have no curbs, water encroachment shall not exceed past property lines.

6. No buildings or structures may be inundated at the ground line for the one hundred (100)-year storm.

C. *Downstream Analysis.* If it is found through Downstream Analysis that the conveyance facilities do not meet City standards, one or both of the following conditions will exist.

1. Facilities with the limits of the analysis meet or exceed City design standards under existing conditions but increased design flows will exceed the capacity of the facilities under post-development conditions. The capacity of the facilities must be increased so that the capacity of the new facilities meets or exceeds the increased design flows.

2. Facilities within the limits of the analysis do not meet City design standards under existing conditions and design flows to these facilities will be increased under post-development conditions. The capacity of the facilities must be increased by the amount of the increase in design flows.

D. *Downstream Improvements.* Once the downstream improvements have been designed based on the above requirements, the following statement shall be provided and shall bear the signature, date, and seal for the State of Missouri Registered Design Engineer of the project pursuant to this Chapter.

1. No Downstream Impact With Improvements Certification Statement. As the professional engineer or architect of record, I certify that, based on my analysis using standard engineering practices, with the proposed downstream stormwater improvements, the development will not increase downstream flooding.

E. *Supplementary Regulations.*

1. Additional runoff from developments. It is required that, when possible (as determined by the Administrative Officer), additional runoff from developments flow to a public right-of-way or drainage easement. When neither of these is available, it is required that the professional engineer or architect of record certify that the discharge is to a natural channel and will not exceed the capacity of that channel. This statement must be placed on the plans at the point of discharge and a letter from the engineer or architect of record must be sent certified mail to all downstream property owners within the limits of the analysis certifying a portion of their land is a natural channel. A copy of the letter of certification and the mail receipts must be submitted to the Public Works Engineering Division. A copy of the letter of certification shall also be Recorded with the Land Records of St. Francois County for said properties. A sample letter containing the minimum necessary information shall be provided and attached to the application pursuant to this Chapter in a standardized format in accordance with this provision.

Exhibit I

Chapter 420, Table I

Facility Maintenance Access Width Requirements

Facility	Maintenance Access Width
Open drainage channel or facility	Thirty (30) feet, fifteen (15) feet each side
Greenways	Width of greenway
Pipes and culverts	Fifteen (15) feet, centered
Detention areas	Fifteen (15) feet continuous around total area
Connecting access	Fifteen (15) feet