

ARTICLE V. STORM WATER MANAGEMENT

These regulations shall hereafter be know, cited and referred to as the Storm Water Management Code of the City of St. Joseph, Missouri

- (a) APPLICABILITY. The provisions of this ordinance shall extend and apply to all land within the corporate limits of the City. Any person, firm, corporation or business proposing to construct buildings or develop land within the above described area shall make application to the Director of Public Works for approval of a Storm water Management Plan and issuance of a of a drainage permit as specified in this ordinance.
- (b) INTERPRETATIONS. The provisions of this ordinance are intended to supplement existing zoning and land use ordinances of the City of St. Joseph. In their interpretation and application, the provisions herein shall be held to be the minimum requirements for the promotion of the public health, safety and general welfare.
- (c) OBJECTIVES. To promote the public health, safety and general welfare of the citizens of St. Joseph, this Storm water Management Code is enacted for the general purpose of assuring the proper balance between man's use of land and the preservation of a safe and beneficial environment. More specifically, the provisions of these regulations, as amended from time to time, are intended to reduce property damage and to minimize the hazards of personal injury and loss of life due to flooding
- (d) RELATIONSHIP TO OTHER LAWS. These regulations shall not be construed as abating any action now pending under, or by virtue of, prior existing regulations, or as discontinuing, abating, modifying or altering any penalty accruing or about to accrue, or as affecting the liability of any person, firm or corporation, or as vacating or annulling any rights obtained by any person, firm, or corporation, by lawful action of the City, except as shall be expressly provided for in these regulations.
- (e) DISCLAIMER OF LIABILITY. 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 City, or it officers and employees, of the adequacy or safety of any storm water management structure of use of land. Nor shall the approval of a Storm water Management Plan and the issuance of a drainage permit imply that land uses permitted will be free from damages caused by storm water runoff. The degree of protection required by these regulations is considered reasonable for regulatory purposed and is based on historical records, engineering and scientific methods of study. Larger storms may occur or storm water runoff heights may be increased by man-made or natural causes. These regulations, therefore, shall not create liability on the part of the City or any officer with respect to any legislative or administrative decision lawfully made hereunder.

- (f) SEPARABILITY. If any part or provision of these regulations or application thereof to any person or circumstances is adjudged invalid by any court of competent jurisdiction, such judgment shall be confined in its operation to that part, provision, or application directly involved in the controversy in which such judgment shall have been rendered and shall not affect or impair the validity of the remainder of these regulations or the application thereof to other persons or circumstances. The governing body hereby declares that it would have enacted the remainder of these regulations even without any such part, provision, or application found to be unlawful or invalid.
- (g) DEFINITIONS. For the purpose of this title, the words and terms as used herein are defined to mean as set out in this chapter.

Words used in the present tense include the future; words in the singular number include the plural, and words in the plural number include the singular; the word “building” included the word “structure” the word “shall” or the word “must” is mandatory; the term “used for” includes the meaning “designated for” or “intended for”.

CHANNEL. A watercourse of perceptible extent which periodically or continuously contains moving water or which forms a connecting link between two bodies of water.

DETENTION. A Storm water Management technique of which the primary function is to control the peak rate of surface water runoff by utilizing temporary storage and a controlled rate of release. This may include, but not be limited to, the use of reservoirs, roof tops, parking areas, holding tanks, in-pipe and in-channel storage.

DEVELOPMENT. Any man-made change to improved or unimproved real property including the construction or reconstruction of buildings or structures; paving, excavation, grading, filling or similar operations; or the filing and recording of a subdivision plat.

DIFFERENTIAL RUNOFF. The volume and rate of flow of storm water runoff discharged from a parcel of land or drainage area which is or will be greater than that volume or rate which pertained prior to the proposed development or redevelopment.

DRAINAGE PERMIT. A permit issued by the Building Official subsequent to approval of a final Storm water Management Plan by the Director of Public Works.

DRY BOTTOM BASIN. A natural or artificial storm water storage area that is designed and maintained for temporary containment of storm water runoff.

FLOODPLAIN. A land area adjoining a river, stream, watercourse, or lake which is likely to be flooded in a one-hundred year flood, as designated on the Federal Insurance Rate Map (FIRM) by the Federal Emergency Management Agency; a copy of which is on file in the office of the City Clerk.

FLOODWAY. The channel of a watercourse and the adjacent land area that must be reserved in order to discharge a one-hundred year flood without cumulatively increasing the water surface elevation more than 1.0 foot, and as designated on the Flood Boundary and Floodway Map by the Federal Emergency Management Agency; a copy of which is on file in the office of the City Clerk.

FREEBOARD. A factor of safety expressed as the difference in elevation between the top of the detention basin dam and the maximum design surface water elevation resulting from the storm for which the basin's required storage volume was determined.

ONE HUNDRED YEAR STORM. A rainstorm having a one percent chance of being equaled or exceeded in any given year.

TEN YEAR STORM. A rainstorm of one hours duration that will occur on the average of once in ten years.

PLAT. A legally recorded plan of a parcel of land showing the location and dimension of such features as streets, lots, easements, and other elements pertinent to a subdivision.

STORM WATER RUNOFF. Water resulting from precipitation which is not absorbed by the soil, evaporated into the atmosphere, or entrapped by ground surface depressions and vegetation and which flows over the surface.

TRIBUTARY AREA. All of the area contributing storm water runoff to a given point.

WET BOTTOM BASIN. A storm water storage area which is designed and maintained to contain water temporarily and to hold permanently an additional volume of water at a level below the discharge structure of said storage area.

WATERCOURSE. "Watercourse" means any stream, creek, brook, branch, depression, reservoir, lake, pond, or drainageway in or into which storm water runoff flows.

(h) THE STORM WATER MANAGEMENT SYSTEM.

- 1) GENERAL. This article establishes the Storm water Management System which shall be composed of a major system, a minor system, management controls, and management practices. These regulations shall apply in the minor system.
- 2) THE MAJOR SYSTEM. The major system shall be composed of the regulatory floodplain as shown on the National Flood Insurance Program maps as developed for the City of ST. Joseph by the U.S. Department of Housing and Urban Development, Federal Insurance Administration. All components of the major system shall be designed to handle the system shall be designed to handle the 100-year rainfall event.

- 3) THE MINOR SYSTEM. The minor system shall consist of storm drainage facilities including, but not necessarily limited to, roadway curb and gutter, open channels, swales and enclosed conveyance systems which transport storm runoff to the major system (regulatory floodplain). Minor system facilities are those designed to accommodate runoff resulting from a storm with a given design frequency.
- 4) MANAGEMENT CONTROLS. Management controls are regulations applicable to the minor system under the provisions of this ordinance. Such controls shall limit any activity which will adversely affect hydraulic function of detention facilities, open channels, drainage swales, or enclosed storm water conveyance systems contained within the minor system as previously defined.

Exceptions to the applicability of the use of management controls for new developments shall be granted in the following situations.

- a. Existing lots of record zoned single family..
- b. Additions to, improvements or repair of existing single family and duplex dwelling structures.
- c. Additions to, improvements or repair of existing commercial structures so long as there is no change in impervious surface area.
- d. On sites where storm water runoff discharges directly into a major stream or system component, as determined by the Director of Public Works, and such controls would serve no useful purpose.
- e. On land used for agricultural purposed where no change in grade over that which has existed historically will take place.
- f. Construction of any buildings or structures on a site which has been previously included with storm water management control facilities as part of a larger unit of development.

(5) RESPONSIBILITIES

- a) Administration. The administration of these regulations shall be the responsibility of the Director of Public Works, who shall review and approve Storm water Management Plans as provided herein.
- b) PRIVATE RESPONSIBILITIES. Each developer of land within the City has the responsibility to provide on the developer's property all approved storm water runoff management facilities to ensure the adequate drainage and control of storm water on the developer's property both during and after construction of such facilities.
- c) MAINTENANCE

- 1) Operation and Maintenance of Publicly Owned Facilities. The City of St. Joseph Department of Public Works shall be responsible for the maintenance of all drainage structures and improved watercourses which are publicly owned. No dedications to the Public may be made without approval of the City.
- 2) Storm water runoff control facilities including open drainage swales, channels, enclosed systems and detention/retention structures, architectural screenings and decorative shrubbery and plantings on or adjacent to and abutting privately owned property and not under City ownership shall be maintained by the owner, occupant or agent in charge of such property. Such maintenance shall include but not be limited to, keeping said facilities free and clear of weeds, brush, vegetative growth (except decorative shrubbery and plantings) having a height of not more than 12", debris and any other waste material which might impede or hinder the facilities intended use.
- 3) Failure to Maintain. If the Director of Public Works determines that the owner, occupant or agent in charge of any lot, piece or parcel of land on which a drainage control structure exists, abuts or is included in any approved storm management plan has failed to properly maintain such facility as previously set forth, then he shall notify the owner, occupant or agent in charge of the violation in writing. If the owner, occupant or agent in charge fails, neglects or refuses to comply with the requirements specified in the notice, the Director of Public Works shall proceed to cause the necessary remedial work to be performed and shall report all costs of such remedial work to the Finance Director. The Finance Director shall mail a statement of the actual costs plus a penalty of \$1000.00 to last known address of the owner, occupant or agent in charge of the property and if such costs are not paid to the City within ten days of such notice, the Governing Body of the City shall proceed to pass an ordinance levying a special assessment for such costs against the property on which the facility exists, and all the private property included in the approved Storm water Management Plan. The City Clerk shall certify such assessment to the County Clerk for collection and payment to the City the same as other assessments and taxes are collected and paid. The assessments shall bear interest of at least 10% per annum on the unpaid balance.
- 5) Management practices. The following practices may be utilized upon approval of the Director of Public Works. Use of these methods shall be fully in accordance with the design criteria and performance standards as set forth in this ordinance:
 - a) Storage. Runoff may be stored in temporary or permanent detention basins, or through rooftop or parking lot ponding, or percolation storage, or by other acceptable means.
 - b) Open Channels. Maximum feasible use shall be made of existing drainageways, open channels, and drainage swales that are designed and coordinated with the design of building lots and streets.

- c) Streets and Curbs. Streets, curbs, and gutters shall be an integral part of the storm water integral part of the storm water runoff management system. To the maximum extent possible, drainage systems, street layout and grades, lotting patterns and the location of curbs, inlets and site drainage and overflow swales shall be concurrently designed in accordance with the standards set forth in these regulations.
- d) Enclosed Conveyance System. Enclosed conveyance systems consisting of inlets, conduits, and manholes may be used to convey storm water runoff.
- e) Other. The storm water runoff management practices enumerated herein shall not constitute an exclusive listing of available management practices. Other generally accepted practices and methods may be utilized where approved by the Director of Public Works.

(7) PROCEDURE FOR THE SUBMISSION, REVIEW, AND APPROVAL OF STORM WATER RUNOFF MANAGEMENT PLANS.

- a) GENERAL. No development shall increase the quantity and rates of storm water emanating from said land areas except in accordance with an approved Storm water Management Plan as provided in these regulations. The Storm water Management Plan shall be prepared by a person qualified under provisions of state law in the State of Missouri.
- b) Preliminary Storm water Management Plan shall accompany all applications for land development. Following the receipt of the Preliminary Storm water Management Plan, a general review meeting shall be conducted and shall include the Director of Public Works, City Planner, representatives of the developer and the developer's engineer. The purpose of this review shall be to jointly agree on the conceptual methods proposed to be utilized and the possible effects of the proposed development on existing or future adjacent developments, and the need for architectural or landscape features which will shield open detention structures from the public right of way.
- c) FINAL STORM WATER MANAGEMENT PLAN. Following the review of the Preliminary Storm water Management Plan and after the general approval of the preliminary plan by the Director of Public Works, a Final Storm water Management Plan shall be prepared for each phase of the proposed project as each phase is developed. The submittal of the final plan shall coincide with application for final approval of the development and shall constitute a refinement of the concepts approved in the preliminary plan. It is important to note that if a project is to be phased, the total area of the conceptual project is to be considered in all calculations and that facilities should be designed for each phase which would be compatible with those of the total development plan. The Final Storm water Management Plan

shall specifically enumerate the private property responsible for the maintenance of the storm water control facilities and all appurtenances, including architectural screenings and plantings, and shall include all maps, calculations necessary for the approval of the plan by the Director of Public Works.

The Final Storm water Management Plan shall be reviewed by the Director of Public Works. If it is determined that the proposed development will provide control of storm water runoff in accordance with the purposes, design criteria and performance standards of these regulations and will not be detrimental to the public health, safety, and general welfare, the Director of Public Works shall approve the plan or conditionally approve the plan, setting forth in writing, the conditions thereof. If approved, a drainage permit for the development shall be granted.

If it is determined that the proposed development will not control storm water runoff in accordance with these regulations, the Director of Public Works shall disapprove the Storm water Management Plan and the application and data shall be returned to the applicant for corrective action and re-submittal.

d) DESIGN CRITERIA. Unless otherwise approved, the following rules shall govern the design of improvements with respect to managing storm water runoff:

- 1) In determining the amount of storm water runoff from a development it is important for the designer to relate the methodology to be used in his calculations to the proportionate size of the tributary watershed area. In developments of twenty-five (25) acres or less, the rational method of calculating the quantity of runoff shall be used. Optionally, in developments of twenty-five (25) acres or less, those persons not wishing to calculate the quantity of water to be retained may use the attached tabular form. Developments where the area developed is greater than twenty-five (25) acres and up to two-hundred (200) acres shall be designed using the unit hydrograph method. The preferred method of hydrograph development shall be as development shall be as described in the Soil Conservation Service publication "Urban Hydrology For Small Watersheds" (Technical Release No. 55 – June 1986). Use of methods other than those described shall be upon the approval of the Director of Public Works.
- 2) Development Design Streets, blocks, depth of lots, parks, and other public grounds shall be located and laid out in such a manner as to minimize the velocity of overland flow and allow maximum opportunity for infiltration of storm water into the ground, and to preserve and utilize existing and planned streams, channels and detention basins, and include, whenever possible, streams and floodplains within parks and other public grounds.
- 3) Enclosed Systems and Open Channels. The Design Criteria for Storm Drainage Facilities, shall be submitted to and approved by the Director of Public Works.

- 4) Methods of Controlling Downstream Flooding. The Director of Public Works shall determine whether the proposed plan will cause or increase downstream local flooding conditions. This determination shall be made on the basis of existing downstream development and drainage system capabilities and an analysis of storm water runoff prior to and after the proposed development. If the Director of Public Works determines that the proposed development will cause or increase downstream local flooding conditions during the design storm, provisions to minimize such flooding conditions shall be included in the design of storm drainage improvements and/or the temporary controlled detention of storm water runoff and its regulated discharge to the downstream storm drainage system.
- 5) Downstream Improvements. Improvements to minimize downstream flooding conditions may include, but not be limited to, the construction of dams, dikes, levees, and floodwall; culvert enlargement; and channel clearance and modification projects.
- 6) Detention Basins. Temporary detention of storm water runoff may be used in developments in order to minimize downstream flooding conditions. Temporary storage facilities will not be required in situations where the installation of such a facility would adversely affect the environment or where the site discharges directly into a major stream or system component. The design of temporary detention facilities shall be in accordance with the following design criteria:

- a) Storage Volume Requirements. Sufficient storage volume shall be provided to prevent local flooding damage. Such volume shall be adequate to contain the differential volume of runoff which would result from the design storm occurring on a fully developed site minus the volume of runoff which would result from the design storm occurring over an undeveloped site. Inflow rates into the storage basin shall be determined utilizing either the rational method or the unit hydrograph method dependent on the development size limitations and methodologies described in section (a) of this article. The minimum rainfall event to be utilized in determining the detention storage volume shall be based on the 25– year rainfall event.

When utilizing the SCS method of hydrograph development (Technical Release No. 55), the minimum rainfall events shall be based upon the 24-hour point rainfall as indicated in Technical Paper No. 40 published by the Department of Commerce, Weather Bureau.

In the event of special circumstances, the Director of Public Works may require the use of storms of greater magnitude. When utilizing the rational method for runoff computations, the rainfall intensity (I) and runoff coefficient (C) shall be based upon the area being fully developed in accordance with the planned land usage.

Associated with the analysis will be the routing of the storm hydrograph through the basin to determine the effect of the temporary storage on the rate of inflow. As a result of the flood routing procedure, a determination of the required combination to temporary storage volume and outlet controls required to reduce post development peak outflows to no more than the rate may be made.

- b) Maximum Allowable Release Rate. The basic design factor used in the determination of the maximum release rate of a detention facility shall be the capability of the downstream system to handle the flow adequately. In general, the maximum release rate shall be defined as the predevelopment runoff resulting from a 10-year return frequency rainfall calculated using the rational formula

$$Q=CiA$$

Where Q=peak rate of runoff, in cubic feet per second

C= weighted runoff coefficient (average of the coefficient assigned to the different types of contributing areas)

I= average rainfall intensity, in inches per hour, for the selected frequency and for duration equal to the time of concentration

A= drainage area, in acres, of the subject property, tributary to point under design.

Deviations from the use of this rainfall frequency in design calculations shall be only where approved by the Director of Public Works. Actual rainfall intensity (I) shall be determined for the time of concentration of the tributary area in its undeveloped and natural state. The runoff coefficient (C) shall likewise be determined for the land in its undeveloped state. In no case shall the release rate exceed the existing "safe" storm drainage capacity of the downstream system or watercourse.

- c) Freeboard. The minimum elevation of the top of the detention storage basin embankment shall be at least one (1) foot above the water surface with the emergency spillway flowing at design, or a minimum of two (2) feet above the crest of the emergency spillway.
- d) Sediment Storage. A sediment storage volume of at least 5% of the total required temporary storage volume for runoff detention shall be provided.
- e) Outlet Control Works. Outlet works shall not include any mechanical components or devices and shall function without requiring attendance or control during operation. Size and hydraulic characteristics shall be such that all water in detention storage is released to the downstream storm sewer system within 24 hours after the end of the design rainfall.

- f) Emergency Overflow. A method of emergency overflow shall be designed and provided to permit the safe passage of runoff generated in excess of a 100-year storm.
- g) Other Design Considerations. All storm water detention basins shall be designed with the capability of passing a 100-year hydrograph from a fully developed watershed basin through the outlet works without causing a failure of the embankment. It is not the intent of this requirement to entail any additional reduction of the assure the integrity and safety of the structure.
- h) Design data Submittal. In addition to complete plans, the following design data shall be submitted for all temporary detention facilities:
- 1) Rainfall hydrograph plotted in units of inches per hour as ordinates, and time from beginning of the storm as abscissas.
 - 2) Runoff hydrograph plotted in units of cubic feet per second runoff rate of the tributary area as ordinates, and time from the start of runoff as abscissas.
 - 3) Area – capacity curve for proposed detention facility plotted in units of datum elevation as ordinates, and cumulative volume of storage as abscissas.
 - 4) Discharge characteristics curve or outlet works plotted in units of detention facility water surface elevation as ordinates, and discharge rate for cubic feet per second (cfs) as abscissas.
 - 5) Storage capacity-Inflow and outflow curves in units of accumulated volume as ordinates, and time from the start of runoff as abscissas. Curves shall be so arranged that the vertical distance between the accumulated storage and accumulated discharge will indicate the net volume in storage at any point in time. Curves shall be extended to the time required for complete discharge of all runoff stored in the detention facility.

Other Detention Methods. In addition to the above criteria, the following detention methods may be utilized to provide temporary detention storage:

- a) Wet Bottom Basins. The minimum normal depth of water before the introduction of excess storm water shall be four (4) feet. If fish are to be used to keep the basin clean, at least one quarter of the area of the permanent pool must have a minimum depth of ten (10) feet. For emptying purposes, cleaning or shoreline maintenance, facilities shall be provided or plans prepared for the use of auxiliary equipment to permit emptying and drainage. All surface area within the fluctuating limits of the basin storage or that which is susceptible to or designed as overflow areas from storms with a higher return frequency than those utilized in the design of the facility shall be seeded and mulched, sodded or paved.

- b) Dry Bottom Basins. Where possible these shall be designed to serve secondary purposed for recreation, open space or other types of use which will not be adversely affected by occasional or intermittent flooding. To facilitate interior drainage, paved with concrete. Architectural screenings and/or plantings are required for this type of facility unless specifically excluded by council action.
- c) Rooftop Storage. Detention storage may be met in total or in part by detention on roofs. Details of such designs, which shall be included in the drainage permit applications, shall include the depth and volume of storage, details of outlet devices and downdrains, elevations of overflow scuppers, design loadings for the roof structure and emergency overflow provisions.
- d) Paved Parking Lots. May be designed to provide temporary storage of storm water on all or a portion of their surfaces to a maximum depth of 9 inches. Outlets will be designed so as to empty the stored waters in such a time to create the least amount of inconvenience to the public. Minimum slopes of 1 percent and maximum slopes of 4 percent are to be utilized.

The minimum freeboard from the maximum water ponding elevation to lowest sill elevation of adjacent buildings or structures shall be 1 foot.

e) PERFORMANCE STANDARDS

- 1) Storm water Channel Location. Generally acceptable locations of storm water runoff channels in the design of a subdivision may include but not be limited to the following:
 - a) In a depressed median of a double roadway, street, or parkway provided the median is wide enough to permit maximum three (3) to one (1) side slopes.
 - b) Centered on back lot lines or entirely within the rear yards of a single row of lots or parcels.
 - c) In each of the foregoing cases, a drainage easement to facilitate maintenance and design flow shall be provided and shown on the plat. No structures will be allowed to be constructed within or across storm water channels.
- 2) Storm Sewer Outfall. The storm sewer outfall shall be designed so as to provide adequate protection against downstream erosion and scouring.

Lot Lines. Whenever the plans call for the passage and/or storage of floodwater, surface runoff, or storm water along lot lines, the grading of all such lots shall be prescribed and established for the passage and/or storage of waters. No structure may be erected in these areas which will obstruct the flow of storm water. Additionally, installation of fences and the planting of shrubbery or trees within the areas will not be permitted. Changes in the grade and contours of the floodwater or storm water runoff

channels will not be permitted unless approved in writing by the Director of Public Works.

- 3) Manholes. All sanitary sewer manholes constructed in a floodplain or in an area designed for the storage or passage of flood or storm water, shall be provided with either a water-tight manhole cover or be constructed with a rim elevation of the design storm, whichever is applicable to the specific area.
- 4) Easements. Permanent easements for the detention and conveyance of storm water, including easements of access to structures and facilities, shall be dedicated to the Public.
- 5) Drainage Permits. A drainage permit for projects including detention facilities can be granted by the Building Official only after the Final Storm water Management Plan has been approved by the Director of Public Works and all covenants and easements have been dedicated, accepted, and recorded, and all required maintenance assurances and required bonds have been executed.

f) SEDIMENTATION AND EROSION CONTROL.

General. Prior to the approval and recording of the final subdivision or land development plan, a plan depicting proposed site grading within the development shall be submitted to the Director of Public Works for review and approval.

For major subdivision developments consisting of more than ten (10) lots, the grading plan shall be accompanied by a detailed sedimentation and erosion control plan.

- 1) Stripping of vegetation or earth moving shall not be permitted nor will building permits be issued prior to approval of this plan by the Director of Public Works.
- 2) SEDIMENT AND EROSION CONTROL. In major developments, or as specifically required by the Director of Public Works, a detailed sediment and erosion control plan shall accompany all grading plan applications. The implementation of the approved plan shall be concurrent with site grading activities for the proposed development and shall remain in effect until the completion of the subdivision or development. The plan submitted shall address the type and characteristics of the soils within the development and an indication shall be made of the potential erodability of the site during construction operations. Methods to prevent sedimentation and erosion of the site shall include, but not be limited to, chemical treatment of the soil, siltation basins, mulches and netting.

Grading Plan (Subdivision). The grading plan shall be prepared by a person qualified under provisions of state law in the State of Missouri. The contents of the plan shall include but not be limited to the following information

- 1) Contours of existing grades at intervals not more than 5 feet. Intervals less than 5 feet may be required dependent on the character of the topography.
 - 2) Property lines identified as to existing or proposed lot and block number.
 - 3) Elevation and location of nearest bench mark (U.S.G.S. datum).
 - 4) Final grading contours drawn at sufficient intervals of not more than 5 feet to depict major subdivision drainage patterns. In addition, final grading spot elevations shall be shown for all corners of each lot. Such corner elevations shall be general in nature and upon approval of the Director of Public Works may be revised at the time of plot plan submittal.
 - 5) 100 year flood plain line with elevation.
 - 6) Easement and right-of-way information including drainage easements required for offsite drainage ways.
 - 7) Existing or proposed utility information.
 - a) GRADING PLAN (INDIVIDUAL LOTS). Applications for individual building permits shall be accompanied by a specific grading plan for that lot. Such grading plan shall be incorporated into the plot plan and shall contain as a minimum, the following information:
 - 1) Property lines identified as to existing or proposed lot and block number.
 - 2) Proposed location of structure.
 - 3) Proposed type of structure (i.e.bi-level, split-level, etc.)
 - 4) Elevations of the top of foundation, proposed grade at principle structure corners and at lot corners.
 - 5) Approximate location of drainage swales indicated by directional arrows depicting flow patterns. Spot elevations may be utilized in lieu of arrows.
- Additional information may be required by the Director of Public Works to assure protection of adjacent property.
- i) MAINTENANCE BONDS. A two-year maintenance bond against defects in workmanship will be required by the City for any portion of the storm water management improvements dedicated to the public.

- j) DRAINAGE PERMITS. Upon approval of the Storm water Management Plan by the Director of Public Works, and acceptance of the applicant's assurances of performance and maintenance as provided in these regulations, the Building Official shall issue a drainage permit. The permit shall set forth the terms and conditions of the approved Storm water Management Plan.
- k) OCCUPANCY. Those wishing to occupy a development without completing the construction in conformance with the approved Final Storm water Management Plan, shall deposit with the Building Official a performance bond, cash escrow, certified check, or other acceptable form of performance security for the full amount of the work to be done as determined by the Director of Public Works. Only upon completion of the construction in conformance with the approved Final Storm water Management Plan, shall an occupancy permit be issued.
- l) Any person aggrieved by any final decision of the Director of Public Works may seek review by a court of competent jurisdiction in the manner provided by the laws of the State of Missouri.
- l) PENALTIES FOR VIOLATIONS-ACTION. The violation of any provision of this title is a misdemeanor, any person, firm, association, partnership or corporation convicted shall be subject to a fine not to exceed Five Hundred Dollars (\$500.00); and the City of St. Joseph, Missouri, shall further have the authority to maintain suits or actions in any court of competent jurisdiction for the purpose of enforcing any provisions of this thereof; and in addition to other remedies, institute injunction, mandamus, or other appropriate action or proceeding to prevent such unlawful erection, construction, reconstruction, alteration, conversion, maintenance, or use, or to correct or abate such violation, or to prevent the occupancy of the building, structure, or land. Each day any violation of this title shall continue shall constitute a separate offense. Additionally, the Building Official may, upon ten days written notice, revoke the occupancy permit issued or to withhold the issuance of any building permit for any or all premises for which the facility exists, abuts or purports to support in the approved Storm water Management Plan or in the alternative, may order utilities disconnected. Nothing in this article shall prevent the Director of Health and Welfare from exercising his authority in relation to nuisances.
- 2) Notwithstanding any other provision of this Article, whenever any property, based on the latest revision of this policy, is determined to need storm water detention facilities which have a capacity of less than 1000 cubic feet, the developer may pay to the City, in lieu of constructing required storm water detention facilities, not less than one (1) dollar for each cubic foot of required detention. This money shall be used by the City to construct drainage improvements within the drainage basin where the storm water facilities should have been constructed. A waiver of the detention facility requirement may not be allowed if the Director of Public Works has made a finding that there is a significant drainage problem below the property where the waiver is proposed even though the detention facility is marginally efficient. The

Director of Public Works may consider in making such determination that the discharge of any additional waters at an increased rate onto the properties below is not desirable due to significant drainage problems that exist on subservient properties. Annually in July, the payment in lieu of construction fee shall be revised by the Director of Public Works to reflect the annual percentage change in construction cost by using the Construction Price Index, increase or decrease, from the previous twelve (12) months. The first adjustment shall be in July, 1990.

- 3) Notwithstanding any other provision of this Article, whenever any property, based on the latest revision of this policy, is located in the upper 1/3 (elevation wise) of the watershed may make application for payment in lieu thereof as provided for in the preceding paragraph. If it is determined by the Director of Public Works that such development without controls is not detrimental to downstream properties, the Director may approve such application. Nothing in this paragraph shall relieve the engineer from providing sufficient calculation, drawings and submittals to the satisfaction of the Director that such uncontrolled release is not detrimental.
- 4) Notwithstanding any other provision of this Article, whenever any property, based on the latest revision of this policy, is located in the lower 1/3 (elevation wise) of the watershed shall make application for payment in lieu thereof as provided for in the preceding paragraph 2. If it is determined by the Director of Public Works that such development without controls is not detrimental to downstream properties, the Director may approve such application. Nothing in this paragraph shall relieve the engineer from providing sufficient calculation, drawings and submittals to the satisfaction of the Director that such uncontrolled release is not detrimental.

CUBIC FEET OF WATER RETENTION

100 YEAR STORM *** 25 ACRES OR LESS ONLY ***
 100yr Post Development minus 100yr Pre-Development
 % IMPROVED

	10	20	30	40	50	60	70	80	90	100
.1	32	65	97	130	162	194	227	259	292	324
.2	65	130	194	259	324	389	454	518	583	648
.3	97	194	292	389	486	583	680	778	875	972
.4	130	259	389	518	648	778	907	1037	1166	1296
.5	162	324	486	648	810	972	1134	1296	1458	1620
.7	227	454	680	907	1134	1361	1588	1814	2041	2268
.8	259	518	778	1037	1296	1555	1814	2074	2333	2592
.9	291	582	874	1165	1456	1747	2038	2330	2621	2912
1.0	324	648	972	1296	1620	1944	2268	2592	2916	3240
1.25	405	810	1215	1620	2025	2430	2835	3240	3645	4050
1.50	486	972	1458	1944	2430	2916	3402	3888	4374	4860
1.75	567	1134	1701	2268	2835	3402	3969	4536	5103	5670
2.00	648	1296	1944	2592	3240	3888	4536	5184	5832	6480
3.00	1166	2333	3499	4666	5832	6998	8165	9331	10498	11664
4.00	1555	3110	4666	6221	7776	9331	10886	12442	13997	15552
5.00	2268	4536	6804	9072	11340	13608	15876	18144	20412	22680
10.00	5238	10476	15714	20952	26190	31428	36666	41904	47142	52380

USE LARGEST NUMBER OR COMBINATION OF NUMBERS TO ARRIVE AT ANY ACERAGE

EXAMPLE: 6 ACRES USE 5 + 1
 12 ACRES USE 10 + 2
 23.1 ACRES USE 10 + 10 + 3 + .1

Or use 3240 MULTIPLIED BY # ACRES MULTIPLIED BY % IMPROVED

CUBIC FEET OF WATER RETENTION

25 YEAR STORM *** 25 ACRES OR LESS ONLY ***
 25yr Post Development minus 25yr Pre-Development
 % IMPROVED

For retainage (cu.ft.) Use 2670 MULTIPLIED BY # ACRES MULTIPLIED BY % IMPROVED
 For release rate (cfs.) use 2.04 multiplied by # of Acres