

ORDINANCE NO. 4216

AN ORDINANCE OF THE CITY OF MESQUITE, TEXAS, AMENDING CHAPTER 11 OF THE CODE OF THE CITY OF MESQUITE, TEXAS, BY DELETING ARTICLE V IN ITS ENTIRETY AND ADDING A NEW ARTICLE V THEREBY REVISING THE STORMWATER AND FLOOD PROTECTION ORDINANCE; PROVIDING FOR A PENALTY NOT TO EXCEED TWO THOUSAND (\$2,000.00) DOLLARS FOR EACH OFFENSE; PROVIDING A REPEALER CLAUSE; AND PROVIDING A SEVERABILITY CLAUSE.

WHEREAS, the Stormwater and Flood Protection Ordinance was approved by the City Council on July 17, 1995, and

WHEREAS, the City Council adopted revisions in October 2002 that altered requirements for floodplain modifications and adopted revisions in August 2006 that modified the drainage variance procedure; and

WHEREAS, the intent of the ordinance was to provide a high degree of protection from flooding for developments when the drainage basin was fully developed; and

WHEREAS, the City has not received a single report of house flooding in subdivisions built under the 1995 drainage ordinance; and

WHEREAS, the primary reason for these revisions is to include language required by the Federal Emergency Management Agency (FEMA).

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF MESQUITE, TEXAS:

SECTION 1. That Chapter 11 of the Code of the City of Mesquite, Texas, is hereby amended by deleting Article V in its entirety and adding a new Article V to read as follows, said Code and Chapter in all other respects to remain in full force and effect:

ARTICLE V. - DRAINAGE AND FLOOD HAZARD AREA REGULATIONS*

DIVISION 1. - GENERALLY

Sec. 11-121. Title.

This article shall be known as the "Stormwater and Flood Protection Ordinance" of the City of Mesquite, and shall consist of [originally] a 91-page document attached hereto and made a part of this article.

***Note** – Tables 1-11 and Figures 1-22, referenced in this article, are not set out herein, but are on file and available for inspection in the offices of the City Engineer.

Sec. 11-122. Findings of fact.

- (a) The drainage ways and flood hazard areas of the City of Mesquite, Texas, are subject to periodic inundation which may result in loss of life and property health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, all of which adversely affect the public health, safety and general welfare.
- (b) These floods losses are created by the cumulative effect of obstructions in floodplains that increase flood heights and velocities and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, flood-proofed or otherwise protected from flood damage.

Sec. 11-123. Statement of purpose.

This article sets forth the minimum requirements necessary to provide and maintain a safe, efficient and effective drainage system within the City and to establish the various public and private responsibilities for the provision thereof. Further, it is the purpose of this article to:

- (1) Protect human life, health and property;
- (2) Minimize expenditure of public money for drainage related projects;
- (3) Minimize damage due to drainage to public and private facilities and utilities such as water and gas mains, electric service, telephone and sewer lines, streets and bridges;
- (4) Help maintain a stable tax base and preserve land values;
- (5) Insure that potential buyers are notified that property is in an area of special flood hazard;
- (6) Insure that those who occupy the areas of special flood hazard assume responsibility for their actions;
- (7) Preserve the natural beauty and aesthetics of the community;
- (8) Control and manage all stormwater runoff and drainage from points and surfaces within subdivisions; and
- (9) Establish a reasonable standard of design for development which prevents potential flood and stormwater damage.

Sec. 11-124. Scope of authority and statutory authorization.

These regulations are adopted pursuant to the authority provided in Section 16.315 of the Flood Control and Insurance Act of the Texas Water Code which delegates to political subdivisions the responsibility for adopting regulations designed to minimize flood losses.

Any person, firm, corporation or business proposing to develop land or improve property within the City is subject to the provisions of this article. This article also applies to individual building structures, subdivisions, excavations grading and fill operations, and similar activities. The scope of authority extends to additional improvements on projects, developments, subdivisions, etc. which were previously permitted and/or constructed under the authority of prior ordinances or guidelines.

Sec. 11-125. Organization of this article.

This article revises the provisions Chapter 11, Article V of the Code of the City of Mesquite, Texas, "Comprehensive Drainage Ordinance" and subsequent revisions. Further, it expands and clarifies various aspects of these ordinances. The following list is a synopsis of the contents of each article.

- Article 1 - Discusses the purposes, scope and authority of this ordinance, and provides a penalty for noncompliance with this ordinance.
- Article 2 - Lists and defines various terms used in this ordinance.
- Article 3 - States general provisions related to implementation and enforcement of this ordinance.
- Article 4 - Overviews the administrative procedures to be followed for obtaining the necessary city drainage approvals related to building on or improving property.
- Article 5 - Explains the methodologies to calculate runoff quantities.
- Article 6 - Gives the design standards for building local drainage systems (i.e., enclosed storm sewers).
- Article 7 - States additional design standards for specialty drainage system items.
- Article 8 - Presents the floodplain regulations, including the requirements to be met when reclaiming floodplain land.

Sec. 11-126. Related ordinances.

In addition to this article, the City has other ordinances, regulations and specifications pertaining to drainage and storm sewer facilities. These other documents include the zoning and subdivision ordinances, and shall remain in full force and effect. If there is any conflict between such prior ordinance and this article, this article shall prevail.

Sec. 11-127. Definitions.

Unless specifically defined below, words or phrases used in this article shall be interpreted to give them the meaning they have in common usage and to give this article its most reasonable application:

Angle of flare means the angle between direction of a wingwall and centerline of culvert or storm drainage outlet or inlet.

Appeal means a request for review or interpretation of any provisions of this article or a request for a variance.

Area of shallow flooding means a designated AO or AH zone on the flood insurance rate map (FIRM). The base flood depths range from one to three feet; a clearly defined channel does not exist; and the path of flooding is unpredictable and indeterminate.

Area of special flood hazard means the land in the floodplain within a community subject to a one percent or greater chance of flooding in any given year.

Base flood means the flood having a one percent chance of being equaled or exceeded in any given year, determined based upon FEMA guidelines and as shown in the current effective flood insurance study.

Base flood elevation means the water surface elevation resulting from the base flood.

Best management practices (BMP) consists of schedules of practices, maintenance procedures and other management practices to prevent or reduce the pollution of waters of the United States. This also includes treatment requirements, operating procedures and practices to control construction site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

City means the City of Mesquite, Texas, or the City Council of Mesquite.

City Engineer means the person appointed to the position of City Engineer by the City Manager of the City or the City Engineer's duly authorized representative.

Commencement of construction means the disturbance of soils associated with clearing, grading or excavating activities or other construction activities.

Conduit means any closed device for conveying flowing water.

Critical feature means an integral and readily identifiable part of a flood protection system, without which the flood protection provided by the entire system would be compromised.

Design flood means the flood having a one percent chance of being equaled or exceeded in any given year based upon fully developed watershed conditions.

Detention basin means a dry basin or depression constructed for the purpose of temporarily storing stormwater runoff and discharging all of that water over time at a reduced rate than would have otherwise occurred.

Developer/builder means a person, partnership or corporation engaged in the development of land and/or building of structures and not excluded by exemption sections of this article.

Development means any manmade change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation, drilling operations, grading or clearing.

Discharge means any addition or introduction of any pollutant, stormwater or any other substance whatsoever into the municipal separate storm sewer system or into waters of the United States.

Discharger means any person who causes, allows, permits or is otherwise responsible for, a discharge, including, without limitation, any operator of a construction site or industrial facility.

Elevated building in the case of Zones A1—30, A, A99, AO, B, C, D, VI—V30, and any other designated FEMA Zone, an "elevated building" includes a building elevated by means of fill so that the finished floor of the building is at least two feet above the water surface elevation of the design flood.

Entrance head means the head required to cause flow into a conduit or other structure; it includes both entrance loss and velocity head.

Entrance loss means head lost in eddies or friction at the inlet to a conduit, headwall or structure.

Environmental Protection Agency (EPA) means the United States Environmental Protection Agency, the regional office thereof, any federal department, agency or commission that may succeed to the authority of the EPA, any duly authorized official of EPA or such successor agency.

Equal conveyance means the principle of reducing stream conveyance for a proposed alteration with a corresponding reduction in conveyance to the opposite bank of the stream. The right of equal conveyance applies to all owners and uses and may be relinquished only by written agreements.

Erosion means the wearing away of the land surface by running water, wind, ice or other geological agents, including such processes as gravitational creep. In this manual, erosion due to stormwater runoff is the primary design issue.

Existing construction means, for the purposes of determining rates, structures for which the "start of construction" commenced before the effective date of December 19, 1977. "Existing construction" may also be referred to as "existing structures."

Facility means any building, structure, installation, process or activity from which there is or may be a discharge of pollutant.

Federal Emergency Management Agency (FEMA) means the federal agency which administers National Flood Insurance Program.

Final stabilization means the status when all soil disturbing activities at a site have been completed and a uniform perennial vegetative cover with a density of 70 percent of the cover for unpaved areas and areas not covered by permanent structures have been established or equivalent permanent stabilization measures (such as the use of riprap, gabions or geotextiles) have been employed.

Flood or flooding means a general and temporary condition of partial or complete inundation of normally dry land areas from:

- (1) The overflow of inland waters and/or
- (2) The unusual and rapid accumulation or runoff of surface waters from any source.

Flood insurance rate map (FIRM) means the official map on which the Federal Emergency Management Agency has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.

Flood insurance study means the official report in which the Federal Emergency Management Agency has provided flood profiles, the water surface elevation of the base flood, as well as the flood boundary-floodway map.

Floodplain or flood-prone area means any land area susceptible to being inundated by water from any source (see definition of flooding).

Flood protection system means those physical structural works for which funds have been authorized, appropriated and expended, and which have been constructed specifically to modify flooding in order to reduce the extent of the areas within a community subject to a "special flood hazard" and the extent of the depths of associated flooding. Such a system typically includes hurricane tidal barriers, dams, reservoirs, levees or dikes. These specialized flood modifying works are those constructed in conformance with sound engineering standards.

Flume means any open conduit on a prepared grade, trestle or bridge.

Freeboard means the distance between the design flood elevation and the top of an open channel, dam, levee or detention basin to allow for wave action, floating debris or any other condition or emergency without overflowing the structure.

Functionally dependent use means a use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities.

Harmful quantity means the amount of any substance that will cause pollution of water in the state.

Highest adjacent grade means the highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.

Hydraulic gradient means a line representing the pressure head available at any given point within the drainage system.

Levee means a manmade structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control or divert the flow of water so as to provide protection from temporary flooding.

Levee system means a flood protection system which consists of a levee or levees and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices.

Local jurisdiction means the local governing body in which the construction takes place (known also as the City).

Lowest floor means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor, provided that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of FEMA under 44 CFR, 60.3.

Manning equation means the uniform flow equation used to relate velocity, hydraulic radius and energy gradient slope.

Manufactured home means a structure transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities. For floodplain management purposes, the term "manufactured home" also includes park trailers, travel trailers and other similar vehicles placed on a site for greater than 180 consecutive days. The "manufactured home" does not include a "recreational vehicle."

Manufactured home park or subdivision means a parcel or contiguous parcels of land divided into two or more manufactured home lots for rent or sale.

Maximum extent practicable (MEP) means the goal of pollutant reduction through the use of best management practices.

Mean sea level means, for purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929 or other datum, to which base flood elevations shown on a community's flood insurance rate map are referenced.

Municipal separate storm sewer system (MS4) means the system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels or storm drains) owned and operated by the City and designed or used for collecting or conveying stormwater, and which is not used for collecting or conveying sewage.

Municipal solid waste means solid waste resulting from or incidental to municipal, community, commercial, institutional or recreational activities, and includes garbage, rubbish, ashes, street cleanings, dead animals, abandoned automobiles and other solid waste other than industrial waste.

Natural drainage means the dispersal of surface waters through ground absorption and by drainage channels formed by the existing surface topography which exists at the time of adoption of this article or formed by any manmade change in the surface topography.

Natural floodway means the effective area of a channel, of a river or other water course and the adjacent land areas that must be reserved in order to discharge the "design flood" without cumulatively increasing the water surface elevation. This floodway differs from the FEMA "regulatory floodway."

New construction means structures for which the "start of construction" commenced on or after the effective date of December 19, 1977.

Open channel means a channel in which water flows with a free surface.

Operator means the person or persons who, either individually or taken together, meet the following two criteria:

- (1) They have operational control over the facility specifications (including the ability to make modifications in specifications); and
- (2) They have the day-to-day operational control over those activities at the facility necessary to ensure compliance with pollution prevention requirements and any permit conditions.

Other municipal ordinances means ordinances such as, but not limited to, zoning, subdivision and erosion.

Owner means the person who owns a facility or part of a facility.

Person means any individual, partnership, co-partnership, firm, company, corporation, association, joint stock company, trust, estate, governmental entity or any other legal entity; or their legal representatives, agents or assigns. This definition includes all federal, state and local governmental entities.

Pollutant means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical waste, biological materials, radioactive materials, rock, sand, dirt or cellar dirt generated as part of a construction project.

Pollution means the alteration, due to a construction project, of the physical, thermal, chemical or biological quality of, or the contamination of, any water in the state that renders the water harmful, detrimental or injurious to humans, animals life, vegetation or property, or to the public health, safety or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.

Probable maximum flood (PMF) means the flood magnitude that may be expected from the most critical combination of meteorologic and hydrologic conditions that are reasonably possible for a given watershed.

Probable maximum precipitation (PMP) means theoretically the greatest depth of precipitation for a given duration that is physically possible over a given size storm area at a particular geographical location at a certain time of the year.

Qualified personnel means persons who possess the appropriate competence, skills and ability (as demonstrated by sufficient education, training, experience and/or, when applicable, any required certification or licensing) to perform a specific activity in a timely and complete manner consistent with the applicable regulatory requirements and generally accepted industry standards for such activity.

Rational formula means the means of relating runoff with the area being drained and the intensity of the storm rainfall.

Recreational vehicle means a vehicle which is:

- (1) Built on a single chassis;
- (2) Four hundred square feet or less when measured at the largest horizontal projections;
- (3) Designed to be self-propelled or permanently towable by a light duty truck; and
- (4) Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel or seasonal use.

Registered landscape architect (RLA) means a person who has been duly licensed and registered to practice landscape architecture by the Texas Board of Architectural Examiners.

Registered professional engineer (RPE) means a person who has been duly licensed and registered by the State Board of Registration for Professional Engineers to engage in the practice of engineering in the State of Texas.

Regulatory floodway means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the "base flood," as calculated by the Federal Emergency Management Agency, without cumulatively increasing the water surface elevation more than a designated height. This floodway is used by FEMA to determine compliance with its regulations.

Retention basins means a pond or other water body which has been designed to have both a conservation pool for holding some water indefinitely and a flood storage pool for storing stormwater runoff on a temporary basis for the purpose of reducing the peak discharge from the basin.

Sanitary sewer (or sewers) means the system of pipes, conduits and other conveyance which carry industrial waste and domestic sewage from residential dwellings, commercial buildings, industrial and manufacturing facilities, and institutions, whether treated or untreated, to the sewage treatment plant serving the City (and to which stormwater, surface water and groundwater are not intentionally admitted).

Sediment means the soil particles deposited through the process of sedimentation as a product

of erosion. These soil particles settle out of runoff at variable rates based on the size of the particle and soil type.

Site means the land or water area where any facility or activity is physically located or conducted, including adjacent land used in connection with the facility or activity.

Standard project flood means flood that has a magnitude of approximately one-half of the probable maximum flood, as determined on a case-by-case basis using Corps of Engineers' current criteria.

Start of construction for a structure, "start of construction" includes substantial improvement and means the date the development or building permit was issued, provided the actual start of construction, repair, reconstruction, placement or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction of a structure does not include land preparation, such as clearing, grading and filling, nor does it include the installation of streets and/or walkways; nor does it include excavation for basement, footings, piers or foundations, or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure.

Stormwater means stormwater runoff, snow melt runoff, surface runoff and drainage.

Stormwater pollution prevention plan (SWPPP) means a plan required by either the construction general permit or the industrial general permit and which describes and ensures the implementation of practices that are to be used to reduce the pollutants in stormwater discharges associated with construction or other industrial activity at the facility.

Structure means a walled and roofed building, a manufactured home, a gas or liquid storage tank, or a substation that is principally above ground.

Substantial improvement any combination of repairs, reconstructions or improvements of a structure, the cumulative cost of which equals or exceeds 50 percent of the initial market value of the structure either:

- (1) Before the first improvement or repair is started, or
- (2) If the structure has been damaged and is being restored, before the damage occurred.

For the purpose of this definition, "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. Incremental improvements over a period of time, the cumulative cost of which equals or exceeds 50 percent of the market value at the time of the first improvement, shall be considered as a "substantial improvement."

The term does not, however, include either:

- (1) Any project for improvement of a structure to comply with existing state or local health, sanitary, or safety code specifications which are solely necessary to assure safe living conditions, or
- (2) Any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.

Surety means a corporation surety bond, cash or certificate of deposit.

Time of concentration means the estimated time in minutes or hours required for a drop of water to flow from the most remote point in the drainage area to the point at which the flow is to be determined.

Use any purpose for which a building or other structure or a tract of land may be designed, arranged, intended, maintained or occupied; or any activity, occupation, business or operation carried on, or intended to be carried on, in a building or other structure or on a tract of land.

Use permit means the permit required before any use may be commenced.

Variance means a grant of relief to a person from the requirements of this article when specific enforcement would result in unnecessary hardship. A variance, therefore, permits construction or development in a manner otherwise prohibited by this article.

Violation means the failure of a structure or other development to be fully compliant with this article. A structure or other development without the FEMA elevation certificate prior to a certificate of occupancy, other certifications or other evidence as required by the City Manager, is presumed to be in violation until such time as that documentation is provided.

Watershed means the area drained by a stream or drainage system.

Waters of the United States means all waters which are currently used, were used in the past or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; all interstate waters, including interstate wetlands; all other waters the use, degradation or destruction of which would affect or could affect interstate or foreign commerce; all impoundments of waters otherwise defined as waters of the United States under this definition; all tributaries of waters identified in this definition; all wetlands adjacent to waters identified in this definition; and any waters within the federal definition of "waters of the United States" at 40 CFR 122.2; but not including any waste treatment systems, treatment ponds or lagoons designed to meet the requirements of the Federal Clean Water Act.

Water surface elevation means the height, in relation to the NGVD of 1929 (or other datum, where specified), of floods of various magnitudes and frequencies in the floodplains of riverine areas.

Wetlands means areas identified and designated by the U.S. Army Corps of Engineers as wetlands. (ORD 2726 – Bird Sanctuary)

Sec. 11-128. Lands to which this article applies.

This article shall apply to all areas of land within the jurisdiction of the City of Mesquite, Texas. Certain provisions of this article apply only to special flood hazard areas within the jurisdiction of the City of Mesquite, while other provisions exempt certain other tracts. These limited areas of application are explained in the applicable provisions (See Section 11-208). This article also extends the scope of authority to additional improvements on projects, developments, subdivisions, etc., which were previously permitted and/or constructed under the authority of prior ordinances or guidelines.

Sec. 11-129. Basis for establishing the areas of special flood hazard.

The areas of special flood hazard identified by the Federal Emergency Management Agency in the current scientific and engineering report entitled, "The Flood Insurance Study (FIS) for Dallas County, Texas and Incorporated Areas," dated February 5, 2003 & August 23, 2001, with accompanying Flood Insurance Rate Maps (FIRM) dated February 5, 2003 & August 23, 2001, "Kaufman County, Texas and Incorporated Areas," dated July 3, 2012 with accompanying Flood Insurance Rate Maps (FIRM) dated July 3, 2012, and any revisions thereto are hereby adopted by reference and declared to be a part of this article.

The flood insurance study is on file in the office of the City Engineer.

Sec. 11-130. Penalty clause.

Any person, firm or corporation violating any of the provisions of this article shall be deemed guilty of a misdemeanor and, upon conviction, shall be punished by a penalty or fine not to exceed the sum of two thousand dollars (\$2,000.00) for each offense, and each and every day such offense is continued shall constitute a new and separate offense. In addition, the violator shall pay all costs and expenses involved in the case. Nothing herein contained shall prevent the City from taking such other lawful action as is necessary to prevent or remedy any violation. Section 11-148(c) states an additional penalty against persons proceeding with construction without obtaining the necessary permits from the City.

Sec. 11-131. Repealing clause.

The Drainage; Flood Control Ordinance, Chapter 11, Article 11, Section 11-26 through 11-40 of the new Code of the City of Mesquite, Texas (Ordinance No. 2720), heretofore adopted by the City Council of Mesquite, Texas, shall be and the same are hereby expressly repealed. All provisions of all ordinances conflicting with the provisions hereof are hereby repealed. All other ordinances and provisions of such ordinances not expressly in conflict with the provisions hereof shall remain in full force and effect.

Sec. 11-132. Abrogation and greater restrictions.

This article is not intended to repeal, abrogate or impair any existing easements, covenants or deed restrictions. However, where this article and other ordinance, easement, covenant or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

Sec. 11-133. Interpretation.

In the interpretation and application of this article, all provisions shall be:

- (1) Considered as minimum requirements;
- (2) Liberally construed in favor of the governing body; and
- (3) Deemed neither to limit nor repeal any other powers granted under state statutes.

Sec. 11-134. Warning and disclaimer of liability.

The degree of flood protection required by this article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by manmade or natural causes. This article does not imply that land outside the area of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. This article shall not create liability on the part of the City, any officer or employee thereof or the Federal Emergency Management Agency for any flood damages that result from reliance on this article or any administrative decision lawfully made thereunder.

Sec. 11-135. Severability.

If any section, paragraph, clause, phrase or provision of this article shall be adjudged invalid or held unconstitutional, the same shall not affect the validity of this article as a whole or any part or provision thereof, other than the part so decided to be invalid or unconstitutional; nor shall such unconstitutionality or invalidity have any effect on any other ordinances or provisions of ordinances of the City.

Secs. 11-136 – 11-145. Reserved.

DIVISION 2. - ADMINISTRATION

Sec. 11-146. Duties of city officials.

- (a) *Duties of the City Manager.* The City Manager is hereby appointed to administer and implement the floodplain management portions of this article, including Division 6 and other appropriate sections of 44 CFR (National Flood Insurance Program Regulations) pertaining to floodplain management. The duties of the City Manager or his designee shall include but

not be limited to:

- (1) Review and approval of all development permits to determine that the permit requirements of this article have been met and that all necessary state and federal permits have been obtained;
 - (2) Obtain and record the actual elevation in relation to mean sea level of the lowest habitable floor, including basement of all new or substantially improved structures, and whether or not the structure contains a basement;
 - (3) Maintain for public inspection all records pertaining to the provisions of this article, including flood-proofing certifications;
 - (4) Notify adjacent communities and the Texas Natural Resources Conservation Commission prior to any alteration or relocation of a watercourse and submit evidence of such notification to the Federal Emergency Management Agency;
 - (5) Require that maintenance is provided within the altered or relocated portion of said watercourse so that the flood-carrying capacity is not diminished;
 - (6) Make interpretations, where needed, as to the exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions); and
 - (7) Obtain, review and reasonably utilize any base flood elevation data available from a federal, state or other source, in order to administer this article when base flood elevation data has not been provided.
- (b) *Duties of the City Engineer.* The City Engineer is hereby appointed to administer and implement the storm drainage system portion of this article, and to assist the City Manager with the technical aspects of the floodplain management portions of this article.

Sec. 11-147. Responsibilities of owners.

The owner or developer of property to be developed shall be responsible for all storm drainage flowing through or abutting such property. This responsibility also includes drainage directed to that property by ultimate development as well as the drainage naturally flowing through the property by reason of topography. It is the intent of this article that provision be made for storm drainage at such time as any property affected is proposed for development, use or modification.

Where the improvement or construction of a storm drainage facility is required along a property line common to two or more owners, the owner hereafter proposing development of the property shall be responsible for the required improvements at the time of development, including the dedication of all necessary rights-of-way or easements, to accommodate the improvements.

Where a property owner proposes development or use of only a portion of the property, provision for storm drainage shall only be required in that portion of the property proposed for immediate development, except as construction or improvements of a drainage facility outside that

designated portion of the property is deemed essential to the development of that designated portion.

Owners shall provide for stormwater runoff and design drainage related facilities in accordance with and/or in a compatible manner with any future City of Mesquite master drainage study and plan in effect at the time when plans for drainage facilities are submitted to the City for approval.

Owners and associations shall provide the dedication of drainage easements and shall perform maintenance activities within the dedicated easements as required by this article.

In addition, owners may be required to provide at their expense a preliminary drainage study for the total area to be ultimately developed. This study shall be submitted to the City Engineer as a part of the submitted data for consideration of preliminary plat or site plan approval for the portion of the property proposed for immediate development.

Sec. 11-148. Permits.

The City has several permits related to storm drainage. Some of these permits are listed below and explained in detail in the following paragraphs. Permits required by other ordinances may also be needed.

- (a) *Development permit.* All developers, owners or builders shall obtain and submit for approval a development permit application for new construction, placement of fill, new manufactured home sites, alteration of a waterway, substantial improvements to existing structures or manufactured homes, or improvements to existing structures, or manufactured homes in the floodplain of the design flood that will result in increasing the overall outside dimensions of the structure or manufactured home. The application form can be obtained from the office of the City Engineer. The City Engineer uses this form, along with duplicate copies of the accompanying engineering or architectural plans, to identify those construction or renovation projects that would occur in a flood hazard area. As a minimum, the engineering or architectural plans shall show to scale:
 - (1) The nature, location, dimensions and elevations in relation to mean sea level of the area in question.
 - (2) The elevation in relation to mean sea level and the location of existing or proposed structures, fill, storage of materials and/or drainage facilities.
 - (3) The elevation in relation to mean sea level to which an existing non-residential structure shall be flood-proofed, the location of the foregoing.
 - (4) Any off-site facilities or conditions that may either affect on-site conditions or be affected by on-site conditions.
 - (5) Developers, owners or builders shall also obtain a development permit prior to filling in a floodplain; channelizing, impounding, realigning, deepening or otherwise modifying a natural drainage way; making improvements, substantial or otherwise, to existing

structures or manufactured homes in a floodplain if the improvements result in the increase of the overall outside dimensions of the structures or manufactured homes; or otherwise reclaiming floodplain land. Section 11-149(b) identifies the information that must be submitted to the City Engineer. No floodplain alterations shall begin until a permit is issued by the City Engineer.

If an existing non-residential structure is proposed for flood-proofing, then a certificate sealed by a registered professional engineer in the State of Texas shall be submitted stating that all of the flood-proofing criteria listed in Section 11-207 will be met. Construction or renovation projects cannot begin until the City issues the development permit.

- (b) *Elevation certificate.* Developers, owners or builders adjacent to the design floodplain, other existing creeks, swales or ditches, or other flood prone areas as designated by the City Engineer shall complete an elevation certificate prior to issuance of a certificate of occupancy by the City. Elevation certificate forms can be obtained at the office of the City Engineer.
- (c) *Proceeding without the applicable permits.* Any developer, owner or builder who fails to obtain the applicable development or other necessary permits before beginning the subject project is in violation of this article. Furthermore, any act or omission of any owner or developer of land subject to the provisions herein which has as its effect the circumventing of the intent and purpose of this article shall be considered in violation of same. In addition to the penalties outlined in Section 11-130, no building permit, plat, site plan or certificate of occupancy shall be issued for any construction, reconstruction or development upon any land where such construction, reconstruction or development is not in conformity with the requirements and intent of this article. Anyone who violates any of the terms and provisions of this article shall be denied a building permit, etc., until the violation is corrected.
- (d) *Deviations from permit terms.* Permits may be revoked by the City Engineer if, upon periodic inspection, he determines that the work is not progressing in accordance with specifications of the approved plan and permit.

Field changes to storm sewer plans can be made only upon approval by the City Engineer. Record drawings shall be submitted to the City Engineer at the completion of the project.

Sec. 11-149. Plan requirements.

Plan requirements for stormwater drainage systems and floodplain alterations are listed below. All engineering plans shall be sealed by a professional engineer who is registered in the State of Texas and experienced in civil engineering work. The total cost for such engineering plans and specifications shall be borne by the owner or the developer and shall be furnished to the City Engineer for review and approval.

- (a) *Drainage plans.* As part of the platting process, drainage plans shall be prepared. These plans shall include drainage facilities for both off-site and on-site drainage so that the proper transition between the two can be maintained. Criteria for on-site development shall also apply to off-site improvements.

The construction of all improvements shall be in accordance with the current Standard Specifications for Public Works Construction by the North Central Texas Council of Governments as amended by the City of Mesquite, and Design Standards of the City of Mesquite.

The drainage plans shall include:

(1) *Drainage area map:*

- a. Use one inch equals 200-foot scale for the development and up to one inch equals 2,000 feet for creeks and off-site areas, provide that the scale is adequate for review and show match lines between any two or more maps.
- b. Show existing and proposed storm sewers and inlets.
- c. Indicate sub-areas for each alley, street, off-site, etc.
- d. Indicate contours on map for on- and off-site.
- e. Indicate zoning on drainage area.
- f. Show points of concentration.
- g. Indicate runoff at all inlets, dead-end streets and alleys, or to adjacent additions or acreage.
- h. Provide runoff calculations for all areas showing acreage, runoff coefficient, inlet time and storm frequency.
- i. Indicate all crests, sags, and street and alley intersections with flow arrows.
- j. Show limits of each plan profile sheet.

(2) *Plan profile sheets:*

- a. Show plan and profile of all storm sewers on separate sheets from paving plans.
- b. Indicate concrete cushions or embedment where applicable.
- c. Specify reinforced concrete Class III pipe unless otherwise noted. Use heavier pipe where crossing railroads, deep fill or heavy loads.
- d. Indicate property lines along storm sewer and show easements with dimensions.
- e. Show all existing utilities in plan and profile of storm sewers.
- f. Indicate existing and proposed ground line and improvements on all street, alley and storm sewer profiles.

- g. Show hydraulic gradient with computations.
- h. Show laterals on trunk profile with stations.
- i. Number inlets according to the number designation given for the area or sub-area contributing runoff to the inlet.
- j. Indicate size and type of inlet on plan view, lateral size and flow line, paving station and top of curb elevation.
- k. Indicate quantity and direction of flows at all inlets, stubouts, pipes and intakes.
- l. Show future streets and grades where applicable.
- m. Show water surface at outfall of storm sewer velocity and typical section of receiving water body.
- n. Where fill is proposed or trench cut in creeks or outfall ditches, specify compacted fill and compaction criteria.
- o. Show size of pipe, length of each pipe size, stationing at 100-foot intervals in the plan view.
- p. Begin and end each sheet with even or 50-foot stationing.
- q. Show diameter of pipes, physical grade, discharge, capacity of pipe, slope of hydraulic gradient and velocity in the pipe in the profile view.
- r. Show elevations of flow lines at 100-foot intervals on the profile.
- s. Give bench mark information.
- t. Show capacities, flows, velocities, etc., of the existing system into which the proposed system is being connected.
- u. Show details of all connection boxes, headwalls on storm sewer, flumes or any other item not a standard detail.
- v. Provide lateral profiles and where utilities are crossed, show all utilities in profile.
- w. Show headwalls and specify type for all storm sewers at outfall.
- x. Show if curbing in alleys is needed to add extra capacity.
- y. Provide flat grade on alleys and streets at discharge into streets.
- z. Show curve data for all storm sewers.
- aa. Tie storm sewer stationing with paving stations.

- bb. On all dead-end streets and alleys, show grades for drainage overflow path on the plan and profile sheets, and show erosion controls.
- cc. Specify concrete strength for all structures.
- dd. Provide sections for road, railroad and other ditches with profiles and hydraulic computations. Show design water surface on profile.

(3) *Bridge plans:*

- a. Show the elevation of the lowest member of the bridge and 100-year water surface elevation.
- b. Indicate borings on plans.
- c. Provide soils report.
- d. Show bridge sections upstream and downstream.
- e. Provide hydraulic calculations on all sections.
- f. Provide structural details and calculations with dead load deflection diagram.
- g. Provide vertical and horizontal alignment.

(4) *Creek alteration and channel and ditch plans:*

- a. Show stationing in plan and profile.
- b. Indicate flow line, banks, design water surface and freeboard. Show hydraulic computations.
- c. Indicate nature of banks such as rock, earth, etc.
- d. Provide cross-sections with ties to property lines and easements.
- e. Show side slopes of creek, channels, etc.
- f. Specify compacted fill where fill is proposed.
- g. Indicate any adjacent alley or street elevations on creek profile.
- h. Show any temporary or permanent erosion controls.
- i. Indicate existing and proposed velocities.
- j. Show access and/or maintenance easements.

- k. As necessary, show ground elevations parallel to the top of bank to show how runoff is prevented from overland flow into the creek or channel.

(5) *Detention and retention facilities:*

- a. Show plan view of detention/retention area and outlet structure.
- b. Delineate limits of conservation pool, sediment storage area, flood storage pool and/or freeboard.
- c. Indicate size, dimension, total capacity, design discharge and velocity of the outlet structure.
- d. Show any erosion control features at the discharge point of the outlet structure.
- e. Specify side slopes of basin and outlet structure.
- f. Show existing or proposed structures or other facilities downstream of the outlet structure and emergency spillway, and provide information sufficient to show that the downstream facilities will not be inundated or otherwise affected by the discharge from the basin.
- g. Indicate locations and quantities of all inflows to the basin.
- h. State the design time to empty the basin.

(6) *Levees:*

- a. Show location, extent, nature, dimensions, etc., of levee embankments and associated interior and exterior drainage facilities.
- b. Provide engineering analysis addressing potential erosion of the levee embankments during flood events.
- d. Provide engineering analysis of levee embankment stability and seepage through the levee during flood events.
- d. Demonstrate that future settlement of the levee embankments will not result in freeboard dropping below the minimum requirements. Provide geotechnical reports showing anticipated levee consolidation.
- e. Analyze interior drainage concerns. Identify sources of interior flooding, and extent and depth of such flooding, assuming a joint probability of interior and exterior flooding. Consider capacity of pumps and other drainage devices for evacuating interior waters.
- f. Write an operations manual which discusses the flood warning system to trigger closures; closure operations, procedures and personnel; operation plans for interior drainage facilities; at least an annual inspection program; and maintenance plans,

procedures and frequency.

- g. Provide all other information required in Section 11-188 and any other information requested or required by the City Engineer and/or the Federal Emergency Management Agency.
- (b) *Floodplain alteration plans.* The materials listed below shall be submitted as part of the application for a development permit. It is recommended that applicants coordinate the application materials listed below with those needed for other city permits and with the data requirements of the Federal Emergency Management Agency. Such coordination will facilitate staff review and drawings could be combined so as to save the applicant from multiple drawings.
- (1) An engineering report consisting of at least:
 - a. Project description.
 - b. Description of the hydrologic and/or hydraulic analyses used, including method used to determine historic rainfall and stream data, soils reports used to determine erosive velocity values, and discharges and water surface elevations for both the design and base floods.
 - c. Vicinity map.
 - d. Evaluation of the "natural floodway" and floodplain limits for the design flood. The "natural floodway" differs from the FEMA "regulatory floodway." The "natural floodway" is established to allow the City of Mesquite to effectively manage floodplain areas. FEMA requirements for the "regulatory floodway" must also be met by applicants.
 - e. If hydraulic analyses are being submitted, then a table of values for existing and proposed water surface elevations and velocities must be included.
 - f. Documentation that the principle of equal conveyance has been achieved.
 - g. Copies of computer input and output data for existing and proposed conditions for both the base flood and design flood discharges.
 - h. Evaluation of existing and proposed valley storage (see Article 8 for design requirements).
 - (2) Engineering drawings consisting of at least:
 - a. Water surface profile, including channel flow line, existing and proposed water surface elevations, recorded high water marks, and location and number designation of cross-sections.
 - b. Plan view on 24-inch by 36-inch paper, including:

1. Scale and north arrow.
 2. Title block.
 3. Boundary lines and nearest street intersections.
 4. Existing and proposed contours.
 5. Existing and proposed floodplain limits, and limits of the "natural floodway" and the "regulatory floodway."
 6. Area to be removed from the floodplain or area to be altered.
 7. Top and toe of fill and/or side slopes and the numerical slope of the fill and/or side slopes labeled.
 8. Location of all other associated improvements or alterations to the creek and/or floodplain, such as check dams, swales, channel modifications, etc.
 9. Location of cross-sections.
 10. Location of all existing and proposed easements and dedications.
 11. Site vicinity map.
- c. Plots of cross-sections, including:
1. Scale.
 2. Title block.
 3. Existing and proposed ground elevations.
 4. Cut and/or fill areas labeled.
 5. Limits of and numerical values for existing and proposed "n" values.
 6. Equal conveyance removed from both sides.

Sec. 11-150. Variance and appeal procedures.

- (a) *Variances.* Variances to the stormwater and flood protection ordinance shall be submitted to the City Engineer. In considering the variance request the City Engineer shall review the technical, environmental, financial, social and aesthetic merits of the variance request and shall consider the following relevant factors:
- (1) Whether the variance request increases the potential danger to life and/or property due to drainage, flooding or erosion damage;

- (2) Whether the variance will increase threats to public safety, create additional public expense and/or create nuisances;
- (3) Whether the variance will conflict with state or federal laws or regulations;
- (4) Whether the variance increases the susceptibility of the proposed or an existing facility or its contents or surrounding property to flood damage;
- (5) Whether the variance will result in increased flood heights, create erosive velocities, increase frequency of flooding or duration of flooding or create other adverse impacts to other property owners unless the adverse impact is approved by the affected property owners and documentation of this approval in a form approved by the City Attorney and City Engineer is submitted to the City;
- (6) Whether the variance preserves or expands natural floodplain, greenbelts and associated buffer areas of aesthetic and/or environmental value;
- (7) Whether the variance request preserves adequate buffer distances to development and infrastructure from areas of potential flooding or erosion;
- (8) Whether the variance will decrease floodplain valley storage;
- (9) Whether the variance provides adequate heavy equipment access for periodic maintenance of drainage facilities and other infrastructure;
- (10) Whether the variance request decreases the safety of access to property or facilities in times of flood for ordinary and emergency vehicles;
- (11) Whether there are available alternate locations for the proposed facility that would not require a variance;
- (12) Whether the proposed facility requires a waterfront location, where applicable;
- (13) Whether the variance is compatible with adjacent existing and proposed floodplain and drainage improvements;
- (14) Whether the variance increases the danger that materials may be swept onto other lands to the injury of others;
- (15) Whether the variance will likely increase costs of providing governmental services during and after storm events, including maintenance and repair of public infrastructure such as streets, bridges, storm sewer and channels, water, sanitary sewer, gas, electrical, telephone and other public amenities;
- (16) Whether the variance request assists in the preservation of the historical character of structures or sites listed on the National Register of Historic Places or the State Inventory of Historic Places; and

(17) Whether the variance requested is the minimum necessary to afford relief.

Upon consideration of the factors listed above and the purposes of this section, the City Engineer will issue a report to the Development Review Committee summarizing his findings and recommendations for approval, approval with conditions or denial. As part of the recommendation the City Engineer may attach such conditions to the granting of the variance as deemed necessary to further the purposes of this section and the public welfare.

The Development Review Committee shall review the City Engineer's report, recommendations and conditions, hear other evidence or testimony as it deems pertinent and provide comments to the City Engineer. After receipt of such, the City Engineer will make a recommendation to the City Manager, or his designee, to approve the variance, approve the variance with conditions or deny the variance request.

The City Manager shall review the City Engineer's report, recommendations and conditions, hear other evidence or testimony as he deems pertinent and approve the variance, approve the variance with conditions or deny the variance request. The decision of the City Manager, or his designee, shall be provided in writing to the applicant requesting the variance.

The City Engineer shall maintain the records of all variance requests, including technical information, and shall report variances granted to the Federal Emergency Management Agency upon its request.

- (b) *Appeals.* The decision of the City Manager may be appealed to the City Council. The City Council shall have the authority to sustain, reverse or modify the decision of the City Manager. The decision of the City Council under this section shall be final and recorded in the minutes of the City Council meeting.
- (c) *Time limits.* A variance granted pursuant to this section shall expire one year from the date of the granting of the variance if a permit is not approved and issued within that time and work begun. Should a building permit be issued and diligent work ceases for a period of more than 90 days, the variance approval shall lapse and be deemed void.

Secs. 11-150 – 11-160. Reserved.

DIVISION 3. - RUNOFF CALCULATIONS

Sec. 11-161. Generally.

The selection of which method to use for calculating runoff depends upon the size of drainage area contributing runoff at a most downstream point of a project. The "rational method" is acceptable for situations in which the drainage area is less than 160 acres. A unit hydrograph method is required for situations with larger drainage areas.

Detention may be required by the City Engineer if existing downstream facilities are undersized or downstream cities have detention requirements. If required, the owner or developer shall assume full responsibility for maintenance of the lake or pond. This obligation shall run with the land and be a continuing obligation.

Runoff computations shall be based upon fully developed watershed conditions in accordance with the land use projections in the latest comprehensive land use plan for the City. The design engineer shall size drainage facilities by disregarding the detention effects of upstream property and calculating the runoff as if the off-site property was developed without any detention. If an approved regional detention/retention facility is in operation, the design engineer may size downstream drainage facilities based on consideration of the detention effects of the regional facility.

Sec. 11-162. Procedure for drainage areas less than 160 acres; rational method.

Computation of stormwater runoff for drainage areas less than 160 acres shall be by the "rational method," which is based on the principle that the maximum rate of runoff from a given drainage area for an assumed rainfall intensity occurs when all parts of the area are contributing to the flow at the point of discharge. The formula for calculation of runoff by the "Rational Method" is:

(Equation 1)

$$Q = CIA$$

Where:

Q = The maximum rate of discharge, expressed in cubic feet per second.

C = A runoff coefficient which varies with the topography, soil, land use and moisture content of the soil at the time the runoff producing rainfall occurs. This runoff coefficient shall be based on the ultimate use of the land as recommended by the master plan for the City of Mesquite and shall be selected from Table 1 herein on the basis of the use shown on land use and zoning map of the Comprehensive Zoning Ordinance for the City of Mesquite. If an area has had a change of zoning to give the area land use for which the "C" in Table 1 is higher than use shown on land use and zoning maps, the higher "C" factor shall be used.

A = The drainage area, expressed in acres, contributing to the runoff at the point in question. Calculation of the drainage area shall be made from an accurate topographic map, a copy of which shall be submitted with the engineering plans for approval.

I = Rainfall intensity in inches per hour for the time period that it takes for flow from the farthest point of the drainage area to reach the point of design. The rainfall intensity is found by referring to the applicable curves of Figure 1. Time of concentration or duration of rainfall for use in Figure 1 shall be calculated by velocity data shown in Table 2.

Time of concentration is the longest time, without interruption of flow by detention devices, that a drop of water takes to flow from the farthest point of the drainage area to the point of concentration (i.e., the point of design). The time of concentration is composed of the "inlet time" and the flow time in a conduit or channel to the point of design. Equation 2 shows how to calculate the time of concentration.

(Equation 2)

$$T_c = \text{Inlet Time} + \frac{L}{V \times 60 \text{ sec/min}}$$

Where:

T_c = Time of concentration in minutes.

Inlet time = Ten minutes for property zoned multiple-family, churches, schools, local business, central business, commercial or industrial

or

Fifteen minutes for property zoned for parks, cemeteries, agricultural and single-family residential.

or

$$\frac{L}{V \times 60 \text{ sec/min}}$$

L = Length of conduit or channel, in feet.

V = Velocity of flow in conduit or channel, in feet per second.

When designing inlets and laterals, the time of concentration is simply equal to the inlet time. The design engineer will compare the above specified inlet times to the actual calculated inlet time by computing the flow time overland and along the gutter to the first inlet. The Manning equation, along with the velocity information in Table 2 (or other acceptable procedures such as the SCS method), shall be used to determine flow time to the inlet. The design engineer may use the actual calculated or specified inlet time. In no case shall a longer inlet time be used than 10 minutes for multiple-family, commercial, churches, schools, industrial and business areas, and 15 minutes for parks, cemeteries, agricultural and single-family areas.

When sizing storm sewers and channels, the time of concentration shall be calculated by adding the actual calculated inlet time (but not greater than the specified inlet times) to the flow time in the conduit and/or channel. The design engineer may use the combined times, as described, or the specified inlet times for storm sewer sizing.

Sec. 11-163. Procedure for drainage areas greater than 160 acres.

For drainage areas in excess of 160 acres where the use of the "rational method" does not provide reliable results, the use of a unit hydrograph method shall be made. The use of a unit hydrograph calculation will be based upon standard and accepted engineering principles normally used in the profession subject to the approval of the City Engineer. Use the Corps of Engineers HEC-1 models for drainage areas 160 acres or more.

The unit hydrograph method shall be based upon fully developed watershed conditions assuming no effects from the small on-site detention facilities for maintaining the rate of runoff as

if the property was developed as single-family residential uses. The detention effects of large regional detention facilities can be taken into account in unit hydrograph methods.

Circumstances that may require the use of a unit hydrograph method include sizing open channels, reclaiming floodplains, creating lakes or building other types of drainage-related facilities on major drainage courses. Design engineers of these types of facilities should be aware that the requirement of designing for fully developed watershed conditions will mean that they will have to calculate these fully developed flows instead of using the flows calculated in the Federal Emergency Management Agency's (FEMA) flood insurance studies for Mesquite. FEMA's flows cannot be used because the flows are based upon existing watershed conditions. (For more information, see Division 5 on the sizing of channels and other major drainage facilities and Division 6 for floodplain alteration procedures.) Use of the rational method is allowed for design of storm sewers within the project area.

Secs. 11-164 – 11-170. Reserved.

DIVISION 4. - DESIGN OF LOCAL DRAINAGE SYSTEMS

Sec. 11-171. Design storm frequencies.

The calculations of runoff quantities that must be accommodated in drainage facilities require the selection of the design storm frequency. The design storm frequencies for various drainage structures are given below.

<i>Drainage Facility</i>	<i>Design Recurrence Interval</i>
Closed storm sewer systems (required for all drainage areas less than 70 acres unless approved by the City Engineer.)	25-year with 100-year positive overflow for inlets on grade in streets such that the depth of flow in the street does not exceed the top of curb
Closed storm sewer systems and inlets at street low point or sag	100-year with positive overflow for 100 yr.
Culverts and bridges	100-year
Concrete-lined channels	100-year
Earthen channels	100-year
Levees	Standard project flood
Dams above natural ground/spillways	Spillway design flood varies with the class of structure (See Section 11-187)

The approved drainage system shall provide for positive overflow at all low points. The term "positive overflow" means that when the inlets do not function properly or when the design capacity of the conduit is exceeded, the excess flow can be conveyed overland along a grassed or paved course. Normally, this would mean along a street or alley, or shall require the dedications of special drainage easements on private property.

Sec. 11-172. Street and alley capacities.

Street capacities shall be designed for the 100-year design flood.

Minor arterial and lower classifications — maximum six inches or top of curb.

Principal arterial — one lane open in each direction.

- (a) *Streets.* The depth of flow in the streets shall not exceed the top of curb. Figure 2 shows the capacity of streets with a straight cross slope that varies from one-eighth inch per foot to one-half inch per foot, which are the minimum and maximum allowable street cross slopes.
- (b) *Alleys.* The flows created by the 100-year storm shall be contained within the capacity of all paved alleys. Figure 3 shows the capacity of various alley sections.

Alley capacities shall be checked at all alley turns and "T" intersections to determine if curbing is needed or grades should be flattened. Alley sections shall be super-elevated as required at corners and curves to insure that flow remains in the alley through these changes in alignment.

Curbing shall be required for at least 10 feet on either side of an inlet in an alley and on the other side of the alley so that the top of the inlet is even with the high edge of the alley pavement.

- (c) *Finished floor elevations in relation to alleys, street and positive overflows.* The first floor elevations of all residential and other structures shall be set at a minimum elevation of the higher of either 1.5 feet above the alley invert or one foot above the top of the street curb elevation, and with positive drainage provided away from the structure. Positive overflow sections shall provide a minimum of two feet of freeboard from the overflow invert adjacent to structures and the corresponding first floor elevation of all residential and other structures. Lot grading plans are required for all new subdivisions.

Sec. 11-173. Placement of inlets.

Storm sewer inlets shall be built along paved streets at such intervals that the depth of flow, based upon the 100-year storm, does not exceed the top of curb. Inlets shall be located as necessary to remove the flow based on a 25-year storm. If in the opinion of the City Engineer the flow in the gutters would be excessive using the above design criteria, the storm sewers or inlet locations could be altered to relieve adverse conditions.

Inlets shall be placed upstream from an intersection whenever possible. At any intersection, only one street shall be crossed with surface drainage and this street shall be the lower classified street. When an alley intersects a street, inlets shall be placed in the alley whenever flow down that alley would cause the capacity of the intersecting street to be exceeded.

Sec. 11-174. Inlet capacities and sizes.

Figure 4 shows the various types of inlets allowed for use along various kinds of streets. Other types of inlets may be used upon the approval of those inlets by the City Engineer. The minimum inlet size shall be eight feet. Figures 5 through 18 show how to determine the capacity of inlets. No more than 20 feet of inlets shall be placed along one gutter at any given location. Grate or combination inlets shall not be used in city maintained streets unless approved by the City Engineer.

Minimum sizes of laterals shall be 18 inches for use with eight-foot inlets, and 21-inch laterals with 10-foot, 14-foot and drop inlets, and 24-inch laterals for 20-foot inlets. Where laterals tie into trunk lines, place the laterals on a 60-degree angle with the trunk line and connect them so that the longitudinal centers intersect.

Sec. 11-175. Pipe design standards.

- (a) *The Manning Equation.* Storm sewer conduit shall be sized to flow full. Manning's Equation shall be used to determine the conduit size. Manning's Equation is expressed as:

(Equation 3)

$$Q = \frac{1.486}{n} (A) (R)^{2/3} (S)^{1/2} \quad \text{or} \quad V = \frac{1.486}{n} (R)^{2/3} (S)^{1/2}$$

Where:

Q = Flow in cubic feet per second.

V = Velocity of flow in conduit in feet per second.

A = Cross-sectional area of the conduit in square feet.

R = Hydraulic radius of the conduit, which is the area of flow divided by the wetted perimeter ($R = A/P$).

S = Slope of the hydraulic gradient.

n = Roughness coefficient of the conduit.

P = Wetted perimeter.

Figure 19 is a graphical solution of Manning's Equation, which allows sizing of concrete pipe, assuming an "n" value of 0.013.

- (b) *Minimum and maximum velocities in pipes.* The minimum velocities in conduit shall be 2.5 feet per second. The minimum slopes for various pipe sizes that will maintain this minimum velocity are given in Table 3. The recommended maximum velocities of flow in the conduit and channels are given in Table 4.

The maximum discharge velocities in the pipe shall also not exceed the permitted velocity of the receiving channel or conduit at the outfall to prevent erosive conditions, as shown in Table 4. The maximum outfall velocity of a conduit in partial flow shall be computed for partial depth and shall not exceed the maximum permissible velocity of the receiving channel unless controlled by an appropriate energy dissipater (e.g. stilling basins, impact basins, riprap protection).

- (c) *Roughness coefficients for conduits.* In general, stormwater shall be carried in concrete pipe conduit, but other types of conduit can be used to carry stormwater. However, prior permission to use metal conduit must be obtained from the City Engineer. Table 5 shows recommended roughness coefficients for various types of conduits. If, in the opinion of the design engineer, other values for the roughness coefficient should be used, the different value can be used with the permission of the City Engineer. Appropriate notes of the approved roughness coefficient shall then be shown on the engineering plans.
- (d) *Hydraulic gradient of conduits.* Conduits must be sized and slopes must be set such that runoff flows smoothly down the drainage system. To insure this smooth passage, the hydraulic gradient must be at the proper elevations.

The proper starting elevation of the hydraulic gradient shall be set according to the applicable criteria listed below:

- (1) When a proposed conduit is to connect to an existing storm sewer, the hydraulic gradient of the proposed storm sewer should start at the elevation of the hydraulic gradient of the existing storm sewer based on an evaluation of the existing storm sewer with respect to the requirements found in this ordinance. This criterion will be used for existing systems whether or not they are designed in accordance with this article.
- (2) When a proposed conduit enters an open channel, creek or flood control sumps, the hydraulic gradient of the proposed conduit should start at the 25-year water surface elevation of the channel or creek when the ratio of the drainage area of the receiving creek (at the development) to the development area is 15 or greater. For ratios of less than 15, the 100-year water surface will be used on the receiving creek.

Not only is it important to use the proper starting elevation for the hydraulic gradient, but proper hydraulic gradient elevations must be maintained for the length of the conduit. The inside top of the conduit should be at or below the hydraulic gradient. However, effort should be made to keep the top of the pipe as close to the hydraulic gradient as possible so that deep excavations to lay pipe are not required.

When the conduit is flowing partially full, the hydraulic gradient shall be shown at the inside crown of the conduit.

The hydraulic gradient shall be kept two feet below the top of curb. If this cannot be obtained,

the hydraulic gradient shall be at least $1.5 V_1^2 / 2g$ feet below the gutter line, where V_1 is the velocity in the lateral.

- (e) *Minor head losses.* When establishing the hydraulic gradient of a storm sewer, minor head losses at points of turbulence shall be calculated and included in the computation of the hydraulic gradient.

Entrance losses. Entrance losses to a closed storm sewer system from an open channel or lake shall be calculated using Equation 4.

(Equation 4)

$$H_L = K_e \frac{V_1^2}{2g}$$

Where:

H_L = Head loss in feet.

V_1 = Velocity in the downstream pipe in feet per second.

K_e = Head loss coefficient (see Table 6).

The resulting hydraulic gradeline shall be compared to inlet control conditions for the storm sewer as described in Section 11-176. The higher of the two values will be used as the controlling upstream hydraulic grade line.

Expansion losses. For pipe size expansions, head loss shall be calculated using the following equations:

(Equation 5)

$$H_L = \left(1 - \left(\frac{D_1}{D_2}\right)^2\right)^2 \frac{V_1^2}{2g}$$

Where:

H_L = Head loss in feet.

V_1 = Upstream velocity in feet per second.

D_1 = Upstream pipe diameter.

D_2 = Downstream pipe diameter.

Manhole and bend losses. Head losses associated with manholes for pipe direction

changes and bends in pipes of equal diameter shall be calculated using:

$$H_L = K_b \frac{V_2^2}{2g} \quad (\text{Equation 6})$$

Where:

H_L = Head loss in feet.

V_2 = Velocity in the downstream pipe in feet per second.

K_b = Head loss coefficient from Table 7.

Junction losses. Head losses associated with wye connections or manholes with branch laterals entering the main line can be calculated by using Equation 7.

$$H_L = \frac{V_2^2}{2g} - K_j \frac{V_1^2}{2g} \quad (\text{Equation 7})$$

Where:

H_L = Head loss in feet.

V_1 = Velocity in the upstream pipe in feet per second.

V_2 = Velocity in the downstream pipe in feet per second.

K_j = Head loss coefficient from Table 7.

- (f) *Storm sewer laterals.* Laterals for storm sewer systems shall be sized to control the flooding depth at the inlets. The depth shall not exceed the limits previously established for storm sewer systems. Calculation of the flooding depth shall be determined based on the addition of the velocity head of the lateral to the computed HGL:

$$\text{ELEV} = \text{HGL} + \frac{V_L^2}{2g}$$

This calculated elevation shall be compared to the elevation determined based on inlet control nomographs as developed by the department of transportation. The highest of the two elevations shall be used to establish the capacity of laterals and the corresponding depth of flooding.

- (g) *Outfalls to open channels and lakes.* The flow lines of storm sewer conduits that discharge into open channels shall match the flow line of the channel. One exception to this requirement of matching the flow line is when a storm sewer discharges into a concrete-lined channel or when the outfall is submerged below the normal water surface of a lake. In the case of a pipe discharging to a lined channel, the outlet must be below the top of the channel lining. The second exception pertains to storm sewer discharge that must cross wide floodplain areas. Under this condition, the storm sewer could discharge into a lined ditch which would convey runoff to the flow line of the channel without creating an erosive condition. Permissible velocities within the ditch will be based on the type of lining used and the velocities provided in Table 4. Flumes to bring the discharge down to the flow line of earthen creeks shall not be permitted. Drop structures shall be allowed upon written approval of the City Engineer.

The velocity at the discharge end of the conduit shall be computed based on partial flow depth and shall be sufficiently low so as to not cause downstream erosion problems. Table 4 shows the maximum velocities allowed in various types of channels, which are then the maximum discharge velocities at storm sewer outfalls.

In some circumstances, the configuration of the storm sewer in relation to the flow line of the creek may cause excessive velocities to be reached unless provisions are made to slow the velocity. One recommended method of slowing the velocity is to have the last length of pipe (a length of at least 10 times the diameter) be on a slope that will reduce the partial flow outlet velocity to the values shown in Table 4 for the receiving stream. Stilling basins shall also be allowed to reduce discharge velocities.

The discharge pipe shall also intersect minor creeks at an angle not to exceed 60 degrees. Minor creeks are defined as those creeks, channels or drainageways where the distance from the pipe outlet to the opposite creek bank at the bottom of the channel is 20 feet or less. Pipes may intersect major creeks (greater than 20 feet to opposite bank) at a 90-degree angle. The City Engineer may require that pipes intersect major creeks at an angle not to exceed 60 degrees, when a 90-degree angle would result in an erosive condition.

Figure 20 shows how a storm sewer should be configured to discharge into a creek.

- (h) *Easements for enclosed storm sewers and positive overflow areas.* All storm sewer conduits to be dedicated to the City of Mesquite shall be located in an easement dedicated to the City of Mesquite at the time of final platting of the property. The easement shall be at least 15 feet wide for storm sewers or wider if the City Engineer requires it for maintenance or other purposes. Special drainage easements on private property shall be a minimum of 15 feet wide or wider if the City Engineer requires it for maintenance or other purposes. Maintenance responsibility shall be as required in Section 11-186(e). No fences, buildings or other structures and improvements shall be placed within these dedicated easements.

Sec. 11-176. Culvert design standards.

Culverts shall be in accordance with the Texas Highway Department Hydraulic Manual, Chapter 4 - Culverts. The calculation of hydraulic grade lines will consider both inlet and outlet

control for the culvert. Starting water surface elevations for gradeline calculation will be the same as required for storm sewers. See Section 11-175.

Secs. 11-177 – 11-185. Reserved.

DIVISION 5. - SPECIAL DRAINAGE FACILITIES

Sec. 11-186. Channels.

- (a) *Channel design.* Open channels may be used instead of enclosed systems when the drainage area of contributing flow to the channel is greater than 160 acres. Open channels shall not be permitted when the drainage area is less than 160 acres. Table 4 shows the maximum velocities allowed for certain types of channels. Roughness coefficients for the design of open channels are provided in Table 8. The following criteria shall be used in determining the nature of the open channel.

For channels with a contributing drainage area of 160 acres or greater:

- (1) Channels may be left in their natural state provided that the channel velocities are six feet per second or less, if approved by the City Engineer. Otherwise, all channels shall be in accordance with subsection (a)(4) or fully lined.
- (2) If the natural channel is to be replaced by an improved channel, the flow from the 100-year design flood must be contained within the improved channel while allowing for one foot of freeboard. An improved channel shall meet the floodplain alteration regulations presented in Division 6.
- (3) Improved channels shall include a lined section if the design velocity is greater than six feet per second. Lining types such as concrete and rock walls may be used upon approval of the City Engineer. Improved channels with design velocities of less than the permissible velocities shown in Table 11 may be earthen if the channels are revegetated properly.
- (4) For lined channels, all of the channel bottom and at least the first three feet (vertical height) of the side slopes up from the channel bottom shall be lined, unless approved by the City Engineer.
- (5) Earthen sides above the lined section or totally earthen channels shall be on at least a four horizontal to one vertical slopes and shall have approved ground cover to prevent erosion.
- (6) Unless shown to be feasible in a soils report sealed by a registered professional engineer in the State of Texas, and approved by the City Engineer, improved channels shall have minimum side slopes of:
 - a. Four feet horizontal to one foot vertical for earthen grassed side slopes.
 - b. Two feet horizontal to one foot vertical for side slopes in rock.

- (7) The developer or owner shall use low maintenance vegetation for vegetative cover, as approved by the City Engineer prior to planting. The selection of materials shall comply with either the current ground cover listing for North Central Texas furnished through the Texas Agricultural Extension Service or Table 9 in this article.
 - (8) The developer/owner shall provide a drainage easement and a required maintenance easement (see paragraph (d) below) which shall be dedicated to the City of Mesquite as a permanent drainage right-of-way and open space corridor.
 - (9) Channel improvement shall not include concrete pilot channels which do not meet the requirements of subsection (a)(4), unless approved by the City Engineer.
- (b) *Erosion prevention.* All channel sections must consider and account for channel stabilization in their design. This requirement pertains to all sections whether they are left in their natural condition or are modified in any manner. Three sets of requirements are provided depending upon the relationship of the existing channel to the limits of the developer/owner's property boundaries. The City Engineer shall have the discretion to require the implementation of the portion of these requirements as deemed necessary, depending on the specifics of the property being developed or improved or to allow the escrow of funds sufficient to provide for the construction of a proportionate amount of channel improvements in lieu of actual construction. This discretion may be exercised when a small section of improvements is not deemed by the City Engineer to be economically practicable.
- (1) In cases where the entire channel section is contained within the limits of the developer/owner property boundaries, the developer/owner shall:
 - a. Provide for an improved stabilized channel cross-section which reduces all velocities to six fps or below for vegetated channels. The channel improvements must meet all requirements of this article.
 - b. For vegetated channel sections with channel velocities ranging from six to eight fps, construct grade control structures within the channel and overbank areas to prevent erosion. Grade control structures shall have a minimum effective depth of three feet below existing or proposed grades with an adequate number of structures to prevent less than one foot of degradation.
 - (2) In cases where the property boundary follows the centerline of the channel or incorporates only a portion of the channel cross-section, the developer/owner shall:
 - a. Determine the design section required to provide for an improved stabilized channel cross-section which reduces all velocities to six fps or below for vegetated channels. The design channel section must meet all requirements of this article.
 - b. The design section may include vegetated channel sections with channel velocities ranging from six to eight fps, provided that grade control structures are included within the channel and overbank areas to prevent erosion. Grade control structures shall have a minimum effective depth of three feet below existing or proposed grades with an adequate number of structures to prevent less than one foot of

degradation.

- c. The developer/owner shall construct or escrow funds for construction of the portion of the design improvements required on their property for the ultimate channel design. The City Engineer shall have the discretion to determine the portion of the design improvements to be constructed/escrowed by the developer/owner. In most instances, the developer/owner shall construct one-half of the improvements on their property.
 - d. If grade control structures are incorporated into the design, the developer/owner shall coordinate with adjacent owners in order to construct these features in their entirety at the time of the initial portion of the channel improvements.
 - e. The developer/owner shall provide for a drainage easement and access/maintenance easement consistent with the portion of the improvements provided.
- (3) In cases where the developer/owner owns property adjacent to channel or floodplain areas but does not own a portion of the channel or floodplain area, the developer/owner shall (at the discretion of the City Engineer):
- a. Determine the channel improvement configuration necessary to meet the requirements of subsection (b)(1) above and
 - b. Shall provide a dedicated easement to the City for the portion of this future improvement configuration, including necessary maintenance and access easement, which will include the developer/owner property.
- (c) *Starting water surface condition.* When performing hydraulic analyses for channel or drainageway design, the starting water surface shall be based on the following criteria:
- (1) When the ratio of the drainage area of the receiving creek (at the confluence location) to the drainage area of the channel or drainageway being designed is 15 or greater, the 10-year water surface of the receiving creek shall be used as the starting water surface for hydraulic design calculations. For creeks where the 10-year water surface is not available, the slope-area method will be used for starting design calculations.
 - (2) When the ratio of the drainage area is less than 15, the 100-year elevation on the receiving creek shall be used as the starting water surface for design calculations.
- (d) *Easements required for open channels.* Drainage and/or floodway easements for all open channels, creeks and flumes shall be dedicated to the City of Mesquite. Easements shall encompass all areas having a ground elevation below the higher of one foot above the water surface elevation associated with the design flood or the top of the high bank or channel edge. No fences, buildings or other structures which could impede flow shall be placed within this dedicated drainage easement. In all cases, the easement shall also include at least a 15-foot wide maintenance strip along both sides of the channel or, if the City Engineer so allows, at least a 20-foot wide maintenance strip along one side of the channel. Streets, alleys, bike paths, etc., alongside the channel can serve as all or part of the maintenance easement.

Drainage easements for flumes shall be located with sufficient width to permit future maintenance accessibility, and in no case shall be less than 15 feet wide.

- (e) *Maintenance of facilities and easements.* All drainage easements shall be dedicated to the City of Mesquite. The maintenance responsibility of the easements will vary based on the situation. The following outlines the maintenance responsibility for various conditions.
- (1) Drainage improvements constructed by the City of Mesquite shall be the maintenance responsibility of the City.
 - (2) Drainage improvements constructed in single-family residential areas, where no homeowner's association or other similar association has been formed, shall be the maintenance responsibility of the City of Mesquite.
 - (3) Drainage improvements shall not be the maintenance responsibility of the City of Mesquite when constructed in:
 - a. Residential areas where a homeowner's association or other similar association is formed; or
 - b. Areas of commercial or industrial zoning.

The maintenance activities in these areas shall be the responsibility of private ownership including associations. If such improvement deteriorates in condition, the City Manager or his designated representative shall notify such property owner or association of required corrections and/or maintenance to bring drainage facility up to the standards as originally approved by the City and according to the original improvement. If such maintenance is not accomplished within a reasonable time, then the City may contract for such work and levy an assessment to the property owner or association for such cost.

Perpetual maintenance must be assured by a homeowner's association (single family only), trust fund or other private entity as specified by the City Council.

Sec. 11-187. Lakes and dams.

In the event that a property owner or developer desires to modify an existing pond or lake or desires to impound stormwater by filling or constructing an above-ground dam, thereby creating a lake, pond, lagoon or basin as part of the planned development of that property, the criteria listed below shall be met before city approval of the impoundment can be given. Ponds or lakes created by excavation of a channel area without erecting a dam above natural ground elevation or instream, low water checkdams are also subject to the criteria listed below, with the exception of spillway capacity requirements. The City Engineer has the final authority to determine the design criteria for a proposed dam, check dam or excavated lake. The requirements of the State of Texas must also be met for the construction of dams, lakes and other impoundments.

The design criteria for a dam is dependent on the size and hazard classification of the dam. The size and hazard classification will be based on Chapter 12 of the Texas Water Code and will be

determined by the City Engineer based on information furnished by the owner. The following criteria will be used to classify a dam:

- (1) *Size.* The classification for size is based on the height of the dam and storage capacity, whichever gives the larger size category. Height is defined as the distance between the top of the dam (minus the freeboard) and the existing streambed at the downstream toe. Storage is defined as the maximum water volume impounded at the top of the dam (minus the freeboard).

Size Classification		
Impoundment		
<i>Category</i>	<i>Storage (acre-feet)</i>	<i>Height (feet)</i>
Minor	<100	<10
Small	≥100 and <1,000	≥10 and <40
Intermediate	≥1,000 and <50,000	≥40 and <100
Large	≥50,000	≥100

- (2) *Hazard potential.* The hazard potential for a dam is based on the potential for loss of human life and property damage downstream from a dam in the event of failure. The following categories will be used:

Hazard Potential Classification		
<i>Category</i>	<i>Loss of Life (Extent of Development)</i>	<i>Economic Loss (Extent of Development)</i>
Low	None expected (No permanent structures for human habitation)	Minimal (Undeveloped to occasional structures or agriculture)
Significant	Possible, but not expected (No urban developments and no more than a small number of inhabitable structures)	Appreciable (notable agricultural, industry or commercial development)
High	Expected (Urban development or large number of inhabitable structures)	Excessive (Extensive public, industrial or agricultural development)

- (3) *Spillway design flood.* The classification of a dam based on the above criteria will be used to determine the spillway design flood (SDF). The total capacity of a dam structure, including principal and emergency spillways, shall be adequate to pass the SDF without exceeding the top dam elevation at a minimum. The SDFs for various dam classifications are as follows:

Spillway Design Flood

<i>Hazard</i>	<i>Size</i>	<i>SDF</i>
Low	Minor	100-year
	Small	¼ PMF
	Intermediate	¼ PMF to ½ PMF
Significant	Large	PMF
	Small	¼ PMF to ½ PMF
	Intermediate	½ PMF to PMF
High	Large	PMF
	Small	PMF
	Intermediate	PMF
	Large	PMF

In all cases, the minimum principal spillway design capacity is the 100-year design flood. In certain cases, a dam breach analysis may be required to determine the proper classification of the structure. For all structures requiring a spillway design flood equal to the PMF, a dam breach analysis is required to determine the downstream consequences of a failure. All dams designed for a SDF of ½ PME or less shall be constructed with a minimum freeboard of two feet above the SDF elevation.

(4) *Additional design requirements.*

- a. An engineering plan for such construction, accompanied by complete drainage design information and sealed by a registered professional engineer, shall have been approved by the City of Mesquite;
- b. The spillway and any emergency overflow areas shall be located so that flood waters will not inundate any buildings, roadways or other structures.
- c. All federal, state and county laws pertaining to impoundment of surface water shall have been complied with, including the design construction and safety of the impounding structure. Copies of any federal, state and county permits issued for the proposed impoundments shall be submitted to the City Engineer.
- d. Any existing structure, which is included in the project area, shall be improved to comply with the applicable federal, state, county and city safety requirements for structures.
- e. Before removing, enlarging or altering any existing lake, the owner will furnish a study of the effects of the alteration upon flooding conditions both upstream and downstream. The study shall be prepared by a professional engineer and submitted to the City for approval prior to making the proposed alteration. Compensatory storage shall be provided in some manner such that equal or comparable flood retention capacity is maintained.
- f. Any improvements to existing dams or lakes or construction of new impoundments shall be made at the expense of the developer, prior to acceptance of the adjacent street, utilities and drainage improvements as provided for under the subdivision ordinance.

(5) *Maintenance and liability criteria.*

- a. The owner or developer shall have agreed to retain private ownership of the lake, pond or lagoon, or basin constructed and to assume full responsibility for the protection of the general public from any health or safety hazards related to the lake, pond or lagoon constructed.
- b. The owner or developer shall have agreed to assume full responsibility for the maintenance of the lake, pond or lagoon, or basin constructed. The owner or developer shall keep the City Engineer advised of the current responsible agent for this maintenance.

Sec. 11-188. Levees.

In the event that developers or owners wish to build levees to protect an area from flooding, applicable FEMA and State of Texas guidelines and the following criteria apply:

- (1) Levees shall be designed to have four feet of freeboard above the standard project flood for the fully developed watershed flows.
- (2) Levees shall be designed according to the Corps of Engineers design criteria whether or not they are federally authorized levees.
- (3) Levee systems shall be designed with interior drainage systems to prevent flooding from local runoff contained within the system for the 100-year design flood.
- (4) Levee systems shall have written operation procedures that address gate closure conditions and emergency warning plan. A copy of these procedures shall be furnished to the City Engineer.
- (5) Automated gate closure systems shall have power from two independent sources and shall be capable of being operated manually.
- (6) Ring levees protecting individual structures proposed for construction after the enactment date of this article shall not be permitted.
- (7) All new levee systems shall have permanent positive closures to the required design elevation. Temporary closures involving sandbagging or other procedures requiring manual operations shall not be permitted.
- (8) Provisions shall be made for ensuring the permanent maintenance of levees either by a flood control district or similar governmental organization or by the existing property owner and all future owners, heirs or assigns.
- (9) Additional plan requirements include water surface profiles for the design flood and SPF; top of levee profile, definition of interior drainage facilities, including pump station and ponding areas; location of gravity outlets, gatewells and closure structures;

and elevation-duration data on the receiving system.

Sec. 11-189. Detention and retention facilities.

As previously described in Division 3 of this article, the City Engineer may require that runoff rates for all land uses be limited to the rates that would be produced from single-family residential areas. This requirement may also apply to the development of sites as churches, schools and other institutional uses. Detention/retention facilities to reduce runoff rates will be provided within approved levee districts unless the district can demonstrate, with technical data, that adequate detention/retention storage is provided in dedicated sumps and storage areas to offset the impacts of developments to runoff rates equal to a single-family residential rate. Detention/retention facilities shall be designed for the 100-year design flood according to the following criteria:

- (1) The minimum amount of storage volume of the detention basin shall be that volume required to reduce runoff rate to a single-family rate. Dedicated detention/retention basins shall also include an additional one foot of freeboard and two feet of sediment storage. The volume of runoff storage for drainage areas greater than 160 acres shall be computed using unit hydrograph procedures. Snyder's Unit Hydrograph will be utilized for all computations. Manual methods or use of the computer program HEC-1 are allowed for runoff hydrograph computation and flood routings.

For drainage areas less than 160 acres, the above methods are recommended; however, an approximate routing method based on the rational formula is allowable, as outlined in Figure 21.

- (2) Detention areas in parking lots shall not be:
 - a. In required parking spaces but in extra spaces.
 - b. Behind speed bumps unless the speed bumps are made with reinforced concrete.
 - c. Deeper than six inches unless warning signs are posted.
- (3) Drainage easements shall be provided for all regional detention/retention facilities and for other detention/retention facilities where two or more owners are involved.
- (4) Detention/retention facilities shall be designed to empty in less than 24 hours unless it is also serving as an erosion control facility.
- (5) Detention/retention facilities shall not be counted as an erosion control technique unless
 - (1) the basins are designed to empty a minimum of 24 hours from the storm event and
 - (2) adequate sediment storage areas in the basin have been set aside and are maintained.Other municipal ordinances give additional details as to how to design multi-purpose detention/retention facilities.
- (6) Detention/retention facilities shall be maintained by the owner unless the facilities are dedicated to and accepted by the City of Mesquite.

Sec. 11-190. Flumes.

The use of flumes is not recommended for widespread use. Flumes shall not be permitted when the purpose of a permanent flume is to carry runoff down the sides of earthen channels. A flume may be used to direct overflow runoff along property lines until the runoff can be intercepted by streets or conduit flows. Flumes crossing sidewalks shall be covered or bridged such as to minimize danger to pedestrians.

Sec. 11-191. Connections from buildings to storm sewers.

Drainage from residential areas, such as roof tops, should be allowed to flow overland before joining the storm sewer system.

Seepage into basements or sub-surface structures that is pumped to ground level, seepage from springs and runoff from roof drains on non-residential buildings that would flow onto or across driveways, sidewalks or other areas commonly crossed by pedestrians can create hazards or nuisances to pedestrians. Thus, if hazards or nuisances would be created, the basement and rooftop drains shall be tied directly to the nearest storm sewer, provided that pumped lines from basements have back flow preventers and the water is uncontaminated.

Secs. 11-192 – 11-205. Reserved.

DIVISION 6. - FLOODPLAIN GUIDELINES

Sec. 11-206. Lands to which this article applies.

A person shall comply with the requirements of this article for floodplain areas before making substantial improvements to or increasing the outside dimensions of an existing structure or developing land within the design flood line of a creek or stream having a contributing drainage area of 160 acres or more, whether or not the land has been formally designated as a floodplain. Floodplain areas shall also include all areas inundated by the design flood and shown as areas of special flood hazard on the flood insurance study's maps.

Sec. 11-207. General floodplain regulations.

- (a) *Permitted uses of floodplain areas.* To minimize possible losses of life and property, the following uses are permitted in a floodplain area provided they are also permitted in the underlying zoning district:
- (1) Farm or ranch;
 - (2) Local utilities, electrical substation, water reservoir or pumping station, and water treatment plant;

- (3) Public park or playground, private recreation club or area, private community center and golf course;
- (4) Outside commercial amusement approved by a specific use permit;
- (5) Helistop approved by a specific use permit; and
- (6) Radio, television or microwave tower, and amateur communications tower with a special use permit.

Structures customarily associated with the above uses may be constructed within a floodplain area only if the proposed structure meets the same engineering requirements applicable to filling in a floodplain (See Section 11-208).

Open private recreation clubs or areas and private community centers, without exterior walls which would incur structural damage during flood conditions, are permitted in floodplain areas. Private facilities listed above, with enclosed walls that would incur damage, are not permitted in floodplain areas.

Uses and structures other than those mentioned above shall not be permitted in floodplain areas.

Notwithstanding the previous provisions of this section, the City will seek to preserve the 100-year floodplain for the following stream and creek segments:

- (1) Stream 2B7 south of Town East Boulevard to its confluence with South Mesquite Creek.
- (2) The West Fork of South Mesquite Creek south of U.S. 80 to its confluence with South Mesquite Creek.
- (3) South Mesquite Creek from North Mesquite Drive to the East Fork of the Trinity River.
- (4) North Mesquite Creek from U.S. 80 to its confluence with the East Fork of the Trinity River.
- (5) The East Fork of the Trinity River within the City.

Plans for encroachment and/or improvement of the floodplain in the five stream and creek segments identified above shall be submitted for review to the City Engineer, the City Planner and the Director of Parks and Recreation. The City Engineer will comment on the effects of the proposed encroachments and/or improvements on floodwater elevations and on the hydraulic adequacy of the channel. The City Planner may comment on the advisability of the zoning and land use. The Director of Parks and Recreation will comment on the use of the land for parks and open space as well as bird and wildlife habitat. The 100-year floodplain may not be developed in the stream and creek segments identified above without staff and City Council review of the ramifications of such development.

(b) *Residential construction.* New construction in reclaimed floodplain areas and "substantial

improvements" of any existing residential structure in floodplain areas shall have the lowest floor, including basements or fully enclosed areas of any new or "substantial improvement" construction, elevated to at least two feet above the design flood elevation. Fill elevations shall be one foot above the elevation of the design flood. Incremental improvements, either at one time or over a period of time, the cumulative cost of which equals or exceeds 50 percent of the market value at the time of the first improvement, shall be considered as a "substantial improvement." New residential structures or "substantial improvements" on stilts or behind ring levees serving individual lots shall not be permitted.

Improvements to an existing structure that increase the outside dimensions, but do not result in a "substantial improvement," must meet the requirements of Section 11-208.

Table 10 presents a synopsis of the requirements for residential construction in floodplain areas.

(c) *Non-residential construction.* New construction in reclaimed floodplain areas and "substantial improvement" of any existing commercial, industrial or other non-residential structure in floodplain areas shall either have the lowest floor, including basements of any new or "substantial improvement" construction, elevated to at least two feet above the design flood elevation, or, together with attendant utility and sanitary facilities, shall:

- (1) Be flood-proofed so that below two feet above the design flood elevation the structure is watertight with walls substantially impermeable to the passage of water;
- (2) Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and
- (3) Be certified by a registered professional engineer or architect that the standards of this subsection are satisfied. Such certifications shall be provided to the official set forth in Section 11-146(a).

Incremental improvements, either at one time or over a period of time, the cumulative cost of which equals or exceeds 50 percent of the market value at the time of the first improvement, shall be considered as a "substantial improvement." Improvements to an existing commercial, industrial or other non-residential structure that increase the outside dimensions, but do not result in a "substantial improvement," must meet the requirements of Section 11-208.

Table 10 presents a synopsis of the requirements for nonresidential structures in floodplain areas.

(d) *Manufactured homes.*

- (1) All manufactured homes shall be anchored to resist flotation, collapse or lateral movement by providing over-the-top and frame ties to ground anchors. Special requirements shall be that:
 - a. Over-the-top ties be provided at each of the four corners of the manufactured home, with two additional ties per side at intermediate locations, with

- manufactured homes less than 50 feet long requiring one additional tie per side;
- b. Frame ties be provided at each corner of the home with five additional ties per side at intermediate points, with manufactured homes less than 50 feet long requiring four additional ties per side;
 - c. All components of the anchoring system be capable of carrying a force of 4,800 pounds; and
 - d. Any additions to the manufactured home be similarly anchored.
- (2) For all new manufactured homes, new manufactured home parks and manufactured home subdivisions; for expansions to existing manufactured home parks and manufactured home subdivisions; for existing manufactured home parks and manufactured home subdivisions where the repair, reconstruction or improvement of the streets, utilities and pads is planned; and for manufactured homes not placed in a manufactured home park or manufactured home subdivision; for new manufactured homes moved into an old site in an existing manufactured home park; and for substantial improvements to a manufactured home, require that:
- a. Stands or lots are elevated on compacted fill so that the lowest floor of the manufactured home will be at least two feet above the design flood elevation;
 - b. Adequate surface drainage and access for a hauler are provided; and
 - c. No new manufactured homes shall be placed in a floodplain, except on a pad site created by compacted fill in an existing manufactured home park, in which the new fill pad site is elevated to the design flood elevation.

Manufactured homes may be supported to the required two feet above the design flood elevation by stands or foundation features as accepted by FEMA.

Table 10 overviews the requirements for placing manufactured homes in flood hazard areas.

- (e) *Recreation vehicles.* Recreational vehicles located on a site within a designated floodplain area shall (i) be on the site for fewer than 180 consecutive days and (ii) be fully licensed and ready for highway use, or (iii) meet the elevation and anchoring requirements for "manufactured homes" outlined in this section. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.
- (f) *Streets, parking lots and bridges* The top of curb of all new streets to be built in reclaimed floodplain areas shall be at least two feet above the design flood elevation. The low beam of all new bridges to be constructed across floodplains shall be a minimum of two feet above the design flood elevation. All new private bridges to individual homes shall have their low beams at two feet above the design flood elevation. Parking lots associated with residential, commercial and industrial uses in reclaimed floodplain areas shall be at least at the design flood elevation. Parking lots for public parks or playgrounds, private recreation club or area,

private community center and golf courses may be located below the design flood elevation.

- (g) *Utilities.* All new and replacement water supply systems, sanitary sewer facilities and other public utilities shall be designed to minimize or eliminate flood damage and infiltration of flood waters into the system.
- (h) *Fences.* Fences (private and public screening) shall be constructed such that blockage of surface water flow does not occur. Fences shall not be allowed in floodplain area or within dedicated easements. This includes the requirement that erosive conditions shall not be created around, under or near a fence structure.
- (i) *Additional construction standards for structures.* All improvements and construction permitted in a floodplain area must comply with the following requirements:
 - (1) Structures must be securely anchored to the foundation to prevent flotation and collapse during inundation and designed to prevent damage to nonstructural elements during inundation.
 - (2) Thermal insulation used below the first floor elevation must be of a type that does not absorb water.
 - (3) Adhesives must have a bonding strength that is unaffected by inundation.
 - (4) Doors and all wood trim must be sealed with a waterproof paint or similar product.
 - (5) Mechanical, electrical and utility equipment shall be located above the design flood elevation. Water heaters, furnaces, electrical distribution panels, and other critical mechanical or electrical installations must not be placed in basements. Electrical circuits for basements shall be separate from circuits serving floors above the basement and circuits for basements shall be installed lowered from above.
 - (6) Basements are permitted for non-residential structures only if they are designed to preclude inundation by the design flood elevation, either by:
 - a. The elimination of exterior openings below the design flood elevation; or
 - b. The use of water-tight closures, such as bulkheads and flood shields. However, no basements are permitted in soils whose permeability meets or exceeds the minimum local standards of permeability established for the installation of individual sewage disposal systems.
 - (7) Plywood used at or below the lowest floor elevation must be of an "exterior" or "marine" grade and of a water-resistant or waterproof variety.
 - (8) Wood flooring used at or below the lowest floor elevation must be installed to accommodate a lateral expansion of the flooring, perpendicular to the flooring grain, without incurring structural damage to the building.
 - (9) Basement ceilings for non-residential structures must be of sufficient wet strength and

be so installed as to survive inundation.

- (10) Paints or other finishes used at or below the lowest floor elevation must be capable of surviving inundation.
- (11) All air ducts, large pipes and storage tanks located at or below the lowest floor elevation must be firmly anchored to prevent flotation.
- (12) Tanks must be vented at a location above the design flood elevation.

Sec. 11-208. Floodplain alterations.

As stated previously in Section 11-207, no new construction is allowed in floodplain areas, but construction is allowed in those areas that can be reclaimed from the floodplain. The City of Mesquite has adopted a "natural floodway" that differs from the "regulatory floodway" established by FEMA. The "natural floodway" consists of the natural channel and floodplain that is effective in conveying the design flood. Areas of ineffective flow around bridges, topographic constrictions and other constrictions are excluded from the "natural floodway." The effective flow area and limits of the "natural floodway" are determined using 4:1 flow expansions downstream of constrictions and 1:1 flow expansions upstream of constrictions. Figure 22 displays an example of effective flow areas at a typical bridge location.

A development permit for floodplain reclamation or other types of alterations shall be allowed only if all of the following criteria are met:

- (1) Alterations of the floodplain and "natural floodway" shall not increase the water surface elevation of the design flood nor increase the volume of water to any adjacent, adjoining, upstream or downstream property owner, or otherwise adversely affect the property of any adjacent, adjoining, upstream or downstream property owner unless:
 - a. Full disclosure of the effects of the increase is made to the City;
 - b. Full disclosure of the effects of the increase is made to all property owners, governmental agencies and quasi-governmental agencies affected by such increase; and
 - c. The applicant provides evidence to the City, in a form acceptable to the City, that the applicant has acquired legal right (capable of being assigned to the City) to encroach upon the affected property which right shall take into consideration the effect of such encroachment on the remaining property of the affected owners.
 - d. Applicant's delivery to the City of policies of insurance in amounts and containing terms agreeable to the City and which name the City as a named insured or as an additional insured, insuring City against claims by third parties arising as a result of claims which may be made by adjacent, adjoining, upstream or downstream property owners for damages occasioned, or claimed to be occasioned, as a result of flooding due to development of the property or construction of any improvements upon the property.

- e. Applicant's delivery to the City of a legally enforceable and binding indemnity agreement containing terms agreeable to the City, indemnifying the City from and against all loss or liability (including attorney's fees) which may be occasioned by the City as a result of claims by third parties arising as a result of claims which may be made by adjacent, adjoining, upstream or downstream property owners for damages occasioned, or claimed to be occasioned, as a result of flooding due to development of the property or construction of any improvements upon the property.

It shall be the duty and obligation of the applicant to show and establish that there will not be an increase of surface elevation, volume or velocity, or alternatively the extent of the amount of such increase together with the full disclosure of all property affected by such increase. The matters herein required shall be evidenced by submission of drainage plans in form and content satisfactory to the City under seal of a professional registered engineer in the state. The cost of preparation of such drainage plans shall be paid exclusively by the applicant. The matters required by this paragraph shall be reviewed by an outside consultant of the City's choosing. The cost incurred by the City as a result of outside consultant review shall be paid by the applicant.

- (2) Alterations shall be in compliance with FEMA guidelines. All projects shall receive a conditional letter of map revision prior to issuance of a development permit.
- (3) Alterations of the floodplain shall not create an erosive water velocity on- or off-site.
- (4) The effects of existing improvements or public and private improvements for which a future commitment has been made by the City, county, state or federal agencies shall be used in determining water surface elevations and velocities.
- (5) Any alteration of floodplain areas shall not cause any additional expense in any current or projected public improvements.
- (6) The floodplain shall be altered only to the extent permitted by equal conveyance on both sides of the natural channel. The right of equal conveyance applies to all owners and uses including greenbelt, park areas and recreational usages. Owners may relinquish their right to equal conveyance by providing a written agreement to the City.
- (7) Maximum slopes of filled areas shall not exceed three to one. Slopes of any excavated areas not in rock shall not exceed four to one.

Fill slopes, vertical walls, terracing and other slope treatments may be considered provided no unbalancing of stream flow results and only as a part of a grading permit application.

- (8) A grading permit shall be required so that proper provisions for protecting against erosion losses will be made.
- (9) The City will utilize an engineering consulting firm to assist city staff in the review of a flood study. The cost of this consultant review shall be borne by the developer,

engineer or property owner submitting the flood study.

The City shall first obtain a cost estimate from the engineering consultant for the flood study review. Before the review begins, the developer, engineer or property owner submitting the flood study shall deposit with the City funds equal to the cost estimate. The City shall disburse the funds to the consulting engineer as the review progresses. Should the consultant fees exceed the initial estimate, the developer, engineer or property owner submitting the flood study shall be informed of the shortage and a new estimate made by the consultant engineer to complete the flood study review. Additional funds will then be deposited with the City by the developer, engineer or property owner submitting the flood study to cover the estimated shortfall before the review of the study resumes.

These criteria shall be met before a development permit can be issued for a proposed project. Typical projects requiring a development permit include placing fill, whether or not it actually raises the property out of the floodplain, constructing a dam, straightening channel sections, making improvements, substantial or otherwise, to existing structures in a floodplain in which the existing outside dimensions of the structure are increased and temporary storage of fill materials, supplies and equipment.

The required submittals for a development permit are listed in Section 11-149(2). In general, the information needed for the application can be obtained by running a backwater model, such as HEC-2, and a flood routing model, such as HEC-1. Both models shall be run by permit applicants. The backwater information shall be used to determine that upstream water surface elevations and erosive velocities have not increased. Starting water surface conditions for backwater calculations are outlined in Section 11-186(c). Flood routing information shall be used to insure that the cumulative effects of the reduction in floodplain storage of flood waters will not cause downstream increases in water surface elevations and erosive velocities.

The City Engineer shall keep the models current with modifications to the floodplain.

Sec. 11-209. Verification of floodplain alterations.

Prior to final acceptance by the City of utilities and street construction for projects involving floodplain alterations or adjacent to defined floodplains, creeks, channels and drainageways, a certified statement shall be prepared by a registered public surveyor showing that all lot elevations, as developed within the subject project, meet or exceed the required minimum finished floor elevations shown on the final plat of the subdivision. This certification shall be filed with the City Engineer.

In addition, at any time in the future when a building permit is desired for existing platted property which is subject to flooding or carries a specified or recorded minimum finished floor elevation, a registered public surveyor shall survey the property prior to obtaining a building permit. The certified survey data showing the property to be at or above the specified elevation shall be furnished to the City Engineer for approval. Certificate of compliance with the provisions of this article pertaining to specified finished floor elevations shall be required.

The owner/developer shall furnish, at his expense, to the City Engineer sufficient engineering

information to confirm that the minimum floor elevations proposed are as required by this paragraph. Construction permits will not be issued until (1) a conditional letter of map revision or amendment has been issued by FEMA, and (2) lots and/or sites are certified by a registered public surveyor and are elevated from the floodplain according to the FEMA-approved revisions to the floodplain and the requirements of this article.

SECTION 2. That all ordinances or portions thereof in conflict with the provisions of this ordinance, to the extent of such conflict, are hereby repealed. To the extent that such ordinances or portions thereof are not in conflict herewith, the same shall remain in full force and effect.

SECTION 3. That should any word, sentence, clause, paragraph or provision of this ordinance be held to be invalid or unconstitutional, the validity of the remaining provisions of this ordinance shall not be affected and shall remain in full force and effect.

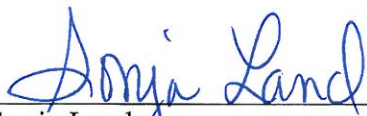
SECTION 4. That any person (as defined in Chapter 1, Section 1-2 of the Code of the City of Mesquite, Texas, as amended) violating any of the provisions or terms of this ordinance shall be deemed to be guilty of a Class C Misdemeanor and upon conviction thereof, shall be subject to a fine not to exceed Two Thousand (\$2,000.00) Dollars for each offense, provided, however, if the maximum penalty provided for by this ordinance for an offense is greater than the maximum penalty provided for the same offense under the laws of the State of Texas, the maximum penalty for violation of this ordinance for such offense shall be the maximum penalty provided by the laws of the State of Texas. Each day or portion of a day any violation of this ordinance continues shall constitute a separate offense.

DULY PASSED AND APPROVED by the City Council of the City of Mesquite, Texas, on the 2nd of July, 2012.



John Monaco
Mayor

ATTEST:



Sonja Land
City Secretary

APPROVED:



B. J. Smith
City Attorney