ORDINANCE NO. 3294

AN ORDINANCE AMENDING CHAPTER FOUR, ARTICLE TWENTY, SECTION 4-403 OF THE MUNICIPAL CODE OF THE CITY OF GUTHRIE, OKLAHOMA, ADDING SECTION 4-403(C) DESIGN POLICIES AND STANDARDS, SECTION 4-403(D) REGIONAL DETENTION SYSTEMS, SECTION 4-403(E) REGULATORY REQUIREMENTS, SECTION 4-403(F) CONSTRUCTION PLAN REQUIREMENTS, SECTION 4-403(G) REQUIREMENTS FOR DRAINAGE REPORTS AND PLANS, SECTION 4-403(H) DRAINAGE SYSTEM REQUIREMENT, SECTION 4-403(I) RAINFALL, SECTION 4-403(J) RUNOFF; THIS ORDINANCE PROVIDES FOR SEVERABILITY, REPEALER AND DECLARES AN EMERGENCY.

BE IT ORDAINED BY THE MAYOR AND CITY COUNCIL OF THE CITY OF GUTHRIE, OKLAHOMA:

SECTION 1

CHAPTER 4, ARTICLE 20, SECTION 4-403(C)-(J): DESIGN POLICIES AND STANDARDS SHALL BE ADDED AS FOLLOWS:

(C) Design Policies and Standards

(1) Drainage policies.

a) The storm water drainage system shall be designed to pass the peak storm water run-off received from upstream and from the subject property for storms with durations up to 24 hours and return periods of up to 100 years.

b) All development, redevelopment, and earth changes shall be constructed so that it will not increase the frequency of flooding or the depth of flood flows for any storm, up to and including the 24-hour 100-year storm.

c) Peak flows shall not be increased at any location for any storm, up to and including the 24-hour 100-year storm.

d) Regulation of peak flows to allowable levels, as determined by subsections (a)(2) and (3) of this section, shall be achieved by on-site or off-site storage and/or other water management facilities as provided in the city drainage standards.

e) Subject to requirements for a drainage plan or earth change permit and of the city drainage standards, downstream conveyance may be improved or easements obtained for inundated areas to compensate for increased flow depths if such improvements comply with the policies of this chapter.

f) All development, redevelopment, and earth changes shall be constructed so that it will not cause harm to other properties as a result of concentrating flows.

g) On-site storm water control may not be required for sites less than 2.5 acres in size if it is determined by the city engineer that storm water runoff from the site will not cause adverse effects as described in this chapter. The city engineer may request that the applicant provide such information as required to make this determination. In such cases, a cash payment in lieu of on-site storm water control will be made to the storm water management fund in an amount equal to the estimated cost of providing on-site storm water control.

(2) Erosion and sediment control policies.

a) All development, redevelopment, and earth changes shall be designed, constructed and completed in a manner which minimizes the exposure of bare earth to precipitation.

b) All development, redevelopment, and earth changes shall be constructed only if appropriate sedimentation facilities are installed and maintained throughout the construction period.

c) All development, redevelopment, and earth changes shall be accompanied by best management practices for controlling sediment and erosion so as to minimize the amount of sediment leaving the site.

(3) Standards.

a) Requirements and design standards for all components of drainage facilities shall be established by the city drainage standards.

b) The city drainage standards shall govern all earth changes, drainage plans, excavating, grading, regrading, revegetation, landfilling, berming and diking of land within the jurisdictional area of the city and shall specifically regulate the following considerations:

i. The city drainage standards shall regulate the design, installation, utilization and removal of all temporary and permanent drainage facilities and best management practices; and
ii. The city drainage standards shall regulate the placement and compaction of fill material.

(D) Regional Detention Systems

(1) Regional detention systems may be permitted and are recognized as one of the preferred methods of providing storm water control. These systems may be designed to control the fully urbanized flows so as to permit the maximum use by developments in lieu of constructing small, on-site detention.

(2) If it is determined by the city engineer that storm water runoff from the site will cause adverse effects as described in this chapter, the site shall not be eligible for the cash payment option. The city engineer may request that the applicant provide such information as required to make this determination.

(E) Regulatory Requirements

(1) Develop all storm water design plans to ensure all applicable regulations are met:

a) Any applicable City of Guthrie Municipal Codes

b) Any applicable State of Oklahoma statutes

c) Any applicable United State of America federal regulations

(2) Develop all storm water system plans with applicable Oklahoma Department of Environmental Quality (ODEQ) design standards and to ensure proper permits are obtained.

(F) Construction Plan Requirements

(1) Construction plan drawings shall include:

a) contour lines and spot elevations to support construction;

b) existing and proposed elevations;

c) existing and proposed structures with elevation information;

d) obstructions;

e) storage basins;

f) roadways, pavement, parking areas or other impervious surfaces;

g) curbs/gutters;

h) all utilities (buried, elevated and/or abandoned);

i) easements, property lines, and rights-of-ways;

j) Best Management Practices (BMPs) for erosion and sediment control;

k) all work limits;

l) FEMA regulatory floodplain zones (floodway, 100-YR, 500-YR);

m) appropriate profiles and section details; and

n) directions of flow.

(2) Building Elevations

At a minimum, plans shall include ground elevations and grade at the buildings perimeter. Where buildings are within the FEMA regulatory floodplain, base floor elevations shall be identified.

(3) Hydraulic Gradient

Plans shall include hydraulic gradient lines and/or 100-year floodplain water surface elevations, where applicable.

(4) Site Context

Plans shall include any additional information for areas outside of the site limits that may require modification as part of the project to mitigate adverse impacts downstream.

(5) Easements and Rights-of-Way

a) All restricted drainage easements shall be clearly shown detailed as to type, location, and width on the construction plans, record drawings, and final plats, as well as described in the conditions and restrictions of the plat or by separate instrument.

b) Adequate right-of-way shall be provided for access and maintenance to the drainage easement. Location and width shall be identified on the construction plans, record drawings, and final plats, as well as described in the conditions and restrictions of the plat or by separate instrument.

(G) Requirements for Drainage Reports and Plans

(1) Drainage Report Certification and Submittal

a) The report to be submitted shall include a cover letter presenting the study for review.

b) Drainage reports shall be prepared following the guidelines below and All reports and plans must be signed, sealed, and dated by a professional engineer with certification that the report and plan is in compliance with good engineering practice and the requirements of this Code.

(2) Cover letter required. A cover letter shall accompany all submittals and include the following:

a) Summary statement identifying and characterizing (location, area of project in acres, and proposed land use) the proposed land development project and discussing how the project will adhere to the requirements of this Code.

b) Brief description of drainage system components, the overall concept of the proposed drainage system, and its interaction with existing drainage facilities.

c) Policy statement discussing the design criteria and any proposed deviation from methodology, as set forth by this Code.

(3) Preliminary drainage study. The report submitted as a preliminary drainage study shall be formatted in accordance with the following outline and contain all of the information listed:

a) Project location map and information. The project location map shall contain the following information:

i. Map with township, range, section, quarter section.
ii. Name and address of property owner.
iii. Legal description of property.
iv. Streets within and adjacent to the project.
v. Names of surrounding developments.

b) Existing drainage map. The existing drainage map shall show the following:

i. Drainage area map at a scale of one inch equals 20 feet to one inch equals 100 feet identifying all predevelopment drainage basins and sub basins within and that contribute flow through or across the proposed land development project.
ii. Existing land use and predominant cover type (shrubs, trees, grass).
iii. Identify all existing basins and discharge points with unique alphanumeric labels, list area of each basin in acres, and list runoff coefficients or curve numbers appropriate for the existing land use.
iv. Existing contours at two-foot maximum intervals for all basins and sub basins.
v. Limits of floodplain and floodway located within or adjacent to (within 75 feet of the property) the proposed land development project.
vi. Existing drainage facilities within and adjacent to (within 75 feet of the property) the proposed land development project.
vii. Location, size and type of easements within and adjacent to the proposed land development project.

c) Proposed drainage map. The proposed drainage map shall show the following:
i. Drainage area map at same scale as existing drainage map identifying all proposed (post-development) drainage basins and sub basins and existing basins that will not be altered.

ii. Identify all proposed basins and proposed discharge points with unique alphanumeric labels, list area of each basin in acres, and list runoff coefficients or curve numbers appropriate for the proposed land use.
iii. Existing and proposed contours at two-foot maximum intervals for all basins and sub basins.
iv. Limits of floodplain and floodway located within or adjacent to (within 75 feet of the property) the proposed land development project.
v. Existing drainage facilities to remain and proposed drainage facilities within and adjacent to (within 75 feet of the property) the proposed land development project.
vi. Existing and proposed easements within and adjacent to (within 75 feet of the property) the proposed land development project.

d) Hydrology and hydraulics. The hydrology and hydraulics shall show the following:

i. A written summary of the existing drainage patterns and off-site drainage patterns and impact on the proposed development.
ii. A summary table of the following: existing (predevelopment) hydrologic characteristics, including, but not limited to, discharge points, basin areas, soil types, runoff coefficients, curve numbers, hydraulic lengths, and time of concentration values; and assumptions, including a written description of the basis for each assumption used in the calculations.
iii. A summary table of hydrologic analysis results for all of the basins and sub basins based on existing conditions for the minor and major storm events.
iv. A written general description of the proposed storm water drainage facilities and methods for controlling the post-development drainage including the proposed locations of storm water drainage facilities required to mitigate any potential adverse impacts.
v. A summary table comparing existing and proposed peak flow rates at each discharge point for the minor and major storm events.
vi. Design rainfall data used for minor and major storms.
vii. Hydraulic capacity calculations for all existing drainage facilities that currently serve or will serve the proposed land development project.
viii. Volumetric computations for compensatory storage requirements for any alterations of the floodplain.

(4) Final drainage study. The report submitted as a final drainage study shall include a final drainage plan, shall be formatted in accordance with the following outline, and shall contain all information listed for a preliminary drainage study in addition to the following information:

a) Drainage facility design. The drainage facility design shall show the following:

i. Post-development hydrologic characteristics, including but not limited to discharge points, basin areas, soil types, runoff coefficients, curve numbers,

hydraulic lengths, and time of concentration values); and assumptions, including a written description of the basis for each assumption used in the calculations.

ii. A summary table of hydrologic analysis results for all of the basins and sub basins based on proposed (fully developed) conditions for the minor and major storm events.

iii. A summary table of hydraulic capacity calculations for all proposed drainage facilities, including but not limited to streets, storm inlets, storm sewers, drainage channels, swales, culverts, and on-site or regional detention facilities, that will serve the proposed development project (on-site and off-site) or convey pass through runoff from upstream or off-site basins and sub basins.

b) b. Conclusions.

i. A written summary statement indicating compliance with this Code, the city drainage standards and the city standards, as well as any accepted drainage plans, where applicable.

ii. A detailed statement concerning the projected effects of the proposed land development project on property adjoining the site and on existing drainage facilities and systems both on and off site.

c) References. List all design criteria and technical information used.

d) Appendices. The appendices shall contain the following:

i. Land use assumptions regarding adjacent properties.
ii. Time of concentration flow path characteristics and calculations.
iii. Runoff calculations at specific design points on site and off site.
iv. Historic and fully developed runoff computations at points of compliance.
v. Hydrographs at critical design points, if applicable.
vi. Culvert capacity charts.
vii. Storm sewer capacity calculations.
viii. Street capacity calculations.
ix. Storm inlet capacity calculations.
x. Open channel design calculations.
xi. Grade control and/or channel drop design.
xii. Detention area/volume capacity and outlet capacity calculations (stage-storage discharge table).
xiii. Routing of off-site drainage flow through the development, easements, and/or right-of-way dedications.
xiv. Location/alignment of watercourse and the appropriate hydraulic analysis for any alteration of a watercourse.
xv. Hydraulic analysis for compensatory storage requirements for any alterations of the floodplain.
xvi. Detention facility outlet details and maintenance plan.
xvii. All appropriate FEMA submittal data and application for a LOMR, if applicable.

(5) Final drainage plan.

a) A drainage plan must contain a general location map in sufficient detail to identify all surface drainage entering and leaving the development and general drainage patterns. The map should be at a scale of one inch equals 200 feet up to one inch equals 2,000 feet and show the path of all drainage from the upper reach of any offsite basins to the defined major drainage ways.

b) Maps of the proposed development at a scale of one inch equals 20 feet to one inch equals 100 feet on a full size drawing (22 inches by 34 inches) oriented in plan view with north arrow and scale shall be included with the drainage plan. The plan shall show the following:

i. Existing and proposed contours at one-foot maximum intervals.
ii. Spot elevations and drainage arrows at all grade breaks within the development and at all locations where proposed surface improvements tie into existing grade around the perimeter of the property. In every instance, the plan shall include topography a minimum of 75 feet beyond the limits of proposed development.
iii. Property lines, easements, and common areas with purposes noted.
iv. Streets, roads, and highways adjacent to the property.
v. Overall drainage area boundary and drainage sub-area boundaries identified by bold, dashed lines.
vi. Existing drainage facilities and structures, natural or manmade, including roadside ditches, drainage ways, gutter flow directions, and culverts. All pertinent information such as material, size, shape, slope and location shall also be included.
vii. Proposed storm sewers and open drainage ways, including inlets, manholes, culverts, retaining walls, erosion control measures, and other appurtenances.
viii. Drainage arrows indicating individual lot grading patterns shall be clearly illustrated. Surface drainage from the lesser of three residential lots or three acres is allowed to combine before entering storm water drainage facilities designed to collect and transport surface drainage.
ix. Proposed discharge points for runoff from the project area and all facilities designed to convey flows to the final outfall point without adverse effects to downstream property.
x. The on-site 100-year flood elevations and the limits of regulatory floodway, floodplain and/or water surfaces. In every instance, the plan shall include a determination of the 100-year water surface elevation and the area of inundation based on routing off-site drainage flow through the development for a 100-year 24-hour storm.
xi. Location and elevation of all existing and proposed utilities affected by or affecting the drainage design.
xii. Details for the construction of all proposed storm water drainage facilities at a scale sufficient to demonstrate conformance with city drainage standards and city standards shall be included. Details shall include, but not be limited to, plan and profile view of all drainage facilities, culvert and underground pipe trench details,

detention storage and outlet details, street inlet details, low-flow concrete swale and curb cut details and channel and swale standard cross sections.

xiii. Water surface profiles for the major storm shall be computed using standard backwater analysis (taking into consideration all losses due to changes in velocity, drops, bridge openings, culverts, and other obstructions) and delineated in the profile view of all channels and drainage facilities.

xiv. The existing and proposed surface area (in units of square feet) of impervious materials for nonresidential land development projects shall be calculated and included in tabular form for proper assignment of equivalent residential units (ERUs) for drainage fees.

xv. When construction is phased or when temporary facilities are used, an outline of the sequence of construction activities shall be provided that notes when the various aspects of the drainage study will be implemented.

(H) Drainage System Requirements

(1) Storm water Drainage System Design Capacity

a) The storm water drainage system shall be designed to receive and pass the runoff from a 1% (100-year) frequency rainstorm under full urbanization. The entire flow shall be confined within the storm water drainage system and shall include easements and drainage facilities within the public rights-of-way.

b) When roadways are used as a part of the storm water drainage system, all street design requirements shall be followed.

(2) Storm water Flow

a) The storm water flow of a collector system shall be designed within the confines of dedicated rights-of-way or restricted drainage easements to ensure that storm water runoff can pass through a project site without inundating the lowest level of any building, dwelling, or structure.

b) When storm water drainage system features are located between buildings or lots rather than within the right-of-way of a street, designs shall include restricted drainage easement as platted. City code prohibits structures from being located within restricted drainage easements.

c) The adjacent water surface elevation produced from a 1% (100-year) storm shall be no closer than 1 foot from the finished floor of any structure.

d) Drainage easement language shall state on the plat that the restricted drainage easement is provided for storm water flow, and that the area shall be maintained by the property owner in accordance with the Land Development Code.

(3) Bridges, Culverts, and Swales

a) All bridges shall be designed to pass the flow produced by the regulatory 1% (100-year) storm with 2 feet of freeboard from the water surface to the low chord of the bridge. All culverts determined to be bridge box culverts, shall be designed to pass the flow produced by the regulatory 1% (100-year) storm with 2 foot of freeboard from the water surface to the inside top of the culvert.

b) All culverts under roadways, regardless of size, shall be designed to pass the flow produced by the regulatory 1% (100-year) storm with 1 foot of freeboard from the water surface to the upstream edge of pavement, for which backwater from 100% blockage would flood upstream structures. Backwater analysis shall be provided to illustrate compliance with this requirement.

c) Maximum upstream headwater allowed shall be 1.5 times the vertical interior dimension the culvert; the culverts shall be designed to have overland relief in a restricted drainage easement or right-of-way assuming 100% blockage of the culvert.

d) Culverts, gutter lines, and associated longitudinal street grades for all streets shall be designed without street overtopping for floods produced by all storms up to and including the regulatory 1% (100-year) storm. Where overtopping will occur, the design shall include roadside swales, storm sewers or other storm water appurtenances.

e) Culverts shall be designed such that backwater from the culvert does not inundate any structure.

f) Provide protective measures for culverts and embankments to minimize embankment damage during overflow.

g) When roadside swales without storm sewers are to convey storm water, the swales shall convey the regulatory 1% (100-year) flow and have a maximum depth of 30 inches to limit traffic and pedestrian safety hazards, regardless of right-of-way width, slope or paved bottom. If a greater depth is required, by design and/or site conditions, an alternative storm water conveyance system must be used. Special considerations will be made for use of engineered bioswales which require a greater depth than 30 inches; traffic and pedestrian safety will be required to be addressed as part of the design. Roadside swale cross-slopes shall be no steeper than 3:1 (H:V). Wherever practical, side slopes of 4:1 (H:V) shall be required to allow for maintenance safety.

h) Roadside swales with vegetative cover shall have a longitudinal slope of no less than 2% to ensure drainage. When slopes greater than 2% are used, the channel must be designed to ensure that surfaces are protected from erosion.

(I) Rainfall

All hydrological analyses for projects within the City of Guthrie shall utilize the rainfall data published by the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 as the basis for rainfall intensity or cumulative depth.

(J) Runoff

(1) General

a) A drainage study which compares pre-project conditions to proposed conditions and shall be developed and submitted as a report as part of the design submittals.

b) For new construction projects, "pre-project conditions" refers to the natural state.

(2) Soil Conservation Service (SCS) Unit Hydrograph Method The method of runoff analysis that shall be used for the design of storm drainage system components is the SCS Method.

a) Soil-Cover Complex Number (CN) Determination When using the SCS unit hydrograph method for a sub-basin, the SCS basin lag time shall be used in conjunction with the CN value to determine runoff. The soil type and vegetative covers of a watershed are generally classified separately. A combination of a specific soil type and a specific cover is referred to as a Soil-Cover Complex Number (CN) and a measure of this complex can be used as a watershed parameter in estimating runoff. The CN for each area in the hydrologic analysis can be derived by first determining the classification of the soil, and then choosing the CN from the NRCS Urban Hydrology For Small Watersheds (TR-55 report).

b) Basin Characteristics
Sub-basin characteristics needed for the SCS Unit Hydrograph Method are:

i. Drainage area of the sub-basin;
ii. Longest flow path length;
iii. Characteristics of individual flow paths that make up the longest flow path (e.g., overland, grassed channel, gutter);
iv. Slope of individual flow paths; and
v. Land use types and areas throughout the basin (e.g., agricultural, residential, business)

(3) Time of Concentration
The Time of Concentration (Tc) for the basin is made up of two time components, according to the following equation:

$Tc = To + Tt$
Where: Tc = time of concentration (minutes)
To = initial, inlet, or sheet flow time (minutes)
Tt= travel time in the ditch, channel, gutter, storm sewer, etc. (minutes)

a) For urban areas, the time of concentration consists of an overland sheet flow time (To) plus the time of travel (Tt) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel.

b) For non-urban areas, the time of concentration consists of an overland sheet flow time (to) plus the time of travel (Tt) in a combined form, such as a small swale, channel, or drainage way.

c) Overland sheet flow time, To, varies with surface slope, surface coverage and distance of surface flow.

d) Overland flow distance shall not exceed 200 feet.

e) A one-minute time increment shall be used in developing the rainfall distribution.

(4) Rational Formula

The Rational Method shall only be used to determine pipe sizes for storm water drainage systems. It shall not be used for any routing calculations for storm water storage facilities.

a) The Rational Method, using the Wright-McLaughlin modifier (correction factor) is based on the formula:

$Q = CIA$

Where:

Q = peak discharge, (cubic feet per second, cfs)
C = runoff coefficient (dimensionless) (see Table 1800.2 or 1800.3)
I = rainfall intensity for a duration equal to the time of concentration, (inches/hour)
A = watershed area (acres)

b) Runoff Coefficient

Runoff coefficients for different land use or surface characteristics are found in Table x. If the sub basin is not homogeneous in its land use type, then a composite runoff coefficient should be calculated by averaging the areas of different runoff coefficients.

c) Rainfall Intensity: The rainfall intensity is the average rainfall rate in inches per hour for the period of maximum rainfall of a given frequency having a duration equal to the time of concentration. As described in the February 1988 ODOT Drainage Design Manual, the following equations shall be used. The most current ODOT Intensity-Duration-Frequency curves shall supersede this information.

$I = a/(Tc+b)c$

Where:

I = rainfall Intensity (inches per hour)
Tc = time of concentration (minutes)
a,b,c = defined through regression of NOAA Atlas 14 data

SECTION 2:
All other provisions of Chapter 2 of the Guthrie Municipal Code not amended by this Ordinance shall remain in full force and affect.

SECTION 3:
Any Ordinance in conflict with this Ordinance is repealed.

SECTION 4:
For the preservation of the public peace, health, and safety of the citizens of the City of Guthrie, an emergency is hereby declared to exist, whereupon this Ordinance shall be in full force and effect upon its passage and approval.

Passed and approved, and the emergency clause ruled upon separately, this 6th day of September, 2016.

Steven J. Genthing, Mayor

ATTEST:

Kim Biggs, City Clerk

APPROVED AS TO FORM AND LEGALITY:

Randel Shadid, City Attorney