

**CHAPTER VIII**  
**CITY OF COWETA DESIGN CRITERIA FOR DRAINAGE, DETENTION, STREETS**  
**AND EARTH CHANGE**

- 8.0 DESIGN CRITERIA CONTENTS**
- 8.1 General
- 8.2 Drafting
- 8.3 Bench Marks
- 8.4 Typical Sections
- 8.5 Cross Sections
- 8.6 Plan Sheets and Profiles
- 8.7 Streets
- 8.8 Structures and Specific Details
- 8.9 Easement and Right-of-Way
- 8.10 Drainage
- 8.11 Detention Facilities
- 8.12 Earth Change, Soil Erosion and Sedimentation
- 8.13 Floodplain Area Maps
- 8.14 Determination of Floodway

Note: The following design criteria was taken from the “Criteria, Standards and Specifications for Storm Drainage, Streets and Earth Change” Engineering Department, City of Coweta. This section of that document has been included within these Regulations for information purposes only. The Engineering Department should be consulted for possible changes to the included section and for detailed design standards and specifications.

**8.0 DESIGN CRITERIA FOR DRAINAGE, DETENTION, STREETS AND EARTH CHANGE**

**8.1 General**

1. Where on a particular tract, the standards and specifications set forth herein are not necessary or applicable by reason of topography, soils or other conditions peculiar to such tract, other standards may be used with the prior approval of the City Engineer.
2. For any item of work not covered by the adopted standards and specifications of the City of Coweta, the Consulting Engineer shall include two copies of the design, specifications and/or special provision with his first submittal for review and approval by the City Engineer.
3. Approval of the plans by the City Engineer does not release the Consulting Engineer from his responsibility to meet the planning and design of the project as required by the City engineer and/or other departments of the City.

4. All of the plan sheets and the cover sheet of the calculation report shall be signed, sealed and dated by a Professional Engineer, registered in the State of Oklahoma, prior to submitting the plans to the City Engineer for review.
5. Directly above the title block and signature of the Professional Engineer, registered in the State of Oklahoma, the first sheet of the plans shall contain the following statement:

“I hereby certify that I am familiar with the adopted ordinances and regulations of the City of Coweta governing drainage, detention and earth change; that these plans have been prepared under my direct supervision; the above and foregoing drainage plans comply with all governing ordinances and the adopted standards of the City of Coweta pertaining to drainage, detention and earth change to the best of my knowledge, information and belief.”
6. All developments with private streets and drainage facilities shall contain the following statement on the first sheet of the plans directly above the title block and signature of the Professional Engineer, registered in the State of Oklahoma.

“These plans comply with all governing ordinances and the adopted criteria of the City of Coweta pertaining to drainage, detention and earth change to the best of my knowledge, and information and belief.”
7. Construction pay items and Engineer’s cost estimate for each item of work covered by the standard specifications and/or special provisions shall be rounded off to the nearest unit and listed in the proposal clearly indicating the basis for payment.

## **8.2 Drafting**

1. Construction plans shall be drawn on a transparent reproducible medium (paper velum, linen or Mylar).
2. Standard sheets shall be 34: wide by 22” high having a margin of 1 ½” along the left border and ½” along the top, bottom and right border.
3. North shall be oriented to the top or right hand side of all sheets.
4. A City of Coweta Standard Title Block shall be located in the lower right hand corner of each sheet.
5. All plan sheets shall use the City of Coweta Standard Title Block for all Privately Financed Public Improvement Projects.
6. All plan sheets for private streets and/or storm sewer design will use City of Coweta Standard Title Block for private paving and storm sewer plans.

7. All line work shall be of sufficient density to be reproducible by current division reproduction processes. Any line work which does not reproduce satisfactorily may be cause for rejection of the plans by the division.
8. Freehand lettering shall be no smaller than the No. 4 setting on the Ames lettering guide (0.12" minimum height). Mechanical lettering shall be at least comparable to the 100 Leroy guide (0.10" minimum height) except mechanical lettering on plats or records reproduced in the plans may be comparable to the 80 Leroy guide (0.08" minimum height). Typing shall be at least 0.10" minimum height. Adhesive or transfer lettering shall have a minimum height of 0.10". These lettering sizes are minimum. Sizes greater than these are desirable and suggested.
9. "Record" drawings shall be either India ink or linen or .003 Mylar base black line autopositive matte both sides not reversed. (Diazo processes will be acceptable.) "Stick-on" will not be acceptable.
10. The sheets shall be arranged in the following order:
  - a. The front sheet shall contain existing topography (maximum 2' contour intervals), City of Coweta Title Block, north arrow, index to sheets, street layout, lot layout, off site adjacent structures, location map, project number, description, symbol legend, owner's and engineer's name, address and telephone number, bench mark, PE seal and signature, certified statement and PFPI description.
  - b. Preliminary clearing, leveling and grading plan identifying areas where erosion and sediment control is needed.
  - c. Soils map, type of erosion and sediment control measures needed, a timing schedule indicating the anticipated starting and completion dates of developments construction sequence.
  - d. Drainage areas for inlet design with flow arrows indicating areas, Q100, Q15 and time of concentration. Summation tabular column of drainage areas and flows to respective inlet.
  - e. Layout of streets with stations, cul-de-sacs, elbows and intersections numbered with cross reference to plan detail.
  - f. Storm sewer layout (may be included with paving plans).
  - g. Final grading plan showing final grades and minimum pad elevations for lots close to sump areas, for areas where pad is lower than the curb, and for lots adjacent to floodplain areas, permanent erosion and sediment control practices.

- h. Large scale drawing of cul-de-sacs, intersections, elbows showing drainage system.
- i. Detention pond(s) showing existing and proposed topography cross sections thru the pond including 5 and 100 year water levels, details of inlet and outlet structures, a back water profile for the existing and proposed topography if located in a floodplain area subject to mapping and indicate if privately or publicly maintained.
- j. Details of structures, both standard and special.
- k. Drawings of all dam structures.

### **8.3 Bench Marks**

- 1. All elevations shown on the plans shall be based on USGS or USC&GS datum.
- 2. The permanent benchmark location and description used to extend level datum to the projects shall be noted on the front sheet of the plans.
- 3. All temporary benchmarks used for control of the project shall be designated on the plans stating elevation, location and description. The nearest such benchmark shall be shown on each sheet.
- 4. Prior to commencement of construction, a permanent bench mark shall be established on the project. This permanent bench mark will be a brass cap set in concrete. The cap shall read "City of Coweta Bench Mark" together with a letter and/or numerical designation assigned it by the City Engineer from the master file of benchmarks maintained by the City Engineer. The location, description and elevation of the permanent benchmark shall be shown on the front sheet of the plans.
- 5. Level notes shall be provided to the City Engineer for all permanent and temporary benchmarks. All levels notes shall be of closed loop survey.

### **8.4 Typical Sections**

- 1. Typical sections shall be drawn at the same horizontal and vertical scale.
- 2. Typical sections shall show dimensions, type of materials, layer details, reserve topsoil, temporary and permanent erosion control, compacted thickness, etc.
- 3. All typical sections or notes that are necessary to clearly reflect the design shall be included.

## 8.5 Cross Sections

1. Cross sections may be required by the City Engineer as a part of the construction plans when necessary to reflect more clearly the intent of the design.
2. All cross sections for street rights-of-way shall be drawn to scale showing existing ground and proposed construction from building line to building line.
3. Typical cross sections shall be shown for each street if the slope to the property line exceeds one quarter inch per foot.
4. Each section shall be stationed clearly.
5. The beginning and ending points of a project shall be stationed and cross sections for both the stations shall be drawn.
6. Maximum distance between cross sections shall be 100' when  $\frac{1}{4}$ " per foot of slope to the right-of-way is exceeded.
7. Sufficient information shall be furnished to show that water is not ponded behind curbs or in ditches
8. Scale for cross sections shall not be less than:

Channels	1" = 10' Horizontal	1" = 5' Vertical
Streets	1" = 5' Horizontal	1" = 5' Vertical
9. Cross section will be required on plans at center line of each lot when the slope to right-of-way exceeds twelve (12%) percent.

## 8.6 Plan Sheets and Profiles

1. All property lines shall be shown, dimensioned and locations referenced thereto. This includes rights-of-way, easements, building lines, etc.
2. All intersections, cul-de-sacs, and other critical locations shall be shown in large plan detail, including direction of drainage, top of curb elevation at PC's, PT's and high or low points. All curve information shall be shown in detail.
3. All drainage areas shall be clearly marked on the drainage area plan sheet; showing acreage, run-off and off-site pickup points.
4. A site plan showing proposed locations and elevations of all utilities shall accompany the street and storm sewer plans.
5. The profile may be either three separate profiles or one single profile.

- a. Three separate profiles: When using three separate profiles, the top and bottom shall show existing property line and proposed top of curb. The middle profile shall show only existing center line profile. Stationing shall be along center line.
  - b. One single profile: When using one single profile both property lines shall be shown along with the proposed top of curb. The center line profile shall not be shown. Stationing shall be along center line.
6. All fill areas within the street right-of-way and beneath storm drainage structures, shall be cross hatched on the profile and notation shall be made that the fill area shall be compacted to a minimum of 95% standard proctor density.
  7. A list of construction pay items and estimate of quantities shall be shown on the plans.
  8. Curb returns with elevations shall be clearly labeled on profile.
  9. Vertical curves in profile shall give the top of curb elevations at the PC, PI, PT and high or low point, at a minimum of 50' intervals.
  10. All structures (manholes, junction boxes, inlets, headwalls, etc.) shall be numbered and labeled both in plan and in profile and detailed on plans.
  11. Scale shall not be less than 1" = 50' horizontal, and 1" = 5' vertical on profile sheets. Minimum scales shall be 1" = 100' on plan sheets.
  12. Storm sewer lines shall be identified on both plan and profile sheets by letter or number.
  13. Storm sewers shall be located along centerline of streets unless otherwise approved by City Engineer.

## **8.7 Streets**

1. All arterial street designs shall be furnished by the City of Coweta Engineering Division.
2. The centerline of paving shall be the centerline of right-of-way where dedication has been made according to the major street plan. All other cases shall be determined by the City Engineering Division.
3. The minimum grade set along the curb shall be .5%. The maximum desirable grade for non-arterial streets shall be limited to 8%. For situations where the topography is unusually hilly, grades will be permitted up to a maximum of 12% providing they do not exceed 500-feet in length from PT to PC.

4. The grade of the curb returns will continue for the full arc on all intersections where a midway opposing break is not provided.
5. Sag vertical curves shall be designed according to AASHTO Specifications using the criteria of headlight site distance and drainage control. Crest vertical curves shall be designed according to the current AASHTO Specifications using the criteria of safe stopping sight distances.
6. Vertical curves shall be the minimum length available for the two grades entering into a sump area as defined by the AASHTO publication titled. "A POLICY ON DESIGN OF URBAN HIGHWAYS AND ARTERIAL STREETS".
7. Design speed shall be 25 miles per hour on all residential streets and 30 miles per hour on all collector streets.
8. The minimum centerline radius on street alignment shall be 125-feet.
9. The minimum radius on returns at residential intersections shall be 25-feet. At intersections of a residential and arterial street, the minimum radius on returns shall be 30-feet. The minimum radius on the returns for industrial districts shall be 40-feet.
10. Soil tests will be required for all areas to be paved. Soil tests will be submitted to the City Engineering Division for approval. If soil tests indicate that the soil has a plasticity index of 10 or greater, a minimum of 6" of subgrade shall be modified with a minimum of 5% lime by weight. If the soil tests indicate that the soil is granular and unstable, the method of stabilization shall be approved by the City Engineering Division. If desired, subgrade may be built of an approved borrow material.
11. The maximum grade of a residential street when intersecting an arterial shall be 2% for a minimum of 100-feet from the curb line of the arterial. No vertical curve shall begin any closer than 50-feet from the curb line of the arterial. The maximum grade of residential streets at intersections shall be 4%.
12. Industrial pavement sections shall be a minimum of 10-inch asphaltic concrete or 8-inch PC Concrete. Residential pavement sections shall be a minimum of 6 ½" asphaltic concrete or 6-inch PC Concrete.
13. A proposed and existing profile shall be shown beyond the end of all dead end streets for a minimum of 200-feet to determine a satisfactory grade for future development.
14. Cross slope may be 1/4-inch or 3/8-inch per foot; however, crown will be flattened off so that crown never exceeds curb height.

## **8.8 Structures and Specific Details**

1. All special structures will be detailed.
2. When standards are used, standard sheets shall be included as part of project plans.
3. Special structures shall be drawn to scale; unless noted otherwise.
4. Sufficient details, dimensions and related notes shall be provided for all structures.
5. All structures subject to vehicular traffic shall be designed for H-20 loading.
6. All bridge design shall meet the requirements in the latest edition of Standard Specifications for Highway Bridges prepared by AASHTO.

## **8.9 Easement and Right-of-Way**

1. Easements and rights-of-way shall be clearly dimensioned in the plans.
2. All overland restricted drainage easements will be shown detailed on the “Plans” and “Final Plat”, as well as described in the conditions and restrictions of the plat.
3. Additional overland drainage easements may require “Separate Instruments” as shown in Appendix.
4. An unimproved drainageway left in a natural state shall be dedicated to the public, either by title or easement, and platted with a minimum width equal to the floodplain width required to pass the regulatory flood. Dedicated drainageway shall be provided with adequate vehicular ingress and egress for maintenance purposes. If said drainageway width is less than 150’ the minimum width required will be the floodplain plus an additional width of 15’ on each side of the floodplain. A permanently visible monument shall be set on each property line at its intersection with the easement of right-of-way line to identify the limits of the drainageway. Said monuments to conform to adopted City Standards. Said dedication may have an ownership reverter provision.
5. City may accept dedication of the entire floodplain area for an unimproved channel.
6. Adequate restrictive easements for dedicated right-of-way must be provided for access and maintenance.

7. The minimum width for all storm sewer easements shall be the outside diameter of pipe plus 10', and the pipe shall be laid in the center of easement.

## **8.10 Drainage**

1. All stormwater run-off shall be subject to review and approval by the appropriate public authority with regard to analysis, design and construction of drainageway facilities and the appropriate public authority shall have the right to maintain or to cause to be maintained the drainageway system for its intended purposes.

Drainageway facilities, both public and private, shall consist of all elements necessary to convey stormwater run-off from its initial contact with the earth to its disposition in either the Arkansas River or Coweta Creek. The drainageway system, both public and private, shall consist of storm sewers (which are closed conduits); improved channels constructed in conformity with adopted City Standards; unimproved drainageways left in their natural condition; the areas covered by restricted drainageway easements for the purpose of providing overland flow; and all appurtenances to the above including inlets, manholes, junction boxes, headwalls, dissipators, culverts, etc. All portions of the drainageway system that exist on dedicated right-of-way or restricted drainageway easements shall be owned and maintained by the City of Coweta.

2. The stormwater drainageway system shall be designed to receive and pass the run-off from a 100-year frequency rainstorm with full urbanization. The collector system shall be designed either:
  - a. to pass a minimum of 15-year frequency storm in a pipe network with overland flow capacities so that the combination of the two will pass the run-off from a 100-year frequency rainstorm under fully urbanized conditions. Or,
  - b. pass the entire 100-year flood in the pipe network. The overland flow portion of the collector system shall be continued to dedicated right-of-way, or restricted drainage easements to assure that stormwater can pass through the development without inundating the lowest level of any building, dwelling or structure.
3. The stormwater drainageway system shall be designed to pass the run-off from a 100 year frequency rainstorm under full urbanization. The entire flow shall be confined within the said stormwater drainageway system.
4. The rational method of runoff analysis shall be used for the design of the closed pipe networks of the storm sewer system up to discharge of 400 cfs. For discharges over 400 cfs a hydrograph method will be used.

5. The Rainfall Intensity Curves prepared from TP-40 and National Weather Service HYDRO-35 (June, 1977) shall be used for design when using the rational method (Refer Appendix).
6. The Oklahoma Department of Highways Technical Manual dated April, 1970, shall be used for determining the basic "C" values. (Refer Appendix). A weighted 'C' value shall be determined with minimum values of .45 for residential (RS & RD), .65 for multifamily (RM) and .90 for industrial and commercial areas. Unplatted areas within 300' either side of an arterial shall be either considered commercial or shall be in accordance with the comprehensive plan in estimating runoff co-efficients.
7. The time of concentration (Tc) shall be determined by first reading the velocity from the slope-velocity graph included in Appendix and computing by the formula:

$$T_c = \frac{\text{(Length of Reach (ft.))}}{\text{(60 (Sec./Min.) X Velocity (Ft./Sec.))}} \text{ Minutes}$$

8. A maximum time of concentration of 10 minutes to the first inlet shall be used for single and multifamily residential areas.
9. A maximum time of concentration of 5 minutes to the first inlet shall be used for commercial and industrial areas.
10. The distance between inlets shall be determined so that gutterflow for the 15-year storm will not exceed gutter capacity. The water depth in the street on slopes shall not be deeper than the curb of the street for the 100-year design rainfall. Distance between inlets shall not exceed 600 feet. The water depth at sump locations shall not exceed more than 1' above the top of curb for the 100-year design rainfall.
11. Inlets at intersections shall be located in such a manner that no part of the inlet will encroach upon the return. The flowing and top of curb elevations shall be on all inlets. Inlets shall not be placed on main storm sewer lines.
12. Where possible, run off from large areas outside the roadway shall be collected before it reaches the roadway. Parking lots shall have internal drainage systems so as to reduce concentrated flow into streets.
13. Drainage areas and the 15 year and 100-year flows to the respective inlets shall be summarized and tabulated on the plans as shown in Appendix. The summary table shall also be a part of the calculations.

14. Grates and curb inlets shall be sized in accordance with the grate throat chart in this chapter.
15. Gutter flow shall be computed by using the “Nomograph for flow in triangular channels”.
16. Calculations for inlets, pipes and gutter flow shall be summarized as illustrated in this chapter.
17. Borrow ditches along arterial streets shall not exceed 3 feet in depth. Culverts shall be sized to handle the 15-year or larger storm.
18. All off roadway inlets up to 24” will be of the standard drop inlet design. The standard inlets larger than 24” may be used upon special review and approval by the City Engineer.
19. Manholes and catch basins shall be stationed on plan sheet using centerline of street stationing. Inlets with grates shall be stationed at the centerline of the grated section. Inlets without grates shall be stationed at the centerline of the throats.
20. Storm sewer systems shall be closed conduit up to 60” diameter pipe or its hydraulic equivalent. Exceptions may be made to this requirement for lands being developed for park purposes which will be under the jurisdiction of the Mayor and Board of Commissioners.  
  
Stormwater drainageway systems that must carry a flow greater than the capabilities of a 60” closed conduit system may be a closed system, an improved channel constructed in accordance with adopted City Standards and adopted floodplain policies, or in accordance with adopted floodplain zoning ordinances.
21. Roughness coefficient for drainage design will be as listed in tables 5-5 and 5-6, figure 5-5, pages 109 through 123, of “Open Channel Hydraulics” by Ven Te Chow, published by McGraw-Hill Book Company, 1959.
22. Minimum Velocity in a drainageway system, having a roughness coefficient less than or equal to 0.015, shall be 2.5 fps to avoid sedimentation.
23. Pipes shall be sized using either Kutters or Mannings charts for design flow. The slope used for design shall be the slope of the invert of the pipe.
24. No pipe shall be installed downstream having a diameter smaller than the pipe from which it is receiving water.
25. Concrete pipe shall not be less than C-76 Class III. Corrugated metal pipes shall meet Oklahoma State Highway Department gauge requirements for fill heights.

26. Junctions between different pipe sizes shall be made with the top inside of the downstream pipe no higher than the top inside of the upstream pipe.
27. A manhole or junction box shall be required at all changes of grade, changes in alignment, and junctions between two or more different size pipes.
28. The horizontal distance between pipes being placed in the same trench shall be a minimum of 2' or one-third the diameter of the largest pipe, whichever is greater. This would include multiple pipe crossings for culvert purposes.
29. Radius pipes will not be used on storm sewers having a diameter less than 36". Radius pipes will be used on storm sewers larger than 36". The radius of the curve shall be no less than 5 times the diameter of pipe. The degree of deflection shall be no more than 7-1/2° per joint of radius pipe.
30. Manholes of 4' inside diameter shall be used whenever possible. If the diameter of the manhole exceeds 4', junction boxes will be used. Junction boxes must be used whenever manholes can not be used. The rim elevation shall be indicated on all manholes and junction boxes. Manhole and junction boxes may be precast or cast in place.
31. Drainage pipes shall not enter manholes with 4' inside diameter in the Corbel (neckdown) section. The size of pipe entering or leaving a 4' diameter manhole shall not exceed 24".
32. A minimum of 6" cover shall be provided over pipes and box culverts to the bottom of the subgrade except when box culverts are built with the top at grade.
33. All storm sewers shall be shown in profile, showing flowline, size type, grade and the design discharge. Profiles shall show the natural and proposed ground line at the center line of the storm sewer.
34. The radius of curve for a culvert shall be a minimum of 3 times the maximum width of the culvert.
35. Box culverts and bridges shall have adequate capacity to pass 100-year fully urbanized flows with 1' freeboard. Backwater analysis shall be provided by the consulting engineer to illustrate compliance with this requirement.
36. All headwalls shall be broken back design except for culverts; under roadway embankment where purpose of headwall is primarily to retain earth.
37. Pipes discharging at a steep gradient into drainageways and detention facilities shall be provided with a slope wall.

38. All open channels shall conform to the City of Coweta's standards. The centerline radius of a curve on an improved channel shall be a minimum of 3 times the maximum of 3 times the maximum top width at the design flow depth.
39. All improved channels shall be provided with a minimum of 1' of freeboard.
40. When storm sewers are constructed in fill areas, all materials in fill areas shall be compacted to a 95% standard proctor density prior to the laying of the pipe.
41. Maximum spacing between manholes or junction boxes shall not exceed 300'.

### **8.11 Detention Facilities**

1. Detention is required for all RS development of 10 acres or more and for all other developments of 2 acres or more except as provided in items 2 and 3 below. Peak release rates from the developments should not exceed the natural run-off that occurred before developments for all storms up to and including 100-year storm. Item 11 below will be used to determine the peak release rate.
2. RS development less than 10 acres and all other developments less than 2 acres may also be required by the City Engineer to have detention if the location of the developmental site with respect to the watershed and its inherent flooding problems warrants it.
3. Detention will not be required for a developmental site that has 100-year full urbanization drainageway capacity to either the Arkansas River or Coweta Creek.
4. The detention storage requirements shall be that excess run-off generated due to urbanization resulting in less impervious area and alteration of times of concentration due to storm sewerage of the area, overland flows on rights-of-way and alteration of the drainage patterns as a result of earth change, etc., for a 100-year frequency storm.
5. Snyder Synthetic unit hydrograph method, the Soil Conservation Service derivative thereof, the Storm Water Management Model, the Stanford Watershed Model, or Massachusetts Institute of Technology Catchment Model shall be used for the design of all detention facilities.
6. U.S. Weather Bureau Technical Paper No. 40 and National Weather Service HYDRO-35 (June, 1977) shall be used for rainfall information. (Refer Appendix)
7. The duration of the storm used for design shall not be less than two times the time of concentration. The time of concentration is defined as the time for run-off to travel from the furthestmost point in the watershed to the point in question.

8. The time increment used in developing the rainfall distribution and in reading off the ordinates of the unit hydrograph may be rounded off to the nearest whole time interval or to the nearest time increment.
9. The rainfall excess shall be critically arranged in such a way that the largest increment is located one time interval past the center of the duration of the rainfall excess.
10. The loss rates in determining the runoff hydrograph shall be an initial loss of 0.5 inches and a uniform loss of 0.08 inches/hr. for the subsequent hours once the initial losses are satisfied.
11. To determine peak release rate a minimum of 5 and 100-year storm frequencies under natural site conditions shall be investigated.
12. All calculations for detention facilities shall be submitted for review by the City Engineering Division to include hydrographs, outflow structures and time phase analysis thru the facility.
13. Floodplain areas and detention pond locations shall be identified at the preliminary plat stage to illustrate how these areas will be managed during and after construction.
14. If a tract of land under development as a floodplain area within its boundary, the information that must be furnished before the final plat is filed, shall include:
  - a. A backwater analysis on the existing drainageway system.
  - b. A backwater analysis on the proposed drainageway system.
15. Detention facilities should not be located in undesirable non-reusable areas that would demand continued high maintenance costs to the City of Coweta. Each facility shall incorporate methods to minimize erosion and other maintenance reducing designs.
16. Detention facilities located in non-reusable locations where soil or other conditions exist that would require continued high maintenance costs after the facility may no longer be needed will be required to have a dual storm sewer system.
17. A dual storm sewer system will not be required for a detention facility. However, the developer should carefully consider any advantages to him that would result from the immediate installation of a dual storm sewer system which would be realized by him upon reversion of ownership.
18. Detention facilities may be located in the Floodplain area or Floodway area when the elimination of the facility could be easily accomplished, thereby returning the

site to its natural state, providing the Floodplain area and the Floodway area are determined with the facility in place and that no rise in the water surface offsite of the development results from the installation of the facility except that permitted by the adopted Floodplain Development Permit Ordinance or adopted Floodplain Zoning Ordinance.

19. A dual stormwater drainageway system may be required for the development of a tract of land lying within an area where a Master Drainage Plan exists and a regional detention facility is being implemented until the regional detention facility is completed and in operation.
20. Additional detention storage, in excess of the required storage for a drainage area, can be provided to satisfy the detention requirements for a tract of land downstream of the detention facility, providing the detention facility is constructed prior to the development of the downstream tract.
21. All detention facilities will be designed “dry” unless a special maintenance agreement in writing has been negotiated with the City of Coweta.
22. A minimum number of detention facilities is encouraged for each development.
23. If runoff has a natural tendency to drain in several directions for a given developmental tract of land where detention is required, then detention storage shall be provided for the biggest drainage area. Additional detention storage may be provided, at the same facility, to satisfy detention requirements for a separate drainage area on the same development, provided that;
  - a. The whole development tract of land is in the same watershed.
  - b. The smaller drainage area(s) that, has/have been compensated for does/do not, either singly or in combination, adversely impact the health, welfare and safety of the general public downstream.
24. If a tract of land being developed is located in more than one watershed, grading work to divert flows from one watershed to another will not be permitted and compensatory storage will not be permitted in one watershed for that required in another.
25. Detention facilities may be used for compensatory storage when encroaching into the Floodplain area provided that the overall drainageway system does not:
  - a. Cause a rise in the water surface elevation beyond the extent of the developmental tract of land.
  - b. Adversely impact adjacent properties by an increase in velocity.
26. All dikes and spillways on detention facilities will show typical cross sections on plans.

27. Access road, with grade of 10% or less, shall be provided to the detention areas for maintenance purposes.
28. Side slopes on detention facilities shall not be steeper than 4:1.
29. Detention facilities shall be provided with a trickle channel from the inlet to the outlet structure to transmit low flows and the trickle channel shall be constructed in accordance with City standards.
30. Storm sewer outlets in the slope of the detention pond shall be protected by a Standard Slopewall.
31. Erosion and sediment control practices in and around detention facilities shall be in conformance with the earth change criteria.
32. The detention area shall be identified as a separate platted area; as appropriate, it may consist of one or more platted lots, a separate block, or it may be identified as a reserve area.
33. Dedication of the detention facility shall not appear among the plat's restrictive covenants; the format of the dedication shall be consistent with the dedication of public streets.
34. Every plat dedication shall contain an ownership reverter provision. Whether the reverter shall run in favor of the subdivider, an identified third party, or to a designated abutting property shall be determined as follows:
  - a. If the detention area meets all applicable subdivision regulation/zoning requirements (area, street frontage, etc.), so as to permit its subsequent redevelopment upon reverter of ownership, at the option of the subdivider, reverter may be in favor of any designated party or one or more abutting properties.
  - b. If the detention area fails to meet all applicable subdivision regulation/zoning requirements and appropriate variances/special exceptions are not approved by the Coweta Board of Adjustment which would permit its proper redevelopment upon reverter of ownership, reverter shall run only in favor of an identified abutting property or properties; if all deficiencies receive variance/special exception approval, reverter shall be governed by paragraph 34a (above).
35. Every plat shall provide an access way at least 20 feet wide to any required detention area. Access may be provided by frontage on a dedicated public street or by the platting of an access easement from a dedicated public street to the detention area.

36. If the detention facility is approved by the City to serve areas outside the subdivision in which it is located, such additional areas shall be specifically identified in the dedication.
37. In designing the dams for detention facilities, the book titled “DESIGN OF SMALL DAMS” by U.S. Department of the Interior, Bureau of Reclamation shall be used. An analysis shall be furnished of any proposed earthen dam construction soil. A boring of the foundation for the earthen dam may be requested.
38. The ownership and maintenance responsibility for detention facilities shall remain with the private sector if the facility is an integral usable part of the development. In all other cases, the detention facility will be dedicated to the public and the public will be responsible for the maintenance thereof. In the event the detention facility, as a result of drainageway improvements, becomes unnecessary, the facility by action of the City Council shall revert to the person, firm or corporation making such dedication or his heirs, successor or assignees.

## **8.12 Earth Change, Soil Erosion and Sedimentation**

### **1. Introduction**

The principles of erosion and sedimentation control can be successfully formulated and implemented by understanding the basic processes of soil erosion and sedimentation.

There is a certain amount of erosion and sedimentation that occurs in nature. The process of natural erosion and sedimentation is greatly accelerated due to construction activity. If the accelerated process is not accounted for at the time of construction, the adverse effects, possible are:

- a. A large increase in area exposed to storm water runoff and soil erosion.
- b. Increased volumes of storm runoff, accelerated soil erosion and sediment yield and higher peak flows caused by:
  1. Removal of protective vegetative cover.
  2. Exposure of underlying soil or geologic formations less pervious and/or more erodible than original soil surface.
  3. Reduced capacity of exposed soils to absorb rainfall due to compaction caused by heavy equipment.
  4. Enlarged drainage areas caused by grading operations, diversions and street construction.

5. Shortened times of concentration of surface runoff caused by altering steepness, distance and surface roughness and installation of improved storm drainage facilities.
  6. Increased impervious surfaces associated with the construction of streets, buildings, sidewalks and paved driveways and parking lots.
- c. Alteration of the groundwater regime that may adversely affect drainage systems, slope stability and survival of existing and/or newly established vegetation.
  - d. Creation of exposures facing south and west that may hinder plant growth due to adverse temperature and moisture conditions.
  - e. Exposure of subsurface materials that are rocky, acidic, droughty or otherwise unfavorable to the establishment of vegetation.
  - f. Adverse alteration of surface runoff patterns by construction and development.

## 2. General Applicability

Earth change permit applications shall be required for areas as determined by the City Engineer.

## 3. Minimum Approval Requirements

The plans and specifications accompanying the permit application shall contain the following data as deemed applicable by the City Engineer:

- a. A vicinity sketch at the scale of 1-inch to 200 feet indicating the site location as well as the adjacent properties within 500-feet of the site boundaries.
- b. A boundary line survey of the site on which the work is to be performed.
- c. A plan of the site at a minimum scale of 1-inch to 100-feet showing:
  1. Name, address and telephone number of the legal land owner, developer and petitioner.
  2. A timing schedule indicating the anticipated starting and completion dates of the developments construction sequence and the time of exposure of each area prior to the completion of effective erosion and sediment control measures.

3. Estimate of the quantity of excavation and fill involved.
  4. Existing topography at a maximum of 2-foot contour intervals.
  5. Proposed topography at a maximum of 2-foot contour intervals.
  6. Location of any structure or natural feature on the site.
  7. Location of any structure or natural feature on the land adjacent to site and within 50-feet of the site boundary line.
  8. Location of any proposed additional structures or development on site.
  9. Plans of all drainage provisions, retaining walls, cribbing, planting erosion control measures, or other temporary or permanent soil erosion control measures to be constructed in connection with, or as a part of the proposed work together with a map showing the drainage area of land tributary to the site and estimated runoff of the area served by any drains.
- d. The estimated total cost of the required temporary and permanent soil erosion control measures shall be provided.
  - e. Other information or data that may be required by the City Engineer such as a soil investigation report which shall include but not be limited to, data regarding the nature, distribution and supporting ability of existing soils and rock on the site.
4. Principles of Applying Erosion and Sediment Control Criteria
    - a. Plan the development to fit the particular topography, soils, water ways and natural vegetation at a site.
    - b. Expose the smallest practical area of land for the shortest possible time.
    - c. Apply “soil erosion” control practices as a first line of defense against on-site damage.
    - d. Apply “sediment” control practices as a perimeter protection to prevent off-site damage.
    - e. Implement a thorough maintenance and follow up operation.
5. Temporary Structural Practices

- a. Dikes:
  - 1. Diversion dike.
  - 2. Interceptor dike.
  - 3. Perimeter dike.
- b. The design drainage area for dikes shall not exceed 5 acres.
- c. The minimum dimensions shall be in accordance with the adopted standards.
- d. Swales:
  - 1. Interceptor swale.
  - 2. Perimeter swale.
- e. The design drainage area for swales shall not exceed 5 acres.
- f. The minimum dimensions shall be in accordance with the adopted standards.
- g. Straw Bale Dike:

Where no other practice is feasible a temporary barrier with a life expectancy of three months or less can be installed across or at the toe of a slope for contributing drainage areas less than half acre, in accordance with the adopted standards.
- h. A stabilized construction entrance shall be built in accordance with the adopted standards to reduce or eliminate the tracking or flowing of sediment onto public rights-of-way.
- i. A stone outlet structure shall be constructed in areas where the entire drainage area to the structure is not stabilized or where there is a need to dispose runoff at a protected outlet or where concentrated flow for the duration of the period of construction needs to be diffused. The structure shall be in accordance with adopted standards.
- j. A grade stabilization structure in the form of a paved chute or flume shall be constructed to prevent erosion, where concentrated flow of surface runoff to be conveyed down a slope, in accordance with the adopted standards. The maximum allowable drainage area upstream of such a structure shall not exceed 36 acres.
- k. A grade stabilization structure in the form of a pipe slope drain shall be constructed to prevent erosion, where concentrated flow of surface runoff

is to be conveyed down a slope, in accordance with the adopted standards. The maximum allowable drainage area upstream of such a structure shall not exceed 5 acres.

- l. Storm water detention facilities may be used temporarily as sediment basins. A temporary outlet structure for the storm water detention facility to work as a sediment pond shall be constructed. At the end of the construction activity, the developer shall make sure that the outlet structure shall meet the design requirements of a storm water detention facility.
  - m. Condition of the detention facility that is used as a sediment pond during construction, shall meet the following requirements at the time of acceptance.
    1. It shall be completely cleaned by the developer and be rid of any immediate maintenance.
    2. It shall meet all design standards.
6. Permanent Structural Practices
- a. Depending on the development layout, a diversion shall be constructed across a slope less than 15% to:
    1. Prevent runoff from higher areas which have a potential for causing erosion and thereby interfere with the establishment of vegetation on lower areas.
    2. Reduce the length of slopes to minimize soil loss.
  - b. Diversions need be constructed only below stabilized or protected areas in conformance with standards.
  - c. Outlets from diversions shall be constructed to discharge in such a manner as not to cause erosion.
  - d. Outlets shall be constructed and stabilized prior to the operation of diversion.
  - e. Storm drain outlet protection shall be provided when converting pipe flow to channel flow. The reduction in velocity shall be consistent with the roughness co-efficient of the receiving waterway. The reduction in velocity may be accomplished by:
    1. Providing mortared riprap, stabilization:
    2. Providing energy dissipaters;

3. Providing permanent vegetation, depending on the site specific needs.

7. Vegetative Practices

Vegetative practices can be applied very effectively to control erosion. The practice can be either temporary or permanent erosion. The practice can be either temporary or permanent depending on the site-specific needs. The specifications for establishing vegetation both temporary and permanent are briefly outlined below.

a. Temporary Practices

Small grains like oats, rye and wheat, and sudans and sorghums are the most feasible temporary vegetation to control erosion for the Coweta area. This practice is effective for areas where soil is left exposed for a period of 6 to 12 months. The time period may be shorter during periods of erosion rainfall.

1. Prior to seeding, needed erosion control practices such as diversions, grade stabilization structures, berms, dikes, etc. shall be installed.
2. Temporary vegetative practice is usually applied prior to the completion of final grading of the site.
3. If the area to be seeded has been recently loosened to the extent that an adequate seedbed exists, no additional treatment is required. However, if the area to be seeded is packed, crusted and hard, the top layer of soil shall be loosened by other suitable means.
4. Fertilizer shall be applied at a rate of 600 pounds per acre or 15 pounds per 1000 square foot using 10-20-10 or equivalent.
5. Soils known to be highly acidic shall be lime treated.
6. Seeding requirements shall be as specified in the following:

Plant	Per Acre	Per 1000 Sq. Ft.	Planting Date	Depth of Seeding
Annual Ryegrass	40 Lbs.	0.9 Lbs.	9/15 – 11/30	¼ Inch
Elbon Rye	2 Bu.	3.0 Lbs.	8/15 – 11/30	2 Inches
Wheat	2 Bu.	3.0 Lbs.	8/15 – 11/30	2 Inches
Oats	3 Bu.	2.5 Lbs.	8/15 – 11/30	2 Inches
Sorghum	60 Lbs.	1.4 Lbs.	3/1 – 9/15	2 Inches
Sudan Grass	40 Lbs.	0.9 Lbs.	4/1 – 9/15	2 Inches

7. Seeds shall be drilled uniformly.

8. Seeding implements should be used at right angles to the general slope to minimize erosion.
9. After 2 to 3 months of planting the seeded site shall be top dressed with 8 pounds per 1000 square feet or 350 pounds per acre of 33-0-0.
10. Areas that are not well covered shall be replanted.
11. The seeded area shall be watered when feasible and needed.

b. Permanent Practices

Bermuda grass, Kentucky 31 Tall Fescue and Weeping Lovegrass are some of the types of permanent vegetation that could be effectively used to control erosion.

1. Prior to seeding, needed erosion control practices such as dikes, swales, diversions, etc. shall be installed.
2. The subgrade shall be loosened evenly to a depth of 2 to 3 inches and 10-20-10-fertilizer (10 pounds per 1000 square feet or 450 pounds per acre) shall be mixed with the loosened surface soil by discing or other suitable means.
3. Soils known to be high acidic shall be lime treated.
4. Planting rate requirements shall be as specified in the following table:

Plant	Per Acre	Per 1000 Sq. Ft.	Planting Date	Depth of Seeding
Bermuda Grass	10 Lbs.	0.25 Lbs.	4/1 - 8/15	0-1/2 Inch
Fescue	40 Lbs.	0.90 Lbs.	9/1 - 11/1	0-1/2 Inch
Lovegrass	5 Lbs.	0.10 Lbs.	4/1 - 6/30	0-1/2 Inch

5. Seeds shall be drilled uniformly.
6. Seeding implements should be used at right angles to the general slope to minimize erosion.
7. Mulch will be used where needed.
8. The area shall be watered daily or as often as necessary to maintain adequate soil moisture until the plants grow about 1/2 - 1 inch.

## 8.13 Floodplain Area Maps

1. Initial Maps
  - a. The City Commission shall adopt initial floodplain area maps, developed by the City Engineer, identifying lands subject to flooding hazards and periodic inundation, based on the best available information.
  - b. Sources of available information include but are not limited to:
    1. Federal Insurance Administration (FIA) Zone A designated areas, with and without flood elevation;
    2. High water marks from previous floods;
    3. Engineering studies, and
    4. Flood prone soils maps.
2. Map Revisions
  - a. As new information becomes available, maps will be updated by the City Engineer and adopted by the City Commission.
  - b. The regulatory flood will be used in Engineering analyses to determine the floodplain area. Analysis will also include delineation of the floodway.
  - c. The regulatory flood will be computed based upon full potential urbanization of the contributing watershed, considering the Comprehensive Plan, adopted Floodplain Management Policies and the Watershed Drainage Plan where adopted.
  - d. In calculations of the degrees of watershed urbanization to be considered in floodflow routing:
    1. Natural floodplains and those which can be reasonably expected to remain unaltered by man-made changes may be considered as remaining in their natural states.
    2. Floodplains altered by existing or anticipated man-made changes shall be considered as having the natural channel eliminated.
    3. Where an adopted Watershed Drainage Plan exists, the effects of urbanization shall be determined in accordance with that plan's floodplain development guidelines. '.
  - e. Floodplain area maps shall be limited to delineating those floodplains where the contributing drainage area is approximately 40 acres or more.
  - f. Mapping of Floodway Zoning Districts (FD) shall be limited to delineating those floodplains where the contributing drainage area is approximately 640 acres or more.

## **8.14 Determination of Floodway**

1. The floodway is comprised of the channel of a watercourse plus those portions of the adjoining floodplain which are reasonably required to carry and discharge the regulatory flood.
2. A floodplain has two basic functions:
  - a. Carrying and discharging the flood flows (f100dway);
  - b. Temporarily storing flood water (floodplain).
3. Any appreciable change in either function of the floodplain can result in an increase in flood heights and/or an increase in velocity.
4. Floodway boundaries shall be determined so that:
  - a. Sufficient area is reserved to carry and convey the regulatory flood.
  - b. Existing floodplain storage capacity is maintained.
  - c. No measurable increase occurs in flood flows, flood heights or potential flood damage and danger to off-site properties.