5.0 OPEN CHANNELS

5.1 General

This section describes the criteria for the design of drainage channels. The minimum slope for all proposed channels shall be 0.25% and the minimum depth shall be 18-inches, unless otherwise approved by the City Engineer.

The hydraulic characteristics of improved channels are to be determined through the application of Manning's Equation. In lieu of Manning's Equation, HEC-RAS can be used to determine the water surface profile. According the complexity of the system, the City Engineer may require the use of the HEC-RAS Computer Program.

5.2 Cross Sections

Figure 2 in Appendix 2, contains typical sections that are to be used in the design of open channels.

All improved channels shall be designed to carry the 100 ~~25~~-year flow plus one foot of freeboard. Adjacent building structures finish floor elevations shall be at least one foot above the 100-year water surface elevation.

A dedicated drainage easement shall be provided to the City of Jonesboro for open channels. The easement width shall be no less than the minimum width required to convey the 100-year frequency runoff or 15 feet, whichever the greater. The easement, where practicable, should not be split between adjacent lots.

Unlined improved channels that contain bends shall be designed such that erosion at the bends is minimized. Erosion protection at bends shall be determined based on the velocity along the outside of the channel bend. Unlined improved channels shall have side slopes no steeper than 3:1 and lined channels shall have side slopes no steeper than 2:1, unless authorized by the City Engineer. A soil analysis shall be performed to determine the maximum slope that the soil, at the channel improvement site, can sustain without failure.

5.3 Roughness Coefficients

The roughness coefficients that are to be used are shown in Table 4 in Appendix 1. Variations from that which is shown must be approved by the City Engineer.

5.4 Velocity Requirements

The velocity limits for open-channel flow are given in Table 4 in Appendix 1. The channels for which the velocity exceeds these limits shall be protected by appropriate erosion protection or energy dissipater or both.

5.5 Channel Drop Structures

The function of a drop structure is to reduce channel velocities by allowing flatter upstream and downstream channel slopes. Sloping channel drops and vertical channel drops are two commonly used drop structures.

The flow velocities in the channel upstream and downstream of the drop structure need to satisfy the permissible velocities allowed for channels in Table 4 in Appendix 1. The velocities shall be checked for flows produced by the 10-, 50- and 100-year frequency events.

An apron shall be constructed immediately upstream of the chute to protect against the increasing velocities and turbulence which result as the water approaches the drop structure. The apron shall extend at least five (5) feet upstream of the point where flow becomes supercritical. In no case shall the length of the upstream apron be less than ten (10) feet.

An apron shall be constructed immediately downstream of the chute or stilling basin to protect against erosion due to the occurrence of the hydraulic jump. The apron shall extend a minimum of ten (10) feet beyond the anticipated location of the hydraulic jump.

The design of drop structures is based on the height of the drop, the normal depths upstream and downstream of the drop structure and discharge.

5.5.1 Vertical Drop Structures

The approximate height of the drop required to stabilize the hydraulic jump should be determined.

The drop length and the hydraulic jump length of the drop structure should be calculated to determine the length of the downstream apron required to prevent erosion.

5.5.2 Sloping Drop Structures

The location of the hydraulic jump should be determined based on the upstream and downstream flow depths and channel slopes.

The length of the hydraulic jump should be calculated to determine the length of the downstream apron required to prevent erosion.