Glossary

AASHTO Headloss Method - Automatic computation of the junction loss based on the geometry of the junction, which accounts for bend loss, based on the upstream pipe angle, as defined in the AASHTO Model Drainage Manual (1991).

AASHTO Shaping Method - Specifies whether the junction bottom is designed with a partial diameter shaping or not. See also Headloss – AASHTO Method.

Absolute Headloss - A user specified headloss - see Absolute Headloss Method.

Absolute Roughness - Average height of roughness particles on the channel walls.

Active Grate Length - Grate length $L_a$ reduced by the clogging factor, $f$:

$$L_a = L_g (1 - f)$$

Where: $f$ = Clogging factor (unitless, $f = 1.0$ means that the grate is completely clogged)

Active Grate Open Area - Clear opening of the grate used when the grate acts as an orifice (at high water depth). This is a function of the grate length, the grate width, the opening ratio, which accounts for the bars of the grate reducing the opening area (specific to each grate type), and the clogging factor.

Active Grate Weir Length - Weir length of the grate used when the grate acts as a weir (at low water depth). This is a function of the grate length, the grate width, and the clogging factor.

Active Slot Open Area - Area of the slot opening used in the case of orifice flow.

Active Slot Weir Length - Length of the slot opening used in the case of weir flow.

Additional Carryover - Additional surface flow besides the rational flow. This flow is included in the calculation of the total flow to the inlet.

Additional Flow - Supplementary flow that enters directly into an inlet and is included in the flow rate. This flow is entered directly as a flow rate.

Average Velocity - Average velocity is the upstream velocity plus the downstream velocity, divided by 2.

Bend Loss Coefficient $K$ - Coefficient used in the AASHTO equation for junction headloss calculation.

Bend Angle - Angle between the pipe and the downstream pipe, measured as a deflection. Note that this angle is used in the HEC-22 and AASHTO junction loss methods.

Bolted Cover - Indicates whether a junction is bolted. If the junction is bolted, then the hydraulic grade
line is not reset to the ground elevation at the downstream end of the upstream pipe(s) in the case of a flooding situation (the calculated HGL being higher than the rim elevation).

**Bottom Width** - For a regular channel, width of the bottom of a channel cross section.

**Bypass Flow** - Portion of the flow that is not captured by the inlet. The bypass flow is captured by the target downstream inlet.

**Bypass Target** - Inlet (or outlet) located downstream to which the bypass flow is carried over.

**Cancel Button** - When you click on this button, it cancels the command you chose and closes the dialog.

**Capacity** - The effective carrying ability of a drainage structure. Capacity is the discharge of the pipe or closed channel under the filled condition computed with the friction slope equal to constructed slope. For discharges greater than capacity, the friction slope exceeds the constructed slope.

**Carryover** - Surface flow from an upstream inlet. This flow is usually due to the upstream inlet being smaller than required. This flow rate can be directly entered at any inlet.

**Carryover Additional Flow** - Sum of all additional carryover flows bypassed from upstream inlets to the current inlet. A bypassed additional carryover flow at an inlet is the product of the additional carryover specified at that inlet and the difference (1-E), where E is the efficiency of that inlet.

**Carryover CA** - Total bypassed CA from upstream to the inlet in question.

**Carryover Rational Flow** - The product of the carryover CA and the local intensity.

**C Coefficient** - Roughness coefficient used in the Hazen-Williams Equation.

**Click** - To quickly press and release one of the mouse buttons.

**Clogging factor** - The clogging factor accounts for the reduction in efficiency of the inlet due to partial clogging by debris, leaves, etc. The valid range is from 0 percent to 100 percent. 100 percent corresponds to a completely clogged grate inlet resulting in no flow interception.

**Closed Channel** - A channel with a perimeter that forms a continuous closed boundary.

**Combination Inlet** - Combination inlets consist of both grate and curb inlets, and are generally used in areas where debris builds up in rainfall runoff, causing grates to clog.
Composite Rational C - The weighted average rational coefficient for the watershed draining to the inlet (this does not include bypassed CA).

Constructed Slope - The difference in the invert elevations between the upstream end and downstream end of the pipe divided by its length.

Context Menu - A pop-up menu opened by right-clicking a project element or data entry field. Commands on the context menu are specific to the current context state of the selected item.

Contributing Area (CA) - A contributing area is the weighted rational C of an area multiplied by the total area. A number of different contributing areas can be displayed or entered in StormCAD.

Contraction Coefficient - Adjustment coefficient used in the AASHTO equation to account for contraction of the flow on the entrance in the outlet pipe.

Critical Depth - Depth of water in the channel for which the specific energy is at its minimum.

Rectangular:

\[ Y_c = \left( \frac{Q^2}{gT^2} \right)^{1/3} \]

Non-rectangular:

\[ Y_c = gA^3 - Q^2T \] (implicit solution, solving for \( Y_c \))

Where:

- \( A \) = Flow Area \( \left( \text{m}^2, \text{ft}^2 \right) \)
- \( g \) = Gravitational acceleration \( \left( \text{m/s}^2, \text{ft/s}^2 \right) \)
- \( Q \) = Discharge \( \left( \text{m}^3/\text{s}, \text{ft}^3/\text{s} \right) \)
- \( T \) = Top Width (m, ft)
- \( Y_c \) = Critical Depth (m, ft)

Critical Slope - Channel or pipe slope for which the uniform flow is critical

Crosshairs - The cursor that looks like a plus sign (+).

Cross Section - A cross section perpendicular to flow across a channel.

Cumulative CA - Sum of upstream watersheds and external contributing areas.

Cumulative Flow Time - The accumulated time of travel of all upstream elements. Includes travel time in pipes. The cumulative flow time is calculated as the greatest time of flow or time of concentration.

Curb Inlet - Curb inlets are openings within the curb itself. On grade, the efficiency of the inlet is based on the ratio of the actual inlet length to the inlet length required to capture 100% of the discharge. In sag, the efficiency is calculated using forms of the orifice and weir equations depending on the depth.
of the discharge.

**Curb Opening Length** - Length of the opening of the curb inlet.

**Curb Throat Type** - Three types of curb inlets are defined:

- horizontal throat (most common curb inlet)
- vertical throat
- inclined throat

The throat type defines the shape of the curb opening as defined below:

- **a. Horizontal Throat**
  \[ d_o = d_i - \frac{h}{2} \]
- **c. Vertical Throat**
  \[ d_o = d_i \]
- **b. Inclined Throat**
  \[ d_o = d_i - \frac{h}{2} \sin \theta \]

**Database** – See External File.

**Database Connections** - A connection represented by a group of database links. There may be a single linked external file within a connection, or there may be several external file links within a single connection.
DBMS - An acronym which stands for Database Management System.

Depth - See flow depth.

Design Sump Depth - Sump depth used in design. A positive value will design a junction or inlet structure with a sump elevation below the downstream pipe invert elevation.

Diameter - The inside diameter of a circular channel, unless stated otherwise.

Discharge - Volumetric rate of flow given in units of \( \text{length}^3 / \text{time} \).

Display Precision - In worksheets, rating tables, curves, and cross sections, the rounding of numbers and the number of digits displayed after the decimal point.

Ditch Inlet - A grate lying flat at the bottom of a trapezoidal ditch. The grate cannot be made to extend onto the slopes of the ditch.

Diversion - Gravity element that diverts a portion of the flow out. A diversion element has two outlets while standard gravity elements have only one downstream pipe.

![Diagram of a trapezoidal ditch with dimensions labeled T, W, B, Z1, Z2, and d.]

Diversion Curve Rating Table - A table that defines diverted flows as a function of total upstream flow.

Diversion Target - Destination for flows diverted out of a diversion element.

Double-Click - To click one of the mouse buttons twice in rapid succession.

Drag - To hold down one of the mouse buttons while you move the mouse.

Element - An object in a drawing, such as an inlet, junction, outlet, or pipe.

Elevation - The distance from the datum plane to the center of the element. Elevations are often referenced with mean sea level as the datum elevation.
Elevations Considered Equal Within - Used to determine the maximum differences in pipe elevation for which the pipes are still considered approximately the same elevation. The correction factor for relative flow (CQ) is applied only to situations where there are two or more pipes entering the structure at approximately the same elevation.

Energy Grade Line (EGL) - Sum of datum (base elevation), elevation, velocity head, and pressure head at a section.

Energy Slope - The slope of the EGL. The energy grade at each end of the pipe is computed by adding the velocity head component to the hydraulic grad.

Equivalent Cross Slope - An imaginary straight cross-slope having a conveyance capacity equal to that of the given compound cross-slope.

Exit Discharge - Discharge in the pipe downstream of a structure.

Exit Velocity - Velocity at the upstream end of the pipe downstream of a structure.

Exit Velocity Head - Velocity head at the upstream end of the pipe downstream of a structure.

Expansion Coefficient - Adjustment coefficient used in AASHTO equation to account for expansion of the flow on the exit from incoming pipe.

External File - Any file outside of this program that can be linked. These include database files (such as FoxPro, Dbase or Paradox) and spreadsheets (such as Excel or Lotus). Throughout the documentation, all of these file types will be referred to as "databases" or "external files" interchangeably.

External Piped CA - CA value to be used along with the external Tc in the rational formula, but does not contribute to the flow coming to the inlet opening (not included in the gutter/inlet computations). This rational flow is simply added to the flow in the pipe downstream of that junction.

External Piped Additional Flow - Additional flow that is added at a nodal structure but is not a surface flow (not included in the gutter/inlet computations). This flow is simply added to the flow in the pipe downstream of that junction.

External Piped Known Flow - Known flow that is added to the flow in the pipe downstream of that junction.

External Tc - Time of concentration of the external contributing area.

External CA - The contributing area of an external source other than a watershed. An external CA acts like a watershed.

Field Links - Within each database table, the field links define the actual mapping between model element attributes and columns in the database.

File Extension - The period and typically three characters at the end of the filename. A file extension usually identifies the kind of information the file contains. For example, files you create in AutoCAD have the extension .DWG.
Flow Rate - Volumetric rate of flow given in units of length$^3$/time in the pipe or channel.

Common units of flow are ft$^3$/s, gpm, liters/sec, and cms.

Flow Area - Cross sectional area of flow.

Flow Depth - Distance from water level to low point of channel bottom.

Flow Energy - Total energy of flow with reference to a datum. Computed for closed channels as the sum of channel centerline height above datum, piezometric height, and the velocity head. Computed for open channels as the sum of channel invert height above datum, the flow depth, and velocity head.

Flow Type - The flow is defined as:

Supercritical if F > 1

Subcritical if F < 1

Critical if F = 1

Where: F = Froude Number

Friction Factor - Friction Coefficient used in the Darcy-Wiesbach Formula.

Friction Slope - Given a depth, roughness, section shape, friction method, and discharge, the friction slope is the computed slope that would be required to convey the specified discharge under uniform flow conditions. Under uniform flow conditions, depth and flow area are constant and the friction slope, the actual or constructed slope, and the energy slope are all equal.

Frontal Flow - Portion of flow $Q_w$ that is in the gutter within the width of the grate (as opposed to the side flow).

Frontal Flow Factor - Ratio of frontal flow intercepted by the grate inlet to total frontal flow.

Froude Number – The ratio of inertial forces to gravity forces. It is computed as:

$$F = \frac{V}{\sqrt{g \cdot D}}$$

Where: F = Froude number (unitless)

V = Velocity (m/s, ft/s)

D = Hydraulic depth (m, ft)

$g = \text{Gravitational acceleration} \ (m/s^2, \ ft/s^2)$
At critical depth, the Froude number is equal to 1.0.

**Generic Inlet** – Inlet with a user-defined efficiency. Bypass and intercepted flows are calculated based on the efficiency when the inlet is located on a grade.

**Global Diverted Flow** - The diverted flow entering a gravity node from one or more nodes located in other networks.

**Grate Flow Ratio** - Ratio of frontal flow to total flow.

**Grate Inlet** - A common inlet type consisting of an opening in pavement covered by a variety of different protective grates. The efficiency of grate inlets is based on the inlet’s size and surrounding location. While in sag, the intercepted flow is calculated using orifice and weir equations.

**Grate Length** - Total length (L) of the grate.

**Grate Type** - The HEC-22 methodology contains 8 different types of inlet grates, which define their geometry (spacing, shape of the bars, etc.). The grate type affects the inlet efficiency. The types defined by HEC-22 are:

- Curved Vane
- 30°- 45 Tilt Bar
- 45° - 60 Tilt Bar
- 45° - 85 Tilt Bar
- P - 30
- P - 50
- P - 50x100
- Reticuline
Please refer to Figures 4-5 to 4-10 in the HEC-22 manual for a detailed description.

**Grate Width** - Total width of the grate inlet measured along the cross-sectional plane of the roadway.

![Grate Inlet](image)

**Gravity Constant** - Our products use these constants for all equations with gravitational constant g:

US: \(32.174 \text{ ft/s}^2\)

SI: \(9.81 \text{ m/s}^2\)

**Ground Elevation** - The elevation of the ground surface at the node.

**Gutter Cross Slope** - Slope \(S_w\) of the gutter, measured in the cross-sectional plane of the roadway.

![Gutter Cross Slope](image)

**Gutter Depression** - The depth \(d\) of the gutter measured at the curb face, from the projection of the pavement cross-slope at the curb face. Used for a composite gutter section, the gutter depression applies to gutters that are continuously depressed (as opposed to local depression that applies to a depression of the gutter at the location of the inlet only).

![Gutter Depressions](image)

**Gutter Width** - Width of the gutter \(W\) measured from the curb face to the break in slope of the roadway pavement.

![Gutter Width](image)

**Headloss** - Loss of energy grade over a longitudinal channel distance.

**Headloss Method** - One of the following methods: Standard Headloss Method, Absolute Headloss Method, HEC-22 Energy Headloss Method, or AASHTO Headloss Method.

**HEC-22 Benching Method** - Specifies which correction factor for benching is to be used, as specified in table 7-6 p. 7-19 of the FHWA HEC-22 manual used in the HEC-22 Energy Method.

**HEC-22 Energy Loss Method** - Similar to the standard method, the HEC-22 Energy Loss Method (from the FHWA’s Urban Drainage Design Manual, Hydraulic Engineering Circular No. 22) correlates structure headloss to the velocity head in the outlet pipe using a coefficient.
HGL - See hydraulic grade line.

HGL In - The hydraulic grade at the downstream end of the incoming pipe section.

HGL Out - The hydraulic grade at the upstream end of the outgoing pipe section.

Horizontal Throat - See Curb Throat Type

Hydraulic Grade - See hydraulic grade line.

Hydraulic Grade Line - Sum of the datum (base elevation), elevation and pressure head at a section. In open channels the hydraulic grade is equal to the water surface elevation.

Hydraulic Radius - Flow area divided by wetted perimeter.

Inclined Throat Type - See Curb Throat Type

Inlet Adjustment - Adjustment coefficient used in the AASHTO equation for junction headloss calculation (refer to the equation in Help) to account for surface inflow. If surface inflow is 10% or more of the mainline outflow then the headloss is increased by this factor (30% default).

Inlet Area - Sum of the subwatershed areas discharging to an inlet.

Inlet C - The weighted rational coefficient, C, for the Inlet.

Inlet CA - CA value representing the rational flow coming to the inlet opening (does not include bypassed flow from upstream inlets).

Inlet Discharge - The discharge computed at an inlet using the rational method.

Inlet Efficiency - Ratio of the Intercepted Flow by the inlet over the total gutter flow. The range is [0;1].

Inlet Intensity - The rainfall intensity computed using the time of concentration for the inlet.

Inlet Opening Area - Area of the orifice opening.

Inlet Opening Height - Vertical measurement of the orifice opening.

Inlet Opening Height Breadth - Width h of the opening in the curb inlet (measured vertically for the common curb inlet with a horizontal throat type).
**Inlet Opening Width** - Horizontal measurement of the orifice opening.

**Inlet Tc** - The inlet time of concentration.

**Inlet Throat Incline Angle** - Angle of the curb opening throat (measured from the vertical).

**Inlet Type** - The inlet types used in StormCAD are Curb, Grate, Combination, Slot, and Ditch, as defined in FHWA’s HEC-22 manual. An additional type, Generic, lets you define an inlet by a given efficiency.

**Intercepted Additional Flow** - Part of the additional flow that is intercepted by the inlet.

**Intercepted Flow** - Portion of the flow in the gutter that is captured by the inlet (the remaining portion of the flow that is not intercepted is called bypass flow). Note the amount of flow intercepted by an inlet in sag is assumed to be 100%.

**Intercepted Rational Flow** - Part of the Rational Flow that is intercepted by the inlet, calculated as surface Rational Flow multiplied by the inlet capture efficiency.

**Intensity** - Rainfall volume for a given duration, usually in inches/hour.

**Invert** - Bottom edge (lowest point) of the pipe opening.

**Invert Elevation** - The elevation at the bottom of the pipe. The invert elevation is the lowest point of the pipe opening.

**Junction** – Gravity flow structure where two or more pipes come together.

**Kinematic Viscosity** - Viscosity divided by the mass density given in units of \( \text{length}^3 / \text{time} \).

**Known Flow** – A user-defined flow used to simulate observed flows. When specified, known flows overwrite upstream values of known flows. Known flows should normally not be mixed with other types of flows in a same scenario.
**Kutter's n Coefficient** - Roughness coefficient used in Kutter's Formula.

**Label** - A unique identifier for an element. Labels are used in reports, error messages, and tables.

**Length** - Horizontal distance measured from the centers of the node structures located at the two ends of a pipe (when it is not user-defined).

**Length Factor** - Ratio of curb opening length over total interception length.

**Linear Extrapolation** - Infer a value based on other values in an interval as in interpolation, with the value lying outside the known range of values.

\[
\frac{Y_u - Y_1}{Y_2 - Y_1} = \frac{X_k - X_1}{X_2 - X_1}
\]

Where: \( Y_u \) = Unknown value in Y  
\( X_k \) = Known value in X  
\( X_1, X_2, Y_1, Y_2 \) = Known values

**Linear Interpolation** - A way of estimating a value between two known values assuming a linear relation.

\[
\frac{Y_u - Y_1}{Y_2 - Y_1} = \frac{X_k - X_1}{X_2 - X_1}
\]

Where: \( Y_u \) = Unknown value in Y  
\( X_k \) = Known value in X  
\( X_1, X_2, Y_1 \) and \( Y_2 \) = Known values

**Local Depression** - Depth of a gutter depression \( a' \) existing only at the location of the inlet.

\[ \text{Local Depression Width} \] - Horizontal width of the locally depressed gutter. In the case of a continuously depressed gutter, the larger of the local depression width and gutter width is used to calculate the inlet efficiency.

**Local Diverted Flow** - Flow entering a gravity node that was diverted to that node from another node in the same network.
**Local Intensity** - Rainfall intensity obtained from the Intensity-Duration-Frequency curve for the inlet watershed time of concentration.

**Local Rational Flow** - Rational flow resulting from the inlet watershed (does not include rational flow bypassed from upstream inlets).

**Log Axis Scaling** - Compresses the values on the X and/or Y axis to the nearest power of 10.

**Manning's Coefficient** - Roughness coefficient used in Manning's formula.

**Matchline Offset** - Used to design invert elevations in and out of a junction or inlet structure. The specified value will produce a corresponding drop between the upstream pipe invert elevations and the downstream pipe invert. A drop such as 0.1 ft is typically used to compensate for the junction headloss. This drop is applied either at the crown or at the invert of the pipes, depending on the pipe matching option you selected (crowns or inverts).

**Maximum Discharge** - The maximum theoretical discharge that could occur for a closed channel using a given hydraulic computation method. For closed circular channels, this discharge occurs at 0.938 x Diameter. Any increase in depth will decrease the discharge, which is why the full flow discharge is less than the maximum discharge for a circular channel. For a detailed explanation of this effect, see Ven Te Chow's *Open-Channel Hydraulics*.

**Maximum Depth in Sag** - Maximum allowed impounding depth at an inlet in sag. This parameter is used for the design lengths of inlets in sag. During an automatic design, the inlet length is selected from the different possible inlet lengths as specified in the inlet library. The length used in the automatic design will be the smallest length that will generate a spread and a depth at the curb less than the maximum spread in sag and the maximum depth in sag specified.

**Maximum Spread in Sag** - Maximum allowed impounding width at an inlet in sag. This parameter is used for the design lengths of inlets in sag. During an automatic design, the inlet length selected from the different possible inlet lengths as specified in the inlet library. The length used in the automatic design will be the smallest length that will generate a spread and a depth at the curb less than the maximum spread in sag and the maximum depth in sag specified.

**Minimum Efficiency on Grade** - Maximum capture efficiency of an inlet on grade. Used for designing lengths of inlets located on a grade. The inlet length selected during the design calculations from the different possible inlet lengths for that inlet (as specified in the inlet library), is the smallest length that will generate an inlet efficiency larger than the Minimum Efficiency on Grade specified.

**Mouse Buttons** - Buttons on the pointing device. The left mouse button is the primary button for selecting or activating commands. The right mouse button is used to activate (pop up) context menus and help.

**Normal Depth** - For a prismatic channel section under a given constant discharge, the depth of flow that results for a specific channel slope.

**Number of Sections** - Number of parallel pipes.

**Object** - An icon on the tool palette that represents an element, such as an inlet, outlet, or junction in a drawing.
**ODBC** - Open Database Connectivity is a standard programming interface developed by Microsoft for accessing data in relational and non-relational database management systems (DBMSs).

**OK Button** - When you click this button, it carries out the command you chose.

**Open Channel** - A channel with a free top surface.

**Orifice Discharge Coefficient** - Discharge coefficient Co used in the general orifice equation:

\[ Q = C_o \times A \times (2gH)^{1/2} \]

Where:  
- \( Q \) = Discharge (\( m^3/s \), \( ft^3/s \))
- \( A \) = Area of orifice (\( m^2 \), \( ft^2 \))
- \( H \) = Head on centerline of orifice (m, ft)
- \( g \) = Gravitational acceleration (\( m/s^2 \), \( ft/s^2 \))

**Overflow Diversion Target** - Flow diverted out of an element can be transferred to another element in the system or lost from the system. Overflow indicates that the flow diverted out of the element is lost from the system.

**Peak Runoff** - The peak volume of rainfall that flows from the watershed.

**Percent Full** - Used in closed channels as a measure of flow depth divided by maximum depth.

**Piezometric Height** - Height that liquid rises to in a piezometric tube.

**Pipe Cover** - Distance between the crown (soffit) of the pipe and the ground surface elevation.

**Pipe Crown Elevation** - Elevation of the crown of the pipe calculated as pipe invert elevation plus the height or diameter of the conduit. Also called crown, or soffit.

**Pipe Invert Elevation** - Elevation at the bottom of the pipe or channel.

**Pipe Material** - Used to determine a default value for the pipe's roughness. The material field is for selecting the pipe's construction material.

**Point** - To move the mouse until the pointer on the screen is where you want it to rest.

**Pressure** - Pressure measured at the specified elevation of an element.

**Pressure Head** - Energy due to the pressure of a liquid, expressed as a height of water column. For open channel flow, this value is zero.

\[ \frac{P}{\gamma} \]

Where:  
- \( p \) = Pressure (\( N/m^2 \), \( lb/ft^2 \))
\[ \gamma = \text{Specific weight (} \text{N/m}^3, \text{lb/ft}^3 \text{)} \]

**Profile Description** - Specifies the type of flow profile in the pipe (such as S2 curve, M1 curve, etc.).

**Pull-down Menu** - A menu of available commands or actions you can carry out. A pull-down menu can be accessed from the menu bar at the top of the main program window.

**Rainfall Duration** - Time period, usually in minutes, of a rainfall event. In calculation of a storm sewer discharge using an IDF relationship, the cumulative time of flow is taken as the duration.

**Rational Flow** - Flow obtained by applying the Rational Method.

**RDBMS** - An acronym which stands for Relational Database Management System.

**Return Period** – Statistic parameter that defines the average occurrence time for an examined phenomenon (i.e. rainfall) that exceeded a given magnitude.

**Reynold's Number** – Ratio of viscous forces relative to inertial forces.

\[ R_e = \frac{4VR}{V} \]

Where: \( V = \text{Kinematic viscosity (} \text{m}^3/\text{s}, \text{ft}^3/\text{s} \text{)} \)

\( R = \text{Hydraulic radius (m, ft)} \)

\( R_e = \text{Reynold's number} \)

\( V = \text{Velocity (m/s, ft/s)} \)

A high Reynold's number indicates turbulent flow, while a low one indicates laminar flow.

**Rim Elevation** - The top elevation of a manhole structure. This elevation is typically flush with the ground surface. In some cases, the rim elevation may be slightly below the ground surface elevation (sunk) or slightly above the ground surface elevation (raised).

**Road Cross Slope** - Slope \( S_x \) of the road pavement, measured in the cross-sectional plane of the roadway.

**Roughness Coefficient** – Coefficient representing the roughness of a channel or pipe.

**Runoff** - Volume of rainfall that flows off the watershed.

**Section Shape** - The section type or geometric shape of the pipe. Haestad Methods provides the typical shapes: circular pipes, box pipes, arch pipes, horizontal and vertical ellipses.

**Section Size** - Inside diameter of a pipe section for a circular pipe.

Dimensions of a box section or pipe arch (width x height).
Select - To click the left mouse button while pointing the cursor at an element.

Shaping Adjustment - Adjustment coefficient used in the AASHTO equation for junction headloss calculation (refer to the equation in the Help) to account for partial diameter inlet shaping (equivalent to Half and Full in HEC-22). If inlet shaping is used then the headloss is decreased by this factor (50% default).

Shear Force - Force component acting tangent to a surface. Also, the tangential channel surface applied to the flowing liquid.

Shortcut Keys - Combination of keyboard keys allowing you to carry out menu commands instead of using the mouse.

Side Flow - Portion of flow \( Q_s \) on the pavement that is not within the width of the grate (as opposed to the frontal flow).

Side Flow Factor - Ratio of side flow intercepted by the grate inlet to total side flow.

Slope - Longitudinal slope in the channel. Non-uniform flow may have two types of slopes: friction slope and construction slope.

Slot Inlet - This inlet is usually designated for the interception of sheet flow off roadways. They consist of a continuous opening within the pavement and a structure to transport away the intercepted flow. When the inlet is on grade the interception capacity is equivalent to that of a curb inlet. When the inlet is in sag, it acts as either a weir or orifice depending on the depth of the sheet flow.

Slot Length - Length of the slot inlet opening.

Slot Width - Width, W, of the slot length opening.
Specific Energy – Total energy of flow expressed as the sum of the elevation head and velocity head as related to the section of a channel bed.

\[ E = Y + \frac{V^2}{2g} \]

Where:  
\( g \) = Acceleration of gravity \( (m/s^2, \text{ft/s}^2) \)  
\( V \) = Velocity \( (m/s, \text{ft/s}) \)  
\( Y \) = Depth \( (m, \text{ft}) \)  
\( z \) = Elevation above the datum \( (m, \text{ft}) \)

Specific Weight - The weight of a unit volume of a substance.

Splash Over Velocity - Gutter velocity at which splash-over (not all the flow passing over the grate being intercepted) first occurs. The splash-over velocity is a function of the grate type and the grate length, as defined on Chart 5 in the HEC-22 manual, page A-6.

Spread - A measure of the transverse lateral distance \( T \) from the curb face to the limit of the water flowing on the roadway.

Standard Headloss Method - The Standard Method used to estimate headloss through inlets or junctions of a storm sewer system based on the exit pipe's velocity. The exit velocity head is multiplied by a user-entered coefficient to determine the loss.

Station Number - Station numbers are calculated from the network outlet, moving upstream along the pipe lengths. The Station Number format is specified by right clicking in the Station Number field and selecting Station Number Properties.

Status Line - The pane at the bottom of the window that shows information such as the coordinates for the current location of your cursor and the toolbar command being used.

Structure Length - Length (in the horizontal plane) of a junction or inlet structure, assuming that the structure's horizontal section is rectangular.

Structure Width - Width (in the horizontal plane) of a junction or inlet structure, assuming that the structure's horizontal section is rectangular.
**Sub-Menu** - A list of related options that is available by selecting a pulldown menu item.

**Sump Elevation** - Elevation of the bottom of a junction or inlet structure.

**System Additional Flow** - Total of the additional flows defined at that node and at nodes located upstream in the pipe network.

**System Contributing Area** - The total area draining to that node, corresponding to the portion of the surface flow intercepted at that node, and all nodes located upstream in the pipe network.

**System Flow Time** - The governing time of concentration at the Inlet or Junction. It is the largest of Inlet TC, External TC or Upstream Flow Time.

**System Intensity** - The rainfall intensity computed using a storm duration that is the largest of the External TC, Inlet TC, and System Flow Time.

**System Known Flow** - Total of the external-piped known flow at that node and upstream pipe known flow.

**System Rational Flow** - Total rational flow computed at that node, including the rational flow entering the pipe network through this node, plus the rational flow coming from nodes located upstream in the pipe network.

**Table Links** - A table link must be created for every database table (or spreadsheet worksheet) that is to be linked to the model. Any number of Table Links may reference the same database file.

**Tailwater Elevation** - Water elevation downstream of the structure.

**Task List** - A list of all the applications that you are currently running in Windows. The Task List lets you switch among applications, rearrange their windows, or close applications altogether.

**Throat Type** – See Curb Throat Type.

**Tick Interval** - Distance between ticks on a graph.

**Time of Concentration** - Maximum amount of time it takes water to travel from the farthest point in the watershed to an inlet.

**Top Width** - Cross sectional width of the free water surface. For a cross section flowing full, this value is zero.

**Total Bypassed Flow** - Portion of the flow in the gutter that is bypassed by the inlet. The remaining portion of the flow that is not bypassed is called intercepted flow. Note the amount of flow intercepted by an inlet in sag is assumed to be 100%.

**Total CA** - Total accumulation of the individual watershed areas, A, times their rational coefficient, C.

**Total Depression** - Sum of the local depression, \( a' \), and the gutter depression, \( a \).
Total Discharge – Sum of the total accumulated flow of all the upstream inlets and the discharge from the inlet.

Total Diverted Flow – The sum of global and local diverted flow.

Total Flow to Inlet - Total Ditch/Gutter Surface Flow coming to the inlet opening. Includes local rational flow, carryover rational flow, and carryover additional flow.

Total Inlet CA - Total CA value representing the rational flow component of the total surface flow.

Total Intercepted Flow - Portion of the flow in the gutter that is captured by the inlet. The remaining portion of the flow that is not intercepted is called Bypass Flow. It is also the sum of the Intercepted Additional Flow and the Intercepted Rational Flow. Note the amount of flow intercepted by an inlet in sag is assumed to be 100%.

Total Interception Length - Length of the curb opening that would be required to intercept 100% of the flow.

Total System Flow - Flow leaving a gravity structure, which is the sum of local flows entering the structure and upstream piped flows.

Total System Additional Flow - Flow leaving a node or structure, which is the sum of local flows entering the structure and upstream piped flows.

Total System Rational Flow - Flow leaving a node or structure, which is the sum of local flows entering the structure and upstream piped flows.

Total System Piped Flow - Flow leaving a node or structure, which is the sum of local flows entering the structure and upstream piped flows.

Total Upstream Piped Flow - Total flow coming from pipes directly upstream of the node structure.
Total Upstream Added - Accumulated carryover and additional flow from upstream areas.

Total Watershed Discharge - The watershed discharge computed using the rational method with system intensity and Total CA. This is the discharge from all local and upstream contributing areas.

Uniform Flow - Equilibrium flow for which the slope of total energy equals the channel slope.

Upstream CA - All upstream watersheds and external contributing areas.

Upstream Discharge - Total accumulated flow of all upstream node structures.

Upstream Flow Time - The accumulated time of travel plus any times of concentrations for all upstream elements, including travel time in pipes.

Upstream Intensity - Rainfall intensity calculated by using the system flow time.

Upstream Piped Additional Flow - The portion of the Total Upstream Flow which comes from upstream External Additional Piped Flows.

Upstream Piped Known Flow - The portion of the Total Upstream Flow which comes from upstream External Known Piped Flows.

Upstream Piped Rational Flow - The portion of the Total Upstream Flow which comes from upstream rational sources.

Velocity Head - Energy due to the velocity of a liquid expressed as a height of water column:

\[ \frac{V^2}{2g} \]

Where:  
\[ g = \text{Acceleration of gravity (m/s}^2, \text{ft/s}^2) \]

\[ V = \text{Velocity (m/s, ft/s)} \]