2.1 BASELINES

ASAD incorporates a COGO feature that uses the horizontal alignment baseline and stationing into the structure definitions. This promotes continuity between the drainage design and the roadway design. The drainage designer can also determine stations with offsets without the use of another design software such as GEOPAK.

There are two available methods for entering the baseline geometry. The first method, which is the fastest, importing a GEOPAK input file which is discussed in Section 2.1.1 "Importing Baselines." The other method involves manually keying in the northing and easting for each ending point on tangent (POT), and point of intersection (PI) as well as any curve radii within the baseline. It should be noted that if the horizontal alignment contains a reverse curve, a northing and easting point must be defined for the point of reverse curvature (PRC) when entering the horizontal alignment.

The "Edit Baseline Geometry" dialog box (see figure 2.1) has two distinct sections which control the handling of the baseline alignments. The first section is referred to as the "Header." This is called the Header since it will appear in the list of baseline names available to associate with the structures. Inside the Header section of the "Edit Baseline Geometry" dialog is the baseline selection box which contains a list of all baselines currently defined in the project. Highlighting a specific baseline by clicking the left mouse button on the baseline name displays the entered northing and easting and curve radii that describe the baseline in the "Segment n" portion of the dialog. In addition to the baseline names, the beginning station of the selected baseline appears in the Header section of the dialog. This information is used to calculate the location of drainage structures with respect to the baseline.

Control buttons for the baselines are along the right side of the dialog box. There are buttons to Add, Delete, and Print all the information for a specific baseline. The control buttons in the Segment portion of the dialog box are to manipulate the actual baseline segments. The "Add" button adds a point to the baseline. The " Delete" button removes an alignment point. The "Insert" button is used to insert a point between two previously entered points.

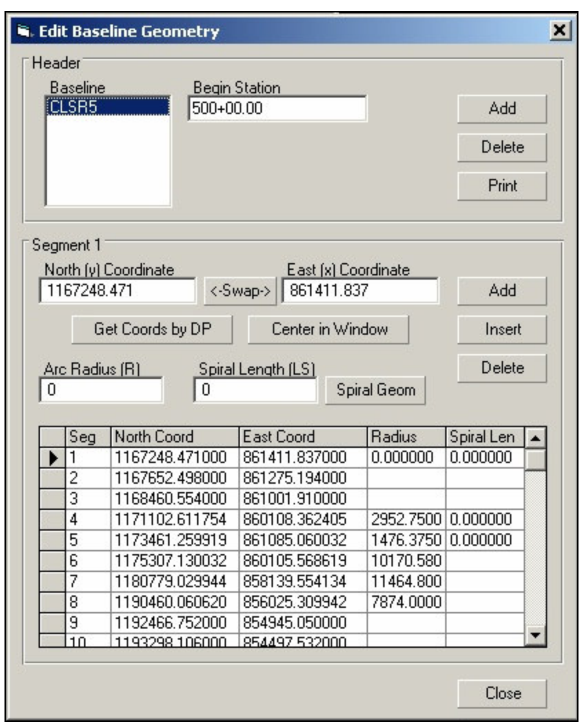


Figure 2.1

Begin Station: This is the station of the first PI (Segment 1) in the segment table. This value must include the plus (+) sign and have the following format: 99+99.9999

If the Begin Station value is zero (0+00), you MUST store the station as 00+00.00

Add (Header): Upon pressing the Add button, you will be prompted for the new Baseline name. This name must conform to the ASAD object naming convention.

Delete (Header): Delete the currently highlighted baseline.

Warning: Deleting a baseline that has nodes associated with it may cause future 'Missing Baseline' errors. Edit these nodes and make appropriate changes to the 'Baseline' field.

Print: Print a detailed listing of the current baseline's geometry. This includes all PIs, PCs, PTs, bearings, deltas, etc. This information can be used to check ASAD's baseline geometry to GEOPAK or other source of the horizontal geometry.

North & East Coordinates: North and east coordinates for each PI of the baseline.

Swap: Swaps the numbers between the North and East coordinates for the highlighted PI. This is useful when a baseline is stored from an input file that was erroneously created not with north/east coordinates but with x/y coordinates instead.

Get Coords by DP: Use this to snap/dp to a CAD point, retrieve the coordinates, and store them in the highlighted PI.

Center in Window: Pressing this button will window center the CAD window on the coordinates.

Arc Radius (R): The arc radius is used to define a curve or spiral/curve in the baseline.

Spiral Length (LS): Length of spiral. This value can only be input manually (no importing of spiral geometry) and can be found in a GEOPAK chain description listing for chains which include spirals.

Spiral Geo: ASAD needs the PI of the spiral. This may not always be available. The Spiral Geo button invokes the Spiral Assistant window which, when given the back & ahead bearings and PIs, will compute the PI at the spiral.

Add (Segment): Add a new segment to the end of the list of segments.

Insert (Segment): Add a new segment after the currently highlighted segment.

Delete (Segment): Delete the currently highlighted segment.

2.1.1 Importing Baselines

ASAD can import baseline input files into its database by means of an import routine located in the ‘File>Import’ pulldown of the ASAD Main Window (see figure 1.2). To import the input files, first, select the tab for GEOPAK Chains at the top of the ‘Import’ dialog. Next, enter the input filename by typing the full path and filename or use the browse function to locate the file. A list of chains or profiles contained in each input file will appear in the ‘Selection’ list. Select the chains you wish to import. If the chain already exists in the ASAD project database which is currently open, be sure to check the ‘Overwrite Existing’ box you wish to redefine or update the alignment. Click ‘Ok’ to process the input file.

2.1.1.1 COGO Input Files

The input file **must be created using the *make input* command** in GEOPAK COGO. ASAD can read only input files created in the following manner:

1. Enter GEOPAK COGO.
2. Make sure you have the correct GEOPAK database (GPK file) open.
3. Key in one of the following lines:

   for baselines

   make input file c:\asad\baseline.inp cha *

   make input file c:\asad\baseline.inp cha CLCONST

   for profiles

make input file c:\asad\profiles.inp pro *
make input file c:\asad\profiles.inp cha CLPGL
,where * is the wildcard for ALL chains (cha) or ALL profiles (pro).

4. Return to ASAD Import window (figure 2.2) and proceed.

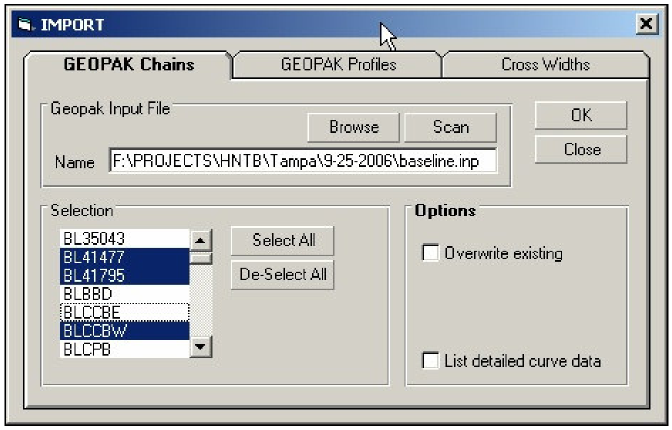


Figure 2.2

Input File: Using the Browse button to select the input file to be imported. Once selected, the file will be scanned automatically, placing the names of all chains in the 'Selection' list box. If the filename is keyed manually, you must press the Scan button to force the scan of the file. This will place all detected chain names in the 'Selection' list box.

Selection, Select All, De-Select All: The Selection list box displays all chain names found in the input file. Click to select individual entries to be imported or use the Select All or De-Select All buttons to manipulate all entries.

Overwrite Existing: This switch, when checked (ON), will allow an already existing baseline to be overwritten, in the ASAD database. If unchecked (OFF), this switch will not allow any existing baselines to be changed in the ASAD database.

OK: Pressing the OK button starts the import process. Only those baselines highlighted in the selection list box will be imported.

In the previous version of ASAD (ver 2), there were certain chains that would not import properly. Mainly chains with reverse curves and no tangents in between, and some chains that began on a PC. These import problems have been resolved ASAD version 3.

2.1.2 DATA REQUIRED

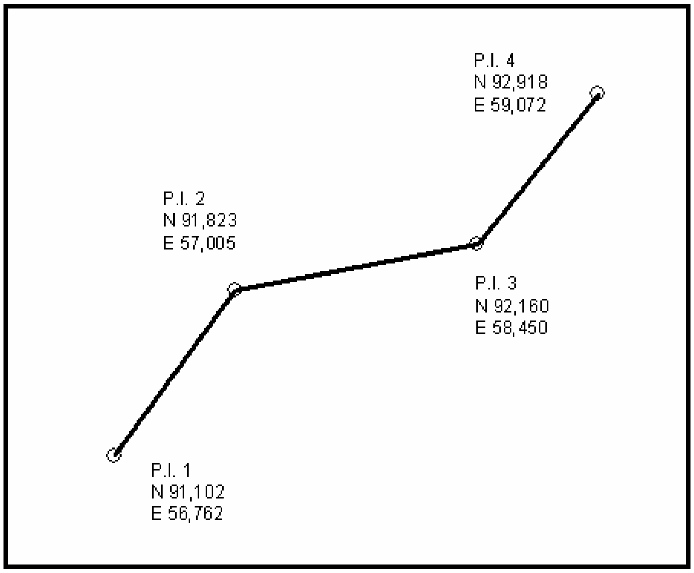
Listed below is minimum required data for any baseline stored in ASAD:

1. PI at the beginning and ending points of the baseline.
2. PI at each bearing deflection.
3. Arc Radius for each curve.
4. PI at each PRC.

Listed below are examples of baselines and the data needed to store them in ASAD. These four examples will demonstrate the data required to store baselines with the following characteristics:

- Baselines with no curves.
- Baselines with curves (with a tangent between reverse curves)
- Baselines with curves (no tangent between reverse curves)
- Baselines that begin and/or end on a PC or PT respectively.

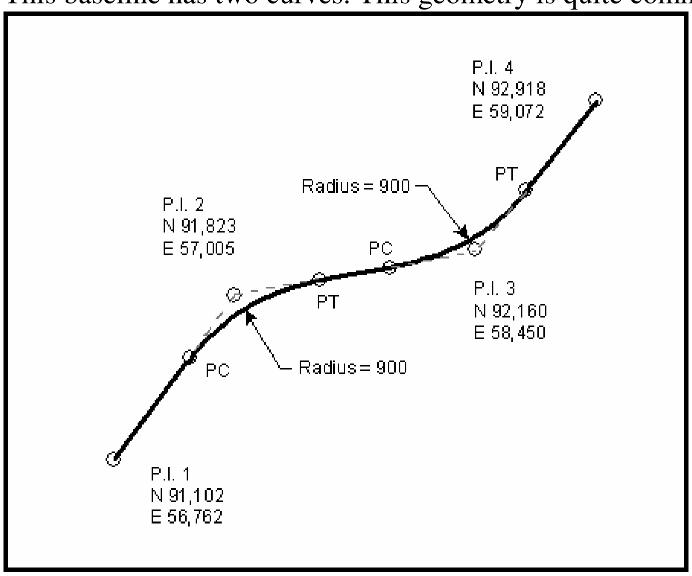
The following baseline has no curves. This is the most simplistic of all baselines.



In this case, each PI shown above is represented by a Segment in the table below.
Because there are no curves, the radius for a four PIs is set to zero (0).

SEGMENT	NORTH COORD	EAST COORD	RADIUS
1	91,102	56,762	0
2	91,823	57,005	0
3	92,160	58,450	0
4	92,918	59,072	0

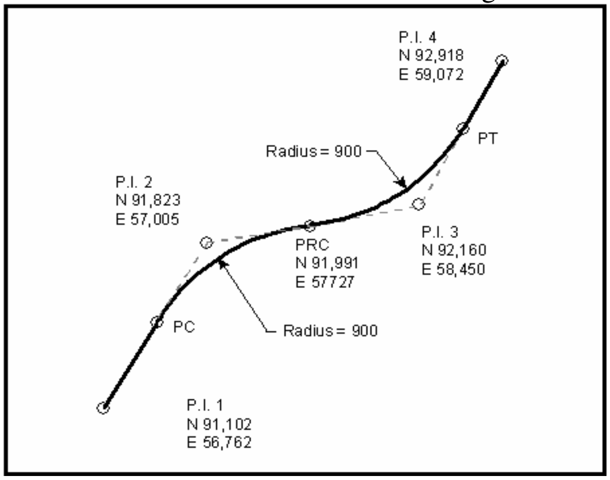
This baseline has two curves. This geometry is quite common on many roadways.



In this case, each PI shown above is represented by a Segment in the table below. The curves at PI2 and PI3 are also represented in Segment 2 and 3 respectively. This is noted by a value of 900 in the 'RADIUS' column. Because the two curves have a tangent between them (meaning the location of the PT of the first curve is not the same as the PC of the second curve), no additional points are needed.

SEGMENT	NORTH COORD	EAST COORD	RADIUS
1	91,102	56,762	0
2	91,823	57,005	900
3	92,160	58,450	900
4	92,918	59,072	0

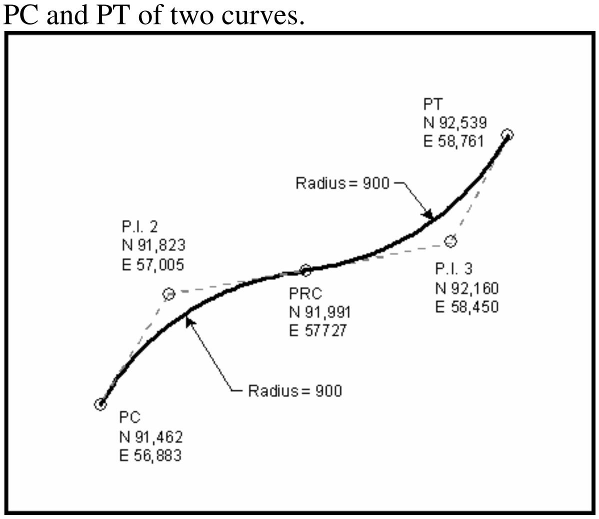
This baseline has two curves with no tangent between them. This is a reverse curve.



As in the previous case this baseline contains two curves. However, the second curve begins (PC) where the first curve ends (PT). This point is called the Point of Reverse Curvature (PRC). ASAD requires that an additional point (Segment) be inserted to reflect this PRC. Without the PRC defined, ASAD will compute incorrect North and East coordinates for any nodes based off of this baseline. In the table below the PRC is located in segment 3. Segments 4 and 5 represent PIs 3 and 4 respectively.

SEGMENT	NORTH COORD	EAST COORD	RADIUS
1	91,102	56,762	0
2	91,823	57,005	900
3	91,991	57,727	0
4	92,160	58,450	900
5	92,918	59,072	0

This baseline has two curves with no tangent between them. The baseline also begins and ends on the PC and PT of two curves.



In this case, the baseline begins on a PC, transitions through reverse curves, and ends on a PT. The PC of the first curve is placed in Segment 1 below. Segment 2 represents PI2 with a radius of 900 to indicate that it is a curve. Segment 3 is the PRC between curves. Segment 4 is PI3 with a radius of 900 to indicate that it is a curve. And finally, Segment 5 represents the PT of the second curve.

SEGMENT	NORTH COORD	EAST COORD	RADIUS
1	91,462	56,883	0
2	91,823	57,005	900
3	91,991	57,727	0
4	92,160	58,450	900
5	92,539	58,761	0

2.1.3 BASELINE TANGENT INTERSECTION CALCULATOR

Use this window to compute a PI at the intersection of two tangents. Pulldown menu Tools>Special>Compute Intersection will start this window.

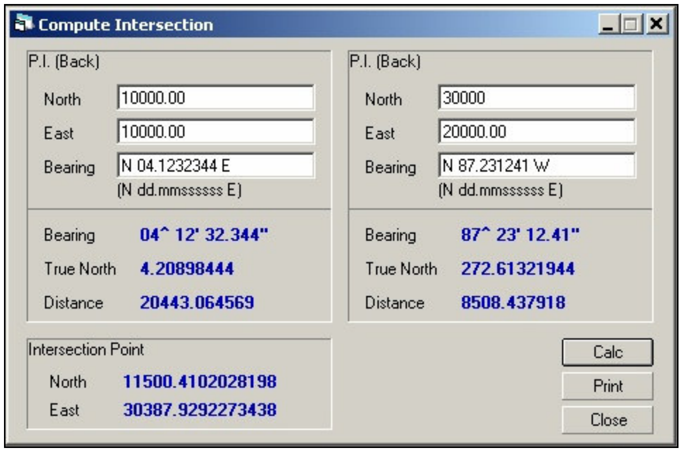


Figure 2.3

North, East: North and East coordinates. Enter the North and East coordinates two known points.
Bearing: Enter the bearing from the associated points. The acceptable format is:
N dd.mmssssss E, where dd = degrees, mm = minutes, ssssssss = seconds.
Calc: Initiates the calculation.

2.1.4 VERIFY BASELINE GEOMETRY (BY DRAWING IN CAD)

A quick and easy way to verify baseline geometry is to draw the baseline in a scratch CAD file and attach another CAD file that contains the same baseline (typically drawn by GEOPAK or InRoads). The two baselines should lie directly on top of each other. If there is any difference in the two, then go back and review the baseline geometry. To open this window, use pulldown CAD>Storm Sewer>Draw Baseline Locations or click on the right-most icon on the 'Draw Storm Sewer' toolbar. 

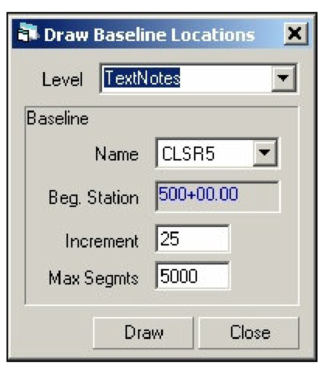


Figure 2.4

Level: Select the level name to draw to.
Name: Select the baseline to draw
Increment: Length of each line segment to draw. For speed and simplicity, this routine draws the baseline as a series of short line segments. For more accuracy, shorten this value to 10, 5 or even 1. However, the number of Max Segments may need to be increased to display the entire baseline.
Max Segments: This limits the number of segments to be drawn in the case of a baseline that is stored incorrectly. Image an correct baseline with a length of 300 miles instead of 3 miles. Dividing the 25' increment into a baseline length of 1,584,000' (300 miles x 5280'/mile) would yield 63,360 segments.
Note: This routine only draws the baseline and has no labeling capabilities.

2.2 PROFILES

Similar to editing baselines, another method for entering the vertical profile, in addition to importing, is to key them manually. A dialog box dedicated to manually keying in the profile is provided (see figure 2.5). This dialog is displayed in a grid.

To add a new profile to the database, select the “Add” button and enter the desired profile name. The user must then select the new profile name from a list on the dialog as the current profile. This will show the first segment with all the fields zeroed. The control buttons for the profiles are on the right side of the dialog. The same buttons that were described for the baselines are in the profiles dialog. The only difference in this case is the designer enters point of vertical inflection (PVI) beginning with the segment number and ending with the elevation to define the profile instead of northing and easting coordinates.

The Length ahead and Length back are for vertical curve lengths. If the profile contains a vertical curve the values for the entering and leaving curves are entered in these fields.

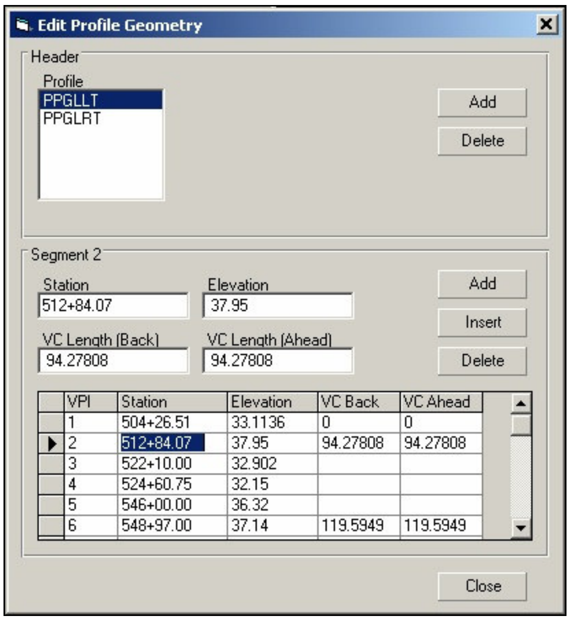


Figure 2.5

Add: Upon pressing the Add button, you will be prompted for the new profile name. This name must conform to the ASAD object naming convention.

Delete: Delete this currently highlighted profile.

Warning: Deleting a profile that has nodes associated with it may cause future 'Missing Profile' errors. Edit these nodes and make appropriate changes to the 'Profile' field.

Station: The Segment (VPI) Station should be in ascending order (from top to bottom) and be of the format: 99+99.9999

Elevation: The segment's (VPI) elevation.

VC Length (Back & Ahead): To define a vertical curve at a VPI, enter the vertical curve lengths into the appropriate field. The length of VC ahead of the VPI is placed in the 'VC Length (Ahead)' field, likewise, the length of VC back of the VPI is placed in the 'VC Length (Back)' field.
Examples:
(1) If a symmetrical vertical curve has a total length of 300', then both the VC Length fields should contain 150.
(2) If a non-symmetrical vertical curve has a total length of 100' with 40' of the curve occurring ahead

(in station) of the VPI, then the VC Length (Ahead) field should contain 40 while the VC Length (Back) field should contain 60.

Add (Segment): Add a new segment (VPI).

Insert (Segment): Add a new segment (VPI) after the currently highlighted segment.

Delete (Segment): Delete the currently highlighted segment (VPI)

2.2.1 IMPORTING PROFILES

ASAD can import profile input files into its database by means of an import routine located in the 'File>Import' pulldown of the ASAD Main Window (see figure 1.2). To import the input files, first, select the tab for GEOPAK Profiles at the top of the 'Import' dialog. Next, enter the input filename by typing the full path and filename or use the browse function to locate the file. A list of profiles contained in each input file will appear in the 'Selection' list. Select the profiles you wish to import. If the profile already exists in the ASAD project database which is currently open, be sure to check the 'Overwrite Existing' box if you wish to redefine or update the alignment. Click 'Ok' to process the input file. For important information on creating input files from GEOPAK, see section 2.1.1.1 - COGO Input Files.

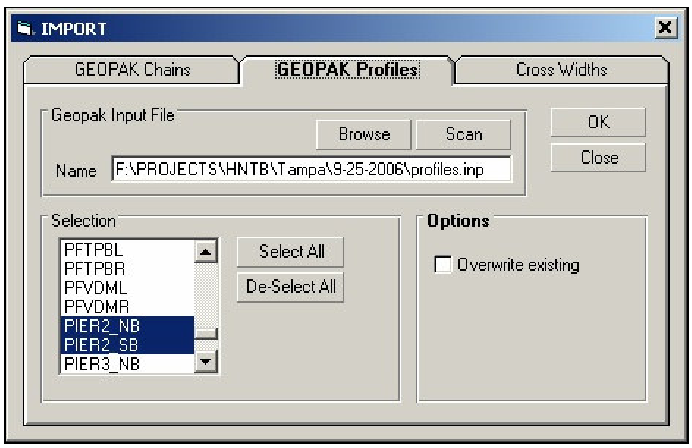


Figure 2.6

Browse: Use the Browse button to select the input file to be imported. Once selected, the file will be scanned automatically, placing the names of all profiles in the 'Selection' list box. If the filename is keyed manually, you must press the Scan button to force the scan of the file. This will place all detected profile names in the 'Selection' list box.

Selection, Select All, De-Select All: The Selection list box displays all profile names found in the input file. Click to select individual entries to be imported or use the Select All or De-Select All buttons to manipulate all entries.

Overwrite Existing: This switch, when checked (ON), will allow an already existing profile to be overwritten, in the ASAD database, during the import. If unchecked (OFF), this switch will not allow any existing profiles to be changed in the ASAD database.

OK: Pressing the OK button starts the import process. Only those profiles highlighted in the selection list box will be imported.

2.2.2 VERIFY PROFILE GEOMETRY (BY DISPLAYING)

Using the Profile View window to review the general shape of a profile stored in ASAD. Use pulldown CAD>Storm Sewer>Display Profile to open window. This is not a CAD window, it is simply a graphical display window and therefore has no utilities such as zoom in, zoom out, print, etc.

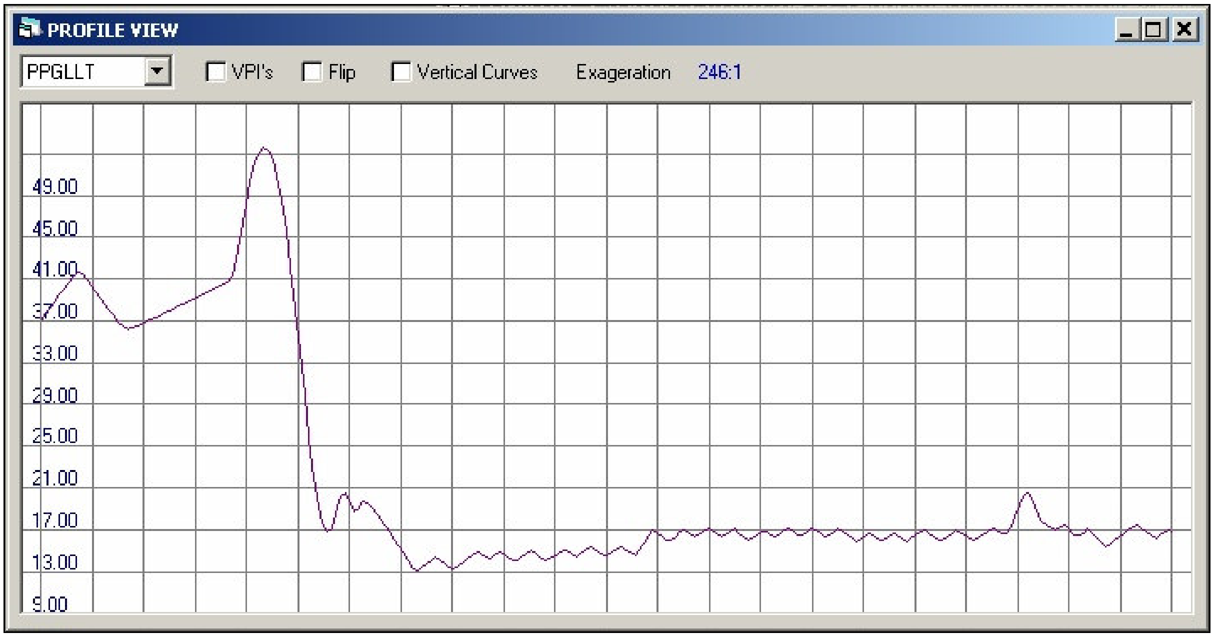


Figure 2.7

Pulldown at Top Left: Select the profile to be displayed.
VPI's: Check this box and then click on the drawing screen to show profile and VPI data.
Flip: Working in conjunction with the VPI's check box, this will change the orientation of the VPI notation to make it more readable. After changing the box, click on the drawing window to refresh.
Vertical Curves: The check box turns on/off Vertical Curve data. After changing the box, click on the drawing window to refresh.

2.3 CROSS SLOPES

The cross slope and corresponding offsets are entered in the "Edit Cross Slopes" dialog (see figure 2.8). This information is most important for determining inlet elevation. It is also used for the HEC-12 "spread" Analysis which determines the amount of water that will cover the roadway. The information entered should be based on the typical section for the specific node. Each node can have a different typical section, therefore it can also have different cross slopes. Nodes adjacent to side streets can have a different typical section than nodes elsewhere. Turn lanes are NOT to be considered when entering the cross slopes and will be explained later.

The typical section information is entered by first keying in the baseline tie to the Profile Grade Line (PGL). The PGL/Baseline Tie is defined as the distance from C/L of construction to the PGL. For instance, if the typical section is for a two-lane undivided road, then the Tie = 0, and for a multi-lane divided roadway, the PGL/Baseline Tie = (0.5 * Median Width) for a symmetric alignment. Note that as you enter the PGL/Baseline Tie, the first offset is set to the same value. This means that the inner-most lane begins at the PGL.

Adding additional outside lanes can be achieved by using a typical section with an expanded outside offset. The outer pavement edge would then be defined as the outer most offset. ASAD will interpret this to mean that the pavement cross slope exists within this range of numbers.

The next step to entering the Cross Slope information is to define the cross slope to the first offset. For example, in most FDOT projects the cross slope = -0.02 m/m for a distance of 3.6 m. Assuming the PGL/Baseline Tie = 0.0, then the first "To" offset should be set to 3.6. If the PGL/Baseline Tie = 4.0, the first "To" field is set to 7.6 and so on.

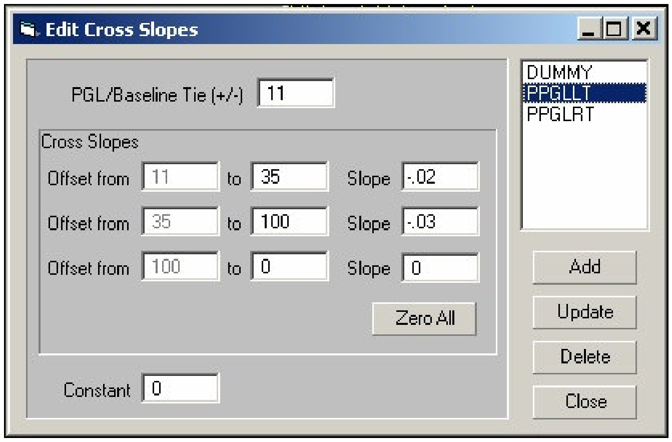


Figure 2.8

PGL/Baseline Tie (+/-): The constant distance between a baseline and the location of the profile grade line (PGL). For example, a 4-lane divided highway that has a 22' median with the centerline in the center and the PGL at the inside edge of pavement (offset = 11' left and right). In this case the PGL/Baseline Tie (+/-) value would be 11.0

Cross Slopes: The offsets and cross slopes define the pavement slope at any given offset. For example: In the above image, the first cross slope begins at the PGL offset (11 as shown above) and continues to the break in cross slope at offset 35. Through this section the cross slope is -.02. From the break, at offset 35, the cross slope slopes at -.03 to the final offset of 100.

Note: It is important to always store the final offset value well past the offset of your furthest node that depends on the cross slope for Inlet Elevation or Spread cross slope information.

Zero All: This will fill all fields of the current selected cross slope with zeros.

Constant: In addition to the cross slope information for computing inlet elevation, the Constant field will be added to the computed cross slope elevation. In the case of all zeros in the cross slope data, a node's elevation would be set at its profile elevation plus the Constant value.

Add: Clicking the Add button will allow you to enter a new cross slope into the list. The cross slope name must conform to ASAD object naming convention.

Update: Write any changes to the current record to the database.

Delete: Delete the current from the database.

Warning: Deleting a cross slope record that is referenced by a node may cause the node to have a 'missing cross slope error' in the future. Edit the node, change the cross slope to a valid record.

2.4 Cross Widths

The cross width window is used to define widths of onsite drainage surfaces, typical onsite paved and onsite grassed, to be used later by the 'Storm Sewer Geometry and Drainage Areas' window for computing onsite drainage areas for nodes.

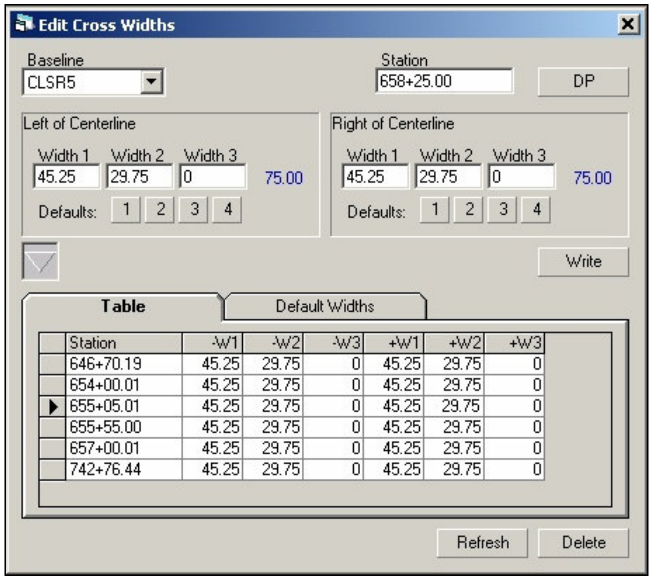


Figure 2.9

Baseline: Select the baseline you want to associate surface widths to.
Station & DP Button: The station you are currently defining widths for. Use the DP button, with the CADD graphics window and design files, extract the station at an exact point such as the beginning or end of a lane taper.

When snapping to a drawing element in ASAD, position the cross hairs close to your target and press the SPACE bar to snap. Complete the process by clicking on the left mouse button to accept the point.
Width 1, 2, & 3 (Left & Right of Centerline): These fields, Width 1, Width 2, Width 3, are used to compute a node's Area 1, Area 2, and Area 3 respectively. The areas, 1, 2, and 3, are associated with runoff C values 1, 2, and 3, as stored in the Storm Sewer Outfall and Header Details for the current active system. Each width value represents a total width of impervious (or pervious) surfaces on the left (or right) side of the centerline. For example:

A project is setup with Area 1 as impervious and Area 2 as pervious. At a particular station, let's say 685+25.00, you have on the left side of the center line the following surfaces and widths (as seen along an imaginary line perpendicular to the baseline at said station):

```
Grass area in median to E curb:                8.75ft
One type E curb:                               2.25ft
Three lanes of roadway pavement:               36.0ft
One type F curb:                               2.0ft
Grass area between F curb and sidewalk:        4.0ft
One concrete sidewalk:                         5.0ft
Grass area between sidewalk and Right-of-Way:  17.0ft

Total Impervious width (W1):                   45.25ft
Total Grass width (W2):                        29.75ft
Total width (C/L) to Right-of-Way:             75.00ft
```

Adding all impervious widths you get a Width 1 value of 45.25ft. Doing the same with the pervious widths you get a Width 2 value of 29.75ft.

This process is repeated for the right of centerline widths. Once these numbers are filled in, pressing the Write button will store them into the cross widths Table.
Write: Write the current data, station and widths, to the cross widths Table.
Table: This table shows all cross data stored for the specific baseline selected.

Refresh: The refresh button will refresh the Table and place out of sequence records back in sequence.
Delete: Delete the current record out of the cross widths Table
Default Buttons (1 to 4): These buttons are used to automatically fill in the Width 1, 2, & 3 fields. By pressing on one of these buttons, the corresponding values stored in the 'Default Values' (see figure 2.10) tab, will be placed into the Width 1, 2, & 3 fields. This is very useful when there are multiple occurrences of the same widths combinations. For example, you may have the same two or three width combinations occurring when you have a roadway that is typically three lanes, but sometimes has a fourth (turn) lane.

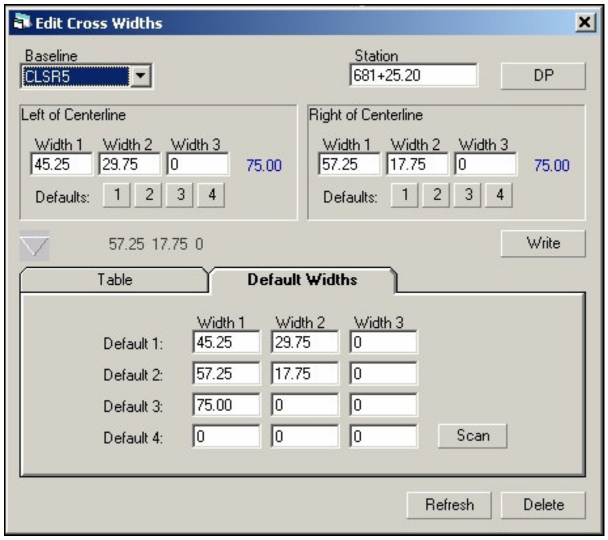


Figure 2.10

Default Widths (Tab): This tab contains the default data used by the Default Buttons mentioned above. Data entered on the 'Default 1' row on this tab will be placed in the corresponding 'Width 1, Width 2 , Width 3' fields in the upper half of the window. The example shown above represents three scenarios:

Default 1: 'Width 1' (impervious) = 3 roadway lanes + sidewalk + curbs = 45.25ft
'Width 2' (pervious) = grass in median +grass curb to sidewalk + grass s/w to r/w = 27.75ft
'Width 3' – not used = 0

Default 2: 'Width 1' (impervious) = 3 roadway lanes + 12' turn lane + sidewalk + curbs = 57.25ft
'Width 2' (pervious) = grass in median +grass curb to sidewalk + grass s/w to r/w = 17.75ft
'Width 3' – not used = 0

Default 3: 'Width 1' (impervious) = Intersection, entire Lt (or Rt) of centerline is paved = 75.00ft
'Width 2' (pervious) = No grass = 0.00ft
'Width 3' – not used = 0

Scan
Use the scan function to scan the existing data in the Table, placing the most commonly occurring width combinations into the Default Widths fields. This is only useful if you have a considerable amount of data stored in the Table.