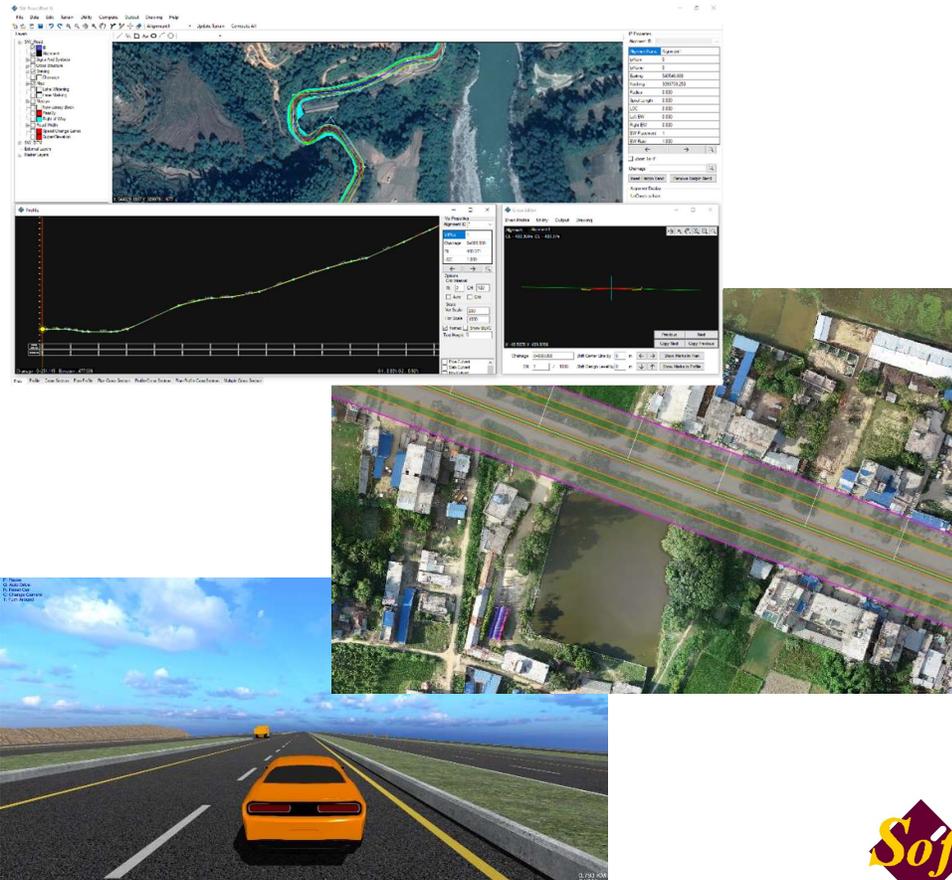


# SW ROAD V2

Road Design/Drawing/Estimation and Visualization Software

## Operation Manual

(Version 2.0.0)



July, 2020

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## **About SW ROAD V2**

The SW ROAD was developed during 1993 by WELINK Consultants. Later it was adopted by SOFTWEL (A sister concern of WELINK) and has been upgrading and supporting it since 2000. It was extensively applied in design and drawings of many road projects in Nepal including ADB funded (TRP, RNDP, RCIP, RRRSDP, DRLIP, PPC2, PPC3), World Bank Funded Projects RSDP, Indian Exim Bank Project (RIP 1, RIP 2, and RIP 3), SDC funded DRSP Roads and many local roads and hydropower project access roads. It has more than 1000 clients in Nepal and abroad.

Present SW ROAD V2 is a significant upgrade to the previous version of SW ROAD 2010. It includes multicore parallel processing, better graphics and higher computation speed, designing of multilane roads, multi alignment, handling of background imageries, 3D view and road animation and cost estimation. The version is self-updating such that user gets automated update notice.

The SW ROAD V2 comes with five variants of deployment:

- a) Learning Version: Intended for learning purpose and provided at free of cost. It is of same capability as Professional Version but limited to design up to 2.5 Km at a time.
- b) Professional Version: It is an upgrade to previous version of SW ROAD and is available to all previous users of SW ROAD.
- c) Enterprise Version: It has additional tools e.g. design of pavement, retaining walls, small bridges etc. and enhanced graphical capability.
- d) Server Version: It is targeted for firms and has Professional Version operating under a central database with multiple licenses with concurrent design capability.
- e) Cloud Version: It is intended for departments/road agencies/projects for managing and maintaining numerous design works including monitoring of the construction and maintenance works in cloud.

## **Development Credits**

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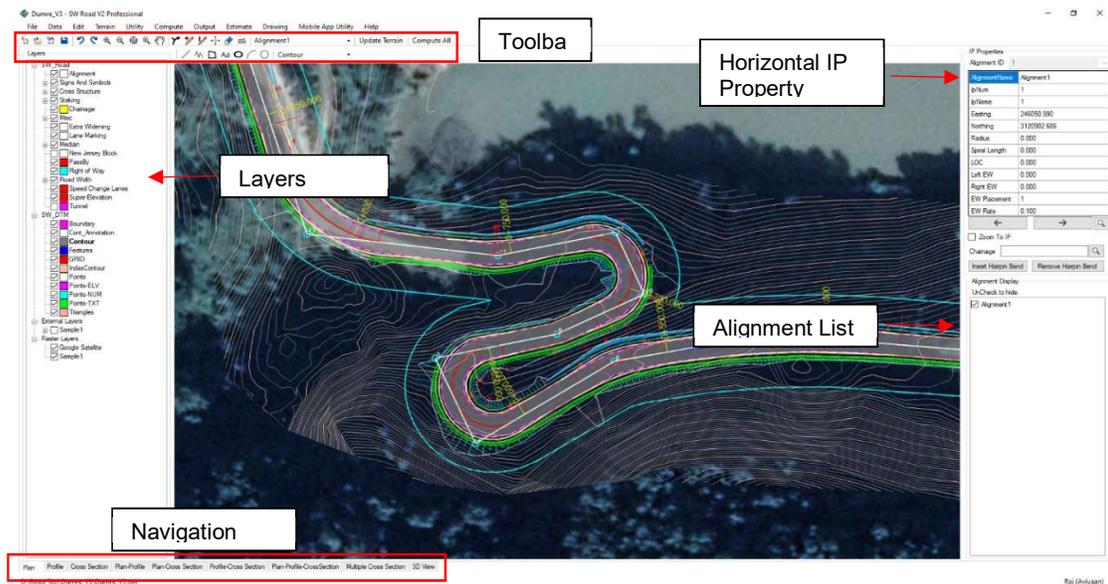
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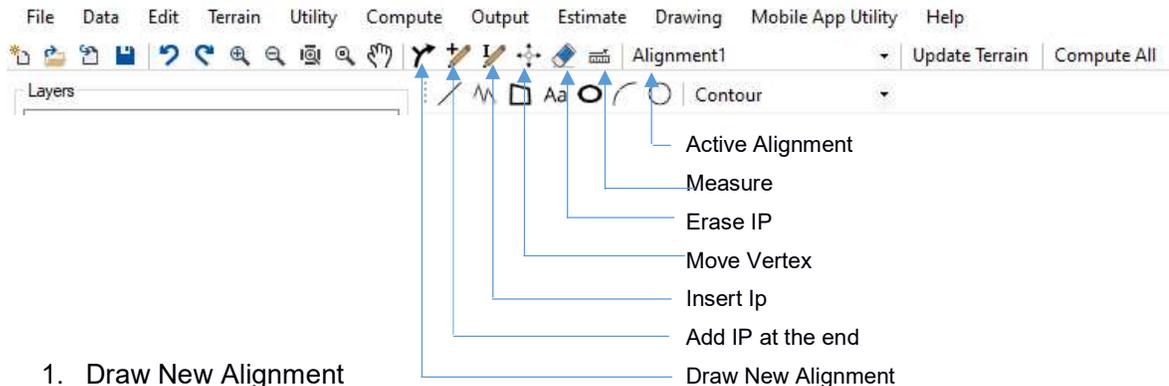
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# 1 INTRODUCTION (USER INTERFACE)

## 1.1 Main Window (Plan Window)

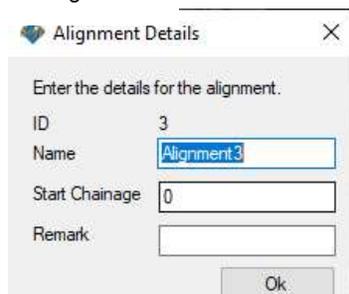


## 1.2 Main Toolbar



### 1. Draw New Alignment

It is used to draw new horizontal alignment or new longitudinal profile. If the Plan window is active, it starts to draw new horizontal alignment and if the profile window is active, it draws a new longitudinal profile. If both plan and profile windows are active, it works on Plan window. If a longitudinal design profile is already assigned, the button does nothing in profile. While drawing new horizontal alignment, the road name and start chainage of the road has to be defined before the start of the new alignment. While drawing a new alignment, the appropriate radii are auto-assigned. **To finish adding IP, the user has to right-click on the mouse.**



### 2. Add IP

This tool adds the IP at the end of the active alignment.

### 3. Insert IP

This tool inserts new IP between two nearest IP of the active alignment. It works on Plan and Profile windows.

4. Move Vertex

This tool is used to move or edit the position of the IP. It works on Plan and Profile windows.

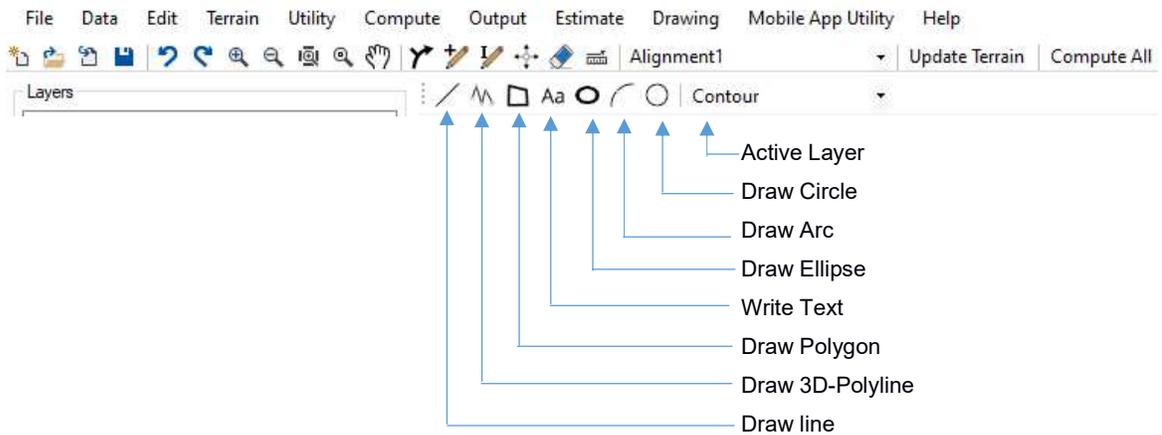
5. Erase IP

This tool is used to erase unnecessary IP in Plan and Profile.

6. Switch Active Alignment

This drop-down is used to switch the active alignment.

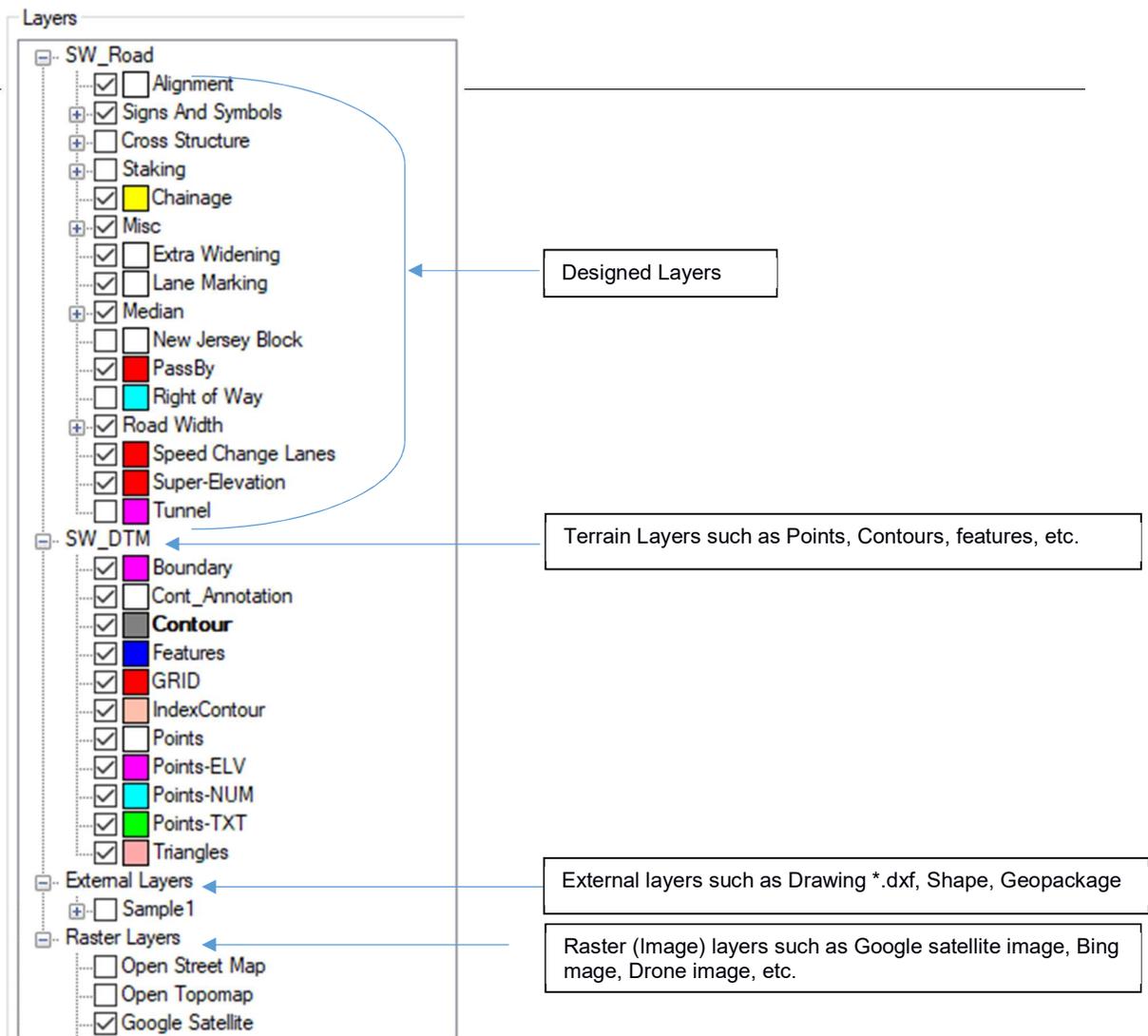
### 1.3 Draw Toolbar



- While using “Draw Toolbar”, mouse right-click complete the command, keyboard “Backspace” key undo the inserted vertex.
- “Draw 3D-Polyline” is used to draw the 3d-features that indicate the terrain undulation such as road edge, steps in terrain, cutting edge, etc.
- All the drawn features are added under active layer. So user has to change the active layer as per requirement.

#### 1.3.1 Layers Panel

It controls the display of all the designed layers (road width, chainage, extrawidening etc), drawn terrain layer (Points, features, contours, etc), imported external layers (drawing file (\*.dxf), shape (\*.shp), geopackage (\*.gpkg), etc) and imported raster layers (satellite imagery, topographic map, drone images in \*.tif or \*.mbtiles format).



### 1.3.2 IP Properties:

It is used to display the properties of the selected Horizontal IP. It is the place to assign and modify the radius and transition length of the IP.

Active Alignment

Radius of curve

Transition Curve length, Double click on the value will auto calculate the length if applicable.

Zoom to active IP instantly

Zoom to Chainage

Alignment Name	Alignment1
IpNum	10
IpName	IP11
Easting	245655.293
Northing	3121226.670
Radius	12.000
Spiral Length	0.000
LOC	18.609
Left EW	0.750
Right EW	0.750
EW Placement	1
EW Rate	0.100

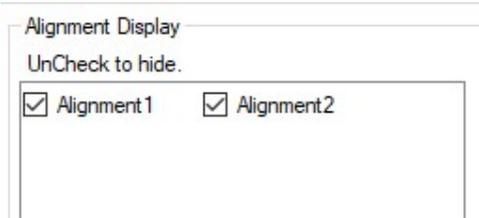
Alignment ID: 1

Zoom To IP

Chainage:

### 1.3.3 Alignment Display:

It is used to hide and unhide the design component of alignment such as road width, extra widening, etc of respective alignment. The alignments remain visible even after turning off this layer. The visibility of alignment can be turn off from the Alignment property Manager. (Menu bar>Data>Alignment>Properties).



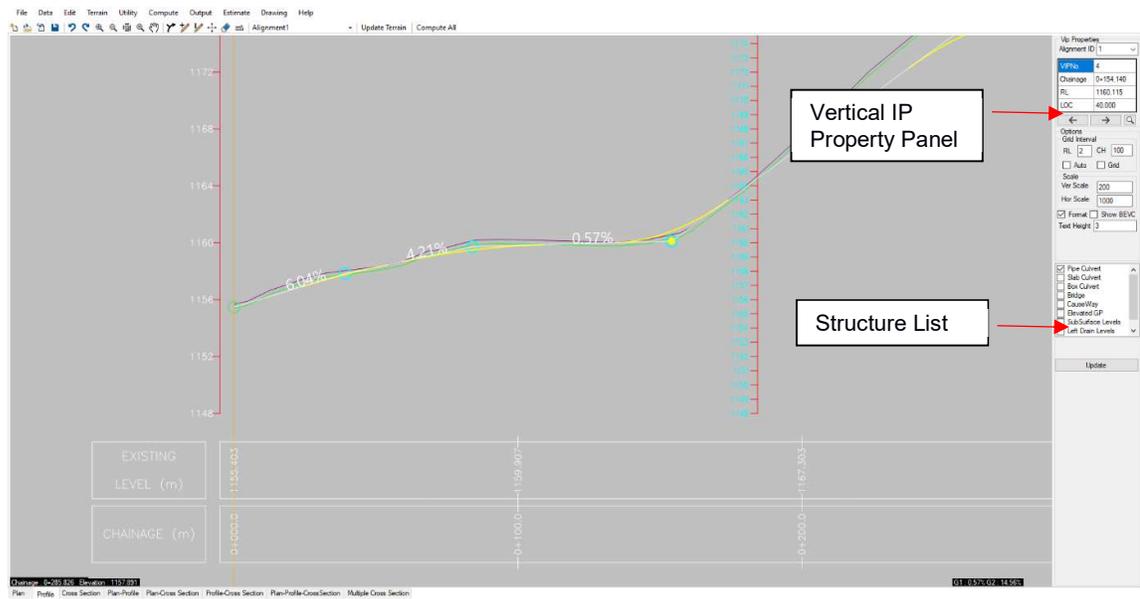
### 1.3.4 Navigation Tab:



Navigation Tab is used to quickly switch between the various window. The main windows available are Plan, Profile and Cross Section. These windows can be arranged in a different configuration to make the designing job comfortable. The job will be more comfortable if the user uses multiple monitors for parallel referencing.

## 1.4 Profile Window

This window is used to design the longitudinal profile of the road.



Length of Curve. User can input the appropriate length manually. Double click on the value auto calculate the length of vertical curve.

Option for grid interval. It controls the grid interval in display as well as in exported longitudinal profile.

Controls text height of longitudinal gradient.

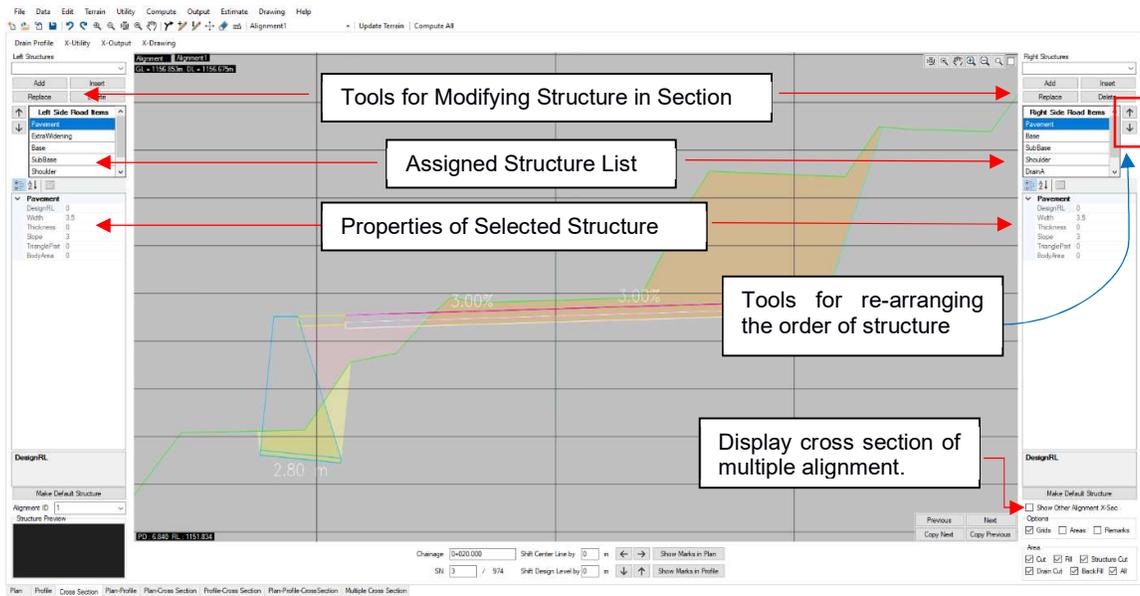
Switch the visibility of different listed road component.

Update design profile

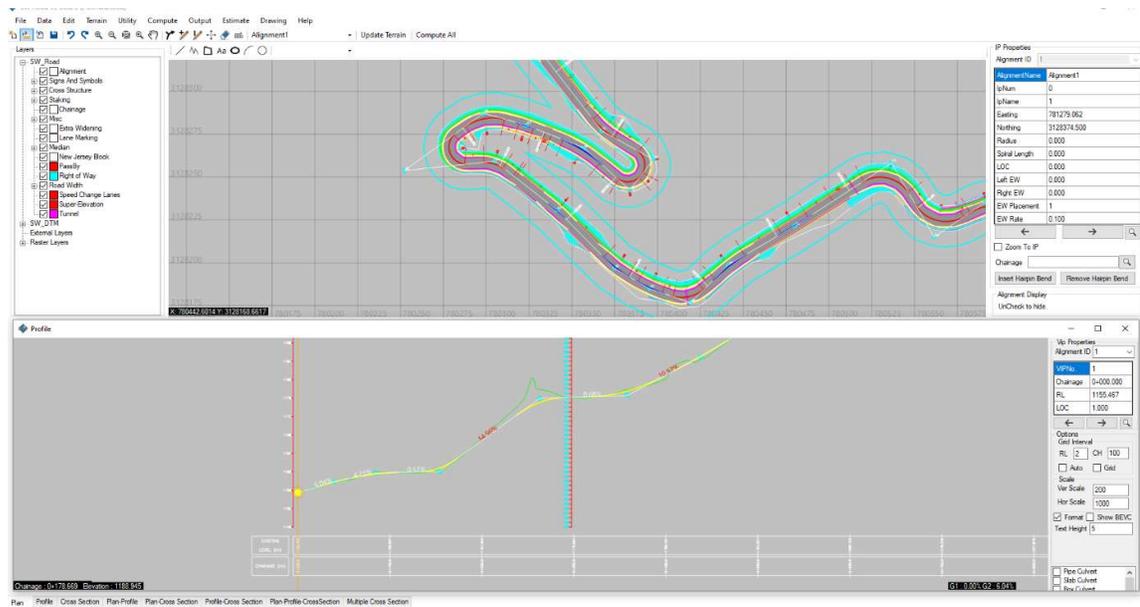
This block shows a detailed view of the 'Vip Properties' panel. A red box highlights the 'Vip Properties' section, which includes fields for Alignment ID, VIPNo, Chainage, RL, and LOC. Below this, there are sections for 'Options' (Grid Interval, Scale, Format, Text Height) and a 'Structure List' with checkboxes for various road components. At the bottom is an 'Update' button. Red arrows from the surrounding text boxes point to these specific elements.

## 1.5 Cross-Section

This window is used to design the cross structures such as Retaining wall, breast wall, cut/fill slope, drainage, etc. The cross-section menu has been discussed in detail in a separate chapter.

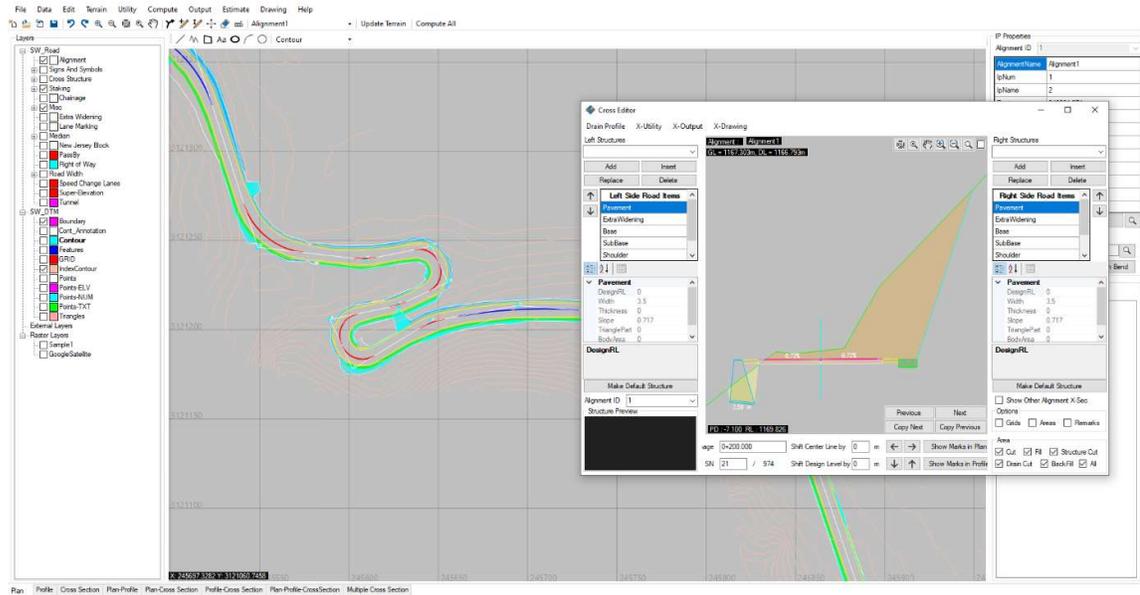


## 1.6 Plan-Profile

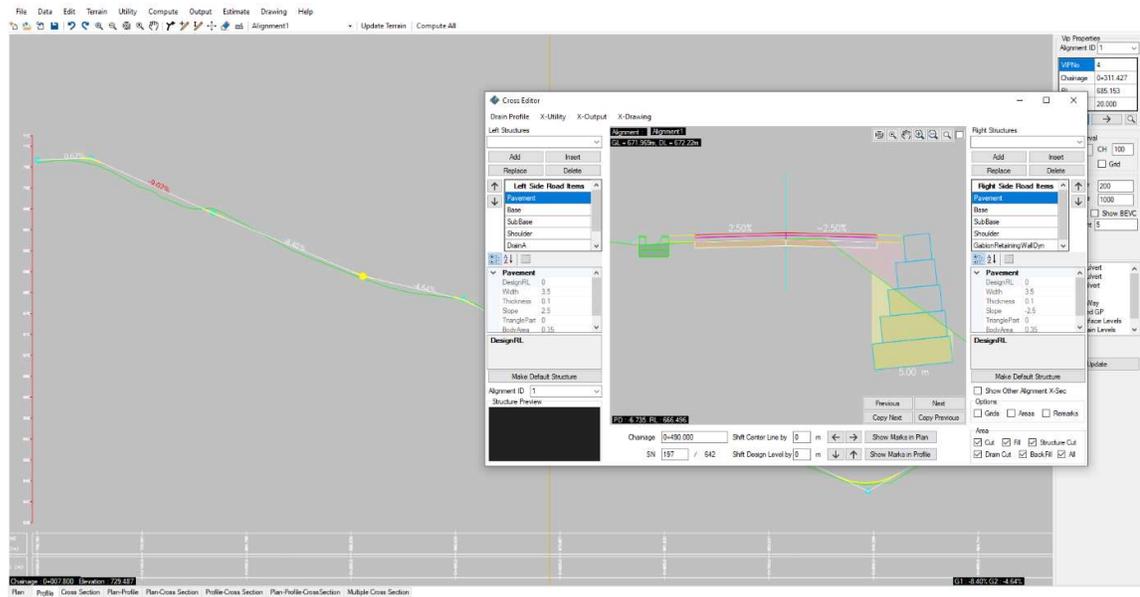


### 1.7 Plan – Cross Section

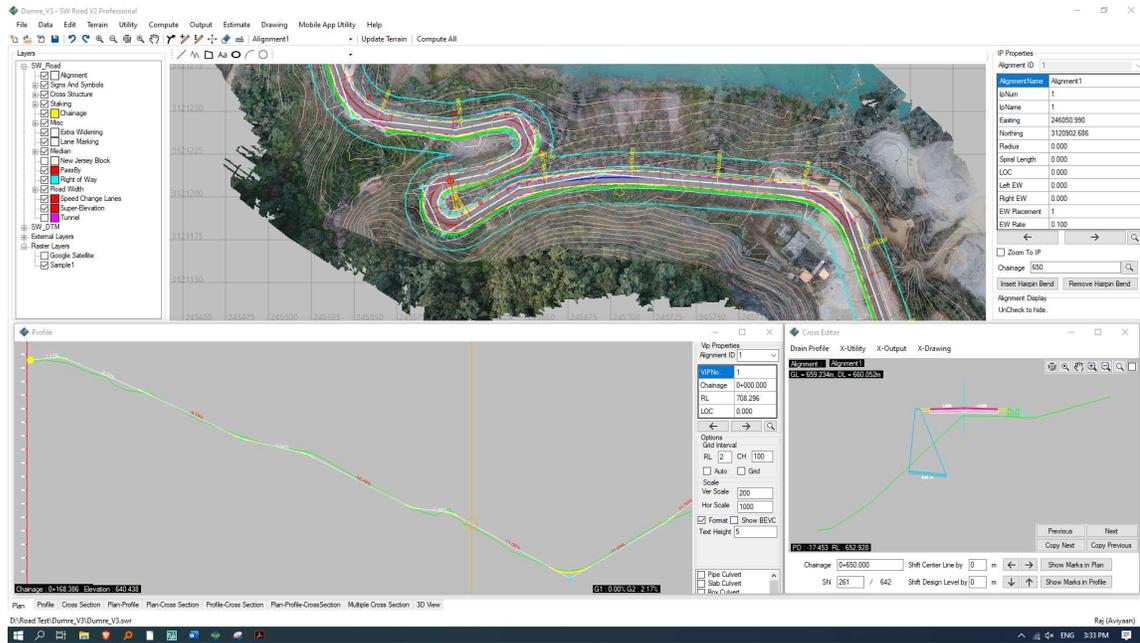
The cross-section is detachable in this view. If the user has multiple monitors, it can be viewed separately.



### 1.8 Profile-Cross Section

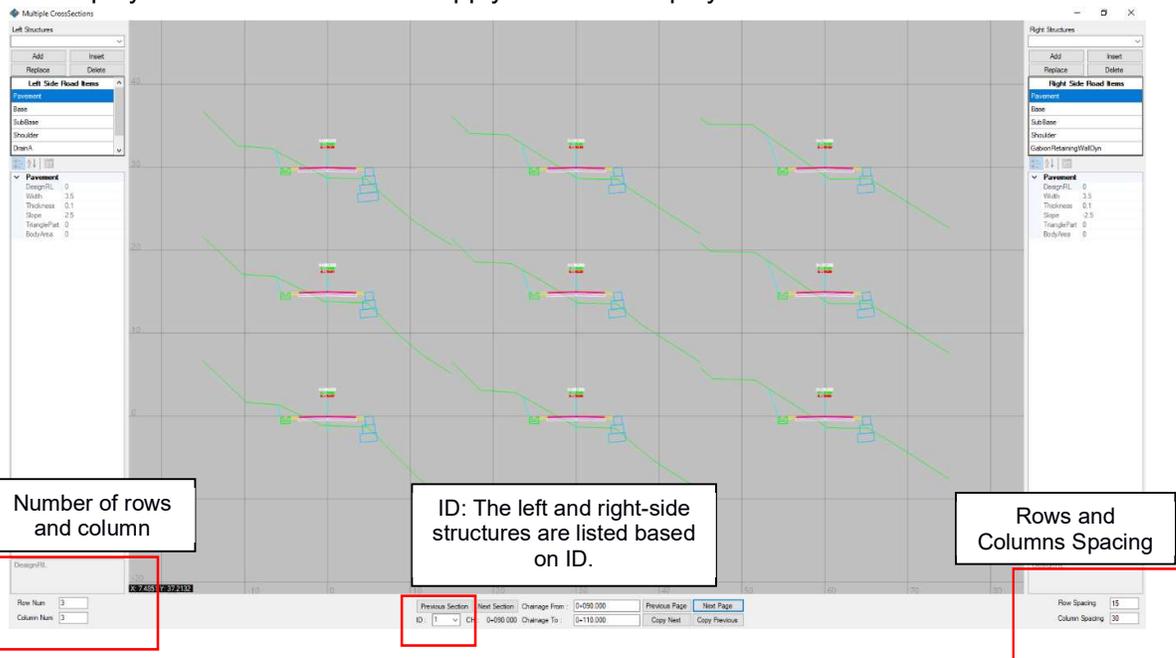


## 1.9 Plan-Profile-Cross Section



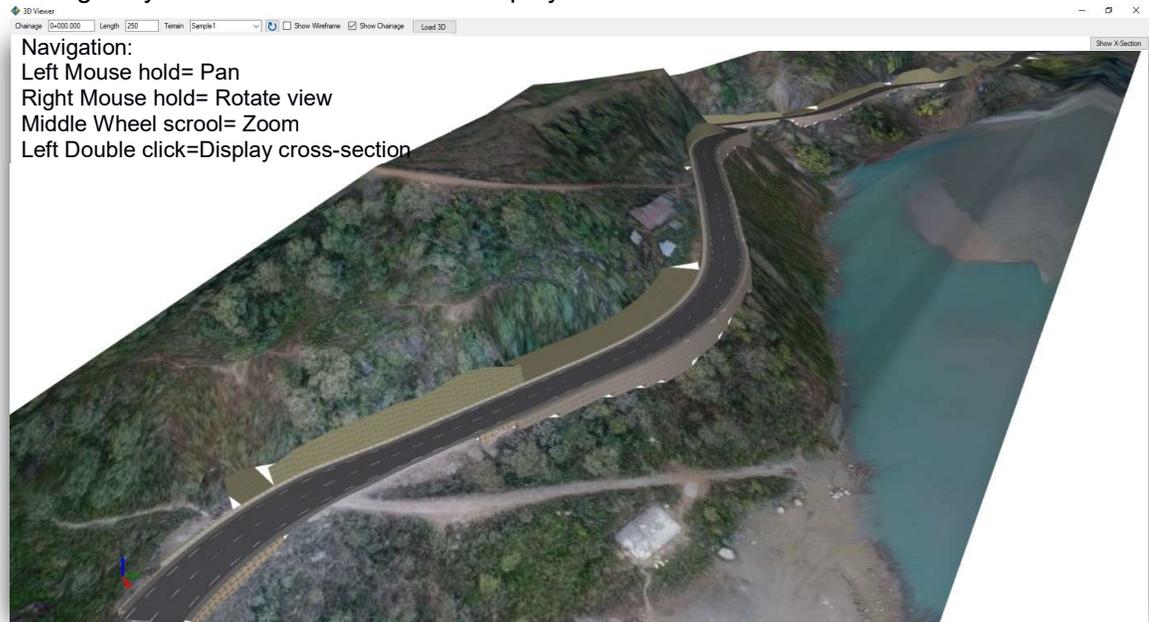
## 1.10 Multiple Cross Section

This window can be used to design multiple cross-sections at once. Multiple cross-sections are displayed and action taken will apply for all the displayed sections.



### 1.11 3D-View

3D-model can be viewed either with background terrain or without background. Longer stretch of view need more memory. So, it is recommended to view short stretch at a time (around 250 m or as per the processing speed of system) and regenerate another stretch for next view. Cross-section can be viewed from "Show X-section". For this user has to double-click on the carriageway and cross-section will be displayed.



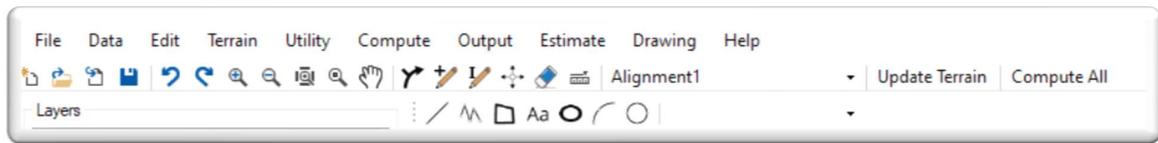
- Start Chainage
- Length of Stretch
- Background layer
- Display Mesh
- Display Chainage
- Load 3D View

Display cross section at a



## 2 MAIN MENU

The entire system is grouped into menus based on their similarity of functions. The following table provides the summary of the menus and the sub-subsequent section provides details of each of the menus and the sub-menus



Menu	Description
<b>File</b>	Allows users to create new project, import project from (*.swi) file format and import settings from another project, create backup copy of project, save and exit.
<b>Data</b>	Most of the data that is required for designing road is entered here. Eg: Design Parameter, Design Table, Cross Structure, Sub-Surface layers, etc.
<b>Edit</b>	Superelevation and Extra-widening data generated from user defined criteria can be edited.
<b>Terrain</b>	Surveyed points are processed, contours and terrain surfaces are generated. The source of terrain file required for the design is selected whether the source is internal DTM, external DTM or Grid.
<b>Utility</b>	Update the terrain, temporary raising of ground in longitudinal profile, shift the chainage, reverse the alignment and generate 3D model of the designed road.
<b>Compute</b>	Recalculate the design criteria based on user defined design table.
<b>Output</b>	Export the design data, Layout data and quantities of work.
<b>Estimate</b>	Estimate and prepare bill of quantity of the project
<b>Drawing</b>	Export Design Drawing (Plan, Profile and Cross-Section)
<b>Mobile App Utility</b>	Import and export files for mobile application.
<b>Help</b>	About the system.

## 3 FILE

File menu has been divided into following sub-division.

### 3.1 New Project

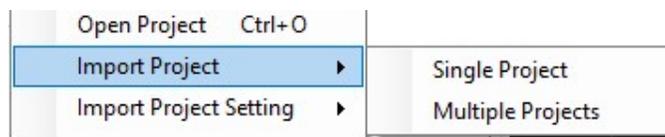
Create new project with default settings. Users can do nothing without creating a project.

### 3.2 Open Project

Open existing project

### 3.3 Import Project

Import Project that has been created by previous version of SW\_Road (\*.swi). A single project or multiple projects file can be imported.



### 3.4 Import Project Setting

Project setting is imported from existing project file.

### 3.5 Project Details

The project properties, information and projection system is displayed. The projection system can be changed from here.

### 3.6 Save Project

Save the project

### 3.7 Create Backup

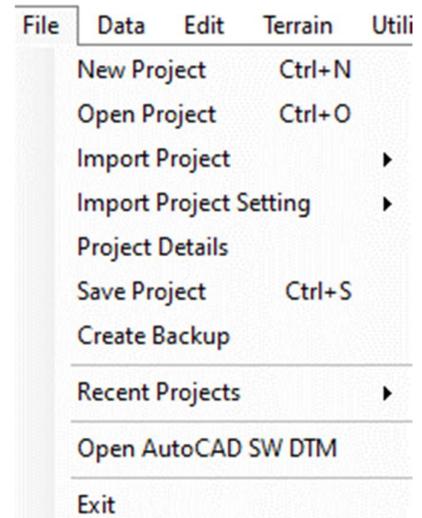
Save another copy of project in the same directory of project file.

### 3.8 Recent Projects

Display the list of recently opened project for quick opening of project file.

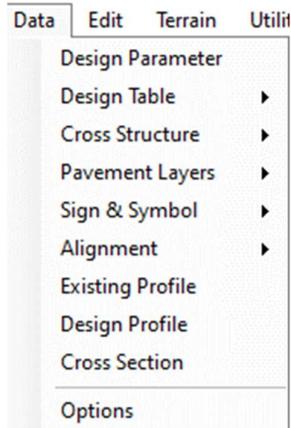
### 3.9 Exit

Exit the project file.



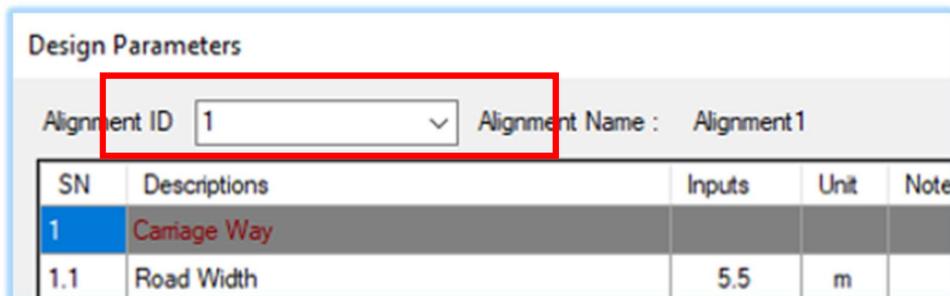
## 4 DATA

Before proceeding to road design, the design requirement and criteria need to be entered. In this menu, all the design requirement and criteria are entered. The Data menu is sub divided into following sub-menu.



### 4.1 Design Parameter

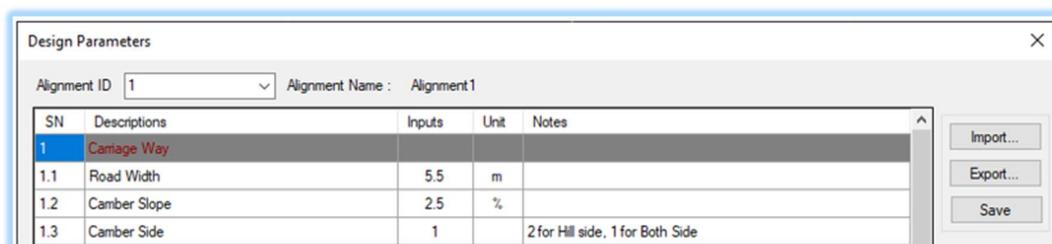
The parameter required for design such as road width, camber slope, design speed, extra-widening calculation option, etc is defined here. All the design parameter can be set for multiple alignments individually choosing the alignment id. This rule is applied on the rest of the tables as well.



#### 4.1.1 Carriageway

Carriageway is defined as the road width where the movement of the vehicles takes place. The designer gives Road width according to the design criteria and the standards for the road project. While designing urban roads, standard width of median and new jersey block along with the kerb shyness should be included in road width.

Camber is the slope provided to the road surface in the transverse direction of the road to drain off the rainwater from the road surface. The required camber of a pavement depends on the type of pavement surface and amount of rainfall.



### 4.1.2 Vertical Alignment Design

The vertical alignment is the elevation or profile of the centre line of the road. It consists of grades and vertical curves and is governed by the design speed, acceleration, deceleration, stopping sight distance and comfort associated with the vehicle movement. The design speed of roads depends upon the class of the road and terrain.

2 Vertical Alignment Design				
2.1	Design Speed	30	km/hr	
2.2	Stopping Sight Distance	45	m	
2.3	Minimum Vertical Curve Length	20	m	
2.4	Minimum Change in Grade	1.5	%	

### 4.1.3 Super Elevation Design

Super elevation is the transverse inclination to the pavement surface to counteract the effect of centrifugal force and to reduce the tendency of the vehicle to overturn. Super elevation is provided to the road by rotating the cross-section line about the centre of the road. The parameter “Se Design By Option” is very much useful for overriding the super-elevation value by user. Put the value for this option as 1, if designer wish to edit the super-elevation data. Then use command “Edit>Super elevation” to edit the super elevation table manually.

3 Super Elevation Design				
3.1	Maximum Outer Edge Slope(1 in..)	60	m	
3.2	Normal Outer Edge Slope(1 in..)	100	m	
3.3	Minimum Super Elevation	2.5	%	
3.4	SuperElevation Design By Option	0		0-By Program, 1-By User

### 4.1.4 Extra Widening Design

Extra widening is simply the widening of road at horizontal curves. As the rear wheels of vehicle doesn't follow the same path as front wheel at bends, the necessity of extra widening arises. It provides the easiness to the vehicle for the movement when the radius of horizontal curve is less.

The parameter “Ew Design By Option” is for overriding the extra-widening table by user. So put the value 1 for this parameter, if designer has to edit the extra-widening data. Then use command “Edit>Extra-widening” to edit the extra-widening table manually.

4 Extra Widening Design				
4.1	Fixed Widening Transition Rate	0.1	m/m	For Extra Widening Totally Outside the Curve
4.2	Fixed Transition Length	10	m	Fixed Length Irrespective of Widening
4.3	EW Design By Option	0		0-By Program, 1-By User
4.4	Extra Widening Placement Method	1		0 For Totally Inside, 1 for 1/3 Inside, 2 for Totally Outside
4.5	Extra Widening Transition Length Calculation	0		0 For Transition Rate, 1 for Fixed Length, 2 for Curve Length

### 4.1.5 Design Override for hill roads

It allows the user to specify the minimum curve length of the horizontal curves for which geometric design is to be carried out for superelevation and extra widening. If the length of the curve is smaller than the value specified by this parameter, no geometric calculation is carried out for such curves.

5 Design Override for Hill Roads				
5.1	Minimum Length of Curve for Sup & ExWid	10	m	

### 4.1.6 Right of way

Right of way is the area of land acquired for the road, along its alignment taken from the centre

line of the road on either direction of the centre line.

6	Right of Way				
6.1	Right of Way	15	m	Either Direction	

#### 4.1.7 Starting Chainage

It displays the starting chainage of the current alignment. User has to define starting chainage while adding the alignment (Toolbar>Draw Alignment). If the starting chainage has to be changed during the design or after completion of design, shift can be applied to the alignment for changing starting chainage (Menu>Utility>Shift Chainage).

7	Starting Chainage				
7.1	Starting Chainage	0	m		

Alignment Details ×

Enter the details for the alignment.

ID 1

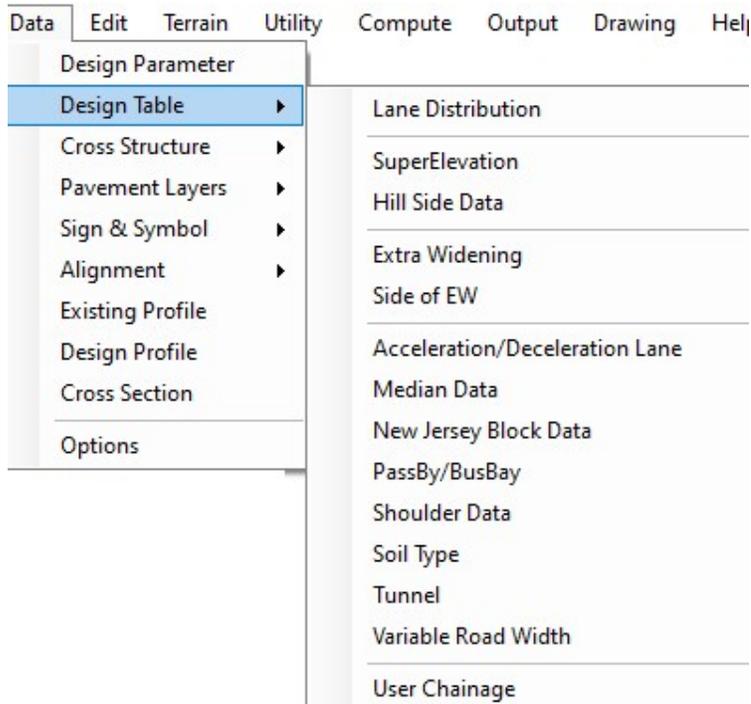
Name

Start Chainage

Remark

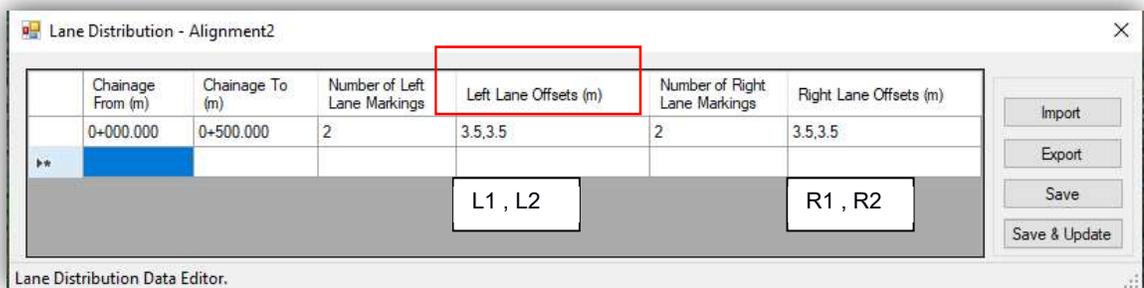
## 4.2 Design Table:

This is the main sub-menu for entering the design data. This sub-menu is further divided into multiple sub-menus.



### 4.2.1 Lane Distribution:

While designing urban road, the lane distribution can be defined from this command.



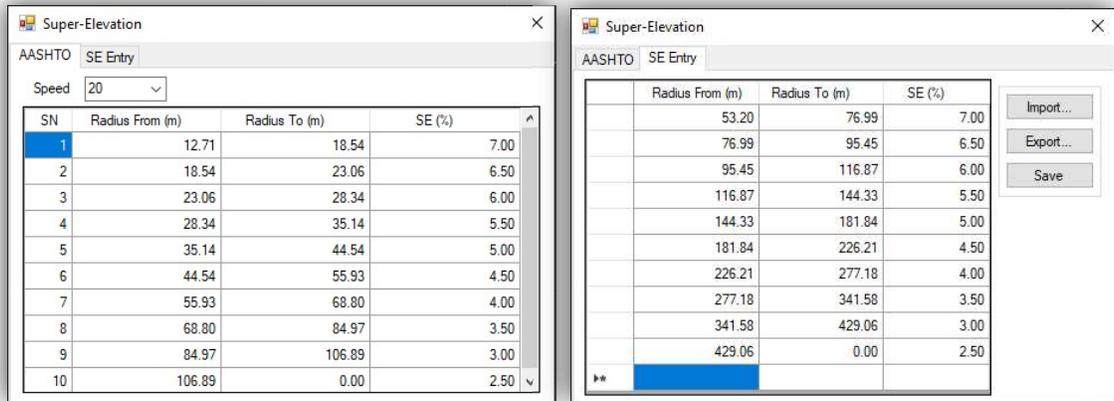
#### Lane offsets:

It is the position of lane marking line offset starting from road centre line followed by offset from next line. The two consecutive offset values are **separated by comma (,)**. For eg: A road with 4 lane road (3.5 mx4 No., 2 left lane and 2 right lane) can be input as 3.5,3.5 as shown above in table “Left Lane Offsets (m)”.



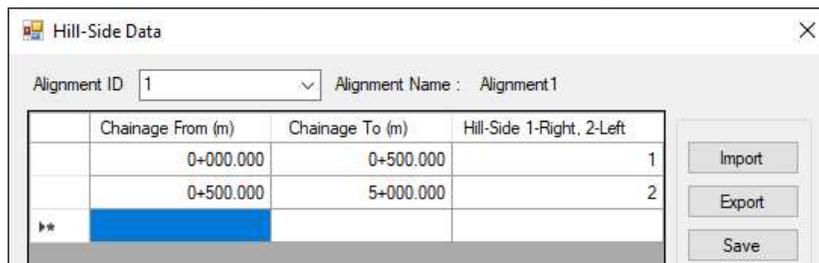
### 4.2.2 Superelevation:

The criteria for applying Superelevation are defined here. If the criteria are not defined by the user the pre-input criteria will be adopted based on design speed defined in the design parameter. The tables below show the pre-input criteria and custom criteria (SE Entry tab) for Superelevation design.



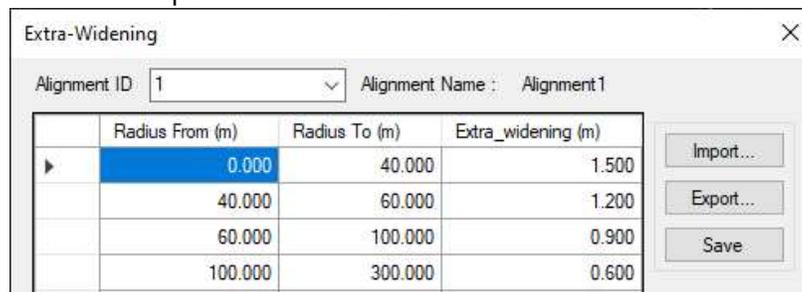
### 4.2.3 Hill Side Data:

Hill side data is used while designing the one side camber road for direction of slope of camber. The camber will be designed with sloping toward hill side for draining toward hill side drain in normal camber. If hill side is not defined by user, system will assume as hill side at left.



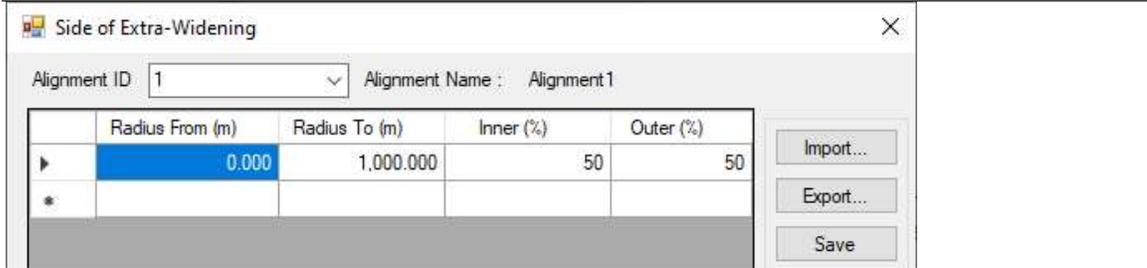
### 4.2.4 Extra Widening:

The extra-widening at curve is calculated based on this table. If the radius assigned in specific IP (Horizontal Intersection Point) is not found in the range of input radius, extra-widening will not be applied on curve of that specified IP.



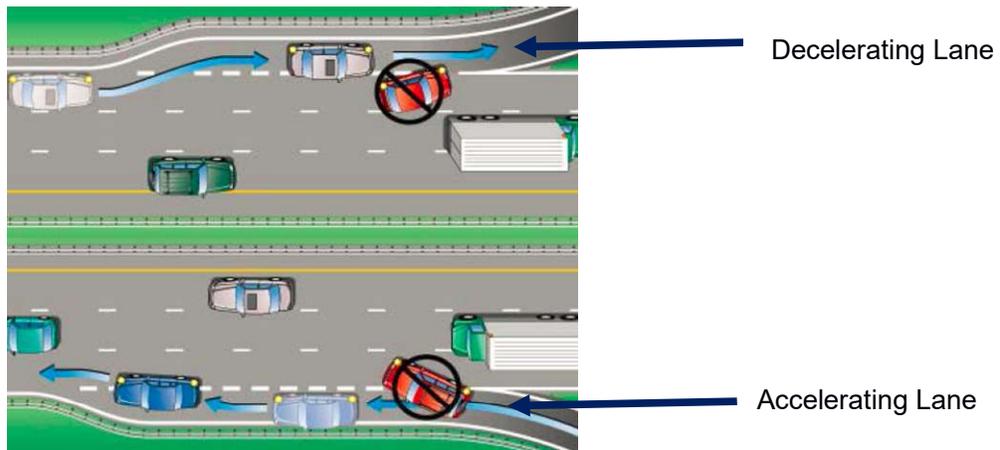
### 4.2.5 Side of Extra Widening:

Side of extra widening is the provision of mode of placement of extra widening to the horizontal curves according to the radius of curve. The percentage value is assigned to the value of extra widening to place on either inner side of the horizontal curve or the outer.

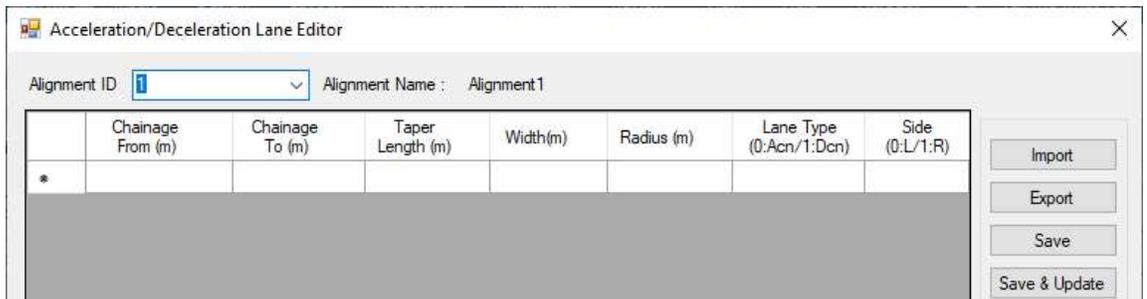


4.2.6 Accelerating and Decelerating Lane

It is also known as speed-change lane. In urban road, it provides opportunity for drivers to speed-up or slow down the vehicle.

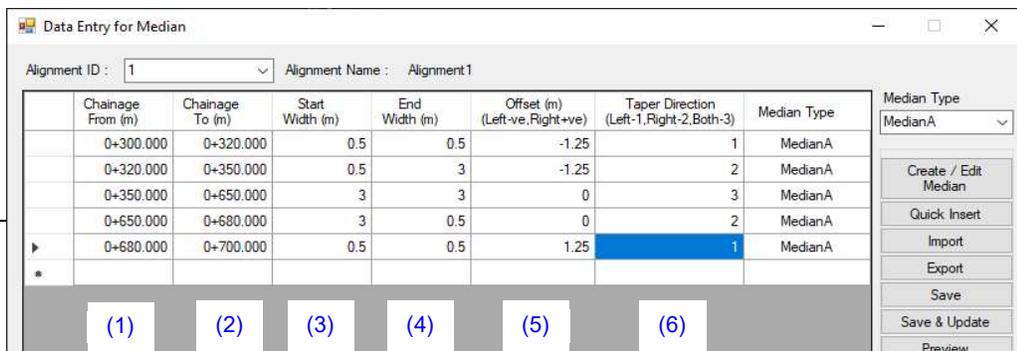


The acceleration and deceleration lane can be added and modify from this table.

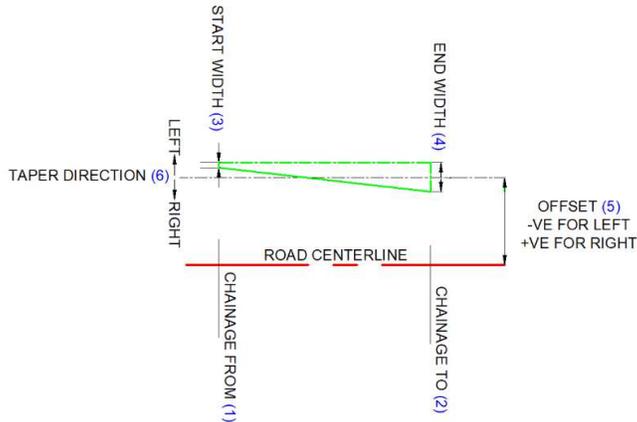


4.2.7 Median Data

The median is the reserved area that separates opposing lanes of traffic on divided roadways. Multiple medians can be added in the same section from this table. The offset value is entered to assign multiple medians on same section.



The input format of the table shall be described with the given sketch.



The Median can be modified easily with right-click on a row and choose “Modify Data”. A form will appear that has multiple options of output with output preview on right side. Use need to fill the form and on pressing “Apply”, the selected row will be modified to give the desired modification in data.

Chainage From (m)	Chainage To (m)	Start Width (m)
0+300.000	0+320.000	
0+32		
0+35		
0+65		
0+68		

The function of buttons provided in the main form is presented below

Sample entry in quick insert median is given below.

	Chainage From (m)	Chainage To (m)	Storage Length (m)	Storage Width (m)	Transition Length (m)	Median Width (m)	Central Offset (m)
▶	0+300.000	0+700.000	20	0.5	30	3	0

#### 4.2.8 New Jersey Block

A new Jersey barrier is a modular concrete or plastic barrier employed to separate lanes of traffic. This table is used to insert new jersey barrier in design road. It can be placed anywhere along the road by entering the offset distance from the centre.



New Jersey Barrier Data Editor			
Alignment ID : 1		Alignment Name : Alignment 1	
	Chainage From (m)	Chainage To (m)	Offset from Center (m) (Left-ve, Right+ve)
...	0+070.000	0+150.000	3

### 4.2.9 Pass By/ Bus Bay

A Bus Bay is an indented space adjacent to a traffic lane designed to let buses embark and disembark passengers, without hindering the flow of traffic. User can define bus bay from this table with varying start and end transition. The same table can be used to define the passing zone in narrow road design.

Pass-By/Bus-Bay Data Editor

Alignment ID: 1 Alignment Name: Alignment 1

Chainage (m)	Length (m)	Left Width (m)	Right Width (m)	Start Transition Length (m)	End Transition Length (m)
0+350.000	30	3	0	15	9

The diagram illustrates the geometry of a bus bay. It shows a road cross-section with a central 'ROAD CENTERLINE' indicated by a red dashed line. A blue line represents the bus bay, which is wider than the road centerline. The bus bay is defined by a 'START TRANSITION LENGTH' on the left and an 'END TRANSITION LENGTH' on the right. The main length of the bus bay is labeled 'LENGTH'. The width of the bus bay is labeled 'WIDTH'. A vertical line indicates the 'CHAINAGE'.

### 4.2.10 Shoulder Data

This table is used for providing the shoulder data for the road. The shoulder data include width and thickness for the desired chainage interval. The thickness can be input with multiple layers. The shoulder data can be imported from excel as well as can be exported.

Shoulder

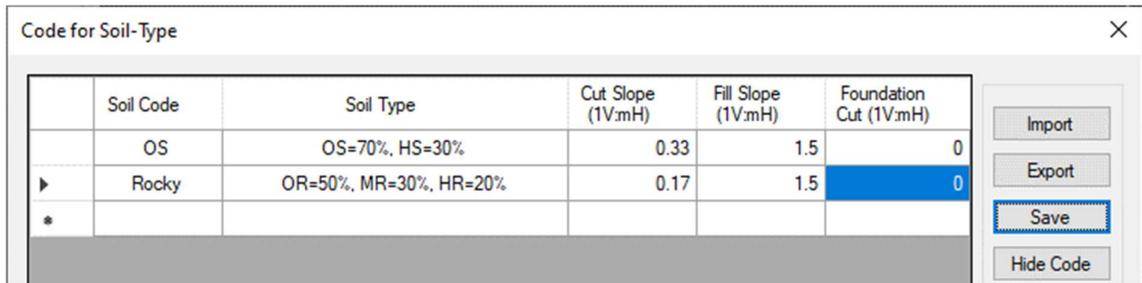
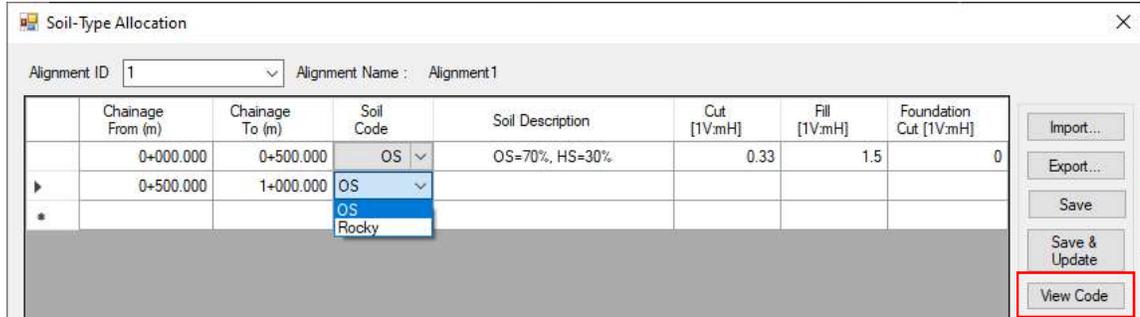
Alignment ID: 1 Alignment Name: Alignment 1

Chainage From (m)	Chainage To (m)	Width Left (m)	Width Right (m)	Thickness1(m)	Thickness2(m)	Thickness3(m)	Slope Left (%)	Slope Right (%)	Triangle Part 0-False, 1-True
0+000.000	1+000.000	1	1	0.250	0	0	3.5	3.5	1

Shoulder Data Saved and Cross Design Updated!

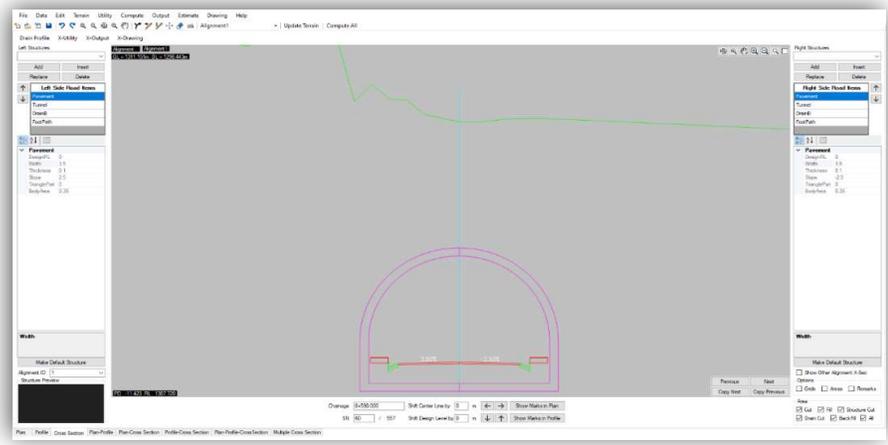
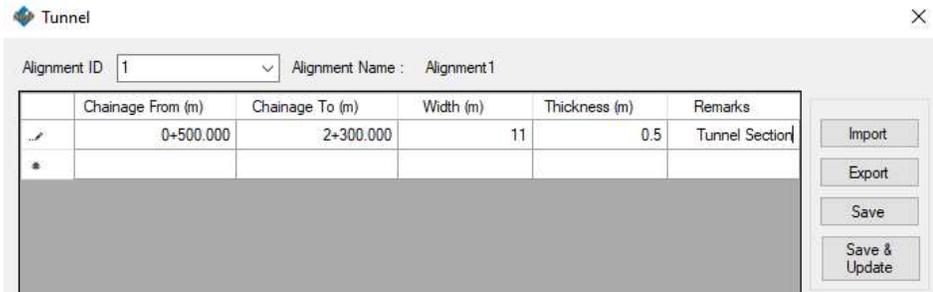
### 4.2.11 Soil Type Data

Soil type according to the chainage is defined in this field. Prior to defining the chainage, soil code has to be generated. This can be done by clicking the “View Code” button. This opens a form “Soil-Type Allocation”. Soil codes are the abbreviated form of the soil types defined in a manner that, when needed, they can be called by their abbreviated form. Similarly, cut, fill and foundation cut slopes are also defined in the code segment. Provision for importing the soil code is also available from the previously defined project from the excel file.



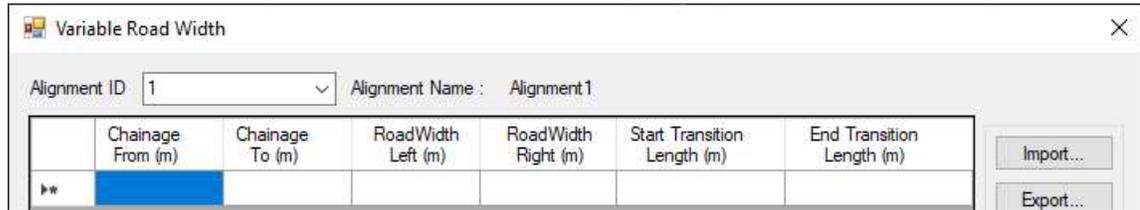
### 4.2.12 Tunnel

The tunnel can be input in this sub-menu. Tunnel sections are shown in cross-section and plan. Quantities are not calculated at the tunnel section.



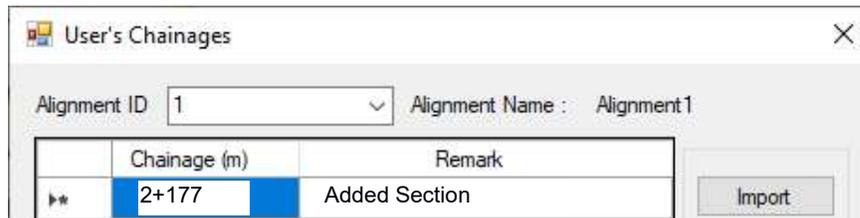
4.2.13 Variable Road Width

While designing a long road, some stretch has to be assigned different road width than the designer assigned in design parameter. In such case, variable road width can be assigned in this table and this overwrites the road width at defined sections.



4.2.14 User Chainage

When cross-section is required at the chainage other than the multiple of data extraction interval then user chainage is defined. For eg: if the data extraction interval is 10 m and we need a section at chainage 2+177. Then define chainage in user chainage and while updating terrain (Menu>Utility>Update Terrain), check the box “Include User’s Chainage”. Then the cross-sections will include this new section as well.



### 4.3 Cross Structure

The crossing structures are required for water bodies to cross the road. Different type of crossing structures can be assigned in the design.

#### 4.3.1 Causeway

CauseWay							✕	
Alignment ID		Alignment Name :						
1		Alignment1						
Chainage (m)	Span (m)	Width (m)	Thickness (m)	Slope (1V:mH)	Remarks		Import	
0+050.000	15	9	0.250	20	Proposed Causeway			

#### 4.3.2 Bridge

Bridge						✕	
Alignment ID		Alignment Name :					
1		Alignment1					
Chainage (m)	Span (m)	Thickness (m)	Depth (m)	Remarks		Import	
0+700.000	40	0.5	7	Proposed Bridge			

#### 4.3.3 Pipe culvert

Pipe Culvert							✕	
Alignment ID		Alignment Name :						
1		Alignment1						
Chainage (m)	Length (m)	Diameter (m)	Pipe Count	Clear Cover Depth (m)	Slope (1V:mH)	Remarks	Import	
0+090.000	9	0.6	2	1	20	Proposed Pipe Culvert		

#### 4.3.4 Box Culvert

Box Culvert							✕	
Alignment ID		Alignment Name :						
1		Alignment1						
Chainage (m)	Length (m)	Width (m)	Height (m)	Clear Cover Depth (m)	Slope (1V:mH)	Remarks	Import	
0+140.000	12	1	1.2	1.5	20	Proposed Box Culvert		

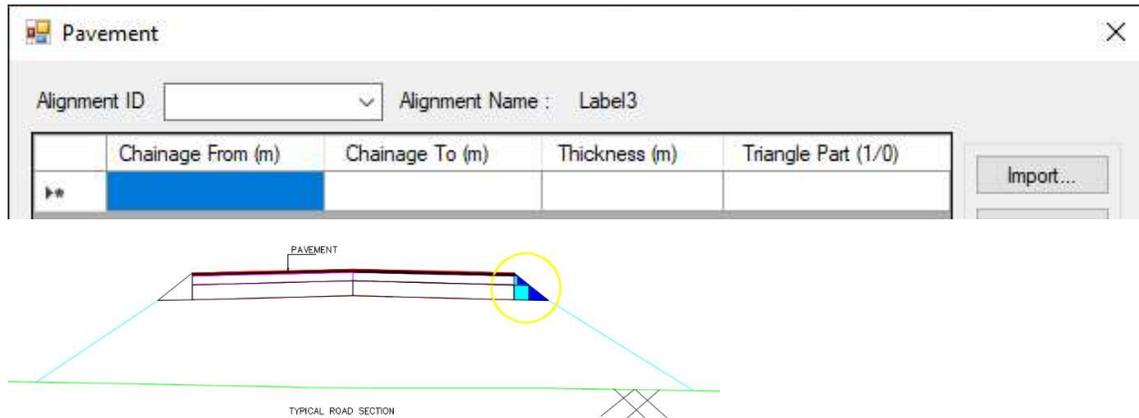
#### 4.3.5 Slab Culvert

Slab Culvert						✕	
Alignment ID		Alignment Name :					
1		Alignment1					
Chainage (m)	Span (m)	Thickness (m)	Depth (m)	Remarks		Import	
0+050.000	4	0.5	2	Proposed Slab Culvert			

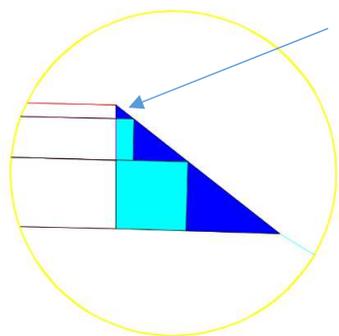
## 4.4 Pavement Layers

### 4.4.1 Pavement Data

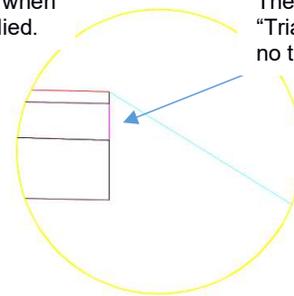
The properties of pavement surface can be defined from this table. "Triangle Part" in the given form indicate



The figures below show the differences in output while using and without using triangle part. Entering "1" indicate the use of triangle part and "0" indicate the ignoring the triangle part. The same concept applies on other sub-surface layer and shoulder as well. The triangle part will be ignored when there is some structure at the edge of pavement.



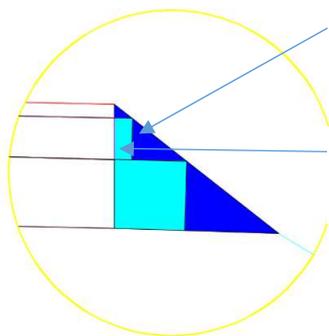
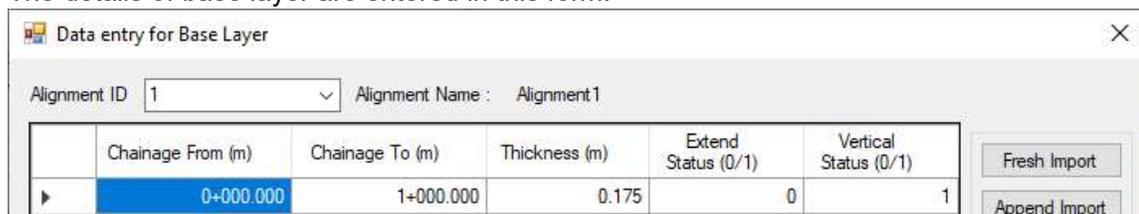
The pavement edge when "Triangle Part" =1 is applied.



The pavement edge when "Triangle Part" =0 is applied, ie no triangle edge is formed.

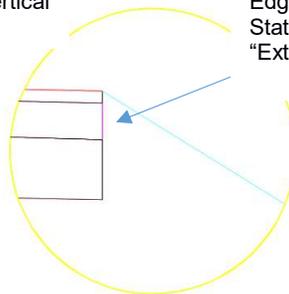
### 4.4.2 Base

The details of base layer are entered in this form.



Edge of base when "Vertical Status" =1 is applied.

Edge of base when "Extend Status" =1 is applied.



Edge of base when "Vertical Status" =1 is applied with "Extend Status"=0

the base layer is to be assigned or not. "0" indicate no and "1" indicate yes. Similarly, the "Vertical Status" means whether the vertical or slope edge is to be assigned. "1" mean vertical and "0" mean slope. This concept is same in other

sub-surface layers as well.

#### 4.4.3 Sub-Base

Data entry for the Sub Base Layer

Alignment ID: 1 Alignment Name: Alignment1

	Chainage From (m)	Chainage To (m)	Thickness (m)	Extend Status	Vertical Status
▶	0+000.000	1+000.000	0.250	0	1

Fresh Import  
Append Import

#### 4.4.4 Sub-Grade

Data entry for the Sub Grade Layer

Alignment ID: 1 Alignment Name: Alignment1

	Chainage From (m)	Chainage To (m)	Thickness (m)	Extend Status	Vertical Status
▶▶					

Fresh Import  
Append Import

#### 4.4.5 Capping

Data entry for the Capping Layer

Alignment ID: 1 Alignment Name: Alignment1

	Chainage From (m)	Chainage To (m)	Thickness (m)	Extend Status	Vertical Status
▶▶					

Fresh Import  
Append Import

## 4.5 Sign & Symbol

Different road marking can be assigned from this sub-menu.

### 4.5.1 Zebra Crossing

For Drawing zebra crossing in plan, select a cell in chainage column and press "Draw in Plan". This draws a zebra crossing and save the chainage in the table for future record.

ZCID	Chainage (m)	Width (m)	Thickness (m)	Spacing (m)
1		3.25	0.6	0.6

### 4.5.2 Arrow Marking

It is similar to drawing zebra crossing. The arrow showing direction in lane can be drawn from here.

AMID	Chainage (m)	Type
>>		ArrowLeft

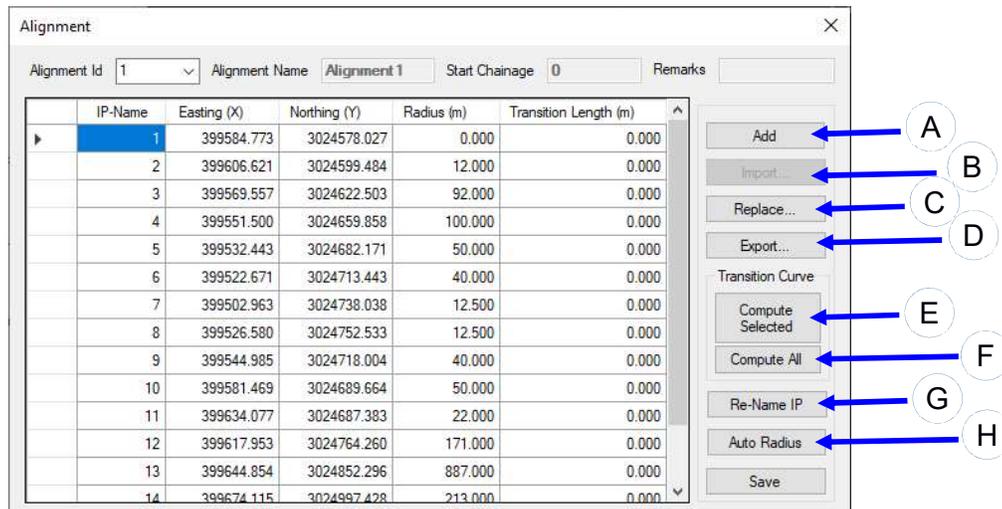
### 4.5.3 Regulatory Sign

RSID	Chainage (m)	Type
>>		

## 4.6 Alignment

### 4.6.1 Data Editor

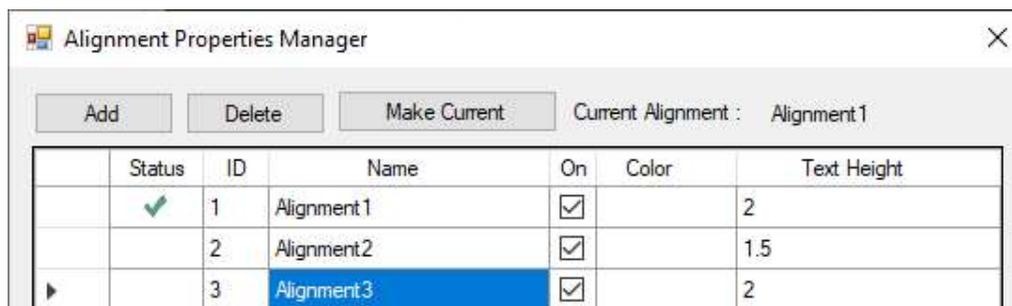
The horizontal alignment data can be viewed and modified from here. The functions are further described on figure below.



- A. Add: Add new alignment
- B. Import: Import alignment data from the excel spreadsheet. It will be active only on a new alignment.
- C. Replace: It replaces the current alignment with new imported alignment.
- D. Export: It exports the current alignment to excel spreadsheet.
- E. Compute Selected: Update transition curve in selected transition length.
- F. Compute All: Update transition curve in all IP.
- G. Rename IP: Change the name of IP.
- H. Auto Radius: Assign radius in IP with zero radii.

### 4.6.2 Properties

Alignment Properties manages the properties of multiple alignments such as adding new alignment, deleting/removing, making active alignment, etc. Alignment can be added as the offset of another existing alignment. This tool is helpful for designing alignment which is parallel to the other alignment. The "Tick" on status column indicates the current active alignment. The alignment can be turned ON/OFF from "on" column. The text size of IP name in the plan can be changed from "Text Height" column.



### 4.6.3 Alignment Intersections

When One alignment intersects another alignment, a road junction is created. This tool

smoothens the road intersection. On pressing “Compute Intersection”, it identifies all the intersection in the plan and displays the details in table. Then pressing “Apply Fillet” smoothens the intersections.

SN	Alignment 1 Name	Alignment 2 Name	Alignment 1 Chainage (m)	Alignment 2 Chainage (m)	Radius (m)
1	Alignment1	Alignment2	0+566.170	0+000.240	10
2	Alignment1	Alignment2	0+560.513	0+003.301	10
3	Alignment1	Alignment3	0+547.699	0+001.015	10
4	Alignment1	Alignment3	0+553.201	0+000.834	10

#### 4.7 Existing Profile

It displays the existing longitudinal profile of roads. “Interpolate”. The RL can be interpolate from two successive elevation using “Interpolate” command.

Chainage (m)	Reduced Level (m)	Remarks
0+000.000	574.991	
0+002.500	575.288	
0+005.000	575.584	
0+007.500	575.880	
0+008.820	576.036	

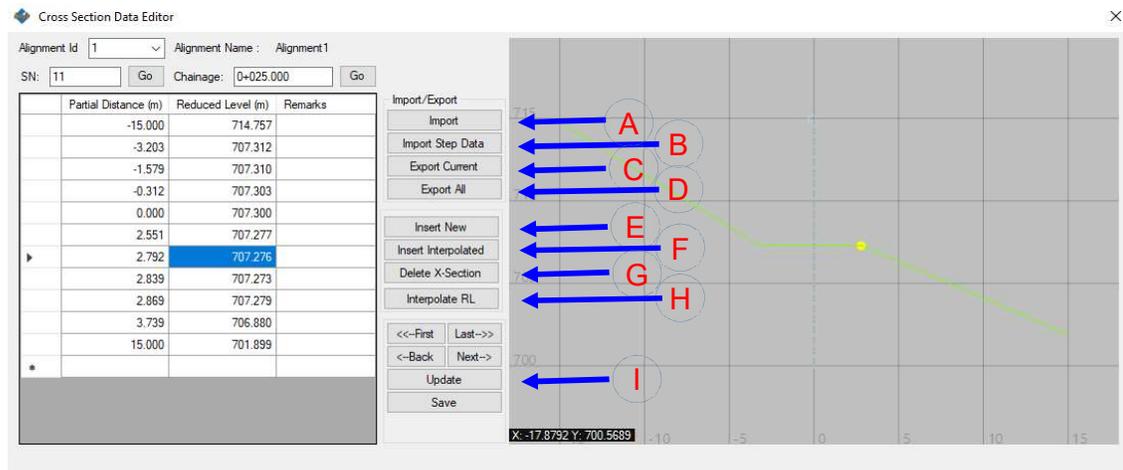
#### 4.8 Design Profile

It is the longitudinal profile of the finished level.

Chainage (m)	Reduced Level (m)	Length of Vertical Curve (m)
0+000.000	541.902	0.000
0+128.170	557.144	60.000
0+256.420	567.012	50.000
0+391.720	568.310	60.000
0+507.780	574.831	170.000
0+661.520	575.468	50.000
0+922.750	603.150	250.000
1+315.080	634.111	80.000
1+457.980	649.548	40.000

#### 4.9 Cross Section

After extraction of terrain data, all the cross-section data are saved in project data base. Cross-section data editor is used to view and edit data. The data can be imported from excel data as well in the form of partial distance format or stepping data format.



A. Import: It imports the excel data into the project. The data format must be as shown below.

Chainage	Partial Distance	Partial RL	Remarks
0+000.000	-15.000	541.493	
	-9.940	541.281	
	-9.318	541.294	
	-9.097	541.298	
	-5.623	541.096	
	-5.545	541.093	

B. Import Step Data: It imports the excel data into the project when the excel data is in stepping format.



C. Export Current: It exports the current cross-section data.

D. Export All: It export all the cross-section data.

E. Insert New: It inserts cross-section at new chainage. For this press “Insert New” button. A blank table will appear. Input Chainage at chainage text box and enter rest of the value in the table. Then save it.

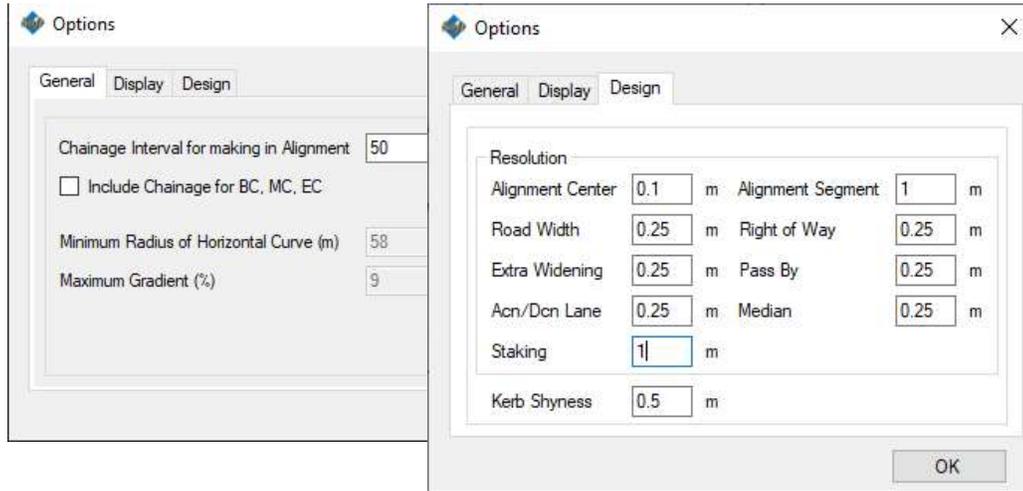
F. Insert Interpolated: It inserts the interpolated section.

G. Delete cross-section: It deletes the current cross-section.

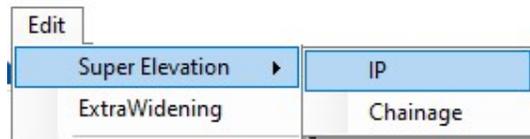
H. Update: It updates the modification made in data.

### 4.10 Option

It is the option for changing the chainage interval display option and other miscellaneous design option. In design, road elements are computed based on the provided interval. So, lower the input value, higher will be the accuracy and computation time and vice-versa.



**5 EDIT**



**5.1 Superelevation>IP**

The calculated Superelevation data can be viewed here base on horizontal IP

SuperElevation IP

Alignment ID: 1 Alignment Name: Alignment1

IP Name	Radius (m)	Curve Length (m)	Super Elevation	Outer Slope	Status
1	0.000	0.000	100.000	100	Excluded
2	15.000	15.000	7.000	68	Include
3	30.000	30.000	-6.000	60	Include
4	90.000	90.000	4.000	60	Include

Buttons: Save, View Chainage, Re-Calculate

**5.2 Superelevation>Chainage**

The calculated Superelevation data can be viewed here based on chainage. When superelevation design is in manual mode, the data can be changed and re-calculate Superelevation based on this modified data.

SuperElevation Chainage

Alignment ID: 1 Alignment Name: Alignment1

Chainage From (m)	Chainage To (m)	SE From (%)	SE To (%)	Remark
0+000.000	0+013.632	2.500	-2.500	NC
0+013.632	0+015.732	-2.500	0.000	NC_FC
0+015.732	0+017.832	0.000	2.500	FC_RC
0+017.832	0+022.032	2.500	3.000	RC_SE
0+022.032	0+044.096	3.000	3.000	SE
0+044.096	0+053.889	3.000	-3.000	T

Buttons: Import..., Save, View IP, Reset, Export

Remarks used in the Superelevation table and its description

Abbreviation	Description
NC	Normal Camber
NC_FC	Normal Camber to Flat Camber (0%)
FC_RC	Flat Camber to Reverse Camber (-NC)
RC_SE	Reverse Camber to Necessary Superelevation
SE	Superelevation
T	Transition

### 5.3 Extra widening

The calculated extra widening can be viewed here based on horizontal IP. When the extra widening design is in manual mode, this table is used as source criteria for extra widening design.

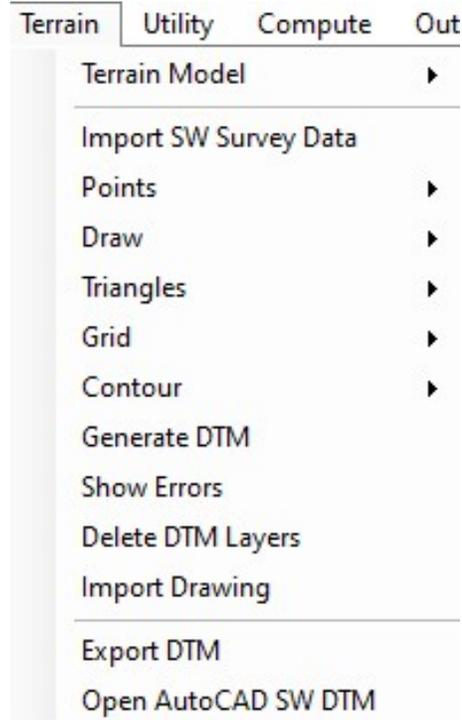
Extra-Widening Design ×

Alignment Id:  AlignmentName: Alignment1

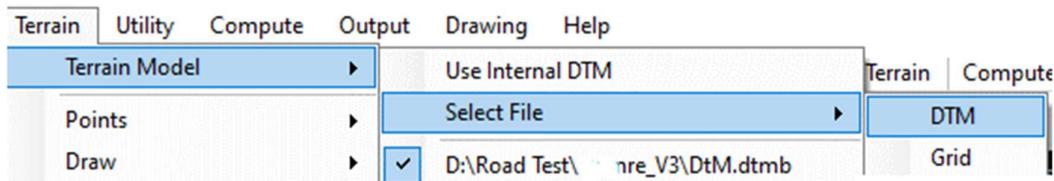
	IP-Name	Radius (m)	EW Left(m)	EW Right(m)	EW Rate(m/m)	EW Placement
▶	1	0.000	0.000	0.000	0.100	1
	2	15.000	1.500	0.000	0.100	1
	3	30.000	0.000	1.500	0.100	1
	4	90.000	0.450	0.450	0.100	1

## 6 TERRAIN

It is the built-in tools for the generation of a topographic map and terrain model. The available tools in the Terrain menu are as shown in the figure.



### 6.1 Terrain Model



This sub-menu specifies the terrain file to be used for design. The terrain file may be internal DTM or external DTM/Grid file. If the data is processed and dtm is created within the SW Road, the "Internal Dtm" can be used. Otherwise, external dtm or Grid can be imported for the terrain data.

\*.Dtm is the classic format of digital terrain model generated by SW-DTM software. Now Grid (\*.tif) is also supported by current version. User can import terrain from different DEM source such as SRTM, Palsar, etc.

### 6.2 Import SW Survey Data

It imports the data from "SW Survey" Mobile App.

### 6.3 Points

This sub-menu deals with the points data. It may be the surveyed data or generated data.

#### 6.3.1 Add Point

It adds point with user-defined elevation.

#### 6.3.2 Import Points from File

It imports the surveyed points from \*.csv format. The data format should be Serial Number,

---

 Easting, Northing, Elevation and Remark.

	A	B	C	D	E
1	S.No	Easting	Northing	RL	Remark
2	1	642635.415	3063265.047	1343.921	BS
3	2	642635.415	3063265.047	1343.921	GPS1
4	3	642577.776	3063200.045	1342.821	REB
5	4	642569.628	3063192.760	1342.754	REB
6	5	642562.104	3063185.387	1342.636	REB
7	6	642574.555	3063202.678	1342.841	REB
8	7	642564.412	3063193.196	1342.793	REB

### 6.3.3 Set Point Block Scale

It Changes the display scale of the point in plan view.

### 6.3.4 Delete Point Range

It deletes the points based on user defined point number range.

### 6.3.5 Export Points

It exports the points to \*.csv format.

## 6.4 Draw

### 6.4.1 Add Boundary

It creates boundary line around the survey data for triangulation of points.

### 6.4.2 Auto Boundary

It detects the data and creates boundary lines around the survey data automatically.

## 6.5 Triangles

### 6.5.1 Draw Triangles

It draws the triangles obtained after triangulation.

### 6.5.2 Erase Triangles

It erases the drawn triangulation.

## 6.6 Grid

### 6.6.1 Show Grid Extents

It displays extents of the grid terrain in Plan.

### 6.6.2 Erase Grid Extents

It erases the extents of the grid terrain from Plan.

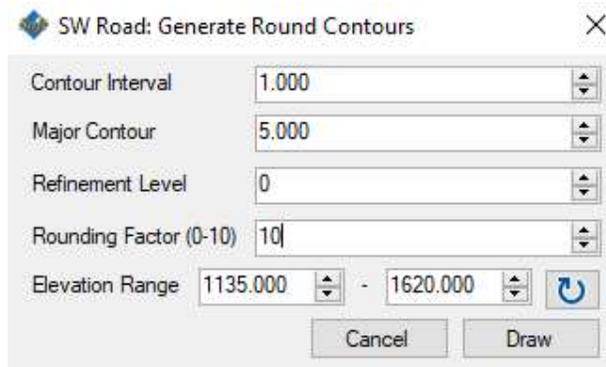
## 6.7 Contours

### 6.7.1 Draw Quick Contour

It allows the user to draw contours with the specified interval.

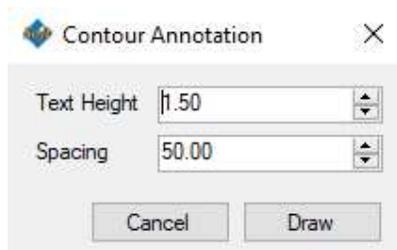
### 6.7.2 Draw Round Contour

It allows the user to draw smooth and round contours with the specified interval. Option for refinement level and rounding factors are provided in the form. User can modified as per requirement. Higher the refinement level and rounding factor, smoother will be the contour with longer processing time.



### 6.7.3 Contour Annotation

It allows the user to annotate the elevation of contour at specified distance.



### 6.7.4 Erase Contour

It erases all the contours in DTM layers (not from imported external layers).

## 6.8 Generate DTM

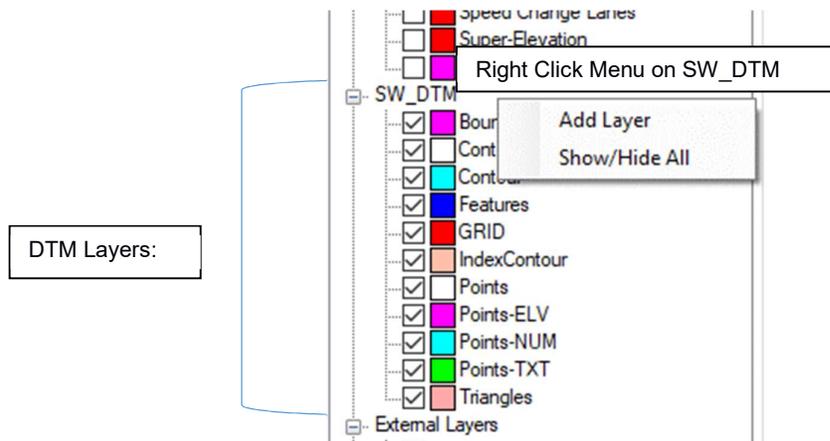
It processes all the points and features and generate dtm file which will be used as internal dtm while updating terrain.

### 6.9 Show Errors

While generating dtm, the system may encounter errors. These errors can be seen from this sub-menu.

### 6.10 Delete DTM Layers

It deletes the layers under SW\_DTM.



### 6.11 Import Drawing

When surveyed data is processed outside the SW Road, all the features need to be imported in SW Road. This sub-menu imports such drawings including points, features, etc.

### 6.12 Export DTM

It exports the generated dtm file in the format \*.dtmb so that the same terrain file can be used in another project.

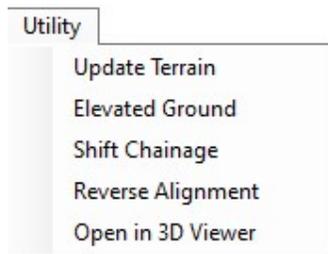
### 6.13 Open AutoCad SW DTM

It is improved and more efficient SW DTM that works on Autocad for data processing.



## 7 UTILITY

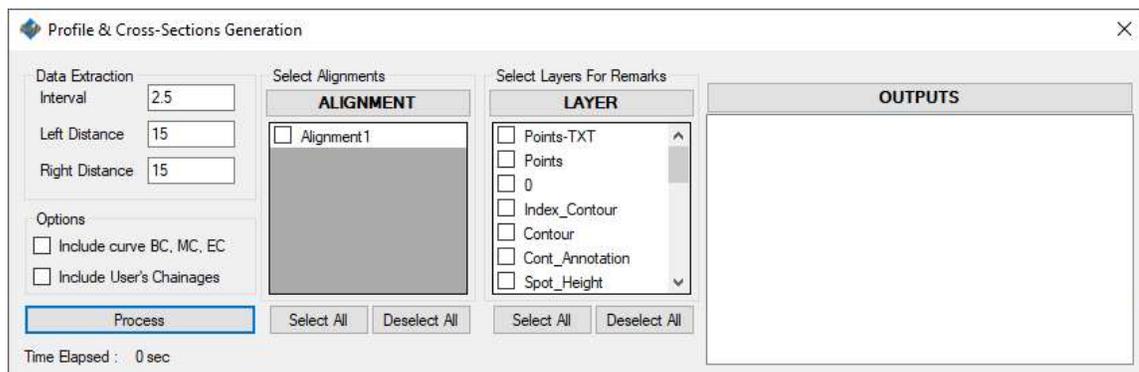
Utility Menu has been divided into following sub-menu.



### 7.1 Update Terrain

When data of the terrain is changed during the design process, to mark the change, use this sub-menu. The path for the terrain file is defined at *Menu>Terrain Model>Use internal DTM/Select File*. It generates profile and cross-sections of the alignment at an interval specified in the “Data Extraction Interval”.

#### 7.1.1 Data Extraction



The cross-section data are extracted at an interval specified in “Interval”. “Left Distance” and “Right Distance” are the maximum distance from the centre that will be extracted for the cross-section.

Option: Include curve BC, MC, EC

When it is “checked”, cross-section will be generated at the begin of the curve, mid of curve and end of the curve as well.

Option: Include user’s Chainage

When it is “checked”, cross-section will be generated at user-defined chainage as well. User chainages can be defined at *Menu>Design Table>User Chainage*.

Select Layers for Remarks

When remarks need to be displayed at the cross-section, check the necessary layers. This list of layers is generated from imported drawing layers or layers created in “SW-DTM” at “Layers” panel in Plan.

After setting all required options and data, press on “Process” for data extraction.

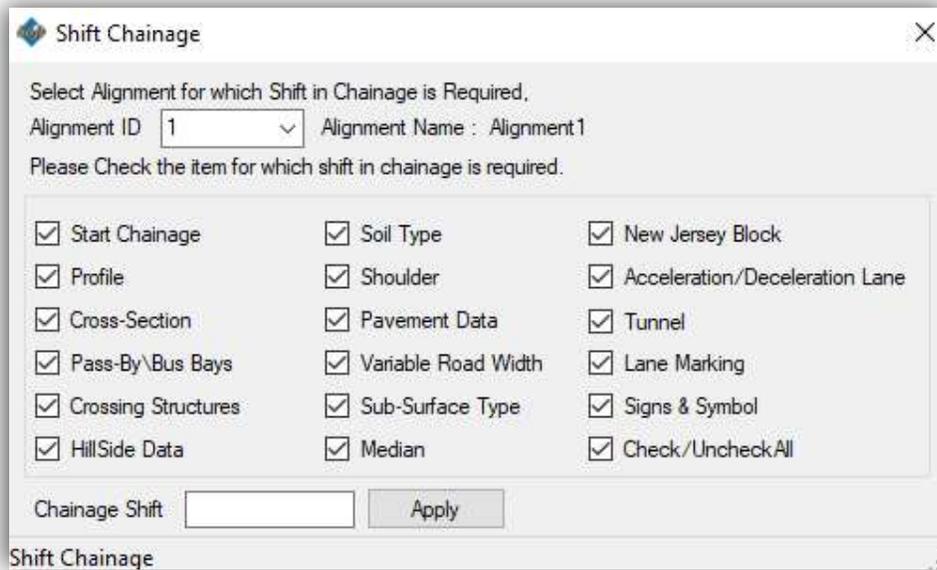
### 7.2 Elevated Ground

“Elevated ground” is a tool to raise the existing ground level by the value of the total thickness

of pavement and sub-surface layer. It is displayed in a longitudinal profile on checking “Elevated GP” in the list of profile component at the right-side panel.

### 7.3 Shift Chainage

When start chainage of the design needs to be changed, this tool is used. The shift value can be either positive or negative. The process is non-reversible. So, a backup copy will be made at the project directory.

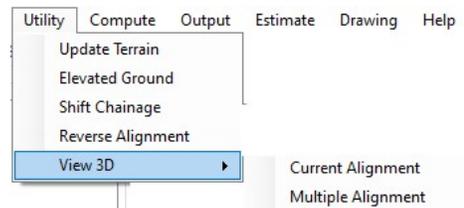


### 7.4 Reverse Alignment

When the start point of alignment is needed to be switched with endpoint, this tool is used. The process is non-reversible. So, a backup copy will be made at the project directory.

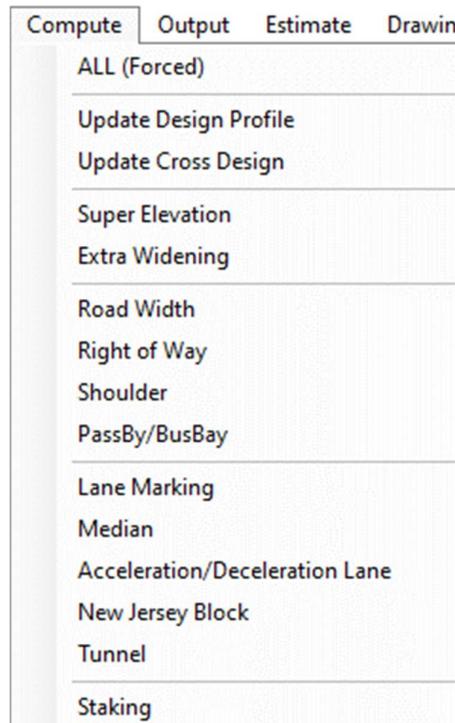
### 7.5 View 3D

This tool is used to view the 3D-model of the designed road. All the structures assigned on the project are displayed on the model along with the background terrain. Either active alignment or multiple alignments can be viewed in 3D-Model.



## 8 COMPUTE

This menu is used to re-calculate the various road elements. Following road elements can be computed from this menu.



### 8.1 All (Forced)

This command computes all the elements at once. This command is nearly equivalent to “Compute All” on the toolbar. The only difference is that “Compute All” on toolbar compute only that elements which are not computed previously or that need re-compute whereas this “compute all (Force)” compute all the element. So, the computation time is longer than “Compute All”.

### 8.2 Update Design Profile

It updates the longitudinal profile of alignment and also updates the design elevation in each cross-section.

### 8.3 Update Cross Design

It updates the cross-section components.

### 8.4 Staking

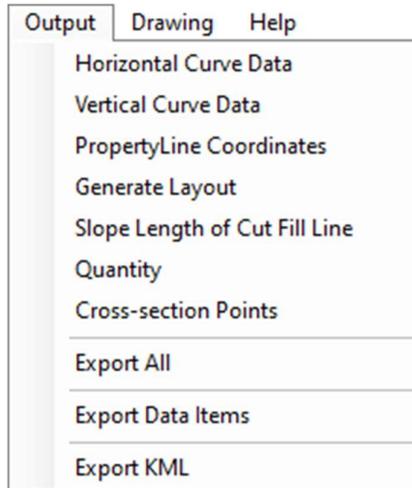
Computation of staking is required to display all the structures used in each cross-section of current alignment in the plan, so this will help to give an overall idea about the structures on the plan of the road.

### 8.5 Other commands

Rest of the “compute>Sub-menu” computes only the respective element of the current alignment as the name suggests.

## 9 OUTPUT

After completion of the design, the design data can be exported from this command. Following data can be exported from this command.



### 9.1 Horizontal Curve Data

It generates designed horizontal curve data.

HORIZONTAL CURVE DATA TABLE																
IP (Num)	COORDINATE		Cum. Dist. (m)	WCB (deg)	Def. Angle (deg)	Tangent Length (m)	Spiral Curve Data		Simple Curve Data			CHAINAGE				
	X (m)	Y (m)					Length (m)	Shift (m)	Radius (m)	Apex Dist (m)	Length of Curve (m)	BC of Spiral Curve (m)	BC of Simple Curve (m)	MC (m)	EC of Simple Curve (m)	EC of Spiral Curve (m)
1	246050.990	3120902.686	0.000	302.144	0.000	0.000	0	0	0	0.000	0.000	0+000.000	0+000.000	0+000.000	0+000.000	0+000.000
2	245977.448	3120948.897	86.855	315.194	13.050	11.438	0	0	100	0.652	22.777	0+075.417	0+075.417	0+086.805	0+098.194	0+098.194
3	245891.989	3121034.936	208.123	340.695	25.501	22.629	0	0	100	2.528	44.508	0+185.396	0+185.396	0+207.649	0+229.903	0+229.903
4	245833.403	3121202.182	385.334	274.689	66.006	25.979	0	0	40	7.696	46.081	0+358.506	0+358.506	0+381.547	0+404.587	0+404.587
5	245694.753	3121213.555	524.450	259.849	14.841	35.685	0	0	274	2.314	70.970	0+482.039	0+482.039	0+517.524	0+553.009	0+553.009
6	245645.881	3121204.804	574.099	238.588	21.260	7.508	0	0	40	0.698	14.843	0+559.466	0+559.466	0+566.887	0+574.308	0+574.308

### 9.2 Vertical Curve Data

It generates the design vertical alignment data.

VERTICAL CURVE DATA TABLE									
VIP No.	VIP		Length (m)	BVC		MVC		EVC	
	Chainage (m)	Elevation (m)		Chainage (m)	Elevation (m)	Chainage (m)	Elevation (m)	Chainage (m)	Elevation (m)
1	0+000.000	425.812	20	-1+990.000	425.812	0+000.000	425.624	0+010.000	425.436
2	0+042.120	424.228	50	0+017.120	425.168	0+042.120	424.844	0+067.120	424.519
3	0+110.160	425.020	80	0+070.160	424.554	0+110.160	425.550	0+150.160	426.547
4	0+212.040	428.908	20	0+202.040	428.526	0+212.040	428.791	0+222.040	429.056
5	0+405.130	431.769	50	0+380.130	431.399	0+405.130	432.206	0+430.130	433.014
6	0+514.800	437.229	70	0+479.800	435.486	0+514.800	435.818	0+549.800	436.149

### 9.3 Property-line coordinate

It generates the coordinate of left and right-side extremities of designed road.

PROPERTY LINE COORDINATES												
Left Extreme Point				Center Point					Right Extreme Point			
X (m)	Y (m)	Z (m)	Partial Dist. (m)	Chainage (m)	Easting (m)	Northing (m)	Design Level (m)	Cross Dearing (deg)	Partial Dist. (m)	X (m)	Y (m)	Z (m)
540544.340	3093755.734	400.408	5.061	0+000.000	540546.688	3093751.250	400.370	152.358	5.116	540549.061	3093746.718	400.570
540553.226	3093760.321	400.151	5.003	0+010.000	540555.547	3093755.889	400.291	152.358	5.004	540557.869	3093751.456	400.156
540560.553	3093767.135	399.855	7.633	0+020.000	540564.395	3093760.540	400.270	149.781	6.220	540567.525	3093755.166	400.392
540563.338	3093770.592	400.036	7.672	0+030.000	540570.598	3093768.113	400.303	108.853	6.329	540576.587	3093766.068	400.352
540564.531	3093775.983	400.211	6.131	0+040.000	540570.351	3093777.909	400.341	71.687	6.352	540576.381	3093779.905	400.880
540561.257	3093785.433	400.131	6.269	0+050.000	540567.209	3093787.403	400.375	71.687	6.333	540573.221	3093789.393	400.857

### 9.4 Generate Layout Data

It generates the centerline coordinate of the designed data along with the width of the

carriageway, extra widening and other road cross-section component width.

LAYOUT DATA														Remarks								
LEFT							RIGHT															
FootPath (m)	Drain (m)	Shoulder (m)	PassBy (m)	Extra Widenin	Carriage Way (m)	Cross Slope (%)	Median (m)	Chainage (m)	Easting (m)	Northing (m)	Design Level (m)	L-R WCB of Cross Line (deg)	Median (m)	Cross Slope (%)	Carriage Way (m)	Extra Widenin	PassBy (m)	Shoulder (m)	Drain (m)	FootPath (m)		
0.00	0.00	-1.50	0.00	0.00	-3.50	2.50	0.00	0+000.000	545293.188	3100353.000	425.812	88.001	0.00	-2.50	3.50	0.00	0.00	-1.50	0.00	0.00	0.00	
0.00	0.00	-1.50	0.00	0.00	-3.50	2.50	0.00	0+003.720	545293.318	3100349.285	425.672	88.001	0.00	-2.50	3.50	0.00	0.00	-1.50	0.00	0.00	0.00	
0.00	0.00	-1.50	0.00	0.00	-3.50	2.09	0.00	0+013.720	545293.667	3100339.291	425.296	88.001	0.00	-2.50	3.50	0.00	0.00	-1.50	0.00	0.00	0.00	
0.00	0.00	-1.50	0.00	0.00	-3.50	-0.77	0.00	0+023.720	545294.015	3100329.297	424.941	88.001	0.00	-2.50	3.50	0.00	0.00	-1.50	0.00	0.00	0.00	
0.00	0.00	-1.50	0.00	0.00	-3.50	-2.50	0.00	0+033.720	545294.358	3100319.303	424.680	88.132	0.00	-2.50	3.50	0.00	0.00	-1.50	0.00	0.00	0.00	
0.00	0.00	-1.50	0.00	0.00	-3.50	-2.50	0.00	0+043.720	545294.667	3100309.308	424.516	88.323	0.00	-2.50	3.50	0.00	0.00	-1.50	0.00	0.00	0.00	
0.00	0.00	-1.50	0.00	0.00	-3.50	-2.50	0.00	0+053.720	545294.943	3100299.311	424.451	88.514	0.00	-2.50	3.50	0.00	0.00	-1.50	0.00	0.00	0.00	
0.00	0.00	-1.50	0.00	0.00	-3.50	-1.37	0.00	0+063.720	545295.185	3100289.310	424.485	88.685	0.00	-2.50	3.50	0.00	0.00	-1.50	0.00	0.00	0.00	
0.00	0.00	-1.50	0.00	0.00	-3.50	1.49	0.00	0+073.720	545295.414	3100279.313	424.596	88.685	0.00	-2.50	3.50	0.00	0.00	-1.50	0.00	0.00	0.00	

### 9.5 Slope Length of Cut Fill Lines

Slope length of the cut-fill line can be exported from cross-section editor. So, on clicking it, the cross editor window will open. The slope length of cut-fill lines can be exported from cross-editor menu>Output>Slope Length of Cut-Fill Line.

Chainage	Left			Right		
	Line Item	Slope(1V:mH)	Length(m)	Line Item	Slope(1V:mH)	Length(m)
0+000.000	CutFillLine1	0.33	4.111	CutFillLine1	0.33	4.728
0+003.720	CutFillLine1	0.33	4.022	CutFillLine1	0.33	5.131
0+013.720	CutFillLine1	0.33	4.068	CutFillLine1	0.33	4.583
0+023.720	CutFillLine1	0.33	3.463	CutFillLine1	0.33	4.274
0+033.720	CutFillLine1	0.33	2.235	CutFillLine1	0.33	3.834

### 9.6 Quantity

It exports all the quantity of works. The quantity can be exported from cross-editor. So, clicking Menu>Output>Quantity opens cross-editor. Cross Editor Menu>Output>Quantities will export quantities.

While exporting quantities, error messages may be displayed stating that “Insufficient ground profile on .....”. Users have to review on that specified chainage. We can correct it by adding ground section data or by modifying the design. If we ignore it, some area will be missed from quantity calculation.

Errors in cross sections.

- Insufficient Ground Profile on Left at chainage 0+163.720.
- Insufficient Ground Profile on Left at chainage 0+343.720.
- Insufficient Ground Profile both on Left and Right at chainage 0+383.720.
- Insufficient Ground Profile on Left at chainage 0+393.720.

This area will be ignored if error is not corrected.

Quantity extraction has different options.

**Export All:** It will export all the quantity in details.

**Export Range:** It will export quantity only within the range specified in “Start Chainage” and “Final Chainage”

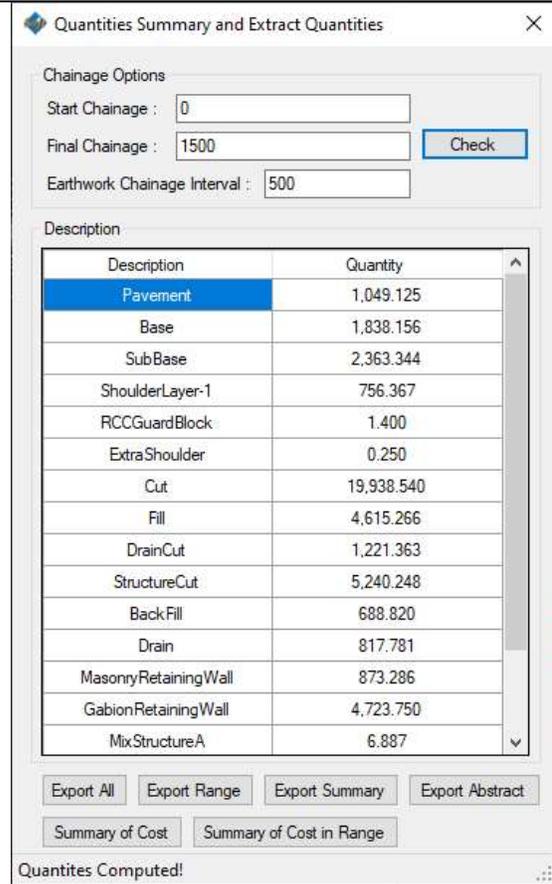
**Export Summary:** It export quantities in a summarised format. Earthwork will be calculated at the interval specified in “Earthwork Chainage Interval”.

**Export Abstract:** It exports on abstract of quantity.

**Summary of Cost:** It displays a summary of the cost of the project.

**Summary of Cost in Range:**

It displays a summary of the cost of the selected range.



### 9.7 Cross-Section Points

It exports all the X-coordinate, Y-coordinate and elevation of cross section points.

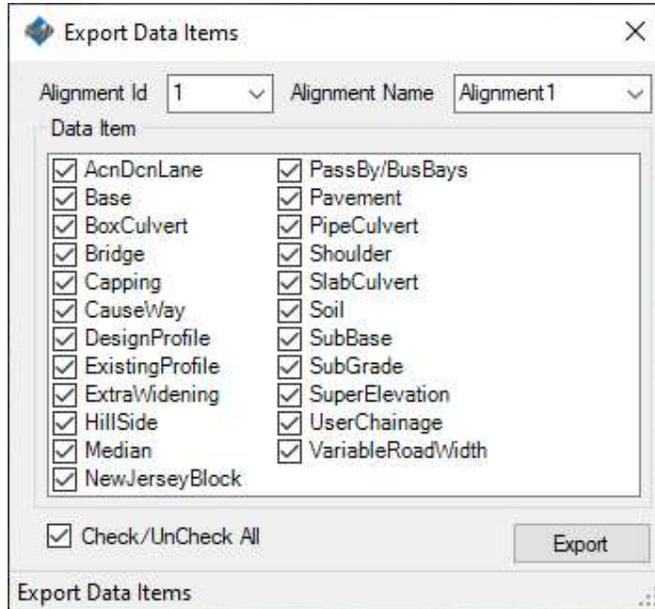
Cross Section Points					
S.N.	Chainage (m)	X (m)	Y (m)	Z (m)	Remarks
1	0+000.000	246044.854	3120892.921	713.306	
1	0+000.000	246049.927	3120900.994	706.695	
1	0+000.000	246050.990	3120902.686	706.782	
1	0+000.000	246051.110	3120902.878	706.792	
1	0+000.000	246051.443	3120903.407	706.819	
1	0+000.000	246051.840	3120904.039	706.755	
1	0+000.000	246052.668	3120905.357	706.662	
1	0+000.000	246058.971	3120915.387	697.733	
2	0+002.500	246040.892	3120891.315	715.341	
2	0+002.500	246041.245	3120891.877	715.005	
2	0+002.500	246047.568	3120901.939	706.766	

## 9.8 Export All

It exports Horizontal curve data, vertical curve data, property line coordinate and cross section points data in a single spreadsheet file.

## 9.9 Export Data Items

This command exports all the selected data table that has been used for the design of road.

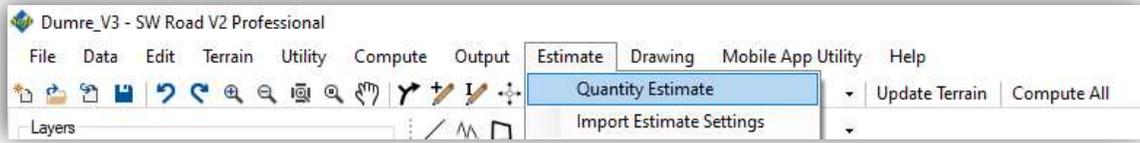


## 9.10 Export KML

This tool exports the designed layers to Keyhole Markup Language (\*.KML) format to view in Google Earth or GIS software such as Qgis, Arcmap, etc. To exports the data on the correct position, the data must be on Universal Transverse Mercator UTM 44 or UTM 45 Projection system.

## 10 ESTIMATE

This menu is used for quantity estimation and preparation of Bill of Quantity (BOQ). Before running “Estimate” users have to compute quantity (Output>Quantity, and not necessary to export). Otherwise, it uses the last computed data.



Then go to menu “Estimate>Quantity Estimate”. This launches the SW-Road Estimator.

### 10.1 Quantity Estimate

This sub-menu launches the SW-Road Estimator.



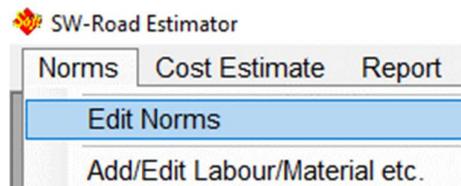
### 10.2 Import Estimate Settings

This sub-menu imports estimate settings such as item rates, rate analysis, etc.

### 10.3 Norms

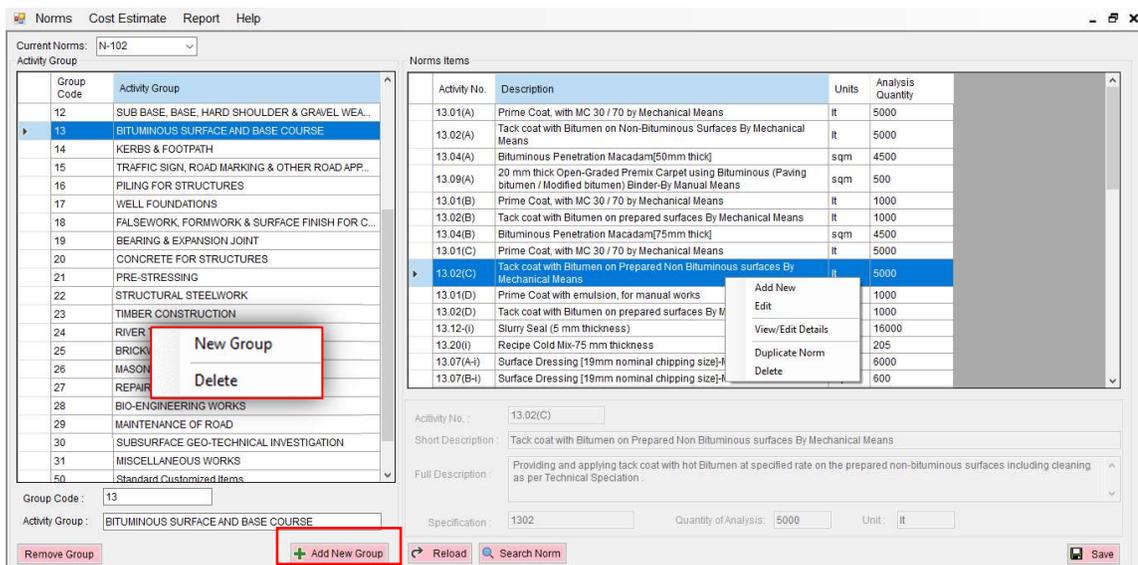
#### 10.3.1 Edit Norms

This sub-menu is used to add and edit the norm. “Norms for Rate Analysis of Road and Bridge Works 2075” by Department of Road is added in the norm. User can add other norms creating a separate group.



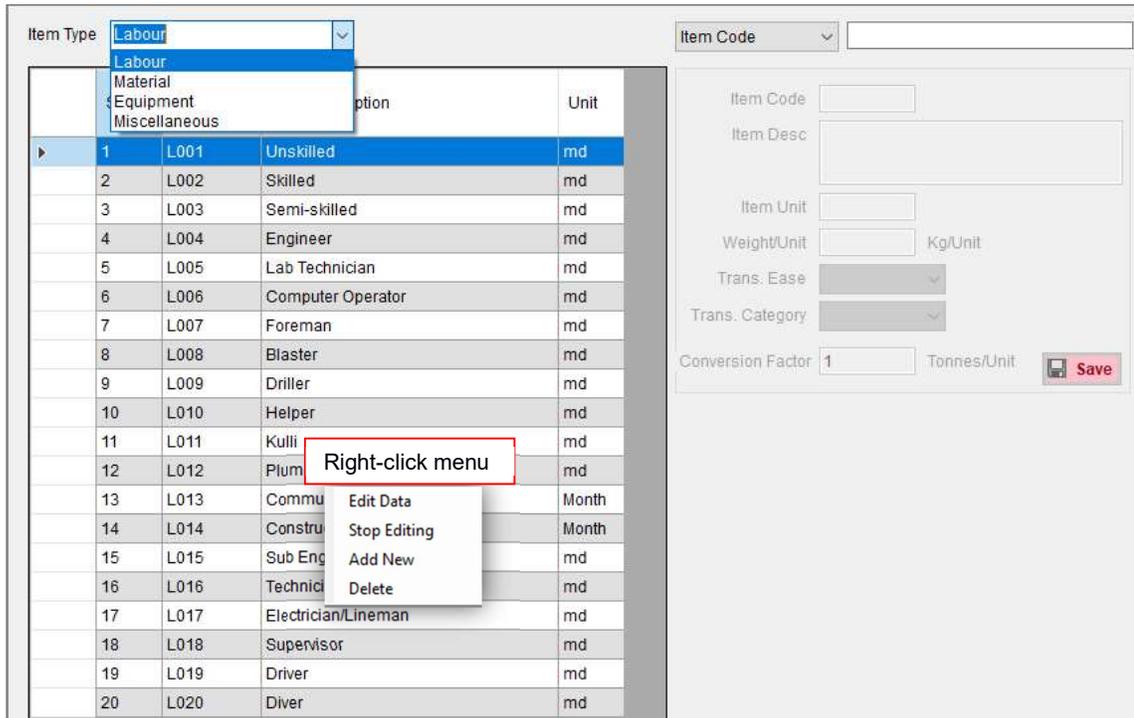
Right-click on “Activity Group” list pop-up menu for adding groups.

Clicking on “Activity Group” item lists all its norm item at right space.



10.3.2 Add/Edit Labour/Material etc.

This sub-menu opens a form for entering and editing rate of labour, materials, equipment and other miscellaneous items. The item can be added from the right-click menu. Items can be added based on the categories such as Labour, Material, Equipment and Miscellaneous.

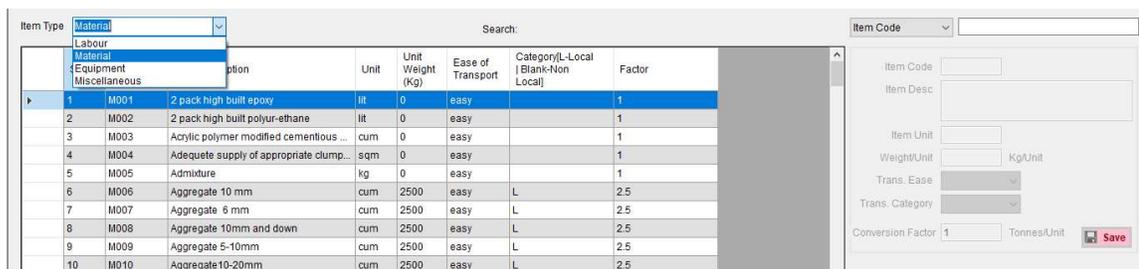


1. Labour

The human resources are entered in labour categories. Skill, unskill, engineer, driver, etc manpower are entered in this form.

2. Materials

All the construction materials are entered in this form. Users can add and edit the materials along with the Unit, weight per unit quantity, Ease of transport and conversion factor. Weight per unit quantity, Ease of transport and conversion factor will be used for the calculation of transport cost. If it is ignored, the transportation cost for that item will not be calculated.



3. Equipment

All the equipment used in the construction is added under this category. Basic equipment such

as dozer, roller, crane, tractor, generator, etc. has been already added in the list. However, if the user wants new equipment, it can be added.

4. Miscellaneous

The item whose quantities are assigned as some percentage of other items is placed under a miscellaneous item. Some example of miscellaneous items is tools and plant, laboratory testing, insurance, etc.

10.4 Cost Estimate

10.4.1 Rates



1. Transportation Distances

Materials source and distance of the source to the site are entered in this form.

Item Code	Item Description	Unit	Material Source	Black Top Distance(km)	Gravel Road Distance(km)	Earthen Road Distance(km)	Porterage Distance(km)
M008	Aggregate 10mm and down	cum	Kathmandu	10	0	0	0
M009	Aggregate 5-10mm	cum	Kathmandu	10	0	0	0
M010	Aggregate 10-20mm	cum	Kathmandu	10	0	0	0
M011	Aggregate 20-40mm	cum	Kathmandu	10	0	0	0
M021	Bitumen	t	Kathmandu	10	0	0	0
M023	Bitumen MC30	lit	Kathmandu	10	0	0	0

2. Transportation Rate

Transportation Rate can be defined with two methods. One with the district rate and another with DOR standard rate of analysis.

The 'Unit Transportation Cost' form is divided into three main sections:

- Transportation by Truck (NRs/Kg/Km):** Includes a 'District Rate' section with input fields for Blacktop (0.028), Gravel (0.034), and Earthen (0.058). Below this are 'Easy Load', 'Uneasy Load', and 'Very Uneasy Load' sections, each with three input fields for different terrain types.
- Transportation by Porter (NRs/Kg/Km):** Includes a 'District Rate' section with input fields for Easy Load (1.3), Uneasy Load (1.5), and Very Uneasy Load (1.5).
- Load/Unload (Nrs/Kg):** Includes a 'District Rate' section with input fields for Load and Unload, each with three input fields for different terrain types.

Form for entering Transportation rate as per District Rate

SN	ItemCode	Description	Unit	Black Top [Norm]	Gravelled Road [Norm]	Earthen Road
1	M008	Aggregate 10mm and down	cum	08.16-i:Haulage in Blacktop Road, Hilly Terrain	08.16-ii:Haulage in Gravelled Road, Hilly ...	08.16-iii:Haula
2	M009	Aggregate 5-10mm	cum			
3	M010	Aggregate 10-20mm	cum	08.16-i:Haulage in Blacktop Road, Hilly Terrain	08.16-ii:Haulage in Gravelled Road, Hilly ...	08.16-iii:Haula
4	M011	Aggregate 20-40mm	cum	08.16-i:Haulage in Blacktop Road, Hilly Terrain	08.16-ii:Haulage in Gravelled Road, Hilly ...	08.16-iii:Haula
5	M021	Bitumen	t			
6	M023	Bitumen MC30	lit			
7	M026	Boulders/stones	cum			
8	M029	Cement	t	08.16-i:Haulage in Blacktop Road, Hilly Terrain	08.16-ii:Haulage in Gravelled Road, Hilly ...	08.16-iii:Haula
9	M035	Coarse sand	cum	08.16-i:Haulage in Blacktop Road, Hilly Terrain	08.16-ii:Haulage in Gravelled Road, Hilly ...	08.16-iii:Haula
10	M059	Geotextile	sqm			
11	M095	Planks 38mm thick	cum			
12	M112	Sand	cum	08.16-i:Haulage in Blacktop Road, Hilly Terrain	08.16-ii:Haulage in Gravelled Road, Hilly ...	08.16-iii:Haula
13	M130	Sturte, ballies, etc.	cum			

Form for defining Transportation rate as per DOR norms for rate analysis

## 10.4.2 Rate Analysis



### 1. View Summary

This Sub-menu is used for viewing the summary of item rates. The items which are used in the project are shown in the list.

The screenshot shows the 'Summary of Item Rates' window. It contains a table with the following data:

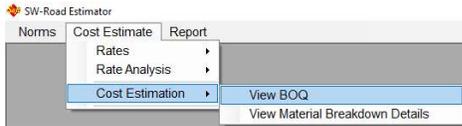
SN	Norms No.	Description of Work	Quantity	Unit	Total	ItemRate
<b>1</b>		<b>COLLECTION &amp; TRANSPORTATION OF MATERIALS</b>				
1.01	08.16-i	Haulage in Blacktop Road, Hilly Terrain	80	t.km	1,308.60	16.36
1.02	08.16-ii	Haulage in Graveled Road, Hilly Terrain	80	t.km	1,744.80	21.81
1.03	08.16-iii	Haulage in Earthen Track and Track in River Bed/N...	80	t.km	2,617.20	32.72
1.04	08.08	Haulage of Stone Boulder/ aggregates/ Sand/ excav...	1	cum	144.20	144.20
1.05	08.10	Loading and Unloading of Cement or Steel by Manu...	10	t	4,308.00	430.80
<b>2</b>		<b>EARTH WORK</b>				
2.01	09.01(I-A)	Roadway Excavation in all types of Soil by Manual M...	12	cum	6,798.00	566.50
2.02	09.01(I-B)	Roadway Excavation in all types of soil by mechanic...	360	cum	28,020.00	77.83
2.03	09.09(B)	Construction of Embankment with Material Deposit...	300	cum	98,252.00	327.51
2.04	09.04(I-A-i)	Ordinary Soil Depth upto 3m By Manual Means	10	cum	6,600.00	660.00
2.05	09.04(I-B-i)	Ordinary Soil Depth above 3m By Mechanical Means	240	cum	24,520.00	102.17
<b>3</b>		<b>SUB GRADE</b>				
3.01	10.04(II)	Compacting original ground supporting embankment	600	cum	45,848.00	76.41
3.02	10.08	Laying of hand pack Stone soling	5	cum	35,400.00	7,080.00

## 2. View Detail Rate Analysis

This sub-menu is used to view the detail rate analysis used in the project. The item which is used in the project is shown in it.

SN	Item Code	Description of Work	Quantity	Unit	Kind	Description	Quantity	Unit	Rate	Amount	Total	Item Rate(Without OH)							
1	20.01	PCC M10(1:3:6)	15	cum	Labour	Skilled	2	md	1,000.00	2,000.00	150,718.00	10,047.87							
						Unskilled	22	md	700.00	15,400.00									
					Material	Aggregate 20-40mm	13.5	cum	3,550.00	47,925.00									
						Coarse sand	6.75	cum	3,224.00	21,762.00									
						Cement	3.45	t	17,180.00	59,271.00									
						Water	2000	lit	0.26	520.00									
					Equipment	Concrete Mixer	6	hr	523.00	3,138.00									
						Generator (< 2 KVA)	6	hr	117.00	702.00									
2	12.06(B)	Water Bound Macadam by Mechanical Means	360	cum	Labour	Skilled	10	md	1,000.00	10,000.00	1,973,994.00	5,483.32							
						Unskilled	375	md	700.00	262,500.00									
					Material	Aggregates	435.6	cum	3,550.00	1,546,380.00									
						Stone Screening 13.2 mm	57.6	cum	1,540.25	88,718.40									
						Water	144000	lit	0.26	37,440.00									
						Equipment	Vibrator Roller	12	hr	2,413.00			28,956.00						
					3	12.01(A)	Providing and laying Granular Sub-Base Material By...	300	cum	Labour			Skilled	2	md	1,000.00	2,000.00	522,584.00	1,741.95
													Unskilled	12	md	700.00	8,400.00		
Material	Sub base Material S1 type or S2 t...	384	cum	1,155.00						443,520.00									
	Water	18000	lit	0.26						4,680.00									

### 10.4.3 Cost Estimate



#### 1. View Bill of quantity (BOQ)

This sub-menu is used to view the BOQ of the project.

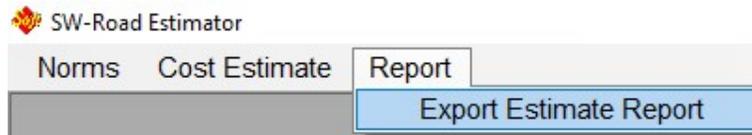
Activity No.	Description of Work	Unit	Quantity	Rate Without Overhead	Amount Without Overhead (NRs)
<b>20</b>	<b>CONCRETE FOR STRUCTURES</b>				
20.01	Providing and laying of Plain Cement Concrete M 10 ( or 1:3:6 for nominal mix) in Foundation complete as per Drawing and Technical Specifications.  Remarks: 1. Vibrator is a part of minor T & P which shall be covered in overhead charges of the contractor. 2. In case of manual mixed concrete add 50 % of Labour component and reduce Equipment	cum	8,001.19	10,047.87	80,394,900.34
20.02(B)	Providing and laying of Plain/Reinforced Cement Concrete in Foundation complete as per Drawing and Technical Specifications.  Remarks: 1. In case of manual mixed concrete add 50 % of Labour component and reduce Equipment	cum	2,163.17	12,708.68	27,490,968.89
<b>12</b>	<b>SUB BASE, BASE, HARD SHOULDER &amp; GRAVEL WEARING</b>				
12.06(B)	Providing, laying, spreading and compacting Water bound macadam including brooming requisite type of screening/ binding Materials to fill up the interstices of coarse aggregate, watering and compacting to the required density as per Drawing and Technical Specifications.	cum	11,598.03	5,483.32	63,595,684.09
12.01(A)	Providing and laying granular sub-base on prepared surface, mixing at OMC, and compacting to achieve the desired density, complete as per Drawing and Technical Specifications.	cum	9,665.02	1,741.95	16,835,952.86
<b>13</b>	<b>BITUMINOUS SURFACE AND BASE COURSE</b>				
13.01(B)	Providing and applying prime coat with Hot Bitumen ( including cutter) on prepared surface of granular base including cleaning of road surface and spraying by mechanical means as per Technical Specification .	lt	77,320.18	95.42	7,378,123.54
13.02(B)	Providing and applying tack coat with hot Bitumen at the specified rate the prepared surfaces including cleaning as per Technical Specification .	lt	85,052.20	52.59	4,472,469.94
13.07(A-ii)	Providing and laying surface dressing with 13mm nominal size chipping as wearing course in single coat using gravel of specified size on a recently applied layer of bituminous binder on prepared surface as per Drawing and Technical Specifications[By Mechanical Means]	sqm	68,058.76	26.63	1,812,105.32
	Providing and laying surface dressing as wearing course in single coat using gravel of specified size on a recently applied layer of bituminous				

#### 2. View Material Breakdown Details

This sub-menu is used to view the total material used in the project.

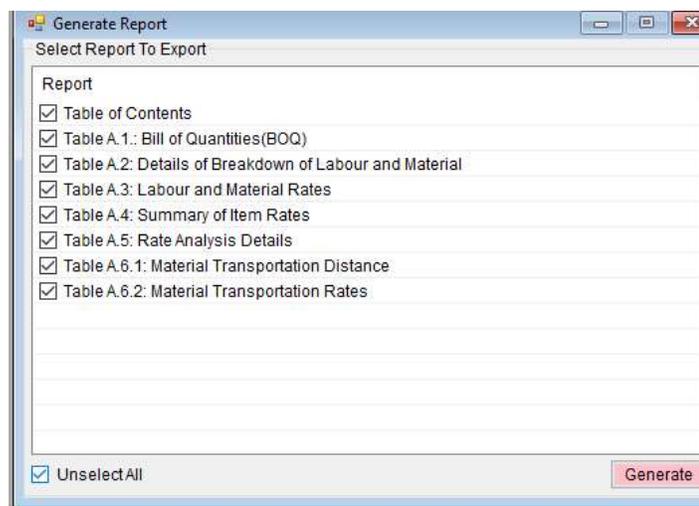
Breakdown of Material						
Quantity & Rate						
S.No	Item Description	Unit	Quantity	Rate	Amount	
<b>A Labour</b>						
A.1	Unskilled	md	87,616.14	700.00	61,331,300.95	
A.2	Skilled	md	17,570.81	1,000.00	17,570,806.01	
<b>Total Labour Cost</b>					<b>78,902,106.96</b>	
<b>B Material</b>						
<b>B.1 Local Material</b>						
B.1.1	Aggregate 10mm and down	cum	389.37	3,143.50	1,223,983.65	
B.1.2	Aggregate 10-20mm	cum	778.74	3,100.00	2,414,092.14	
B.1.3	Aggregate 20-40mm	cum	7,979.81	3,550.00	28,328,330.12	
B.1.4	Aggregates	cum	14,033.62	3,550.00	49,819,337.87	
B.1.5	Boulders/stones	cum	5,379.00	2,888.00	15,534,552.00	
B.1.6	Coarse sand	cum	4,573.96	3,224.00	14,746,447.68	
B.1.7	Sand	cum	3,178.49	3,246.08	10,317,623.42	
B.1.8	Stone	cum	8,786.92	3,500.00	30,754,234.91	
<b>Total Local Material Cost</b>					<b>153,138,601.79</b>	
<b>B.2 Non-Local Material</b>						
B.2.1	Bitumen	t	93.56	70.00	6,549.02	
B.2.2	Bitumen MC30	lit	85.05	70.00	5,953.65	
B.2.3	Cement	t	3,272.06	17,180.00	56,213,924.66	
B.2.4	Geotextile	sqm	4,207.20	110.31	464,079.40	
B.2.5	Planks 38mm thick	cum	183.21	33,523.17	6,141,680.21	

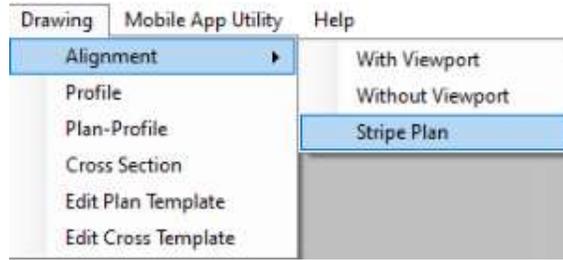
### 10.5 Report



#### 10.5.1 Export Estimate Report

This sub-menu is used to export the estimation report to excel format.





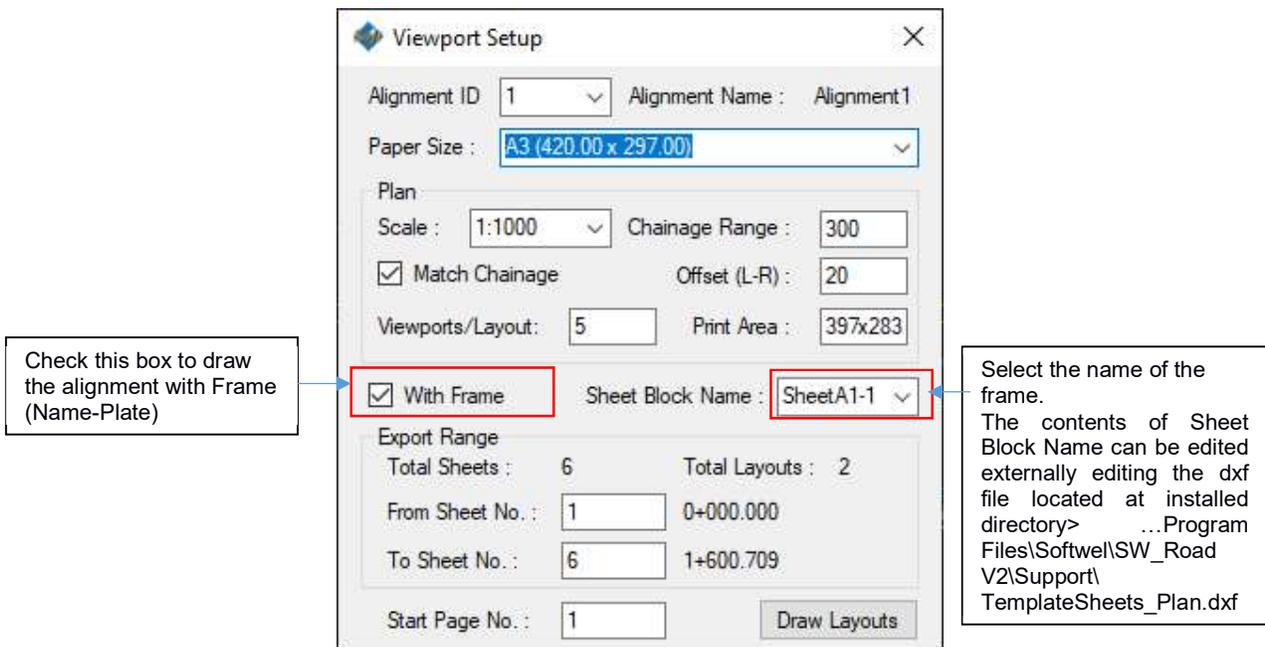
The design drawing can be exported to \*.dxf format which can be further opened with many drafting software such as Autocad, Nanocad, Draftsight, Intellicad, etc.

### 11.1 Alignment

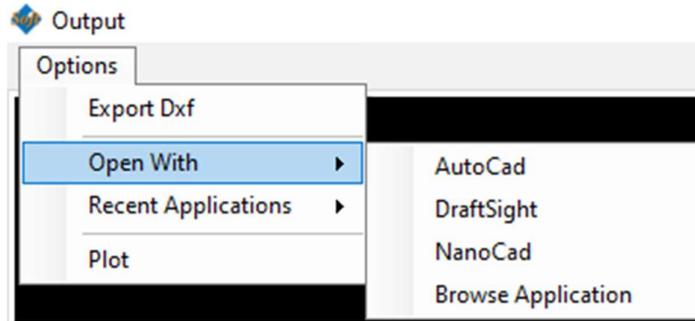
Alignment can be exported with the viewport, without viewport and stripe plan. For reporting, alignment with viewport is appropriate whereas for overall viewing the alignment “Without Viewport” is suitable. Stripe plan is suitable for viewing the structure along the alignment which can further be used for road inventory.

#### 11.1.1 With Viewport

With this command, the user can export plan with viewport and frame. To export plan with the frame, users have to check “With Frame” and specify the sheet block name. Then press on “Draw Layouts” button.



After pressing this button, the output window will open with “Options” menu. Then the user can either export the drawing to \*.dxf or open directly on drafting software for further editing. The behaviour and options in “Output window is the same for other drawings output (profile, cross-section, stripe plan)



### 11.1.2 Without Viewport:

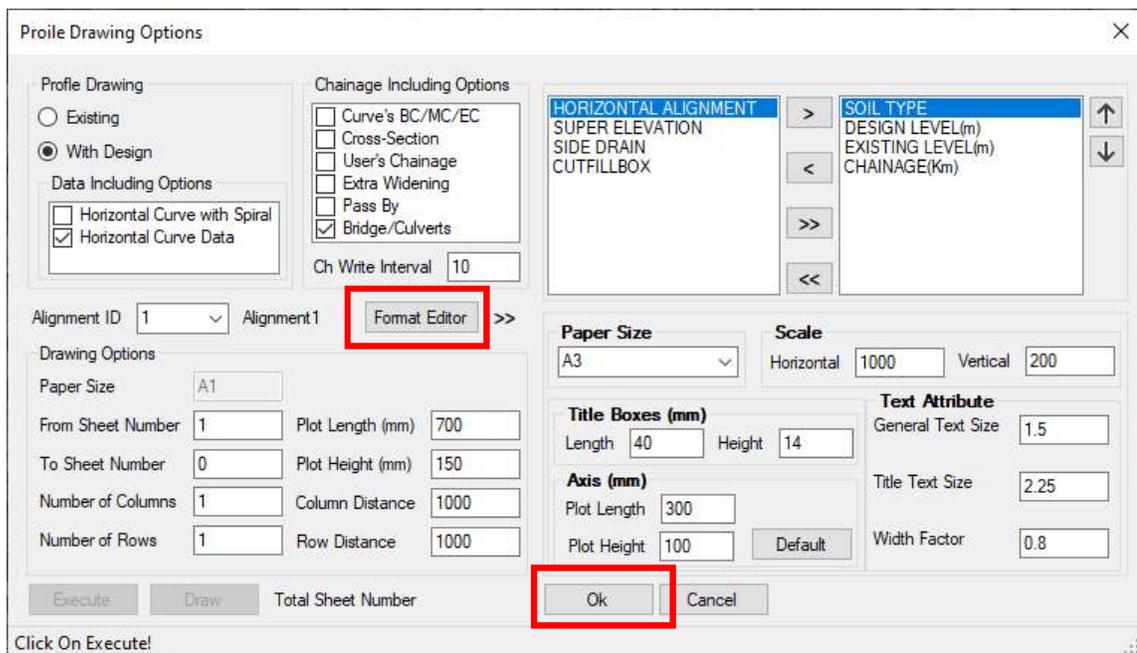
With this command, the user can export plan without viewport and no frame. It is a basic export of plan for viewing the overall plan of the design road.

### 11.1.3 Stripe Plan:

It is the overview of assigned structures shown in a straight path. It can be used during the inventory of roads.

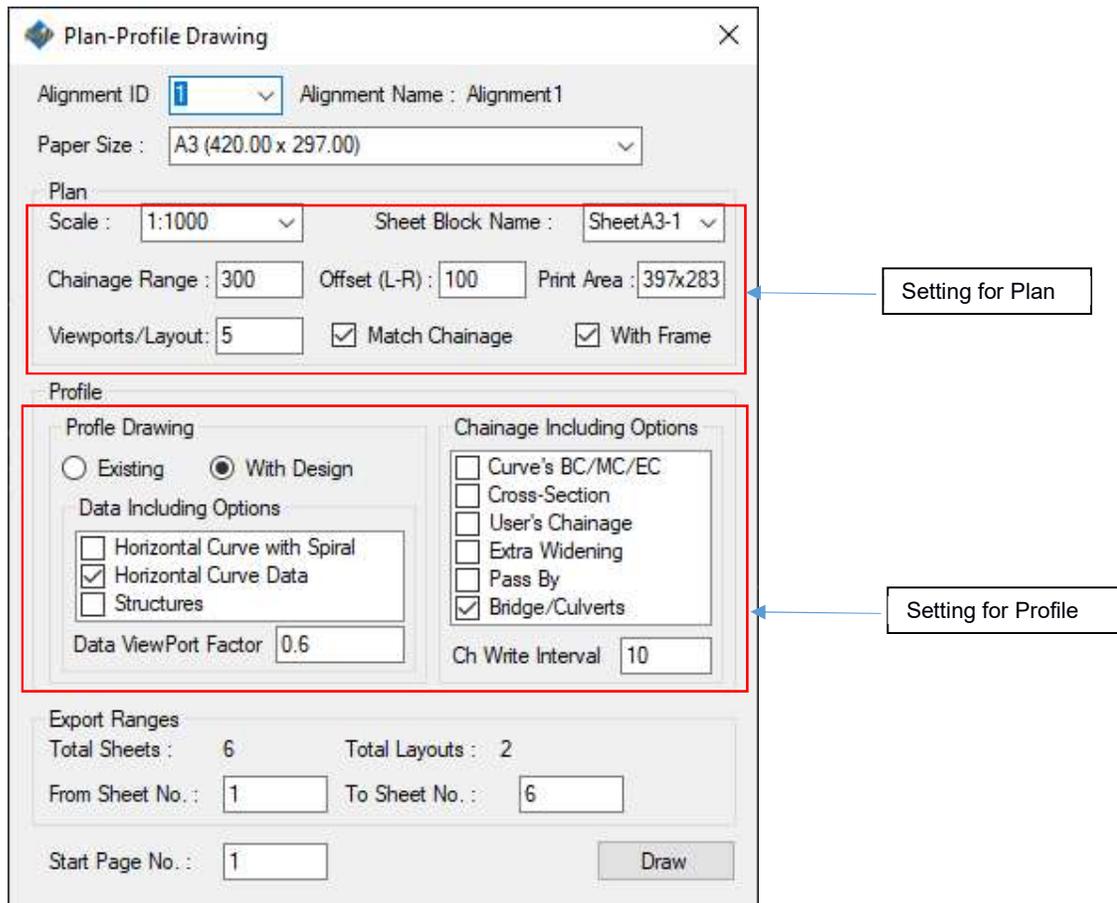
## 11.2 Profile

With this command, the user can export Horizontal Profile. On clicking Drawing>Profile, a dialogue box with multiple options will open. On clicking "Format Editor", the dialogue box expand that has more options to set the output such as scale, data to include in the profile, etc.



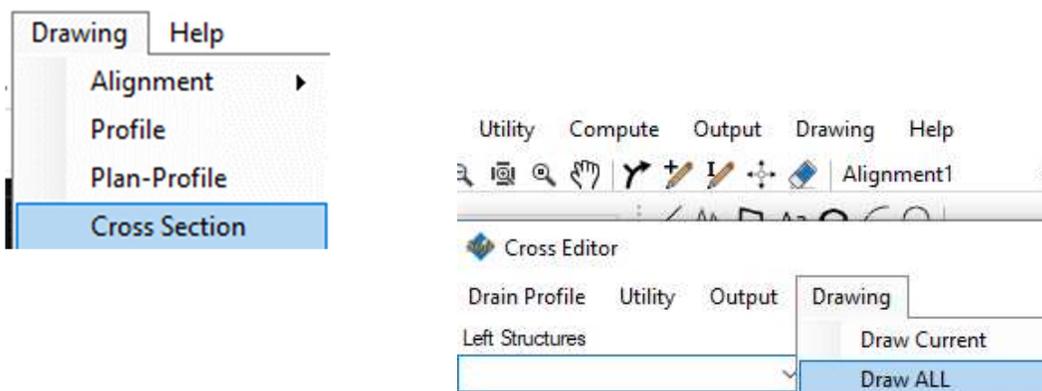
### 11.3 Plan-Profile

It is the improved form of export alignment with viewport and profile. For data to be set under horizontal profile, user has to defined it from “Drawing>Profile>Format Editor”.

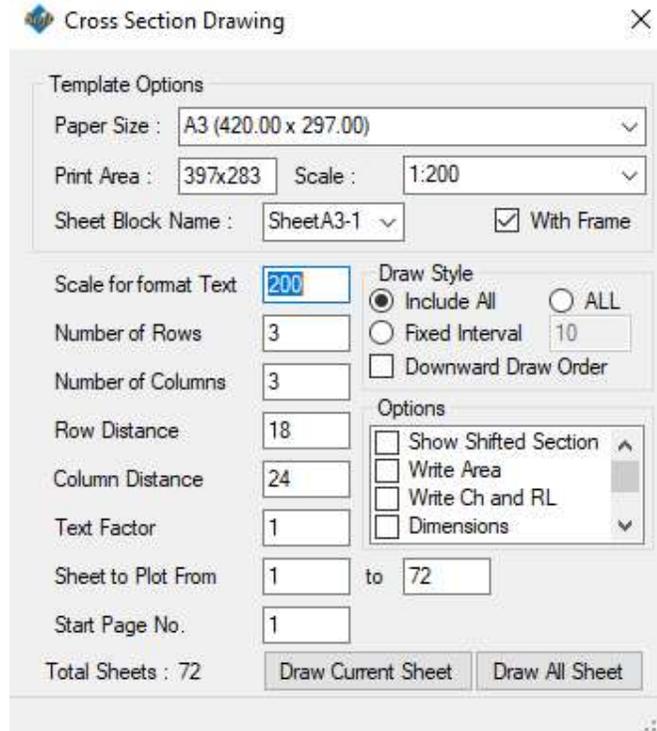


### 11.4 Cross-Section

User can export design cross-section from this menu. On clicking “Cross-section”, it opens Cross Editor. Cross-Section can be exported from Cross Editor. On clicking Cross Editor menu>Drawing>” Draw All” will open forms for exporting all cross-sections.



User can export cross-sections with a nameplate (frame). The nameplate can be edited externally editing the "TemplateSheets\_Cross.dxf" file located at "support" folder in the installed directory (Typically, C:\Program Files\Softwel\SW\_Road V2\Support).



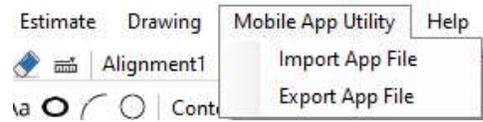
### 11.5 Edit Plan Template

This sub-menu opens the template file for plan and profile in AutoCAD. User can modify the template files as per requirement and save with different name. The saved template files can be then used while exporting plan with viewports.

### 11.6 Edit Cross Template

It is similar to "Edit Plan Template". This sub-menu opens the template file for cross-section in AutoCAD.

## 12 MOBILE APP UTILITY

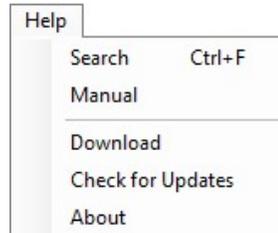


### 12.1 Import App File

This sub-menu is used to import the data from SW-Road Mobile app.

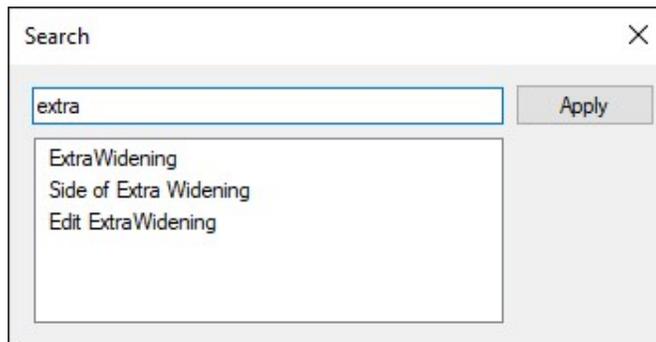
### 12.2 Export App File

This sub-menu is used to export the data from SW-Road to SW-Road Mobile app.



### 13.1 Search (Ctrl+F)

User can search and open form for data entry. On entering the text, the result will be shown instantly. Then selecting a result and pressing apply will open the corresponding form dialogue box. User can access this command through keyboard shortcut (Ctrl+F) as well.



### 13.2 Manual

It opens the user operation manual for the SW Road software.

### 13.3 Download

It opens the website for downloading the free utilities from Softwel.

### 13.4 Check For Updates

It checks whether the update is available or not. If update is available user can log-in the Softwel Account and download the updates.

### 13.5 About

It displays the information about the software.

## 14 MENU IN CROSS EDITOR

Beside the main menu, there is another menu in cross editor.

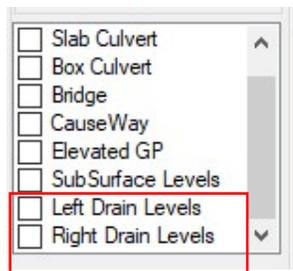


### 14.1 Drain Profile



#### 14.1.1 Compute Drain Profile

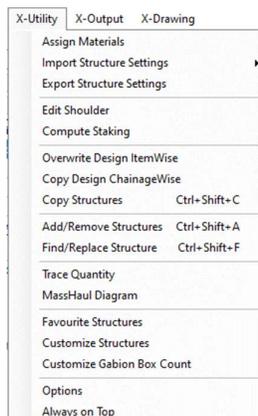
To show the longitudinal profile of the invert level of side drains, it needs to be computed. After computation user can check on “Left Drain Levels” and “Right Drain Levels” to display the drain profile on longitudinal profile.



#### 14.1.2 Export Drain Profile

After computation of the drain profile, it can be exported to spreadsheet from this command.

### 14.2 X-Utility



#### 14.2.1 Assign Materials

It is used to assign materials to each and every part of structure. Material has been assigned to all the structure component by default. However, if the user wishes to edit the materials and

norms used for rate analysis, it can be done from this form.

SN	Name / Specs	Norm ID	Activity ID	Unit	Factor	Prop
1	PCC Capping	N-102	20.01	M3	1	CappingArea
2	RRM	N-102	26.03(C)	M3	1	WallArea
3	PCC Base	N-102	20.01	M3	1	BaseArea
4	Formwork	N-102	18.01(A)	M2	2	BaseThickness
5	Soling	N-102	10.08	M3	1	SolingArea

### 14.2.2 Import Structure Settings

The structure properties once edited can be imported from this tool. It can be imported either from structure setting file or from the project file.

### 14.2.3 Export Structure Settings

The structure properties once edited can be exported from this tool.

### 14.2.4 Edit shoulder

The shoulder once assigned to the cross-section can be easily edited with this tool. There are multiple options for edit and user can use as per requirement.

### 14.2.5 Compute Staking

Computation of staking is required to display all the structures used in each cross-section of current alignment in the plan, so this will help to give an overall idea about the structures on the plan of the road.

### 14.2.6 Overwrite Design Item Wise

This command is used to copy the structure from another project file based on the section ID regardless of section chainage.

### 14.2.7 Copy Design Chainage Wise

This command is used to copy the structure from another project file based on section chainage.

#### 14.2.8 Copy Structures (Ctrl+Shift+C)

This command is used to copy section to range of chainage. User has to define source section chainage or section Number and chainage range to paste the structure.

#### 14.2.9 Add/Remove Structures (Ctrl+Shift+A)

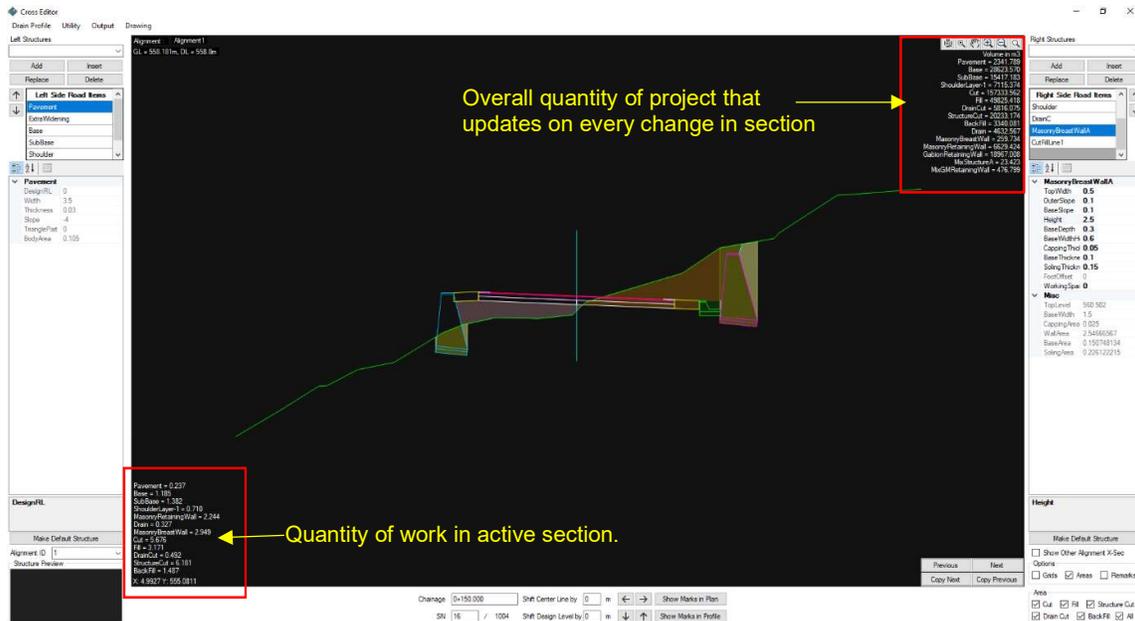
This command is used to add or remove certain structure at defined chainage range at defined side. Shortcut for this command is "Ctrl+Shift+A"

#### 14.2.10 Find and Replace Structure (Ctrl+Shift+F)

This command is used to search certain structure and replace with another structure. Shortcut for this command is "Ctrl+Shift+F".

#### 14.2.11 Trace Quantity

This command is used to trace the quantity of work till the current time. On updating or editing the structure section wise, the quantity also updates at the same time.

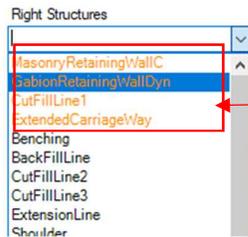


### 14.2.12 Mass Haul Diagram

This tool draws mass haul diagram. User can export it to dxf format and do further planning for economic mass movement.

### 14.2.13 Favourite Structure

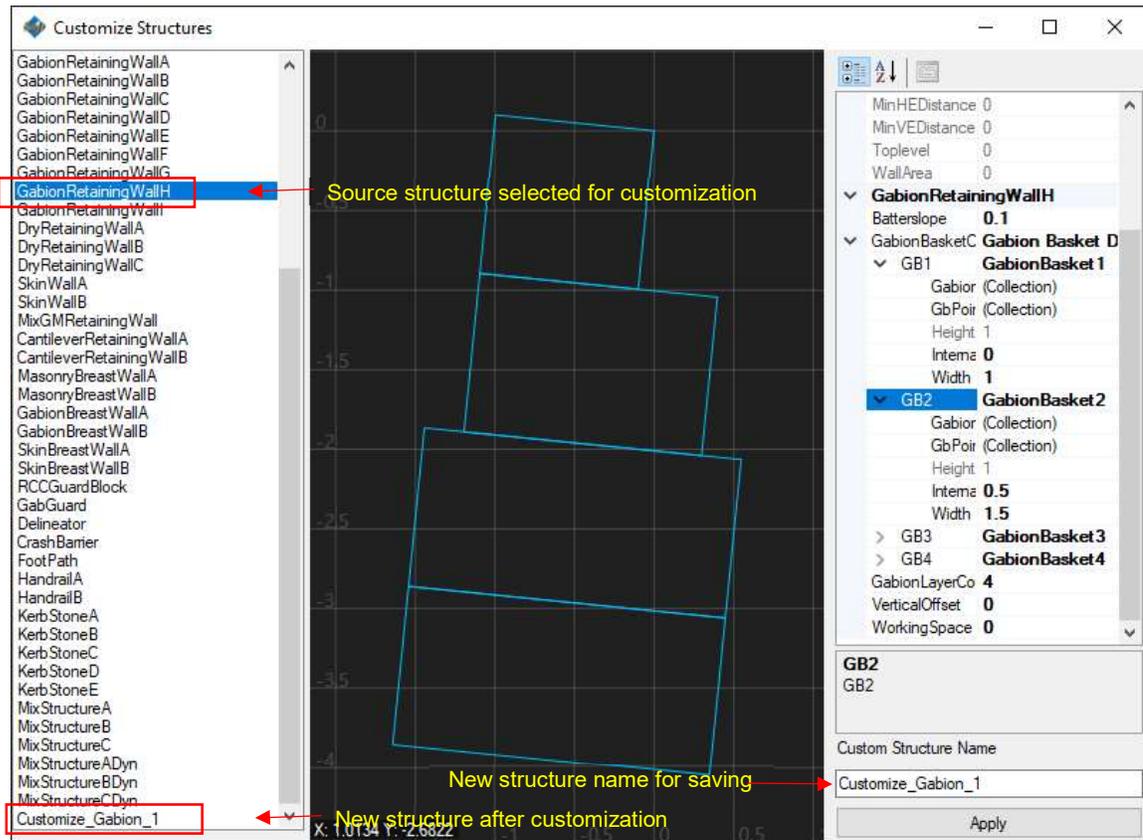
There are too many structures in the list. So, to keep some specified structures at top of the list, this tool is used.



Favourite Structures at top of the list in different colour.

14.2.14 Customize Structures

It is the tool for customization of existing structure and save as new structures. This new structure will also be listed in structure list for assigning to cross-section.



14.2.15 Customize Gabion Box Count

It is counting of gabion box of different size while using on the section. A default counting is provided in the form. User can modify as per requirement. It is used for quantity calculation of gabion mesh area.

	Height	Width	1.5m Width	2.0m Width	3.0m Width	Status
▶	1	1	0	0.5	0	Correct
	2	1.5	1	0	0	Correct
	3	2	0	1	0	Correct
	4	2.5	1	0.5	0	Correct
	5	3	2	0	0	Correct
	6	3.5	1	1	0	Correct
	7	4	0	2	0	Correct
	8	4.5	3	0	0	Correct
	9	5	2	1	0	Correct
	10	5.5	1	2	0	Correct
	11	6	0	3	0	Correct
	12	6.5	3	1	0	Correct

Different options for design are available in this form.

The screenshot shows the 'Options' dialog box with the following settings and callouts:

- Update CutFill Lines Slope: Callout: "Cut/Fill Lines updated based on slope assigned on Soil Type Data. But **It will not be updated by Compute All or Compute Force unless 'Update Cut Fill Lines Slope' is checked.**"
- Update Shoulder: Callout: "Shoulder will **not be updated by Compute All or Compute Force unless 'Update Shoulder' is checked.**"
- Separate Fill Area according to their Categories
- Separate Left and Right Side Area
- Grid Options:
  - PD Interval: 5 m
  - RL Interval: 1 m
  - Callout: "It controls the grid interval in cross editor and exported cross section drawings."
- Dynamic Wall Option:
  - Minimum Vertical Exposure:
    - Cantilever: 1.0 m
    - Others: 0.4 m
    - Callout: "These are the criteria govern the height of dynamic wall."
  - Dynamic Wall Precision: 0.1 m

### 14.2.17 Always on Top

This keeps the cross-editor always on top of other forms.

## 14.3 X-Output

### 14.3.1 Slope Length of Cut Fill Line

It exports the slope data to excel format. The exported data contains slope length and adopted cut and fill slope of Cut/Fill line and Benching line.

### 14.3.2 Quantities

This sub-menu is used to export the quantity of works. For detail refer section 9.6.

## 14.4 X-Drawing

### 14.4.1 Draw Current

It exports the current cross-section displayed in cross-editor.

### 14.4.2 Draw All

## 15 NEW IN SW ROAD V2

### 15.1 Improved Computational Speed

The Computational speed has been improved drastically.

### 15.2 Added Mouse Navigation Control

Mouse wheel control has been added. Now user can easily zoom-in and zoom-out. For zoom extent, users can double click on the middle wheel.

### 15.3 Compatible with the previous version of the software

With the new version of the software, new improved file format (\*.swr) has been introduced. For opening the old format file, user has to import file. The software will convert into the new format. Multiple old format file can be now combined importing multiple project files at once.

### 15.4 Support background imagery

Background images can be imported for the reference base map. Geo Tiff (\*.Tif) and Mbtiles (\*.Mbtiles), tiff file can be imported as background from local drive and XYZ-tiles can be imported online. Users have to input once the URL link for the tiles and it will be saved until the software is uninstalled. URL link of XYZ tiles for difference imagery services can be found easily on the internet. Some sample links for tiles has been provided below;

SN	Image	URL Link
1	Open Street Map	<a href="https://tile.opentopomap.org/{z}/{x}/{y}.png">https://tile.opentopomap.org/{z}/{x}/{y}.png</a>
2	Open Topo Map	<a href="https://tile.opentopomap.org/{z}/{x}/{y}.png">https://tile.opentopomap.org/{z}/{x}/{y}.png</a>

### 15.5 3-D Visualization

SW Road can now 3D view of the design roads. Each and every structure assigned can be viewed in 3D-model with real terrain and background view. So the design can be optimized with this feature. No extra tedious effort is required for this task.

### 15.6 Left side layer panel

User interface has been slightly changed. The right side panel has been divided into the left and right side panel.

- Details from Dwg File

Now the software imports \*.DXF file instead of \*.Dwg file. It has been placed under “External Layers” in layers panel. Right-click on “External Layers” has menu for importing \*.dxf file. The layers of imported DXF file will be listed under “External Layers”.

- Road Element

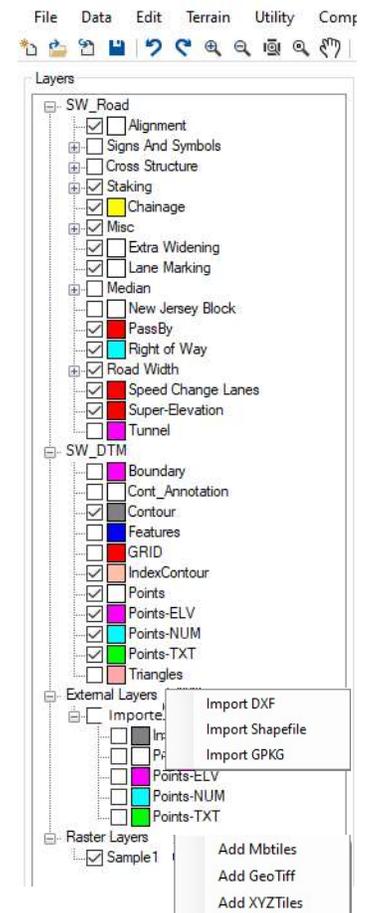
The design road elements have been placed under left side layers Panel.

### 15.7 Compatible with GIS Shape file (\*.shp), Geopackage (\*.gpkg)

User can import shape file and geopackage file for background reference with UTM or MUTM projection system. It is placed under “External Layers”. It can be imported same as DXF file.

### 15.8 Right Side multiple Alignment Display control

As the road support multiple alignments, a list of alignments will be displayed at the right-side



panel. The visibility of design road elements of the corresponding road can be switched from this panel.

### **15.9 Compatible with multiple alignments**

Users can design multiple alignments in the same project. Design parameter can be set for all the alignment separately as per requirement.

### **15.10 Urban Road Components**

Multi-lane alignment can be designed in the newer version. So urban road can be designed now. Urban road components such as median, new jersey block, speed change lane (acceleration and deceleration lane), footpath, kerbstone, handrail, lane separator, sign and symbol, bus-bay, etc have been added.

### **15.11 Support DEM terrain**

SW Road now supports DEM terrain layer. SRTM, Alos Palsar, Aster, etc dem can be used (\*.tif format) for designing roads. This feature may be helpful while undertaking a feasibility study of road.

### **15.12 Auto-Calculation of curves**

- Radius of curve

The software now inputs the best fit radius of curve in all horizontal IP while drawing new alignment.

- Calculate spiral length

The software now calculates the transition curve at every horizontal IP where applicable. It calculates the spiral length on double-clicking on the spiral length input field. It can be calculated for all the IP from the "Alignment Editor" form.

- Vertical curve length

The vertical curve length at every vertical IP can be calculated. The procedure is similar to the spiral length calculation.

### **15.13 Terrain Menu (Integrated SW DTM)**

SW Road has built-in SW DTM that works in SW Road environment. Autocad is no more compulsory software for preparing terrain file and background reference. However, the terrain and map prepared in AutoCAD are still supported in the current version. All the functions included in SW-DTM has been integrated into this version. "Contour Annotation" feature has been Improved that needs no manual input as the previous version of SW DTM does.

Besides this, a separate SW-DTM is also included which works on Autocad. The processing speed has been improved with options of drawing refined and smoothen contours.

### **15.14 Reverse Alignment**

User can reverse or flip the alignment as per requirement without any cumbersome effort.

### **15.15 Easily assign hairpin bent**

User can insert or remove hairpin bent easily.

### **15.16 Drain Profile**

User can view drain profile along with the longitudinal profile and drain profile data can be exported easily.

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### 15.17 Cross-Editor

- Keyboard and mouse control added for selecting and deleting structures
- Many types of structures have been added such as a dynamic retaining wall, Breast Wall, Benching, Mixed wall, Covered drain, guard block, crash barrier, handrail, delineator, composite wall, etc.
- The order of assigned structures can be re-order.
- The assigned structures can be grouped and named with a user-friendly name. This name is listed in the structure list and all the structures in the group can be assigned easily as any other structures.
- Assign Materials

The material and Government Norm ID can be assigned to the components of the structures. It is used for the preparation of BOQ. A default material has already been defined. It can be re-defined as per user requirement.

- Customize Structure

User can now modify the existing structure and give a unique name. This name can further be used for assigning structure.

- Export and import Structure Setting

User can now export all the structure setting and import these settings on another project. So users do not have to modify structures in every project.

- Copy Structures

User can copy structures assigned in a section to a range of sections easily.

- Trace Quantity  
User can now trace the total quantity while designing the road. This feature updates the total quantity instantly when cross-section or structure is changed.
- Mass Haul Diagram
- User can draw mass haul diagram and use it for further planning of mass movement.
- Favourite Structures  
In the list of structure, user can put the structures at the top of the list which is going to be used frequently.
- Customize Gabion Box Count  
Users can customize the gabion count as per requirement based on size of gabion box.

### 15.18 Warning for insufficient Ground profile

When ground data is insufficient in cross-section, the exported quantity may not include the whole quantity. In such a case, there will be an error in quantity. So the software will warn you in cross-section and while exporting the quantity. The users have to rectify it to get the full quantity.

### 15.19 Multiple cross-section Editing

A separate window has been added to work on multiple cross-sections. User can assign structures in multiple sections at once.

### 15.20 Drawing in Print Ready Format.

Plan and profile can be exported in the viewport with a single command. Cross-section

drawings can be exported with frame.

### **15.21 Quantity**

Quantity export in detailed and summary format with DOR Norm ID.

### **15.22 Bill of quantity**

The estimating tool has been added which can estimate and prepare BOQ with ease.