

**SUNSARI-MORANG
IRRIGATION DEVELOPMENT PROJECT**

**IRRIGATION CANAL LONGITUDINAL & CROSS
SECTION DRAWING AND QUANTITY OFFTAKE
PACKAGE**

USER'S REFERENCE MANUAL

MARCH, 2004

 ***Softwel (P) Ltd.***

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INTRODUCTION:

SW_Canal_2004: software for irrigation canal design works.

SW_Canal_2004 is software package for the new and existing canal design work. It has been entirely developed by SOFTWEL (P) Ltd. SW_Canal_2004 runs in Windows platform. The executive modules are programmed in Visual Basic. This encompasses many different areas of expertise, which provide a means of storing, processing, analyzing, retrieving and using data.

SW_Canal_2004 takes input data from excel template file where all the field data are entered and design work is completed .After reading the required data from the excel sheet, it draws canal profile and cross-section as per data.

Sw_Canal is also able to draw plan with boundary lines taking the cross-section points as the guiding points for the boundary.

The software has been implemented successfully in a number of projects undertaken by WELINK

Consultants (P) Ltd.

INSTALLATION AND SOFTWARE INITIALIZATION

INSTALLATION:

SOFTWEL: SW_CANAL_2004 is provided in a CD. The program should be installed from the CD every time you run the program. Simple instructions should be followed to install the program.

- a) The CD-ROM contains the Directory SW_CANAL_2004
- b) Open this directory and run the **Setup Icon** (by double clicking)
- c) Select directory of installation as "**C:\SOFTWEL\ SW_CANAL_2004**" and follow the instructions from screen for proper installation.
(In older versions of WIN 95/98, the program may ask to restart the computer.)
- d) The program will automatically generate a shortcut in "Program" menu as **SOFTWEL PROGRAMS-> SW_CANAL_2004**

After installing the program you should first initialize it, and then only it becomes ready to run.

SOFTWARE INITIALIZATION

The **SW_CANAL_2004** program is protected through software lock. While operating the **SW_CANAL_2004** program for the first time, the computer displays code for **Computer ID** for that computer on which the program is running. At that time, the program should be initialized with proper unlock code supplied by SOFTWEL otherwise the program will not be executed.

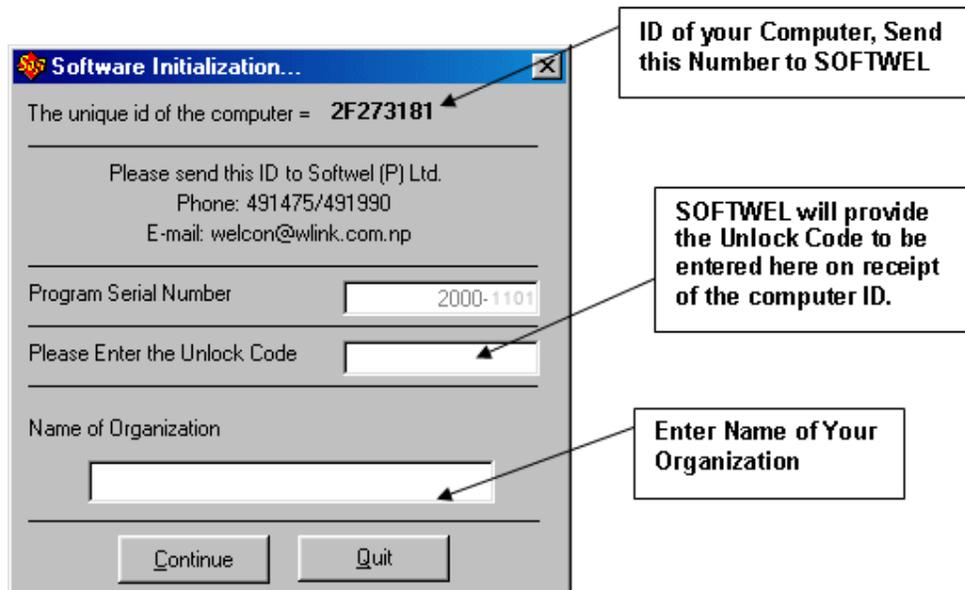


Fig: 1

SW_CANAL_2004

3.1 Contents of SW_CANAL_2004

The following files are associated with this program:

1. SW_CANAL_2004.exe: **Main executive module for irrigation canal design**
2. PRO_IRR_2004.exe: **Executable file for new profile drawing.**
3. CRO_IRR_2004.exe: **Executable file for new cross-section drawing.**
4. PRO_IRR_Existing.exe: **Executable file for existing canal profile drawing.**
5. CRO_IRR_Existing.exe: **Executable file for existing canal cross-section drawing.**
6. Irr_New_Canal_Sample.xls: **Sample file for design work of new irrigation canal.**
7. Irr_Existing_Canal_Sample.xls: **Sample file for design work of existing irrigation canal.**
8. Irr_2004_blank.dwg: **AutoCAD 2000 Template file for the drawings.**

Note:

All these files are supplied as "Read Only" so that the format is protected. All these files except for the Excel File should always be in the same directory.

CONTENTS OF THE DATA FILE:

1.Introduction sheet:



Project No.:	
Project:	
Irrigation Sector :	

2.Alignment :

The data collected from site is entered in the form of Ip number, Easting(X-Cor), Northing (Y-Cor) and radius of curve as shown in table.

Start Chainage			0+000.00
IP Data			
IP	Coordinate		Radius
	Easting	Northing	
(no)	(m)	(m)	(m)
[1]	[2]	[3]	[4]
0	365363.540	3062030.100	0.0
1	365341.430	3062067.270	55.0
2	365339.390	3062109.590	18.0
3	365362.390	3062125.840	12.5
4	365348.630	3062144.020	13.0
5	365325.890	3062136.730	16.0
6	365316.020	3062090.970	95.0
7	365296.660	3062061.600	50.0

The element for the horizontal curve are calculated in alignment Sheet by formula that are attached in the sheet and the the results should be as shown in tables.

Traverse Data					
IP	Cumm Dist	ABS Angle	WCB	Def Ang	Radius
(no)	(m)	(deg)	(deg)	(deg)	(m)
[1]	[2]	[3]	[4]	[5]	[6]
0	0.00	30.7456	329.2544	0.0000	0.00
1	43.25	2.7598	357.2402	27.9859	55.00
2	85.62	54.7580	54.7580	57.5177	18.00
3	113.78	37.1212	322.8788	91.8792	12.50
4	136.58	72.2252	252.2252	70.6536	13.00
5	160.46	12.1717	192.1717	60.0535	16.00
6	207.27	33.3919	213.3919	21.2202	95.00
7	242.45	6.0288	186.0288	27.3632	50.00

Horizontal Curve Data Table													
IP	COORDINATE		DIST	WCB	Def Ang	Radius	CURVE DATA			CHAINAGES			
	X	Y					T	E	LC	BC	MC	EC	IP
(no)	(m)	(m)	(m)	(deg)	(deg)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
0	365363.540	3062030.100	0.00	329.2544	0.0000	0.0000	0.00	0.00	0.00	0+000.00	0+000.00	0+000.00	0+000.00
1	365341.430	3062067.270	43.25	357.2402	27.9859	55.0000	13.71	1.68	26.86	0+029.54	0+042.98	0+056.41	0+043.25
2	365339.390	3062109.590	42.37	54.7580	57.5177	18.0000	9.88	2.53	18.07	0+075.19	0+084.23	0+093.26	0+085.07
3	365362.390	3062125.840	28.16	322.8788	91.8792	12.5000	12.92	5.47	20.04	0+098.63	0+108.65	0+118.67	0+111.54
4	365348.630	3062144.020	22.80	252.2252	70.6536	13.0000	9.21	2.93	16.03	0+119.34	0+127.36	0+135.37	0+128.56
5	365325.890	3062136.730	23.88	192.1717	60.0535	16.0000	9.25	2.48	16.77	0+140.79	0+149.18	0+157.56	0+150.04
6	365316.020	3062090.970	46.81	213.3919	21.2202	95.0000	17.80	1.65	35.18	0+177.33	0+194.92	0+212.51	0+195.13
7	365296.660	3062061.600	35.18	186.0288	27.3632	50.0000	12.17	1.46	23.88	0+217.72	0+229.66	0+241.60	0+229.90

3.Profile:

Stretches	Chainage		Canal Bed Elevation		Design Discharge	Bed Slope	Water Depth	Iteration Status		Bed Width	B/H Ratio
	From	To	From	To				Status	Diff in Computed & Given		
					Q	I	H		Q	B	B/H
	(m)	(m)	(m)	(m)	(m ³ /s)	(m/m)	(m)			(m)	
	[0 decimal]	[0 decimal]	[3 decimal]	[3 decimal]	[3 decimal]	[5 decimal]	[3 decimal]			[2 decimal]	[1 decimal]
[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
1	0	100	94.742	94.636	8.168	0.00020	1.471		0.000	7.00	4.8
1	100	200	94.636	94.830	8.168	0.00020	1.471		0.000	7.00	4.8
1	200	270	94.830		8.168	0.00020	1.471		0.000	7.00	4.8
2	270	300		94.720	7.238	0.00020	1.483		0.000	6.00	4.0
2	300	400	94.720	94.905	7.238	0.00020	1.483		0.000	6.00	4.0
2	400	500	94.905	94.949	7.238	0.00020	1.483		0.000	6.00	4.0
2	500	600	94.949	94.843	7.238	0.00020	1.483		0.000	6.00	4.0
2	600	700	94.843	94.940	7.238	0.00020	1.483		0.000	6.00	4.0
2	700	800	94.940	94.797	7.238	0.00020	1.483		0.000	6.00	4.0
2	800	900	94.797	94.680	7.238	0.00020	1.483		0.000	6.00	4.0
2	900	1000	94.680	94.785	7.238	0.00020	1.483		0.000	6.00	4.0
2	1000	1100	94.785	94.782	7.238	0.00020	1.483		0.000	6.00	4.0
2	1100	1200	94.782	94.752	7.238	0.00020	1.483		0.000	6.00	4.0

Side Slope IV:mH	Channel Geometry & Hydraulic Characteristics						Drop at Beginning	Design Bed & Water Surface Elevation				Free Board	Bank Top Elevation	
	Vetted Flow Sectional Area	Vetted Perimeter	Hydraulic Radius	Manning's Roughness Coefficient	Mean Flow Velocity	Canal Bed Elevation		Water Surface Elevation		From	To			
	A	P	R	n	V	From	To	From	To			From	To	
	(m ²)	(m)	(m)		(m/s)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
	[1 decimal]	[2 decimal]	[3 decimal]	[3 decimal]	[3 decimal]	[3 decimal]	[2 decimal]	[3 decimal]	[3 decimal]	[3 decimal]	[3 decimal]	[1 decimal]	[3 decimal]	[3 decimal]
[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]	[23]	[24]	[25]	
1.5	13.54	12.304	1.101	0.025	0.603	0.00	94.950	94.930	96.421	96.401	0.4	96.821	96.801	
1.5	13.54	12.304	1.101	0.025	0.603	0.00	94.930	94.910	96.401	96.381	0.4	96.801	96.781	
1.5	13.54	12.304	1.101	0.025	0.603	0.00	94.910	94.896	96.381	96.367	0.4	96.781	96.767	
1.5	12.19	11.346	1.075	0.025	0.594	0.25	94.646	94.640	96.129	96.123	0.4	96.529	96.523	
1.5	12.19	11.346	1.075	0.025	0.594	0.00	94.640	94.620	96.123	96.103	0.4	96.523	96.503	
1.5	12.19	11.346	1.075	0.025	0.594	0.00	94.620	94.600	96.103	96.083	0.4	96.503	96.483	
1.5	12.19	11.346	1.075	0.025	0.594	0.00	94.600	94.580	96.083	96.063	0.4	96.483	96.463	
1.5	12.19	11.346	1.075	0.025	0.594	0.00	94.580	94.560	96.063	96.043	0.4	96.463	96.443	
1.5	12.19	11.346	1.075	0.025	0.594	0.00	94.560	94.540	96.043	96.023	0.4	96.443	96.423	
1.5	12.19	11.346	1.075	0.025	0.594	0.00	94.540	94.520	96.023	96.003	0.4	96.423	96.403	
1.5	12.19	11.346	1.075	0.025	0.594	0.00	94.520	94.500	96.003	95.983	0.4	96.403	96.383	
1.5	12.19	11.346	1.075	0.025	0.594	0.00	94.500	94.480	95.983	95.963	0.4	96.383	96.363	

Check of Stable Channel Principle			Data on Canal Offtake				Remarks			
Tractive Stress	Froude Number	Regnold's Number	LEFT Side Offtake		RIGHT Side Offtake		Remark-1	Remark-2	Remark-3	Remark-4
			Canal Name	Required Water Level	Canal Name	Required Water Level				
				(m)		(m)				
(1 decimal)	(2 decimal)	(0 decimal)		(3 decimal)		(3 decimal)				
[26]	[27]	[28]	[29]	[30]	[31]	[32]	[33]	[34]	[35]	[36]
1.7	0.16	663842					BP OF TST_1	SILL OF H/R	TEST_REM_1	TEST_REM_2
1.7	0.16	663842								
1.7	0.16	663842								
1.7	0.16	637922								
1.7	0.16	637922								
1.7	0.16	637922								
1.7	0.16	637922								
1.7	0.16	637922	OFF_1	95.700			OFFTAKE_1	BP OF TST_2	TEST_REM_1	TEST_REM_2
1.7	0.16	637922								
1.7	0.16	637922								
1.7	0.16	637922								
1.7	0.16	637922								

The column with blue colored text in the profile sheet is the column where required data obtained from field is entered for the profile design. According to the data , the formula attached in the excel sheet calculate all the parameters and the iteration involved in the calculation is completed by running macro by pressing short cut key “Ctrl + a” at corresponding cell of the “column J”.

The design data for output is obtained simply printing the required table from the profile excel sheet.

4.Cross-Section:

The cross-section data are collected from field and entered into this sheet named “Cross”, in the format given in the first table. No one is allowed to insert or delete column before the tables given in the sheet.

First table is the cross-data entry table where all the cross-data are entered with the their bank width and cut fill slope according to the soil type.

Second table is for the output table for section area calculated by program. The sectional area of the cross-section is calculated by program during the processing of the cross-section and the program puts the section area in this table during process of cross-drawing after the process.

The tables that are found inside “Cross” sheet are given in next page.

Note:

The sheets “Profile” and “Cross” are used in new canal design .

In case if Exsiting Canal is to be designed then use another excel sample file.

Other two sheets named “Pro_Existing” and “Cro_Existing” are similar to the sheets “Profile” and “Cross” respectively , but they are separately placed together for the existing canal design.

Chainage	Partial Distance	Reduced Level	Remarks	Slopes		Bank Width	
				Fill (1V:mH)	Cut (1V:mH)	Left	Right
(2 decimal)	(1 decimal)	(3 decimal)		(1 decimal)	(1 decimal)	(2 decimal)	(2 decimal)
(m)	(m)	(m)					
[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]
0+000.00	-20.00	99.000		1.5	1.0	4.00	2.00
	-17.50	98.000					
	-10.50	98.000					
	-4.70	98.600					
	-3.50	97.000					
	-2.50	94.500					
	0.00	94.000					
	1.80	94.200					
	2.50	94.300					
	2.80	94.600					
	9.20	96.000					
	10.30	96.500					
	12.00	95.000					
	15.00	96.000					
	20.00	95.000					
0+100.00	-20.00	99.000		1.5	1.0	4.00	2.00
	-17.50	98.000					
	-10.50	98.000					
	-4.70	98.600					
	-3.50	97.000					
	-2.50	94.500					
	0.00	94.000					
	1.80	94.200					
	2.50	94.300					
	2.80	94.600					
	9.20	96.000					
	10.30	96.500					
	12.00	95.000					
	15.00	96.000					
	20.00	95.000					

Chainage	Cut Area	Fill Area	Stripping Length	Stripping Area	Total Fill Area
(2 decimal)	(2 decimal)	(2 decimal)	(2 decimal)	(2 decimal)	(2 decimal)
(m)	(m2)	(m2)	(m)	(m2)	(m2)
[12]	[12]	[12]	[12]	[12]	[12]
0+000.00	14.07	9.39	12.69	1.92	11.32
0+100.00	14.25	9.15	12.65	1.92	11.07
0+200.00	15.83	11.67	17.19	2.60	14.26
0+270.00	15.14	6.48	11.68	1.77	8.25
0+300.00	15.19	6.41	11.67	1.77	8.18
0+400.00	15.37	4.58	11.31	1.71	6.29
0+500.00	15.55	5.97	11.58	1.75	7.73

PROCEDURES FOR RUNNING PROGRAM:

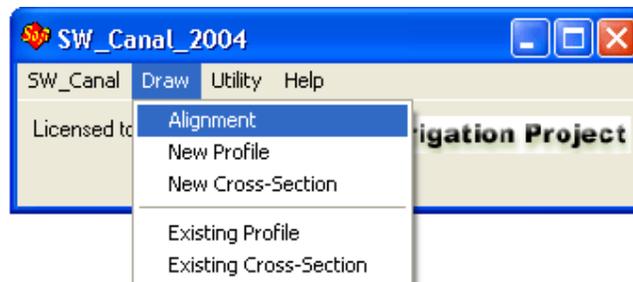
1. Open AutoCAD template file named “Irr_2004_blank.dwg” and save it to another file name by save as command from the file menu.
2. Similarly open excel data file named “Irr_Sample_2004.xls” and again save it to another name by save as command from the file menu.
3. Now Run program “SW_CANAL_2004” by command shown below.
 - **Start->programs->Softwel->SW_CANAL_2004**Then the program appears giving outlook shown below.



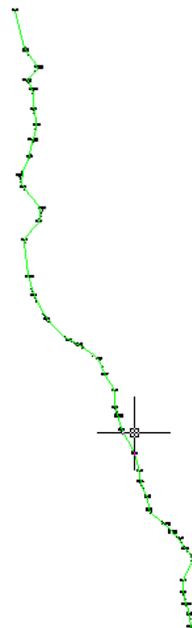
Drawing Alignment:

Confirm that all the data required for the alignment are entered into the sheet named “Alignment” of the data file.

Click **Draw->Alignment**.



This command will inform the program to read data from the alignment sheet of data file and draw the center line of the canal alignment in the AutoCAD drawing file currenting opened and alignment may look like below.



Drawing Profile:

Select first column titled “Stretches” upto required columns from sheet named “Profile” as shown in figure below.

Stretches	Chainage		Canal Bed Elevation	
	From	To	From	To
	(m)	(m)	(m)	(m)
	(0 decimal)	(0 decimal)	(3 decimal)	(3 decimal)
[0]	[1]	[2]	[3]	[4]
1	0	100	94.742	94.636
1	100	200	94.636	94.830
1	200	270	94.830	
2	270	300		94.720
2	300	400	94.720	94.905
2	400	500	94.905	94.949
2	500	600	94.949	94.843
2	600	700	94.843	94.940
2	700	800	94.940	94.797
2	800	900	94.797	94.680
2	900	1000	94.680	94.785

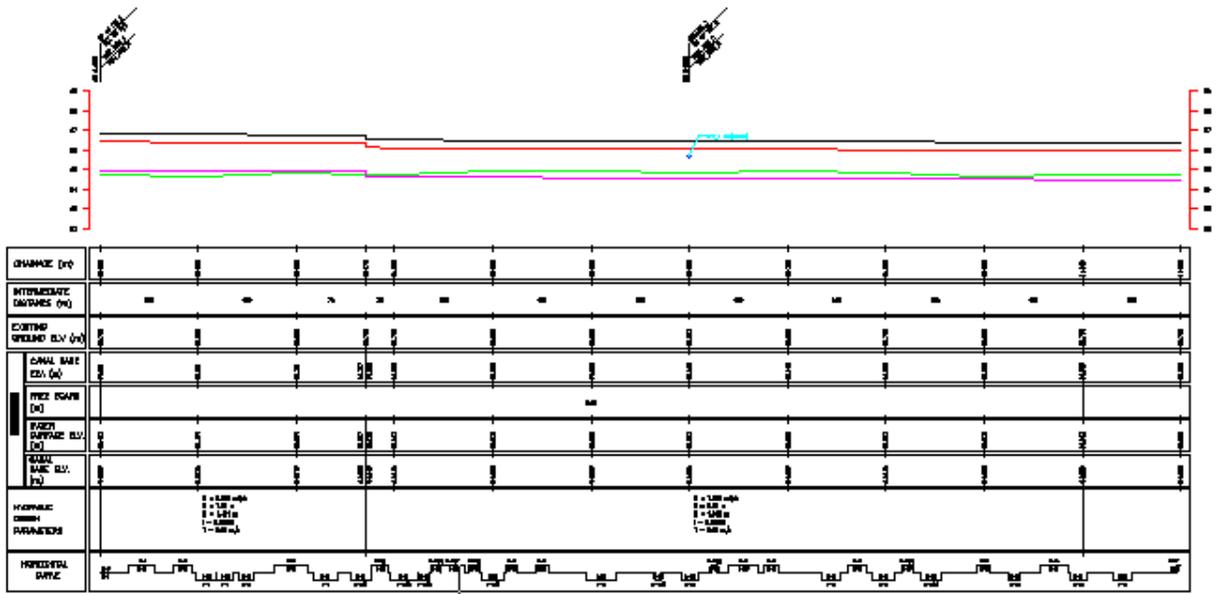
Click Draw->new profile



then this command will show new form shown below.

Now adjust the horizontal scale ,vertical scale and plot length for the sheeting planning. If the profile should show horizontal curve along the alignment , tick the check box “Include H.Curve.”
Click “Execute” .

This command will draw profile for the canal as shown below.



Typical Profile of the Canal

Drawing Cross-Section:

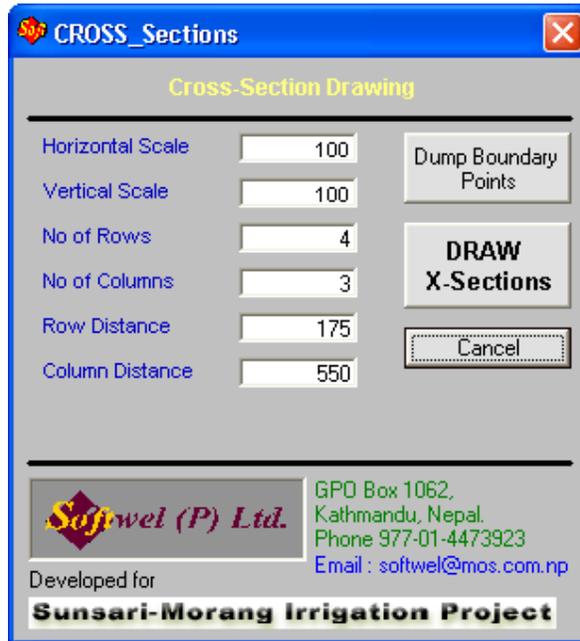
Select the range of cells in excel sheet named “Cross” upto required number of cross-section as shown below.

Chainage	Partial Distance	Reduced Level	Remarks	Slopes		Bank Width	
				Fill (1V:mH)	Cut (1V:mH)	Left	Right
(2 decimal)	(1 decimal)	(3 decimal)		(1 decimal)	(1 decimal)	(2 decimal)	(2 decimal)
(m)	(m)	(m)					
[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]
0+000.00	-20.00	99.000		1.5	1.0	4.00	2.00
	-17.50	98.000					
	-10.50	98.000					
	-4.70	98.600					
	-3.50	97.000					
	-2.50	94.500					
	0.00	94.000					
	1.80	94.200					
	2.50	94.300					
	2.80	94.600					
	9.20	96.000					
	10.30	96.500					
	12.00	95.000					
	15.00	96.000					
	20.00	95.000					
0+100.00	-20.00	99.000		1.5	1.0	4.00	2.00
	-17.50	98.000					
	-10.50	98.000					
	-4.70	98.600					
	-3.50	97.000					
	-2.50	94.500					
	0.00	94.000					
	1.80	94.200					
	2.50	94.300					
	2.80	94.600					
	9.20	96.000					
	10.30	96.500					
	12.00	95.000					
	15.00	96.000					
	20.00	95.000					

click Draw->new Cross-section

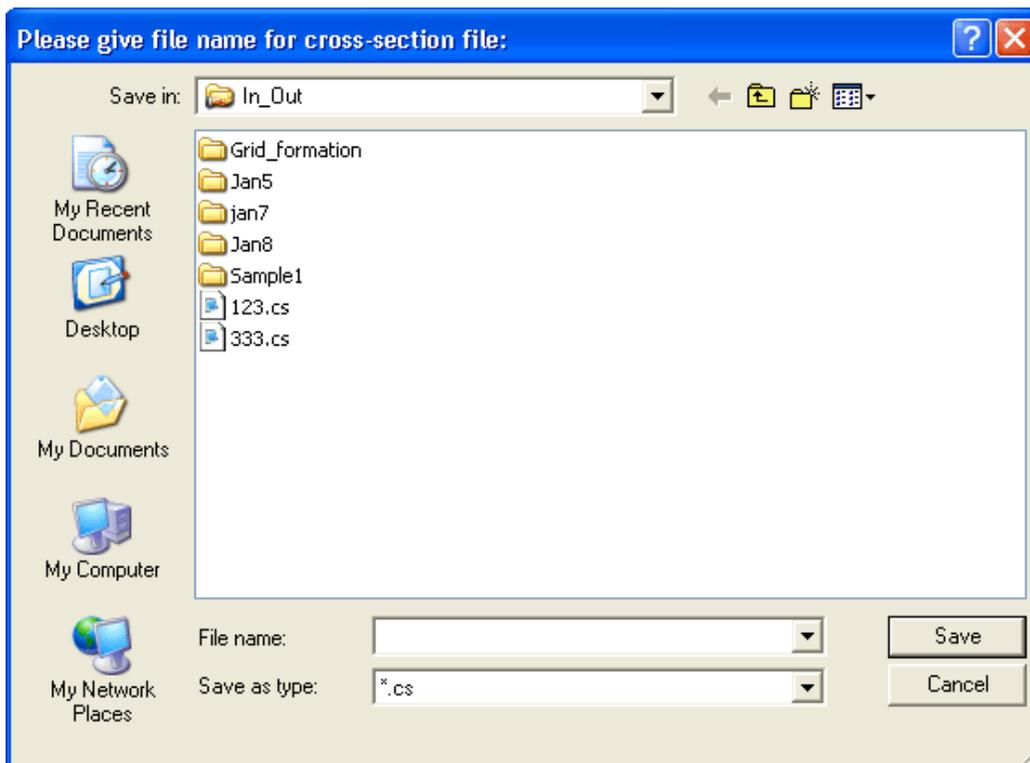


This command will show author form for drawing cross-section.

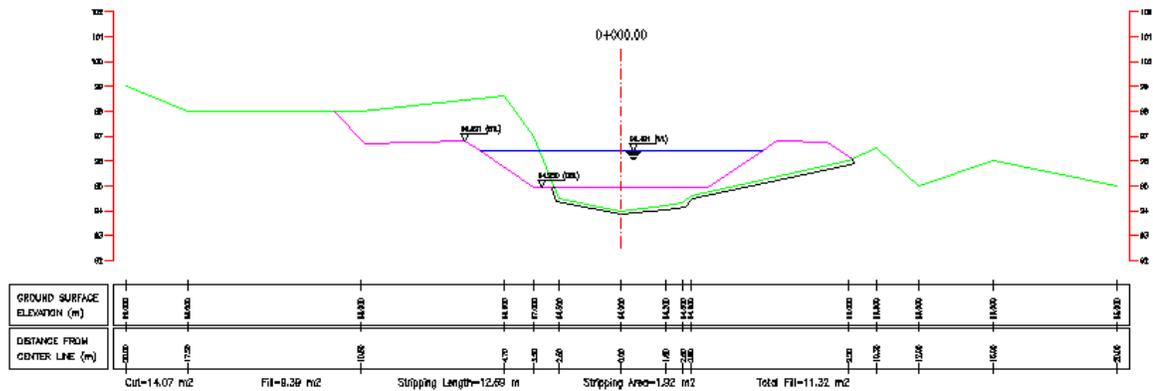


Now give proper horizontal and vertical scale and the sheet planning data like no. of rows, no. of columns, row distance and column distance.

Click command button "DRAW X-Sections". Then this program will prompt the user for giving a name for a file to dump the cross-sections points that will be used by main program "SW_CANAL_2004" while drawing boundary (or property lines) for the canal as shown below.



Now give proper name for file that will save giving extension name “.cs”(e.g 333.cs) and click save button of the save dialog box. Then the program will start drawing selected cross-section in the AutoCAD drawing file. The cross-section output of the program will shown as below.



Typical Cross-section of Canal with water level

If only boundary points for the canal (without cross-section drawing) is required , the button “Dump Boundary Points” can be used. The file saving for the boundary points are same as mentioned above.

Note:-

If canal design work is done for existing canal , then sheets named “Pro_existing” and “Cro_existing” should be used and the steps involved in the drawing are same as the steps mentioned above. But the commands used will be as shown below.

For drawing existing profile.

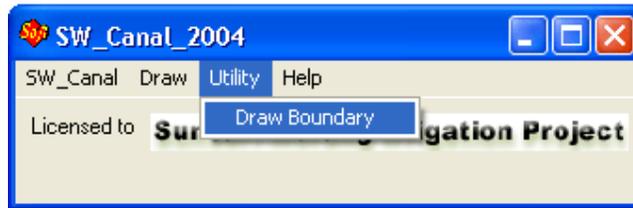


For drawing existing Cross-Section.

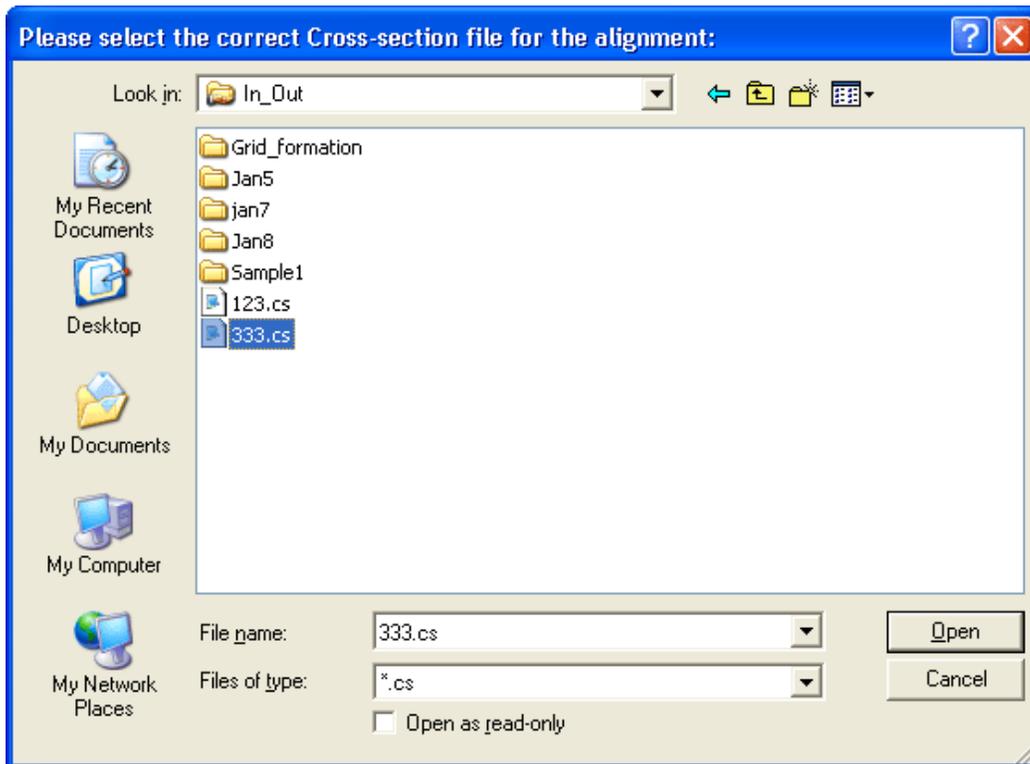


Drawing Boundary for Canal:

Click **Utility->Draw boundary** as shown below.



then the program will prompt user to open the boundary file previously saved having extension “.cs” as shown in figure .



Select correct boundary file and click “Open” button of the dialogue box. Then the program will ask the starting chainage for the alignment (which is going to be selected from AutoCAD drawing file.)

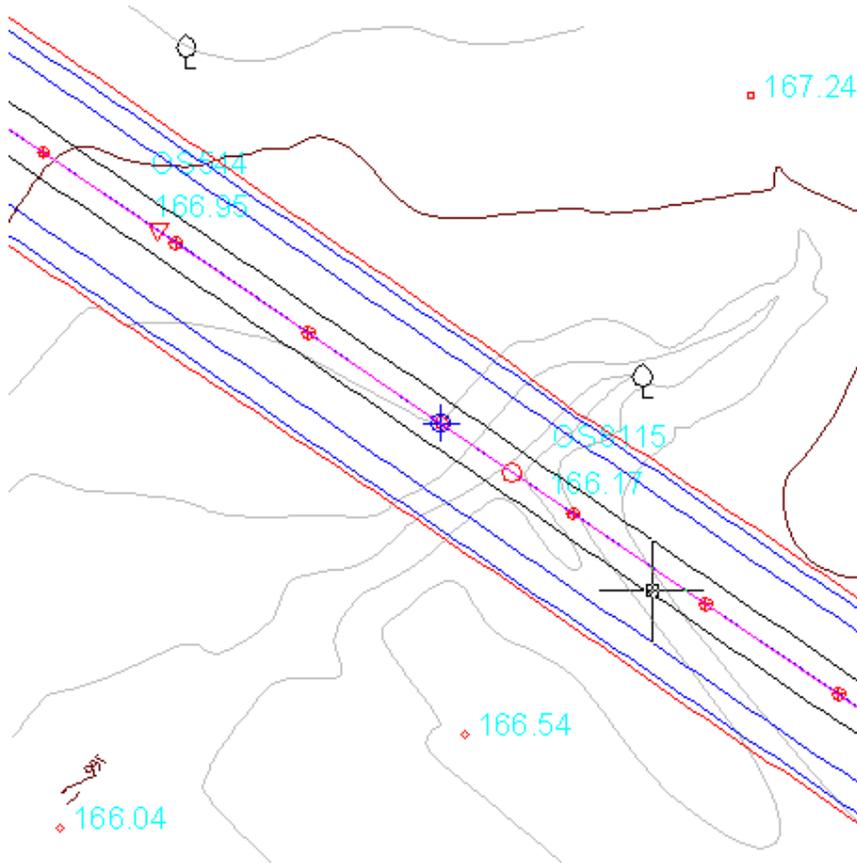
Give the correct starting chainage and click “Ok”.

Then program will allow user to select alignment in AutoCAD drawing at start of the alignment and end of the alignment so that program can recognize the starting point for the alignment.

[Note:

While selecting the alignment from AutoCAD drawing read the message in the command prompt of the AutoCAD carefully and do what suggest by the program systematically.]

The final plan drawing with boundary will give appearance as shown below.



Typical Plan of canal with its boundary lines fixed by cross-sections