

River surveys and output to EACSD

The general sequence involves inputting suitably organised and coded cross section survey observations into the drawing, preparing the drawing before generating the river cross and long sections, analysis and refining of the data and finally to write an EACSD (Environment Agency specified format) file.

The survey – from site to the plan drawing

What to survey

For cross sections :-

- 1 Ensure there is adequate width to cover either side of the channel
- 2 Survey the soft bed
- 3 Survey the hard bed
- 4 Include structures such as bridges and walls
- 5 Include the water level
- 6 Photos of the section – general view, close ups, structures and points of interest. Mark the locations where the photographs were taken from with CA coded observations (see below)
- 7 Date and time (time optional)
- 8 Survey method (normally total station)
- 9 Structure dimension (length)

For long section and other items :-

- 1 Left and right banks
- 2 Structures
- 3 Bed – soft, hard and structure
- 4 Inverts
- 5 General photographs with location of the camera marked by a CA coded observation (see below)

Codes

Suggested survey coding using the first two characters of the code :-

- | | |
|------|---|
| SB | Soft bed (include where the water meets both banks) |
| HB | Hard bed |
| HC | High chord (defining the top of a structure) |
| DF | Defence |
| CU | Culvert |
| BS | Bridge spring points e.g. bridge arch one BS01, bridge arch two BS02. These are drawn as 3D Polylines with three vertices that will be output as SL1, SO1 and SR1 (spring point left, soffit and spring point right). |
| WD | Weir Downstream Toe |
| WU | Weir Upstream Toe |
| WC | Weir Crest |
| LBPI | Pipe invert on left side of river |
| RBPI | Pipe invert on right side of river |
| LC | Low chord – used for defining irregular structure shapes |
| CA | Location where photographs are taken from – specific photographs will be linked later. |

Codes for general information and admin. Take these optional observations near to each cross section :-

IWL0 Water level

ITM0 Survey time (optional). Add the current time as a comment e.g. "13.45" (1.45 pm)

IDT0 Survey date. Add the current date as a comment e.g. "04.04.2014" (4th April 2014)

ISD0 Structure dimensions – enter the length of the structures as a comment e.g. "16.25"

ISA0 Structure skew angle. Add as a comment e.g. "13"

INT0 General note added as a comment e.g. "High tide"

IDS0 Description added as a comment e.g. "Roman bridge"

Survey method :-

ISM1 GPS

ISM2 Level and tape

ISM3 Total Station

ISM4 Echo sounder

Section type :-

ITP1 Open

ITP2 Structure

All the above will be read into the drawing from the survey data as Tag Information Blocks (TIBs).

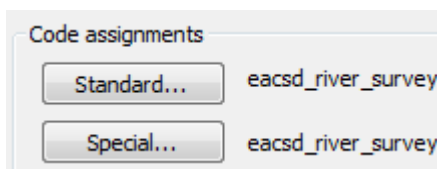
Survey input

See the help system for information on menu items *Land Survey*, *User specific Observation file Input(s)* and *File utilities, .txt Co-ordinate files, Input*.

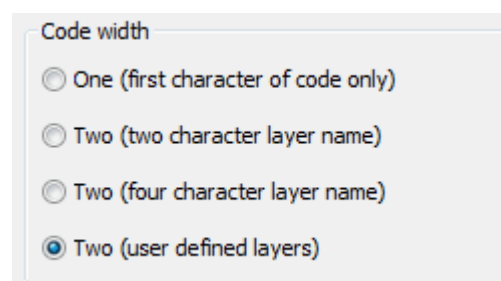
471041.325	164500.073	41.990	89	SB04
471012.271	164541.224	42.020	90	SB04
470936.507	164486.801	43.380	91	SB04
470897.558	164401.346	43.650	92	SB04
470887.145	164382.627	43.060	93	IWL0
470883.669	164372.243	43.620	94	BS01
470851.179	164319.163	44.460	95	BS01
470803.450	164264.119	44.470	96	BS01
470696.061	164180.677	44.480	97	ITP1
470660.723	164163.471	44.010	98	IDT0 04.04.2014

In the small extract from a .txt co-ordinate file above observations 89, 90, 91 and 92 are on the soft bed, 93 is the water level, 94, 95 and 96 are defining bridge spring points and observation 98 is the date of the survey.

Use menu item *Land Survey, User specific Observation file Input(s)* to draw the majority of surveyed features as 3D Polylines on suitable layers.

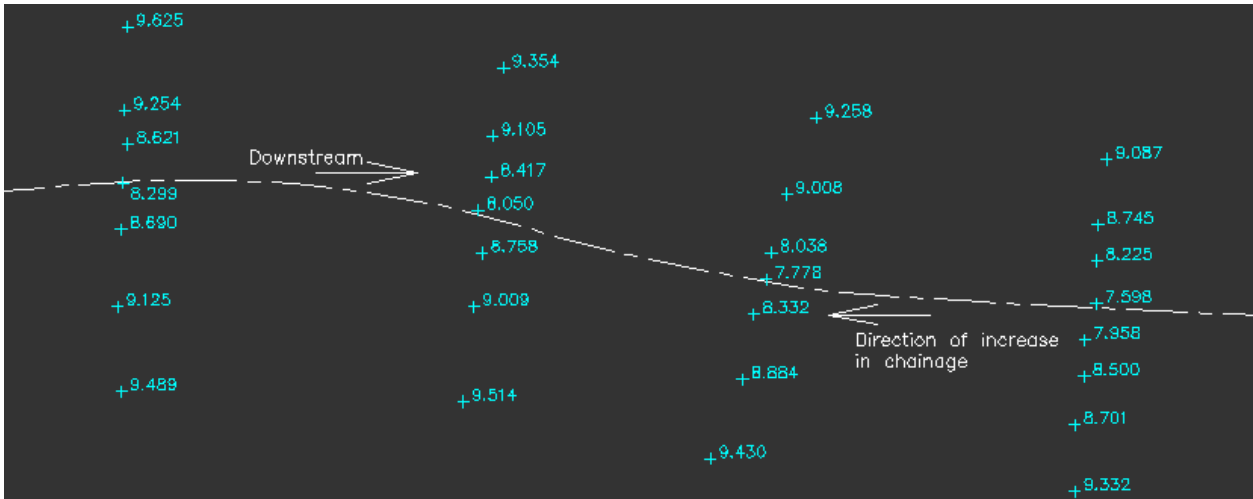


Import the supplied EACSD .stc and .spc files from the program support folder and set the code width :-

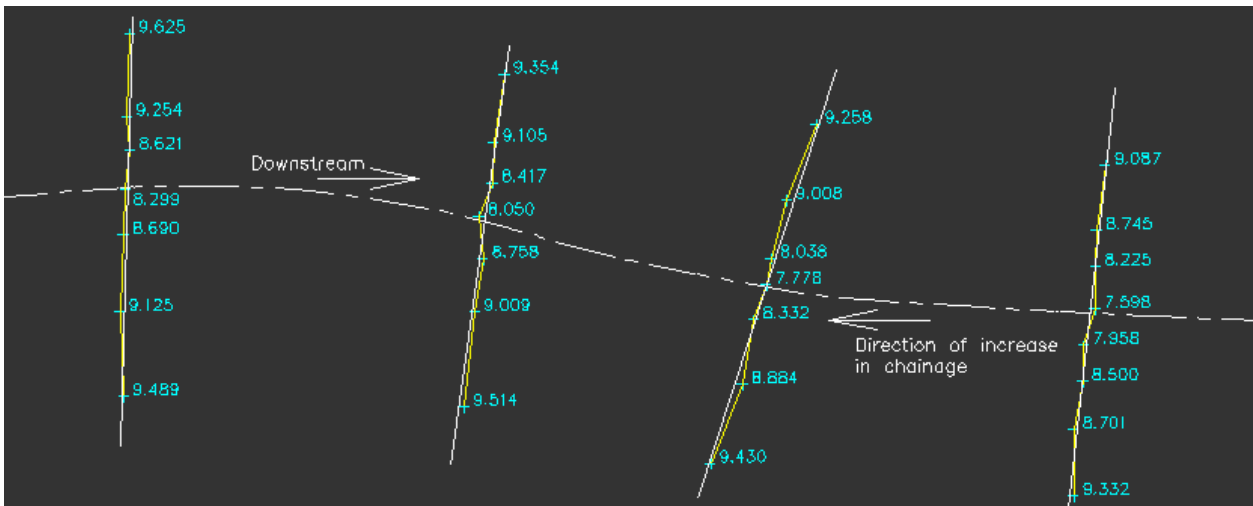


Note that all soft bed, hard bed, chord, wall and defence features should now be represented as 3D Polylines on suitable layers. The vertices of the 3D Polylines will be projected onto the section location 2D Polylines.

Starting with level blocks



If the starting point is levels as shown above and not 3D Polylines these need to be joined by using menu item *3D Polylines, from picking Levels*. The 3D Polylines representing the soft bed are shown in yellow below and also the section location 2D Polylines in white before they have been trimmed.



The white section location 2D Polylines have been drawn from north to south in the above example i.e. left and right for the sections to be created is in relation to the downstream direction.

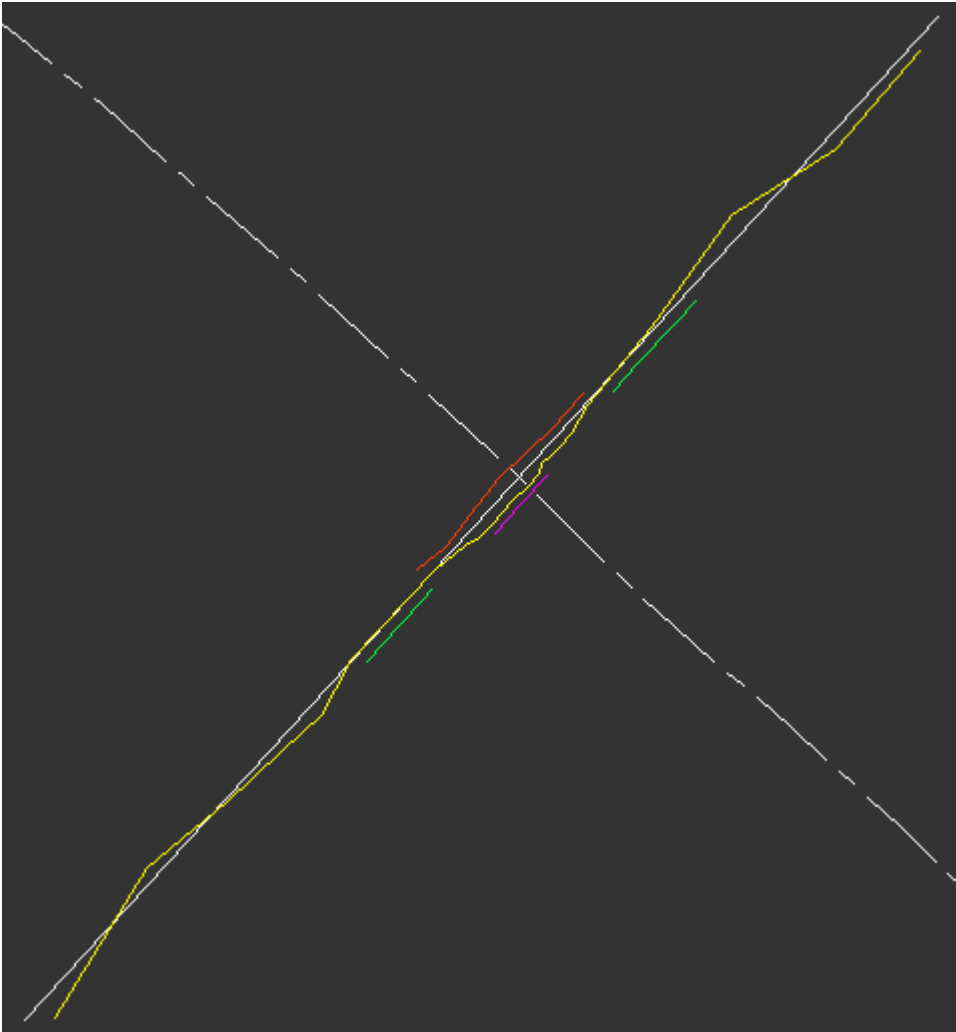
Drawing preparation

Centreline

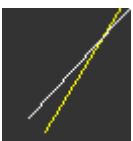
Draw the river centreline as a 2D Polyline. This may be sketched by hand on top of the survey information or you can use the surveyed river centreline Polyline if that is included with survey. Compare the centreline with OS background to ensure the location looks OK. Note that the **direction of increase of chainage is upstream** so the direction of this 2D Polyline must also run upstream.

Section location 2D Polylines

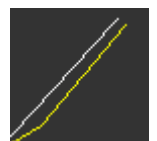
These need to be drawn by hand from left to right going **downstream** at each surveyed cross section location making sure that the Polylines reach beyond the surveyed data at each end.



River centre in white (center linetype)
Section location in white (continuous linetype)
Soft bed in yellow
High chord in red
Defences in green
Bridge spring points in magenta



The section location 2D Polyline lines need to be trimmed to the extents of the survey data i.e. the white section location 2D Polyline needs to start and end at locations defined by the extents of the observed section (start and end of yellow soft bed in the above example). Use menu item *Polyline utilities, Trim Polyline by another Polyline*



Cross Sections

Ensure that the cross section (soft bed, hard bed, structures, walls etc.) are represented as continuous 3D Polylines on appropriate layers. Also look for the tagged information Blocks for each section making sure they are within 1.5 metres from the section location 2D Polylines.

Tag Information Blocks (TIBs) are like KTF level blocks but with a fourth attribute of "TAG".

```
+<description: Open Channel>
+<type: Open>
+<water_level: 41.990>
+<survey_method: Total Station>
+<survey_date: 11Mar2014>
```

TIBs shown in cyan

Photographs

Minimum requirement per section is one close up and one distance photo. Rename the photos by section name, for example 1001_closeup.jpg, 1001_distance.jpg, 1002_closeup.jpg and so on. Use photo software like IrfanView to reduce the file sizes to something sensible, say, below 500kB per photo.

Survey observations should include CA coded points to mark locations where the photograph was taken from with a Camera block.

Menu item *KTF, Translators, Rivers, Digitise river photo locations* to place the relevant TIBs at the surveyed locations marked by Camera blocks for the relevant sections. Remember to mark the cross section chainage in the TIB block if the location is not near enough to the section.

Layer...	Photo locations
Nominal Scale 1:	500
Block:	ktf_tag_info
Photo file name:	
Photo comment:	
Bearing:	
Chainage (optional):	
<input checked="" type="radio"/> Section photo	<input type="radio"/> General photo

```
+<section_photo:[1005_closeup.jpg][Culvert Outlet][225.021][1.005]>
```

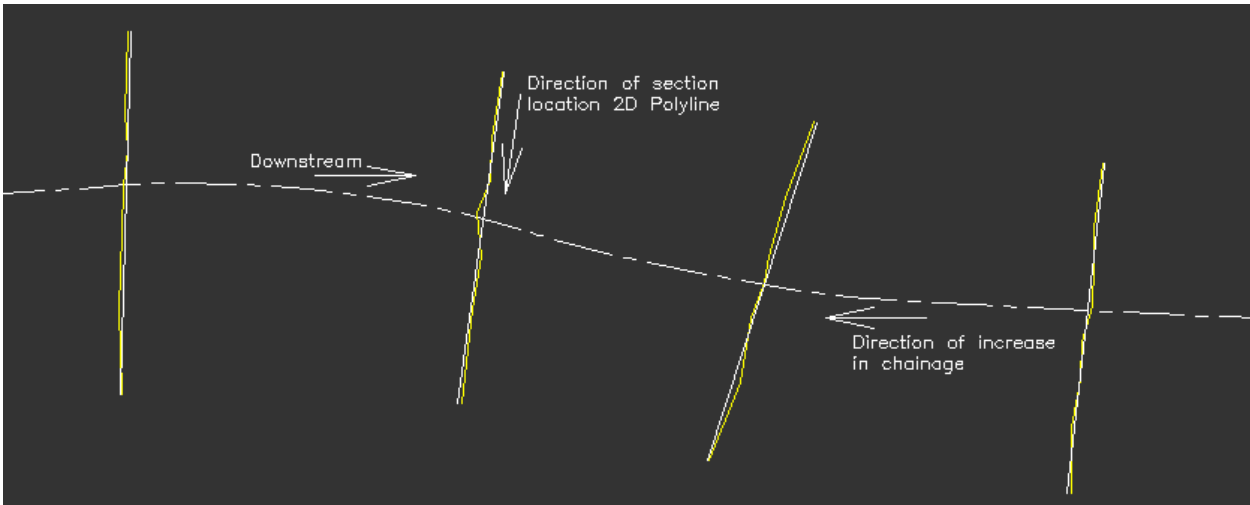
TIB with photo information

Long sections

Confirm that the 3D Polylines for long sections are OK. Left and right banks, walls, structures etc. And that they are on appropriate layers. Make sure all Level blocks for inlet pipes (coded LBPI and RBPI) are there and that they have descriptive labels.

Creating and drawing cross sections

Depending on the complexity of the drawing it may help to use *Layers and Erase, Freeze by all but selected entities* to only see the layers for soft bed, section location 2D Polylines and river centre only. The soft bed (yellow) is the default channel unless other specified. The section location 2D Polylines have been trimmed.



Menu item *KTF, Translators, Rivers, Create River cross sections*

Select the 2D Polyline representing the river centreline.

Enter the River Reach reference.

Enter the number for the first section.

Enter the name for the output section file.

Return to write a .csv file listing section number, chainage, Easting and Northing on the centreline :-

```
Reach1,1.001,39.197,400086.580,100003.922
Reach1,1.002,65.009,400060.871,100006.009
Reach1,1.003,87.958,400038.541,100011.208
Reach1,1.004,116.522,400010.209,100013.893
```

Return to accept the default tolerance of 1.5. Any section data more than 1.5 metres from the section location 2D Polyline will be ignored. Do you need more? Be careful here as increasing the value will help include points taken outside of the 1.5 metre range but may include data from another section if the sections are close to one another.

Return to accept the reporting tolerance or reduce if sections are very close.

Select all the 3D Polylines representing the soft bed and the section location 2D Polylines.

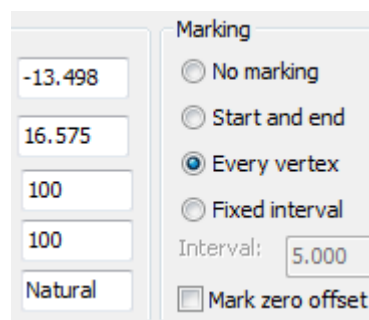
If errors were reported review and repeat until all is OK. Check how far away the vertices are from the relevant section location 2D Polyline.

Menu item *KTF, Sections, Draw cross sections*

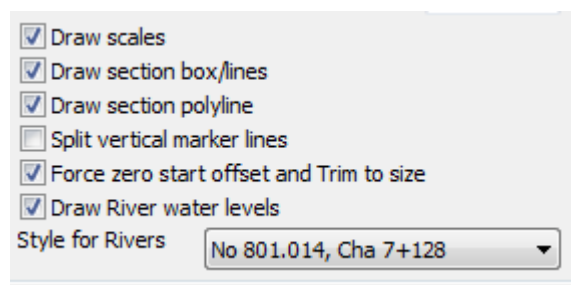
Select the .sek file you created above.

Choose a suitable section type.

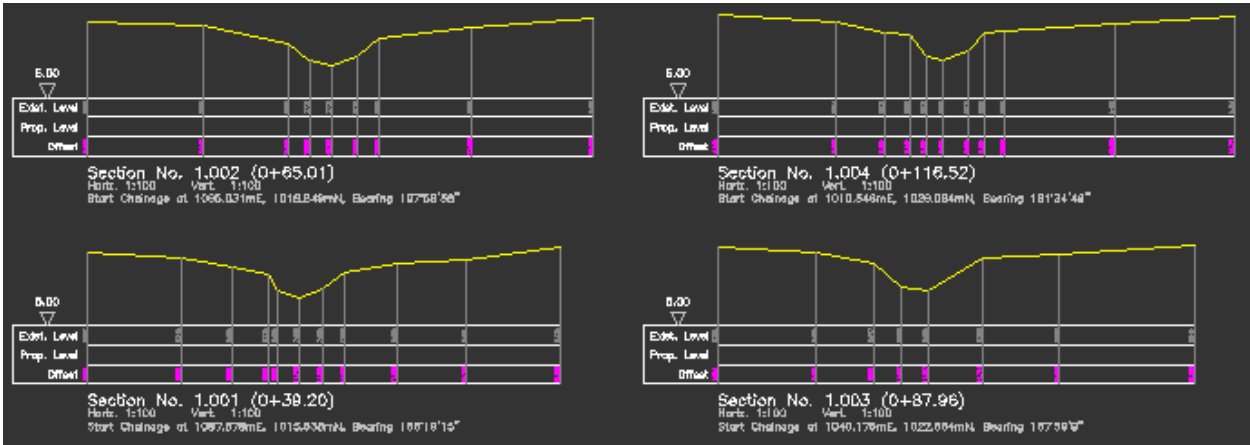
Typical scale and marking settings shown here :-



Typical defaults for section drawing should not be used but the following Drawing Options should be set :-

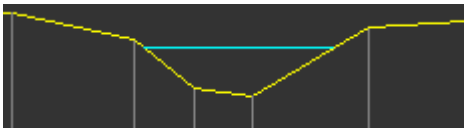


Ensure that the correct box and line are assigned for levels and offsets for the section type being used.



Note that the cross sections must be drawn in the same drawing as the 3D survey.

If a TIB with the TAG attribute value of <water_level: 9.255> (where 9.255 is an example water level) is close the section location 2D Polyline and is included in the selection set when creating the river cross sections this will enable the water levels to be drawn but they will need trimming.



Adding the other surveyed features to the cross sections

We now need to add features such as hard bed, bridges and walls etc. onto the sections. These features should exist as 3D Polylines from the survey input on suitable layers – see example on page 4. They will be drawn as 2D Polylines on the cross section on the same layer as the 3D Polyline.

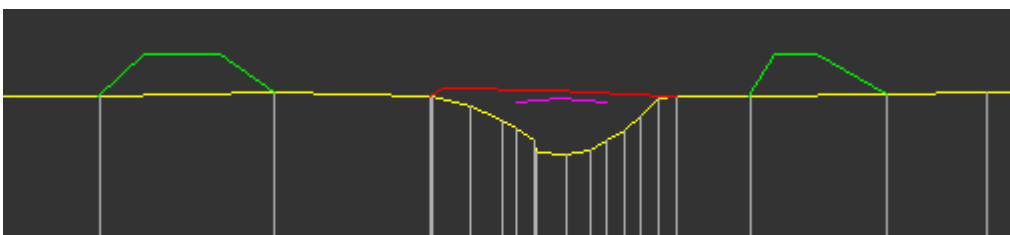
Menu item *Sections. Add to section(s), Levels and 3D Polylines from plan*

Select a cross section Datum line.

Select the corresponding section location 2D Polyline.

Select the 3D Polylines and level blocks for that section representing walls, structural details etc.

These features should now be drawn onto the cross section. Manually enhance the sections.



Soft bed in yellow

High chord in red

Defences in green

Bridge spring points in magenta

Working on Cross Sections and producing the EACSD file

Once the cross section drawings are ready i.e. all work as described above has been done it's time to wrap it all together and prepare them for EACSD output.

Menu item *Sections, Add to sections, Codes to vertices including EACSD output.*

Pick one cross section Datum line and select all the 2D Polylines section polylines that require coding. For example Soft Bed, Hard Bed, Structures and Water Level.

Cross section 1.001 at chainage 4.678 Description: Open Channel
 Polyline "SB", 1 of 3 polylines on section, 23 vertices. Layer: Soft Bed

No.	Offset	Level	Code	Comment	Vegetation	Surface	Irregularit
1	0.000	43.210	, ,	Grass	Soil		
2	7.342	43.126	, ,	Grass	Soil		
3	13.318	43.221	LB, ,	Grass	Soil		
4	17.390	43.133	, ,	Grass	Soil		
5	19.576	43.078	, ,	Grass	Soil		
6	20.345	43.058	, ,	Grass	Soil		
7	21.877	42.552	, ,	Grass	Soil		
8	22.607	42.236	, ,	Reed	Soil		
9	22.694	41.990	, ,	Reed	Gravel		
10	23.106	41.264	, ,	None	Gravel		
11	23.575	41.230	, ,	None	Gravel		
12	24.345	41.227	DB, ,	None	Gravel		

Highlighted section polyline type: Section data

Polyline controls: Header..., Edit vertex..., Mark lowest, Mark banks, <<, >>, Deselect

Section controls: Header..., New section, Volactivate, Clone codes, Show vertices

Write a KTF .txt file | Write a KTF .sek file | Write a .csv file | Write an EACSD file

Section, Header...

Specify the general information like survey date and method plus water level.

<< or >> to scroll through each Polyline. Enter the appropriate type for each one and the relevant data.