
This is in regards to Reporting 1 in 10,000 style Closure and Angle Balance reporting inside the SurvNet routine.

This option is useful for surveyors who due to statutory requirements are still required to compute traverse closures and for those surveyors who still like to view traverse closures prior to the least squares adjustment

In addition to the least squares statistical information, SurvNet gives the surveyor the ability to compute traverse closures during the preprocessing of the raw data. Traditional traverse closures can be computed for both GPS loops and Total Station traverses.

Closure for multiple traverse loops in the same raw file can also be computed.

This option has no effect on the computation of final least squares adjusted coordinates.

To use this option the user has to first create a traverse closure file. The file contains a .cls extension. The traverse closure file is a file containing an ordered list of the point numbers comprising the traverse. Since the raw data for SurvNet is not expected to be in any particular order it is required that the user most specify the points and the correct order of the points in the traverse loop. Both GPS loops and angle/distance traverses can be defined in a single traverse closure file.

After follow the steps on Page 2 to Create a *.CLS Closure file you can view the Traverse Closure Results by:

- 1) Click Process / Preprocess or Network Adjustment
- 2) Open the "Lst. Sq Reduction Report"
- 3) click on the "Unadjusted Obs." Tab and scroll all the way to the bottom to find "Traverse Closures"

Below is a sample of the report:

```
Traverse Closures
=====
Traverse points:
7,101,2-7,101

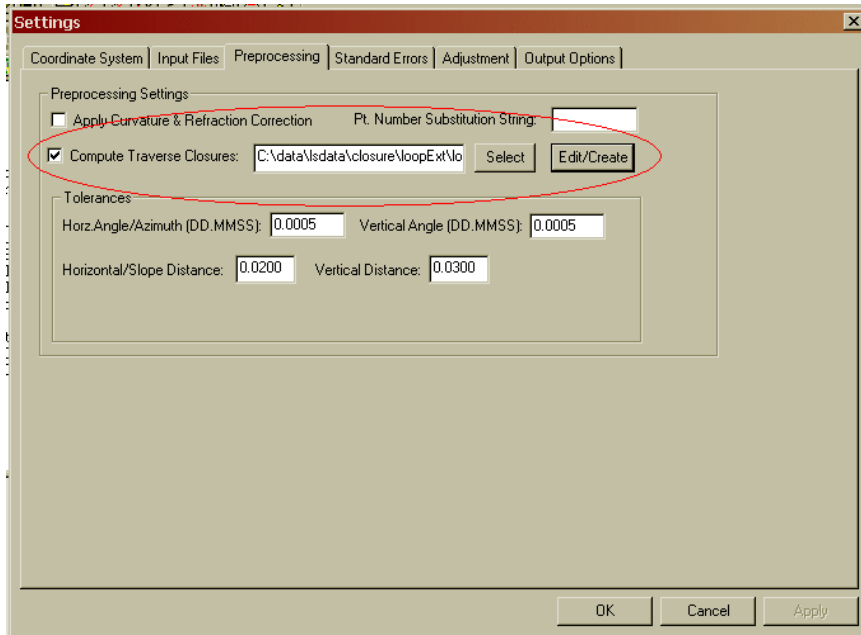
Loop Traverse; Interior direction reference;
Compute angle closure.

Do not compute vertical closure.
Total angular error: 000-04'16''
Angular error per point: 000-00'37''

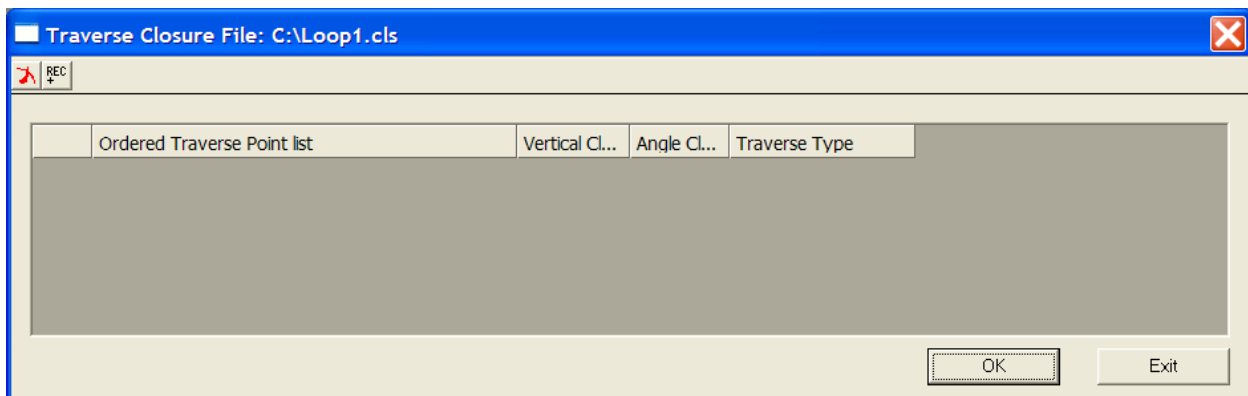
Correct Ending Coordinates, North: 249369.069 East: 642232.387
Ending Coordinates, North: 249369.156 East: 642232.360
Error, N: 0.087 E: -0.026 Total: 0.091 Brg: S 16-46'01''E
Distance Traversed: 344.651 Closure: 3776.794
```

To start a New Closure File window:

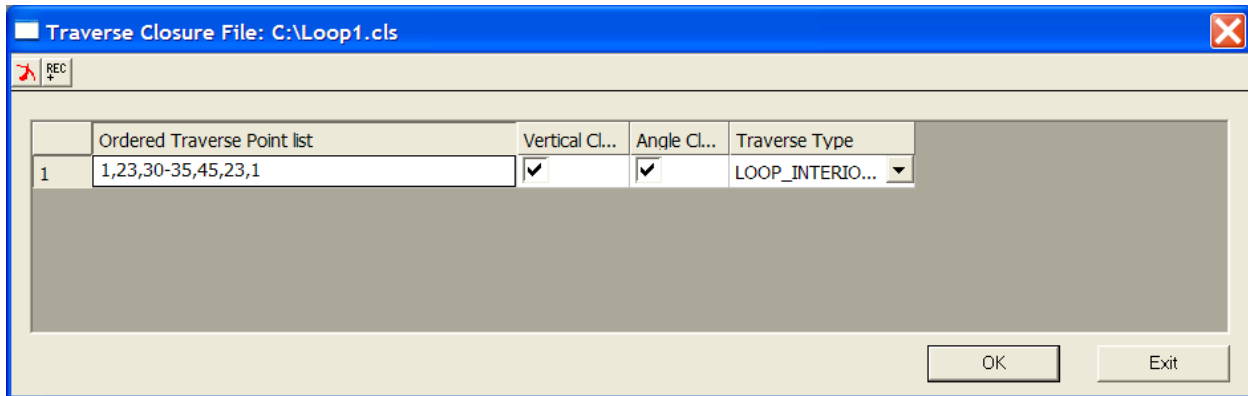
- 1) Click Settings / Project Settings / Preprocessing Tab
- 2) Check the box next to “Compute Traverse Closures”
- 3) Click “Edit/Create” to start a new file or click Select to choose an existing *.CLS file you have already created.
- 4) This opens the “Traverse Closure File” window



Step # 5) Click the “REC +” button in the upper left Corner to add a New “Traverse Point List”



Step # 6) Double click the White Box under “Ordered Traverse Points List” then Enter the points that define the traverse.



	Ordered Traverse Point list	Vertical Cl...	Angle Cl...	Traverse Type
1	1,23,30-35,45,23,1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	LOOP_INTERIO...

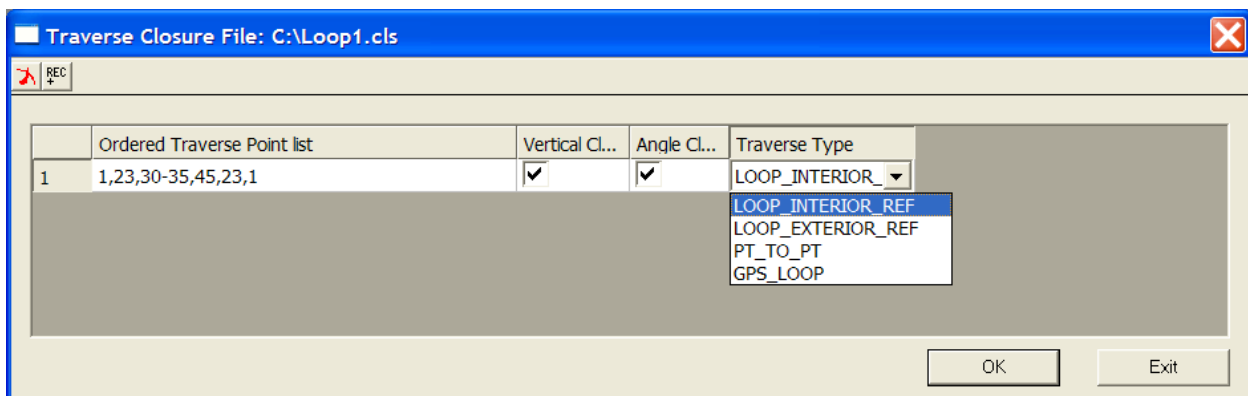
Points can be entered in the form:
1,23,30-35,45,23,1

A comma separates the point numbers. You can select a range (30-35) when the points are sequential. You must start with the first backsight point number and end with the last foresight point number. For example, if you have a simple loop traverse with angle closure using points 1, 2, 3 and 4, it will be entered as "4,1,2,3,4,1" where 1 is the first occupied point and 4 is the initial backsight.

You can turn the "Vertical Closure" ON or OFF by checking or unchecking the Box under “Vertical Closure”. If the vertical closure is ON, you will be shown the total vertical distance closure.

You can turn the "Angle Closure" ON or OFF by checking or unchecking the Box under “Angle Closure”. If the angle closure is ON, you will be shown the total angular error and error per angle point. If the final closing angle was not collected you can turn "Angle Closure" OFF and only the linear closure will be computed.

Step # 7) In order to calculate the traverse closure, you must select the TRAVERSE TYPE by double-clicking on “Loop_Interior” under Traverse Type and then left-clicking the type you would like to use.



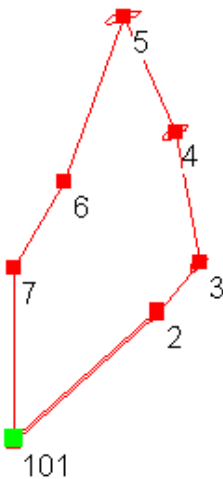
	Ordered Traverse Point list	Vertical Cl...	Angle Cl...	Traverse Type
1	1,23,30-35,45,23,1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	LOOP_INTERIOR_REF

Below is a List of Traverse Types:

Pt_To_Pt - A point to point traverse is a traverse that starts at a set of known coordinates and ends at another known coordinate. This option assumes you start from two control points and tie into two control points if an angle closure is desired and one control point if only a linear closure is desired. The first backsight distance and last foresight distance are not used in computing the linear closure. Following is an example = **100,101,2-5**

In the above Pt_To_Pt list Pt 100 is the starting backsight point, Pt. 101 is the starting instrument point. Pt. 4 is the ending instrument point and the foresight to the angle closure point is point 5. If a closing angle was not collected the list would look as follows: **100,101,2-4**

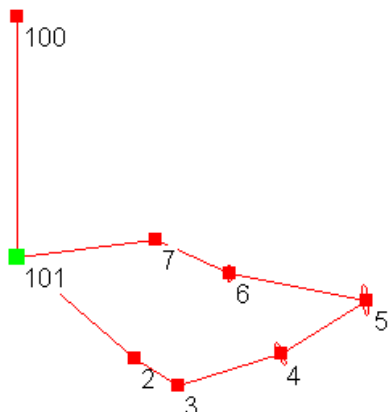
Loop_Interior_Ref - A closed loop traverse that begins by backsighting the last interior point on the traverse.



In the example to the Left we see a Closed Loop with an Angle Balance where point 7 is the backsight point and point 101 is the first occupied point which would use this list: **7,101,2-7,101**

If the closing angle Occupying 7 / Backsight 6 / Foresighting to 101 was *not collected* the list would be entered as follows: **7,101,2-7**

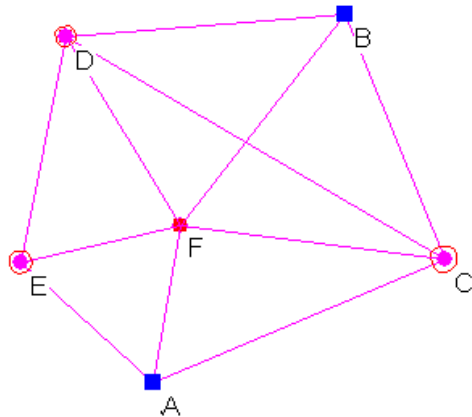
Loop_Exterior_Ref - A closed loop traverse that begins by backsighting an exterior point (point not on the traverse).



In the example to the Left we see a Loop with exterior reference and angle balance, point 100 is the backsight point and point 101 is the first occupied point the list would be: **100,101,2-7,101,100**

If the closing angle Occupying 101 / Backsighting 7 and Foresighting 100 was *not collected* the list would be entered as follows: **100,101,2-7,101**

GPS_Loop - GPS loop closures can be computed using this option



A,E,F,A

In the above example GPS loop, closure will be computed from the GPS loop going from A-E-F-A. After the closure, .CLS, file has been created the preprocessing project settings need to be updated to include the closure file in the project. Following is a view of the settings screen that defines a closure file to be used in preprocessing. Notice that the check box 'Compute Traverse Closure' is checked and a closure file has been entered in the edit box field. Notice that the 'Edit/Create' button can be used to edit an existing closure file or create a new closure file.

When the data is processed, the closure reports will appear in the RPT and ERR files. Following is an example of a closed loop traverse report:

Following is an example of a GPS loop closure report

```
Traverse Closures
=====
GPS Loop Points:
A,E,F,A

GPS Loop Closure;
Misclosure, X: -0.0323 Y: -0.0162 Z: -0.0105
Closure error: 0.0376 Perimeter: 20229.3858
Precision: 1:537594

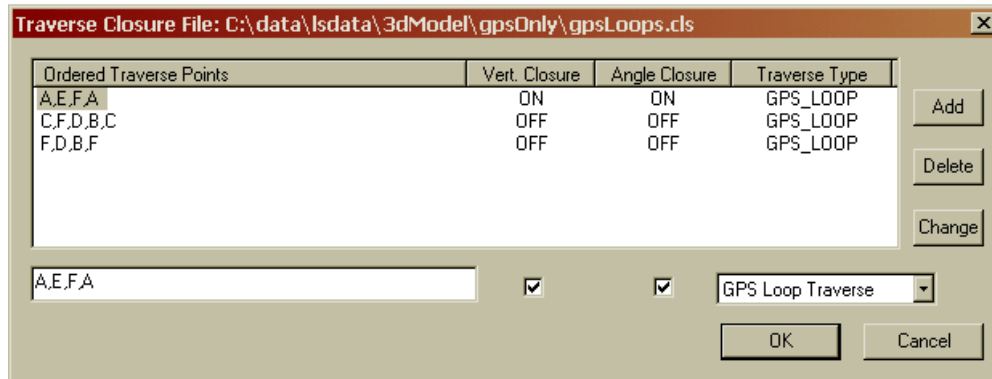
GPS Loop Points:
C,F,D,B,C

GPS Loop Closure;
Misclosure, X: -0.0121 Y: -0.0101 Z: 0.0002
Closure error: 0.0158 Perimeter: 41332.9807
Precision: 1:2622216

GPS Loop Points:
F,D,B,F

GPS Loop Closure;
Misclosure, X: -0.0022 Y: -0.0044 Z: 0.0097
Closure error: 0.0109 Perimeter: 30814.5047
Precision: 1:2833226
```

Following is a view of the closure file that created the above GPS closure report. The 'Vert. Closure', and 'Angle Closure' toggles serve no purpose with GPS loop closures.



Here is some Limitations of defining a Closure Report:

For a “Pt to Pt traverse” to get an angle closure you have to start on a pair of control point and tie in to a pair of control points. This is not a limitation of SurvNet it is just the mathematics of Closure.

The basic rule on a “Pt to Pt” traverse is if you want to get an angle closure you have to start on a pair of control points and end on a pair of control coordinates.

If you do not want an angle closure you still have to start on a pair of control points but you can end on a single point. If you do not start on a pair of coordinates you do not have any fixed, explicit starting orientation.

This is not a limitation of SurvNet. It is just the mathematics of Traverses in general.