Desurvey methods in MineSight Torque

Desurveying computes the geometry of a drillhole in three-dimensional space based on its collar location, and the raw dip, azimuth and depth data of one or more surveys. The resulting geometry is a polyline - a series of (X, Y, Z) coordinates. This polyline is used to find the composite locations.

This article will discuss the desurvey options available within MineSight Torque for converting survey geometry to polyline geometry, and the differing results each one produces. Several algorithms can be used for desurveying, and selection of the correct one is important, particularly in situations where data points are sparse. In a drillhole with a downhole depth of several hundred metres, the bottom-of-hole position can differ in the order of tens of metres depending upon the specific desurveying method which is employed. The larger the spacing between survey points in the data, the more sizable this spatial relationship can be. However, when simply creating an MSTorque drillhole view, the desurvey operation has no effect on the original data. It should also be noted that MSTorque desurvey options are not used for sample sites that already have polyline geometry – only sample sites with survey geometry are converted.

The desurvey methods available in MSTorque are similar to the **data smoothing options** within the MineSight Compass procedure **concsa.dat**, used for converting collar, survey and assay files to a single M201V1 input file. The two differ in that procedure **concsa.dat** creates the polyline geometry from the survey data. On displaying the drillhole, the same polyline will always be displayed. Conversely MS Torque stores the survey data, therefore the path of the drillhole in the MS Torque drillhole view will be different depending on the desurvey method chosen.

CONCSA.dat data smoothing options will be discussed in detail later.

When creating new drillhole views from MSTorque data, the **Selection and Filtering Wizard** presents two options for different desurveying algorithms available to be used:

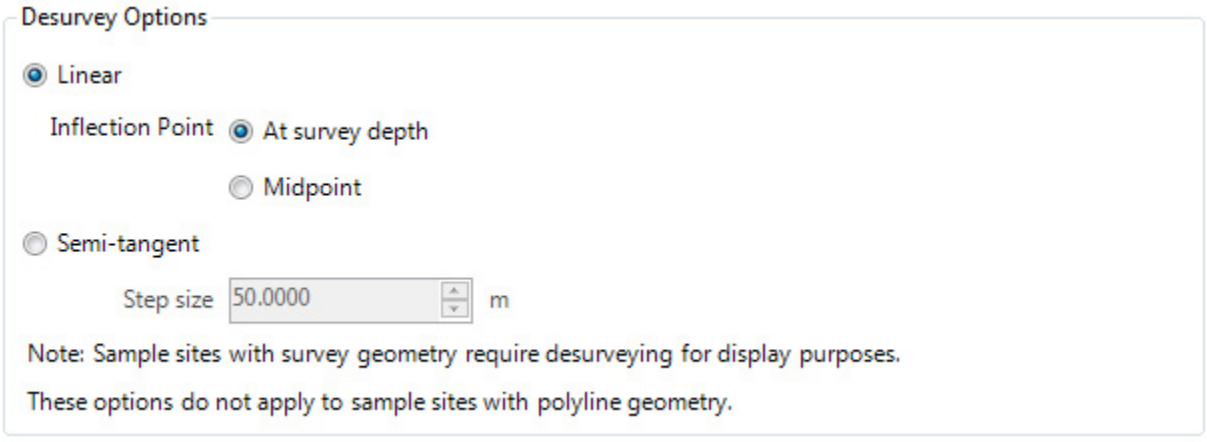

Figure 1) *Desurvey Options for MSTorque drillhole views.*

The first option available is to use a **Linear** algorithm. When this is selected, one polyline segment is generated for each survey, according to the **Inflection Point** option, which affects the outcome as follows:

- **At survey depth**: A new segment is started at each survey, and continues in a straight line to the next survey. For instance, if there is a survey at the collar, and every 100 feet down the hole, then our polyline segments would run from zero to 100 feet, then from 100 feet to 200 feet, and so on.

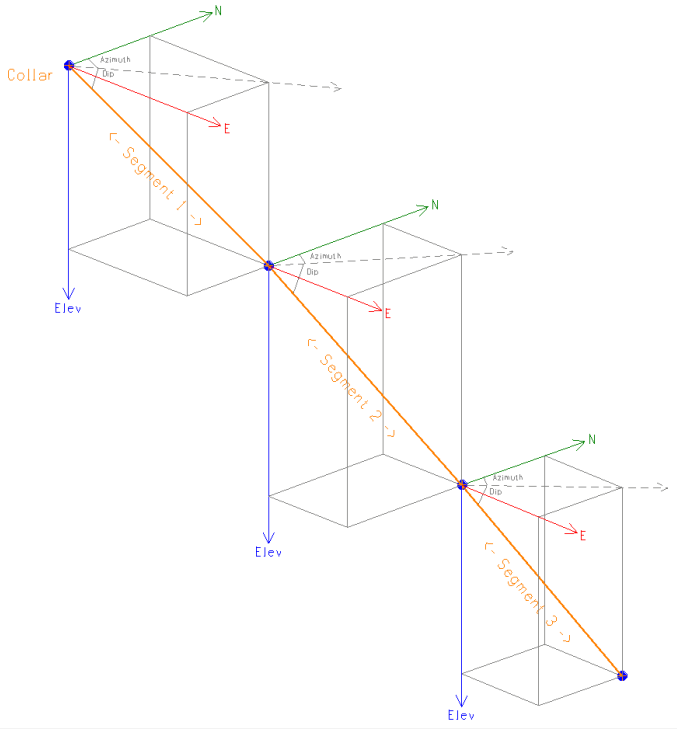

Figure 2) *Borehole geometry created from survey data using a* ***Linear*** *algorithm, with Inflection Point At* ***Survey Depth*** *(Survey points in blue).*

- **Midpoint**: Each segment is centred about a survey. For instance, in the previous example, our polyline segments would run from zero to 50 feet, then 50 feet to 150 feet, then 150 feet to 250 feet, and so on.

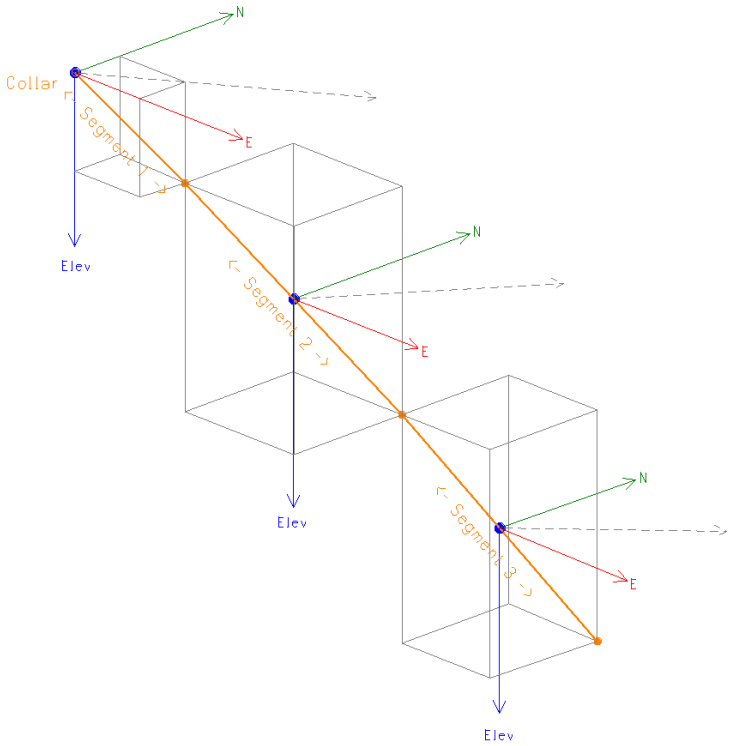

Figure 3) *Borehole geometry created from survey data using a* ***Linear*** *algorithm, with Inflection Point at* ***Midpoint*** *(Survey points in blue).*

The second desurvey option for an MSTorque drillhole view uses a **Semi-tangent** algorithm. This method creates a smooth curve from one survey to the next, whose tangent is exactly equal to the survey data at each survey depth. This curve is then approximated with a polyline of user specified **step size**. A smaller step size will produce a polyline more closely fitting the smooth curve, but it will also have more segments, which in turn may hamper performance.

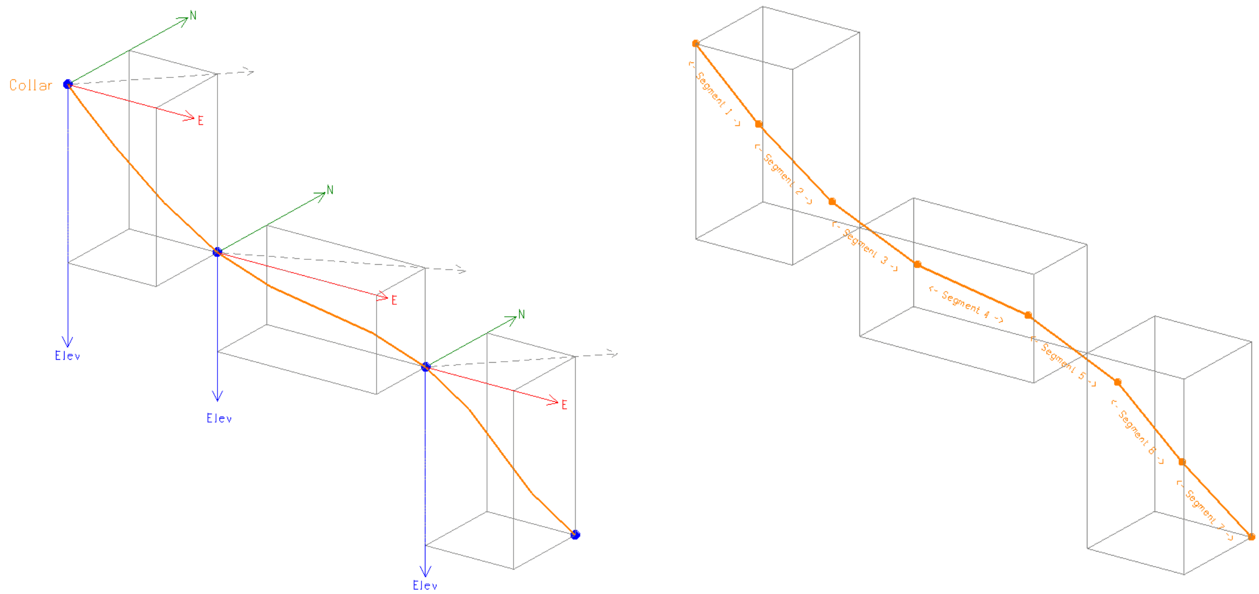

Fig 4) a) *Using the Semi-Tangent option creates a smooth curve from one survey to the next b) This curve is then approximated with a polyline according to the desired step size.*

In the MSCompass procedure concsa.dat, the desurveying options are made available by selecting **Modify the survey data** checkbox on the survey information panel. This will present an extra panel, which needs to be completed.

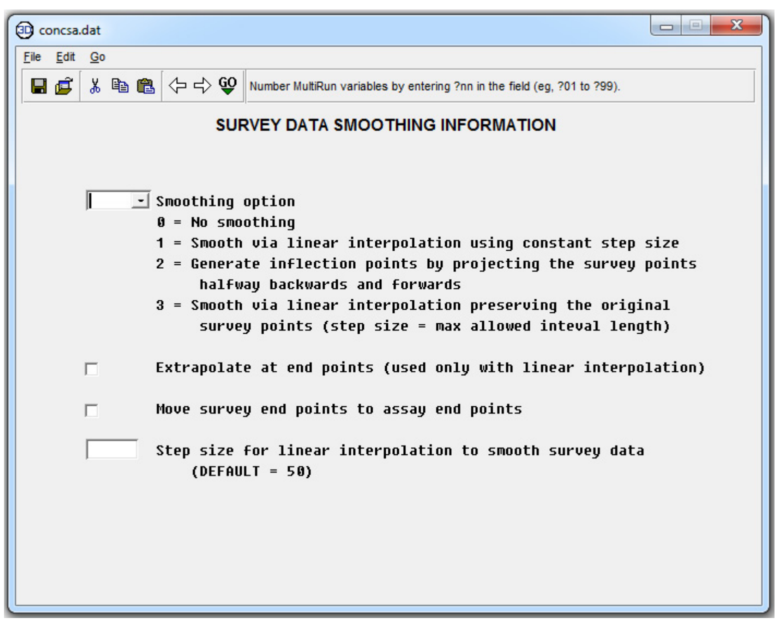

Fig 5) *Survey data smoothing options available in MSCompass procedure concsa.dat*

Smoothing options 0 through 3 provide you with different ways of interpolating the data for the desurvey operation. In contrast to MSTorque, concsa.dat completes all desurveying using a linear algorithm.

- Option '0 – No smoothing' has no effect on the data.
- Option '1 – Smooth via linear interpolation using constant step size' will smooth the data downhole according to a set step size, which is entered at the bottom of the panel and has a default value of 50 units. Just like the **semi-tangent** option for MSTorque, a smaller step size will give a more accurate interpolation, but too small a step size may hamper performance due to large numbers of segments.
- Option '2 – Generate inflection points by projecting the survey points halfway backwards and forwards' works in much the same way as using **Midpoint** inflection points does for MSTorque.
- Option '3 – Smooth via linear interpolation preserving the original survey points' will smooth downhole according to the designated step size, while ensuring that the interpolated drillholes pass through the original survey points where the data was recorded.

All desurveying methods give only an estimation of the true drillhole path. By selecting the desurvey method which gives the best likely approximation of the 3-D reality, the user can ensure that any subsequent modeling of a deposit is as accurate as possible. When creating a drillhole view from MSTorque data you're presented with several options for presenting data. Each of the options explained here differs slightly in its operation. Understanding how each works will help you select the correct one for your purpose.