KellyDown Tips

Periodic tips to help you use KellyDown more effectively

Grid North vs. True North

Question: I'm confused about how KellyDown handles Grid North and True North. You can switch between True North and Grid North on the fly when the horizontal origin is set to **Structure** or **Well** but when it is set to **Global** or **Project** you can only view coordinates relative to Grid North.

Answer: All data in KellyDown is stored relative to Grid North and then displayed relative to either Grid North or True North depending on the **Horizontal Origin** setting in the **Data Reference** panel.

Map Coordinates are always referenced Grid North and based on a square grid. It means that along a straight path, e.g. a wellplan, the direction to Grid North is always constant so it doesn't matter whether you are at the wellhead or the target, the angle between Grid North and the hole direction will always be constant.

Consider the following horizontal section view. **Well #1** is planned to hit a target 4000m to the north east of the well in a direction of 45° relative to Grid North. The convergence at the well is +1° indicating that the direction relative to True North is 44°.
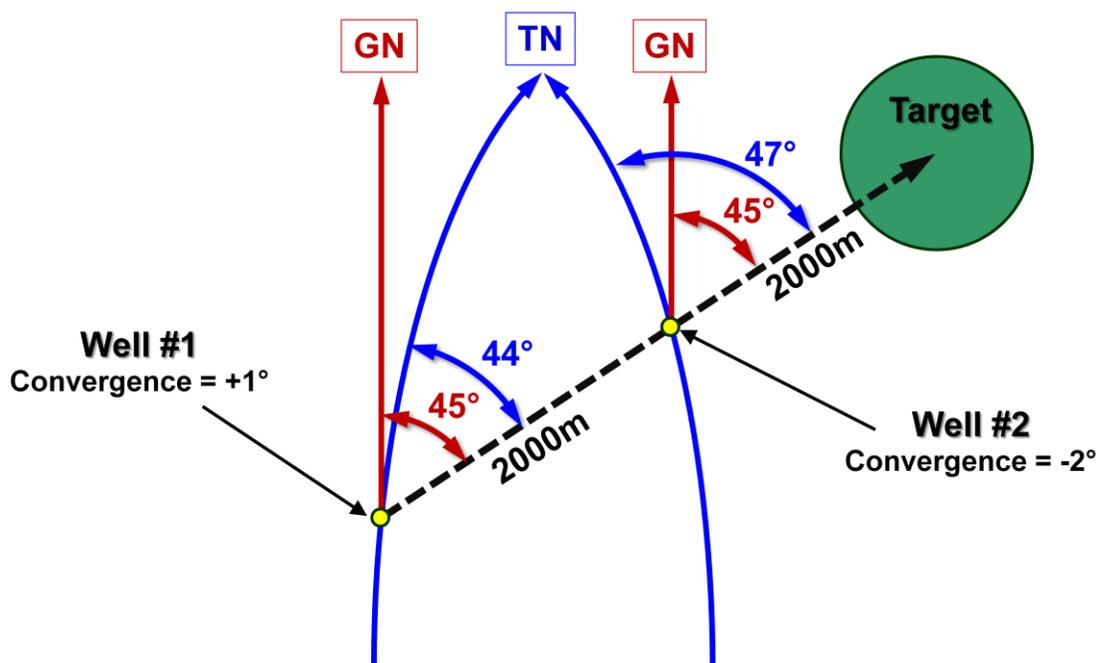
Where **Well #1** passes directly beneath the wellhead of **Well #2**, the direction relative to Grid North is still 45°, but the direction relative to True North has changed so that the convergence is +2° indicating that the direction to True North is now 47°.

When a well is drilled, it is normally assumed that the convergence applied to the survey data is constant for the whole length of the well, but this isn't necessarily so. Theoretically, one should compensate for the changing convergence when drilling a well relative to True North, but it doesn't typically make a enough of a difference to warrant such precision.

In KellyDown, all coordinates are converted to Grid North before being stored in the database and then converted back to True North if the reference is set to True North but this is only available if the horizontal origin is set to either Structure Origin or Well Origin because it is assumed that the adjacent wells are close to each other and can safely be assumed to have the same convergence value.

Wells that reside in a common project however, may be quite some distance apart; far enough that the difference in convergence could affect the relative directions between the wells. In this case, the user is only allowed to view the coordinates relative to Grid North.

Consider a driller standing over **Well #1** looking towards **Well #2**; he is looking in the direction of 45° (Grid) and 44° (True). One might assume that a driller standing over **Well #2** looking back in the opposite direction towards **Well #1** might be looking in a direction that is 180° opposite to the driller standing over **Well #1**, i.e. 225° (Grid), 224° (True) . This is however not the case; relative to True North he would actually be looking in a direction of 227° (True).

A consequence of the changing convergence value is that KellyDown needs to know which North Reference was used to record the survey data stored in the database. Azimuths may be viewed relative to either Grid North or True North and this is not normally a problem, but consider the case where the surface coordinates of a well were in error when provided to the directional company and only discovered to be in error after one or more wells had been surveyed. Let's assume that the correction causes the well coordinates to change from those at **Well #1** to those at **Well #2** where the convergence changes from -1° to +2°.

The azimuth values for the well will have been recorded relative to either Grid North or True North, KellyDown needs to know which azimuths should be persisted when the well is moved to the correct location. If the Grid Azimuths are to be persisted, they will stay the same after the well has been moved but the azimuths relative to True North will change by +3°. If the True Azimuths are to be persisted, they will stay the same after the well has been moved but the Grid Azimuths will change by -3°.

Another consideration of course is that the wrong convergence value may also have been used when the well was surveyed, i.e. the convergence was calculated for the "wrong" well location. In this case, it is like a double negative because the convergence from True to Grid will have been correct for the "wrong" well location so the **Grid Azimuths** stored in the database will be correct for the wrong well location and therefore the **Grid Azimuths** should be persisted when moving the well to the correct location.

This **Original North Reference** that is to be persisted when a well is moved is set at the **Structure** level in KellyDown. By default, once set, it cannot be changed. This is deliberate because KellyDown needs to know which is the Primary North Reference in case a well needs to be moved.

It is possible however to change the **Original North Reference** in case a well needs to be moved when the convergence applied to existing surveys was calculated using the wrong well location or simply for correcting an **Original North Reference** that was set incorrectly when the structure was created.

To do so, simply double click on the **Original North Reference** setting; the word **Grid** in the screenshot shown above. Then select the correct **Original North Reference**.

Remember that the ability to change the **Original North Reference** is hidden for a reason. It is a record of which North Reference was used to record survey data and which North reference should be persisted when moving wells to a new location.

If you are changing the **Original North Reference** simply for the purpose of moving a well that was surveyed using a convergence calculated for the wrong well location, make sure that you set it back to the correct North Reference after moving the well.