

Using Geoid Models

The last 2 newsletters have defined **ellipsoidal** and **orthometric heights** and **geoid models**. This newsletter focuses on the use of geoid models and computing orthometric heights within SKI-Pro.

Unfortunately, this newsletter does not have the space to describe how to create a new geoid model and a co-ordinate system containing a geoid model – please refer to the **SKI-Pro On-Line Help** if necessary.

Computing Geoid Separations

Once a co-ordinate system is defined containing a geoid model and is attached to a project, **N values** (the **geoid / ellipsoid separations**) and orthometric heights can be computed for the points in that project.

With the project open, simply click on **Tools** and then **Compute Geoid Separations**. In the points tab view of the project it is then possible to see the N values and orthometric heights for all points.



Useful to Know

Based on the queries we receive in support about the use of geoid models, the following notes may be of use in explaining the use and functionality of geoid models.

- Geoid separations are only ever computed “on demand” (using **Tools** and then **Compute Geoid Separations** as just described) and during the export of points. For example, if additional data is imported into that project, or the co-ordinates of points are changed, then the correspond-

ing geoid separations and heights are **not** automatically re-computed and updated.

- If a new point is created within a project as a local point with orthometric heights and geoid separations are computed, then a local ellipsoidal height is computed for this point using the entered orthometric height and computed N value.
- N values are individually computed **for all co-ordinate triplets** of all points within a project.
- The N values and orthometric heights of points can only be viewed in the points tab view when points are being viewed as local co-ordinates. N values and orthometric heights of points can **never** be viewed when points are being viewed as WGS84 co-ordinates.

Using WGS84 Geoid Models

In particular, the use of WGS84 geoid models is sometimes not fully understood – the following information may help.

- Even if a WGS84 geoid model is being used, N values and orthometric heights of points can still only be viewed when points are being viewed as local co-ordinates.
- When using a WGS84 geoid model, the N value that is displayed is always the **local N value** – that is, the difference between the local ellipsoidal height and the orthometric height. This value is unlikely to be the same as the computed N value from the WGS84 geoid model.

This is initially difficult to understand and is worth explaining further. Imagine a co-ordinate system containing a **transformation**, the **Bessel ellipsoid**, **projection** and a **WGS84 geoid model** which is attached to a project. Surveyed

points are then imported into the project.

Immediately after import, the WGS84 and local co-ordinates (including the WGS84 and local ellipsoidal heights) of the points can be viewed in the points tab view of the project. For example, point 9001 has a **WGS84 ellipsoidal height of 437.667** and a **local ellipsoidal height of 463.632** (remember, these are the heights of the point above the surface of the corresponding ellipsoid).

The user then chooses to compute the geoid separations (using the WGS84 geoid model as defined in the co-ordinate system). The geoid model returns a value of **46.584m** – this is the difference between the geoid and the WGS84 ellipsoid at this particular point. This value of **46.584** is applied to the **WGS84 ellipsoidal height** which results in an **orthometric height** for this point of **391.083m**.

The user now chooses to view the points as local co-ordinates within the project. The local ellipsoidal and orthometric heights are seen, but the **geoid separation** is shown as **72.549**.

This is quite correct, because as already stated, the local N value is only ever shown and this is computed as the difference between the local ellipsoidal and orthometric heights. Thus, $463.632 - 391.083 = 72.549$

Remember...

- Geoid separations are only computed on demand or during the export of points
- Geoid separations are only shown when viewing local co-ordinates in the points tab view
- Geoid separations computed from a WGS84 ellipsoidal model are transformed and displayed as local geoid separations