Intensity is an important piece of information that is collected by laser scanner systems. The intensity value is the strength of the return pulse, or the amount of energy returning to the system. The intensity is influenced by a number of factors, including the reflectivity of the target, where, highly reflective targets, such as paint markings, result in a higher intensity return than low reflectivity targets, such as asphalt. This variability in the intensity is what allows for a pseudo black and white image to be generated from LIDAR data (Figure 2). With LIDAR data the intensity of the return can also have a significant effect on the elevation of the resulting discrete point. System manufacturers generally attempt to compensate for systematic range biases through the use of intensity tables, or intensity based range correction (IBRC) tables that are unique to each system. If these tables are not correct, or if the system is behaving in a manner contrary to the calibrated values then one will notice highly reflective objects appearing in the DEM (Figure 1) even when they should have relatively the same elevation as the surrounding surface. Typically paint markings, or highly reflective objects, will appear higher than the elevation of the asphalt surface.

Figure 1: DEM with visible abberations from paint markings

TerraMatch provides assistance in determining, or correcting the IBRC’s for laser scanning data using the **Find Range Correction** tool on the Match toolbar. For airborne data the best place to make such a range correction determination is from a smoothly changing hard surface with differing intensity values, such as...
airport runways with highly visible white paint markings. For mobile scanning, a road or parking space, AND a special calibration mat, would be necessary since the accuracy of the mobile system is greater than the elevation differences of paint markings on a road surface.

Figure 2: Intensity image of the Malmi airport in Helsinki, Finland

The Find Range correction tool requires that the data suitable for finding range corrections be classified into a single class.
Figure 3: Suitable surfaces classified

Running the Find Range Correction tool (Figure 4) then compares these laser points to determine a suitable elevation correction value across the spectrum of intensity values (Figure 5).
The results can then be saved as a TerraMatch Solution file (TMS) and applied in the same manner as typical calibration corrections, or may be combined with a system manufacturer's correction table in order to be used when running the processing of the range and associated information into a LAS file using the system manufacturer's proprietary software.

The result is a DEM unaffected by the intensity values of the returns (Figure 6). The profiles (Figure 7 and Figure 8) show the resulting reduction in the noise of the laser returns on the runway surface, where the overlain grid in the images are a ten centimeter spacing. By having a calibration dataset collected over a runway, or other suitable features, TerraMatch provides data providers with the capability to correct
corresponding project datasets that may exhibit these kinds of aberrations saving the time, effort and expense of reflights. To learn more about TerraMatch and how it may aid in the calibration of airborne laser scanning data join us October 21-24, 2014 in Huntsville, AL for a four day training event on the Terrasolid products.

Figure 6: DEM after IBRC applied

Figure 7: Profile of pre IBRC data
Figure 8: Profile of post IBRC data

Note: The Find Range Correction tool does not correct intensity values themselves, only the systematic elevation errors caused by the high intensity values. There’s another tool, Find Intensity Correction, which we’ll address in a future article for modifying intensity values to assist with feature extraction from laser scanning data.