



# TOPICS

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## Beyond A Bird's-Eye View: Aerial Mapping Goes High Resolution

Aerial mapping is not just for getting a bird's-eye view of project sites anymore. Aerial photography has long been an easy way for land and energy developers to visualize potential sites, but photogrammetry – or the process of correcting for topographic relief and obtaining ground measurements from remotely gathered images – has evolved into a powerful and cost-effective way to map large sites.

With high resolution aerial mapping, it is possible not only to see spatial relationships of objects on the ground, but also to gauge their elevation and height above ground. Being able to collect the three-dimensional coordinates of site features provides a valuable tool for documenting existing conditions and designing projects. Digital orthophotos (which are the products of photogrammetry) and their associated terrain data can be used to obtain more current and accurate measurements than are possible with government-issued topographic maps or outdated aerial photos.

Acquisition of high resolution aerial mapping might sound expensive, but the approach is both cost-effective and highly accurate compared to other alternatives for site or route selection. Satellite imagery via web-based data viewers and Digital Orthophoto Quarter Quads (DOQQs) from the U.S. Geological Survey are easy to acquire and low-cost, but they cover large areas at low resolution and may be updated only every 2-3 years. Satellite images and DOQQs can be helpful in early planning stages and may suffice for smaller projects, but the accurate terrain and feature data needed for design must then come from other sources. Remote sensing technologies, such as lidar, produce high resolution data but can be costly to mobilize. Traditional ground surveys are ultimately the most accurate, but the labor involved makes them best suited for data collection once sites or routes have been selected. The high resolution digital orthophoto provides an optimal balance between cost and accuracy.



High resolution aerial mapping can be used to obtain detailed topographic data without requiring a ground presence. Red lines show 2-foot contours in this residential neighborhood, with green lines highlighting depression contours.



Photogrammetric techniques allow for measurement of both distance and elevation. With a resolution of up to 20 or more times that of standard DOQQs, the techniques are accurate enough to measure the height of H-frame poles and conductors for this transmission line entering a substation.

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High resolution aerial mapping is acquired using low-distortion, calibrated camera systems mounted to fixed-wing aircraft or helicopters. Overlapping individual images are subjected to a process known as aerial triangulation, which results in images with known position and orientation. Surveyed ground control points are used to establish the photo-to-ground relationship. The images, when used as "stereo pairs," result in a virtual 3-D model of a portion of the earth's surface. Point and line data that define landscape features are then collected to develop a Digital Terrain Model. The data are in the form of X, Y, Z ground coordinates for every point observed and can be used to locate and measure any feature of interest to the developer or designer.

The acquisition of aerial photography must be properly timed to achieve the necessary image quality, which is affected by environmental conditions including solar elevation, season, wind, and weather. The right shadows are needed to enhance detection and recognition of objects such as poles, fence posts, signs, and trees. Photography of areas with deciduous tree canopies should be acquired in fall or spring when foliage is not present, and the need to observe bare ground means that times of snow cover and mature crops should be avoided. Careful consideration during the planning process results in optimal image acquisition for design purposes.

By reducing data collection time on the ground and producing image-based visualization of features affecting project design, high resolution digital orthophotography moves beyond a bird's-eye view to provide accurate, cost-effective solutions for site or route evaluation in the planning and design phases of your next project.



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